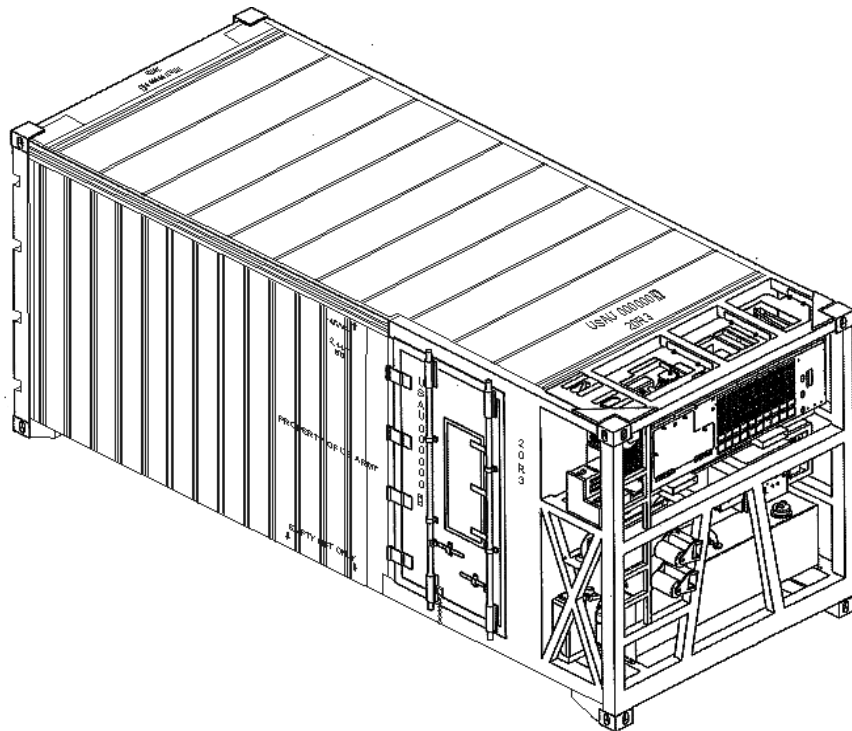


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TECHNICAL MANUAL

OPERATOR AND FIELD MAINTENANCE MANUAL FOR MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)

NSN 8145-01-534-3597



DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

**HEADQUARTERS, DEPARTMENT OF THE ARMY
1 SEPTEMBER 2010**

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous material warnings that must be understood and applied during operation and maintenance of the MTRCS. Failure to observe these precautions could result in serious injury, long-term health hazards, or death to personnel. A summary of the safety and hazardous substance warnings that must be adhered to during operation and maintenance of the MTRCS is provided in the paragraphs below.

FIRST AID DATA

Refer to FM 4-25.11 for general first aid data descriptions.

GENERAL SAFETY WARNINGS

WARNING

Electrical Hazards

Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Electrical voltage and current cannot be seen, and when contacted can result in death, render you unconscious, or severely burn you. Use extreme care when working around or with energized equipment. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning. To ensure your safety and that of other maintenance personnel, always observe the following precautions:

- Prior to installation, make sure power cable outer jackets are not cut or damaged and there are no exposed wires.
- Make sure that the generator is electrically grounded. Failure to establish electrical ground may result in equipment damage, serious injury, or death from electrical malfunction.
- Do not stand in water while handling live power cords or electrical shock may result.
- Position all power cables so that they are out of the way during operation and are not lying in water.
- Do not perform any maintenance on electrical equipment unless all power is removed.
- Be certain that there is someone assisting you who can remove power immediately when needed.
- Always place power off warning tags on circuit breakers or power supply switches so that no one will apply power while you are performing maintenance.
- Be careful not to contact high-voltage connections of 115 VAC input connections when installing or operating this equipment.
- Whenever possible, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.
- Do not disconnect power cables when power is ON, or generator set or refrigeration unit is operating.

WARNING SUMMARY – CONTINUED

WARNING

Heavy Equipment Hazards

The MTRCS weighs approximately 13,400 pounds unloaded and up to 36,250 pounds in the fully loaded configuration. Always use a properly rated forklift, crane, or lifting device if moving the MTRCS. Make sure that the sling used during lifting is properly rated for the load, crane, or lifting device. Do not allow personnel below a suspended or swinging system if using an overhead lift. Failure to comply could cause serious injury or death to personnel, or damage to the equipment.

To prevent slippage of hoisting slings during lifting operations, always use spreader bars.

Never perform a lifting operation alone. Always use guide ropes to move hanging assemblies.

Lifting or moving heavy equipment incorrectly can cause serious injury. Many of the components and items associated with the MTRCS weigh more than 42 pounds and are classified as a two-person lift. Do not try to lift or move more than 42 pounds by yourself. Bend legs while lifting and do not support heavy weight with your back.

A lack of attention or being in an improper position during lifting operations can result in serious injury or death. Pay close attention to movements of assembly being lifted. Do not stand under lifted assembly or in a position where you could be pinned against another object. Watch your footing.

Loading of the MTRCS is performed with a forklift. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. MTRCS loading is partially performed with a forklift. The forklift will be used to lift pallets. The pallet jack will be used to position pallets inside container. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

Never lift, move, or push a refrigerated container system with an insufficiently rated forklift. The MTRCS can fall from regular forklift tines or cause the forklift to flip over, possibly resulting in severe injury or death to personnel and damage to equipment. Use only equipment designed for use with the MTRCS. Never attempt to maneuver a forklift into the container using unpinned MTRCS ramps. Make sure that the MTRCS ramps are pinned into position before driving the forklift on them.

Make sure rear doors are secured to container frame when in the open position. A gust of wind can cause unsecured doors to slam shut with great force possibly causing severe injury or death to personnel.

WARNING SUMMARY – CONTINUED

WARNING

Rotating Parts Hazards

The MTRCS contains parts that rotate and vibrate. Keep hands, feet, clothing, and any loose personal items clear of the equipment while it is operating. Make sure that electrical power is disconnected before attempting to perform any PMCS, troubleshooting, or maintenance on the MTRCS. Failure to comply with this warning can result in serious injury or death to personnel.

The automatic starting and stopping capability of the MTRCS refrigeration unit creates a potential at any time for unannounced diesel engine start. This thermostatic cycling may cause unannounced starting of fans and V-belts. Always use care around the MTRCS when in running condition. Failure to adhere to this warning could result in serious injury or death to personnel.

WARNING

Fuel Hazards

Fuels are toxic and combustible. Always wear eye, face, and hand protection when working with or around fuel. Avoid contact with skin and clothing, and do not breathe vapors. If contact with eyes is made, immediately flush with clean water and get immediate medical aid for eyes. If contact with clothing or skin is made, immediately remove contaminated clothing, clean skin with mild soap or cleanser, and flush with clean water.

Always store fuel container in well-ventilated area as far away as possible from open flames and other potential ignition sources. Failure to observe fuel warnings could cause damage to the equipment, fire danger or potential explosion, and injury or death to personnel within or around the equipment.

Do not fill the fuel tank above the white line marked on side of tank. Movement of MTRCS during transport will cause fuel to spill if tank is overfilled. Make sure a fire extinguisher is nearby when refueling the fuel tank or operating the generator set. Failure to observe fuel filling warnings may cause injury or death to personnel and damage to equipment.

Leaking or spilled fuels will create a fire danger, injuries or death, and environmental damage. Fuel spills must be immediately reported to your Installation Environmental Officer or Hazardous Waste Manager and cleaned up in accordance with local requirements.

Never operate the MTRCS if a fuel leak of any kind is present, or a Class III leak of any kind is present. A Class III leak is classified as a leak sufficient enough to cause the formation of drops from the item or component leaking.

Never use starting aids, such as ether, to start the diesel engine. Use of such aids could result in a fire or explosion and cause serious injury or death to personnel.

WARNING SUMMARY – CONTINUED

WARNING

Chemical Hazards

The lead-acid battery may emit gasses that are explosive. Never perform maintenance on a battery when near sparks, open flame, or while smoking. Use protective clothing and face shield while performing maintenance on the battery. Failure to comply with this warning could result in an explosion that causes severe injury or death to personnel.

The lead-acid battery contains sulfuric acid that can cause blindness and severe burns. Use extreme care when performing maintenance on or around the battery. Use protective clothing and face shield while performing maintenance on the battery. If battery acid gets on your skin, rinse it off with water immediately. If battery acid gets in your eyes, flush your eyes with water and seek immediate medical attention.

Lead-acid batteries are a Hazardous Waste (HW). A Material Safety Data Sheet (MSDS) is required for any battery turned in for recycling or disposal. Batteries may be recycled or disposed of through the local servicing Defense Reutilization and Marketing Office (DRMO), or Hazardous Waste Manager via local contract. Recycling and/or reclamation are the recommended options for disposition of lead-acid batteries in lieu of disposal. Batteries may not be thrown away as ordinary trash.

The DRMO/Hazardous Waste Manager will accept batteries that are properly marked, labeled, packaged, and turned in for recycling or disposal with appropriate MSDS documentation.

Coordinate all recycling or disposal actions with the local Installation Environmental Office or Hazardous Waste Manager to ensure proper management of batteries as Hazardous Waste. All recycling or disposal actions MUST BE in accordance with local, state, installation, and federal regulations and requirements.

For additional information on the proper recycling or disposal of batteries, refer to Technical Bulletin 43-0134, Battery Disposal, and Disposition.

Bleach is a corrosive and causes eye and skin burns, digestive track burns, and is harmful if inhaled. Always wear protective clothing, gloves, and eye protection when working with bleach. If contact is made with the eyes, flush eyes with plenty of water for at least 15 minutes, while occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do not allow victim to rub eyes or keep eyes closed. If contact is made with the skin, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure. If bleach is ingested, do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. If inhaled, remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. Do not use mouth-to-mouth resuscitation. If breathing has stopped, apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Rubber gloves, face and eye protection, and dust mask should be worn when handling chemicals such as detergents or cleaning compounds. Failure to wear proper protective clothing and equipment may result in skin irritation and/or serious eye injury. If contact with eyes or skin is made, flush with clean water and seek immediate medical first aid for eyes. Rinse and dry hands immediately after exposure. Failure to observe this warning may result in drying and/or serious damage to the skin.

WARNING SUMMARY – CONTINUED

WARNING

Pressurized System Hazards

Dry nitrogen cylinders are under high pressure. Never use dry nitrogen cylinders without using a pressure regulator. Always maintain a constant awareness of the condition of pressurized systems. Never use oxygen in or around refrigerant systems as an explosion could result. Failure to comply with this warning can result in serious injury or death to personnel.

WARNING

Burn Hazards

Engine oil temperature rises quickly and becomes extremely hot. Hot engine oil can cause severe burns to personnel. Wear proper protective clothing when working with hot fluid.

Petroleum benzene products can cause severe skin irritation and burns. Do not work with petroleum benzene products without wearing rubber gloves.

Diesel radiator coolant becomes extremely hot very fast, and is pressurized. When removing the radiator cap, wait at least 10 minutes after the engine has stopped running and allowed to cool down, relieving pressure. Failure to wait for engine to cool can cause coolant to gush out of the radiator and could result in serious burns. Wear proper protective clothing when working with hot fluid.

The diesel engine exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30 minutes before performing maintenance.

WARNING

Carbon Monoxide Hazards

Carbon monoxide is present in the exhaust fumes of fuel-burning internal combustion engines, as that in the MTRCS diesel engine. Carbon monoxide has no color or smell, but can kill you. Breathing carbon monoxide produces various symptoms including headache, dizziness, loss of muscular control, sleepiness, and coma. Brain damage or death can result from heavy exposure. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. Never operate the diesel engine if the MTRCS is located indoors or where adequate ventilation is not available.

WARNING

Frostbite Hazards

When operating under extreme cold conditions, wear protective gloves. Do not touch cold metal parts with bare hands as skin may stick to extremely cold metal parts and cause frostbite. Frostbite can cause permanent injury and may require medical attention.

WARNING SUMMARY – CONTINUED

WARNING

Fall Hazards

Do not perform any type of maintenance or operate the MTRCS when it is loaded on the transport vehicle. Failure to comply with this warning can result in serious injury or death to personnel.

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

WARNING

Hearing Loss/Damage Hazards

All personnel operating within the MTRCS or within 8 feet of the Refrigeration Unit must wear approved hearing protection when the onboard diesel engine has been selected as the power source, whether the diesel engine is running or not. The diesel engine cycles on and off automatically, and may come on at any time.

Failure to observe this precaution may result in severe and permanent hearing loss.

HAZARDOUS MATERIALS DESCRIPTION

WARNING

Battery Cleaning Solution

Battery cleaning solution may cause irritation to eyes and skin, and may irritate respiratory system if inhaled frequently or over prolonged period of time. Wear eye protection and rubber gloves when handling battery cleaning solution. Avoid contact with eyes and skin, and prolonged exposure to fumes. If contact is made with eyes or skin flush with large amounts of water. If solution is ingested seek immediate medical attention.

WARNING

Detergent, General Purpose

Detergent may cause irritation to eyes and skin. Wear eye protection and gloves when using detergent. Avoid contact with eyes and skin. If contact is made with eyes flush with large amounts of water. If contact is made with skin remove contaminated clothing, wash area with soap and water. If ingested drink two glasses of water and induce vomiting, then seek medical attention.

WARNING SUMMARY – CONTINUED

WARNING

Electrical Insulating Compound

Electrical insulating compound may cause eye irritation. Wear eye protection when using electrical insulating compound. Avoid contact with eyes. If contact is made with eyes flush with water.

WARNING

Expanding Foam Spray

Expanding foam spray may cause eye and skin irritation and can be harmful if inhaled over long periods of time. Wear eye protection, rubber gloves, and rubber apron when using expanding foam spray. Avoid contact with eyes and skin, and inhalation. If contact is made with eyes flush with large amounts of water and seek medical attention. If contact is made with skin use a rag to remove excess foam from skin and remove contaminated clothing. If inhaled move to fresh air and drink 1 to 2 glasses of water or milk and seek immediate medical attention. If ingested do not induce vomiting contact physician or poison control center.

WARNING

JP-8 Fuel

JP-8 fuel is combustible and can cause eye, skin, and respiratory tract irritation if vapors are inhaled. Wear eye protection and rubber gloves when using JP-8. Avoid contact with eyes and skin. If contact is made with eyes flush with water for 15 minutes including under eyelids and seek medical attention. If contact is made with skin remove contaminated clothing, and wash affected area with soap and water. If inhaled move to fresh air, do not induce vomiting, seek medical attention. A fire extinguisher should be readily available when using JP-8 fuel.

WARNING

Grease, Lubricating

Over exposure to lubricating grease may cause eye, throat, and respiratory tract irritation. Wear eye protection and rubber gloves when using lubricating grease. Avoid contact with eyes and skin. If contact is made with eyes flush with water for 15 minutes including under eyelids and seek medical attention. If contact is made with skin remove contaminated clothing, and wash affected area with soap and water.

WARNING

Oil, Refrigerant Compressor Lubricating

Refrigerant compressor lubricating oil may cause eye and skin irritation. Wear eye protection and rubber gloves when using oil. Avoid contact with eyes and skin. If contact is made with eyes flush with water. If contact is made with skin, remove and clean oil soaked clothing. If product is injected under skin or any part of the body, seek immediate medical attention.

WARNING SUMMARY – CONTINUED

WARNING

Penetrating and Lubricating Oil

Penetrating and lubricating oils may cause eye and skin irritation. Wear eye protection and rubber gloves when using oil. Avoid contact with eyes and skin. If contact is made with eyes flush with water. If contact is made with skin, remove and clean oil soaked clothing.

WARNING

RTV (Room Temperature Vulcanizing products)

RTV may cause eye and skin irritation. Over frequent or extended periods of use, RTV may cause irritation to the respiratory system. Wear eye protection and gloves when using RTV. Avoid contact with eyes and skin. If contact is made with eyes flush with water. If contact is made with skin, remove and clean clothing.

WARNING

Thread Locker

Thread locker will cause eye irritation and may cause permanent eye damage if not immediately irrigated. Repeated or prolonged contact with skin may cause irritation. Wear eye protection and gloves when using thread locker. If contact is made with eyes flush with water for 10 minutes holding eyelids apart and seek immediate medical attention. If contact is made with skin flush area thoroughly with soap and water until all chemicals are removed. Remove contaminated clothing and launder before reuse. Failure to comply with this warning can cause serious injury or death.

WARNING

Paints and Primers

Unusable paint mixtures, paint components, primers, thinners, removers, or other materials may be considered hazardous waste and require disposal in accordance with Federal, State, DOD, and DA hazardous waste regulations. Dispose of materials IAW unit SOP and all applicable regulations. This applies to all dried paint/primer waste.

Many materials are carcinogens. Pay careful attention to all warnings, cautions, notes and safety procedures when using any paints, primers, solvents or cleaners.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

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Date of issue for original manual is:

Original 1 September 2010

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., 1 SEPTEMBER 2010

TECHNICAL MANUAL

OPERATOR AND FIELD MAINTENANCE MANUAL FOR MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)

NSN 8145-01-534-3597

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), located in the back of this manual, directly to: TACOM Life Cycle Management Command, ATTN: AMSTA-LCL-MPP/TECH PUBS, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. You may also send in your recommended changes via electronic mail or by fax. Our DSN fax number is (309) 793-0726. Our commercial fax number is (309) 782-0726. Our e-mail address is TACOMLCMC.DAForm2028@us.army.mil. A reply will be furnished to you.

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HOW TO USE THIS MANUAL

HOW TO OBTAIN TECHNICAL MANUALS

When a new system is introduced to the Army inventory, it is the responsibility of the receiving units to notify and inform the Unit Publications Clerk that a Technical Manual is available for the new system. Throughout the life cycle of the new system, the Distribution Center DOL-W will also provide updates and changes to the Technical Manual.

To receive new Technical Manuals or change packages to existing Technical Manuals (TM) for fielded equipment, provide the Unit Publications Clerk the full Technical Manual number, title, date of publication, and number of copies required. The Unit Publications Clerk will justify the request through the Unit Publications Officer. When the request is approved, the Unit Publications Clerk will use DA Form 12-R to order the series of Technical Manuals from the Army Publishing Directorate (APD).

Instructions for Unit Publications Clerk

Obtain DA Form 12-R and request a publications account from the APD Web site at <http://www.apd.army.mil>. Once on the Website, click on the "Orders/Subscriptions/Reports" tab. From the dropdown menu, select "Establish an Account," then select "Tutorial" and follow the instructions in the tutorial presentation.

Complete information for obtaining Army publications can be found in DA PAM 25-33.

GENERAL

In order to use this manual efficiently, there are several things you need to know.

All references in this manual are to either work packages, figures (e.g., Figure 1, Item 1), tables, paragraph titles, or to another manual.

Throughout this manual, text is keyed to illustrations by numbered callouts. When an item is called out in a procedure, a number in parentheses in the text corresponds with a number on the illustration.

Organization of This Manual

This manual is divided into seven chapters. Information contained in each chapter is as follows:

Chapter 1. General Information (including purpose of equipment, nomenclature cross-reference list, and list of acronyms/abbreviations), Equipment Description (includes location and description of components and equipment data), and Theory Of Operation.

Chapter 2. Operator Instructions. This chapter contains description and use of controls and indicators, operation under usual/unusual conditions, loading/unloading instructions, and emergency procedures.

Chapter 3. Troubleshooting index and flow charts.

Chapter 4. Operator Maintenance Instructions

Chapter 5. Service Maintenance Instructions.

Chapter 6. Field Maintenance Instructions.

Chapter 7. Supporting Information. This chapter contains general references, the Maintenance Allocation Chart (MAC), tools and test equipment, Components of End Item (COEI), Additional Authorization List (AAL), expendable and durable items lists, and schematics for the electrical and refrigeration systems.

HOW TO USE THIS MANUAL – CONTINUED

The chapters are divided into Work Packages (WP). Each WP is an independent, task-oriented unit. Only essential information is provided. WPs cover the subjects of theory of operation, operating instructions, troubleshooting, preventative maintenance checks, and maintenance instructions. The Table of Contents provides a complete list of chapters and WPs. Each maintenance WP lists the tasks covered, initial set-up requirements, tools required, equipment conditions, reference materials, and material/parts required. Maintenance procedures are integrated with illustrations.

To locate information, refer to the table of contents in the front of the TM or the Index in the rear of the TM. References to paragraph titles, tables, or figures within a TM are made by numbers, e.g., paragraph title, Table 2, or Figure 3. A reference to another WP merely includes the WP number, e.g., WP 0001. To find a particular procedure or topic, it is necessary to refer to that WP.

To find a particular part for replacement, it will be necessary to use the Repair Parts and Special Tools List (RPSTL) technical manual (TM 10-8145-222-23P). Detailed instructions for use of the RPSTL are found in the Introduction of that technical manual.

There is not a Glossary at the back of the Manual.

An Alphabetical Index can be found at the back of the Manual. It lists specific topics with the corresponding work package.

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT
DESCRIPTION, AND THEORY OF OPERATION
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
GENERAL INFORMATION

SCOPE**Type of Manual**

Operator and Field Maintenance Manual.

Model Number and Equipment Name

Multi-Temperature Refrigerated Container System (MTRCS).

This operator and field maintenance technical manual is arranged to provide necessary information to the operator and field maintenance personnel for use when operating and maintaining the Multi-Temperature Refrigerated Container System (MTRCS).

Purpose of Equipment

The MTRCS (Figure 1) is an eight-foot by eight-foot by twenty-foot (8' x 8' x 20') insulated container capable of storing and transporting temperature sensitive cargo. The MTRCS is designed to keep perishable food items at an appropriate storage temperature during transport over land or sea. The unit is designed to operate in an ambient temperature range of -25°F to +120°F, and can be stored in a non-operational state in an ambient temperature range of -28°F to +160°F. The MTRCS simultaneously maintains both proper freezer and refrigerated temperature ranges in each of two zones or it can maintain one temperature throughout container.

The MTRCS inside surfaces are smooth, sealed, and capable of being sanitized. The inside of the container can be cleaned by steam, high pressure hot water washer, and manually cleaned with detergents. All welds, pockets, voids, and joints can be reached or cleaned using conventional methods as described above.

This unit set-up includes an electric motor-driven refrigeration unit, powered by a diesel engine or external power source. The MTRCS also consists of an insulated container with an electrical and multi-fuel capable mechanical refrigeration unit and internal partition allowing the interior of the insulated container to be divided internally into both frozen and chilled compartments.

The MTRCS is equipped with a bale bar and rail system for use with both the Heavy Expanded Mobile Tactical Truck (HEMTT), with Load Handling System (LHS) and the Palletized Loading System (PLS) vehicles.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your MTRCS needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. If you have Internet access, the easiest and fastest way to report problems or suggestions is to go to <https://aeps.ria.army.mil/aepspublic.cfm> (scroll down and choose the "Submit Quality Deficiency Report" bar). The Internet form lets you choose to submit an Equipment Improvement Recommendation (EIR), a Product Quality Deficiency Report (PQDR) or a Warranty Claim Action (WCA). You may also submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 via e-mail, regular mail, or facsimile using the addresses/facsimile numbers specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.

Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), salvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.

SF Form 368, Product Quality Deficiency Report should be submitted to the address specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

OZONE DEPLETING SUBSTANCES (ODS)

The MTRCS refrigeration system uses R-404A. R-404A is a near azeotropic mixture of the following refrigerants: HFC-125 (44%), HFC143a (52%), and HFC-134a (4%). These refrigerants are all hydrofluorocarbons (HFCs) and thus are not on either the Class I or the Class II lists of Ozone-Depleting Substances (ODRs).

PREPARATION FOR STORAGE OR SHIPMENT

Procedures for preparing the MTRCS for storage or shipment, including packaging and administrative storage, are contained in WP 0104.

WARRANTY INFORMATION

The MTRCS is warranted for 24 months. The warranty starts on the date found in block 23 of DA Form 2408-9, Equipment Control Record. Report all defects to your supervisor, who will take appropriate action.

NOMENCLATURE CROSS-REFERENCE LIST

This technical manual uses many common names when referring to components during maintenance procedures. The following list provides a cross-reference between common name found in the technical manual and official name as found in the Repair Parts and Special Tools List (TM 10-8145-222-23P).

Common Name	Official Name
Access Cover	Cover, Access Guard, Connection
Adjustment Rod	Arm, Adjusting, Belt
Air Cleaner Assembly	Air Cleaner, Intake
Air Cleaner Body Mount Bracket	Clamp, Loop
Air Cleaner Inlet Pipe	Hose, Nonmetallic
Air Inlet Hose	Hose, Nonmetallic
Alarm Horn	Buzzer
Alternator	Generator, Alternating
Alternator Bracket	Bracket, Engine Accessory Alternator Idler Pulley
Alternator Cover Bracket	Bracket, Multiple An
Battery Box Clamp	Retainer, Battery
Battery Box Top Bracket	Retainer, Battery
Battery Cables	Lead, Storage Battery Negative
Battery Cables	Lead, Storage Battery Positive
Battery Pan	Tray, Battery
Blower Motor	Fan Assembly, Centrifugal, Motor And Blower, Evaporator
Bracket	Retainer, Battery
Breather	Valve, Pressure Equalization
Breather Cover	Base, Chassis
Capacitor Box Frame	Capacitor Assembly Capacitor Box
Cargo Netting	Net, Draft Cover Row 1 And Row 2
Cargo Netting	Net, Draft Cover Row 3 And Row 4
Cartridge Pen	Pen, Inking, Continuous Green Ink
Cartridge Pen	Pen, Inking, Continuous Red Ink
Chart Paper	Chart, Recording Ins Setup Chart, Ink CCW
Circuit Breaker Bracket	Bracket, Mounting
Circuit Breaker Handle Mechanism	Handle, Manual Control
Clear Cover	Cover, Fuel Pump

NOMENCLATURE CROSS-REFERENCE LIST – CONTINUED

Common Name	Official Name
Coil Retainer	Cap, Snap Fastener
Compressor Discharge Temperature (CDT) Sensor	Sensor Engine Coolant Compressor Discharge
Compressor Pressure Regulating (CPR) Valve	Valve, Regulating, System
Compressor Unloader Valve	Valve, Solenoid Compressor Unloader
Compressor, Idler	Pulley, Groove Idler
Condenser Fan	Fan, Centrifugal Condenser/Radiator
Condenser Piping	Tube, Bent, Metallic
Top-Middle Panel	Cover, Access Panel, RU Top-Middle
Connection Guard	Cover, Access Guard, Connection
Connector Fittings	Tee, Hose
Control Panel Cover	Chassis, Electrical
Controller	Selector Control Microprocessor Controller
Controller Bracket	Bracket, Mounting
Cord Mesh	Grip, Cable, Woven
Cover Assembly	Cover, Access
Diode Box	Semiconductor Device Diode Block
Discharge Service Valve	Valve, Angle
Document Holder	Box, Document Holder
Door Panel	Door, Walk-In Refrigerator
Drain Hose Heater	Heater, Water, Electrical
Drain Hoses	Hose, Nonmetallic
Drain Valve Line	Cock, Poppet Drain, Oil
Draw-Pull Catch	Strike, Catch Hook
Dust Cup	Cap Assembly, Air Cleaner
Electrical Box	Control, Power Supply Electrical Box
Electrical Box Cover	Cover, Access
Electrical Connector P1A	Connector, Plug, Electrical P13
Electrical Connector P1B	Connector, Receptacle J13
Electrical Connector P2A	Connector, Plug, Electrical P14
Electrical Connector P2B	Connector, Receptacle J14
Electro-Magnetic Interference (EMI) Shield Assembly	Cover, Access
Enclosing Tube	Housing, Plunger, Actuating

NOMENCLATURE CROSS-REFERENCE LIST – CONTINUED

Common Name	Official Name
Escape Hatch Door Seals	Gasket Set, Small Door
Evaporator	Cooler Unit, Air Evaporator, Front
Evaporator Cover	Cover, Access Blower Motor Cover
Evaporator Guard	Bumper, Metallic
Evaporator Sensors	Sensor, Ambient Temp Evaporator Return Air
Exhaust Manifold Gasket	Gasket Muffler
Expansion Valve	Valve, Expansion Thermostatic
Filter Element	Filter Element, Intake
Filter-Drier Tube Assembly	Tube, Bent, Metallic
Fitting	Elbow, Pipe To Tube
Front Panel Assembly	Cover, Access Panel Assembly, Front
Front Panel Cover Assembly	Cover, Access
Fuel Level Sending Unit	Transmitter Liquid
Fuel Outlet Assembly	Pipe Assembly, Fuel Outlet
Fuel Pump	Pump, Fuel, Electrical Fuel Feed
Fuel Tank Cap	Cap, Filler Opening
Hatch Marking	Marker, Self-Luminous
Heating Element Wires	Heater, Water, Electrical
Hinge Pins	Pin, Straight, Headless
Idler Pulley	Pulley, Groove Idler
Idler Pulley Assembly	Pulley, Groove Idler
Inboard Engine Mount Bracket	Plate, Mounting Right
Indicator Cap	Lens, Light Green, Panel Mount Indicator
Inlet Elbow	Elbow, Tube
Inlet Elbow	Elbow, Pipe To Tube
Inlet Fittings	Elbow, Tube
Interior Bulkhead	Panel, Body, Vehicular
J-Bolts	Bolt, Hook
L-Bolts	Bolt, Hook
Left Side Access Panel	Cover, Access Panel, Left Side
Left-Side Panel Assembly	Cover, Access Panel, Left Side
Liquid Level Gauge	Gage, Liquid Quantity Complete With Gasket And Attaching Hardware
Liquid Level Gauge Cover	Guard, Mechanical Dr Fuel Gage

NOMENCLATURE CROSS-REFERENCE LIST – CONTINUED

Common Name	Official Name
Locking Clips	Pin, Quick Release
Lower Bracket	Tray, Battery
Main Heat Valve Coil	Valve, Solenoid
Metal Pipe	Pipe, Bent, Metallic
Motor Brackets	Bracket, Mounting
Mount Bracket	Bracket, Mounting Evaporator Fan Motor
Mount Pin	Pin, Straight, Headed
Mounting Plate	Clamp, Block Capacitor
MPC Board	Circuit Card Assembly Microprocessor Controller Logic Board
MPC Box	Control Box, Electrical Microprocessor Controller Box
MPC Controller	Selector Control Microprocessor Controller
Muffler Clamp	Bolt, U
Muffler Pipe	Pipe, Exhaust Elbow
Muffler Rain Cap	Cap, Protective Dust Rain-cap
Multi-Light Assembly	Lamp Assembly Multi-light
Negative (-) Terminal	Adapter, Battery Negative
O-Ring	Packing, Preformed
ORS Fitting	Restrictor, Fluid Orifice, Expansion Valve
Outboard Engine Mount Bracket	Plate, Mounting Left
Outlet Fittings	Adapter, Straight
Pallet Jack	Truck, Lift, Pallet Mobilizer
Panel	Plate, Mounting EMI Gasket
Pen Arm	Holder, Pen
PLS Roller	Roller, Material Handling
Plunger Assembly	Plunger, Solenoid
Plunger Spring	Spring, Helical, Comp
Positive (+) Terminal	Adapter, Battery Positive
Power Box	Power Supply Assembly Power Box
POWER ON/DOWN Switch	Switch, Toggle
Pulley Support	Bracket, Engine Accelerator Idler Pulley
Quarter-Turn Fastener	Stud, Turn-lock Fastener
Radiator	Heat Exchanger, Fluid Condenser Coil/Radiator
Radiator Cap	Cap, Filler Opening
Radiator Hose	Hose, Nonmetallic

NOMENCLATURE CROSS-REFERENCE LIST – CONTINUED

Common Name	Official Name
Radiator Return Hose	Hose, Nonmetallic
Radiator Suction Fan Collar	Bushing, Sleeve Radiator Suction Fan
Rear Doors	Door, Walk-In Refrigerator
Receiver Pressure Solenoid Coil	Coil, Electrical
Receiver Pressure Solenoid Valve	Valve, Solenoid
Red Light Strip Lamp Assembly	Lamp Assembly LED Light-strip, Red
Refrigerant Piping	Tube, Metallic
Refrigeration Lines	Tube, Bent, Metallic
Replacement Coil	Coil, Electrical
Right-Side Panel Assembly	Cover, Access Panel, Right Side
Rocker Switch	Switch, Toggle
Rod	Connecting Link, Rig
Rubber Door Seals	Seal, Nonmetallic Sp Set
Run Solenoid	Solenoid, Electrical Run
Saddle Clamp	Clamp, Block
Seals	Gasket Make From Rubber Strip 39428 93625K63
Selector Switch	Switch, Rotary
Side Door	Door, Walk-In Refrigeration Side
Sight Glass	Glass Liquid Sight
Single-Phase Alternator	Generator, Alternating Single Phase Alternator
Spacers	Standoff, Threaded
Speed Solenoid	Solenoid, Electrical Speed
Standby Motor	Motor, Alternating C 230V
Standby Motor Pulley	Pulley, Groove
Suction Compressor Discharge Temperature Sensor Electrical Connector	Sensor Engine Coolant Compressor Discharge
Suction Service Valve	Valve, Angle
Suction Service Valve Assembly (Standalone)	Tube Assembly, Metal
Swing Out Panels	Brace, Retractable Swing Support, RH Cargo Net
Swing Out Panels	Brace, Retractable Swing Support, LH Cargo Net
Switch S1	Switch, Rotary
Thermostat Cover	Elbow, Flange To Pipe
Thermostat Housing	Elbow, Flange To Pipe
Time Delay	Relay, Electromagnetic

NOMENCLATURE CROSS-REFERENCE LIST – CONTINUED

Common Name	Official Name
Top-Middle Panel	Cover, Access Panel, RU Top-Control Side
Top-Right Panel	Cover, Access Panel, RU Top-Engine Side
Transformer TR1	Transformer, Power
TXV	Valve, Expansion Thermostatic
Unloader Coil	Coil, Electrical
Unloader Coil Retainer Pin	Pin Straight Headless Unloader Coil Retainer
Unloader Valve Repair Kit	Repair Kit, Solenoid Unloader Valve
Valve Body	Ring, Valve Piston
Voltage Monitor Relay	Relay, Electromagnet Voltage Monitor
Voltage Monitor Relay Socket	Socket, Plug-In Electrical Relay
Water Pipe	Pipe, Bent, Metallic
Water Pump	Pump, Cooling System
Water Pump Supply Hose	Hose, Nonmetallic
White Light Strip Lamp Assembly	Lamp Assembly LED Light Strip, White
Wiring	Cable, Power, Electrical

LIST OF ACRONYMS/ABBREVIATIONS

ABBREVIATION OR ACRONYM	DEFINITION
AC	Alternating Current, Alternator Connector
AH	ampere-hour
AL	Alarm
ALT	Alternator
AOAP	Army Oil Analysis Program
AUX	Auxiliary
B	Bars
BATT	Battery
BT	Battery
C	Celsius, Capacitor
CAR	Capacitor Alternator Relay
CB	Circuit Breaker
CD	Compressor Discharge
CDT	Compressor Discharge Temperature
CL	Cool Illuminated Light
CLR	Clear
cm ²	Square centimeters
cm ³	Cubic Centimeters
COMP	Compartment, Compressor
CPC	Corrosion Prevention and Control
CPR	Compressor Pressure Regulating
DC	Direct Current
DER	Diesel Electric Relay
DEFRO	Defrost
DEFRAIL	Defrost Fail
DR	Defrost Relay
DRMO	Defense Reutilization and Marketing Office
DT	Defrost Thermistor
DTS	Defrost Thermistor Sensor
EHR	Electric Heat Relay
EIR	Equipment Improvement Recommendation
EM	Electric Motor

LIST OF ACRONYMS/ABBREVIATIONS – CONTINUED

ABBREVIATION OR ACRONYM	DEFINITION
EMI	Electro-Magnetic Interference
EMR	Electric Motor Relay
ENG	Engine
EPROM	Electronic Programmable Read Only Memory
ES	Emergency Stop
ESDS	Electrostatic Discharge Sensitive
F	Fahrenheit, Fuse
FL	Fault Light
FO	Foldout
FN	Function
ft	Foot
GND	Ground
HC	Heat Illuminated Light
HEMTT	Heavy Expanded Mobile Tactical Truck
HFC	Hydrofluorocarbons
HGV	Hot Gas Valve
HPCO	High Pressure Cut-Out
HW	Hazardous Waste
Hz	Hertz
ISO	International Organization for Standardization
kg	kilogram
kgf	Kilogram-force
kPa	Kilopascal
kW	Kilowatt
lbs	Pounds
LED	Light Emitting Diode
LHS	Load Handling System
LSV	Liquid Solenoid Valve
MC	Motor Contactor
MCD	Microprocessor Controller Display
MGC	Manual Glow/Crank
MHR	Maintenance Hour, Main Heat Relay
MHV	Main Heat Valve

LIST OF ACRONYMS/ABBREVIATIONS – CONTINUED

ABBREVIATION OR ACRONYM	DEFINITION
MOD	Modification
MOL	Motor Overload
MP	Micro Processor
MPC	Microprocessor Controller
MSDS	Material Safety Data Sheet
MTRCS	Multi-Temperature Refrigerated Container System
NC	Normally Closed
N-m	Newton Meter
NO	Normally Open
ODR	Ozone-Depleting Substance
OL	No Continuity, Overload
OP	Operation
OP	Oil Pressure
ORS	O-Ring Seal
P	PSIG
PLS	Palletized Loading System
PMCS	Preventative Maintenance Checks and Services
PQDR	Product Quality Deficiency Report
Press	Pressure
PSI	Pounds per Square Inch
PSIG	Pounds-Force per Square Inch Gauge
RA	Return Air
RC	Run Coil
RCVR	Receiver
RCR	Run Control Relay
REV	Revision
RPM	Revolutions per Minute
RPSTL	Repair Parts and Special Tools List
RR	Run Relay
RS	Run/Stop Switch
RST	Reset
S	Switch
SAE	Society of Automotive Engineers

LIST OF ACRONYMS/ABBREVIATIONS – CONTINUED

ABBREVIATION OR ACRONYM	DEFINITION
SBY	Standby
SERL	Serial Number Lower
SERU	Serial Number Upper
SM	Starter Motor
SON	Switch On Hour
SOP	Standard Operating Procedure
SPD	Speed
SS	Starter Solenoid
SSR	Starter Solenoid Relay
STRT	Start
SUCT	Suction
T	Time
TAMMS	The Army Maintenance Management System
TM	Technical Manual
TMDE	Test, Measurement, and Diagnostic Equipment
TXV	Thermal Expansion Valve
UFR	Unloader Front Relay
URR	Unloader Rear Relay
UV	Ultra-violet
V	Volt
VAC	Volts Alternating Current
VDC	Volts Direct Current
VIP	Vacuum Insulated Panel
W	Watt
WCA	Warranty Claim Action
WP	Work Package
WT	Water Temperature
WTS	Water Temperature Sensor

QUALITY OF MATERIAL

Material used for replacement, repair, or modification must meet the requirements of this manual. If "Quality of Material" requirements are not stated in this manual, the material must meet the requirements of the drawings, standards, specifications, or approved engineering change proposals applicable to the subject equipment.

SAFETY, CARE AND HANDLING

Electrostatic Discharge Sensitive (ESDS) devices are used in this equipment. Ensure that you are properly grounded through connection to a static workstation by proper grounding through a conductive wrist strap or other such device prior to handling ESDS devices.

This equipment contains sensitive optical equipment and should be handled with care.

SUPPORTING INFORMATION FOR REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 10-8145-222-23P.

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The MTRCS is a refrigerated container capable of storing and transporting temperature sensitive cargo. The unit simultaneously maintains both proper freezer and refrigerated temperature ranges in each zone.

The MTRCS set-up includes an electric motor-driven refrigeration unit, powered by a diesel engine or external power source. Refer to Figures 1 through 6 of this WP for a complete view of the MTRCS. See Tables 1 through 6 of this WP for locations and descriptions of the exterior and interior components and essential assemblies of the MTRCS.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

MTRCS Front View Components Location and Description

Table 1 and Figure 1 provide nomenclature and descriptions, and location illustration of major MTRCS components that are found on the front portion of the unit.

Table 1. Location and Description of MTRCS Front View Components.

Item No.	Component Name	Component Description
1	Lift Point	Over head cable connection points provide hoist points during MTRCS lifting operations.
2	MTRCS Frame	ISO standard metal box tubing frame.
3	Refrigeration Unit Assembly	Driven by integral engine or external power source.
4	Capacitor Box	Contains capacitors C1, C2, and C3 used for storing energy for heaters.
5	Power Input Box	Contains motor contactor and voltage monitor relay.
6	Power Box Assembly	Power switch, transformer, circuit breakers, power cords.
7	Control Box Assembly	Metal enclosed EMI protection for control panels.
8	Fuel Cap	Standard ISO fuel cap.
9	Fuel Tank Assembly	Diesel or JP-8 fuel only, used in engine driven mode, 75 gallons.
10	Fuel Level Gauge	Provides visual indication of amount of fuel in tank.
11	Fuel Pump	Housed inside shielded box. Provides fuel pumping capability for fuel tank to diesel engine.
12	Battery	12V direct current onboard power supply.
13	PLS Rollers	Used with rails to load and unload onto PLS and LHS units. Shown in stowed location.
14	Power Supply Cables	Two 50-foot electrical dual voltage cables. One rated at 230V 60 Hz and 190V 50 Hz. One rated at 460V 60 Hz and 380V 50 Hz.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

Table 1. Location and Description of MTRCS Front View Components – Continued.

Item No.	Component Name	Component Description
15	Net Storage Device	Metal device with folding ends used to store netting when not in use. Stored in front of container in slots when netting is in use.
16	Document Holder	Waterproof, weather proof, and fastened to right side wall.
17	Engine Oil Drain	90°-movement drain valve with locking mechanism and drain tubing. Fastened to front of unit under refrigeration unit.
18	Roof Access	Metal tubing with non slip steps provides personnel with access to equipment from atop the MTRCS.
19	Bail Bar and Hook Section	A handling point permanently welded to the MTRCS container frame.

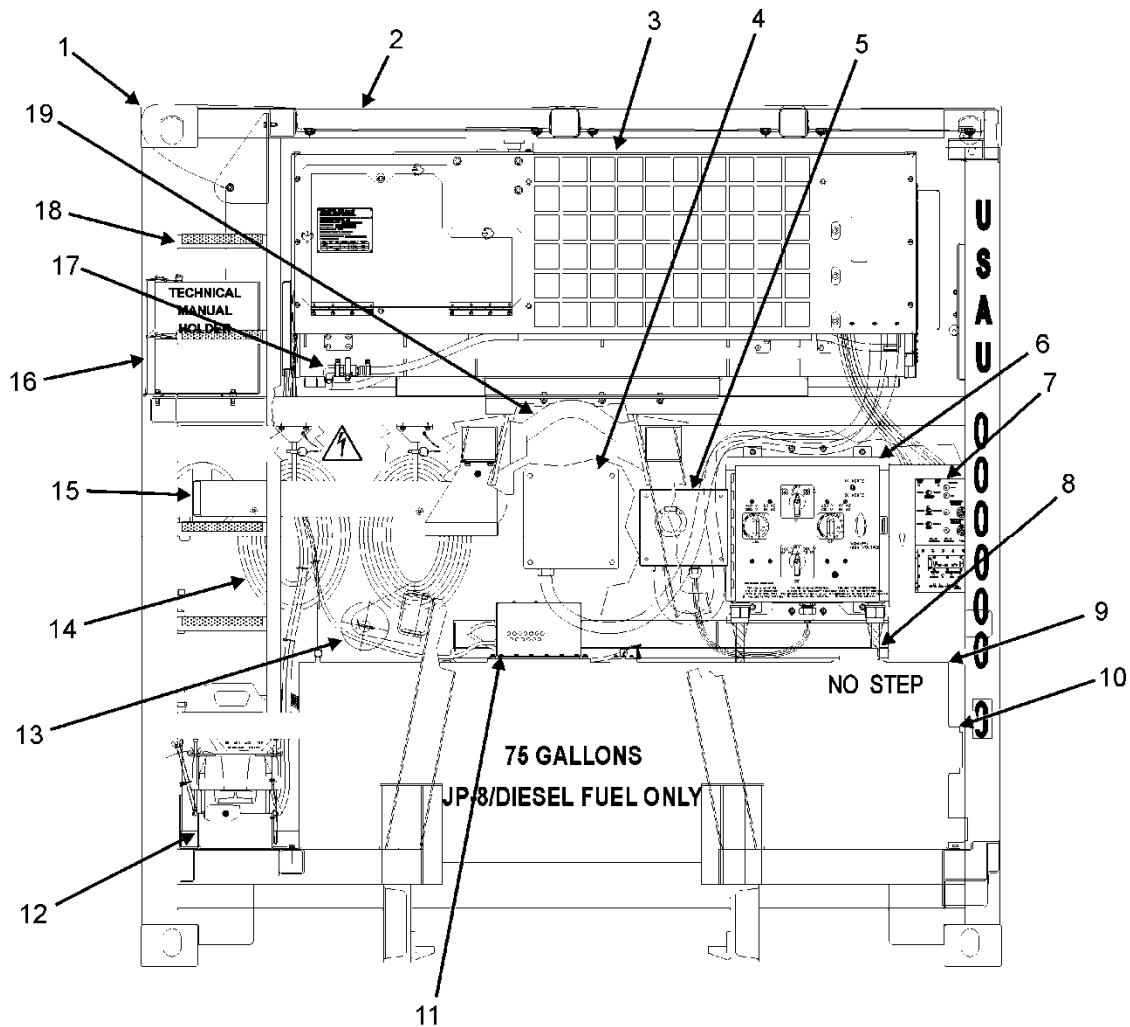


Figure 1. MTRCS Front View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

MTRCS Rear View Components Location and Description

Table 2 and Figure 2 provide nomenclature and descriptions, and location illustration of major MTRCS components that are found on the rear portion of the unit.

Table 2. Location and Description of MTRCS Rear View Components.

Item No.	Component Name	Component Description
1	Container Weight Data	Stenciled painted weight information.
2	Door Latch	Attached fork device located at top and bottom of each door.
3	Escape Hatch	Sealed doors built into each access door of unit for emergency egress.
4	Door Cam Handles	Painted, anti-racking ice breaking hardware.
5	PLS Rollers (Deployed)	Provide rolling movement capability when positioning MTRCS for movement.
6	Door Hold Chains	Used to hold doors in OPEN position.
7	Door Cam Handle Lock	Attached locking device with rotating top portion.
8	CSC Safety Approval Plate	Identifies safety approval certification.
9	MTRCS Identification Plate	Product description, contract, technical manual.
10	MTRCS Unique Identification Label	Part number, NSN, two dimensional barcode.

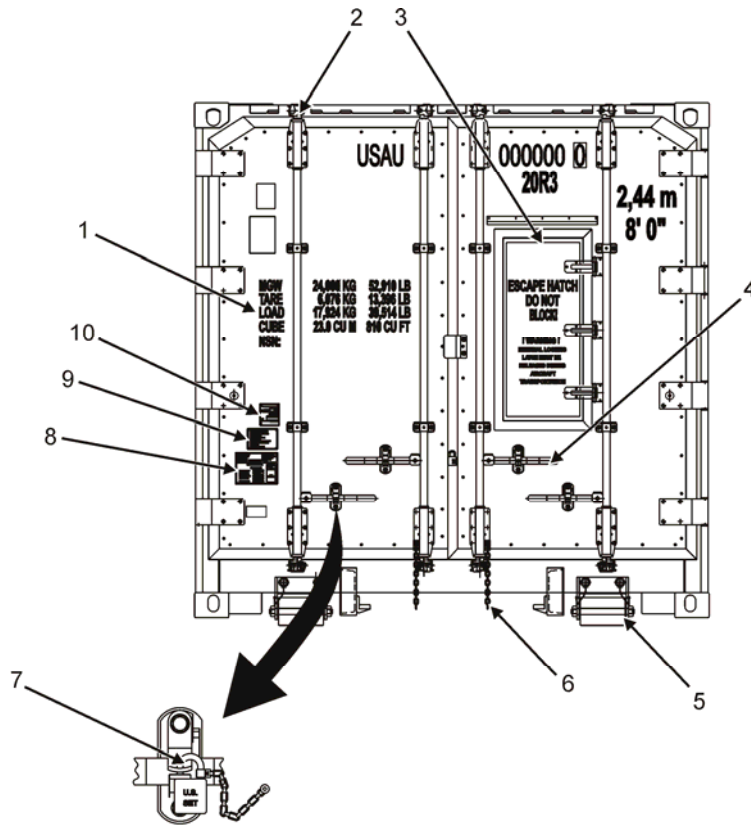


Figure 2. MTRCS Rear View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

MTRCS Right Side View Components Location and Description

Table 3 and Figure 3 provide nomenclature and descriptions, and location illustration of major MTRCS components that are found on the right side of the unit.

Table 3. Location and Description of MTRCS Right Side View Components.

Item No.	Component Name	Component Description
1	Right Side Door	Provides side access to container compartment 1.
2	Escape Hatch	Sealed doors built into each access doors of unit.
3	Environmental Cover	Provides weather cover for refrigeration unit when stored.
4	Document Holder	Waterproof, weather proof, and fastened to right side wall.
5	Fire Extinguisher	Mounted to front of unit.
6	Battery	12V direct current onboard power supply.
7	Fuel Can	Five gallon plastic container for fuel.
8	Door Cam Handles	Painted, anti-racking ice breaking hardware.
9	Door Cam Handle Lock	Attached locking device with rotating top portion.
10	Door Hold Chain	Used to hold doors in OPEN position.
11	Lift Pockets	Alternate lifting point used with forklift when empty.

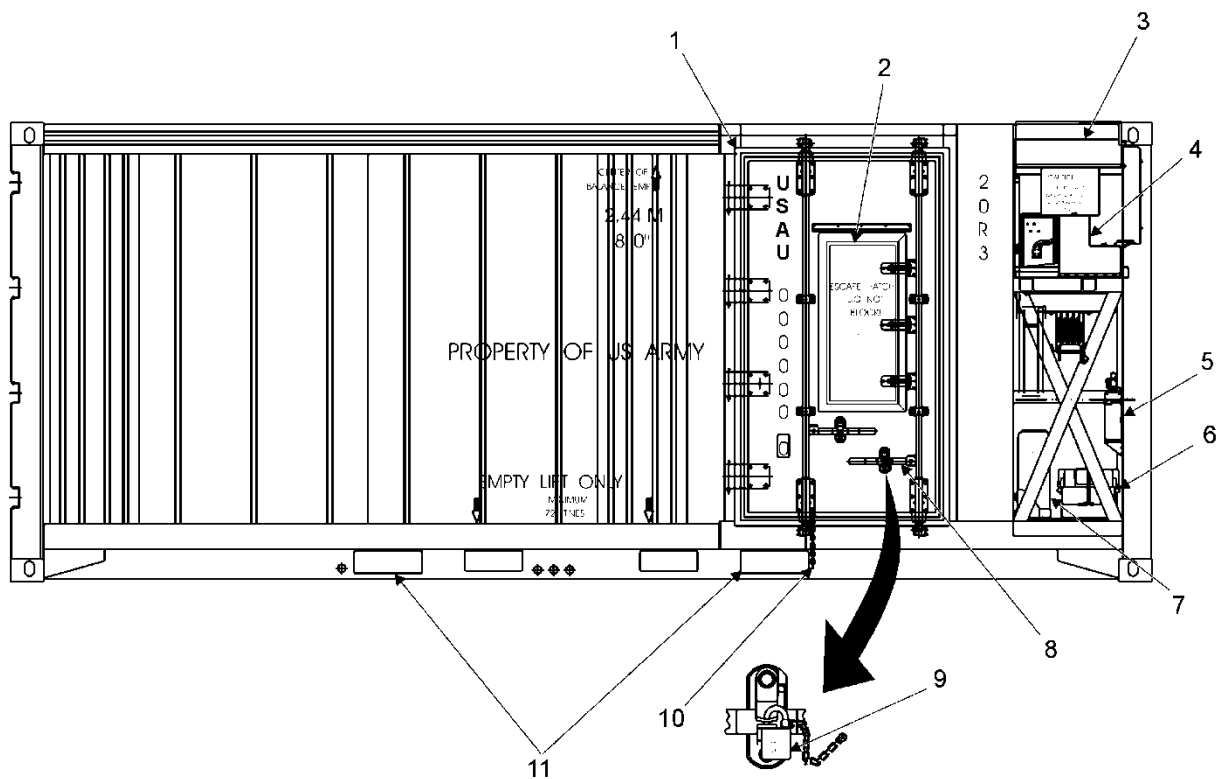


Figure 3. MTRCS Right Side View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

MTRCS Left Side View Components Location and Description

Table 4 and Figure 4 provide nomenclature and descriptions, and location illustration of major MTRCS components that are found on the left side of the unit.

Table 4. Location and Description of MTRCS Left Side View Components.

Item No.	Component Name	Component Description
1	Temperature Chart Recorder	Temperature recording device for each storage compartment.
2	Refrigeration Unit Microprocessor	EMI sealed compartment containing various electronic control devices for refrigeration unit.
3	Engine Operation Instruction Plate	Riveted metal plate with abbreviated engine start up instructions.
4	Lift Pockets	Alternate lifting point used with forklift when empty.
5	Operating Instruction Plate	Riveted metal plate with abbreviated operating instructions.
6	Fuel Drain Cocks	Two drain cocks located on lower side of fuel tank connect through drain tubes to provide fuel tank draining capability through a centralized drain tube.
7	Fuel Level Gauge	Provides visual indication of amount of fuel in tank.

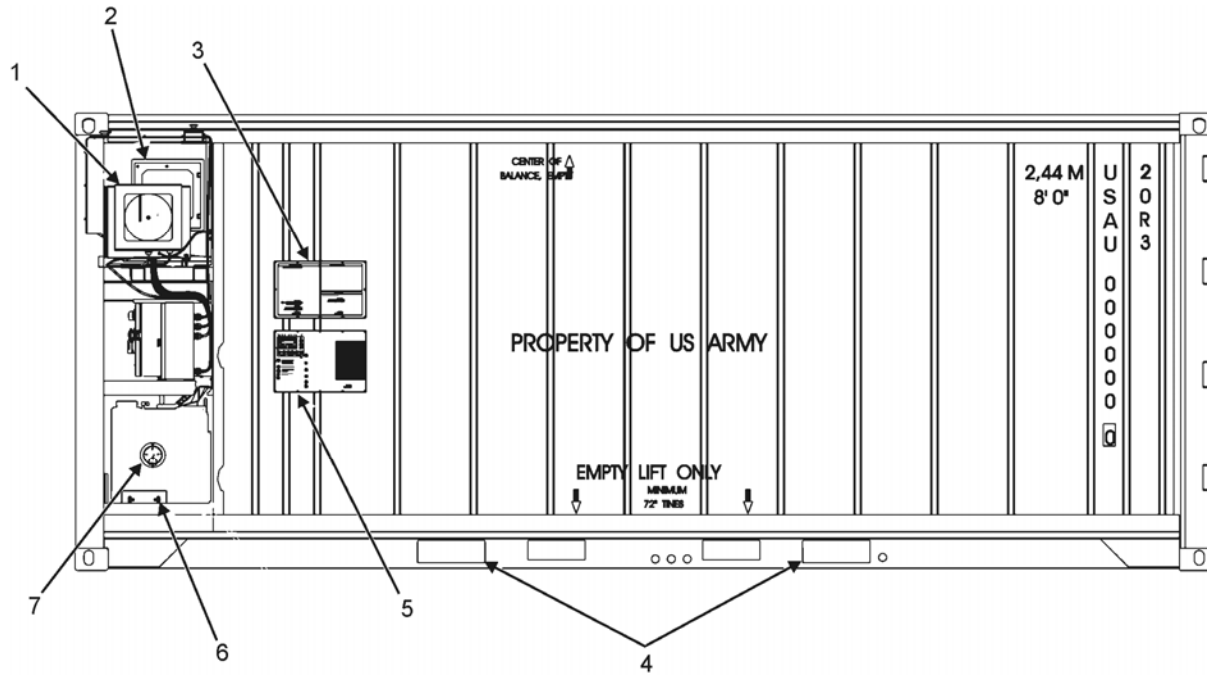


Figure 4. MTRCS Left Side View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

MTRCS Interior Left Wall Components Location and Description

Table 5 and Figure 5 provide nomenclature and descriptions, and location illustration of major MTRCS components that are found on the interior left wall of the unit.

Table 5. Location and Description of MTRCS Interior Left Wall Components.

Item No.	Component Name	Component Description
1	Swing Out Panels	Flat metal pin connecting net holding device.
2	Compartment 2 Evaporator	Ceiling mounted air producing temperature controlled radiator.
3	Red Lighting	Wall mounted red lighting in both compartments to provide lighting in container during blackout enable conditions.
4	White LED Lighting	Wall mounted white LED light strips in both compartments to provide lighting in container during normal mode conditions.
5	Compartment 2 Breather	Mounted to container wall. Used to adjust container pressure during air transportation.
6	Compartment 1 Breather	Mounted to container wall. Used to adjust pressure during air transportation.
7	Compartment 1 Evaporator	Ceiling mounted air producing temperature controlled radiator.
8	Refrigerant Line Container Pass-through	Container pass-through for evaporator refrigerant lines.
9	Container Flooring	Metal raised perforated flooring for air circulation.
10	Pallet Load Line	Red horizontal lines marking placement of pallets.
11	Floor Rails	Metal bars with hook devices secure to flooring.

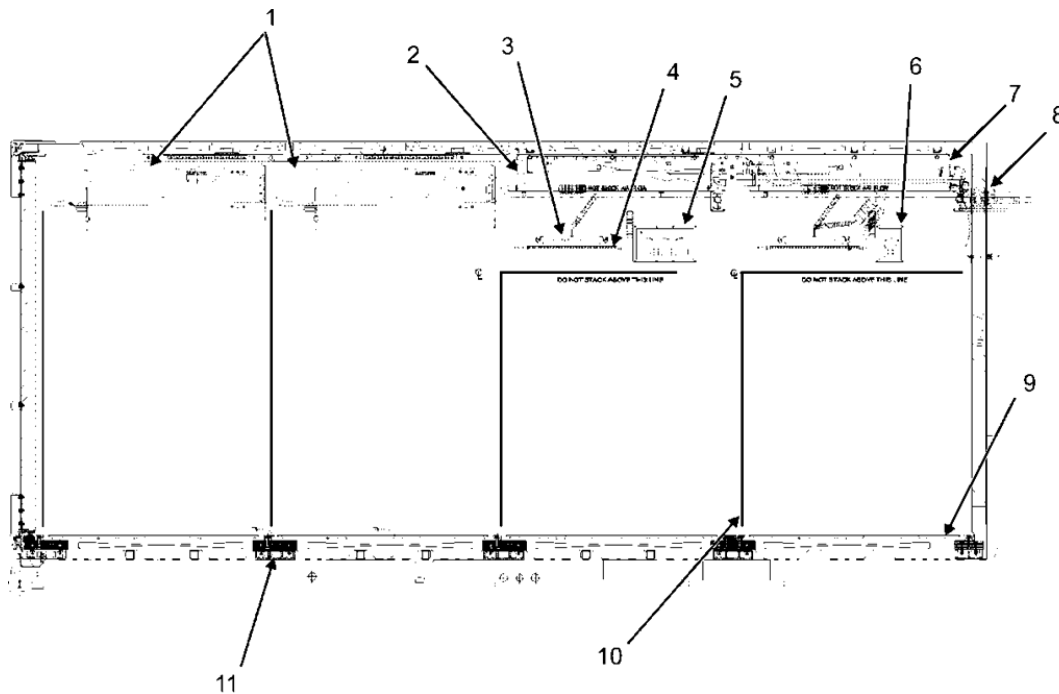


Figure 5. MTRCS Interior Left Wall View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

MTRCS Interior Right Wall Components Location and Description

Table 6 and Figure 6 provide nomenclature and descriptions, and location illustration of major MTRCS components that are found on the interior right wall of the unit.

Table 6. Location and Description of MTRCS Interior Right Wall Components.

Item No.	Component Name	Component Description
1	Escape Hatch (Side Access)	Sealed doors built into each access door of unit.
2	Escape Hatch Handles	Three rotating handles that provide open and close ability for emergency escape hatch door.
3	Hatch Marking	Fluorescent arrow shaped glow in the dark identifiers.
4	Pallet Load Line	Red horizontal lines marking placement of pallets.
5	Swing Out Panels	Flat metal pin connecting net holding device.

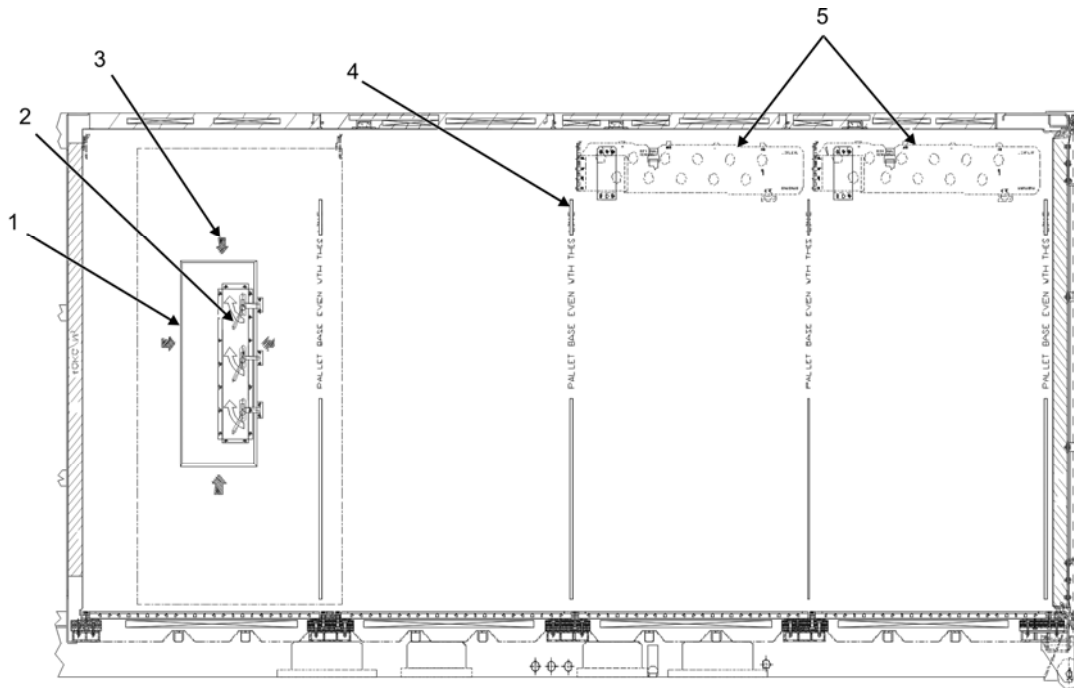


Figure 6. MTRCS Interior Right Wall View.

EQUIPMENT DATA

Table 7. MTRCS System Specifications.

PARAMETER	SPECIFICATION
Power Requirement	230 VAC (+/-10%) 3-phase 60-Hz (+/-2.5%) 190 VAC (+/-10%) 3-phase 50-Hz (+/-2.5%) 460 VAC (+/-10%) 3-phase 60-Hz (+/-2.5%) 380 VAC (+/-10%) 3-phase 50-Hz (+/-2.5%) Diesel engine driven power
Weight	13,396 pounds (Empty) 36,250 pounds (Fully Loaded) 52,900 pounds not to exceed
Cube	Nominal square feet of floor – 122 square feet Nominal cargo capacity – 667 cubic feet
Dimensions	8-foot x 8-foot x 20-foot ISO Container
Refrigerant	R404A (non-ozone depleting)
Compressor Lubricating Oil	EAL 68
Operating Parameters	Two zone operation via split partition
Environmental Operating Temperature	-25°F to +120°F
Transportability	Internal air via C-130 or larger aircraft <ul style="list-style-type: none"> - Container pressure equalization devices - Tie-down provisions External air via sling-load rotary aircraft <ul style="list-style-type: none"> - 30 nautical mile limit - Maximum weight of 23,396 pounds - Elevation of 2000-feet at 70°F ambient Rail Ship <ul style="list-style-type: none"> - Stackable nine (9) high Ground Mobility <ul style="list-style-type: none"> - Primary roads, secondary roads, cross-country terrain - HEMTT LHS compatible - PLS compatible - Integral bale bar and rails
Diesel Engine	
Model	CT3-69 (D1105)
Number of Cylinders	3
Type	Vertical, water cooled, 4-cycle diesel engine
Bore x Stroke	78 x 78.4 (3.07 x 3.09)
Total Displacement – Using cm ³ (cu. In.)	1123 (68.53)
Maximum Bare Speed – rpm	3200
Minimum Idling Speed – rpm	600

EQUIPMENT DATA – CONTINUED

Table 7. MTRCS System Specifications – Continued.

PARAMETER	SPECIFICATION
Maximum Torque – N-m/rpm kgf-m/rpm ft-lbs/rpm	67.3/2000 6.86/2000 49.6/2000
Combustion Chamber	Spherical Type
Fuel Injection Pump	Bosch MD Type Mini Pump
Governor	Centrifugal Mechanical Governor
Direction of Rotation	Counterclockwise (Viewed from flywheel side)
Injection Nozzle	Mini Nozzle (DNOFD)
Injection Timing	18 to 20° (0.14 to 0.35 rad) Before T.D.C
Firing Order	1-2-3
Injection Pressure	140 kgf/cm ² (13.73 MPa, 1991 psi)
Compression Ratio	22:1
Lubricating System	Forced Lubrication by Pump
Oil Pressure Indicating	Electrical Type Switch
Lubricating Filter	Full Flow Paper Filter (Cartridge Type)
Cooling System	Pressurized Radiator, Forced Circulation with Water Pump
Cooling System Capacity	3.0 liters (3.2 quarts)
Starting System	Electric Starting With Starter 12 V, 1.0 kW
Starting Support Device	By Glow Plug in Combustion Chamber
Battery	12 V, 65 AH Equivalent
Dynamo for Charging	12 V, 360 W
Fuel	Diesel Fuel No. 2-D (ASTM D975); JP-8
Lubricating Oil	MIL-L-46152, A-A-52039, MIL-L-2104G, Quality better than CC class (API)
Lubricating Oil Capacity	9.8 liters (11 U.S. quarts)
Weight (Dry)	89.0 kg (196.2 lbs.)

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
THEORY OF OPERATION

GENERAL INFORMATION

The MTRCS is a self-contained, two compartment, refrigerated container system that fits within an International Organization for Standardization (ISO) eight-foot by eight-foot by twenty-foot (8' x 8' x 20') profile. The insulated container is capable of storing and transporting temperature sensitive cargo. The MTRCS consists of an insulated container with an electrical and multi-fuel mechanical refrigeration unit. A two piece internal partition allows the interior of the insulated container to be divided internally into both frozen and chilled compartments. The MTRCS simultaneously maintains both proper freezer and refrigerated temperature ranges in each zone.

This section provides a detailed theory of operation for the MTRCS including:

- Insulated Container
- Interior Bulkhead
- Cargo Restraints
- Power Box Assembly
- Control Box Assembly
- Refrigeration Unit

The MTRCS is equipped with a bale bar and rail system for use with both the Heavy Expanded Mobile Tactical Truck (HEMTT) with Load Handling System (LHS) and the Palletized Loading System (PLS) vehicles. The MTRCS is designed to ship up to a maximum of 14 fully loaded pallets, not to exceed a maximum cargo weight of 12,600 pounds when transporting using the LHS and 22,850 pounds when transporting using the PLS. MTRCS loading is accomplished using forklift and pallet jack combination. Cargo is loaded in a sequence of rows numbered one to four (Figure 1). The cargo nets are designed in two sets of two cargo nets. Rows one and two are secured in place with cargo nets having horizontal yellow and vertical orange strapping. Rows three and four are secured in place with cargo nets having green vertical and yellow horizontal strapping.

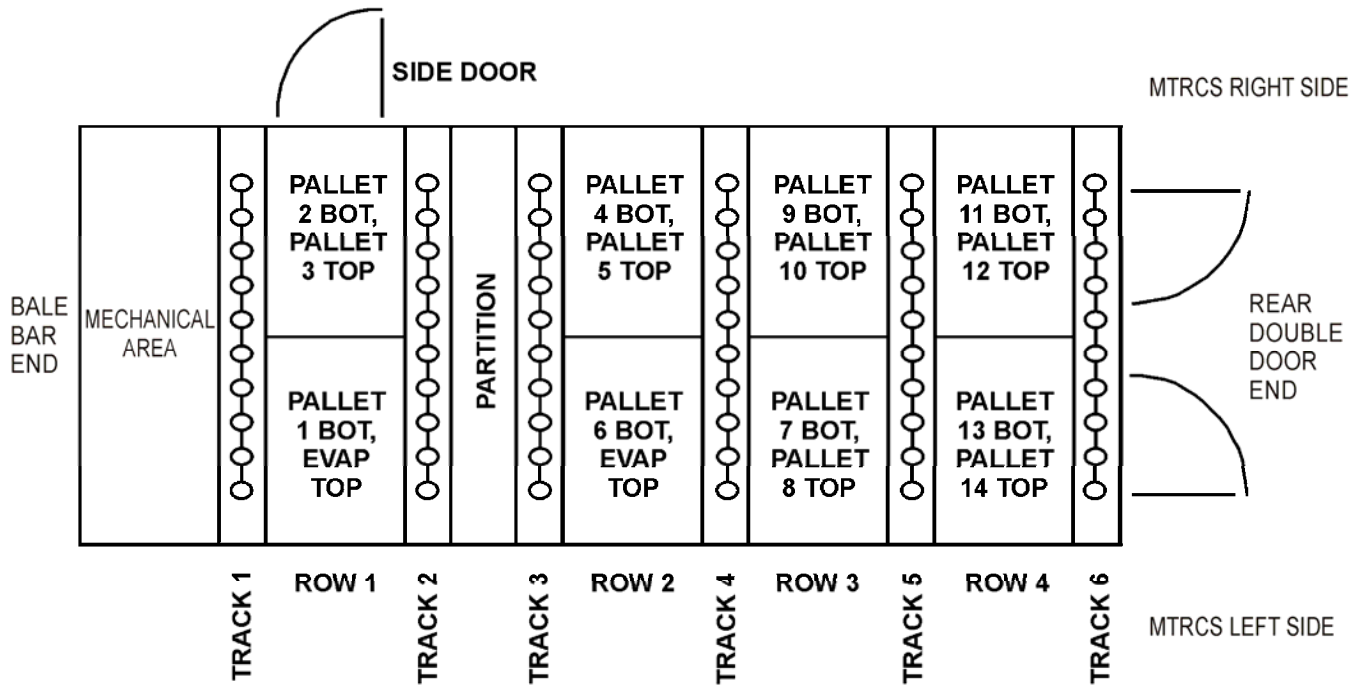


Figure 1. MTRCS Pallet Location.

INSULATED CONTAINER

The fully fueled, empty MTRCS weighs 13,400 lbs. Forklift pockets provide safe lifting and movement of the entire unit in the field using either military or commercial forklift. All MTRCS interior surfaces are smooth and sealed. The interior is cleanable with steam, high pressure hot water, and detergents. The insulated container is equipped with four floor drains that are used to route wastewater run-off outside of the container.

The MTRCS floor, sides, doors, and ceiling contain insulating urethane foam that increases the ability to restrict heat gain from the outside ambient air temperatures. Additionally, Vacuum Insulated Panels (VIPs) have been located in the floor, sides, and ceiling to further reduce heat leakage into the container.

A protective metal skin covers the outer and inner surfaces of the insulated container. The skin adds protection from physical damage during use for the insulating foam and VIPs. The exterior skin is made of a muffler grade stainless steel. The exterior skin is continuously welded to keep out water. The interior skin uses a combination of aluminum and stainless steel. The floor of the container has been designed to carry the weight of the appropriate forklift for loading the container and to restrain the cargo during transportation.

Stainless steel is used in the doorsills and interior walls to prevent corrosion. The rear access double door assemblies and single side door are fitted with icebreaker cams and all necessary hardware, including a heavy duty door handle/latch, hinges, door stays, padlocks, and two emergency exit hatches with glow-in-the-dark indicator arrows pointing to the exit.

The roof design provides a self-draining capability. Roof access is provided by permanently attached standard steps and handholds that support up to 400 pounds each.

CAUTION

A fully loaded MTRCS cannot exceed the gross maximum ISO weight of 26,600 pounds when using the LHS for transport, or 36,250 pounds when using the PLS for transport.

Interior Bulkhead

A two-piece, interior bulkhead is used in the insulated container to form the two compartment configuration. Attached carrying handles allow for ease of installation and connecting together. The partition is wedged into place against the ceiling, floor, and side walls between floor tracks 2 and 3 (Figure 1). The interior core of the partition is made of polyurethane foam with a flexible cushion around the outer edges allowing for a snug friction fit when installed. The partition is steam cleanable.

Cargo Restraints

Cargo restraints are made of mesh-type netting specifically designed with color coded fittings matching the marking of the extruding scalloping rail to hold cargo in place. The netting is held in place by a floor system that is imbedded into the floor of the insulated container MTRCS. The cargo nets are designed in two sets of two cargo nets. Rows one and two are secured in place with cargo nets having vertical yellow and horizontal orange strapping. Rows three and four are secured in place with cargo nets having vertical yellow and horizontal green strapping.

Side Door

The insulated container has the option of configuring for two compartments or just one. The side door allows access to the front compartment if the internal partition is used to separate the insulated container into two compartments. The side door contains an emergency escape hatch that can be used if personnel are inadvertently trapped inside of the container.

Rear Doors

Two rear doors, a left and a right, allow access to the rear of the container and are used for loading pallets into the container using a forklift and a pallet jack. The right rear door contains an emergency escape hatch that can be used if personnel are inadvertently trapped inside of the container.

INSULATED CONTAINER – CONTINUED

Emergency Escape Hatches

There are two emergency escape hatches in the container in the form of two small doors that are hinged on their side. One is located in the side door and the other is located in one of the rear doors. The emergency escape hatches can be opened from inside the container only when the doors are closed. They are also used as blowout panels during air transportation, when the handles are placed in the open position. There are three quarter-turn handles on the escape hatches that when rotated clockwise will allow the emergency escape hatch to be pushed open.

Pressure Equalization Vent

Pressure equalization vents allow pressure equalization between the container interior and ambient air pressure. These vents have been sized to prevent structural damage to the container.

Drains

The drains consist of a hole in the floor of the container that has a protective screen over it to prevent insects from entering the container. Water condensate from the evaporators drains to the container exterior through drains within the container wall.

Fuel Tank

CAUTION

The refrigeration unit diesel engine can operate using JP-8 or diesel fuel only. Do not use any other fuel type. Do not use gasoline. Use of an unapproved fuel type will result in damage to the refrigeration unit diesel engine.

A 75-gallon fuel tank is located at the lower front side of the MTRCS to provide either JP-8 or diesel fuel to power the refrigeration unit. The tank is equipped with an external fuel pump to provide fuel to the diesel engine, a fuel liquid level gauge, fuel level sending unit, filler cap, and two drain-cocks to allow fuel tank draining. The fuel tank is also equipped with a fuel pump strainer located inside of the fuel tank that is used to trap sediment and other debris from entering the fuel system.

Container Electrical

The container has electrical wiring that connects the various components throughout the MTRCS.

The container electrical consists of a power box, electrical cables, cam-action switches for power source selection and internal lighting, fuel level indicators, visual and audible indicators, a microprocessor controller for the refrigeration unit, and a temperature chart recorder.

Power Box Assembly

The Power Box Assembly (Figure 2) located on the front exterior under the refrigeration unit serves as a built-in power supply circuit selector and protector while the MTRCS operates using external power sources. The power box has two (2) fifty-foot attaching power supply cables and two six-foot pigtailed connectors that can be connected to four different electrical input voltages as shown in Table 1. When using an external power source the rotary cam action switches must be set to correspond to incoming electric voltage.

INSULATED CONTAINER – CONTINUED

Table 1. Power Box Assembly Configuration for External Power.

External Power Source	6-Foot Pigtail Connector	50-Foot Cable Connector	Switch S1 Position	Switch S2 Position	CB1 Position	CB2 Position
190 VAC, 3-PH, 50 Hz	P1B	P1A	230 V / 190 V	OFF	ON	OFF
230 VAC, 3-PH, 60 Hz	P1B	P1A	230 V / 190 V	OFF	ON	OFF
380 VAC, 3-PH, 50 Hz	P2B	P2A	460 V / 380 V	380 V 50 HZ	OFF	ON
460 VAC, 3-PH, 60 Hz	P2B	P2A	460 V / 380 V	460 V 60 HZ	OFF	ON

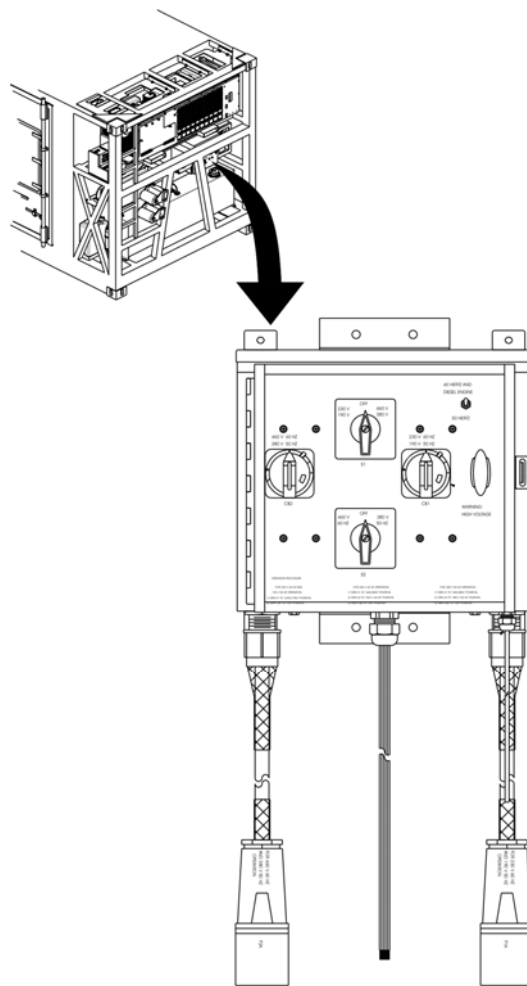


Figure 2. Power Box Assembly.

INSULATED CONTAINER – CONTINUED

When external power is selected by the operator as the power source to operate the MTRCS refrigeration unit, the diesel engine will not be operational and only the electric motor in the refrigeration unit is operated. Power from the selected external power source will be input to the Power Box Assembly based on the hook up requirements of Table 1. The external power is routed through the Power Box Assembly, to the Motor Controller (MC) relay, which in turn directs power to the electric motor and control box. The MTRCS electrical schematic (Figure FO-1) provides additional illustrative detail about MTRCS power control and distribution.

If the integral diesel engine is selected as the power source for the MTRCS refrigeration unit, no external electrical connection is required.

Control Box Assembly

The Control Box Assembly (Figure 3) is a two sub-component assembly consisting of the Control Panel and Microprocessor Controller Display (MCD) (Figure 4), and is accessible from the exterior of the MTRCS unit. The Control Box Assembly is enclosed within a watertight, heated, and electro-magnetic interference (EMI) shielded box. The box is equipped with a trap drain on the bottom that provides drainage of any moisture or liquid that may form or leak into the box. The control box portion of the assembly is located on the upper half and includes three toggle switches for normal or blackout mode selection; compartment 1, 2, power on/down switch, compartment 1 and 2 over/under temperature audio alert signals with corresponding indicator lights; and two fuel level indicator lights for good (green) and low (red) fuel level indication. The bottom portion of the assembly consists of the MCD.

The Control Box, used in conjunction with MCD located at the bottom of the Control Box Assembly, will enable the diesel engine startup. Additionally, various operating parameters can be set and warnings can be given through the microprocessor control during operation.

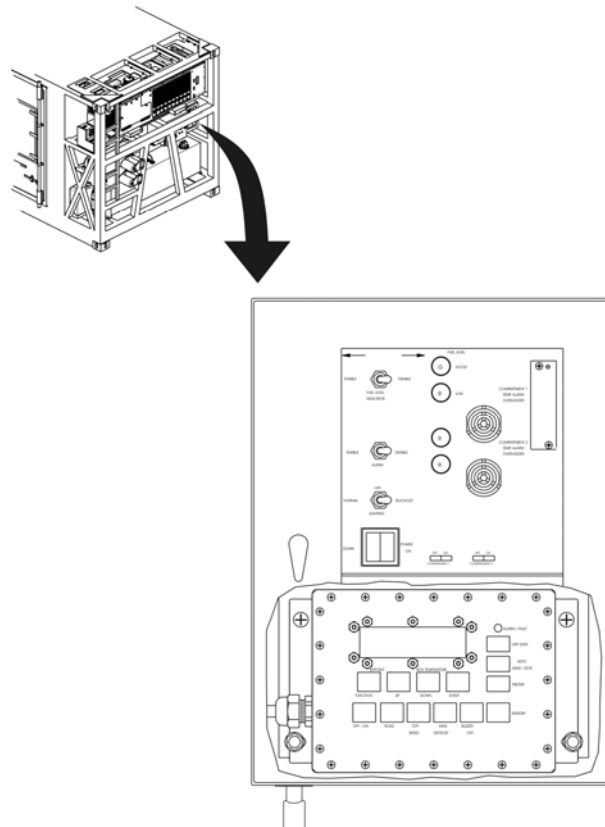


Figure 3. Control Box.

INSULATED CONTAINER – CONTINUED

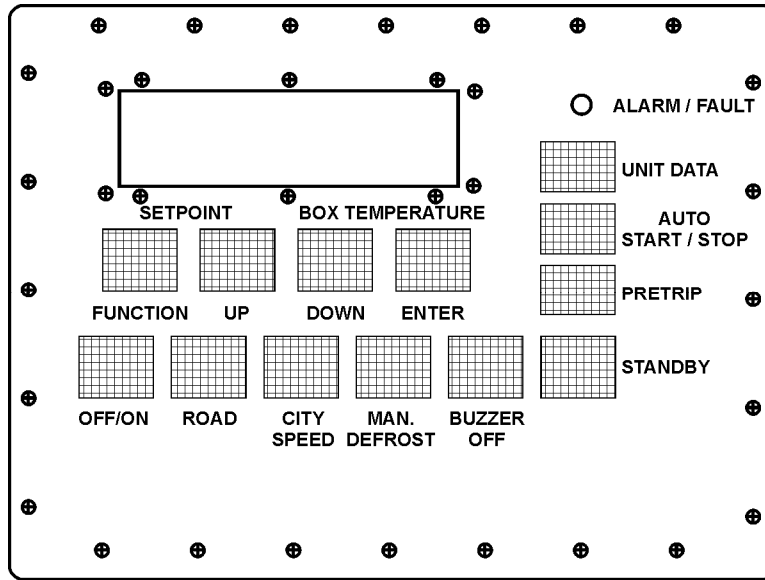


Figure 4. Microprocessor Controller Display.

REFRIGERATION UNIT

The insulated container has two distinct and interchangeable cargo zones – a refrigerator zone and a freezer zone. The unit is equipped with a condenser and a split evaporator system. The refrigerator zone evaporator is connected parallel with the freezer zone evaporator. Both evaporators are secured to the ceiling. The refrigeration unit uses non-ozone depleting R404A refrigerant. The condenser assembly is located on the upper front outside wall of the insulated container, providing favorable airflow during transport. The condenser is designed with a tilt so liquid refrigerant collects at the lowest point of the condenser. A belt driven and semi-hermetic compressor is used in the condenser assembly.

Design Features of Evaporator

Evaporator. The evaporators supply cool air to the insulated container refrigerated and freezer zone. A thermal expansion valve regulates refrigerant flow through each evaporator in order to reach and maintain the desired air temperature in the container cargo sections.

Evaporator Assembly. Each evaporator assembly (Figure 5) is equipped with heat and defrost elements. The air supply is directed across the ceiling while the return air is drawn up into the evaporator assembly.

Heater/Defrost. The heater and defrost elements have two functions. They provide heat to the cargo compartment when required and during cooling they defrost the evaporator coil during a defrost cycle. The evaporator assembly is equipped with a thermometer to measure the cargo compartment temperature.

Blower Assembly. Each evaporator contains two blower assemblies. The blowers force air to pass through the evaporator.

Drainage. A drip pan is located within the evaporator assembly. The drip pan allows water from evaporator to collect in the evaporator housing. Two condensate drain lines on each evaporator direct water collected to drain tubes in the container wall. Drain tubes in the container wall direct the condensate outside the MTRCS insulated container. Condensate drain lines are equipped with drain line heaters to prevent drain lines from freezing.

REFRIGERATION UNIT – CONTINUED

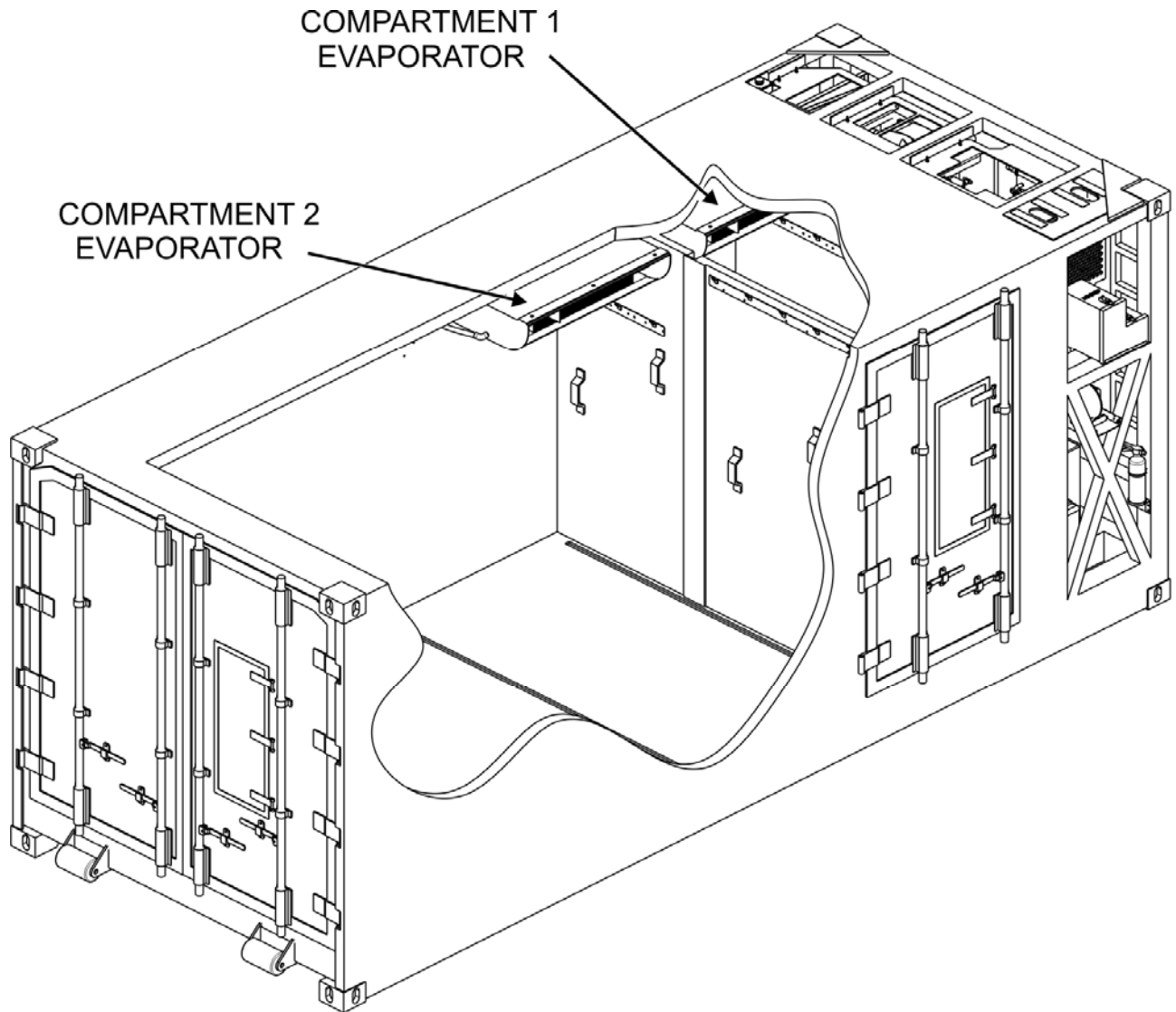


Figure 5. Evaporators.

REFRIGERATION UNIT – CONTINUED**Design Features of Condenser Assembly**

Compressor Pressure Regulating (CPR) Valve. The CPR valve (Figure 6, Item 1) is an adjustable regulating valve installed on suction line of compressor. It is used to regulate amount of suction pressure entering compressor. CPR valve is adjusted to maintain maximum suction pressure. Suction pressure is controlled to avoid overloading electric motor or engine during high box temperature operation.

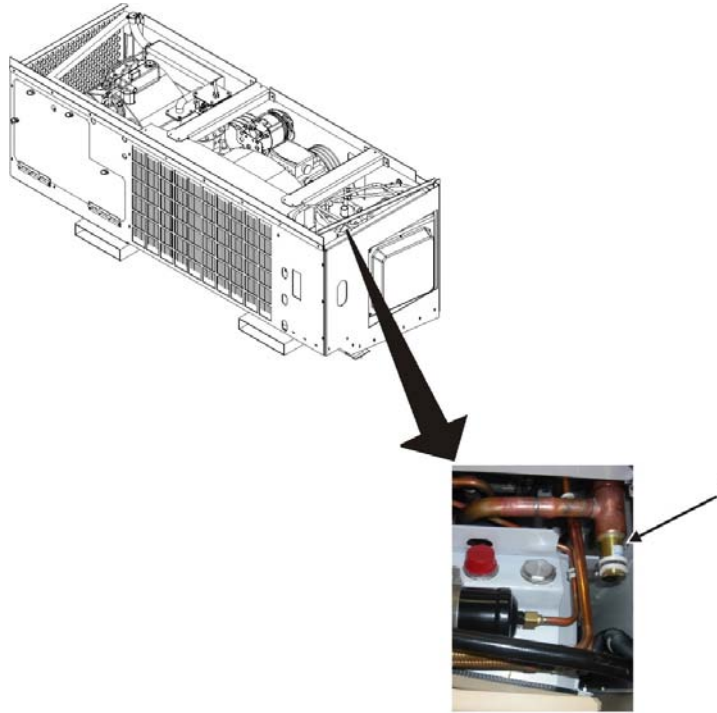


Figure 6. CPR Valve.

Accumulator. The accumulator (Figure 7, Item 1) is a refrigerant holding tank located in suction line between evaporator and compressor. It prevents/minimizes liquid refrigerant (that may be in the suction line) from entering into compressor resulting in internal damage. The compressor draws refrigerant vapor through outlet pipe of accumulator which is equipped with an opening that controls oil return to compressor and prevents accumulation of oil within accumulator tank.

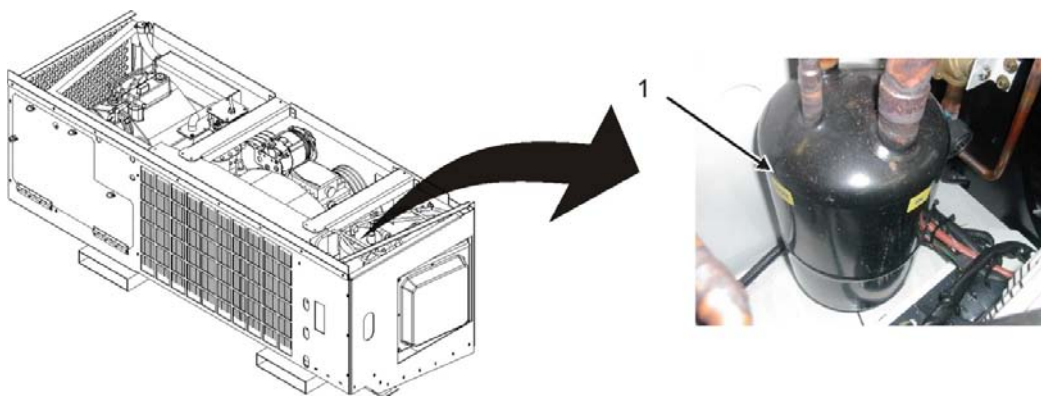


Figure 7. Accumulator.

REFRIGERATION UNIT – CONTINUED**Compressor Unloader**

The compressor is equipped with an unloader (Figure 8, Item 1) that is electronically controlled by the microprocessor. Unloaders are used for capacity control. Capacity controlled cylinders are easily identified by the solenoid (Figure 8, Item 2) which extends from the side of the cylinder head. When the unloader relay is energized, the solenoid valve opens and cylinders unload. Unloaded cylinders operate with little or no pressure differential and consume little power. A de-energized solenoid reloads cylinders.

NOTE

The unloader relay is locked in for a minimum of five minutes once it is energized due to suction pressure.

Temperature Control. In low speed cooling or heating, unloader relays may energize to unload compressor banks.

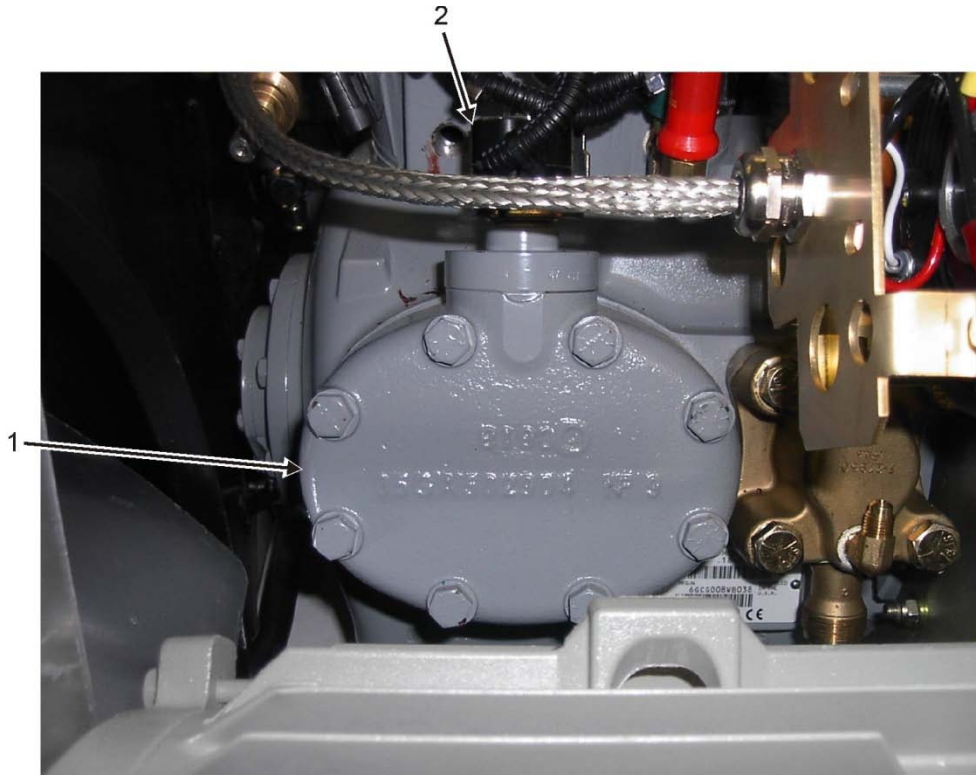


Figure 8. Compressor Unloader.

DIESEL ENGINE

The diesel engine is a vertical, water cooled, 4-cycle diesel engine designed to provide greater power, low fuel consumption, little vibration, and quiet operation. The diesel engine is fueled by an auxiliary tank designed into the MTRCS frame. The fuel tank has a drain system made into the unit and the auxiliary tank is located directly below the refrigeration system. The drain system design completely empties the tank when necessary through two drain cocks connected with drain tubing which feeds into a longer centralized drain tube to allow for easier draining of the tank. Markings on the fuel tank indicate types and quantities of fuel that can be used by the MTRCS refrigeration unit.

Battery Charging Alternator

The refrigeration unit is equipped with an integral alternator. A 12-volt battery system and charger is also integrated into the refrigeration unit.

Alternator Operation. The alternator converts mechanical and magnetic energy to alternating current (AC) and voltage. This is done by the rotation of electromagnetic field (rotor) inside a three-phase stator assembly. The alternating current and voltage is changed to direct current and voltage. This is done by passing AC energy through a three-phase, full-wave rectifier system (six silicon rectifier diodes are used).

Integral Voltage Regulator Operation (12 Volts DC)

The regulator is an all electronic, transistorized, device. No mechanical contacts or relays are used to perform voltage regulation of the alternator system. Electronic circuitry never requires adjustment. System is temperature compensated to permit ideal charging rate at all temperatures. The regulator is an electronic switching device. It senses voltage appearing at the auxiliary terminal of the alternator and supplies necessary field current for maintaining system voltage at output terminal. Output current is determined by the load.

Engine Safety Devices

Safety features include an automatic shut down with emergency bypass for over-speed, low oil pressure, low fuel, high coolant temperature, over-voltage, short circuit, and overload.

Oil Pressure (OP) Safety Switch. This switch (Figure 9, Item 1) is set to open below 1.0 ± 0.2 kg/cm² (15 ± 3 psig). The switch is on a time delay to allow engine to start and automatically stops the engine upon loss of oil pressure.



Figure 9. Oil Pressure Safety Switch.

DIESEL ENGINE – CONTINUED

Water Temperature Sensor (WTS). The water temperature sensor (Figure 10, Item 1) senses engine water temperature and is located near the top rear portion of the engine. The microprocessor will stop the refrigeration unit when water temperature exceeds $110 \pm 3^{\circ}\text{C}$ ($230 \pm 5^{\circ}\text{F}$).



Figure 10. Water Temperature Sensor.

Lubricating System

The engine lubrication system consists of an oil strainer, oil pump, relief valve, oil filter cartridge, and oil switch. Oil pump sucks lubricating oil from oil pan trough oil strainer. Oil flows down to filter cartridge for further filtering. Oil is then forced to the crankshaft connecting rods, idle gear, camshaft, and rocker arm shaft. Splashing or dripping oil from these parts provide lubrication for pistons, cylinders, small ends of connector rods, tappets, pushrods, inlet and exhaust valves, and timing gears.

Oil Filter Cartridge. When filter element is clogged and oil pressure in inlet line is greater than the outlet line, a bypass valve opens and oil flows from inlet to outlet, bypassing the filter element.

Oil Pressure Switch. This switch is mounted on the cylinder block. It serves as a warning to the operator that lubricating oil pressure is poor. If oil pressure falls below 49 kPa (0.5 kgf/cm², 7 psi), oil warning lamp lights up. When lamp lights up, the operator should immediately stop the engine and check for the cause of pressure drop.

Cooling System

The cooling system consists of a radiator (Figure 12, Item 1), condenser fan (Figure 12, Item 2), water pump (Figure 12, Item 4), and a thermostat (Figure 12, Item 3). The radiator and condenser is an assembly housed in one component. A standard mixture of antifreeze and water provides coolant protection from both extremes of hot and cold. The water pump provides coolant flow from the hot engine cylinder block (Figure 12, Item 5) through the radiator core where the fan pulls air through the radiator for cooling. The thermostat controls coolant flow to maintain a constant engine temperature.

DIESEL ENGINE – CONTINUED

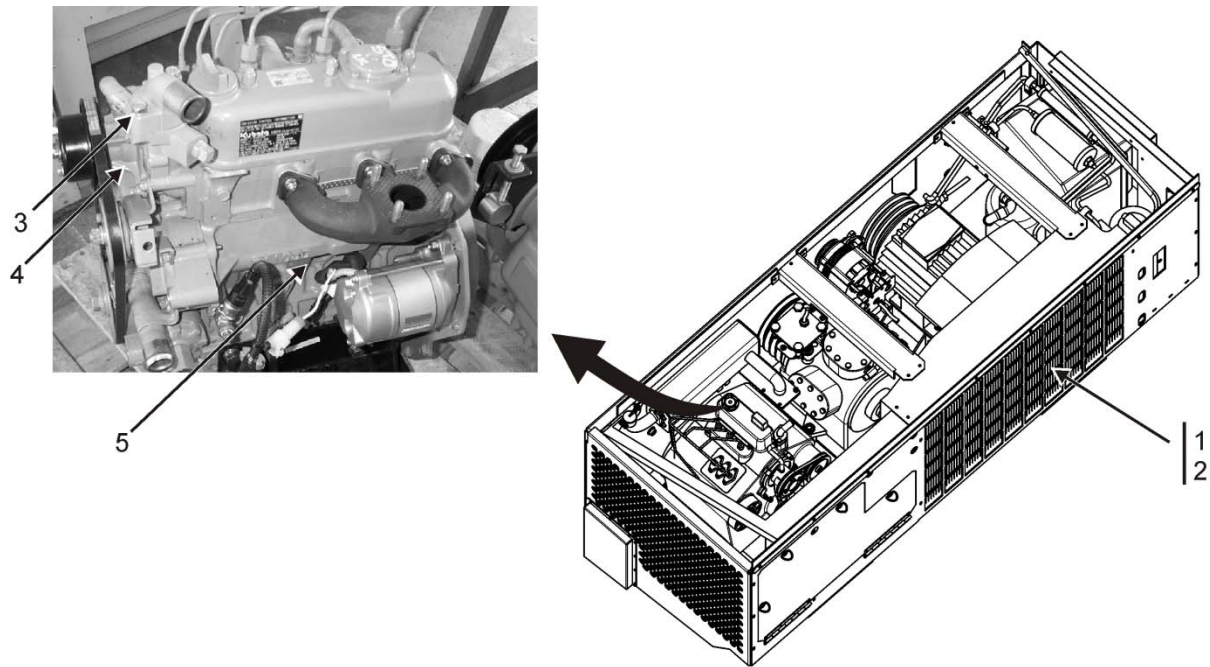


Figure 11. Cooling System.

Water Pump. The water pump is driven by a V-belt connected to the engine crankshaft. Coolant flows from the radiator into the water pump lower portion. Coolant is then pumped outward into the engine water jacket around the cylinder block.

Thermostat. The thermostat maintains coolant temperature at 71°C (160°F). When the thermostat is open, coolant flows through the radiator for cooling. When closed, coolant flows through the bypass back into the engine.

Condenser Fan. The condenser fan blade is driven by the standby motor to pull air through the radiator fins to dissipate heat.

Radiator. The radiator core consists of tubes and fins. Heat from the hot water in the tubes is radiated through the tube walls and fans. The radiator uses a corrugated fin type core, providing a high heat transfer rate.

Radiator Cap. The cap is used for maintaining internal pressure of the cooling system while engine is in operation at the level of 88 kPa (0.9 kgf/cm², 13 psi).

Intake and Exhaust System

Engine Air Cleaner. The engine air cleaner (Figure 13, Item 1) is designed to maintain engine life and performance by preventing dirt and grit from entering the engine and causing excessive wear on the operating parts. Clean air is supplied to the engine through the air cleaner. This air cleaner is a dry-cyclone type for easy maintenance.

DIESEL ENGINE – CONTINUED

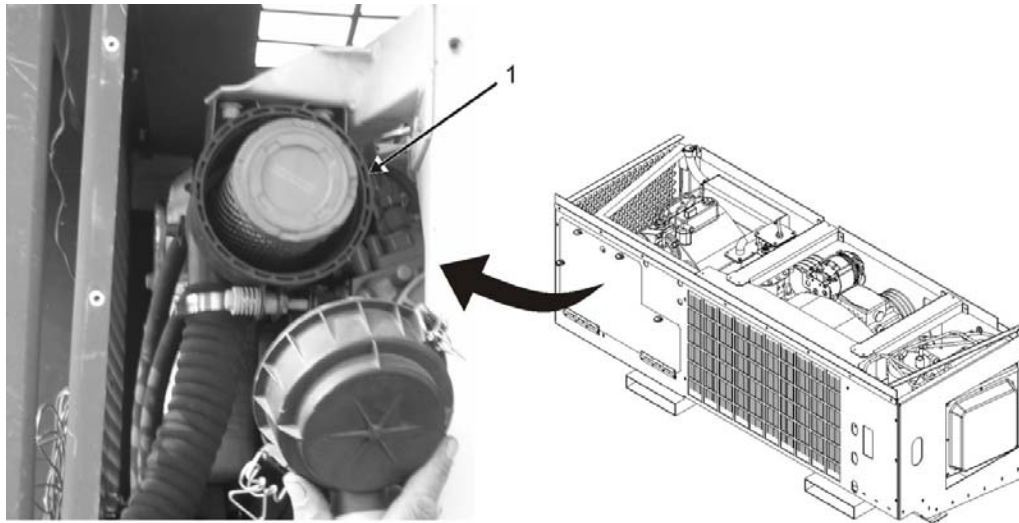


Figure 12. Engine Air Cleaner.

CAUTION

A dirty air filter can/may cause internal engine damage.

Muffler. The muffler is used to reduce noise during engine operation. The glass wool placed between the outer tube and main body of the muffler absorbs exhaust noise of a higher frequency.

Fuel System

A fuel pump strainer located inside of the fuel tank prohibits sediment and other debris from entering into the fuel system. JP-8 or diesel fuel travels from the fuel tank through the fuel filter, and then enters the injection pump after impurities are removed. The fuel, pressurized by the injection pump, is injected into combustion chamber by the fuel nozzle. Part of the fuel fed to injection nozzle lubricates moving parts of the plunger inside the nozzle. The unused fuel is also used as a coolant for the nozzle and then returns to the fuel tank through nozzle overflow pipe from upper part of nozzle holder.

Injection Nozzle and Glow Plug. An injection nozzle (Figure 11, Item 1) and rapid heating sheathed type glow plug (Figure 11, Item 2) is installed in the combustion chamber. The glow plug enables easier engine starts.

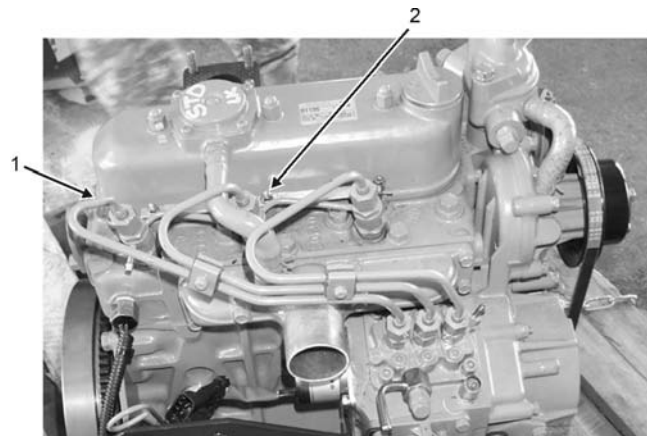


Figure 13. Nozzle and Glow Plug.

DIESEL ENGINE – CONTINUED

Fuel Filter. The fuel filter (Figure 14, Item 1) uses very fine paper to separate and filter dirt from fuel and water found in tank. An air vent plug is fitted to the filter housing.

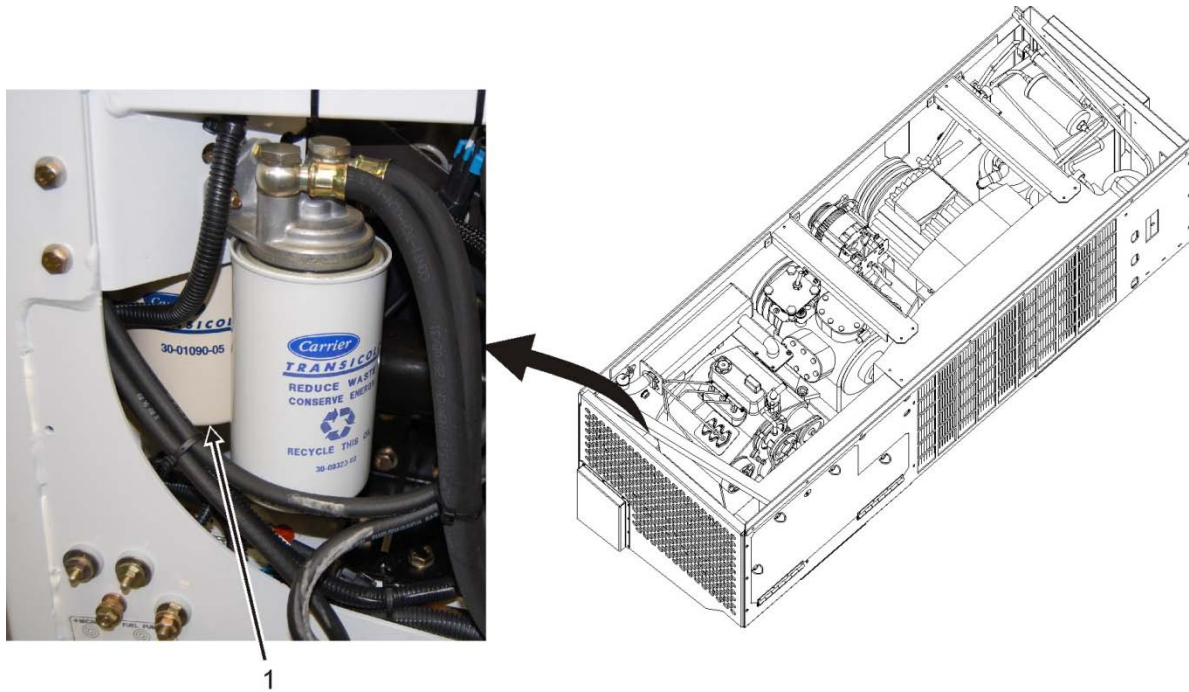


Figure 14. Fuel Filter.

Governor. The governor (Figure 15, Item 1) maintains engine speed at a constant level and also provides stable idling. The governor regulates maximum engine speed by controlling fuel injection rate.



Figure 15. Governor.

DIESEL ENGINE – CONTINUED**ELECTRICAL DESIGN, CABLES, LIGHTING, ALARM, TEMPERATURE CONTROL, AND RECORDING**

The MTRCS electrical design includes system and circuitry components for the refrigeration unit and any additional equipment.

Power Supply Cable

Power cables/connectors are a minimum of 50 feet in length. They are capable of operating each power source. One end of each power cable is permanently attached to the power box (Table 1).

Lighting

System lights are furnished for each compartment of the insulated container. The light switch is located on the control box assembly. The MTRCS is provided with internal blackout capabilities. This allows food service personnel to continue loading/unloading during blackout conditions. This switch is located on the control box assembly. Blackout mode is the default setting.

Alarm System

The alarm system is both audio and visual. The alarm is activated when the inside container temperature changes from either of the set temperature ranges. The temperature range is set at the control box. The operator can choose to use or disable the alarm system at the control box.

Temperature Control

A microprocessor based electronic refrigeration control module is the major operational component of the refrigeration unit. The controller guides all temperature and defrost functions in both compartments of the insulated container. Each compartment of the insulated container has a controller sensing element that monitors all functions throughout the pallets and their configurations. The operator can adjust the compartment temperatures using the microprocessor controller in the control box.

Temperature Recorder

A commercially available shock-mounted, waterproof, seven-day temperature recorder is used on the MTRCS. The temperature recorder is located on the left exterior of the unit. Chart recorder paper is provided inside the document holder.

END OF WORK PACKAGE

CHAPTER 2
OPERATOR INSTRUCTIONS
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

INTRODUCTION

The MTRCS contains three sets of controls and indicators – power box assembly, control box, and microprocessor controller assembly – that provide various levels of control for the MTRCS. The following tables and illustrations provide the description and use of the controls and indicators that are relevant to the MTRCS.

POWER BOX ASSEMBLY CONTROLS AND INDICATORS**CAUTION**

Do not connect the high voltage cable and the low voltage cable at the same time.
Damage to the system will result.

The power box assembly is used to initiate the externally supplied Alternating Current (AC) power needed for operation of the MTRCS. External power is supplied to the power box assembly through two external power cables; one for low voltage, and one for high voltage. Rotary switches S1 (low voltage) and S2 (high voltage) provide selection control for power sources based on the input from the external power source. Circuit breakers CB1 (low voltage) and CB2 (high voltage) provide circuit protection and operator control for power source selection. Refer to Figure 1 and Table 1 for location of and description of Power Box Assembly controls and indicators.

POWER BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

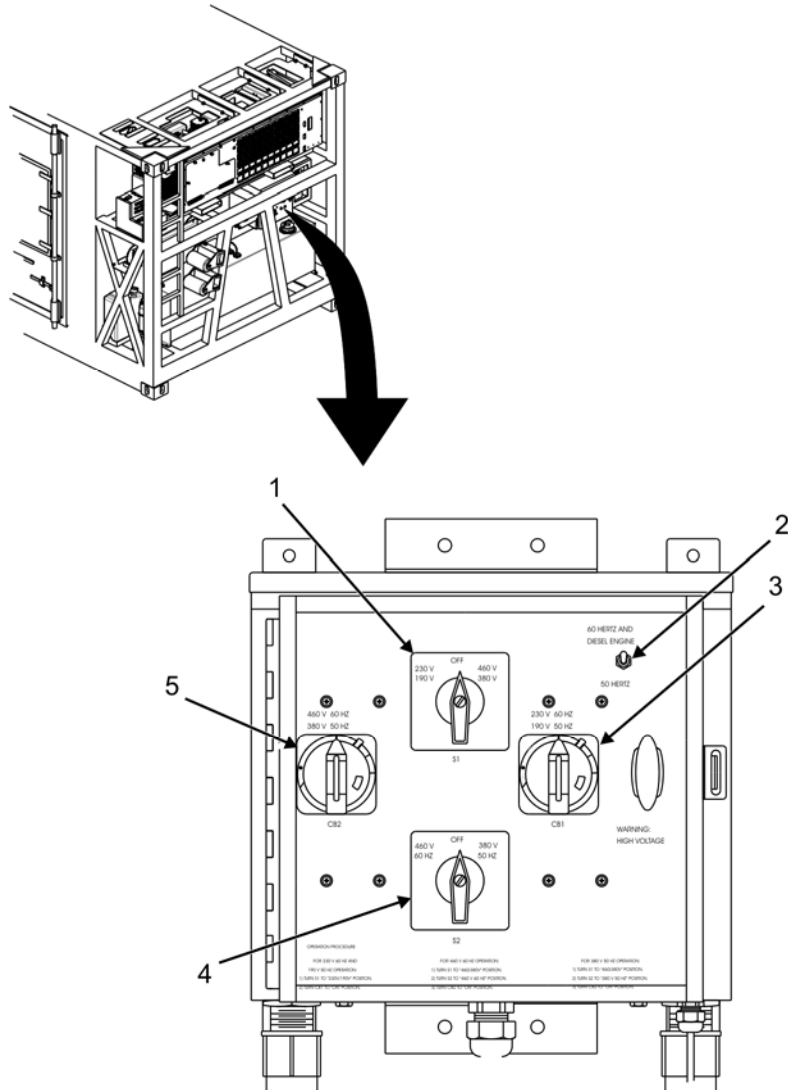


Figure 1. Power Box Assembly Controls and Indicators.

POWER BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 1. Power Box Assembly Controls and Indicators.

Figure 1 Key	Control/Indicator	Function
1	S1	<p>Rotary selector switch. Provides operator with selection control between high or low voltage.</p> <p>In the OFF position, power is not available for distribution.</p> <p>When S1 is positioned to low voltage (230V/190V), input power is routed to low voltage circuit breaker CB1.</p> <p>When S1 is positioned to high voltage (460V/380V), input power is routed to high voltage circuit breaker CB2.</p>
2	S7	<p>60 HERTZ AND DIESEL ENGINE/50 HERTZ switch. Provides operator with selection control between 60 Hz and diesel or 50 Hz standby motor operation.</p>
3	CB1	<p>Circuit breaker. Provides circuit protection ON/OFF control when switch S1 is selected.</p> <p>In the OFF or TRIP position, power is not available for distribution from circuit breaker CB1.</p> <p>In the ON position, low voltage power from switch S1 is routed to standby motor controller as 230 VAC, 60 Hz, 3-phase power or 190 VAC, 50 Hz, 3-phase power, depending on external input power supplied.</p>
4	S2	<p>Rotary selector switch. Provides operator with selection control between 380 VAC and 460 VAC when high voltage is selected on switch S1.</p> <p>In the OFF position, power is not available for distribution from switch S2.</p> <p>When switch S2 is positioned to 460V 60 HZ, power from circuit breaker CB2 is routed to 460V side of transformer TR1 in the power box assembly, then to standby motor controller as 230 VAC, 60 Hz, 3-phase power.</p> <p>When switch S2 is positioned to 380V 50 HZ, power from circuit breaker CB2 is routed to 380V side of transformer TR1 in the power box assembly, then to standby motor controller as 190 VAC, 50 Hz, 3-phase power.</p>
5	CB2	<p>Circuit breaker. Provides circuit protection ON/OFF control when switch S1 selection is 460V/380V.</p> <p>In the OFF or TRIP position, power is not available for distribution from circuit breaker CB2.</p> <p>In the ON position, high voltage power is available at switch S2 for selection as 460 VAC or 380 VAC, depending on external input power supplied.</p>

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS

The control box assembly consists of two panels used to control all the components of the MTRCS unit.

Control Box

The control box provides the operator with toggle switch selection control between NORMAL MODE and BLACKOUT MODE for fuel level indication, lighting, and alarm. Indicator lights and warning horns on the control box provide both visual and audible warning indications for each compartment within the refrigeration unit. Refer to Figure 2 and Table 2 for location of and description of control box assembly controls and indicators.

NOTE

The NORMAL mode and BLACKOUT mode positions indicated on the control box placard are applicable to each one of the toggle switches – FUEL LEVEL INDICATOR, LIGHTING, and ALARM. If it is necessary to operate the MTRCS in the blackout mode, each one of the switches would be toggled to the right.

In the NORMAL MODE, fuel level light indicators are enabled and depending on fuel level conditions, will illuminate either green or red; the audible alarms (HN1 and HN2) and compartment temperature indicators (DS1 and DS2) are enabled and will provide both audible and visual alarms when either compartment is in an over temperature or under temperature condition; and container lighting will use normal (white) lighting circuits.

In the BLACKOUT MODE, fuel level indicators are disabled and will not illuminate; compartment temperature audible and visual alarms are disabled and will not sound or illuminate; and container lighting circuitry will switch to blackout (red) lighting.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

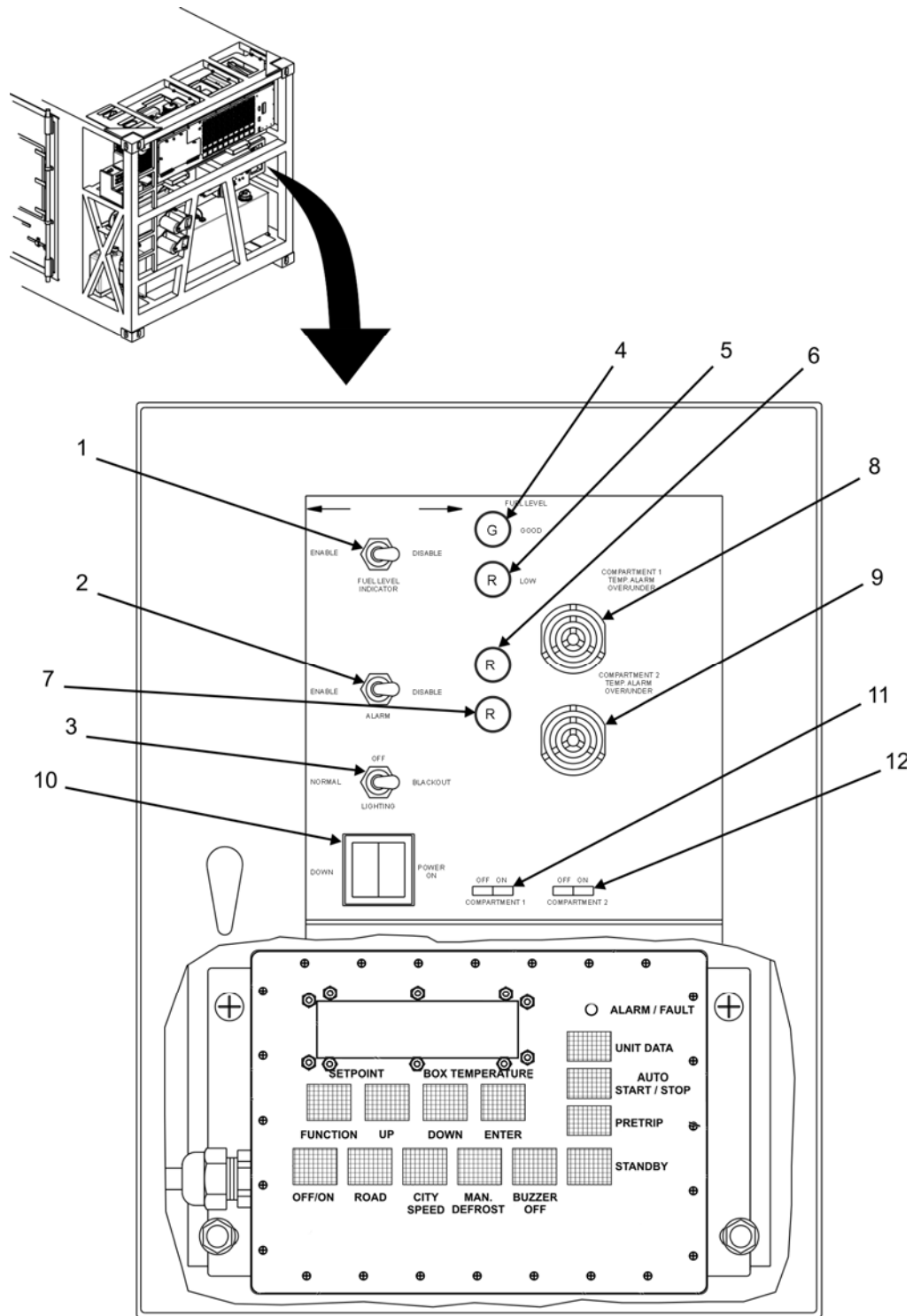


Figure 2. Control Box Assembly Controls and Indicators.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 2. Control Box Assembly Controls and Indicators.

Figure 2 Key	Control/Indicator	Function
1	S6 FUEL LEVEL INDICATOR	<p>Toggle switch, two-position, Single-Pole Single-Throw (SPST). Provides operator with selection control between NORMAL and BLACKOUT modes for fuel level indicators.</p> <p>In the ENABLE position (NORMAL mode), fuel level monitoring is enabled. In this position, a closed path circuit is completed for the FUEL LEVEL GOOD (DS3) green and LOW (DS4) red indicator lights.</p> <p>In the DISABLE position (BLACKOUT mode), fuel level indicator lights DS3 and DS4 are disabled by opening the indicator lights circuit.</p>
2	S5 ALARM	<p>Toggle switch, two-position, SPST. Provides operator with selection control between NORMAL and BLACKOUT modes for refrigeration unit compartments 1 and 2 temperature sensing, visual (DS1 and DS2) and audible (HN1 and HN2) alarms.</p> <p>In the ENABLE position (NORMAL mode), temperature sensing, visual, and audible, alarms are enabled. In this position, a closed path circuit is completed for the temperature sensing alarms through circuitry in the Temperature Chart Recorder (TCR) and a predefined temperature sensor in each of the refrigeration unit compartments.</p> <p>In the DISABLE position (BLACKOUT mode), temperature sensing, visual, and audible alarms are disabled by opening the temperature sensing circuit.</p>
3	S3 LIGHTING	<p>Toggle switch, three-position, Single-Pole Double-Throw (SPDT) with center OFF position. Provides operator with selection control between normal and blackout modes for refrigeration unit compartments 1 and 2 internal lighting (LT1, LT2, BLT1, and BLT2).</p> <p>In the OFF position, the closed path circuit for both NORMAL and BLACKOUT modes is interrupted, and the refrigeration unit compartment lights remain off.</p> <p>When S3 is positioned to NORMAL (NORMAL mode), the normal lighting circuit for refrigeration unit compartments 1 and 2 is completed and internal lights LT1 and LT2 will illuminate.</p> <p>When S3 is positioned to BLACKOUT (BLACKOUT mode), the blackout lighting circuit for refrigeration unit compartments 1 and 2 is completed and internal lights BLT1 and BLT2 will illuminate.</p>
4	DS3 FUEL LEVEL GOOD	<p>Indicator light, Green, FUEL LEVEL GOOD.</p> <p>When S6 is in the ENABLE position and DS3 is illuminated green, the fuel level is at an acceptable level to run the MTRCS. A fuel level switch (S4) located in the fuel tank completes the circuit when the fuel level is at an acceptable level. FUEL LEVEL LOW indicator (DS4) will be extinguished when DS3 is illuminated.</p>

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 2. Control Box Assembly Controls and Indicators – Continued.

Figure 2 Key	Control/Indicator	Function
5	DS4 FUEL LEVEL LOW	Indicator light, Red, FUEL LEVEL LOW. When S6 is in the ENABLE position and DS4 is illuminated red, the fuel level is low and at an unacceptable level to run the MTRCS. A fuel level switch (S4) located in the fuel tank completes the circuit when the fuel level is low. FUEL LEVEL GOOD indicator (DS3) will be extinguished when DS4 is illuminated.
6	DS1 COMPARTMENT 1 TEMPERATURE	Indicator light, Red, TEMP ALARM OVER/UNDER. When S5 is in the ENABLE position and DS1 is illuminated, the temperature of refrigeration unit compartment 1 is outside of the predefined range limit. Note that HN1 should also be audible. When S5 is in the ENABLE position and DS1 is extinguished, the temperature of refrigeration unit compartment 1 is within the predefined range limit.
7	DS2 COMPARTMENT 2 TEMPERATURE	Indicator light, Red, TEMP ALARM OVER/UNDER. When S5 is in the ENABLE position and DS2 is illuminated, the temperature of refrigeration unit compartment 2 is outside of the predefined range limit. Note that HN2 should also be audible. When S5 is in the ENABLE position and DS2 is extinguished, the temperature of refrigeration unit compartment 2 is within the predefined range limit.
8	HN1 COMPARTMENT 1 TEMPERATURE	Refrigeration unit Compartment 1 Horn, TEMP ALARM OVER/UNDER. When S5 is in the ENABLE position and HN1 is audible, the temperature of refrigeration unit compartment 1 is outside of the predefined range limit. Note that DS1 should also be illuminated. When S5 is in the ENABLE position and HN1 is not audible, the temperature of refrigeration unit compartment 1 is within the predefined range limit.
9	HN2 COMPARTMENT 2 TEMPERATURE	Refrigeration unit Compartment 2 Horn, TEMP ALARM OVER/UNDER. When S5 is in the ENABLE position and HN2 is audible, the temperature of refrigeration unit compartment 2 is outside of the predefined range limit. Note that DS2 should also be illuminated. When S5 is in the ENABLE position and HN2 is not audible, the temperature of refrigeration unit compartment 2 is within the predefined range limit.
10	S10 POWER	Rocker switch, double pole, illuminated. In the ON position, power is supplied for operation of the refrigeration unit. In the DOWN position, all power is removed.
11	S8 COMPART- MENT 1 ON/OFF	Refrigeration unit Compartment 1 ON/OFF switch.
12	S9 COMPART- MENT 2 ON/OFF	Refrigeration unit Compartment 2 ON/OFF switch.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Microprocessor Controller

The microprocessor controller is housed in the control box assembly enclosure. The microprocessor controller contains two controller circuit boards and a relay module. A processor board provides the actual microprocessor program memory that is used to store the various operating parameters, and the required input and output circuitry that allows for MTRCS interface. Operator interfaces on the microprocessor controller consist of a Liquid Crystal Display (LCD), keypad, and keypad interface. Refer to Figure 3 and Table 3 for location of and description of microprocessor controller controls and indicators.

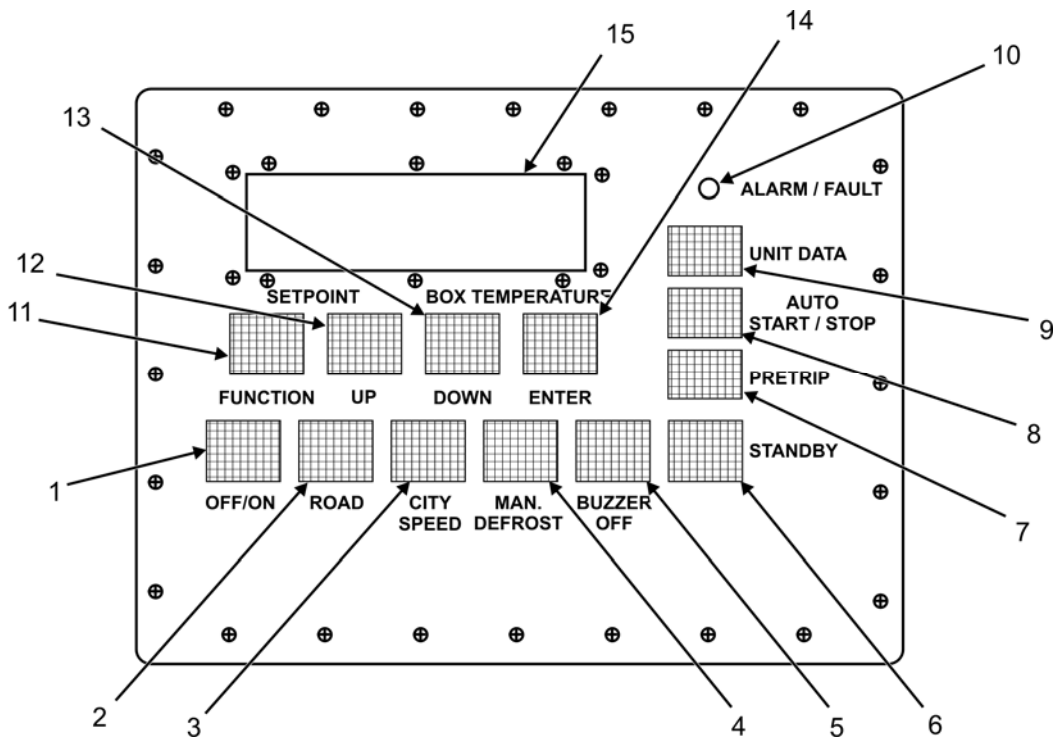


Figure 3. Microprocessor Controller Controls and Indicators.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED**Table 3. Microprocessor Controller Controls and Indicators.**

Figure 3 Key	Control/Indicator	Function
1	OFF/ON	Rocker switch used as main ON and OFF control key for the microprocessor controller. In the OFF position, power is interrupted and cooling compartments are disabled. In the ON position, power from the battery is available to power the microprocessor controller and control cooling compartments.
2	ROAD	The ROAD key provides operating mode selection control for the diesel engine. The selected operating status is stored in memory.
3	CITY SPEED	The CITY SPEED key enables low speed operation. Pressing the CITY SPEED key toggles the operating mode and stores the mode in memory. When active, the CITY SPEED icon is displayed in the microprocessor controller DISPLAY window.
4	MAN. DEFROST	The MAN. DEFROST key provides the operator with the ability to start a defrost cycle manually. Conditions must be met in order to initiate the cycle.
5	BUZZER OFF	The BUZZER OFF key turns off the audio alert buzzer. When a fault light is energized, the buzzer is on. When a fault light is de-energized, the buzzer is off.
6	STANDBY	The STANDBY key selects the electric motor as the operating mode and stores the operating mode in memory. If the operating mode is switched to standby and the external power cord is not plugged in, NO POWER will be displayed in the microprocessor controller DISPLAY window.
7	PRE-TRIP	Not functional on the MTRCS.
8	AUTO START/STOP	The AUTO START/STOP key toggles the operating mode. Operating modes are auto start/continuous run and auto start/stop. Each time the AUTO START/STOP key is pressed, the operating mode alternates, and the operating status is stored in memory. During a power outage, the last memory is retained. When starting the unit in manual mode, the AUTO START/STOP key must be in the auto start/continuous run selection.
9	UNIT DATA	The UNIT DATA key is used to display operating data. The UNIT DATA key is used in conjunction with the UP and DOWN arrow keys to allow the user to view various operating parameters relevant to the MTRCS. Selected values are viewed on the microprocessor controller DISPLAY window.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 3. Microprocessor Controller Controls and Indicators – Continued.

Figure 3 Key	Control/Indicator	Function
10	ALARM/FAULT	<p>The ALARM/FAULT indicator is a red light that illuminates when a fault in the system occurs.</p> <p>The fault light is illuminated only during faults that specify to illuminate it. An alarm in the system will cause the display to alternate between the default setpoint/air temperature and the indicated description of the alarm, or alarms. Each listed fault will be displayed on the microprocessor controller DISPLAY window for a period of three to ten seconds. If more than one fault exists, each will be displayed for the three to ten second time.</p>
11	FUNCTION	<p>The FUNCTION key allows the operator to view the various MTRCS operating parameters and is used in conjunction with the UP and DOWN arrow keys and the ENTER key to change selected parameters. All functional parameters will be stored in memory.</p> <p>Pressing the FUNCTION key a single time and releasing it advances the display to the next parameter.</p> <p>Pressing and holding the FUNCTION key for one second will cause the list to advance one at a time, and continue in a loop.</p>
12	UP ARROW	<p>The UP ARROW key is used to modify the displayed data in an increasing manner.</p> <p>The displayed functional parameter can be increased by pressing the UP ARROW key. Changing the displayed parameter value causes the value to flash on the microprocessor controller DISPLAY window, indicating it has not been entered. Failure to enter the data within 5 seconds will result in the parameter reverting back to the original value prior to increase.</p>
13	DOWN ARROW	<p>The DOWN ARROW key is used to modify the displayed data in a decreasing manner.</p> <p>The displayed functional parameter can be decreased by pressing the DOWN ARROW key. Changing the displayed parameter value causes the value to flash on the microprocessor controller DISPLAY window, indicating it has not been entered. Failure to enter the data within 5 seconds will result in the parameter reverting back to the original value prior to decrease.</p>

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 3. Microprocessor Controller Controls and Indicators – Continued.

Figure 3 Key	Control/Indicator	Function
14	ENTER	<p>The ENTER key is used to accept changes in parameter values and changes to setpoint ranges.</p> <p>After the UP ARROW or DOWN ARROW keys have been used to modify a selected parameter, the ENTER key must be pressed to accept the change. If the ENTER key is not pressed within 5 seconds, the parameter change will not occur and the parameter value will revert to the value prior to the increase or decrease.</p> <p>Pressing the ENTER key when a value has been changed will cause the display on the microprocessor controller DISPLAY window to stop flashing, indicating that the parameter has been entered. The accepted value will continue to be displayed steady for 5 seconds, then the microprocessor controller DISPLAY window will revert to the default display.</p>
15	DISPLAY	<p>The DISPLAY is used to display the various operating parameters, setpoint values, controlled air temperature, and various operating modes of the MTRCS in a digital format.</p> <p>The DISPLAY contains nine digits and is defaulted to display of the compartment number (left side of display) and setpoint value.(middle of display) and controlled air temperature in keypad selectable degrees Fahrenheit or degrees Celsius (right side of display). The user can select compartment 1 or compartment 2, which will display as C1 or C2, respectively.</p>

Microprocessor Controller Display (MCD) Functional Settings for Selected Operating Features

The MCD portion of the Control Box Assembly is located directly beneath the Control Panel inside the Control Box Assembly. The MCD provides the operator with various control and monitoring options for the refrigeration unit. Each of the functions is selectable by pressing various rocker switches on the faceplate. The functions are described in further detail in the paragraphs below.

FUNCTION Key (Figure 3, Item 11). Functional parameters that control selected operating features of the MTRCS can be displayed by pressing the FUNCTION key (Figure 3, Item 11). Selected functions can be further modified using the MCD keypad. All functional settings are stored in MCD memory. Pressing the FUNCTION key, or UP/DOWN arrow keys, will progressively advance the function list by one in a scrolling manner. If the FUNCTION key is pressed and held for one second, the list advances one item at a time. The list is circular, meaning that it will return to the first entry in the list after the last entry in the list has been displayed. This holds true also for the UP/DOWN arrow keys.

A displayed functional parameter can be changed by pressing the ENTER key, then the UP or DOWN arrow key. Changed values then flash, indicating that the change has not yet been accepted. Pressing the ENTER key will cause the display to stop flashing, and accepts the changed value. Failure to accept a change in parameter value within 5 seconds will cause the display to revert back to the original value prior to the change. The 5-second timer delay is reset each time any key is pressed on the MCD. Table 4 provides a description of the various functions that can be displayed on the MCD panel display using the keypad. Function codes can be displayed in English or Code using the Code vs. English function selection available on the MCD panel.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 4. Function Codes.

Code	English	Data	Description												
FN0	DEFR	Defrost Interval	Defrost periods are 1-1/2, 3, 6, or 12 hours. Displays with either Code or English, one decimal and with the letter H at the end to indicate hours. Example – DEFR 6.0H indicates that the defrost interval is set for 6 hours.												
FN1 ON	CITY SPD	Low Speed	Displays status of speed control solenoid override. City speed setting (low speed) is ON and high speed setting is OFF. If display shows CITY SP, unit is locked into low speed.												
FN1 OFF	HIGH SPD	High Speed	Displays status of speed control solenoid override. High speed setting is ON and city speed setting (low speed) is OFF.												
FN2	OFF T	Minimum Off-Time	Provides status of off-time selection for auto start mode. Off-times are 10, 20, 30, 45, or 90 minutes, and are displayed with two digits followed by the letter M to indicate minutes. Example – OFF T 10M indicates that off-time selection for auto start is set to 10 minutes.												
FN3	ON T	On-Time	Provides status of on-time selection for auto start mode. On-times are 4 or 7 minutes, and are displayed with two digits followed by the letter M to indicate minutes. Example – ON T7 M indicates that on-time selection for auto start is set to 7 minutes.												
FN4	DEGREES F OR C	Temperature Unit °C or °F	Provides selection control for how parameters will be displayed. This setting also controls units displayed in pressure ratings rather than temperature.												
FN5 ON	TIME STRT	Maximum Off-Time 30-minutes	When unit is in time start, control will force engine to restart 30-minutes after shutoff.												
FN5 OFF	TEMP STRT	Temperature Based Restarting	When unit is in temp start, the engine will restart when the unit reaches a certain preset temperature.												
FN6	MOP	By-Pass Valve	<p>Once the By-Pass Valve is de-energized, it is held off for a minimum of 2 minutes. Refer to the table below for the various settings available under this function code.</p> <p>By-Pass Valve Setup (PSIG)</p> <table border="1"> <thead> <tr> <th>FN6 Setting</th> <th>Energized (Open)</th> <th>De-Energized (Closed)</th> </tr> </thead> <tbody> <tr> <td>STD</td> <td>17</td> <td>25</td> </tr> <tr> <td>MOP-</td> <td>15</td> <td>27</td> </tr> <tr> <td>MOP+</td> <td>19</td> <td>29</td> </tr> </tbody> </table>	FN6 Setting	Energized (Open)	De-Energized (Closed)	STD	17	25	MOP-	15	27	MOP+	19	29
FN6 Setting	Energized (Open)	De-Energized (Closed)													
STD	17	25													
MOP-	15	27													
MOP+	19	29													

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 4. Function Codes – Continued.

Code	English	Data	Description
FN7 ON	AUTO OP	Auto Start Operation	To start unit in automatic start mode, the AUTO START/STOP selection must be in auto start/stop mode.
FN7 OFF	MAN OP	Manual Start Operation	To start unit in manual start mode, the AUTO START/STOP selection must be in continuous run mode.
FN8	T RANGE	Out-Of-Range Tolerance	Controller indicates an out-of-range condition when the temperature has been within the tolerance limit at least one time, then goes outside of that tolerance for a minimum of 15 minutes. Tolerances are selected as follows: A = 2°C (3.6°F) B = 3°C (5.4°F) C = 4°C (7.2°F) For setpoints in the frozen range, at or below -12.2°C (+10°F), out-of-range considers temperatures above setpoint only.
Code vs. English = Code or English Display Format			Functional parameters, unit status, and alarms can be displayed in either English or Codes using the ENGLISH or CODES function selection. When set to CODES, all display descriptions are set to their respective code display. When set to ENGLISH, all codes are set to their respective English display.
Manual Glow Override = Normal or Add 30 Sec.			Provides the operator with the option for manual override of the auto start glow time. Display is NORMAL or ADD GLOW. Selecting ADD GLOW will add 30 seconds of glow time to the start sequence. The selection of ADD GLOW must be made before three start attempts are completed. ADD GLOW is deselected upon engine start or fails to start.
Alarm RST = Alarm Reset Required Alarm CLR = No Alarm Active			Provides the operator with alarm reset capability. Display is ALARM RST or ALARM CLR. If ALARM CLR is displayed, no alarms are present in the system. If ALARM RST is displayed, there is at least one alarm present. Pressing the ENTER key will clear all present alarms.

UP/DOWN Arrow Key (Figure 3, Item 12, Item 13). A description of the selected function is displayed on the left side with matching data on the right side. The function setting list can be scrolled through either by pressing the FUNCTION key or by using the UP/DOWN arrow key (Figure 3, Item 12, Item 13). Each time the FUNCTION key is pressed, the list moves forward by one item. If the FUNCTION key is pressed and held for one second, the list advances one item at a time. The list is circular, meaning that it will return to the first entry in the list after the last entry in the list has been displayed.

ENTER Key (Figure 3, Item 14). Data is changed when the functional setting is displayed by pressing the ENTER key (Figure 3, Item 14) and then pressing either the UP or DOWN arrow keys. Once new data is entered pressing the ENTER key again will accept the change. There is a five second time limitation to enter new data and accept the data by pressing the ENTER key before the display reverts back to the default display. Pressing the FUNCTION key again will change a different functional setting.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Description messages of functional parameters, unit status, and alarms can be displayed in English or Code using the Code vs. English function selection on display panel. With data set to display code, all display descriptions are set to their code display. When set to English, all display descriptions are set to display a brief English description. This parameter will not change due to this selection. Each individual code and English translation is listed with a description in Table 4.

UNIT DATA Key (Figure 3, Item 9). The UNIT DATA key (Figure 3, Item 9) is used to display various MTRCS operating parameter values. Each value is displayed for five seconds, if no further action is taken, before it reverts back to the default setting. The five second timer is reset each time the UNIT DATA or UP/DOWN arrow keys are pressed. Table 5, Unit Data Codes, provides a description of the data that can be displayed on the MCD panel display using the keypad to cycle through various parameters. Each time the UNIT DATA key is pressed, the list moves forward by one item. If the UNIT DATA key is pressed and held for 1.0 second, the list advances one item at a time every 0.5 second. The list is circular, meaning that it will return to the first entry in the list after the last entry in the list has been displayed. Unit data codes can be displayed in English or Code using the Code vs. English function selection available on the MCD panel.

Table 5. Unit Data Codes, Figure 3, Item 9.

Code	English	Data	Description
CD1	SUCT	Suction Pressure	Displays proper unit designation P (psig) or B (Bars). Readings below 0 psig are displayed in inches of mercury. Display range is from -0.7 Bars to 29.4 Bars (-20.0 HG to 420.0 psig)
CD2	ENG	Engine Hours	Displays the number of hours the diesel engine has operated. Data is displayed with unit designator of H for hours, and a display range of 0 to 99999. Example – ENG 2250H indicates the engine has been operating for 2250 hours.
CD3	WT	Engine Temperature	Displays the engine temperature in Degrees C or Degrees F. Engine temperature data has a display range of -12.0°C to 130.0°C (10.0°F to 266.0°F). Example – WT 135F indicates engine temperature is 135.0°F.
CD4	1RA	Return Air Temperature C1	Displays the compartment 1 return air temperature in Degrees C or Degrees F. Compartment 1 return air temperature data has a display range of -38.0°C to 70.0°C (-36.0°F to 158.0°F) and is displayed with one decimal place. Example – 1RA 2.5F indicates compartment 1 return air temperature is 2.5°F.
CD6	2DT	Compartment 2 Defrost Thermistor Sensor	Displays the compartment 2 defrost thermistor temperature in Degrees C or Degrees F. Compartment 2 defrost thermistor temperature data has a display range of -38.0°C to 70.0°C (-36.0°F to 158.0°F) and is displayed with one decimal place. Example – 2DT 85.0F indicates compartment 2 defrost thermistor temperature is 85.0°F.
CD7	3DT	Compartment 3 Defrost	Not used on MTRCS.
CD8	1DTS	Compartment 1 Defrost Thermistor Sensor	Displays the compartment 1 defrost thermistor temperature in Degrees C or Degrees F. Compartment 1 defrost thermistor temperature data has a display range of -38.0°C to 70°C (-36.0°F to 158.0°F) and is displayed with one decimal place. Example – 1DTS 45.2F indicates compartment 1 defrost thermistor temperature is 45.2°F.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 5. Unit Data Codes, Figure 3, Item 9 – Continued.

Code	English	Data	Description
CD9	CDT	Discharge Temperature	Displays the compressor discharge temperature in Degrees C or Degrees F and has a display range of -40.0°C to 200.0°C (-40.0°F to 392.0°F). Example – CDT 92F indicates compressor discharge temperature is 92°F.
CD10	BATT	Battery Voltage	Displays current battery voltage. Display is made with one decimal point followed by the letter “V,” for volts. If battery status is good, voltage reading is displayed with a “+” (plus) sign. Example BATT +12.5V indicates a battery voltage of 12.5 volts.
CD11	SBY	Standby Hours	Displays the number of hours the standby motor has operated. Data is displayed with unit designator of H for hours, and a display range of 0 to 99999. Example – SBY 2300H indicates the standby motor has operated for 2300 hours.
CD12	MOD V	Future Expansion	Not used on MTRCS.
CD13	REV	Software Revision	Displays the erasable programmable read-only memory (EPROM) software revision number. Pressing the ENTER key for 3 seconds will display CD13 U2 on the left and board mounted software revision number on the right.
CD14	SERL	Serial Number Low	Displays the lower three digits of the unit serial number burned into the EPROM. This number, when used with the Serial Number Upper, represents the complete serial number.
CD15	SERU	Serial Number Upper	Displays the upper three digits of the unit serial number burned into the EPROM. This number, when used with the Serial Number Low, represents the complete serial number.
CD16	2RA	Compartment 2 Air Temperature	Displays the compartment 2 return air temperature in Degrees C or Degrees F. Compartment 2 return air temperature data has a display range of -38.0°C to 70.0°C (-36.0°F to 158.0°F) and is displayed with one decimal place. Example – 2RA 2.5F indicates compartment 2 return air temperature is 2.5°F.
CD17	3RA	Compartment 3 Air Temperature	Not used on MTRCS.
CD18	MHR1	Maintenance Hour Meter 1	Maintenance hour meter is compared to the diesel, standby motor, or switch on hour meter, depending on the mode of operation. If the hour meter is greater than the maintenance hour meter, an alarm is generated. Maintenance hour interval can be custom set for specific monitoring purposes.
CD19	MHR2	Maintenance Hour Meter 2	Maintenance hour meter is compared to the diesel, standby motor, or switch on hour meter, depending on the mode of operation. If the hour meter is greater than the maintenance hour meter, an alarm is generated. Maintenance hour interval can be custom set for specific monitoring purposes.
CD20	SON	Switch On Hour Meter	Displays the number of switch on hours followed by the letter “H” for hours. The display has a range of 0 to 99999.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

ALARM/FAULT Display (Figure 3, Item 10). The fault light (FL) is turned on only for those alarms that specify, through logic, to turn it on. The default MCD panel display is overridden when an alarm is activated. The display alternates between the default display of setpoint/air temperature and the active alarm, or alarms. Each item is displayed for three to ten seconds before continuing to scroll. Table 6 provides a description of alarm display codes that can be generated and displayed in the Code and English equivalent, the type of alarm indicated, and a brief description of why the alarm is generated and consequential result of the alarm on MTRCS operation.

NOTE

The display of the √ mark in Table 6 indicates activation of the Fault Light (FAULT LIGHT ON). These alarm codes not only provide a coded or English display, but also turn on the fault light on the unit.

Table 6. Alarm Display Codes, Figure 3, Item 15.

Code	English	Alarm	Description
AL0	ENG OIL	√ Low Oil Pressure	Alarm is generated if control senses low oil pressure under proper conditions. FL turns on. Engine shuts down.
AL1	ENG HOT	√ High Coolant Temperature	Alarm is generated if control senses a high coolant temperature over 110°C (230°F). FL turns on. Engine shuts down.
AL2	HI PRESS	√ High Pressure	Alarm is generated if high pressure switch opens. FL turns on. Engine shuts down.
AL3	STARTFAIL	√ Start Failure	Alarm is generated if engine fails to start. FL turns on. If in manual start mode (MAN OP), failure alarm is generated after engine fails to start for 5 minutes.
AL4	LOW BATT	√ Low Battery Voltage	Alarm is generated if battery voltage falls below 10.0 VDC. FL turns on.
AL5	HI BATT	√ High Battery Voltage	Alarm is generated if battery voltage rises above 17.0 VDC. FL turns on. Engine shuts down.
AL6	DEFRAIL	√ Defrost Override	Alarm is generated if unit is in a defrost override mode. FL turns on.
AL7	ALT AUX	√ Alternator Auxiliary	Alarm is generated if alternator auxiliary signal is not present with the engine running. FL turns on.
AL8	STARTER	√ Starter Motor	Alarm is generated if starter motor input signal is not present when starter solenoid is energized. FL turns on.
AL9	1RA SENSOR	√ Return Air Sensor Compartment 1	Alarm is generated if return air sensor is open or shorted. FL turns on due to absence of controlling probe.
AL10	2RA SENSOR	√ Return Air Sensor Compartment 2	Alarm is generated if return air sensor is open or shorted. FL turns on due to absence controlling probe.
AL11	WT SENSOR	Coolant Temperature Sensor	Alarm is generated if coolant temperature sensor is open or shorted.

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

Table 6. Alarm Display Codes, Figure 3, Item 15 – Continued.

Code	English	Alarm	Description
AL12	HIGH CDT	√ High Discharge Temperature	Alarm is generated if discharge temperature is sensed above 155°C (310°F) for three minutes. If discharge temperature exceeds 177°C (350°F), the three minute timer is overridden and the unit shuts down immediately. FL turns on. Compressor has failed.
AL13	CD SENSOR	Discharge Temperature Sensor	Alarm is generated if sensor is open or shorted. Main overload input.
AL14	SBY MOTOR	√ Standby Motor Overload	Alarm is generated when the MOL input is sensed open with the Run relay energized in electric mode.
AL15	FUSE BAD	√ Fuse Open	Alarm is generated when FUSE input is sensed low. FL turns on.
AL16	3RA SENSOR	√ Return Air Sensor Compartment 3	Not used on MTRCS.
AL17	DISPLAY	Display	Visual display activation is generated when no communication exists between main board and display board for eight seconds.
AL18	SERVICE 1	Maintenance Hour Meter 1	Alarm is generated when designated hour meter is greater than maintenance hour meter 1.
AL19	SERVICE 2	Maintenance Hour Meter 2	Alarm is generated when designated hour meter is greater than maintenance hour meter 2.
AL20	1RA OUT	√ Compartment 1 Out-Of-Range	Alarm is generated when compartment 1 is out-of-range. FL turns on.
AL21	2RA OUT	√ Compartment 2 Out-Of-Range	Alarm is generated when compartment 2 is out-of-range. FL turns on.
AL22	3RA OUT	√ Compartment 3 Out-Of-Range	Not used on MTRCS.
NO POWER		No Power For Standby	NO POWER is displayed if unit is switched to standby and power plug is not plugged in.

√ Indicates activation of the Fault Light (FAULT LIGHT ON)

CONTROL BOX ASSEMBLY CONTROLS AND INDICATORS – CONTINUED

AUTO START/STOP Key (Figure 3, Item 8). The AUTO START/STOP key (Figure 3, Item 8) allows the diesel engine compressor to be started, stopped, and restarted as required. The automatic cycling of the diesel engine allows the refrigeration system to be turned off when it nears setpoint, and to restart as required when restart sequence conditions are met. The option of engine recycling provides the MTRCS with added fuel efficiency during temperature control operations.

Certain failsafe parameters will prevent the engine shut-off if not safe, as follows:

- Battery condition signal must be good.
- Restart will be initiated if battery voltage drops below 11.0 VDC.
- Engine coolant temperature will override minimum off-time and out-of-range condition, forcing an engine restart, when engine coolant temperature drops below 1°C (34°F).

Additional safety functions applicable to the auto start/stop operation consist of the following:

- The AUTO START/STOP key provides the operator selection control between the continuous run mode, and the auto start/stop operating mode. When in the continuous mode of operation, the diesel engine will not shut down unless due to a safety condition or engine stall. This function is also applicable to the electric standby motor operation.
- An AUTO START/STOP indicator is illuminated when the MTRCS is in the auto start/stop mode.
- A Start/Fail alarm is activated whenever the engine fails to start on three consecutive attempts, shuts down due to a safety condition, or if the engine fails to remain running for the specified minimum run time.
- When in the continuous mode of operation, the engine is not allowed to shut off except when a safety condition exists, prompting engine shutdown, or if the engine itself, stalls.

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
OPERATION UNDER USUAL CONDITIONS

INITIAL SETUP:**Personnel Required**

Automated Logistical Specialist (2), or
Food Service Specialist (2)

References

WP 0004
WP 0007
WP 0019
WP 0069

Equipment Condition

Battery charged and connected

OPERATING PROCEDURES

The MTRCS is designed to operate in environmental temperatures ranging from -25°F to +120°F. The refrigeration unit mounted above the bale section can be operated using the onboard diesel engine or using an external power source. The insulated container portion is designed to maintain temperature for up to twelve (12) hours without running the refrigeration unit. This work package will provide you with the needed instruction to set up the MTRCS, prepare it for use, start and stop the unit using both external power and internal diesel power, and operate the equipment.

SITING REQUIREMENTS

Placement of MTRCS in relation to food preparation area should be carefully considered to assure the safety of all personnel working near the system. The following items must be considered in selecting a site for operation of the MTRCS.

NOTE

When left or right is used in the text, it will be as looking from the rear of the MTRCS where the doors are, forward to where the refrigeration unit and bale bar are located.

Field Location

The MTRCS should be located on as flat and level surface as possible. Care must be taken to make sure that each of the four corners are equally supported in order to prevent the unit from tipping during loading and unloading operations.

Power Source – External or Internal

The MTRCS is designed to operate from either external power or the onboard diesel engine power source. The refrigeration unit mounted above the bale bar section on the front comes equipped with a three-cylinder diesel engine for internal power and an electrical motor for external power. Both motors operate the refrigeration unit compressor, which supplies refrigerant to the split evaporators in order to maintain a near constant temperature inside the insulated container. Only one power source (diesel engine or standby motor) can be operated at any given time.

SITING REQUIREMENTS – CONTINUED**NOTE**

The cables are labeled as to the applicable power source they are rated for.

External power can be supplied to the power box assembly through two 50-foot power supply cable connections mounted under the refrigeration unit and two six-foot pigtails to tie into the external power supply. Each cable is 3-phase and capable of being connected to two different voltages. The right cable can be connected to 460 volts, 60 Hz and 380 volts, 50 Hz; and the left cable can be connected to 230 volts, 60 Hz and 190 volts, 50 Hz.

Operating Space

When positioning the MTRCS in a field environment, consideration must be given to the amount of room needed to offload the MTRCS from the transport vehicle. Allow for plenty of room to offload the MTRCS from the transporting vehicle.

If external power is to be used as a power source for operating the MTRCS, placement of the unit must be within reach of the 50-foot power supply cable. The ground surface should be approximately level, hard packed, and capable of drainage when raining. Avoid areas with soft soil and areas capable of holding water.

AUTO START SEQUENCE

The Auto Start sequence is as follows:

NOTE

The system goes through several various delays before the engine starts. The following sequence is not an operating procedure, but is an explanation of the various routines that the system goes through during start up and what actions are taken automatically if start failures occur.

First attempt to start engine –

- Run relay is energized.
- 5-second delay, glow plug relay is energized.
- 5-second delay, starter is energized.

NOTE

During the initial power-up, there is a 5-second control delay before the starting sequence commences. If the required glow time is zero, control will energize the starter after a 5-second delay.

- Starter solenoid is energized to crank engine.
- Engine cranks for 10 seconds or until engine operation is sensed.

NOTE

Once the engine starts, it will run at high idle for approximately 15 seconds before ramping down to low idle.

- Glow relay is de-energized.

AUTO START SEQUENCE – CONTINUED**NOTE**

A 15-second forced null cycle elapses before the next attempt (second attempt) to start the engine. The run relay will remain energized until the next starting sequence begins.

- Prior to second start attempt, oil pressure and alternator output is checked.

NOTE

The absence of oil pressure indicates the engine is not running.

Second attempt to start engine –

- Glow plug relay is energized.

NOTE

Glow time for the second attempt is increased by five seconds over the first attempt glow time. Example – If first attempt glow time was 40 seconds, second attempt glow time will be set to 45 seconds.

- 5-second delay, starter is energized.
- Starter solenoid is energized to crank engine.
- Engine cranks for 10 seconds or until engine operation is sensed.

NOTE

The presence of an alternator signal indicates the engine is operating.

- Glow relay is de-energized.

NOTE

A 15-second forced null cycle elapses before the final attempt (third attempt) to start the engine. The run relay will remain energized until the next starting sequence begins.

Third attempt to start engine –

NOTE

If the engine does not start after three consecutive start attempts, starting is locked out and start failure alarm is activated.

- Glow plug relay is energized.

NOTE

Glow time for the third attempt is increased by five seconds over the first attempt glow time. Example – If first attempt glow time was 40 seconds, third attempt glow time will be set to 45 seconds.

- 5-second delay, starter is energized.
- Starter solenoid is energized to crank engine.
- Engine cranks for 10 seconds or until engine operation is sensed.

AUTO START SEQUENCE – CONTINUED

NOTE

The presence of an alternator signal indicates the engine is operating.

- Glow relay is de-energized.

Variable Glow Times. Initial glow times are dependent on the ambient air temperature. Any subsequent start attempts will have an additional 5 seconds added to the initial glow time. For example, if the initial glow time was 40 seconds, each subsequent start attempt, up to a second and third attempt, will have a glow time of 45 seconds. Table 1 presents the variable glow times based on ambient air temperature in both degrees Celsius and degrees Fahrenheit.

NOTE

In the case where a coolant temperature sensor is defective, control assumes a temperature of 0°C (32°F) in order to determine required glow time.

Table 1. Glow Times.

Ambient Air Temperature	Glow Time in Seconds
< 0°C (< 32°F)	55
1°C - 10°C (33°F - 50°F)	40
11°C - 25°C (51°F - 77°F)	25
> 26°C (> 78°F)	10

Minimum On-Time

- Engine can only turn off after a minimum of four to seven minutes of run time (preset at 4 minutes).
- Unit shuts down when box temperature is within ± 0.5°C (± 0.9°F) of setpoint.
- After minimum on-time, unit goes to fully loaded for setpoints greater than -12°C (10°F) and high speed loaded for setpoints of -12°C (10°F) or less.
- Unit will not cycle off if engine coolant temperature is less than 50°C (122°F).
- Unit will not cycle off if battery is less than 11 volts.

NOTE

If unit cannot cycle off, it will operate normally in continuous mode.

If all temperature probes fail, and setpoint is -12°C (10°F) or less, unit will not shut down.

Minimum Off-Time

- Operator can select minimum off-time of 10, 20, 30, 45, or 90 minutes (preset at 10 minutes).
- Following minimum off-time, unit restarts as follows:
 - Temperature > ± 2.0°C (± 3.6°F) of setpoint for perishable cargo.
 - Temperature > ± 2.0°C (± 3.6°F) of setpoint for frozen cargo.

AUTO START SEQUENCE – CONTINUED

Battery Voltage

- Battery health sensing provisions. Table 2 presents the possible message displays, applicable voltage values of the battery, and result of the message.
- Good battery defined as 13.4 VDC at 24°C (75°F).
- Unit will not attempt to start if battery voltage drops below 10 VDC.
- Starter will not engage if battery voltage drops below 10 VDC during glow cycle.
 - Start sequence continues (considered a failed start).
 - Start sequence is repeated until unit starts or three consecutive start attempts have failed.

Table 2. Battery Voltages.

Message Display	Voltage Level	Description
LOW BATT AL4	10 VDC or less	Unit shuts down if running, unless starter is cranking.
	11 – 13.4 VDC	If in auto start/stop mode and unit has cycled off, unit will automatically start if battery voltage drops below 11.0 VDC, in order to charge the battery. Unit will continue to operate until battery voltage of 13.4 VDC is reached. Unit will then stop providing that setpoint temperature range has been reached.
HI BATT AL5	17 VDC or more	Unit will shut down.

Oil Pressure Signal

- A closed oil pressure switch indicates that engine is running.
- Prevents engagement of starter motor when operating in auto mode.

Maximum Off-Time

- Provides the operator with keypad selection control to start the engine after a maximum of 30-minutes off-time.
- Engine will start after engine stops regardless of container temperature.

PREPARATION FOR USE – DIESEL ENGINE

NOTE

If MTRCS is to be loaded, perform Loading and Cargo Net Installation (WP 0007, Loading).

Determine if the MTRCS is to be operated from an external power source or internal diesel driven power.

Diesel Engine Power Source

1. Perform BEFORE PMCS (WP 0019).

PREPARATION FOR USE – DIESEL ENGINE – CONTINUED

2. Place toggle switch S7 (Figure 1, Item 5) in the 60 HERTZ AND DIESEL ENGINE position.
3. Make sure all doors are properly closed and secured.

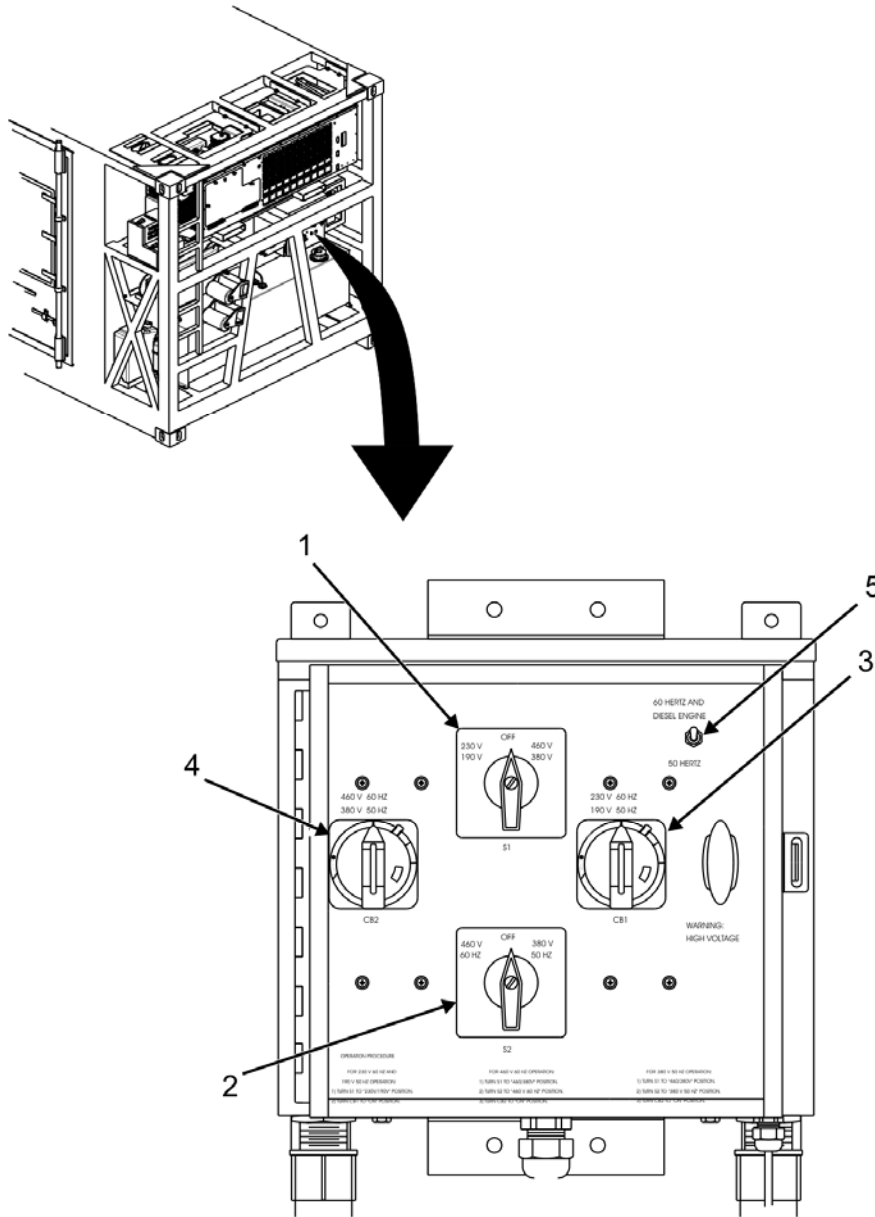


Figure 1. Power Box Assembly.

END OF TASK

REFRIGERATION UNIT OPERATION

To reduce starter and engine loads, the microprocessor always starts and operates the refrigeration unit engine in low speed, unloaded cool for the first 15 seconds. After the first 15 seconds the microprocessor will allow the unit to operate normally, providing the coolant temperature is above 26°C (79°F). In order to prolong engine life, the microprocessor will prevent operation in high speed until coolant temperature reaches this temperature.

The MTRCS can be set up for diesel engine drive operation or external power operation. The procedures covered in the Refrigeration Unit Start Up section consist of the following:

- Diesel Engine Drive Operation
- External Power Operation

WARNING

Do not use any starting aids, such as ether, to start the engine. Serious injury or death to personnel could result.

Thermostatic cycling may cause unannounced starting of fans and V-belts. Always use care around the MTRCS when in running condition. Serious injury or death to personnel could result.

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

Falling from the roof of the MTRCS can cause serious personal injury or even death. Keep three points of contact on the MTRCS at all times when on the roof.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

NOTE

The AUTO START/STOP key can be used to toggle between Auto Start/Stop and Auto Start/Continuous Run once refrigeration unit is operating.

Auto Start/Stop provides a +/-3 degree control of the system and is sufficient to maintain cargo. Auto/Continuous Run operation is not normally used. Use of the Auto/Continuous Run mode is typical when it is necessary to maintain near constant temperatures for cargo. The MTRCS will run continuously and cycle between heating and cooling to maintain the near constant temperature. This is not the most fuel/cost efficient method to operate the system, as it will never shut down.

DIESEL ENGINE DRIVE OPERATION

Auto Start/Stop Mode – Starting

1. Gain access to top of MTRCS using roof access.
2. Make sure emergency stop switch (Figure 2, Item 1) is in the PULL TO START position.

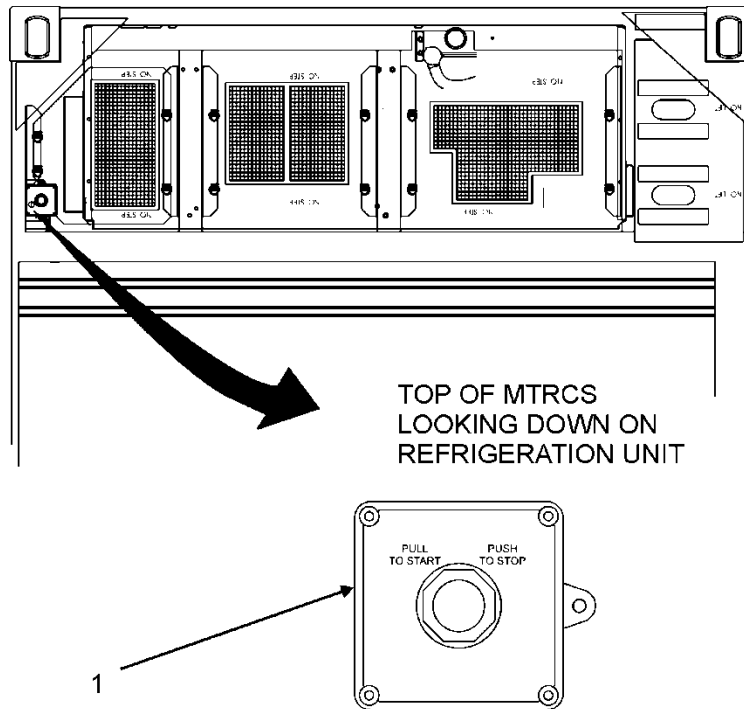


Figure 2. Emergency Stop Switch.

3. Exit top of MTRCS.
4. Open control panel assembly access door.

NOTE

The control panel assembly contains two separate panels. The upper portion of the assembly houses the control box. The lower portion of the assembly houses the MCD.

5. On control panel, place toggle switches (Figure 3, Item 1 and Item 2) of control panel in desired mode of operation, DISABLE or ENABLE.
6. Place toggle switch (Figure 3, Item 3) to desired mode of operation, NORMAL or BLACKOUT.
7. Place POWER ON/DOWN switch (Figure 3, Item 14) to POWER ON position.

DIESEL ENGINE DRIVE OPERATION – CONTINUED

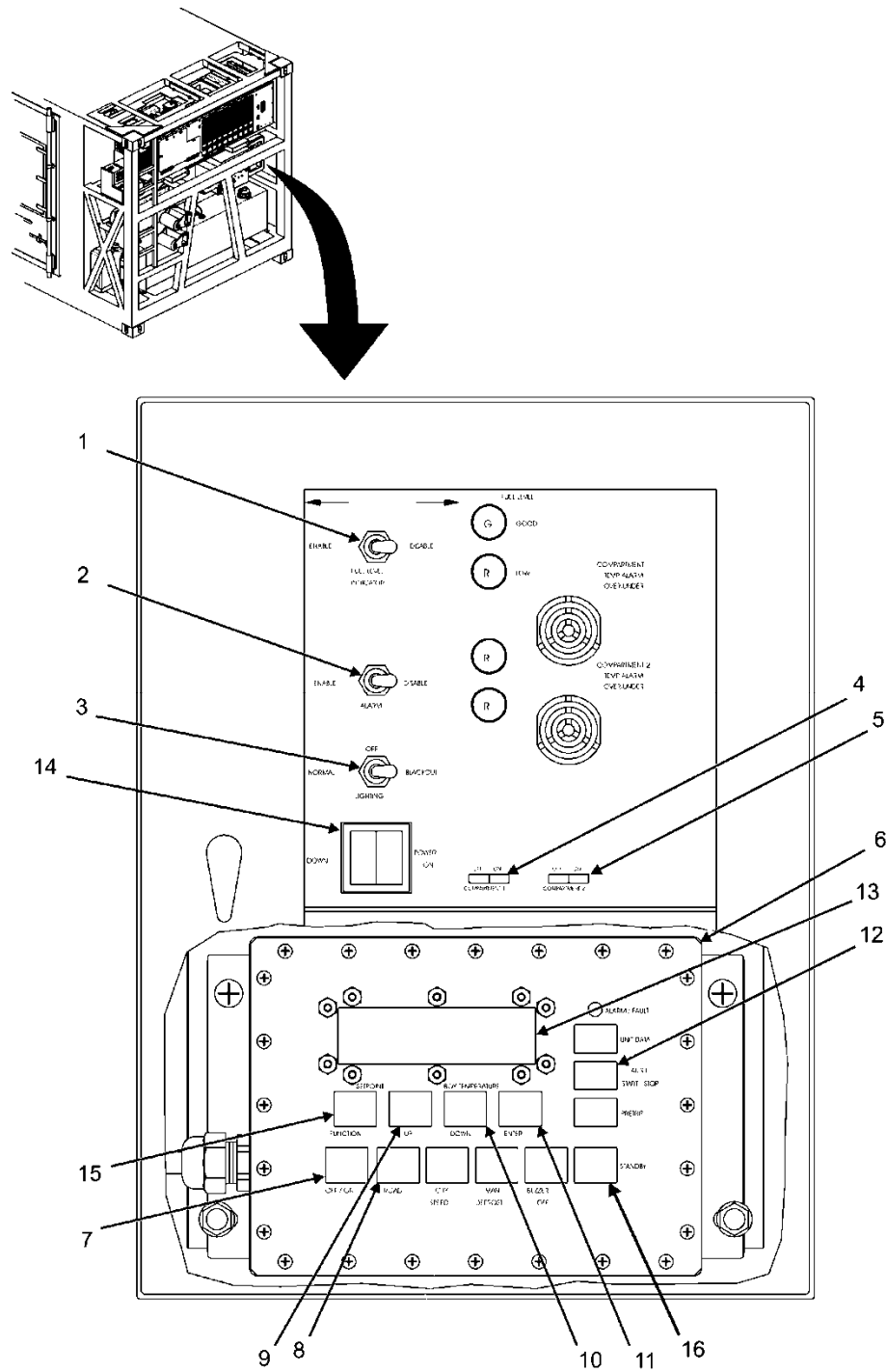


Figure 3. Control Panel Assembly (Diesel Engine Auto Mode) Controls and Indicators.

DIESEL ENGINE DRIVE OPERATION – CONTINUED

8. Place COMPARTMENT 1 (Figure 3, Item 4) and COMPARTMENT 2 (Figure 3, Item 5) switches to ON position.

NOTE

With power on and ROAD key pressed, the MCD will begin a power up self-test. All display messages will appear in the display window. At the completion of self-test, the setpoint and container temperatures are displayed, and the compartment temperatures alternate between each compartment continuously. The MCD will then energize the glow cycle and start the engine. The length of time required for the glow cycle will depend on the engine temperature.

9. On MCD (Figure 3, Item 6), press ON/OFF key (Figure 3, Item 7) to provide power to MCD.

WARNING




Carbon monoxide occurs in the exhaust fumes of the diesel engine. Carbon monoxide has no color or smell. Prolonged exposure to carbon monoxide can cause serious injury or death to personnel.

Carbon monoxide can become dangerously concentrated under conditions of no ventilation. Never operate the diesel engine if the MTRCS is sited indoors or where adequate ventilation is not available.

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

NOTE

If the road key is displayed in the MCD, you will not have to press the ROAD key to start the diesel engine. The diesel engine will automatically start and step 10 can be omitted.





10. Press ROAD key (Figure 3, Item 8) to select diesel engine operating mode.
- ROAD icon  is displayed in MCD at top of display window.
11. Adjust setpoint as for displayed compartment desired by pressing applicable UP (Figure 3, Item 9) or DOWN (Figure 3, Item 10) arrow  key.
12. Press ENTER key (Figure 3, Item 11)  to accept setpoint adjustment.

DIESEL ENGINE DRIVE OPERATION – CONTINUED**WARNING**

Setting MCD to AUTO START/STOP will cause the refrigeration unit to operate at intermittent time intervals based on compartment temperature. This thermostatic cycling may cause unannounced starting of fans and V-belts. Always use care around the MTRCS when in running condition. Serious injury or death to personnel could result.

NOTE


MAN OP mode is only used to ship the unit. If you receive the unit in MAN OP mode, you will need to transition the operating mode to AUTO OP. If AUTO OP appears in MCD after pressing FUNCTION key, the refrigeration unit is in automatic operation mode and steps 13 through 16 are not required.

13. If unit fails to start, press FUNCTION key (Figure 3, Item 15)  repeatedly until AUTO OP or MAN OP appears on MCD (Figure 3, Item 13).
14. Press ENTER key (Figure 3, Item 11)  .
15. Press UP (Figure 3, Item 9) or DOWN (Figure 3, Item 10) arrow key  until AUTO OP appears on MCD (Figure 3, Item 11).
16. Press ENTER key (Figure 3, Item 11)  to place refrigeration unit in AUTO OP mode.

NOTE

Once the unit is operating, various operating features can be selected using the FUNCTION key on the microprocessor controller. The functions available, and operation of the FUNCTION key, are described in WP 0004 and in WP 0004 Table 4, Function Codes.

Additionally, once the unit is operating, various operating parameters can be monitored using the UNIT DATA key on the microprocessor controller. The parameters available for monitoring, and operation of the UNIT DATA key, are described in WP 0004 and in WP 0004 Table 5, Unit Data Codes.

17. Check display for AUTO START/STOP indicator  . If displayed, no further action is required. If not displayed, press AUTO START/STOP key (Figure 3, Item 12) on MCD digital display (Figure 3, Item 13).
18. Display will read compartment C1 and C2 on the left, setpoint in the middle, and controlled air temperature on the right. To change setpoint proceed as follows:

DIESEL ENGINE DRIVE OPERATION – CONTINUED**NOTE**

When pressing UP/DOWN buttons, display will flash for five (5) seconds. If ENTER is not pushed within five (5) seconds, the setting will not be saved. Setting will revert back to prior reading. The system will automatically switch between display of C1 and C2 every three to five seconds. You will only be able to adjust the compartment that is currently displayed in the MCD.

19. When desired compartment, C1 or C2, appears on digital display (Figure 3, Item 13), press UP (Figure 3, Item 9) or DOWN (Figure 3, Item 10) arrow key. Setpoint will flash as temperature is changed.
20. Press ENTER key (Figure 3, Item 11) when desired temperature is reached. Setpoint will stop flashing.

Auto Start/Stop Mode – Stopping

1. On MCD (Figure 3, Item 6), press ON/OFF key (Figure 3, Item 7) to shutdown MCD.

CAUTION

Various MTRCS electrical circuits will operate directly off of the battery when the diesel engine or external electrical power, primary power sources, is shut down. These circuits can quickly drain the power from the battery, disabling the capability for the engine to start when needed. It is important to make sure that the POWER ON/DOWN switch is always in the DOWN position when the MTRCS is not in use. When the POWER ON/DOWN switch is in the ON position, it will be illuminated, and when it is in the DOWN position, it will not be illuminated.

2. Place POWER ON/DOWN switch (Figure 3, Item 14) to DOWN position.

Auto Start/Continuous Run Mode – Starting**WARNING**

Do not use any starting aids, such as ether aid, to start the engine. Serious injury or death to personnel could result.

Thermostatic cycling may cause unannounced starting of fans and V-belts. Always use care around the MTRCS when in running condition. Serious injury or death to personnel could result.

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

Falling from the roof of the MTRCS can cause serious personal injury or even death. Keep three points of contact on the MTRCS at all times when on the roof.

NOTE

The AUTO START/STOP key can be used to toggle between Auto Start/Stop and Start/Continuous Run once refrigeration unit is operating.

DIESEL ENGINE DRIVE OPERATION – CONTINUED

NOTE

AUTO OP provides a +/-3 degree control of the system and is sufficient to maintain cargo. Continuous run operation is not normally used. Use of the continuous run mode is typical when it is necessary to maintain near constant temperatures for cargo. The MTRCS will run continuously and cycle between heating and cooling to maintain the near constant temperature. This is not the most fuel/cost efficient method to operate the system, as it will never shut down.

1. Gain access to top of MTRCS using roof access.
2. Make sure emergency stop switch (Figure 2, Item 1) is in the PULL TO START position.
3. Exit top of MTRCS.
4. Open control box assembly access door.

NOTE

The control panel assembly contains two separate panels. The upper portion of the assembly houses the control box. The lower portion of the assembly houses the MCD.

5. On control panel, place toggle switches (Figure 4, Item 1 and Item 2) of control panel in desired mode of operation, ENABLE or DISABLE.

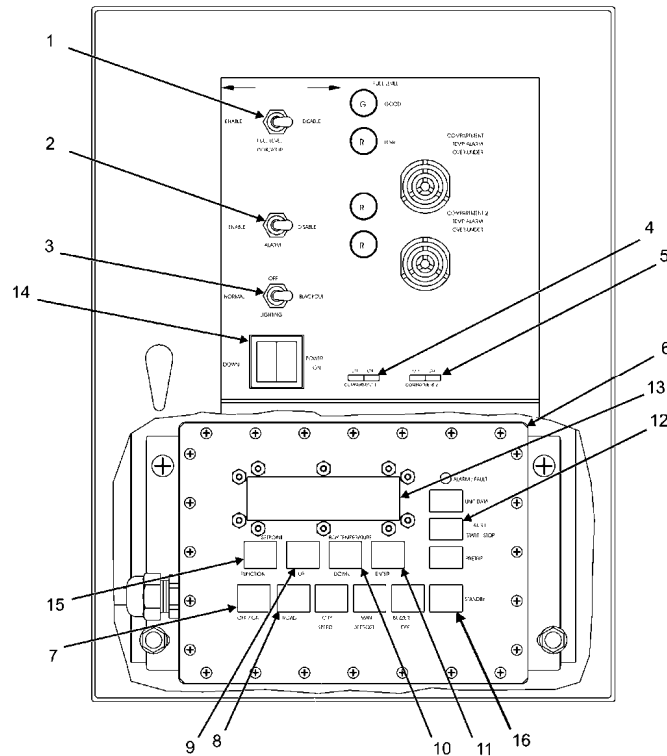


Figure 4. Control Box Assembly (Diesel Engine Continuous Mode) Controls and Indicators.

DIESEL ENGINE DRIVE OPERATION – CONTINUED

6. Place toggle switch (Figure 4, Item 3) of control panel in desired mode of operation, NORMAL or BLACKOUT.
7. Place POWER ON/DOWN switch (Figure 4, Item 14) to POWER ON position.
8. Place COMPARTMENT 1 (Figure 4, Item 4) and COMPARTMENT 2 (Figure 4, Item 5) rocker switches to ON position.

NOTE

With power on and ROAD key pressed, the MCD will begin a power up self-test. All display messages will appear in the display window. At the completion of self-test, the setpoint and container temperature will be displayed. The MCD will then energize the glow cycle and start the engine. The length of time required for the glow cycle will depend on the engine temperature.

9. On MCD (Figure 4, Item 6), press ON/OFF key (Figure 6, Item 7) to provide power to MCD.

WARNING





Carbon monoxide occurs in the exhaust fumes of the diesel engine. Carbon monoxide has no color or smell. Prolonged exposure to carbon monoxide can cause serious injury or death to personnel.

Carbon monoxide can become dangerously concentrated under conditions of no ventilation. Never operate the diesel engine if the MTRCS is sited indoors or where adequate ventilation is not available.

10. Press ROAD key (Figure 4, Item 8)  to select diesel engine operating mode.

NOTE

MAN OP mode is only used to ship the unit. If you receive the unit in MAN OP mode, you will need to transition the operating mode to AUTO OP. If AUTO OP appears in MCD after pressing FUNCTION key, the refrigeration unit is in automatic operation mode and steps 11 through 14 are not required.

11. Press FUNCTION key (Figure 4, Item 15)  repeatedly until AUTO OP or MAN OP appears on MCD (Figure 4, Item 13).
12. Press ENTER key (Figure 4, Item 11) .
13. Press UP (Figure 4, Item 9) or DOWN (Figure 4, Item 10) arrow key  until AUTO OP appears on MCD (Figure 4, Item 11).
14. Press ENTER key (Figure 4, Item 11)  to place refrigeration unit in AUTO OP mode.

DIESEL ENGINE DRIVE OPERATION – CONTINUED**NOTE**

Once the unit is operating, various operating features can be selected using the FUNCTION key on the microprocessor controller. The functions available, and operation of the FUNCTION key, are described in WP 0004 and in WP 0004 Table 4, Function Codes.

Additionally, once the unit is operating, various operating parameters can be monitored using the UNIT DATA key on the microprocessor controller. The parameters available for monitoring, and operation of the UNIT DATA key, are described in WP 0004 and in WP 0004 Table 5, Unit Data Codes.

15. Default display will read compartment C1 and C2 on the left, setpoint in the middle, and controlled air temperature on the right. To change setpoint proceed as follows:

NOTE

When pressing UP/DOWN buttons, display will flash for five (5) seconds. If ENTER is not pushed within five (5) seconds, the setting will not be saved. Setting will revert back to prior reading. The system will automatically switch between display of C1 and C2 every three to five seconds. You will only be able to adjust the compartment that is currently displayed in the MCD.

16. When desired compartment, C1 or C2, appears on digital display (Figure 4, Item 13), press UP (Figure 4, Item 4) or DOWN (Figure 4, Item 10) arrow key. Setpoint will flash as temperature is changed.
17. Press ENTER key (Figure 4, Item 11) when desired temperature is reached. Setpoint will stop flashing.

Auto Start/Continuous Run Mode – Stopping

1. On MCD (Figure 5, Item 6), press ON/OFF key (Figure 5, Item 7) to shutdown MCD.

CAUTION

Various MTRCS electrical circuits will operate directly off of the battery when the diesel engine or external electrical power, primary power sources, is shut down. These circuits can quickly drain the power from the battery, disabling the capability for the engine to start when needed. It is important to make sure that the POWER ON/DOWN switch is always in the DOWN position when the MTRCS is not in use. When the POWER ON/DOWN switch is in the ON position, it will be illuminated, and when it is in the DOWN position, it will not be illuminated.

2. Place POWER ON/DOWN switch (Figure 5, Item 14) to DOWN position.

DIESEL ENGINE DRIVE OPERATION – CONTINUED

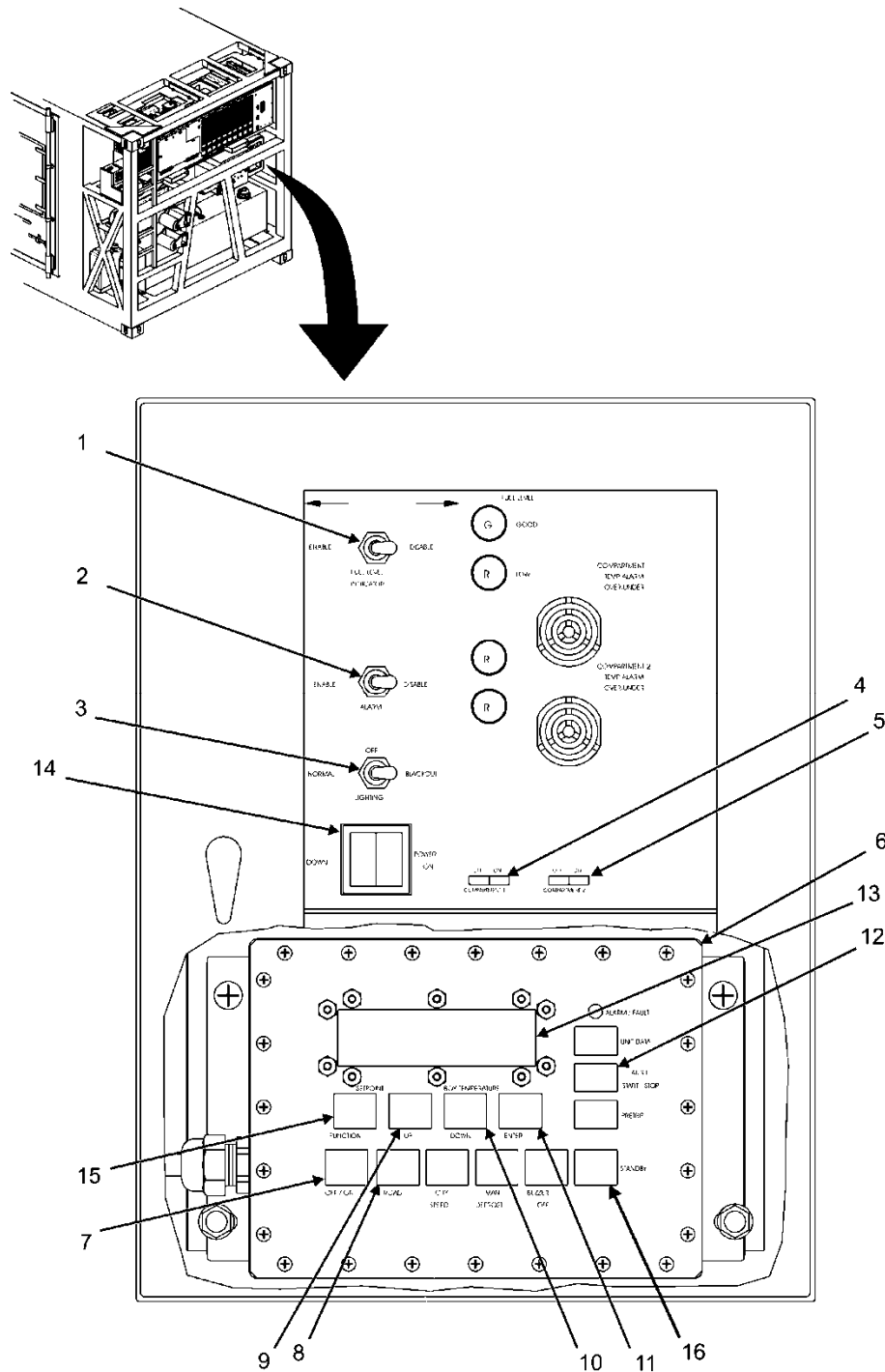


Figure 5. Control Box Assembly (Stopping Diesel Engine Drive Mode) Controls and Indicators.

END OF TASK

EXTERNAL POWER OPERATION**WARNING**

Thermostatic cycling may cause unannounced starting of fans and V-belts. Always use care around the MTRCS when in running condition. Serious injury or death to personnel could result.

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

Falling from the roof of the MTRCS can cause serious personal injury or even death. Keep three points of contact on the MTRCS at all times when on the roof.

NOTE

The AUTO START/STOP key can be used to toggle between Auto Start/Stop and Auto Start/Continuous Run once refrigeration unit is operating.

Auto Start/Stop provides a +/-3 degree control of the system and is sufficient to maintain cargo. Auto/Continuous Run operation is not normally used. Use of the Auto/Continuous Run mode is typical when it is necessary to maintain near constant temperatures for cargo. The MTRCS will run continuously and cycle between heating and cooling to maintain the near constant temperature. This is not the most fuel/cost efficient method to operate the system, as it will never shut down.

Preparation for Use – External Power Source**WARNING**

Do not work on electrical equipment alone. Electrical voltage and current cannot be seen and, when contacted, can result in serious injury or death, render you unconscious, or severely burn you. Use extreme care when working with and around electrical power.

When power is applied do not have P1B 6 ft. pigtail connected to P1A 50 ft. power supply cable with P1B leads not properly connected to external power supply or not properly isolated from direct shorts.

When power is applied do not have P2B 6 ft. pigtail connected to P2A 50 ft. power supply cable with P2B leads not properly connected to external power supply or not properly isolated from direct shorts.

NOTE

The diesel engine cannot be operated when using an external power source.

1. Perform BEFORE PMCS (WP 0019).
2. Determine voltage and frequency of local power source to be used.
3. Make sure all doors are closed and properly secured.
4. Remove and unroll applicable power cable to local power source.

EXTERNAL POWER OPERATION – CONTINUED

5. Make sure power selection switches S1 and S2 (Figure 6, Item 1 and Item 2) on power box assembly are in OFF position.

WARNING

When positioning power cables, make sure that power cable jackets are not cut or damaged and that no bare wires are evident.

Do not stand in water when handling live power cables. Position cables so that they are out of the way during operation and are not lying in water.

6. Have qualified personnel connect power supply cable to local power source using appropriate pigtail for power source being used (WP 0069, Replace).

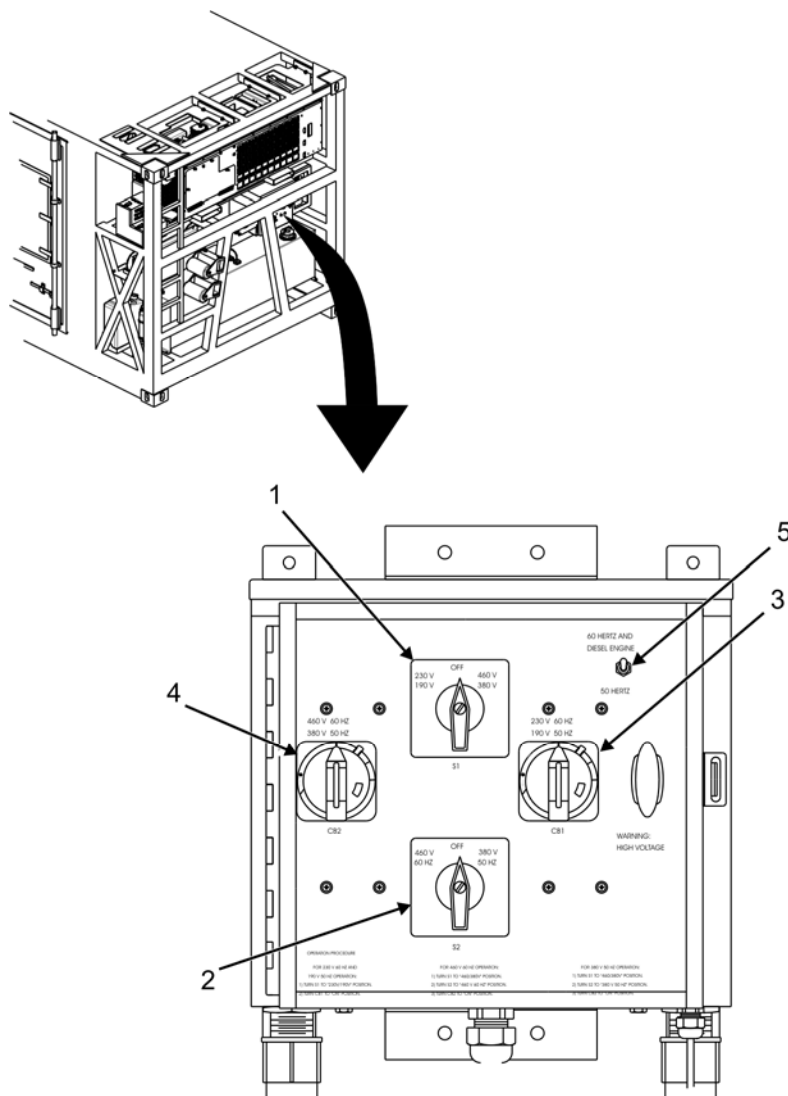


Figure 6. Power Box Assembly.

EXTERNAL POWER OPERATION – CONTINUED**CAUTION**

There are four power sources that can be utilized for operation of the MTRCS. Make sure that you are using the correct power source and external power cable hook ups before applying power. Failure to do so can cause serious equipment damage.

7. Set power box assembly switches based on the local power source as follows:

For low voltage 230V, 60 Hz operation:

- (1) Place switch S1 (Figure 6, Item 1) to 230V 190V position
- (2) Place circuit breaker CB1 (Figure 6, Item 3) to ON position.
- (3) Place S7 in 60 HERTZ AND DIESEL ENGINE position.

For low voltage 190V, 50 Hz operation:

- (1) Place switch S1 (Figure 6, Item 1) to 230V 190V position
- (2) Place circuit breaker CB1 (Figure 6, Item 3) to ON position.
- (3) Place S7 in 50 HERTZ position.

For high voltage 460V, 60 Hz operation:

- (1) Place switch S1 (Figure 6, Item 1) to 460V 380V position.
- (2) Place switch S2 (Figure 6, Item 2) to 460V 60 HZ position.
- (3) Place circuit breaker CB2 (Figure 6, Item 4) to ON position.
- (4) Place S7 in 60 HERTZ AND DIESEL ENGINE position.

For high voltage 380V, 50 Hz operation:

- (1) Place switch S1 (Figure 6, Item 1) to 460V 380V position.
- (2) Place switch S2 (Figure 6, Item 2) to 380V 50 HZ position.
- (3) Place circuit breaker CB2 (Figure 6, Item 4) to ON position.
- (4) Place S7 in 50 HERTZ position.

EXTERNAL POWER OPERATION – CONTINUED**Auto Start/Stop Mode – Starting****WARNING**

Do not work on electrical equipment alone. Electrical voltage and current cannot be seen and, when contacted, can result in serious injury or death, render you unconscious, or severely burn you. Use extreme care when working with and around electrical power.

1. Perform preparation for use – external power source per this WP.
2. Determine appropriate power supply source that is available.

WARNING

When positioning power cables, make sure that power cable jackets are not cut or damaged and that no bare wires are evident.

Do not stand in water when handling live power cables. Position cables so that they are out of the way during operation and are not lying in water.

3. Plug in appropriate power supply cable from power source to refrigeration unit.
4. Make sure emergency stop switch is in PULL TO START position.

NOTE

NO POWER will be displayed on MCD when pressing STANDBY key if power supply cable is not connected from power source to refrigeration unit.

5. On power box, place S1 and S2 to appropriate position for power source being used – preparation for use per this WP.
6. Place CB1 or CB2 to ON position for applicable power source being used – preparation for use per this WP.
7. Place S7 to appropriate position for power source being used – preparation for use per this WP.
8. Start external power source in accordance with procedures of external power source.
9. On control panel, place POWER ON/DOWN switch (Figure 7, Item 14) to ON position.

EXTERNAL POWER OPERATION – CONTINUED

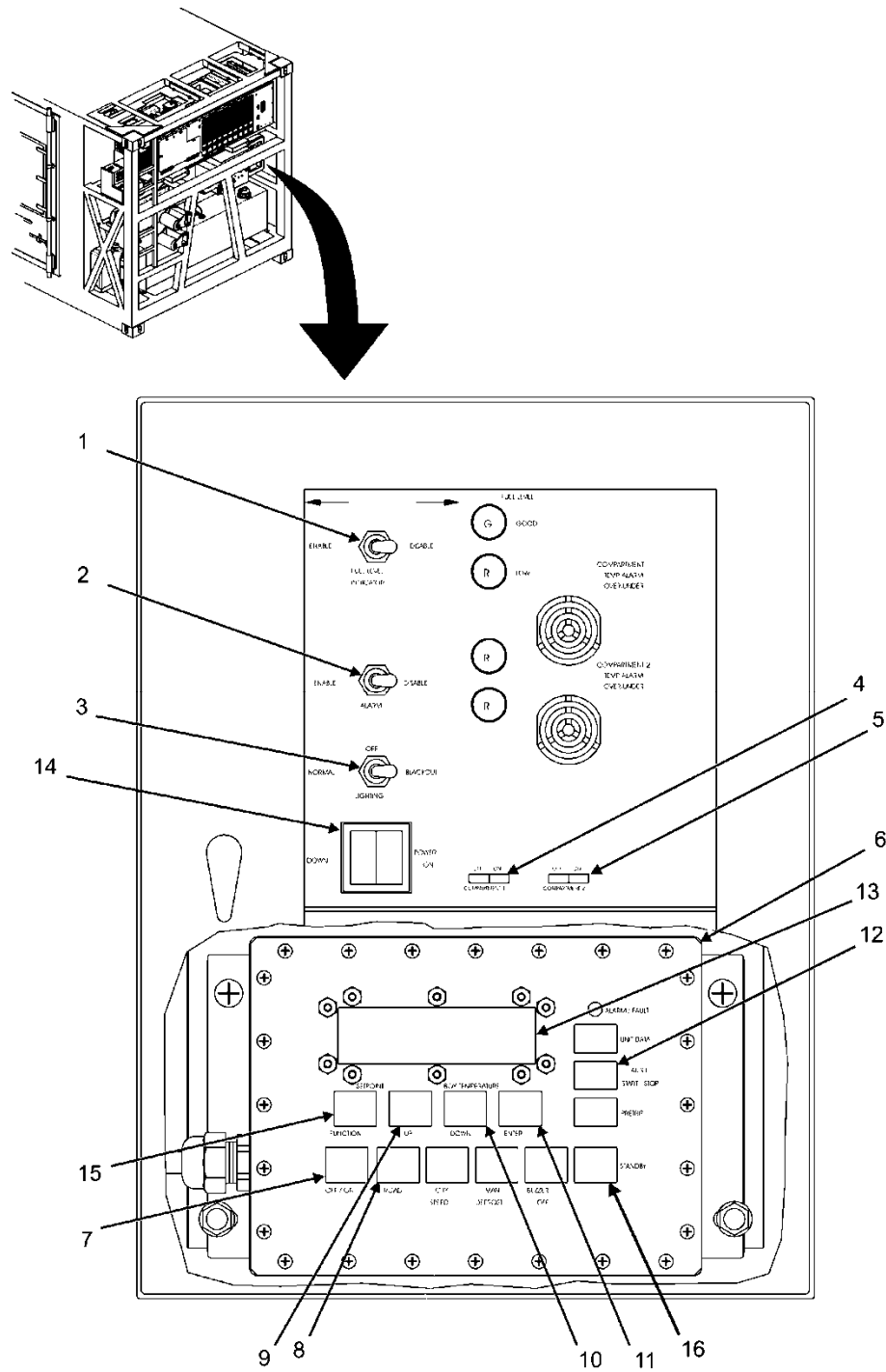


Figure 7. Control Box Assembly (External Power Starting) Controls and Indicators.





EXTERNAL POWER OPERATION – CONTINUED**NOTE**

With MCD power on, the MCD will begin a power up self-test. All display messages will appear in the display window. At the completion of self-test, the setpoint and container temperature will be displayed.

10. On MCD, place ON/OFF switch (Figure 7, Item 7) to ON position.


NOTE

There may be a significant time delay of five to ten minutes before the MTRCS refrigeration unit standby motor will start up after pressing the STANDBY key.

11. On MCD, press STANDBY (Figure 7, Item 16) key.
 - Plug icon  is displayed in MCD at top of display window.
12. On control panel, place COMPARTMENT 1 (Figure 7, Item 4) and COMPARTMENT 2 (Figure 7, Item 5) rocker switches to ON position.
 - Plug icon  is displayed in MCD at top of display window.
13. Adjust setpoint as desired by pressing applicable UP (Figure 7, Item 9) or DOWN (Figure 7, Item 10) arrow  key.
14. Press ENTER key (Figure 7, Item 11)  to accept setpoint adjustment.

WARNING


Setting MCD to AUTO START/STOP will cause the refrigeration unit to operate at intermittent time intervals based on compartment temperature. This thermostatic cycling may cause unannounced starting of fans and V-belts. Always use care around the MTRCS when in running condition. Serious injury or death to personnel could result.

15. Place FUNCTION key (Figure 7, Item 15)  to AUTO OP.

EXTERNAL POWER OPERATION – CONTINUED**NOTE**

Once the unit is operating, various operating features can be selected using the FUNCTION key on the microprocessor controller. The functions available, and operation of the FUNCTION key, are described in WP 0004 and in WP 0004 Table 4, Function Codes.

Additionally, once the unit is operating, various operating parameters can be monitored using the UNIT DATA key on the microprocessor controller. The parameters available for monitoring, and operation of the UNIT DATA key, are described in WP 0004 and in WP 0004 Table 5, Unit Data Codes.

16. Check display for AUTO START/STOP indicator . If displayed, no further action is required. If not displayed, press AUTO START/STOP key (Figure 7, Item 12) on MCD (Figure 7, Item 13).
17. Default display will read compartment C1 and C2 on the left, setpoint in the middle, and controlled air temperature on the right. To change setpoint proceed as follows:

NOTE

When pressing UP/DOWN buttons, display will flash for five (5) seconds. If ENTER is not pushed within five (5) seconds, the setting will not be saved. Setting will revert back to prior reading.

18. When desired compartment, C1 or C2, appears on digital display (Figure 7, Item 13), press UP (Figure 7, Item 4) or DOWN (Figure 7, Item 10) arrow key. Setpoint will flash as temperature is changed.
19. Press ENTER key (Figure 7, Item 11) when desired temperature is reached. Setpoint will stop flashing.

Auto Start/Stop Mode – Stopping

1. On MCD, place ON/OFF switch to OFF position.

CAUTION

Various MTRCS electrical circuits will operate directly off of the battery when the diesel engine or external electrical power, primary power sources, is shut down. These circuits can quickly drain the power from the battery, disabling the capability for the engine to start when needed. It is important to make sure that the POWER ON/DOWN switch is always in the DOWN position when the MTRCS is not in use. When the POWER ON/DOWN switch is in the ON position, it will be illuminated, and when it is in the DOWN position, it will not be illuminated.

2. Place POWER ON/DOWN switch (Figure 8, Item 14) to DOWN position.
3. Place S1, S2, CB1, and CB2 to OFF position.

EXTERNAL POWER OPERATION – CONTINUED

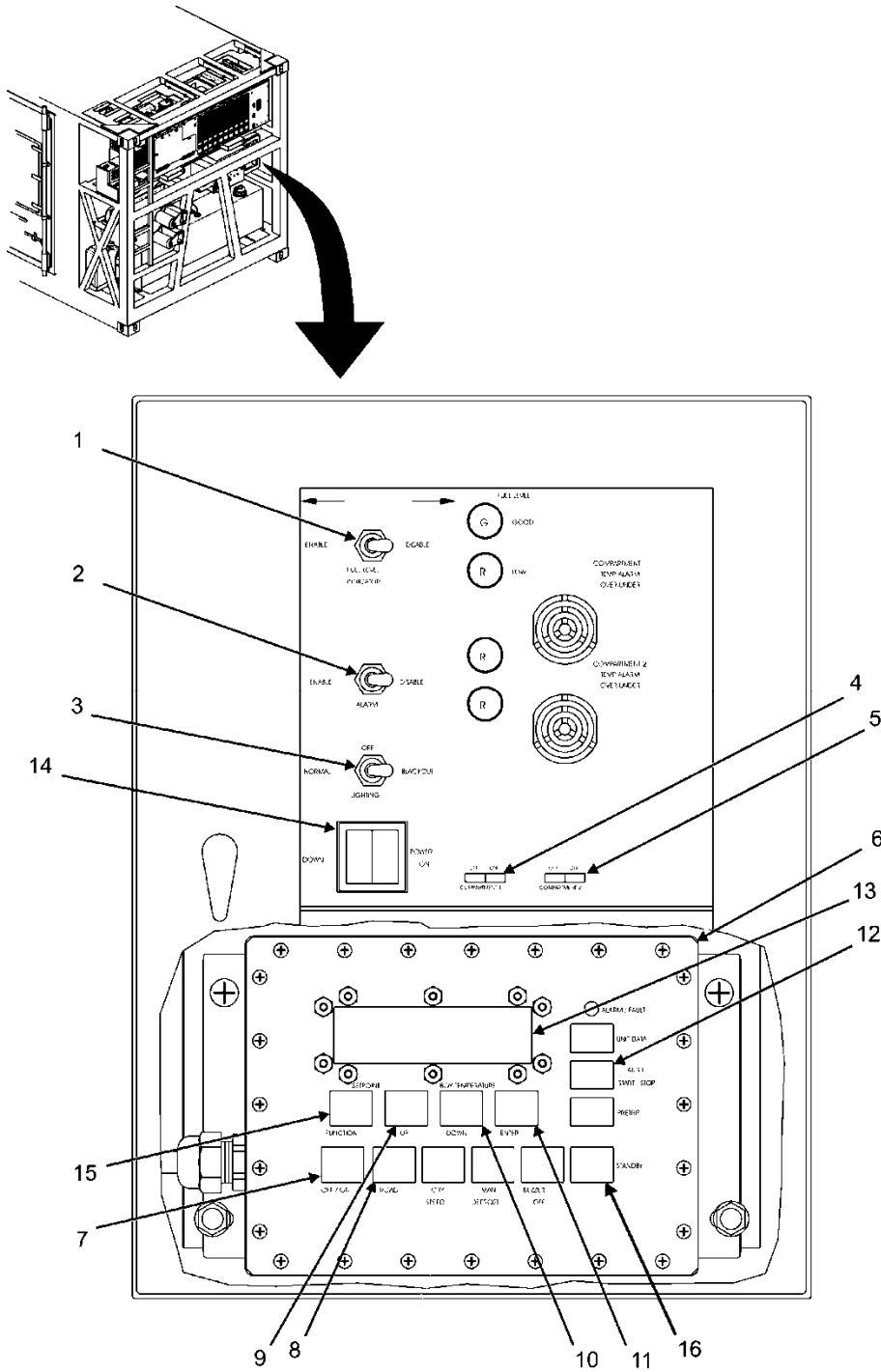


Figure 8. Control Box Assembly (External Power Stopping) Controls and Indicators.

EXTERNAL POWER OPERATION – CONTINUED

4. Turn power off at disconnect box.
5. Disconnect power supply cable from refrigeration unit.

Auto Start/Continuous Run Mode – Starting**WARNING**

Do not work on electrical equipment alone. Electrical voltage and current cannot be seen and, when contacted, can result in serious injury or death, render you unconscious, or severely burn you. Use extreme care when working with and around electrical power.

1. Perform preparation for use – external power source per this WP.
2. Determine appropriate power supply source that is available.

WARNING

When positioning power cables, make sure that power cable jackets are not cut or damaged and that no bare wires are evident.

Do not stand in water when handling live power cables. Position cables so that they are out of the way during operation and are not lying in water.

3. Plug in appropriate power supply cable from power source to refrigeration unit.
4. Make sure emergency stop switch is in PULL TO START position.

NOTE

NO POWER will be displayed on MCD when pressing STANDBY key if power supply cable is not connected from power source to refrigeration unit.

5. On power box, place S1 (Figure 6, Item 1) and S2 (Figure 6, Item 2) to appropriate position for power source being used.
6. Place CB1 (Figure 6, Item 3) or CB2 (Figure 6, Item 4) to ON position for applicable power source being used.
7. Place S7 (Figure 6, Item 5) to appropriate position for power source being used.
8. Start external power source in accordance with procedures of external power source.
9. On control panel, place POWER ON/DOWN switch (Figure 7, Item 14) to ON position.






EXTERNAL POWER OPERATION – CONTINUED**NOTE**

With MCD power on, the MCD will begin a power up self-test. All display messages will appear in the display window. At the completion of self-test, the setpoint and container temperature will be displayed.

10. On MCD, place ON/OFF switch (Figure 7, Item 7) to ON position.

NOTE


There may be a significant time delay of five to ten minutes before the MTRCS refrigeration unit standby motor will start up after pressing the STANDBY key.

11. On MCD, press STANDBY (Figure 7, Item 16) key.
- Plug icon  is displayed in MCD at top of display window.
12. On control panel, place COMPARTMENT 1 (Figure 7, Item 4) and COMPARTMENT 2 (Figure 7, Item 5) rocker switches to ON position.
- Plug icon  is displayed in MCD at top of display window.
13. Adjust setpoint as desired by pressing applicable UP (Figure 7, Item 9) or DOWN (Figure 7, Item 10) arrow  key.
14. Press ENTER key (Figure 7, Item 11)  to accept setpoint adjustment.
15. Place FUNCTION key (Figure 7, Item 15)  to AUTO OP.

NOTE

Once the unit is operating, various operating features can be selected using the FUNCTION key on the microprocessor controller. The functions available, and operation of the FUNCTION key, are described in WP 0004 and in WP 0004 Table 4, Function Codes.

Additionally, once the unit is operating, various operating parameters can be monitored using the UNIT DATA key on the microprocessor controller. The parameters available for monitoring, and operation of the UNIT DATA key, are described in WP 0004 and in WP 0004 Table 5, Unit Data Codes.

16. Check display for AUTO START/STOP indicator . If not displayed, no further action is required. If displayed, press AUTO START/STOP key (Figure 7, Item 12) on MCD (Figure 7, Item 13).
17. Default display will read compartment C1 and C2 on the left, setpoint in the middle, and controlled air temperature on the right. To change setpoint, proceed as follows:

EXTERNAL POWER OPERATION – CONTINUED**NOTE**

When pressing UP/DOWN buttons, display will flash for five (5) seconds. If ENTER is not pushed within five (5) seconds, the setting will not be saved. Setting will revert back to prior reading.

18. When desired compartment, C1 or C2, appears on digital display (Figure 7, Item 13), press UP (Figure 7, Item 4) or DOWN (Figure 7, Item 10) arrow key. Setpoint will flash as temperature is changed.
19. Press ENTER key (Figure 7, Item 11) when desired temperature is reached. Setpoint will stop flashing.

Auto Start/Stop Mode – Stopping

1. On MCD, place ON/OFF switch to OFF position.

CAUTION

Various MTRCS electrical circuits will operate directly off of the battery when the diesel engine or external electrical power, primary power sources, is shut down. These circuits can quickly drain the power from the battery, disabling the capability for the engine to start when needed. It is important to make sure that the POWER ON/DOWN switch is always in the DOWN position when the MTRCS is not in use. When the POWER ON/DOWN switch is in the ON position, it will be illuminated, and when it is in the DOWN position, it will not be illuminated.

2. Place POWER ON/DOWN switch (Figure 3, Item 14) to DOWN position.
3. Place S1, S2, CB1, and CB2 to OFF position.
4. Turn power off at disconnect box.
5. Disconnect power supply cable from refrigeration unit.

Temperature Chart Recorder

The temperature chart recorder is activated when power is supplied to system.

END OF TASK**END OF WORK PACKAGE**

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
OPERATION UNDER USUAL CONDITIONS – DECALS AND INSTRUCTION PLATES

INTRODUCTION

Placards, decals, and instruction plates can be found on all sides, on top, and inside of the MTRCS container. These items provide information and/or safety hazards that you should know about. Figures 1 through 9 provide location, description, and function of the various placards, decals, or instruction plates found throughout the MTRCS.

DECALS AND INSTRUCTION PLATES – CONTINUED

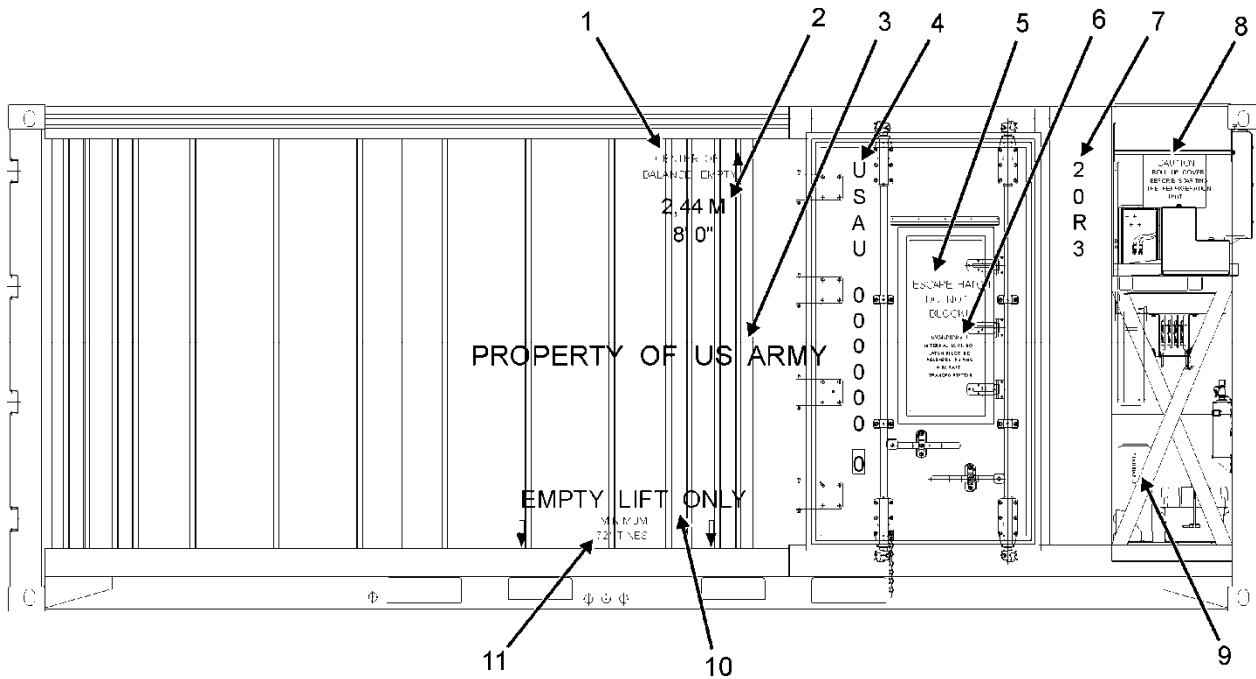


Figure 1. MTRCS Right Side Placards.

Figure 1, Item	Description	Function
1	Center of Balance Stencil	Center of balance while container is empty.
2	Height Stencil	Identifies height of container.
3	Property of US Army Stencil	Identifies owner of container.
4	Serial Number Stencil	Identifies serial number of container.
5	Escape Hatch Stencil	Identifies location of escape hatch.
6	Escape Hatch Warning	Informs crew that internal locking latch must be released during aircraft transportation.
7	Size and Type Code	Indicates the size and type of container.
8	Cover Caution	Informs crew to roll up cover before starting refrigeration unit.
9	Fuel Can Warning Flammable (on can)	Fuel can contains flammable materials.
10	Empty Lift Only	Identifies lifting location for forklift while container is empty.
11	Minimum 72" Tines	Forklift tines must be a minimum of 72" long to lift MTRCS.

DECALS AND INSTRUCTION PLATES – CONTINUED

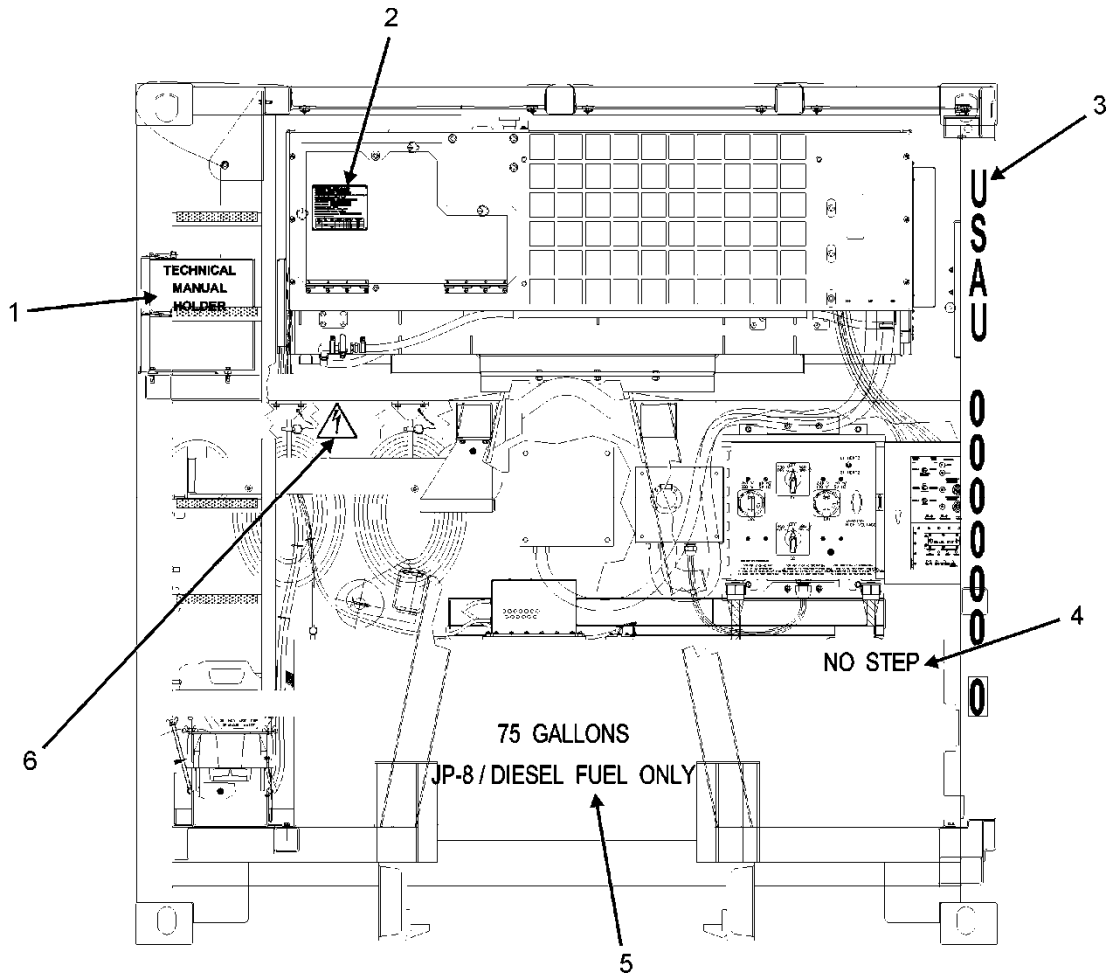


Figure 2. MTRCS Front Side Placards.

Figure 2, Item	Description	Function
1	Technical Manual Holder	Identifies location of Technical Manual Storage container.
2	Consolidated Data Plate	Identifies key elements for transportation to include type, manufacturer's number, system NSN, contract number, supplier of container materials, CSC safety approval information, and next scheduled inspection date.
3	Serial Number	Identifies serial number of container.
4	No Step	Informs crew this area is not to be used as a stepping device.
5	75 Gallons JP-8 / Diesel Fuel Only	Informs crew that container holds 75 gallons of fluid and JP-8 or Diesel is only acceptable fuel.
6	Electrical Hazard Symbol	Informs crew of an electrical hazard.

DECALS AND INSTRUCTION PLATES – CONTINUED

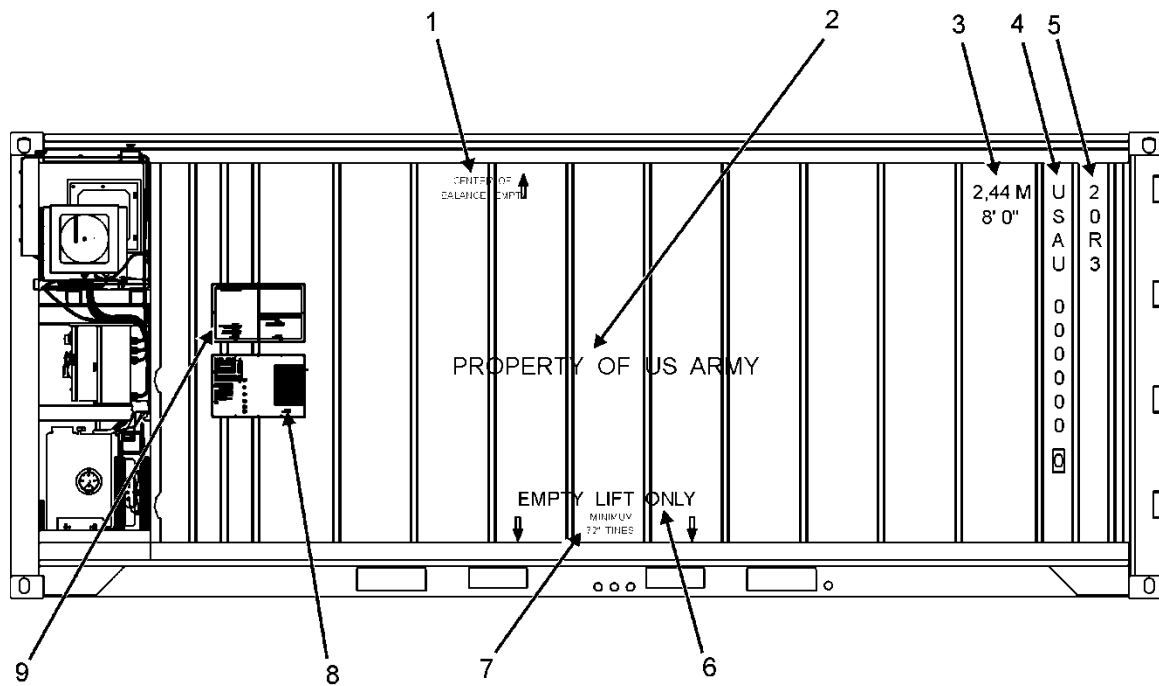


Figure 3. MTRCS Left Side Placards.

Figure 3, Item	Description	Function
1	Center of Balance Stencil	Center of balance while container is empty.
2	Property of US Army Stencil	Identifies owner of container.
3	Height Stencil	Identifies height of container.
4	Serial Number Stencil	Identifies serial number of container.
5	Size and Type Code	Indicates the size and type of container.
6	Empty Lift Only	Identifies lifting location for forklift while container is empty.
7	Minimum 72-inch Tines	Forklift tines must be a minimum of 72" long to lift MTRCS.
8	Instruction Plate	Informs crew a basic overview of how to control the microprocessor controller.
9	Operating Instruction Plate	Informs crew of basic engine operation inspections, engine operation automatic starting procedure and electrical operations.

DECALS AND INSTRUCTION PLATES – CONTINUED

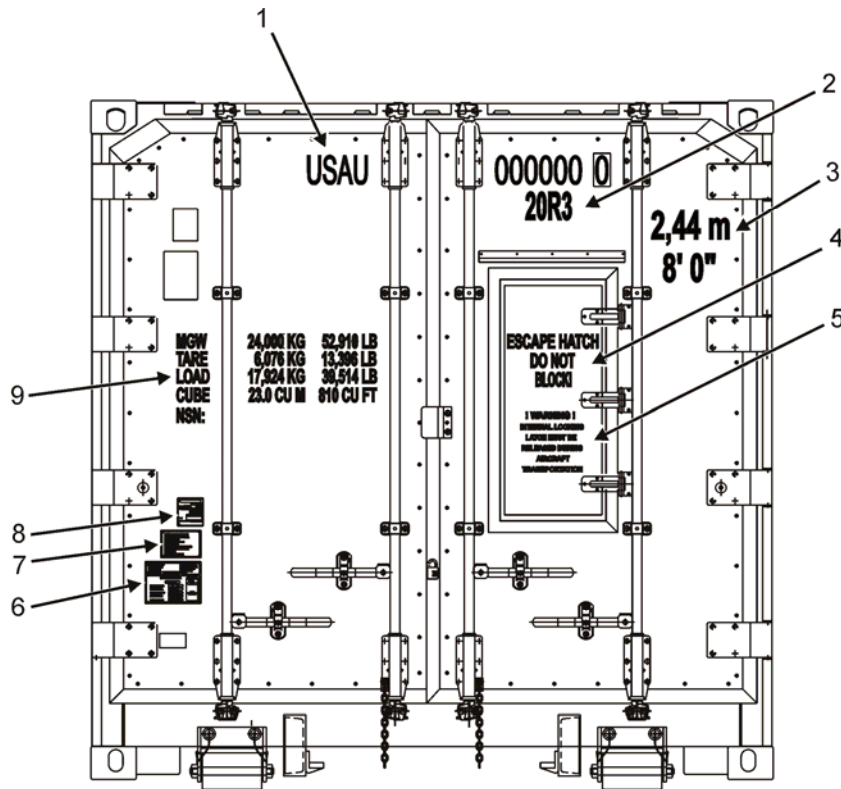


Figure 4. MTRCS Rear Placards.

Figure 4, Item	Description	Function
1	Serial Number Stencil	Identifies serial number of container.
2	Size and Type Code	Indicates the size and type of container.
3	Height Stencil	Identifies height of container.
4	Escape Hatch Stencil	Identifies location of Escape hatch.
5	Escape Hatch Warning	Informs flight crew that internal locking latch must be released during aircraft transportation.
6	CSC Safety Approval Plate	Identifies safety approval certification.
7	MTRCS Identification Plate	Product description, contract, technical manual.
8	MTRCS Unique Identification Label	Part number, NSN, two dimensional barcode.
9	Consolidated Data Placard	Identifies key elements for transportation to include type, manufacturer's number, system NSN, container NSN, contract number, supplier of container materials, CSC safety approval information, and next scheduled inspection date.

DECALS AND INSTRUCTION PLATES – CONTINUED

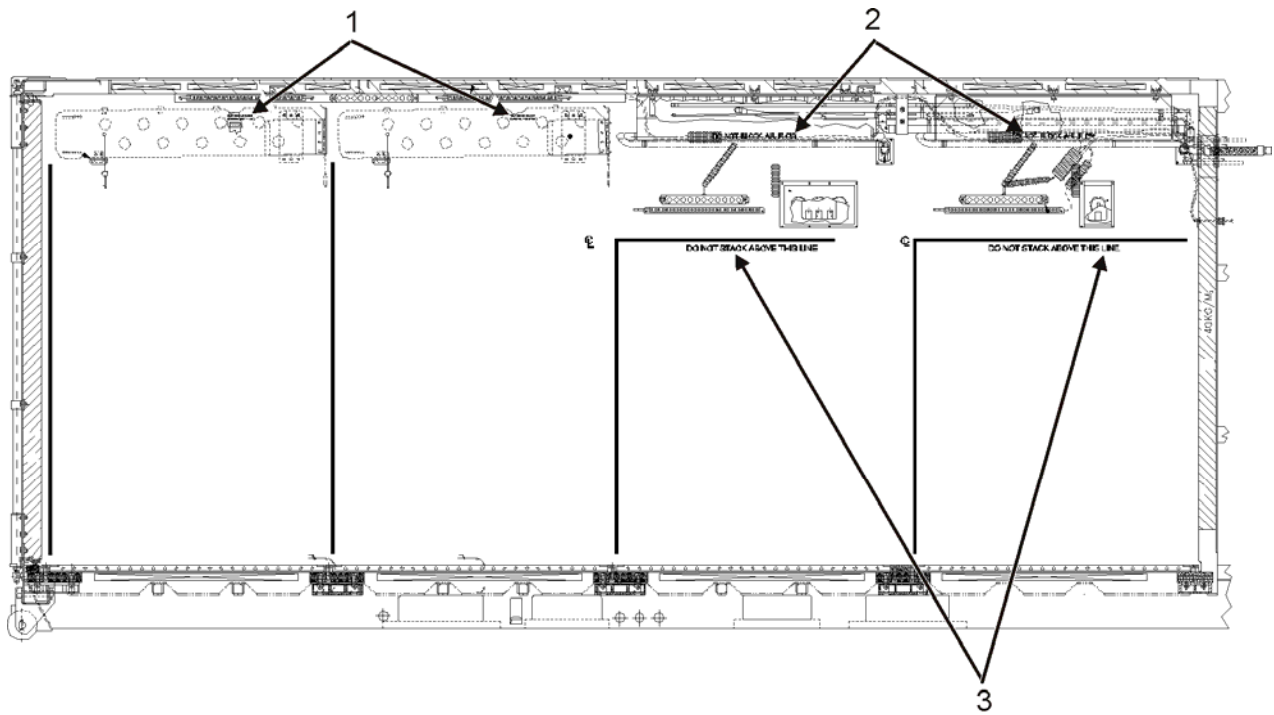


Figure 5. MTRCS Interior Left Side Placards.

Figure 5, Item	Description	Function
1	Diagonal Strap	Indicates to crew where to hang diagonal straps when performing loading procedures.
2	Airflow	Indicates areas that cannot be blocked in order for air flow to circulate properly.
3	Stack Stencil	Indicates to crew the highest point that items can be stacked to in order to allow for proper airflow.

DECALS AND INSTRUCTION PLATES – CONTINUED

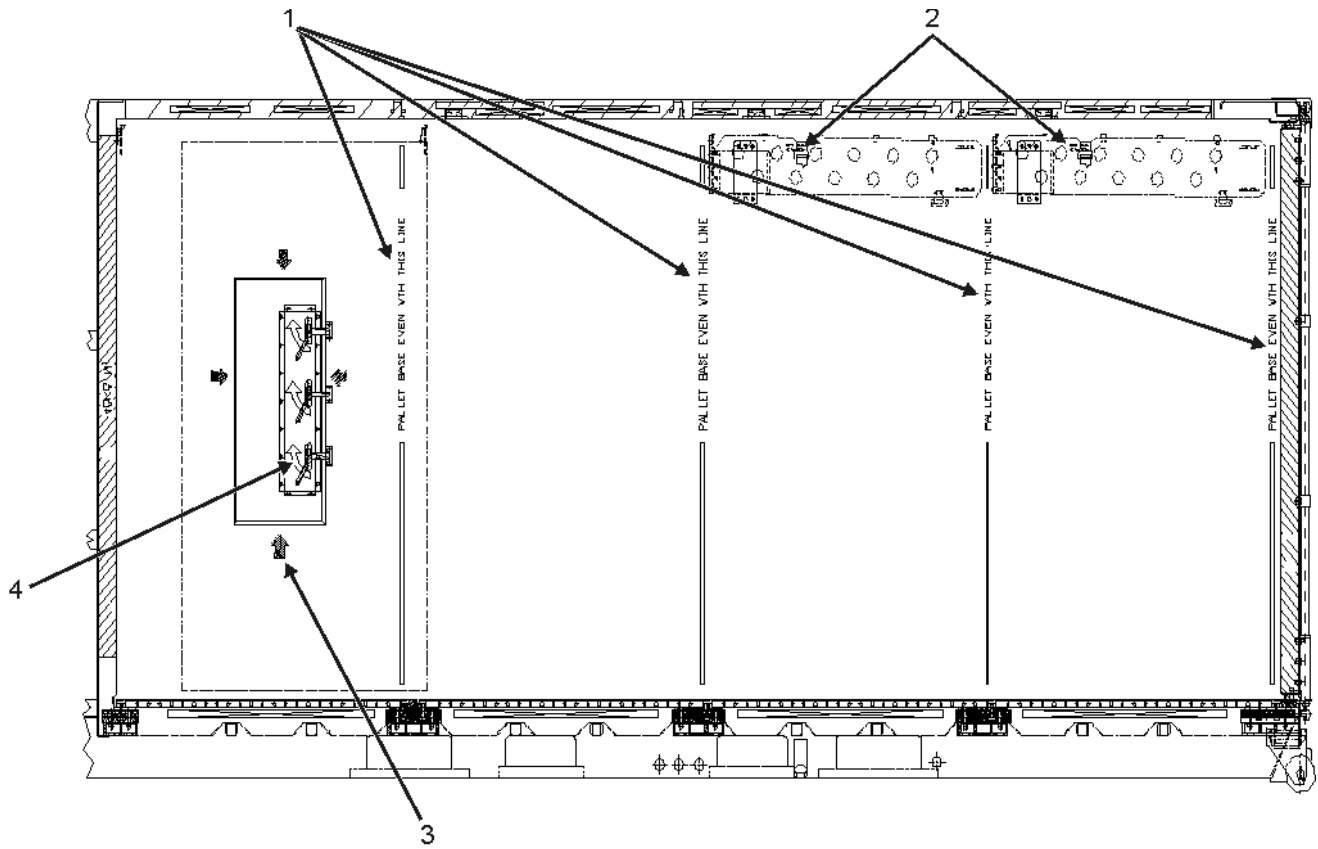


Figure 6. MTRCS Interior Right Side Placards.

Figure 6, Item	Description	Function
1	PALLET BASE EVEN WITH THIS LINE	Indicates to crew the point that the pallets must be forward of when loading the cargo.
2	Diagonal Strap	Indicates to crew where to hang diagonal straps when performing loading procedures.
3	Arrow Marker	Indicates to personnel inside insulated container where emergency door is located.
4	Directional Arrow Marker	Indicates to personnel inside insulated container direction to turn handles to open door.

DECALS AND INSTRUCTION PLATES – CONTINUED

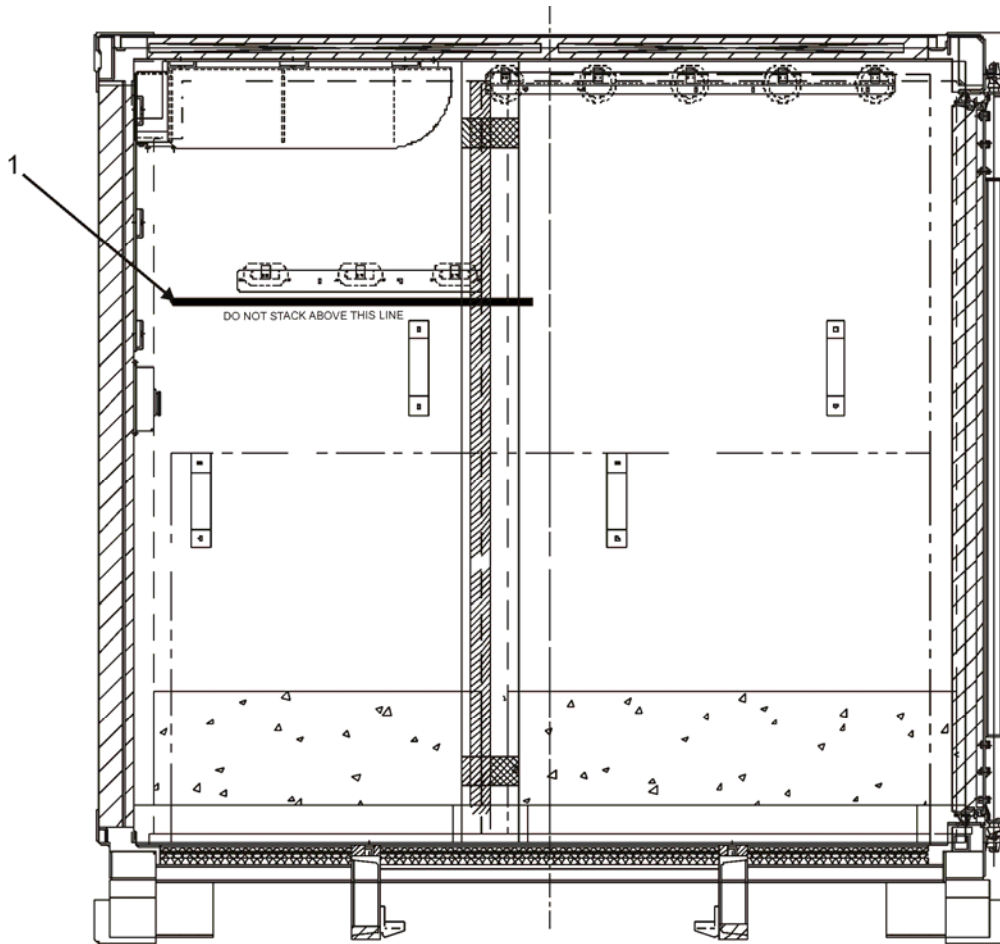


Figure 7. Interior Bulkhead Placards.

Figure 7, Item	Description	Function
1	Stack Stencil	Indicates to crew the highest point that items can be stacked to in order to allow for proper airflow.

DECALS AND INSTRUCTION PLATES – CONTINUED

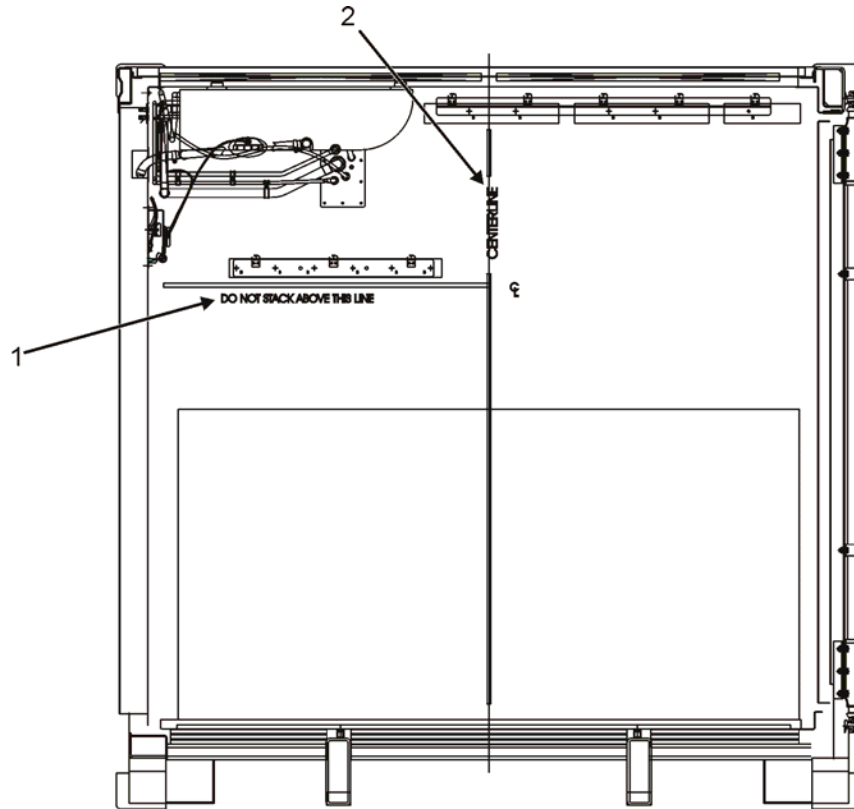


Figure 8. Interior Front Wall Placards.

Figure 8, Item	Description	Function
1	Stack Stencil	Indicates to crew the highest point that items can be stacked to in order to allow for proper airflow.
2	Center Line Stencil	Indicates to crew the centerline that pallets must not cross to be properly installed.

DECALS AND INSTRUCTION PLATES – CONTINUED

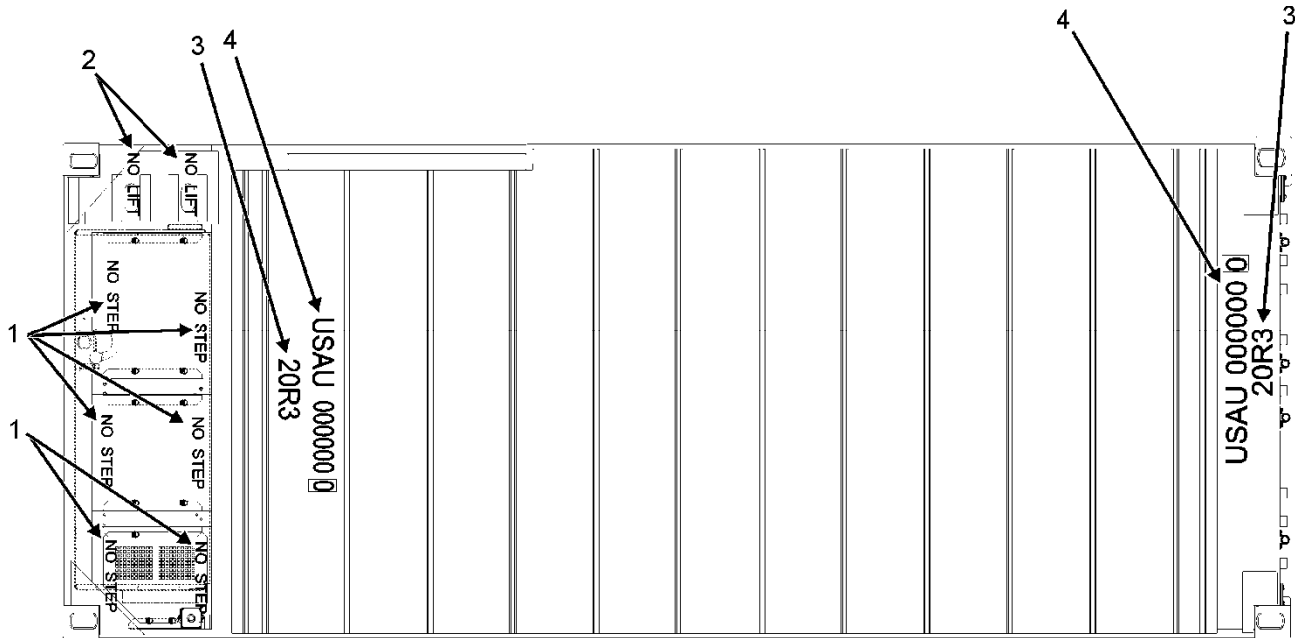


Figure 9. MTRCS Top Placards.

Figure 9, Item	Description	Function
1	NO STEP	Indicates to personnel this area is not built to support weight of personnel.
2	NO LIFT	Indicates to personnel this area cannot be used to lift container.
3	Size and Type Code	Indicates the size and type of container.
4	Serial Number Stencil	Identifies serial number of container.

END OF TASK

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
OPERATION UNDER USUAL CONDITIONS – LOADING

INITIAL SETUP:**Tools and Special Tools**

Forklift (WP 0109)
 Pallet Mobilizer Lift Truck (WP 0109)

Personnel Required

Automated Logistical Specialist (3), or
 Food Service Specialist (3)

Materials/Parts

Rows 1 and 2 cargo net (orange / yellow straps)
 (WP 0108, Item 3)
 Rows 3 and 4 cargo net (green / yellow straps)
 (WP 0108, Item 4)

References

WP 0024

Equipment Condition

Refrigeration unit running (WP 0005)
 MTRCS stationary on flat level surface (WP 0005)
 Interior bulkhead removed (WP 0024)

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

GENERAL

This work package contains instructions for loading the MTRCS while stationary on a flat level surface. The inside of the MTRCS has six extruded, scalloped rails that extend across the width of the MTRCS container flooring. Tasks covered in this work package include general preparations, installing cargo netting, interior bulkheads, loading cargo, unloading cargo, and replacing cargo nets. Whenever left or right is used, it will be as viewed from standing at rear doors facing toward the inside of the container.

The MTRCS is designed to ship frozen and chilled products or a mixture of both. The MTRCS can hold up to a maximum of 14 fully loaded pallets not to exceed a maximum cargo weight of 52,900 pounds. The pallets are secured in place with specifically designed cargo nets that have color coded fittings to match the extruding scalloping rail. The cargo is loaded in a sequence of rows numbered one to four as shown in Figure 1. The cargo nets are designed in sets of two with horizontal orange and vertical yellow strapping for rows one and two. Rows three and four are secured in place with vertical yellow and horizontal green strapping.

GENERAL – CONTINUED

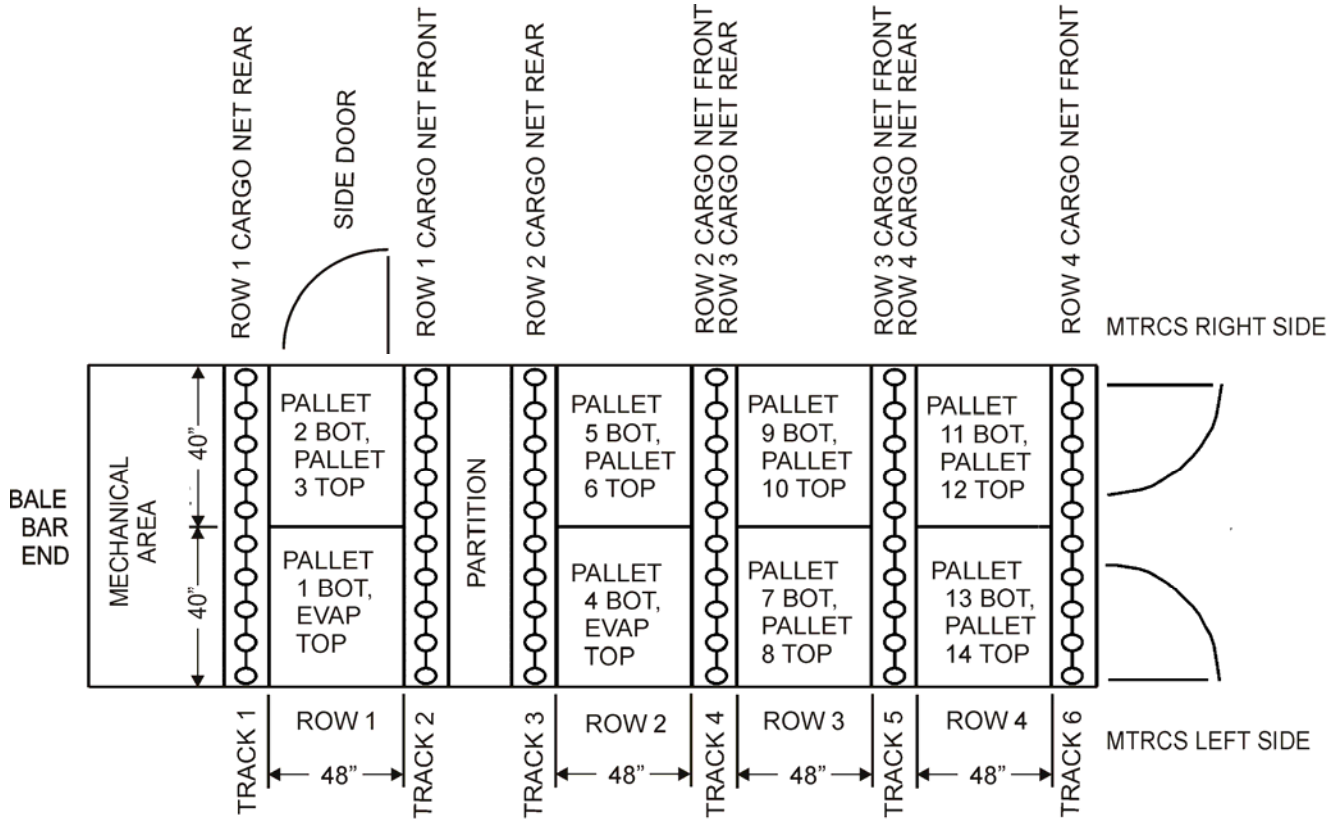


Figure 1. MTRCS Floor Plan Pallet Location.

PREPARATION**WARNING**

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

1. Open right rear door (Figure 2, Item 1) by pushing cam handles (Figure 2, Item 2) away from each other.

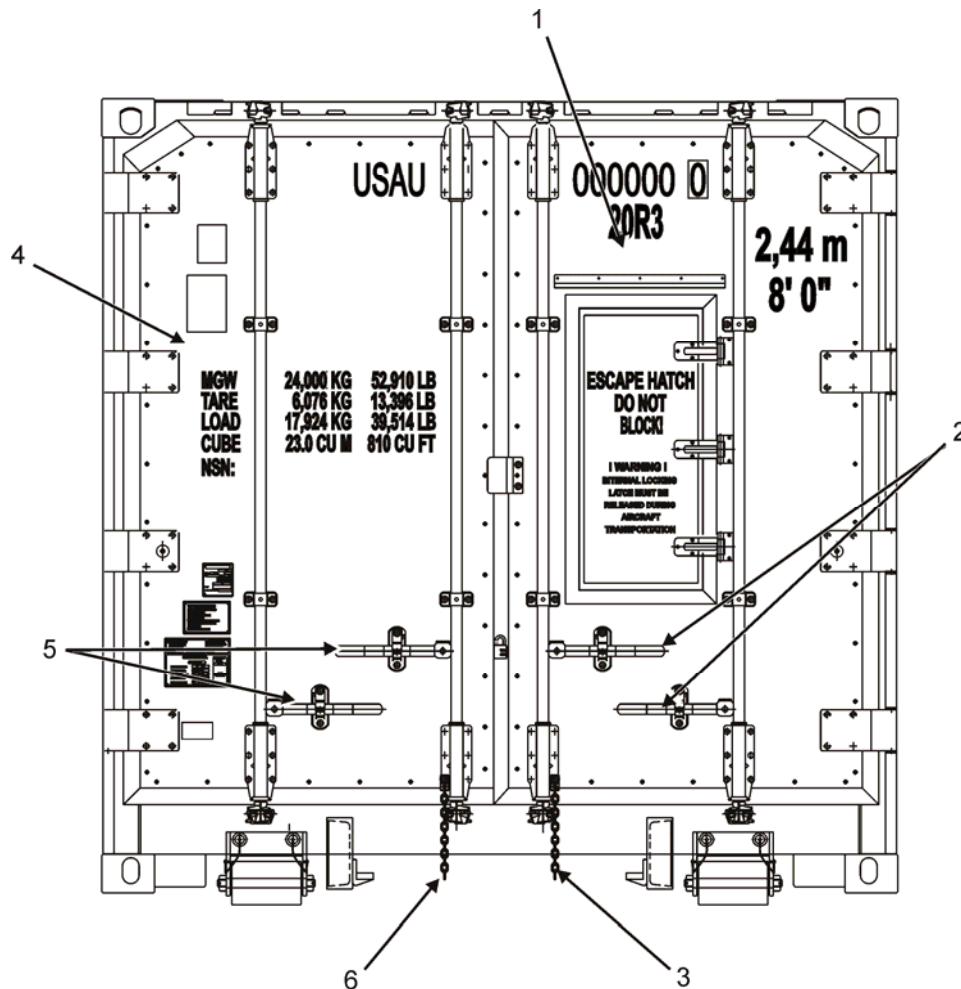


Figure 2. Rear Doors.

2. Open right door (Figure 2, Item 1) completely and secure to side of container with attached door chain (Figure 2, Item 3).
3. Open left rear door (Figure 2, Item 4) by pushing cam handles (Figure 2, Item 5) away from each other.
4. Open left door (Figure 2, Item 4) completely and secure to side of container with attached door chain (Figure 2, Item 6).

PREPARATION – CONTINUED

5. Open side door (Figure 3, Item 1) and secure to side of container with attached door chain (Figure 3, Item 2).

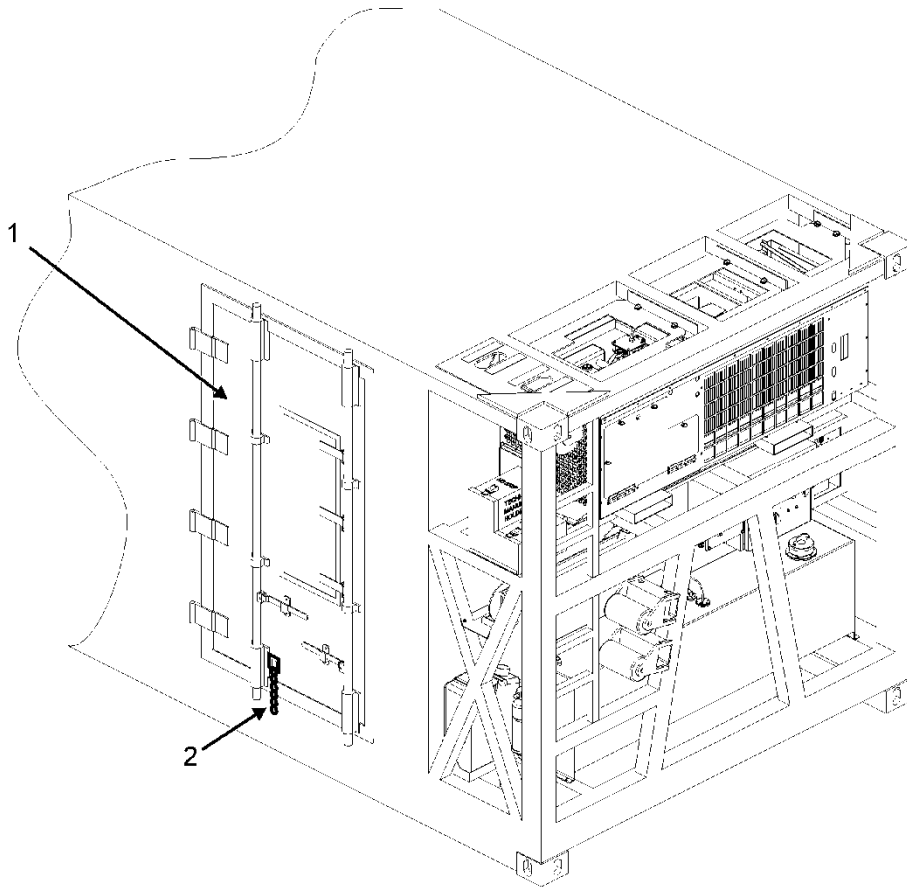


Figure 3. Side Door.

WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury. The rolled cargo netting weighs approximately 70 pounds and a two-person lift is required when moving the netting. Do not try to lift or move more than 42 pounds by yourself. Bend legs while lifting and do not support heavy weight with your back.

6. Remove stored cargo netting from container and set aside for later use.
7. Identify cargo netting for each row as shown in Table 1.

PREPARATION – CONTINUED

Table 1. Cargo Netting Strap Identification.

Row	Color of Vertical Strap	Color of Horizontal Strap
1	Yellow	Orange
2	Yellow	Orange
3	Yellow	Green
4	Yellow	Green

END OF TASK

LOADING

Center of Gravity

Center of gravity is an important consideration that must be taken into account before loading the MTRCS. Refer to Table 2 and Table 3 for basic guidance on load and distribution limits for HEMTT with LHS and PLS vehicles.

Table 2. MTRCS Weight Distribution – Empty Mode.

ITEM	WEIGHT (LBS)	DISTANCE FROM FRONT	MOMENT	ESTIMATED VERTICAL DISTANCE	VERTICAL MOMENT
Front left corner casting	3,513	4	12,294	43	151,038
Front right corner casting	3,513	4	12,294	43	151,038
Rear left corner casting	2,715	235	638,025	43	116,745
Rear right corner casting	2,715	235	638,025	43	116,745
Fuel in tank (72 gal x 8 lbs)	576	15	8,352	24	13,824
Refrigerant in system	15	16	240	80	1,200
Cargo netting spread over 4 rows	320	132	42,240	55	17,600
Partition between rows 1 and 2	30	82	2,460	51	1,530
Row 1:					
Pallet 1	0	58	0	32	0
Pallet 2	0	58	0	32	0
Pallet 3	0	58	0	72	0
Half Pallet	0	58	0	62	0
Row 2:					
Pallet 4	0	110	0	32	0
Pallet 5	0	110	0	32	0

LOADING – CONTINUED

Table 2. MTRCS Weight Distribution – Empty Mode – Continued.

ITEM	WEIGHT (LBS)	DISTANCE FROM FRONT	MOMENT	ESTIMATED VERTICAL DISTANCE	VERTICAL MOMENT
Pallet 6	0	110	0	72	0
Half Pallet	0	110	0	62	0
Row 3:					
Pallet 7	0	159	0	32	0
Pallet 8	0	159	0	32	0
Pallet 9	0	159	0	72	0
Pallet 10	0	159	0	72	0
Row 4:					
Pallet 11	0	208	0	32	0
Pallet 12	0	208	0	32	0
Pallet 13	0	208	0	72	0
Pallet 14	0	208	0	72	0
TOTALS	13,396		1,353,930		569,719
TOTAL UNIT WEIGHT: 13,396 LBS					
WEIGHT AT REAR SUPPORT POINT: 5,677 LBS					
WEIGHT AT FRONT SUPPORT POINT: 7,719 LBS					
CENTER OF GRAVITY (CG) OF UNIT FROM STA. ZERO: 101.07 LBS					
VERTICAL CG FROM GROUND UP: 42.53 LBS					
PLS Limits:		Longitudinal	Vertical		
Max Long. CG Dist:		123.00			
Max Vert. CG Dist:			38.30		
Weight Max		36,250	36,250		
Max Long. Moment		4,458,750			
Max Vert. Moment			1,388,375		
Weight Check:					
Actual:		13,396			
Allowable:		36,250			
Status:		OK			

LOADING – CONTINUED

Table 2. MTRCS Weight Distribution – Empty Mode – Continued.

ITEM	WEIGHT (LBS)	DISTANCE FROM FRONT	MOMENT	ESTIMATED VERTICAL DISTANCE	VERTICAL MOMENT
Longitudinal Moment Check:					
Actual:		1,353,930			
Allowable:		4,458,750			
Status:		OK			
Vertical Moment Check:					
Actual:		569,719			
Allowable:		1,388,375			
Status:		OK			
LHS Limits:		Longitudinal	Vertical		
Max Long. CG Dist:		110.20			
Vertical			39.90		
Weight Max		26,000	26,000		
Max Long Moment		2,865,200			
Max Vert Moment			1,037,400		
Weight Check:					
Actual:		13,396			
Allowable:		26,000			
Status:		OK			
Longitudinal Moment Check:					
Actual:		1,353,930			
Allowable:		2,865,200			
Status:		OK			
Vertical Moment Check:					
Actual:		569,719			
Allowable:		1,037,400			
Status:		OK			

LOADING – CONTINUED

Table 3. LHS and PLS Load Capability.

Pallet Weights – Total Weight – CG Location				LHS Load Check		PLS Load Check	
Pallet Weight (X 14)	Total System Weight - Cannot Exceed 26,000 Lbs. For LHS - Cannot Exceed 36,250 Lbs For PLS	Longitudinal CG	Est. Vertical CG	Weight On Bale Bar - Cannot Exceed 14,000 Lbs Due To LHS Lift Capability	Weight At Rear - Cannot Exceed 12,000 Lbs. Due To Vehicle Suspension	Weight On Bale Bar	Weight At Rear
500	20396	114.63	44.63	10593	9803	10593	9803
550	21096	115.49	44.76	10881	9982	10881	9982
600	21796	116.3	44.89	11168	10395	11168	10395
650	22496	117.05	45	11456	10807	11456	10807
685	22986	117.56	45.08	11657	11220	11657	11220
				LHS Vertical Moment Capability Is Exceeded Beyond This Point.			
700	23196	117.76	45.11			11743	11453
800	24596	119.06	45.31			12318	12278
900	25996	120.22	45.49			12893	13103
1000	27396	121.26	45.65			13467	13929
1100	28796	122.2	45.8			14042	14754
1200	30196	123.06	45.93			14617	15579
						PLS Vertical Moment Capability Is Exceeded Beyond This Point	

Pallet Configurations

As shown in Figure 1, 14 pallets is a full load for the MTRCS. All pallets can be full size pallets. Pallets loaded under the evaporators (pallet positions 1 and 4) are a single stack configuration only. The important consideration is that any combination of stacked pallets cannot exceed 80-inches in height. Always practice sound judgment and loading expertise when loading pallets and considering the stacking options. For instance, never stack an extremely heavy pallet that may contain blocks of ice on a light pallet that may contain boxes of cereal.

LOADING – CONTINUED**CAUTION**

Total system weight for LHS must not exceed 26,000 pounds. When using LHS, weight on bale bar must not exceed 14,400 pounds due to lift capability, and weight at rear must not exceed 12,000 pounds due to vehicle suspension. Total system weight for PLS must not exceed 36,250 pounds.

Load Row 1, Pallets 1, 2, and 3

1. Position row 1 yellow/orange cargo net assembly (Figure 4, Item 1) near inside front wall (Figure 4, Item 2) so that it can be pushed toward rear doors (Figure 4, Item 3) to unroll.

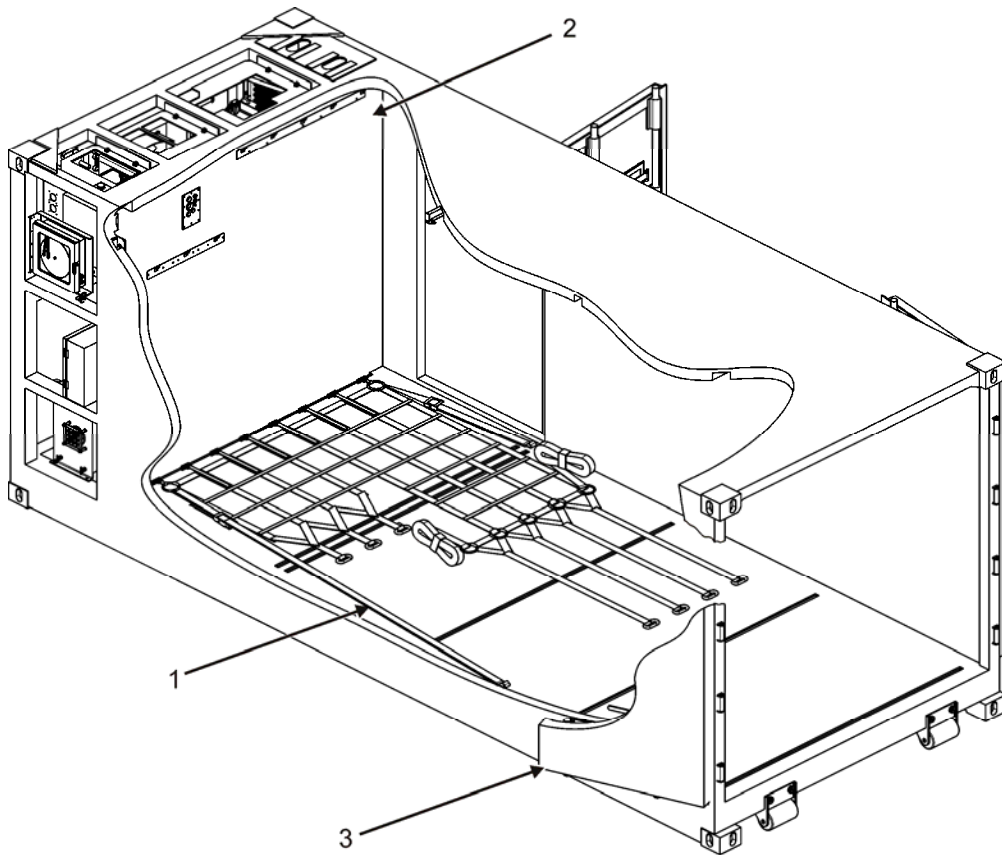
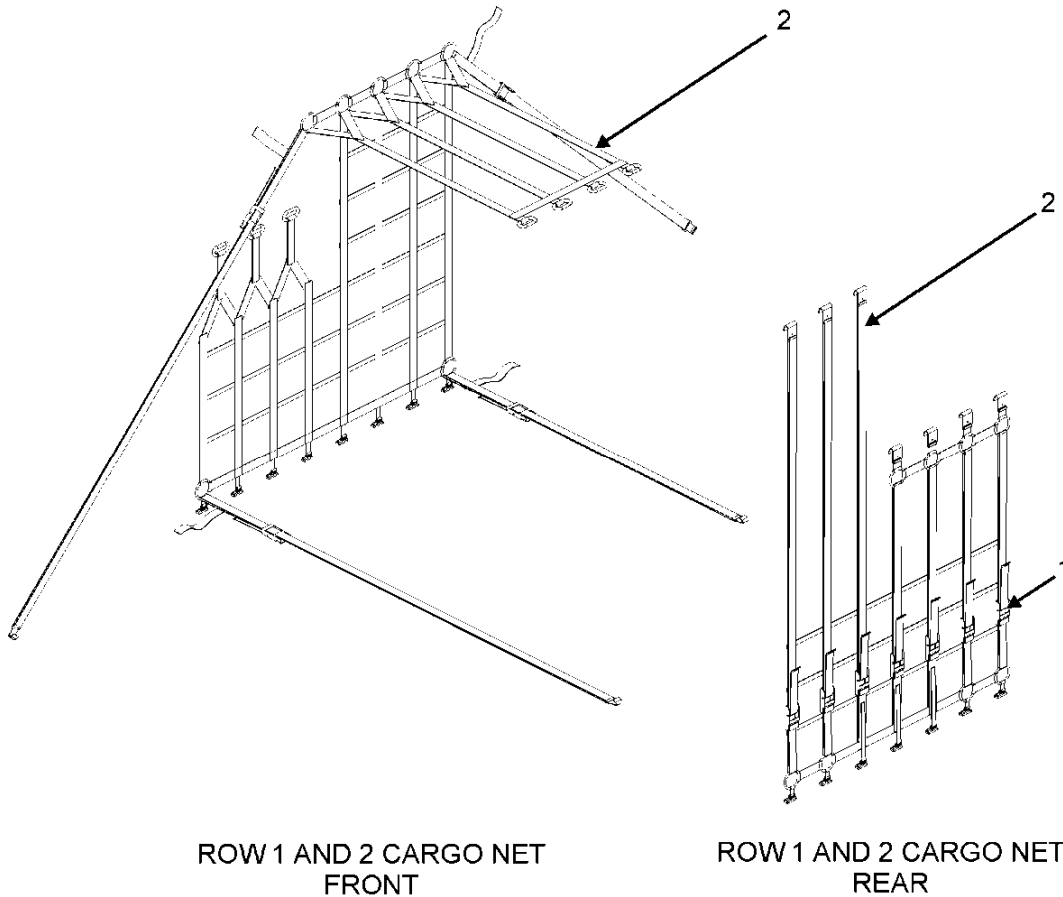


Figure 4. Row 1 Cargo Net Installation.

2. Unroll row 1 cargo net assembly (Figure 4, Item 1) toward MTRCS rear doors (Figure 4, Item 3) until completely unrolled.

LOADING – CONTINUED

3. Separate row 1 cargo net rear (Figure 5, Item 1) from row 1 cargo net front (Figure 5, Item 2) and move aside to provide clear path for pallet jack entrance into container.

ROW 1 AND 2 CARGO NET
FRONTROW 1 AND 2 CARGO NET
REAR**Figure 5. Row 1 and Row 2 Cargo Net Assemblies.**

4. Attach row 1 cargo net front blue strap triple stud fittings (Figure 6, Item 1) onto track 1 blue hook points (Figure 6, Item 2) on floor.

NOTE

It may be necessary to obtain additional slack in order to attach each of the row 1 cargo net rings onto the wall keepers. If additional slack is required, adjust ratchets as required to obtain the needed slack.

5. Rotate right hand part of row 1 cargo net front (Figure 5, Item 2) upward and install five upper round rings (Figure 6, Item 3) onto wall keepers (Figure 6, Item 4).
6. Rotate left hand part of row 1 cargo net front (Figure 5, Item 2) upward and install three oblong rings (Figure 6, Item 5) onto wall brackets (Figure 6, Item 6).
7. Rotate upper portion of row 1 cargo net front (Figure 5, Item 2) upward and install four oblong rings (Figure 6, Item 7) to ceiling using ring boxes (Figure 6, Item 8).

LOADING – CONTINUED

8. Lay lower diagonal straps (Figure 6, Item 9) along floor in channel around sides and away from path of pallet jack.

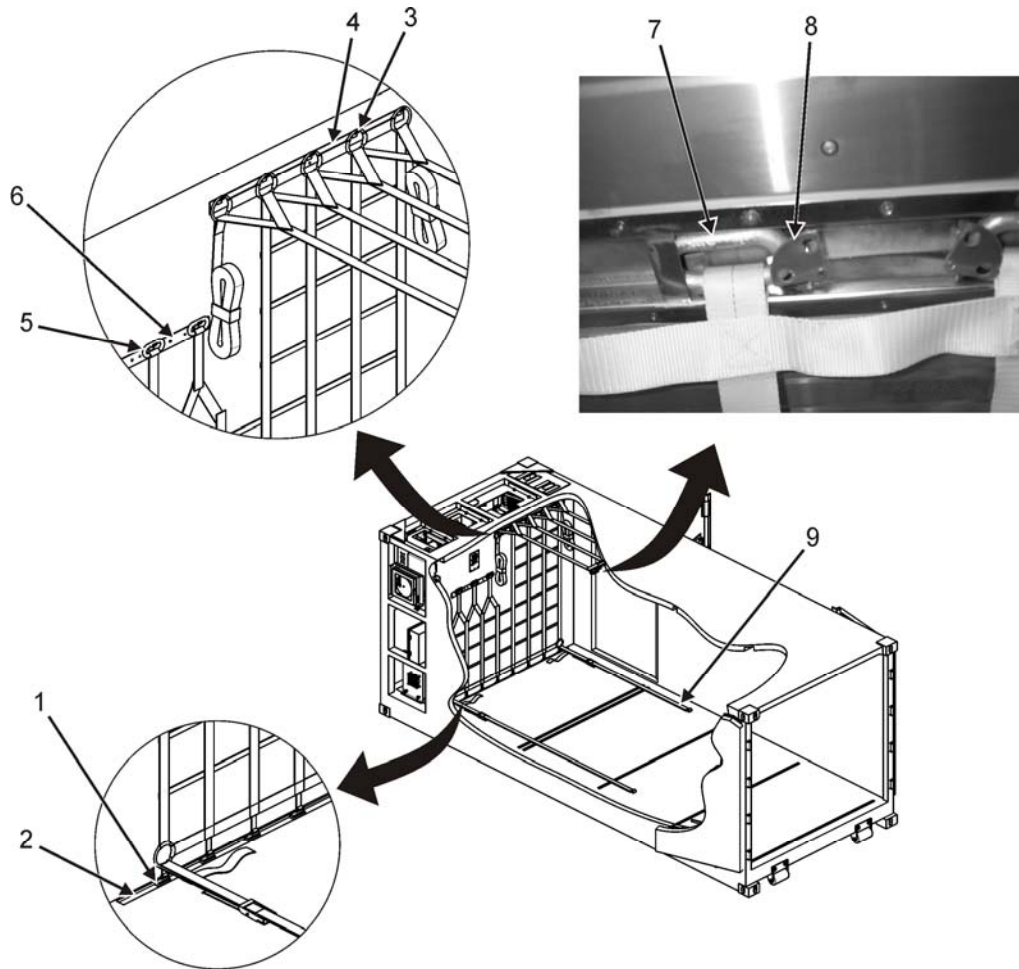


Figure 6. Row 1 Cargo Net Attachment.

LOADING – CONTINUED**NOTE**

Do not unroll other diagonal strap at this time. Leave the other diagonal strap rolled up and secured by the hook and pile fastener for later use.

9. Route upper diagonal strap (Figure 7, Item 1) outside door (Figure 7, Item 2) and hook to door hinge.

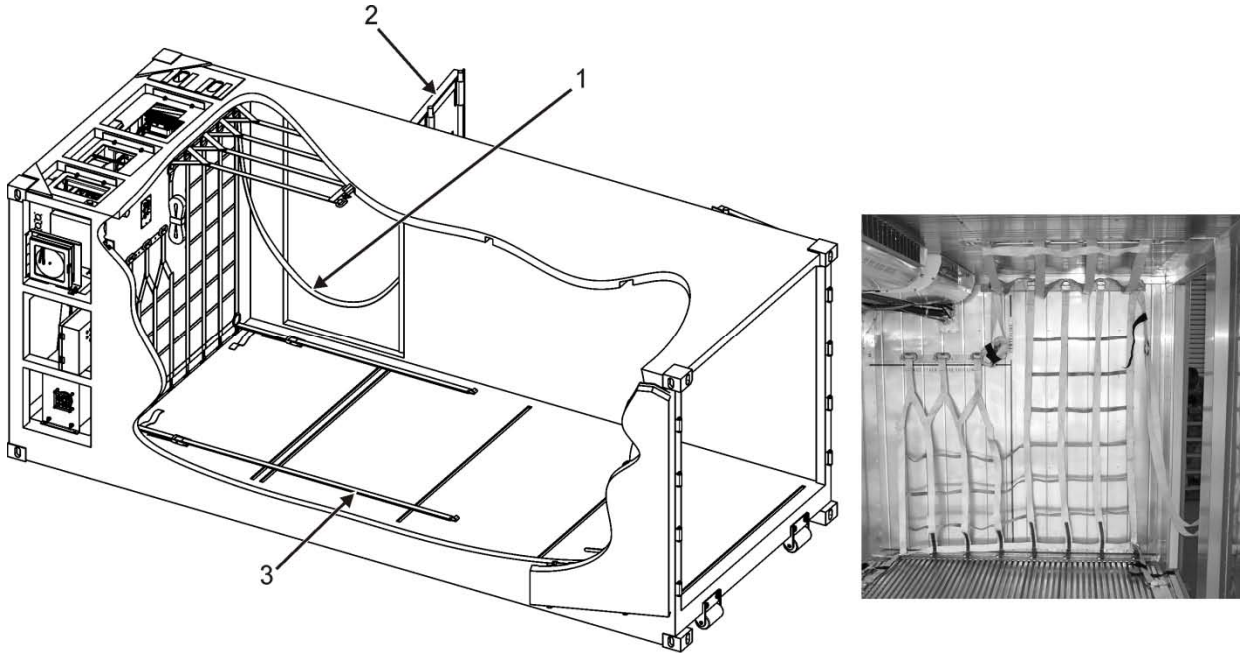


Figure 7. Diagonal Strap.

WARNING

Pallet jack is a two-person lift. Be sure to bend at the knee and lift using legs while placing pallet jack into insulated container. Make sure that pallet jack is always secure inside container and positioned so that it does not roll out of container.

10. Lift pallet jack into insulated container.

LOADING – CONTINUED**WARNING**

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

11. Using forklift (Figure 8, Item 1), pick up pallet 1 (Figure 8, Item 2) by the short (40-inch) side.

CAUTION

Do not place more than one pallet under each evaporator. Stacking pallets in this area will restrict airflow/circulation and can cause damage to equipment. Do not stack pallets above red lines on the walls, or on the interior bulkheads. Do not pinch straps with pallets. Make sure diagonal cargo net straps laying on floor of container are clear of pallet.

NOTE

When placing the pallet inside of container, make sure that pallet is at least 14 inches inside container to allow space for insertion of the pallet jack.

Place pallets on left or right side of container so they can be turned into position for loading. Be sure to leave room between pallet and wall to allow pallet to be turned.

12. Place pallet 1 (Figure 8, Item 2) on floor on right side inside insulated container (Figure 8, Item 3).
13. Remove forklift (Figure 8, Item 1) from pallet 1 (Figure 8, Item 2).
14. Place pallet jack forks (Figure 8, Item 4) into base of pallet 1 (Figure 8, Item 2).
15. Rotate pallet to left as viewed by pallet jack operator.

LOADING – CONTINUED

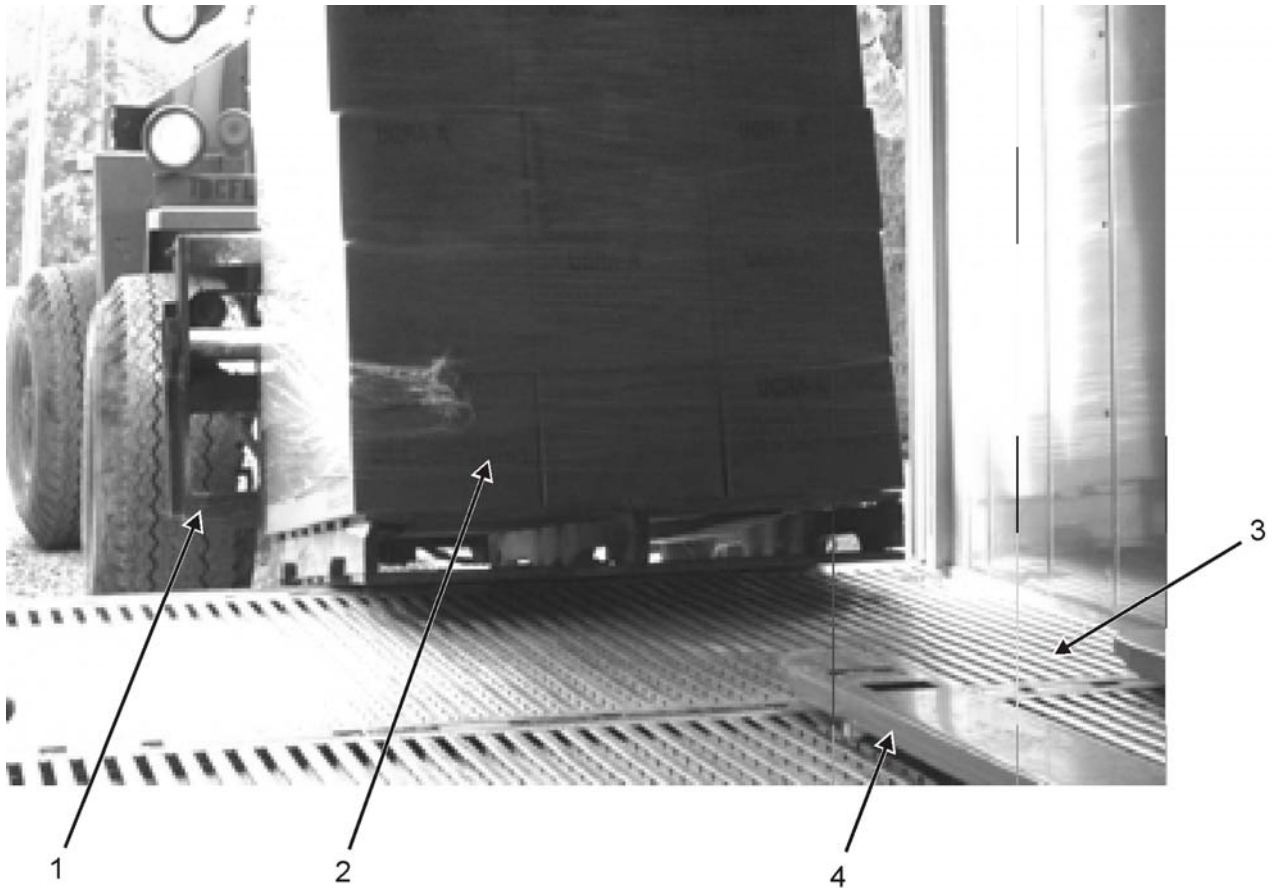


Figure 8. Pallet 1 Forklift Loading.

NOTE

It is very important to make sure that the rear face of pallet 1 is even with, or slightly forward of, the red line on the container wall, and as close to centerline as possible without going over.

Do not trap the lower diagonal strap under pallet 1 when putting pallet 1 in place.

LOADING – CONTINUED

16. Push pallet jack back to pallet 1 loading location (Figure 9, Item 1) making sure an air flow gap of approximately three inches exists between pallet and container wall.

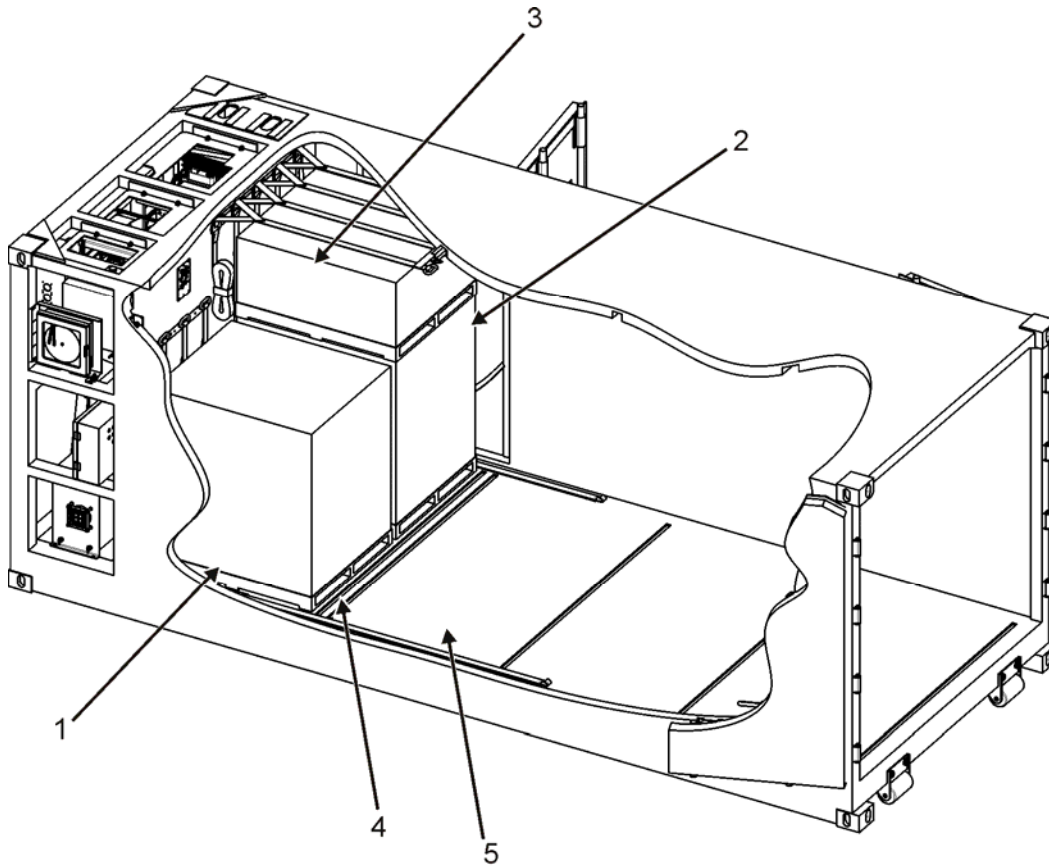


Figure 9. Pallets 1, 2, and 3 Loaded.

17. Lower pallet 1 (Figure 8, Item 2) onto insulated container (Figure 8, Item 3) floor.

LOADING – CONTINUED**WARNING**

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

NOTE

Pallet 3 must be stacked and secured to top of pallet 2 prior to inserting into insulated container with forklift.

18. Using forklift (Figure 10, Item 1), place pallet 3 (Figure 10, Item 2) on top of pallet 2 (Figure 10, Item 3).



Figure 10. Stacking Pallets.

19. Secure pallet 2 (Figure 10, Item 3) and pallet 3 (Figure 10, Item 2) together using plastic pallet wrap.

LOADING – CONTINUED**WARNING**

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. MTRCS loading is partially performed with a forklift. The forklift will be used to lift pallets. The pallet jack will be used to position pallets inside container. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

20. Using forklift (Figure 11, Item 1), pick up pallet 2 (Figure 11, Item 2) and pallet 3 (Figure 11, Item 3).



Figure 11. Pallets 2 and 3 Stacked.

LOADING – CONTINUED**NOTE**

When placing the pallets inside of container, make sure that pallet is at least 14 inches inside container to allow space for insertion of the pallet jack.

Place pallets on left or right side of container so they can be turned into position for loading. Be sure to leave room between pallet and wall to allow pallet to be turned.

21. Place pallet 2 (Figure 12, Item 1) and pallet 3 (Figure 12, Item 2) on left side inside insulated container (Figure 12, Item 3).

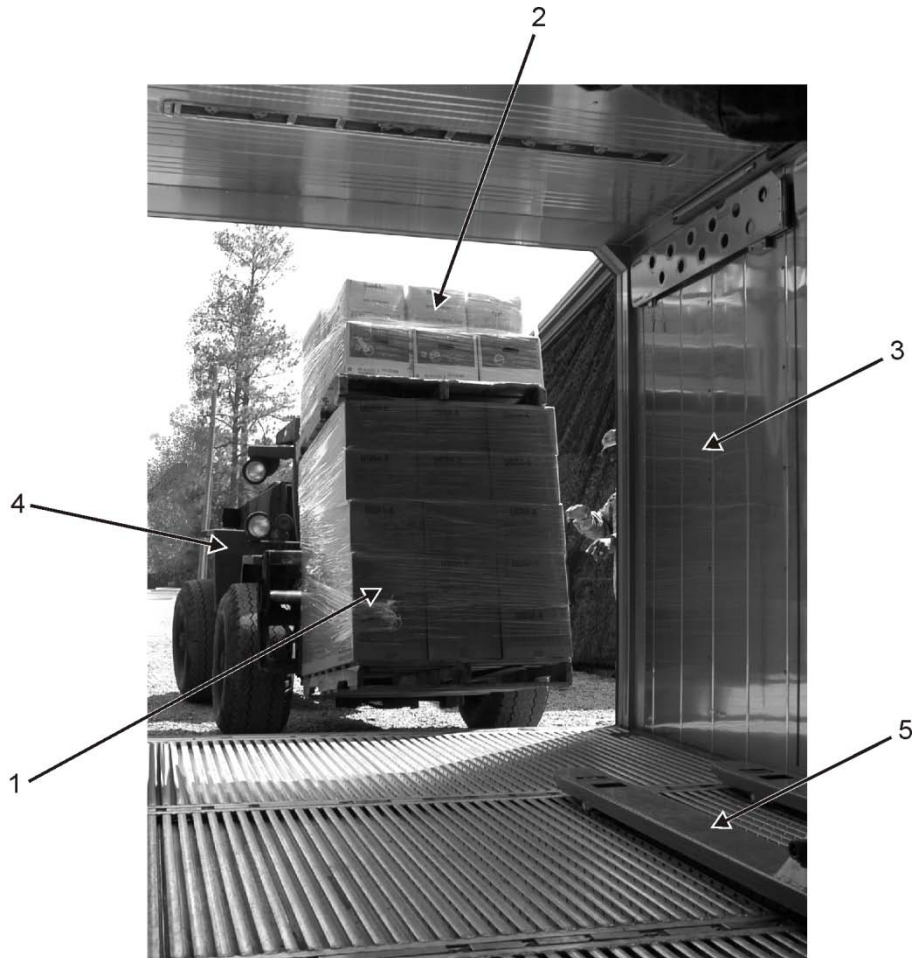


Figure 12. Pallets 2 and 3 Loading.

22. Remove forklift (Figure 12, Item 4) from pallet 2 (Figure 12, Item 1).
23. Place pallet jack fork tines (Figure 12, Item 5) into base of pallet 2 (Figure 12, Item 1).
24. Rotate pallet 2 (Figure 12, Item 1) to left as viewed by pallet jack operator.

LOADING – CONTINUED**NOTE**

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall, and as close to centerline as possible without going over.

25. Push pallet jack (Figure 12, Item 5) back to pallet 2 (Figure 9, Item 2) and pallet 3 (Figure 9, Item 3) loading location (Figure 9, Item 2).
26. Lower pallet 2 (Figure 12, Item 1) onto insulated container floor (Figure 9, Item 5) making sure an air flow gap of approximately three inches exists between pallet and container wall.
27. Remove four row 1 cargo net front oblong rings (Figure 13, Item 1) from ceiling ring boxes (Figure 13, Item 2).

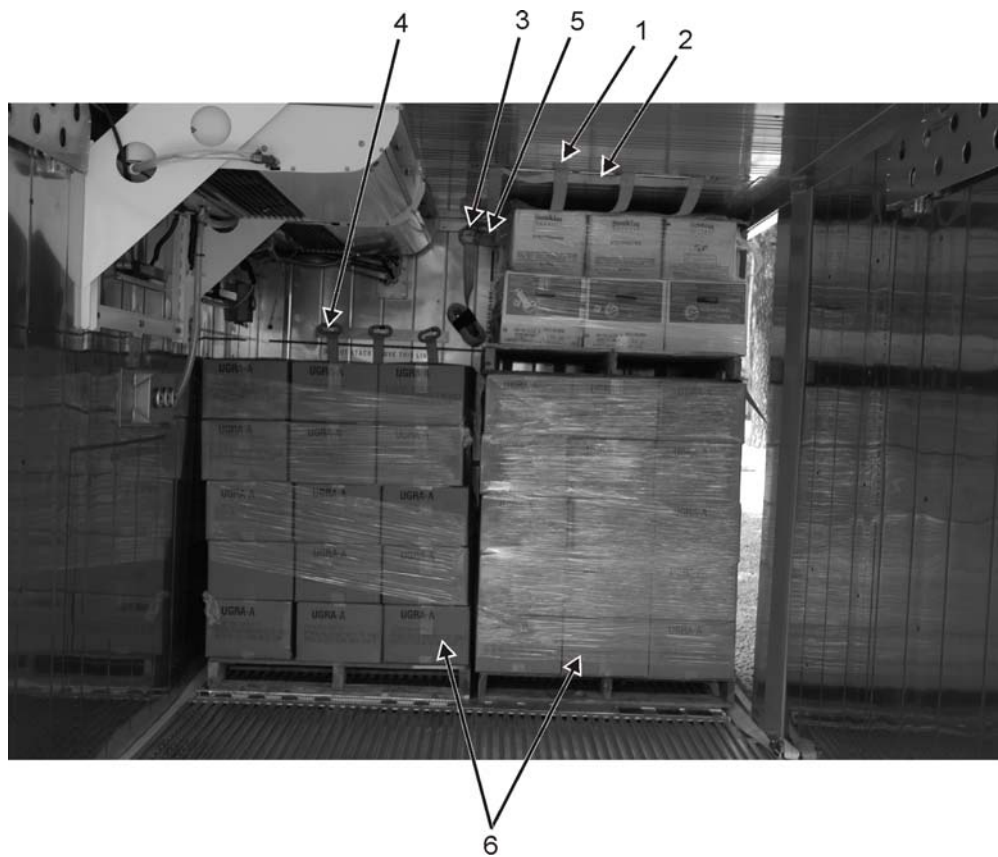
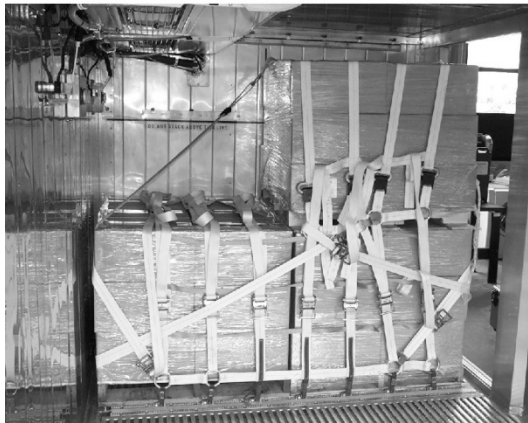
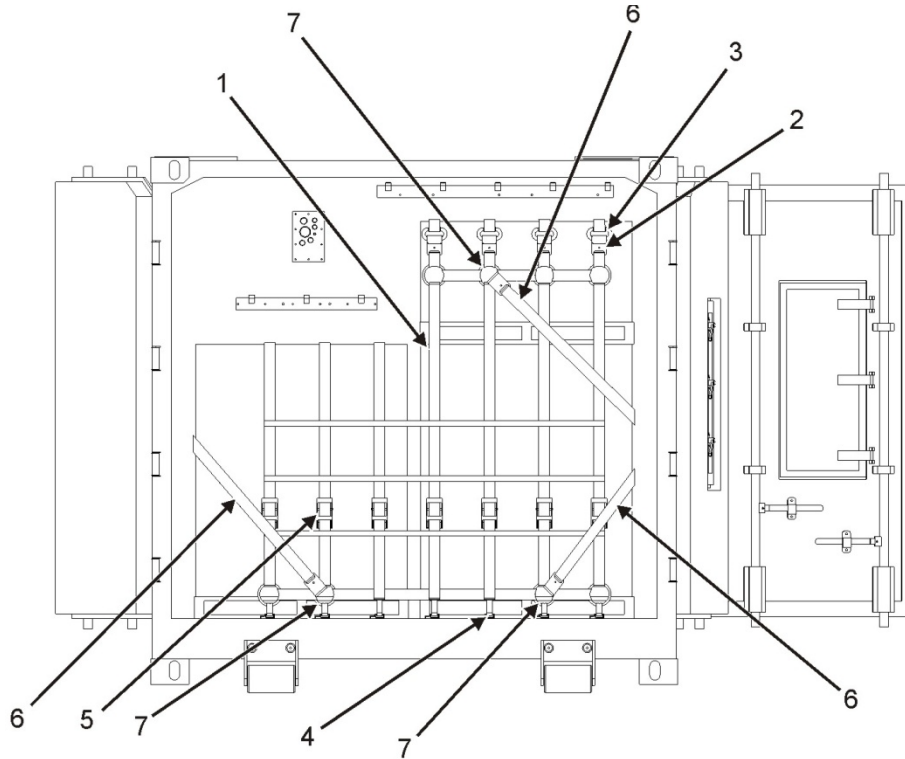


Figure 13. Pallets 1, 2, and 3 Loading Complete.

28. Pull five row 1 cargo net front round rings (Figure 13, Item 3) and three oblong rings (Figure 13, Item 4) from front wall brackets (Figure 13, Item 5) and drape across top of row 1 pallets (Figure 13, Item 6).

LOADING – CONTINUED

29. Carry row 1 cargo net rear (Figure 14, Item 1) portion in and attach hooks (Figure 14, Item 2) to rings (Figure 14, Item 3).



ROW 1 LOADING COMPLETE



ROW 2 LOADING COMPLETE

Figure 14. Row 1 and Row 2 Loading Complete, Looking From Rear.

LOADING – CONTINUED

30. Attach row 1 cargo net rear red strap triple stud fittings (Figure 14, Item 4) to track 2 (Figure 14, Item 8) red hook points.
31. Cinch up net around pallets 1, 2, and 3 using ratchets (Figure 14, Item 5) supplied on row 1 cargo net front.

CAUTION

It is necessary to limit side shifting of pallets as much as possible during transport. Routing the diagonal straps around the sides of the pallets before tightening will help limit the amount of side shifting that takes place during transport operations.

32. Route diagonal straps (Figure 14, Item 6) around sides of row 1 pallets.
33. Anchor diagonal straps (Figure 14, Item 6) to row 1 cargo net front round rings (Figure 14, Item 7) and tighten.

Install Interior Bulkhead.

Install left and right side interior bulkhead (WP 0024, Install).

LOADING – CONTINUED**Load Row 2, Pallets 4, 5, and 6**

1. Position row 2 yellow/orange cargo net assembly (Figure 15, Item 2) near interior bulkhead (Figure 15, Item 1).

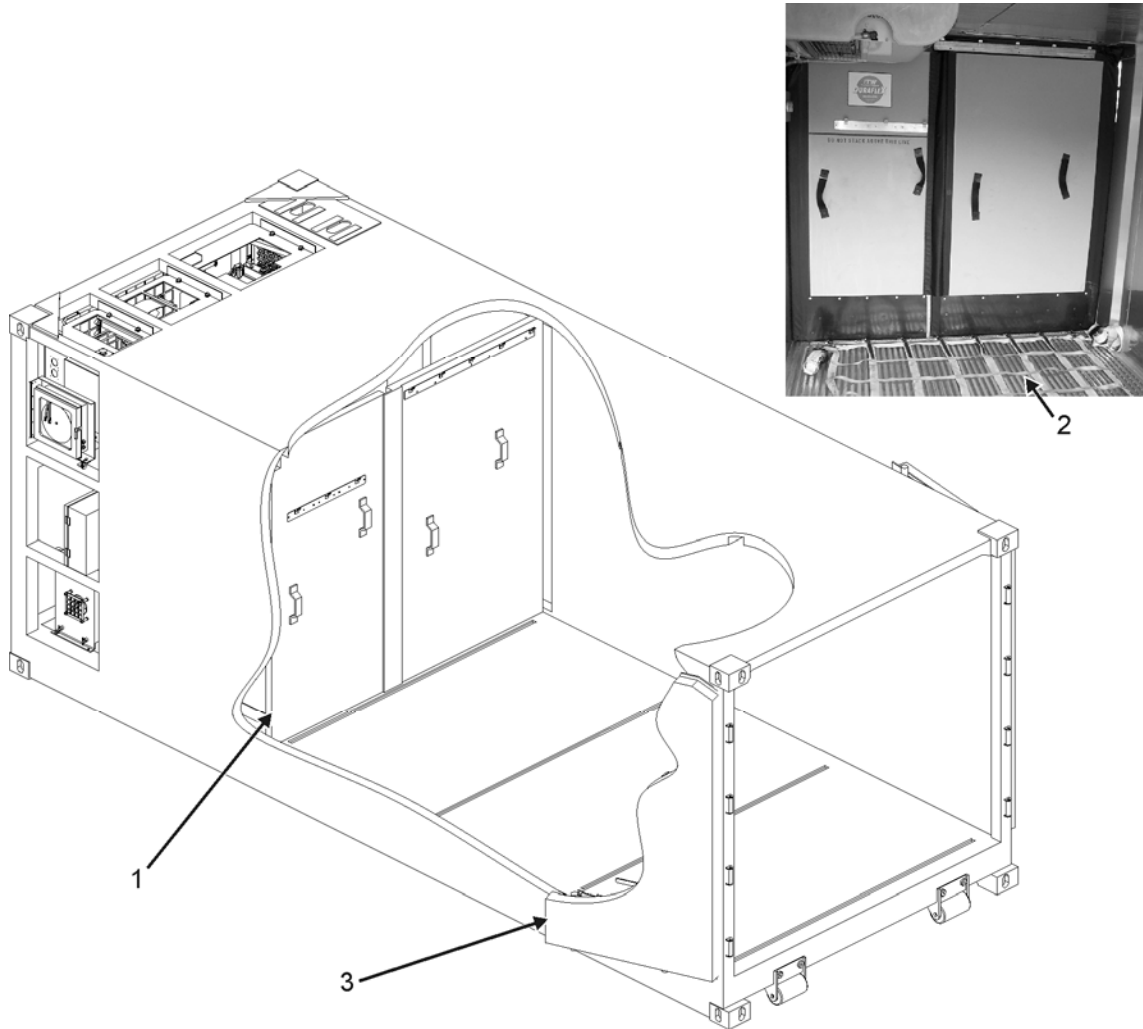


Figure 15. Interior Bulkhead Installed.

2. Unroll row 2 cargo net assembly (Figure 15, Item 2) toward MTRCS rear doors (Figure 15, Item 3) until completely unrolled.
3. Separate row 2 cargo net front (Figure 5, Item 1) and move aside to provide clear path for pallet jack entrance into container.

LOADING – CONTINUED

4. Attach row 2 cargo net front blue strap triple stud fittings (Figure 16, Item 1) to track 3 blue hook points on floor (Figure 16, Item 2).

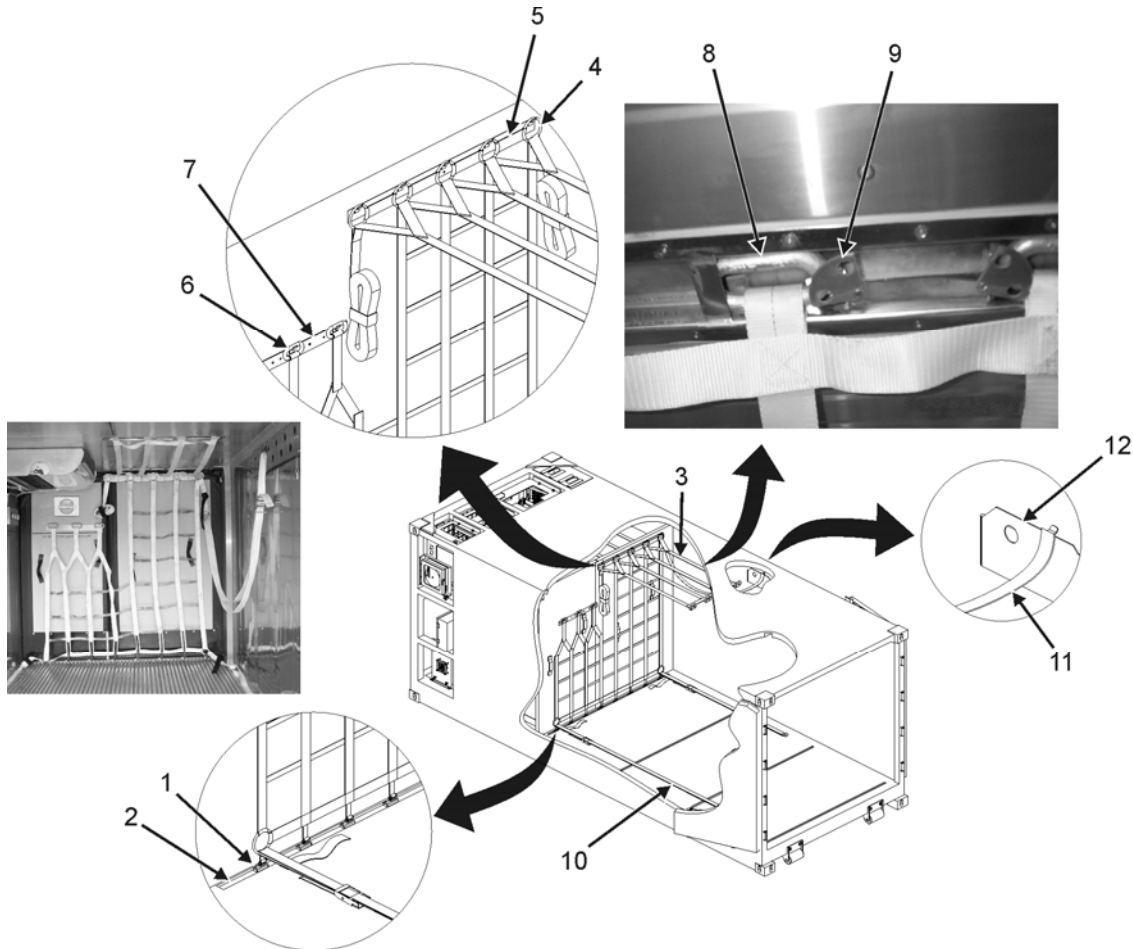


Figure 16. Row 2 Cargo Net Rear Installed.

NOTE

It may be necessary to obtain additional slack in order to attach each of the blue fittings into the blue track areas on the container floor. If additional slack is required, adjust ratchets as required to obtain the needed slack.

5. Rotate row 2 cargo net front (Figure 16, Item 3) upward and install five upper round rings (Figure 16, Item 4) onto interior bulkhead keepers (Figure 16, Item 5).
6. Rotate left hand part of row 2 cargo net front (Figure 16, Item 3) upward and retain three oblong rings (Figure 16, Item 6) with hooks (Figure 16, Item 7) provided on interior bulkhead (Figure 15, Item 1).
7. Rotate upper portion of row 2 cargo net front (Figure 16, Item 3) upward and retain four oblong rings (Figure 16, Item 8) onto ceiling using ring boxes (Figure 16, Item 9).
8. Lay lower diagonal straps (Figure 16, Item 10) along floor against walls and away from path of pallet jack.

LOADING – CONTINUED**NOTE**

Do not unroll upper left diagonal strap at this time. Leave the upper left diagonal strap rolled up and secured by the hook and pile fastener for later use.

9. Clip upper right diagonal strap (Figure 16, Item 11) to swing-out panel (Figure 16, Item 12) making sure it is not twisted.

WARNING

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

CAUTION

Do not stack pallets above red lines on the walls, or on the interior bulkheads. Do not pinch straps with pallets. Make sure diagonal cargo net straps laying on floor of container are clear of pallet.

10. Using forklift (Figure 17, Item 1), pick up pallet 4 (Figure 17, Item 2).

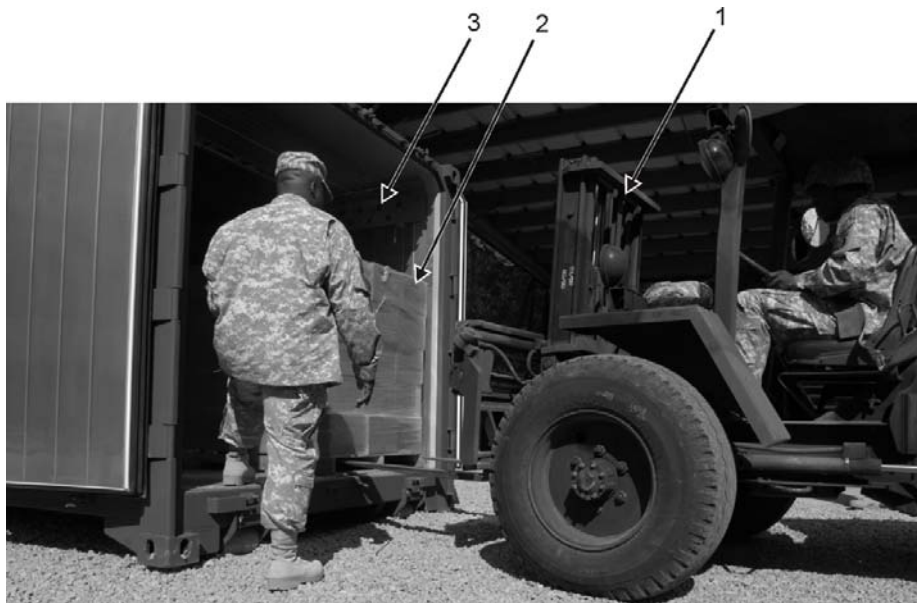


Figure 17. Pallet 4 Loading.

LOADING – CONTINUED**NOTE**

When placing the pallet inside of container, make sure that pallet is at least 14 inches inside container to allow space for insertion of the pallet jack.

Place pallets on left or right side of container so they can be turned into position for loading. Be sure to leave room between pallet and wall to allow pallet to be turned.

11. Place pallet 4 (Figure 17, Item 2) on right side inside insulated container (Figure 17, Item 3).
12. Remove forklift (Figure 17, Item 1) from pallet 4 (Figure 17, Item 2).
13. Place pallet jack forks (Figure 18, Item 1) into base of pallet 4 (Figure 18, Item 2).



Figure 18. Pallet 4 Lift and Place.

14. Rotate pallet to left as viewed by pallet jack operator.

NOTE

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall, and as close to centerline on floor as possible, without going over centerline. Keep pallets off of floor tracks to make sure nets can be attached.

15. Push pallet jack back to pallet 4 loading location (Figure 1).
16. Lower pallet 4 onto insulated container floor (Figure 18, Item 3) making sure an air flow gap of approximately three inches exists between pallet and container wall.

LOADING – CONTINUED

17. Using forklift (Figure 19, Item 1), place pallet 6 (Figure 19, Item 2) on top of pallet 5 (Figure 19, Item 3).

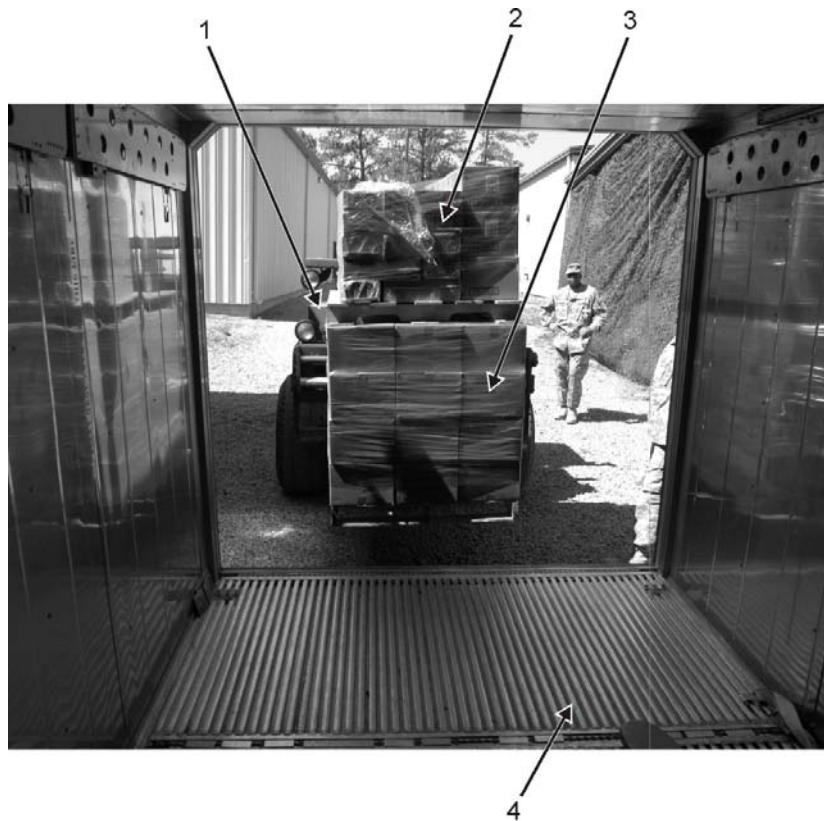


Figure 19. Pallets 5 and 6 Loading.

18. Secure pallets 5 and 6 together using plastic pallet wrap.

WARNING

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

19. Using forklift (Figure 19, Item 1), pick up pallet 5 (Figure 19, Item 2) and pallet 6 (Figure 19, Item 3).

LOADING – CONTINUED**NOTE**

When placing the pallets inside of container, make sure that pallet is at least 14 inches inside container to allow space for insertion of the pallet jack.

Place pallets on left or right side of container so they can be turned into position for loading. Be sure to leave room between pallet and wall to allow pallet to be turned.

20. Place pallet 5 (Figure 19, Item 2) and pallet 6 (Figure 19, Item 3) on left side inside insulated container (Figure 19, Item 4).
21. Remove forklift (Figure 19, Item 1) from pallet 5 (Figure 19, Item 2).
22. Place pallet jack fork tines (Figure 20, Item 1) into base of pallet 5 (Figure 20, Item 2).



Figure 20. Pallets 5 and 6 Lift and Place.

23. Rotate pallet 5 to left as viewed by pallet jack operator.

NOTE

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall, and as close to centerline as possible without going over.

24. Push pallet jack back to pallet 5 and pallet 6 loading location (Figure 1).

LOADING – CONTINUED

25. Lower pallet 5 (Figure 20, Item 2) onto insulated container floor (Figure 20, Item 3) making sure an air flow gap of approximately three inches exists between pallet and container wall.
26. Remove four row 2 cargo net front oblong rings (Figure 16, Item 7) from ceiling ring boxes (Figure 16, Item 8).
27. Pull four row 2 cargo net front round rings (Figure 16, Item 3) and three oblong rings (Figure 16, Item 5) from partition wall brackets (Figure 16, Item 4 and Item 6) and drape across top of row 2 pallets (Figure 1).
28. Carry row 2 cargo net rear (Figure 14, Item 1) portion in and attach hooks (Figure 14, Item 2) to oblong rings (Figure 14, Item 3).
29. Attach row 2 cargo net rear red strap triple stud fittings (Figure 14, Item 4) to track 4 (Figure 1) red hook points.
30. Cinch up net around pallets 4, 5, and 6 using ratchets (Figure 14, Item 5) supplied on row 2 cargo net front (Figure 5, Item 1).

CAUTION

It is necessary to limit side shifting of pallets as much as possible during transport. Routing the diagonal straps around the sides of the pallets before tightening will help limit the amount of side shifting that takes place during transport operations.

31. Route four row 2 cargo net front diagonal straps (Figure 14, Item 6) around sides of pallets.
32. Anchor four diagonal straps (Figure 14, Item 6) to row 2 cargo net front round rings (Figure 14, Item 7) and tighten.

Load Row 3, Pallets 7, 8, 9, and 10**CAUTION**

Use care not to damage lighting above the stowed swing out panels when releasing them from the stowed position.

NOTE

Before attaching the swing-out panels together, make sure the swing-out panels are as close to row 2 pallets as possible.

1. Release left and right forward swing-out panels (Figure 21, Item 1 and Item 2), swing out towards each other, and pin them to each other using two pins (Figure 21, Item 3) and two clips (Figure 21, Item 4).
2. Push swing-out net panels (Figure 21, Item 1 and Item 2) against row 2 pallets.

LOADING – CONTINUED

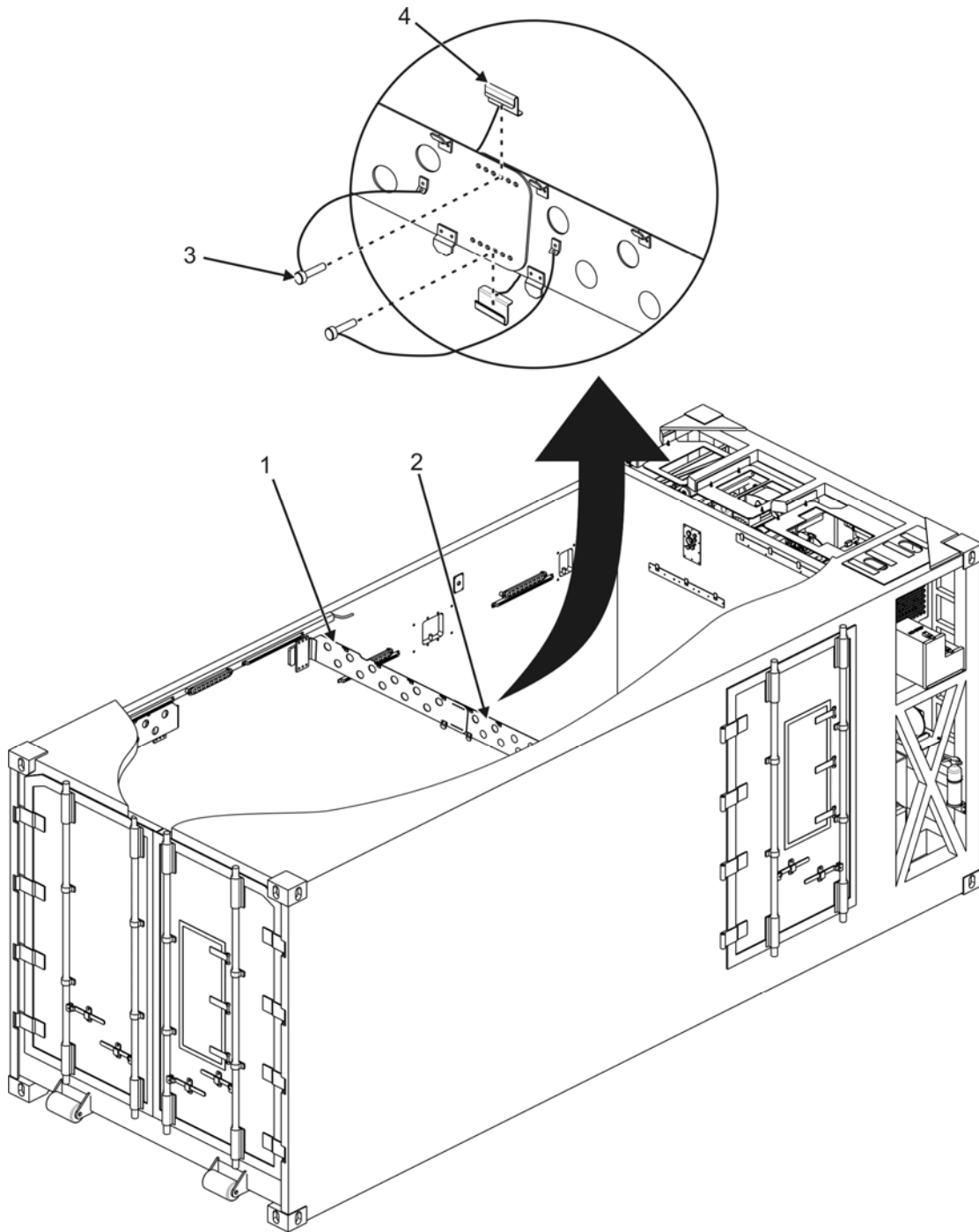


Figure 21. Swing-Out Panels.

LOADING – CONTINUED

- Position row 3 yellow/green cargo net assembly (Figure 22) just rear of previously loaded row 2 pallets.

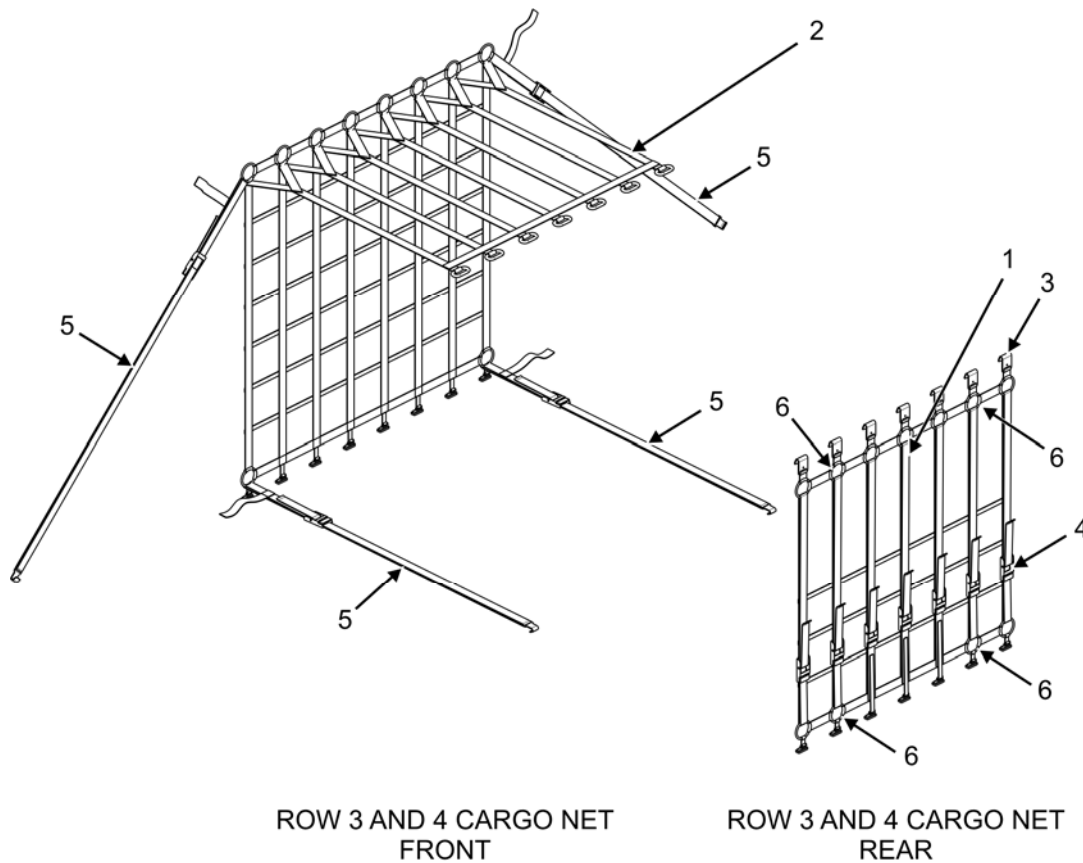


Figure 22. Row 3 and Row 4 Cargo Net Assemblies.

- Unroll row 3 cargo net assembly (Figure 22, Item 1 and Item 2) toward MTRCS rear doors (Figure 15, Item 3) until completely unrolled.
- Separate row 3 cargo net rear (Figure 22, Item 1) and move aside to provide a clear path for pallet jack.

NOTE

The fittings holding row 3 cargo net front will be installed in the same track as row 2 cargo net rear.

- Secure row 3 cargo net front (Figure 22, Item 2) to floor by hooking blue strap triple stud fittings (Figure 23, Item 1) into track 4 (Figure 23, Item 2) blue hook points in floor.

LOADING – CONTINUED

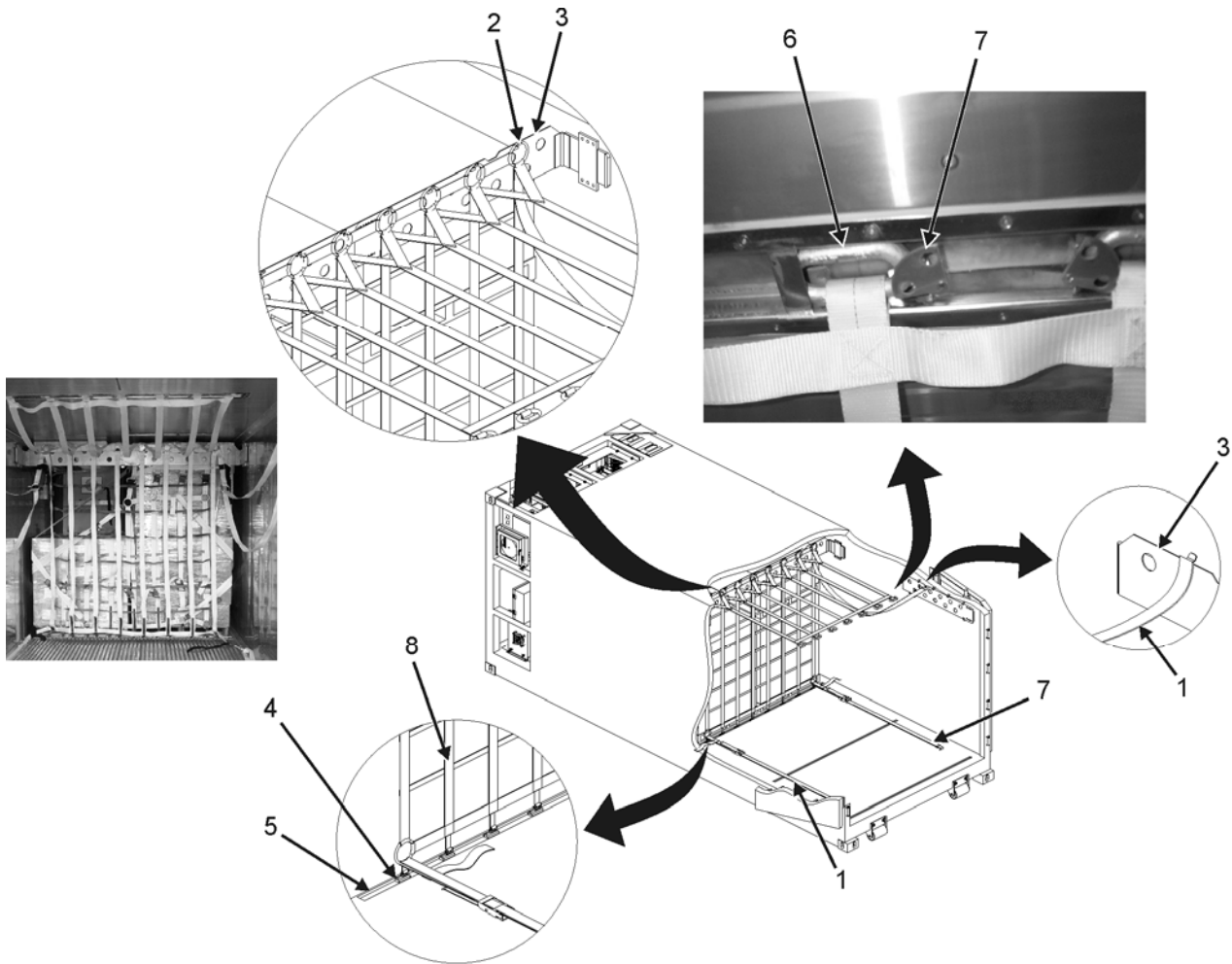


Figure 23. Row 3 Cargo Net Rear.

7. Rotate row 3 cargo net front (Figure 22, Item 2) upward and install eight round rings (Figure 23, Item 3) onto swing-out panel keepers (Figure 23, Item 4).
8. Rotate upper portion of row 3 cargo net front (Figure 22, Item 2) upward and retain four oblong rings (Figure 23, Item 5) to ceiling using rings boxes (Figure 23, Item 6).
9. Lay lower diagonal straps (Figure 23, Item 7) along floor and away from path of pallet jack.
10. Clip upper diagonal straps (Figure 23, Item 8) to row 4 swing-out panels (Figure 23, Item 9).

LOADING – CONTINUED**WARNING**

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

11. Using forklift (Figure 24, Item 1), place pallet 8 (Figure 24, Item 2) on top of pallet 7 (Figure 24, Item 3).

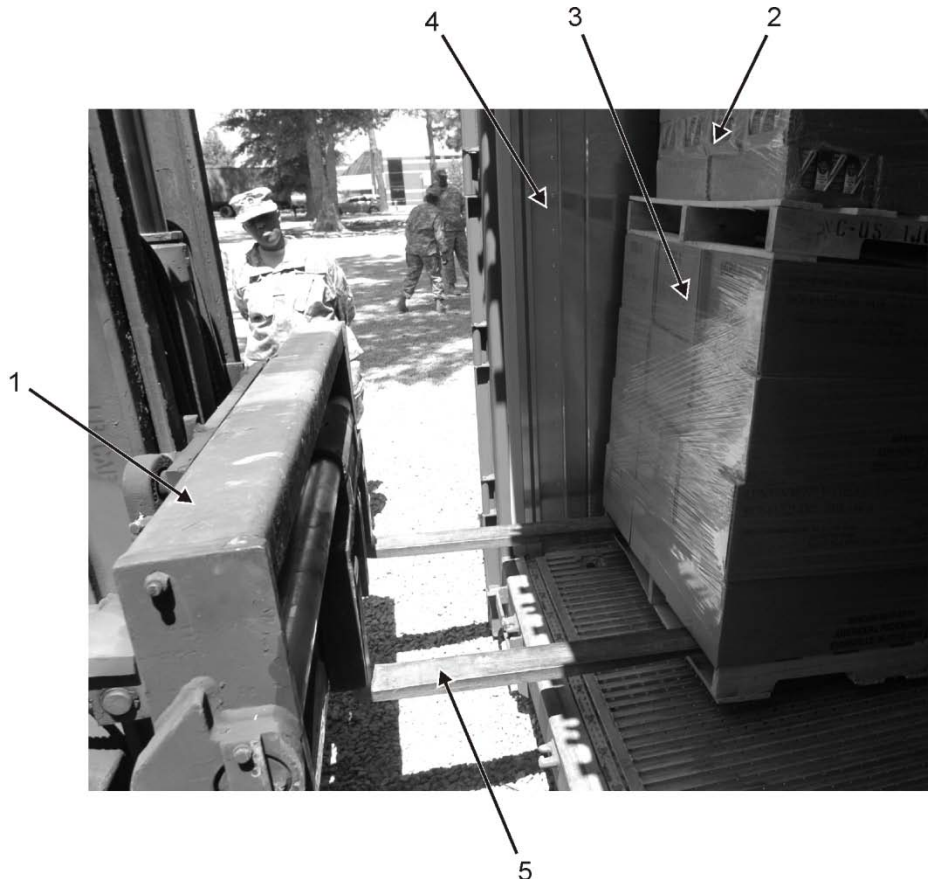


Figure 24. Pallets 7 and 8 Loading.

LOADING – CONTINUED

12. Secure pallets 7 and pallet 8 together using plastic pallet wrap.
13. Place pallet 7 and pallet 8 on left side inside insulated container (Figure 24, Item 4).
14. Back forklift about 3/4 out of pallet 7 (Figure 24, Item 1).
15. Lift pallet 7 (Figure 24, Item 3) enough to be able to push pallet forward.
16. Push pallet 7 (Figure 24, Item 3) as far forward as possible.
17. Remove forklift tines (Figure 24, Item 5) from pallet 7 (Figure 24, Item 3).

NOTE

Pallet jack should be able to be inserted into pallet without having to rotate pallet to store in correct position.

Pallet 7 is far enough forward when pallet jack can be inserted on side of pallet allowing user to push pallet back into position without turning pallet around.

18. Insert pallet jack fork tines (Figure 25, Item 1) in pallet 7 (Figure 25, Item 2). If pallet jack cannot be inserted on side of pallet, repeat steps 14-16 until pallet jack can be inserted; then continue.

NOTE

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall and as close to centerline as possible without going over.



Figure 25. Pallets 7 and 8 Lift and Place.

LOADING – CONTINUED

19. Push pallet jack (Figure 25, Item 1) back to pallet 7 and pallet 8 (Figure 25, Item 2) loading location (Figure 1).
20. Lower pallet 7 (Figure 25, Item 2) onto insulated container floor (Figure 25, Item 3) making sure an air flow gap of approximately three inches exists between pallet and container wall.

WARNING

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

21. Using forklift (Figure 26, Item 1), place pallet 10 (Figure 26, Item 2) on top of pallet 9 (Figure 26, Item 3).

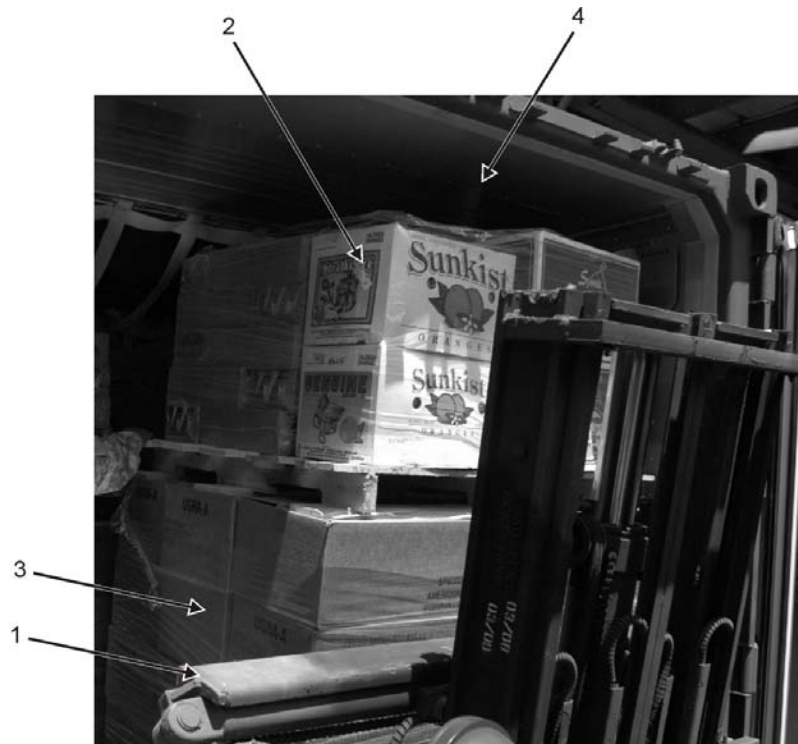


Figure 26. Pallets 9 and 10 Loading.

22. Secure pallets 9 and pallet 10 together using plastic pallet wrap.

LOADING – CONTINUED

23. Place pallet 9 and pallet 10 on right side inside insulated container (Figure 26, Item 4).
24. Back forklift about 3/4 out of pallet 9 (Figure 26, Item 3).
25. Lift pallet 9 (Figure 26, Item 3) enough to be able to push pallet forward.
26. Push pallet 9 (Figure 26, Item 3) as far forward as possible.
27. Remove forklift tines from pallet 9 (Figure 26, Item 3).

NOTE

Pallet jack should be able to be inserted into pallet without having to rotate pallet to store in correct position.

Pallet 9 is far enough forward when pallet jack can be inserted on side of pallet allowing user to push pallet back into position without turning pallet around.

28. Insert pallet jack fork tines (Figure 27, Item 1) in pallet 9 (Figure 27, Item 2). If pallet jack cannot be inserted on side of pallet, repeat steps 24-26 until pallet jack can be inserted, then continue.



Figure 27. Pallets 9 and 10 Lift and Place.

LOADING – CONTINUED**NOTE**

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall, and as close to centerline as possible without going over.

29. Push pallet jack (Figure 27, Item 1) back to pallet 9 and pallet 10 loading location (Figure 1).
30. Remove pallet jack from insulated container.
31. Lower pallet 9 (Figure 27, Item 2) onto insulated container floor (Figure 27, Item 3) making sure an air flow gap of approximately three inches exists between pallet and container wall.
32. Detach row 3 cargo net front round rings (Figure 23, Item 3) from swing-out panel keepers (Figure 23, Item 4).
33. Detach row 3 cargo net front oblong rings (Figure 23, Item 5) from ceiling ring boxes (Figure 23, Item 6).
34. Carry row 3 cargo net rear (Figure 22, Item 1) portion in and attach hooks (Figure 22, Item 3) on row 3 cargo net rear (Figure 22, Item 1) to oblong rings (Figure 23, Item 5) on row 3 cargo net front (Figure 22, Item 2).
35. Attach row 3 cargo net rear red strap triple stud fittings (Figure 22, Item 1) to track 5 (Figure 1) red hook points.
36. Cinch up net around pallets 7, 8, 9, and 10 using ratchets (Figure 22, Item 6) supplied on row 3 cargo net rear (Figure 22, Item 1).
37. Anchor side lower and upper diagonal straps (Figure 22, Item 5) to row 3 cargo net rear round rings (Figure 22, Item 1) at base and tighten.

NOTE

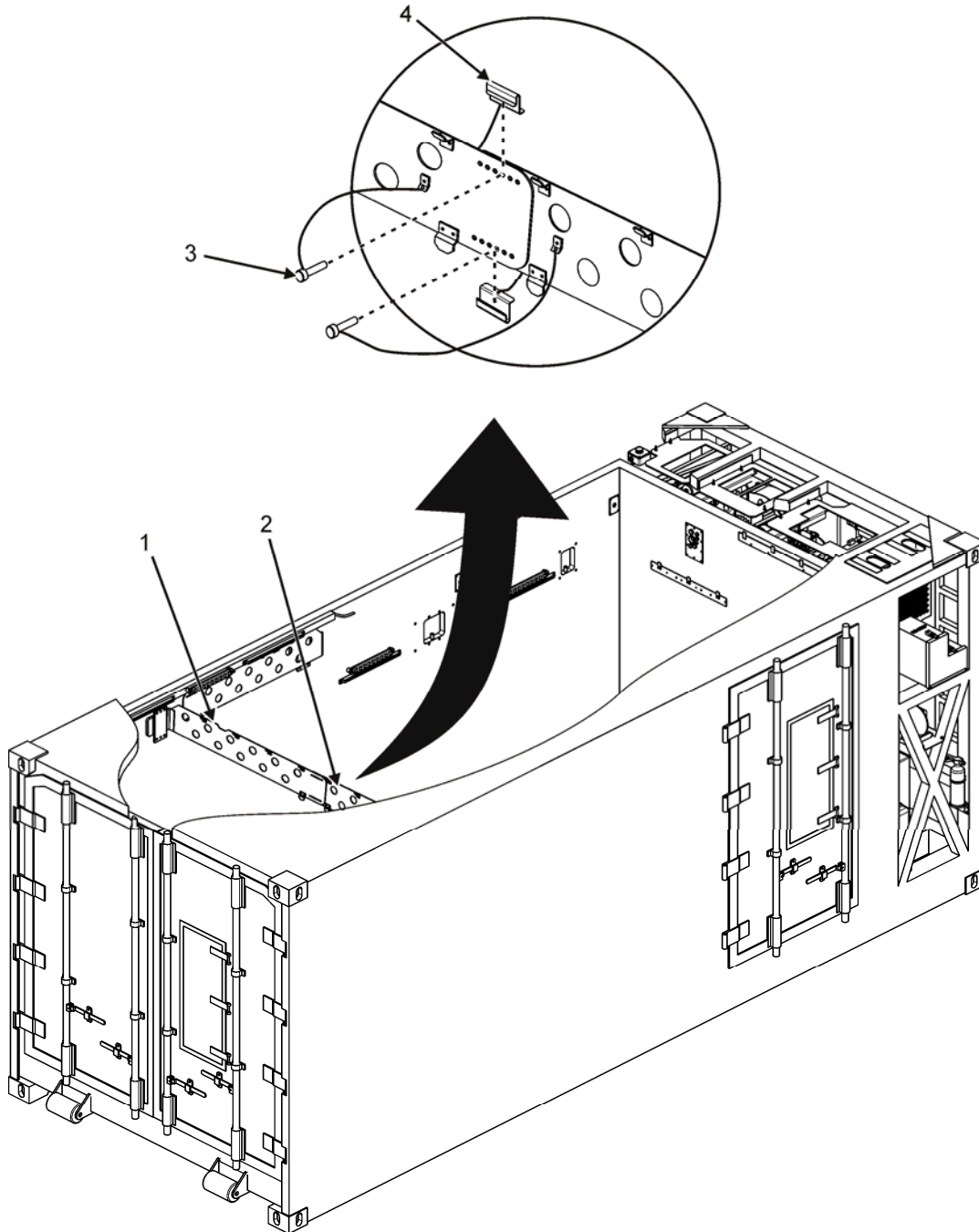
Figure 28 shows row 3 loaded and secured.



Figure 28. Row 3 Loaded.

LOADING – CONTINUED**Load Row 4, Pallets 11, 12, 13, and 14**

1. Release left and right rear swing-out panels (Figure 29, Item 1 and Item 2), swing out towards each other, and pin them to each other with two pins (Figure 29, Item 3) and two clips (Figure 29, Item 4).

**Figure 29. Row 4 Swing-Out Panels.**

2. Push swing-out panels (Figure 29, Item 1 and Item 2) against row 3 pallets.

LOADING – CONTINUED

3. Position row 4 yellow/green cargo net assembly (Figure 22) just rear of previously loaded row 3 pallets.
4. Unroll row 4 cargo net assembly (Figure 22) outside MTRCS rear doors (Figure 15, Item 2) until completely unrolled.
5. Separate row 4 cargo net rear (Figure 22, Item 1) and move aside to provide a clear path for pallet.
6. Secure row 4 cargo net front blue strap triple stud fittings (Figure 22, Item 2) to floor by hooking fittings (Figure 30, Item 1) to track 5 (Figure 30, Item 2) blue hook points.

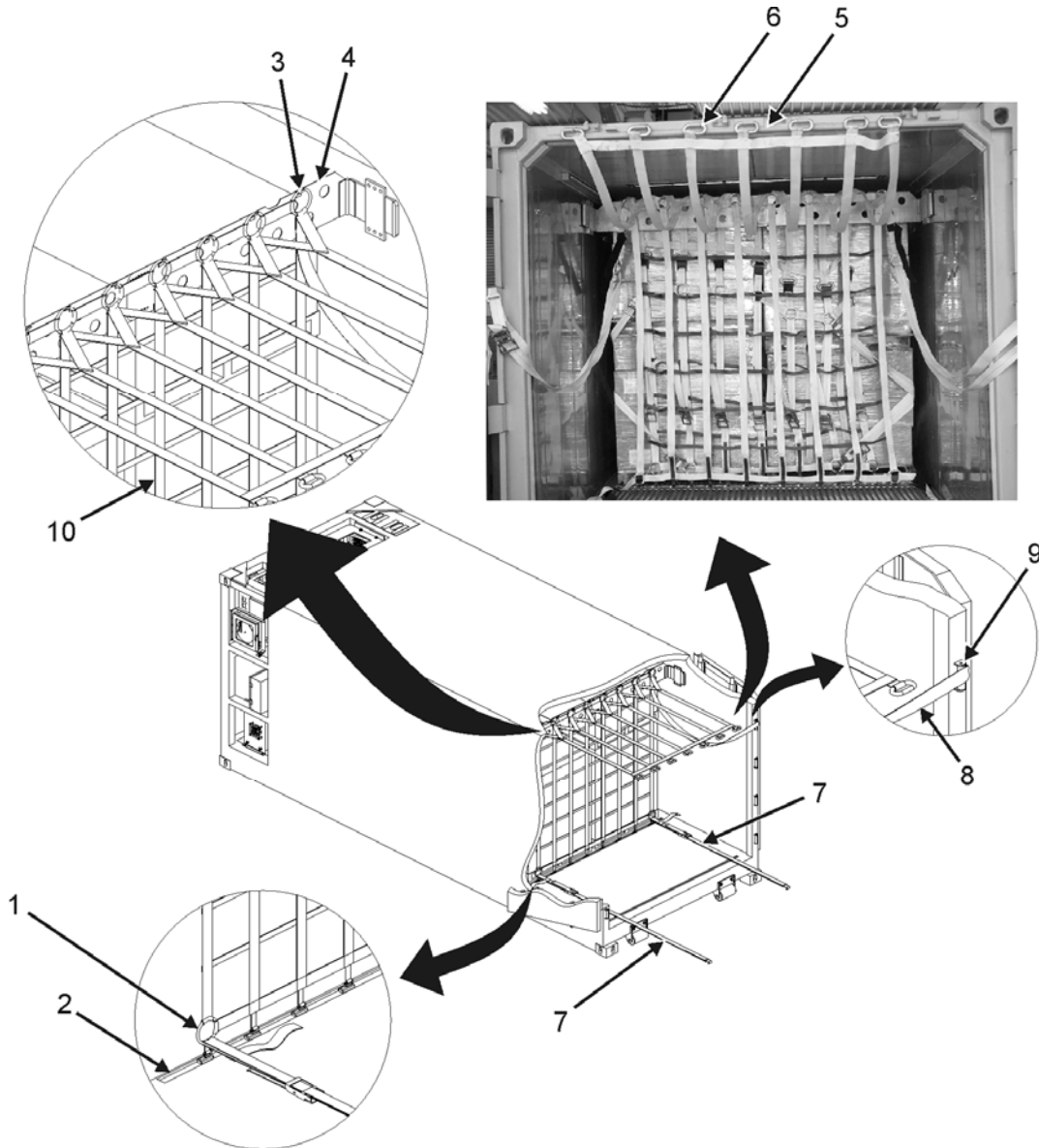


Figure 30. Row 4 Cargo Net Rear.

LOADING – CONTINUED

7. Rotate row 4 cargo net front (Figure 22, Item 2) upward and install eight upper round rings (Figure 30, Item 3) onto swing-out panels (Figure 30, Item 4).
8. Rotate upper portion of row 4 cargo net front (Figure 22, Item 2) upward and retain seven oblong rings (Figure 30, Item 6) to brackets (Figure 30, Item 5) located above rear doors.
9. Lay lower diagonal straps (Figure 30, Item 7) along floor and out rear doors onto ground and away from path of forklift.
10. Clip upper diagonal straps (Figure 30, Item 8) to middle door hinges (Figure 30, Item 9) on rear of MTRCS.

WARNING

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

11. Using forklift (Figure 31, Item 1), place pallet 12 (Figure 31, Item 2) on top of pallet 11 (Figure 31, Item 3).



Figure 31. Pallets 11 and 12 Loading.

LOADING – CONTINUED

12. Secure pallets 11 and pallet 12 together using plastic pallet wrap.
13. Place pallet 11 and pallet 12 on right side inside insulated container (Figure 31, Item 4).
14. Back forklift about 3/4 out of pallet 11.
15. Lift pallet 11 (Figure 31, Item 3) enough to be able to push pallet forward.

NOTE

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall, and as close to centerline as possible without going over.

16. Push pallet 11 and pallet 12 loading location (Figure 1) using forklift.
17. Lower pallet 11 (Figure 31, Item 3) onto insulated container floor (Figure 31, Item 5) making sure an air flow gap of approximately three inches exists between pallet and container wall.
18. Remove forklift tines from pallet 11 (Figure 31, Item 3).

WARNING

MTRCS loading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

19. Using forklift, place pallet 14 on top of pallet 13.
20. Secure pallets 13 and pallet 14 together using plastic pallet wrap.
21. Place pallet 13 and pallet 14 on left side inside insulated container.
22. Back forklift about 3/4 out of pallet 13.
23. Lift pallet 13 enough to be able to push pallet forward.

NOTE

It is very important to make sure that the rear face of the pallet is even with, or slightly forward of, the red line on the container wall, and as close to centerline as possible without going over.

LOADING – CONTINUED

24. Push pallet 13 and pallet 14 loading location (Figure 1) using forklift.
25. Remove forklift tines from pallet 13.
26. Lower pallet 13 onto insulated container floor making sure an air flow gap of approximately three inches exists between pallet and container wall.
27. Detach row 4 cargo net front (Figure 22, Item 2) oblong rings (Figure 22, Item 6) from brackets (Figure 22, Item 5) above rear doors.
28. Carry row 4 cargo net rear (Figure 22, Item 1) portion in and attach hooks (Figure 32, Item 1) on row 4 cargo net rear (Figure 22, Item 1) to row 4 cargo net front (Figure 22, Item 2) oblong rings (Figure 32, Item 2).

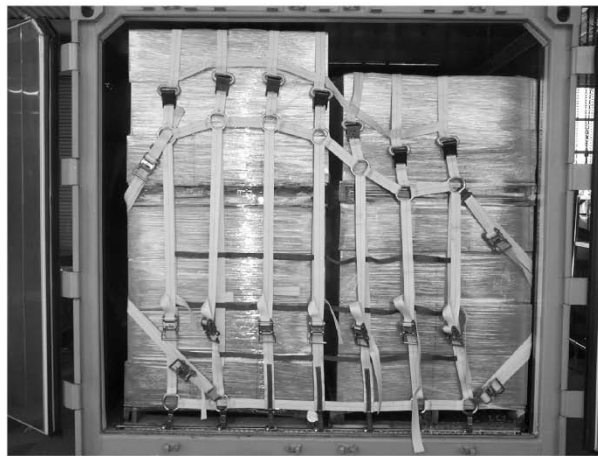
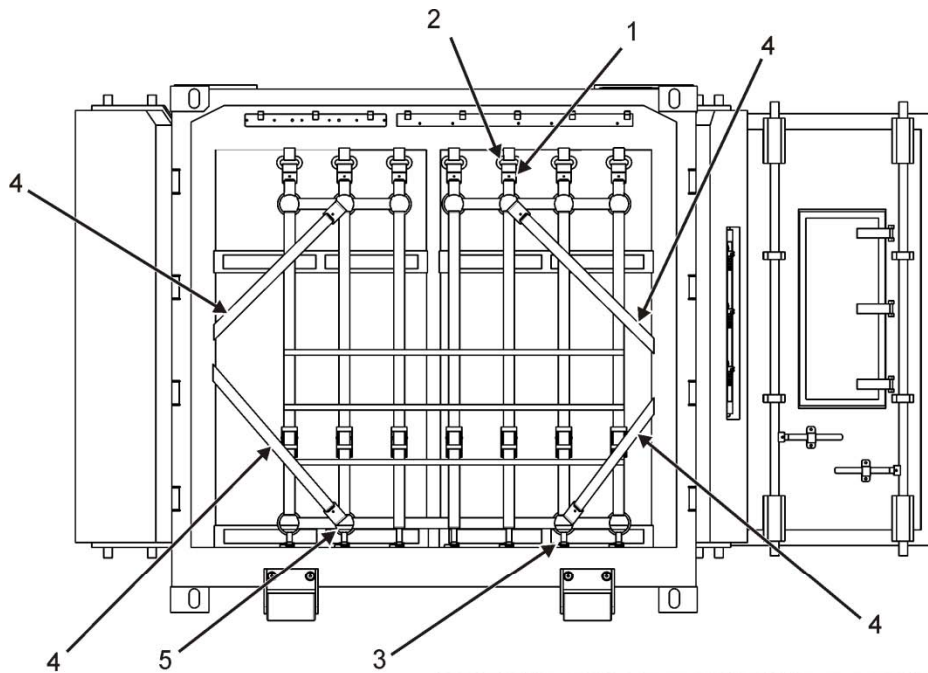


Figure 32. Row 4 Loading Complete.

LOADING – CONTINUED

29. Attach row 4 cargo net front blue strap triple stud fittings (Figure 32, Item 3) to track 6 (Figure 1) blue hook points.
30. Cinch up net around pallets.
31. Anchor row 4 cargo net side lower and upper diagonal straps (Figure 32, Item 4) to row 4 cargo net rear round rings (Figure 32, Item 5) and tighten.

WARNING

The rear doors of the MTRCS are extremely heavy and require two persons to close. Do not attempt to close the rear doors of the MTRCS as serious injury can result.

CAUTION

You will encounter a significant amount of resistance when closing the MTRCS rear doors, as they are stiff and heavy. Do not try to force MTRCS rear doors closed, as damage to equipment or cargo may occur. If you are not able to close the MTRCS rear doors after all cargo has been loaded, it may be necessary to unload and reload portions of the previously loaded cargo in order to obtain the room needed inside the container to close the doors.

32. Close MTRCS rear doors (Figure 2, Item 1 and Item 4).
33. Secure MTRCS rear doors using cam handles (Figure 2, Item 2 and Item 5).
34. Remove four pins (Figure 33, Item 1) securing two round ends (Figure 33, Item 2) of each net storage device (Figure 33, Item 3).
35. Remove round ends (Figure 33, Item 2) and place in storage position (Figure 33, Item 4) on each net storage device (Figure 33, Item 3).
36. Install four pins (Figure 33, Item 1) to secure two round ends (Figure 33, Item 2) to each net storage device (Figure 33, Item 3) in stowed position.
37. Remove pin (Figure 33, Item 5) from bracket (Figure 33, Item 6) on front of MTRCS where net storage devices (Figure 33, Item 3) will be stowed.

NOTE

When installing the net storage devices into the storage position on the front of the MTRCS, make sure that each net storage devices faces the same direction and that each is aligned properly so that bracket can fit between the device holes and into the storage position.

38. Install four net storage devices (Figure 33, Item 3) into storage position (Figure 33, Item 7) on front of MTRCS and secure with bracket (Figure 33, Item 6) and pin (Figure 33, Item 5).

LOADING – CONTINUED

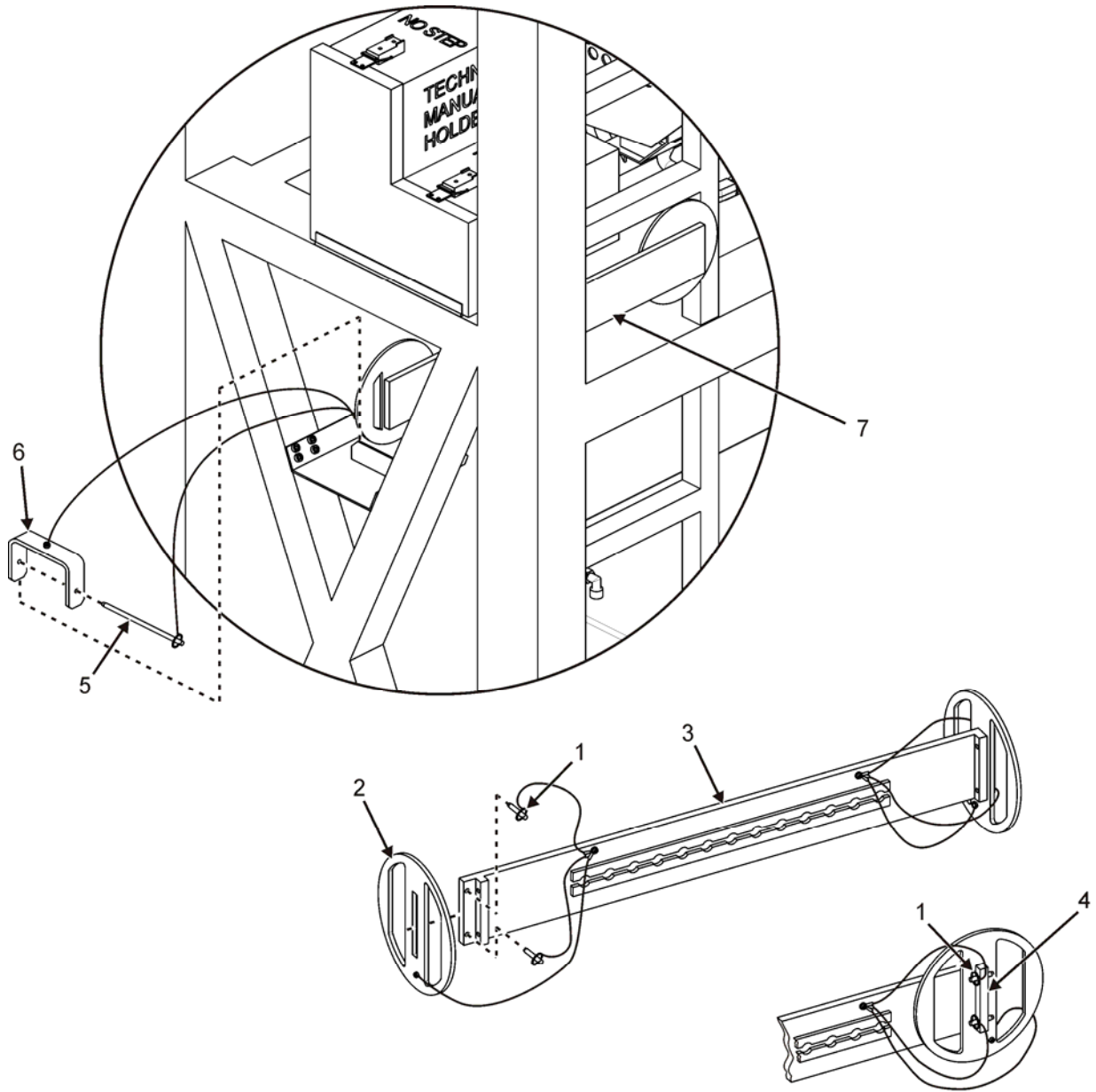


Figure 33. Cargo Net Storage Device.

END OF TASK

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
OPERATION UNDER USUAL CONDITIONS – UNLOADING

INITIAL SETUP:**Tools and Special Tools**

Forklift (WP 0109)
Pallet Mobilizer Lift Truck (WP 0109)

Materials/Parts

Rows 1 and 2 cargo net (orange / yellow straps)
(WP 0108, Item 3)
Rows 3 and 4 cargo net (green / yellow straps)
(WP 0108, Item 4)

Personnel Required

Automated Logistical Specialist (3), or
Food Service Specialist (3), or

References

WP 0024

Equipment Condition

Refrigeration unit running (WP 0005)
MTRCS stationary on flat level surface (WP 0005)
Interior bulkhead removed (WP 0024)

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

UNLOADING**WARNING**

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

1. Open right rear door (Figure 1, Item 1) by pushing cam handles (Figure 1, Item 2) away from each other.
2. Open right door (Figure 1, Item 1) completely and secure to side of container with attached door chain (Figure 1, Item 3).
3. Open left rear door (Figure 1, Item 4) by pushing cam handles (Figure 1, Item 5) away from each other.
4. Open left rear door (Figure 1, Item 4) completely and secure to side of container with attached door chain (Figure 1, Item 6).

UNLOADING – CONTINUED

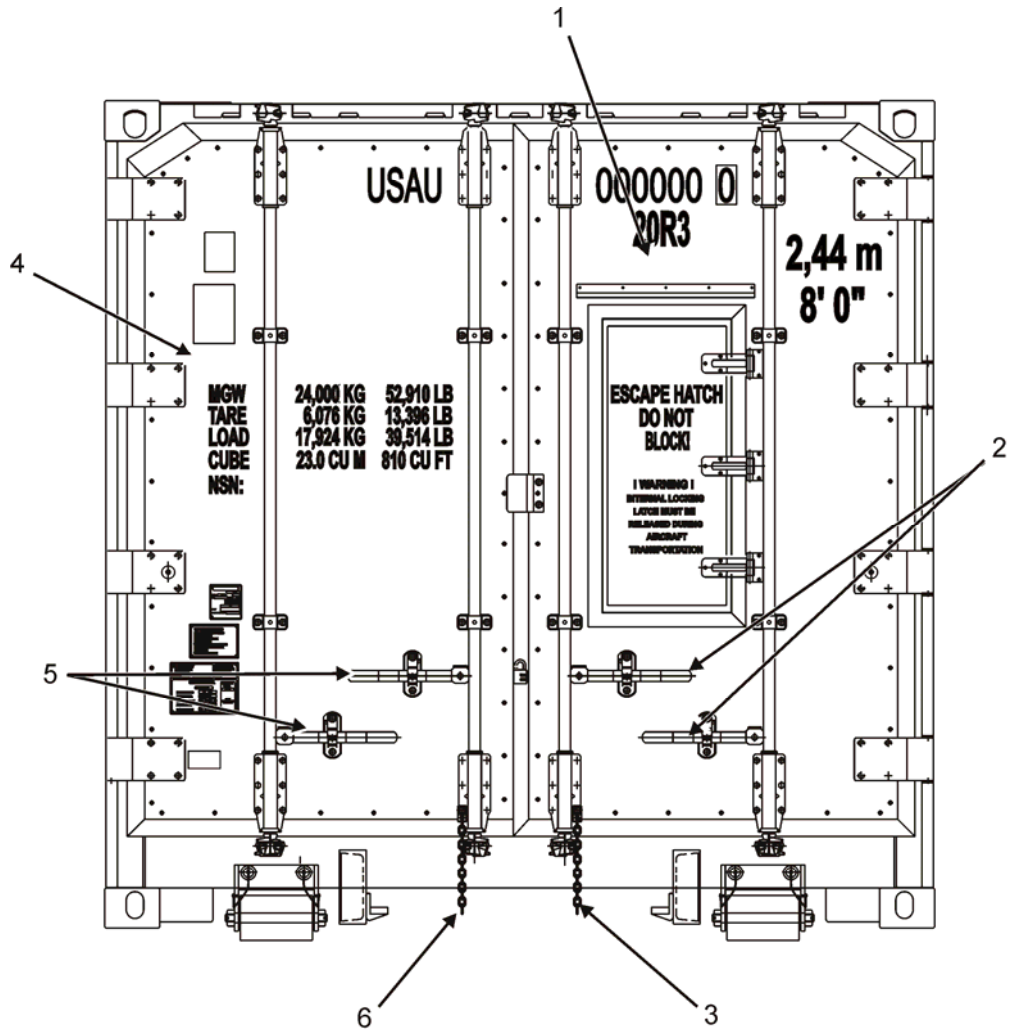


Figure 1. Rear Doors.

UNLOADING – CONTINUED

5. Loosen and disconnect row 4 cargo net side lower and upper diagonal straps (Figure 2, Item 4) from row 4 cargo net front round rings (Figure 2, Item 5).

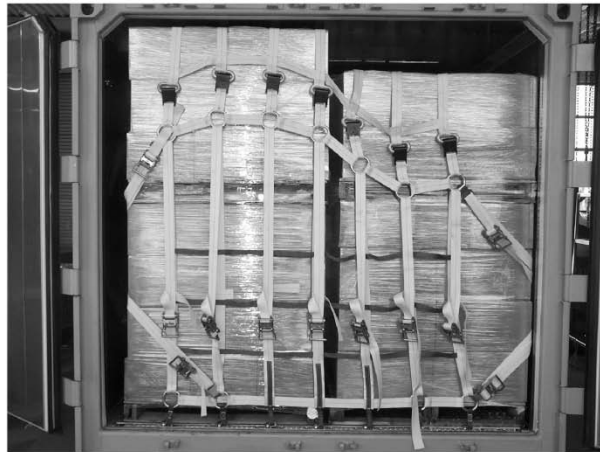
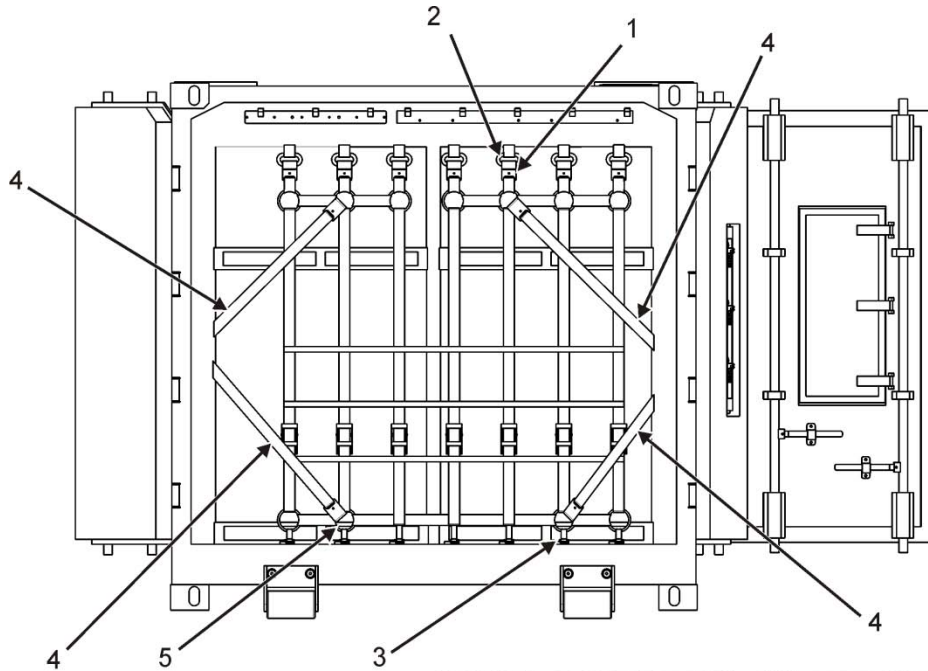


Figure 2. Row 4 Unloading.

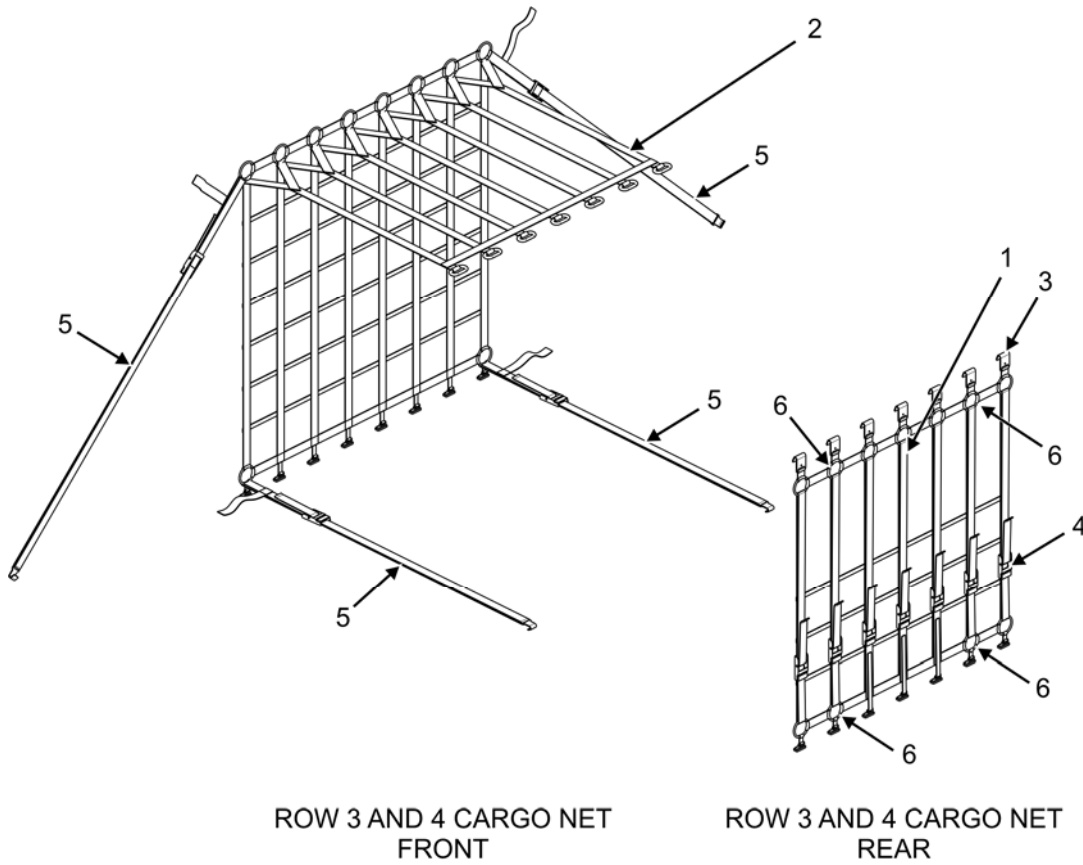
6. Lay lower diagonal straps (Figure 2, Item 4) along floor and outside of container and hook upper diagonal straps (Figure 2, Item 4) to door hinges.

UNLOADING – CONTINUED

NOTE

Loosening cargo net will allow the removal of the hooks from the rings. Only loosen the ratchets enough to remove the hooks.

7. Loosen ratchets (Figure 3, Item 4) on row 4 cargo net rear (Figure 3, Item 1).



ROW 3 AND 4 CARGO NET
FRONT

ROW 3 AND 4 CARGO NET
REAR

Figure 3. Rows 3 and 4 Cargo Net Assemblies.

UNLOADING – CONTINUED

8. Loosen and disconnect row 4 cargo net front blue strap triple stud fittings (Figure 2, Item 3) from track 6 (Figure 4) blue hook points.

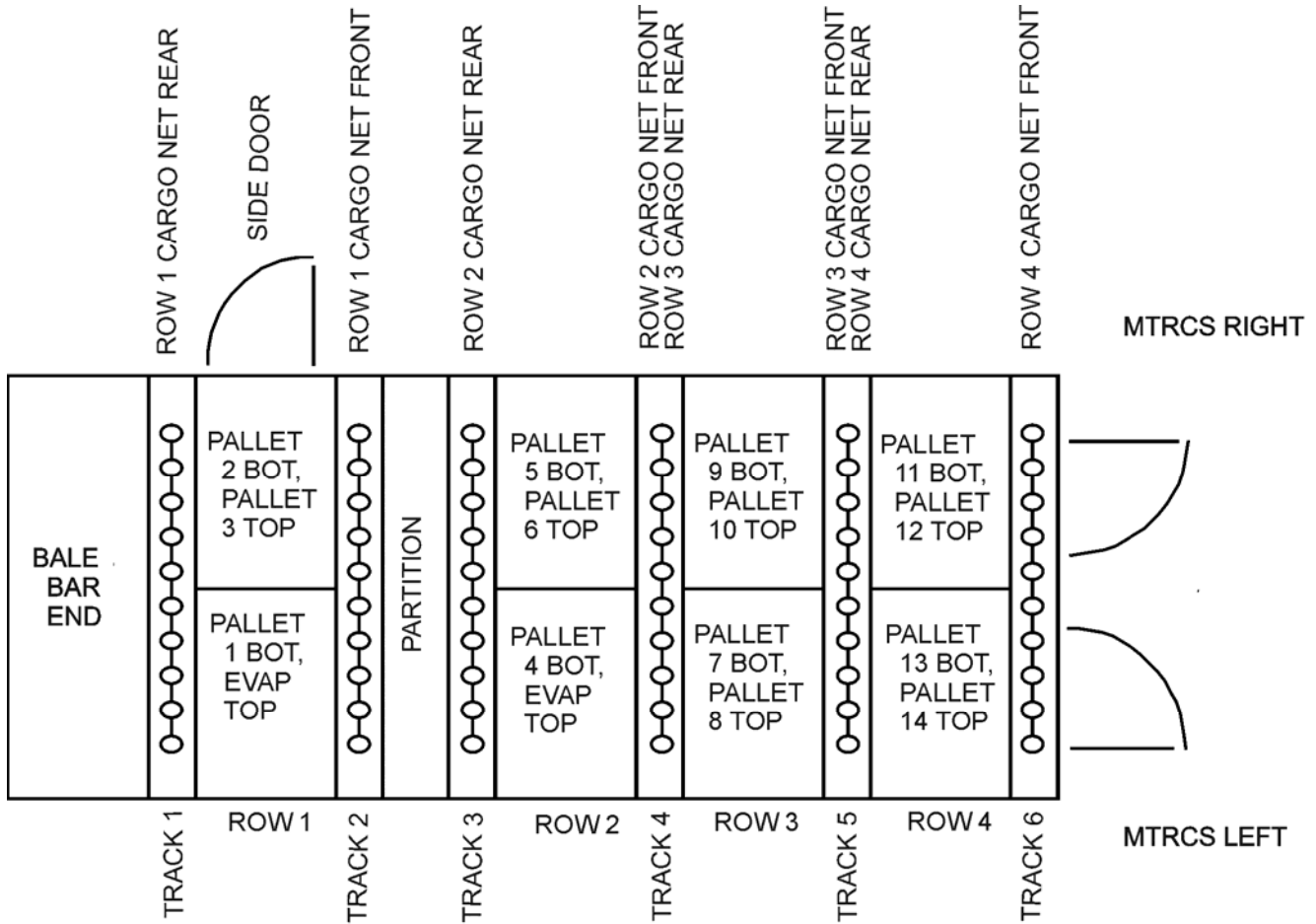


Figure 4. MTRCS Floor Plan Pallet Location.

9. Remove hooks (Figure 2, Item 1) from oblong rings (Figure 2, Item 2) on row 4 cargo net front (Figure 3, Item 2).
10. Carry row 4 cargo net rear (Figure 3, Item 1) portion out of insulated container away from path of forklift.

UNLOADING – CONTINUED

11. Rotate upper portion of row 4 cargo net front (Figure 3, Item 2) upward and retain seven oblong rings (Figure 5, Item 6) to brackets (Figure 5, Item 5) located above rear doors.

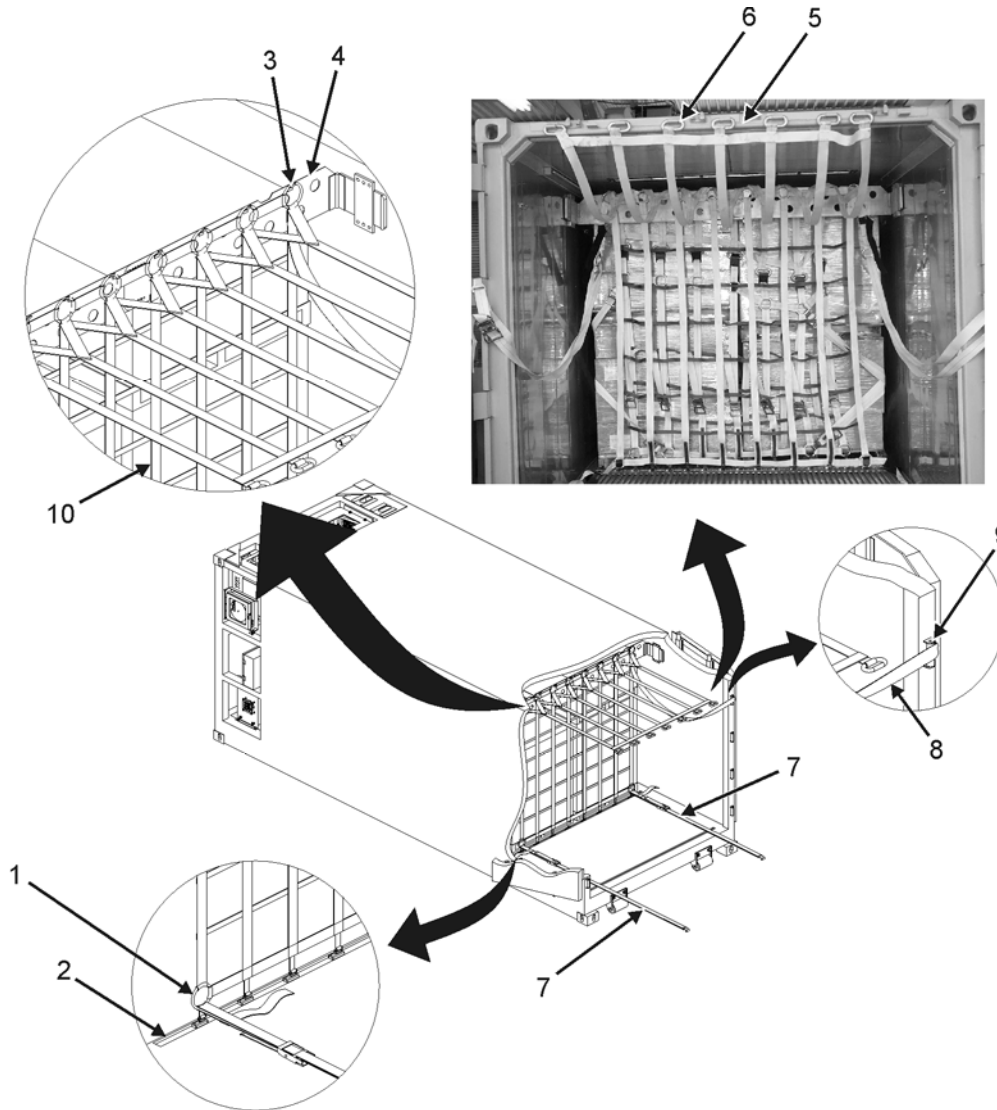


Figure 5. Row 4 Cargo Net Rear.

UNLOADING – CONTINUED**WARNING**

MTRCS unloading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing unloading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

12. Place forklift tines in pallet 13 (Figure 4).
13. Lift and remove pallets 13 and 14 from insulated container.
14. Place forklift tines (Figure 6, Item 1) in pallet 11 (Figure 6, Item 3).
15. Lift and remove pallets 12 and 11 (Figure 6, Item 2 and Item 3) from insulated container (Figure 6, Item 4).
16. Remove seven oblong rings (Figure 5, Item 6) from brackets (Figure 5, Item 5) located above rear doors.
17. Pull row 4 cargo net front (Figure 3, Item 2) towards insulated container door until net is flat.
18. Disconnect row 4 cargo net front blue strap triple stud fittings (Figure 3, Item 2) from blue hook points in floor by removing fittings (Figure 5, Item 1) from track 5 (Figure 5, Item 2).
19. Retrieve net storage devices from storage position on front of MTRCS.

UNLOADING – CONTINUED



Figure 6. Pallets 11 and 12 Unloading.

20. Lay cargo nets (Figure 7, Item 1) out flat on ground with ratchets facing up.

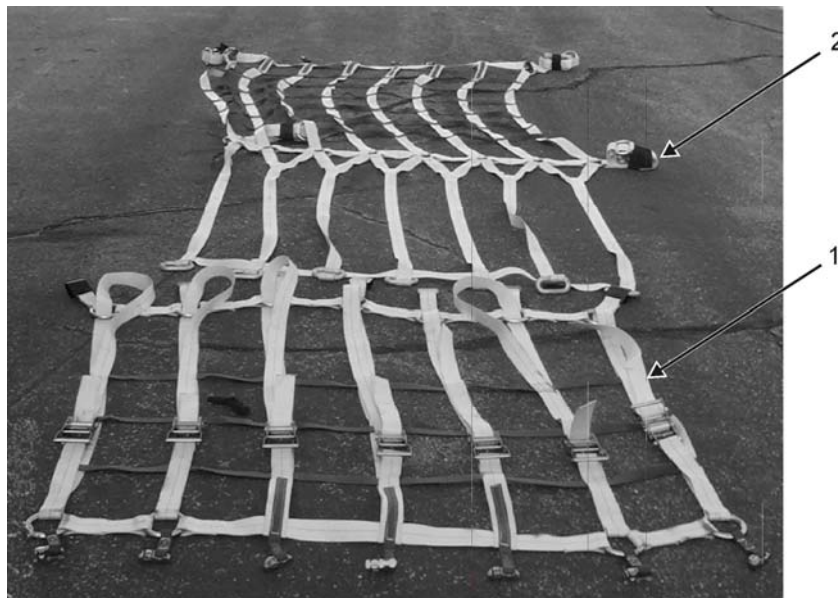


Figure 7. Rows 3 and 4 Net Storage.

UNLOADING – CONTINUED

21. Roll any diagonal straps (Figure 7, Item 2) up and secure with straps.
22. Attach row 4 cargo net rear hooks (Figure 2, Item 1) to oblong rings (Figure 2, Item 2) on row 4 cargo net front.
23. Position net storage device at red fitting end of net on right side of netting.
24. Attach three right side red fittings (Figure 8, Item 1) to net storage device (Figure 8, Item 2).

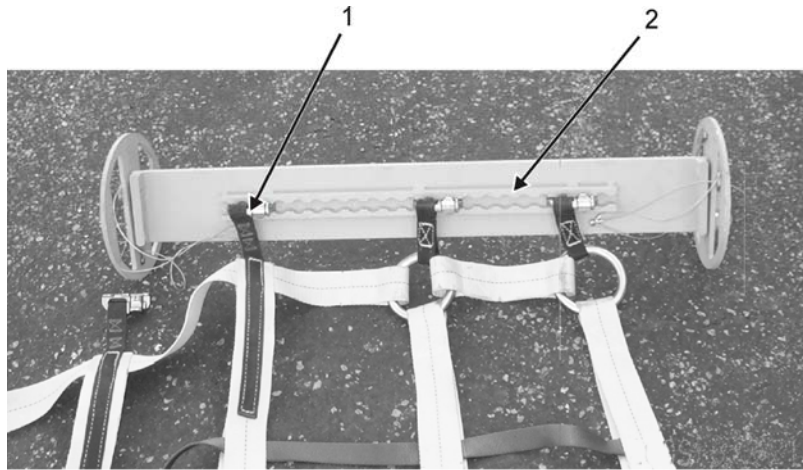


Figure 8. Net Storage – Attachment.

25. Fold cargo net (Figure 9, Item 1) lengthwise in half to facilitate rolling net onto net storage device (Figure 9, Item 2).

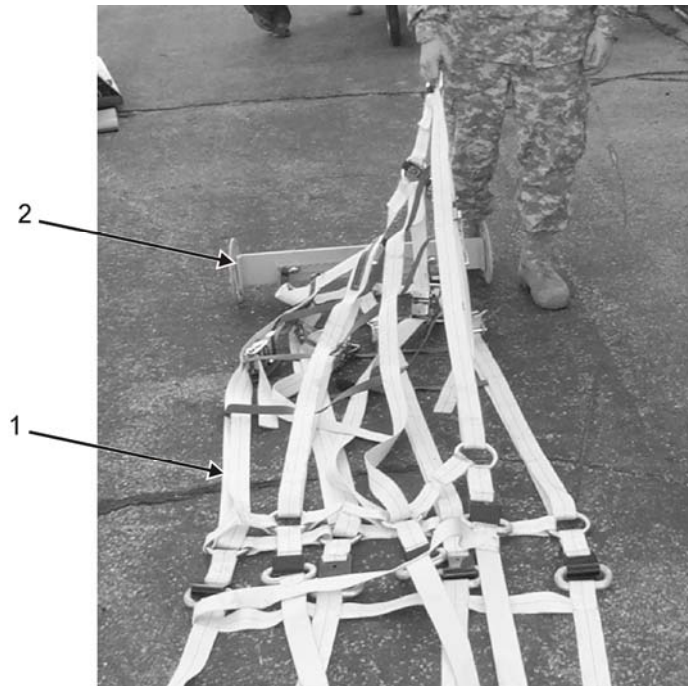


Figure 9. Net Storage – Folding.

UNLOADING – CONTINUED

26. Roll cargo net onto net storage device (Figure 10, Item 1) by pulling towards you.

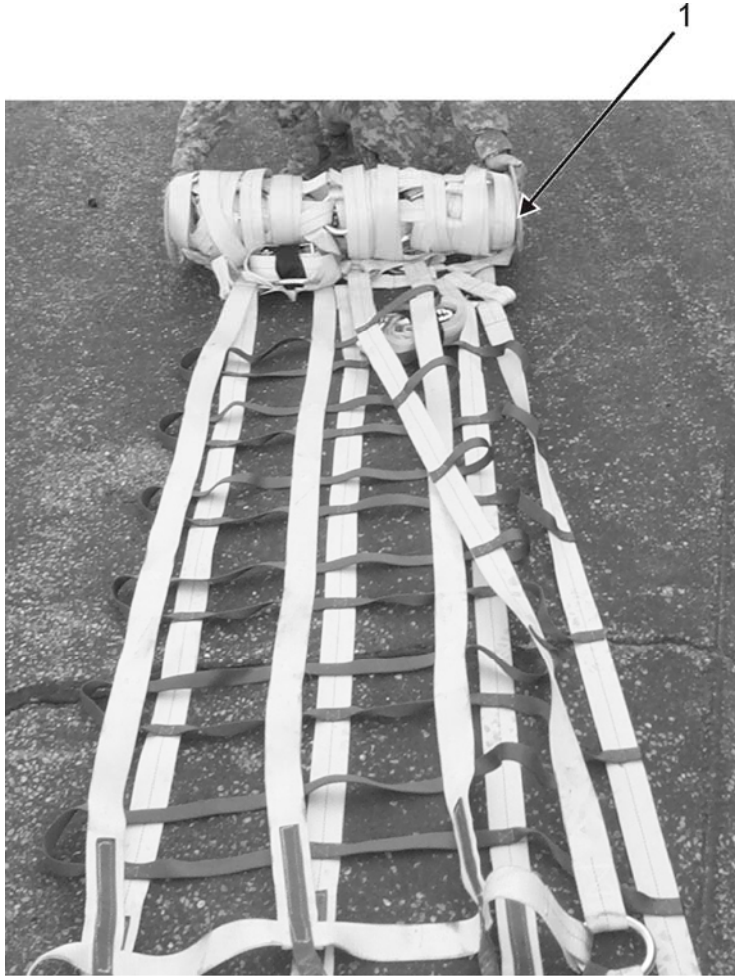


Figure 10. Net Storage – Rolling.

27. Set rolled net out of way.

UNLOADING – CONTINUED

28. Unpin left and right rear swing-out panels (Figure 11, Item 1 and Item 2) from each other by disconnecting two pins (Figure 11, Item 3) and two clips (Figure 11, Item 4).

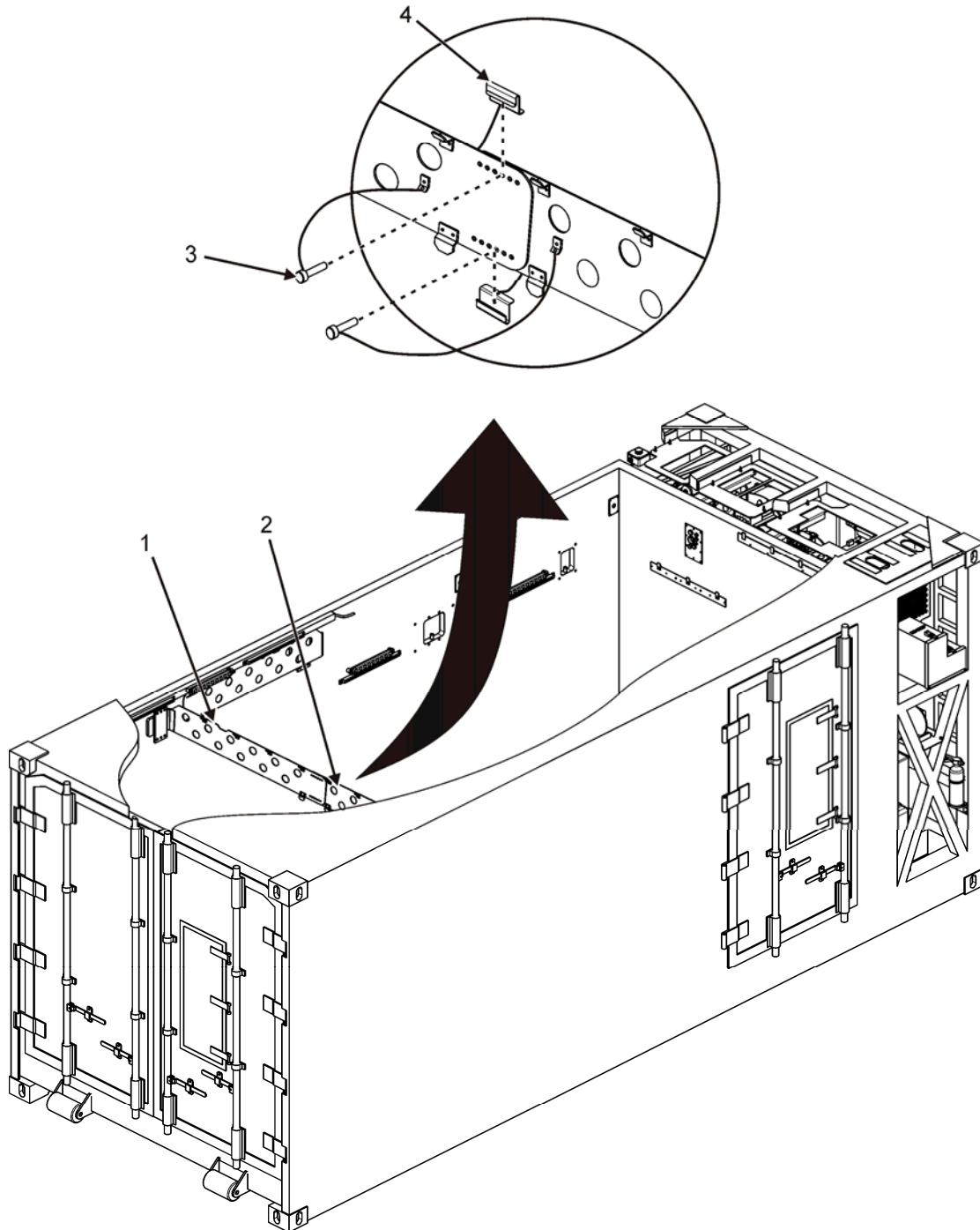


Figure 11. Swing-Out Panels.

UNLOADING – CONTINUED

29. Push swing-out panels (Figure 11, Item 1 and Item 2) towards rear doors and against wall and connect them to wall using two pins (Figure 11, Item 3) and two clips (Figure 11, Item 4).
30. Loosen side lower and upper diagonal straps (Figure 12, Item 1) from row 3 cargo net front round rings (Figure 12, Item 2).
31. Lay bottom diagonal straps along floor and attach top diagonal straps to row 4 swing out panels (Figure 12, Item 3) where indicated on swing out panel.
32. Disconnect side lower and upper diagonal straps (Figure 12, Item 1).

NOTE

Loosening cargo net will allow the removal of the hooks from the rings. Only loosen the ratchets enough to remove the hooks.

33. Loosen ratchets (Figure 3, Item 4) on row 3 cargo net front (Figure 3, Item 1).
34. Disconnect row 3 cargo net rear blue strap triple stud fittings (Figure 12, Item 4) from track 5 (Figure 12, Item 5) blue hook points.
35. Disconnect hooks (Figure 3, Item 3) on row 3 cargo net rear (Figure 3, Item 1) from oblong rings (Figure 2, Item 2) on row 3 cargo net front (Figure 3, Item 2).
36. Remove row 3 cargo net rear (Figure 3, Item 1) from insulated container.

UNLOADING – CONTINUED

NOTE

The ceiling ring boxes contain flat plates that pivot. By swinging a flat plate open, the cargo net ring can be captured into the ceiling cavity. This is accomplished on each oblong ring.

- 37. Retain row 3 cargo net rear oblong rings (Figure 12, Item 6) to ceiling ring boxes (Figure 12, Item 7) by pivoting flat plate .

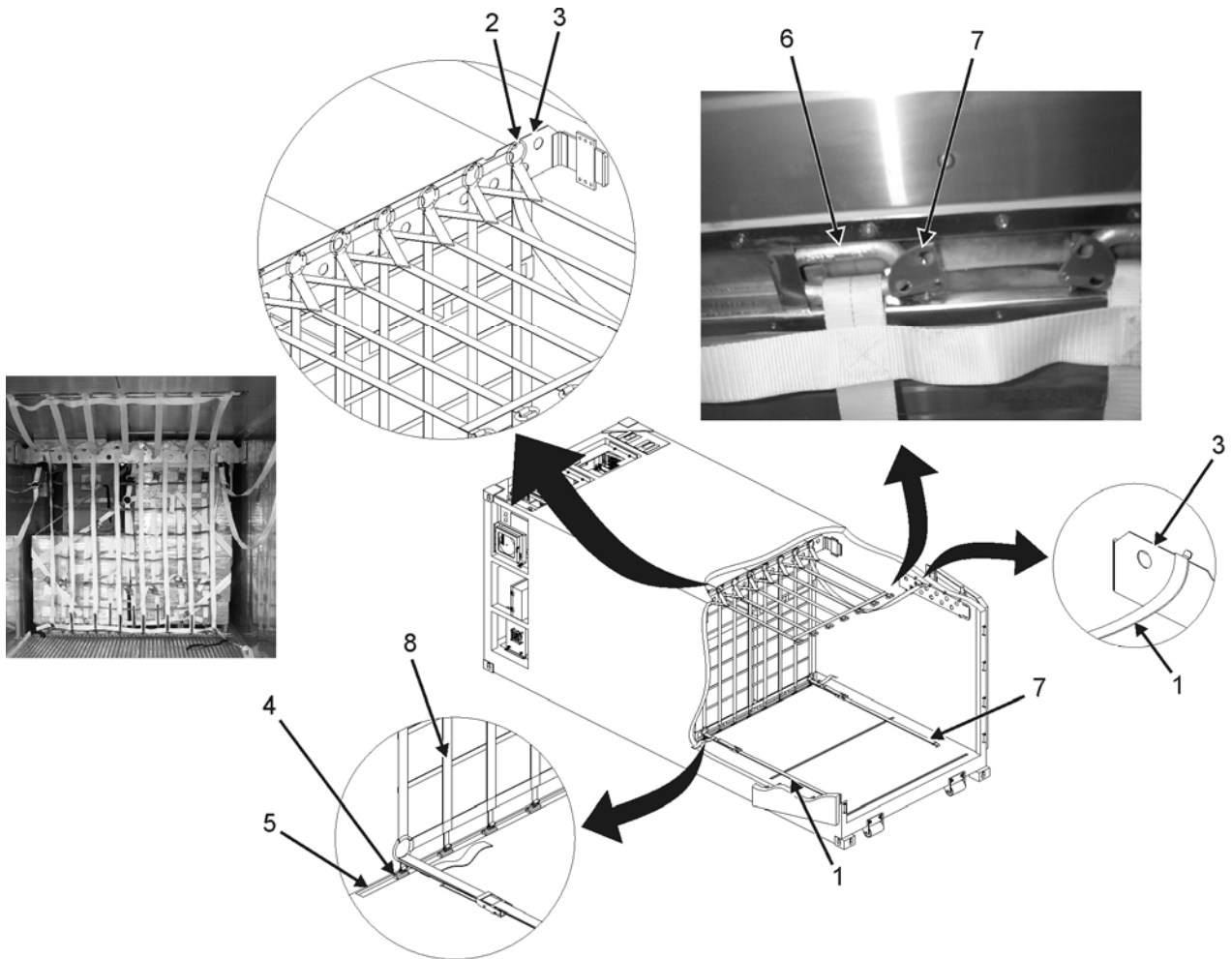


Figure 12. Row 3 Cargo Net.

UNLOADING – CONTINUED**WARNING**

The pallet jack is heavy and bulky. Two persons are required to lift the pallet jack.

38. Lift pallet jack into insulated container with forks facing forward.
39. Insert pallet jack fork tines (Figure 13, Item 1) in pallet 9 (Figure 13, Item 2).



Figure 13. Pallets 9 and 10 Lift and Pull.

UNLOADING – CONTINUED

40. Lift and pull pallet 10 and pallet 9 (Figure 14, Item 2 and Item 3) to rear of insulated container (Figure 14, Item 4).

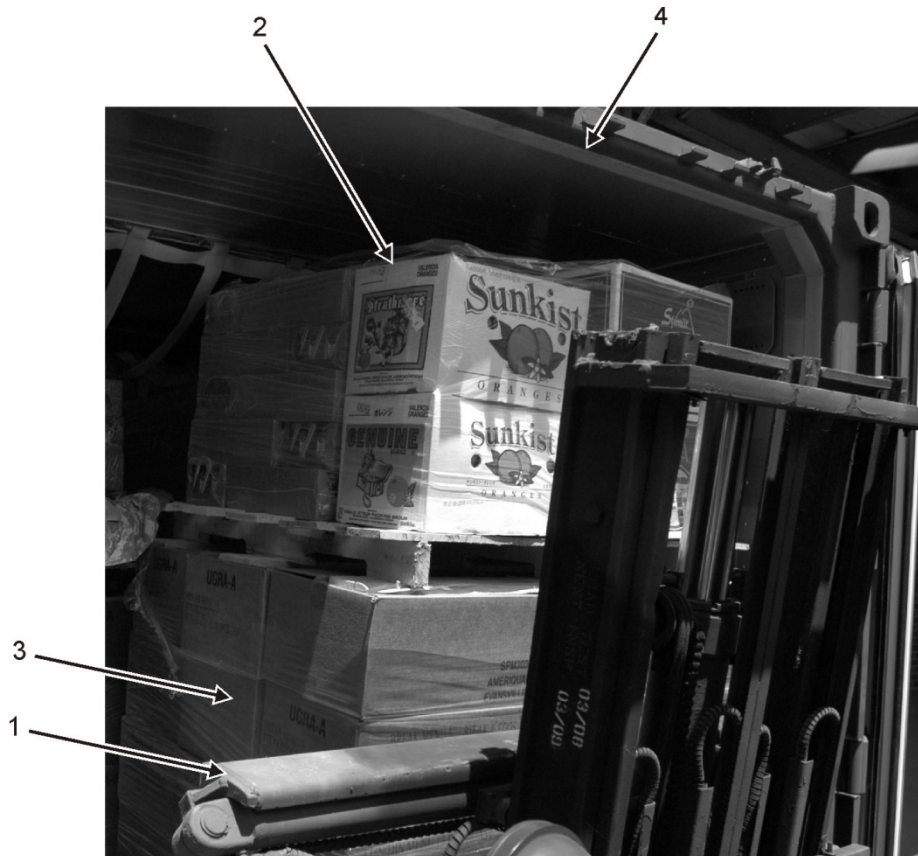


Figure 14. Pallets 9 and 10 Unloading.

41. Lower pallet 10 and pallet 9 (Figure 14, Item 2 and Item 3) onto floor of insulated container (Figure 13, Item 3).
42. Remove pallet jack fork tines (Figure 13, Item 1) from pallet 9 (Figure 13, Item 2).
43. Insert pallet jack fork tines (Figure 13, Item 1) in pallet 7 (Figure 13, Item 2).
44. Lift and pull pallet 8 and pallet 7 (Figure 13, Item 2 and Item 3) to rear of insulated container (Figure 14, Item 4).
45. Lower pallet 8 and pallet 7 (Figure 13, Item 2 and Item 3) onto floor of insulated container (Figure 13, Item 3).
46. Remove pallet jack fork tines (Figure 13, Item 1) from pallet 7 (Figure 13, Item 2).
47. Remove pallet jack from insulated container.

UNLOADING – CONTINUED**WARNING**

MTRCS unloading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

48. Using forklift (Figure 14, Item 1) remove pallets 7, 8, 9, and 10.
49. Remove row 3 cargo net front oblong rings (Figure 12, Item 6) from ceiling ring boxes (Figure 12, Item 7).
50. Remove row 3 cargo net front (Figure 12, Item 8) from floor by detaching fittings (Figure 12, Item 4) from track 4 (Figure 12, Item 5).
51. Remove row 3 cargo net front (Figure 12, Item 8) from insulated container.
52. Lay cargo nets (Figure 7, Item 1) out flat on ground with ratchets facing up.
53. Roll any diagonal straps (Figure 7, Item 2) up and secure with straps.
54. Attach row 3 cargo net rear hooks (Figure 3, Item 3) to oblong rings (Figure 12, Item 6) on row 3 cargo net front.
55. Position net storage device at red fitting end of net on right side of netting.
56. Attach three right side red fittings (Figure 8, Item 1) to net storage device (Figure 8, Item 2).
57. Fold cargo net (Figure 9, Item 1) lengthwise in half to facilitate rolling net onto net storage device (Figure 9, Item 2).
58. Roll cargo net onto net storage device (Figure 10, Item 1).
59. Set rolled net out of the way.
60. Unpin left and right rear swing-out panels (Figure 15, Item 1 and Item 2) from each other by disconnecting two pins (Figure 15, Item 3) and two clips (Figure 15, Item 4).

UNLOADING – CONTINUED

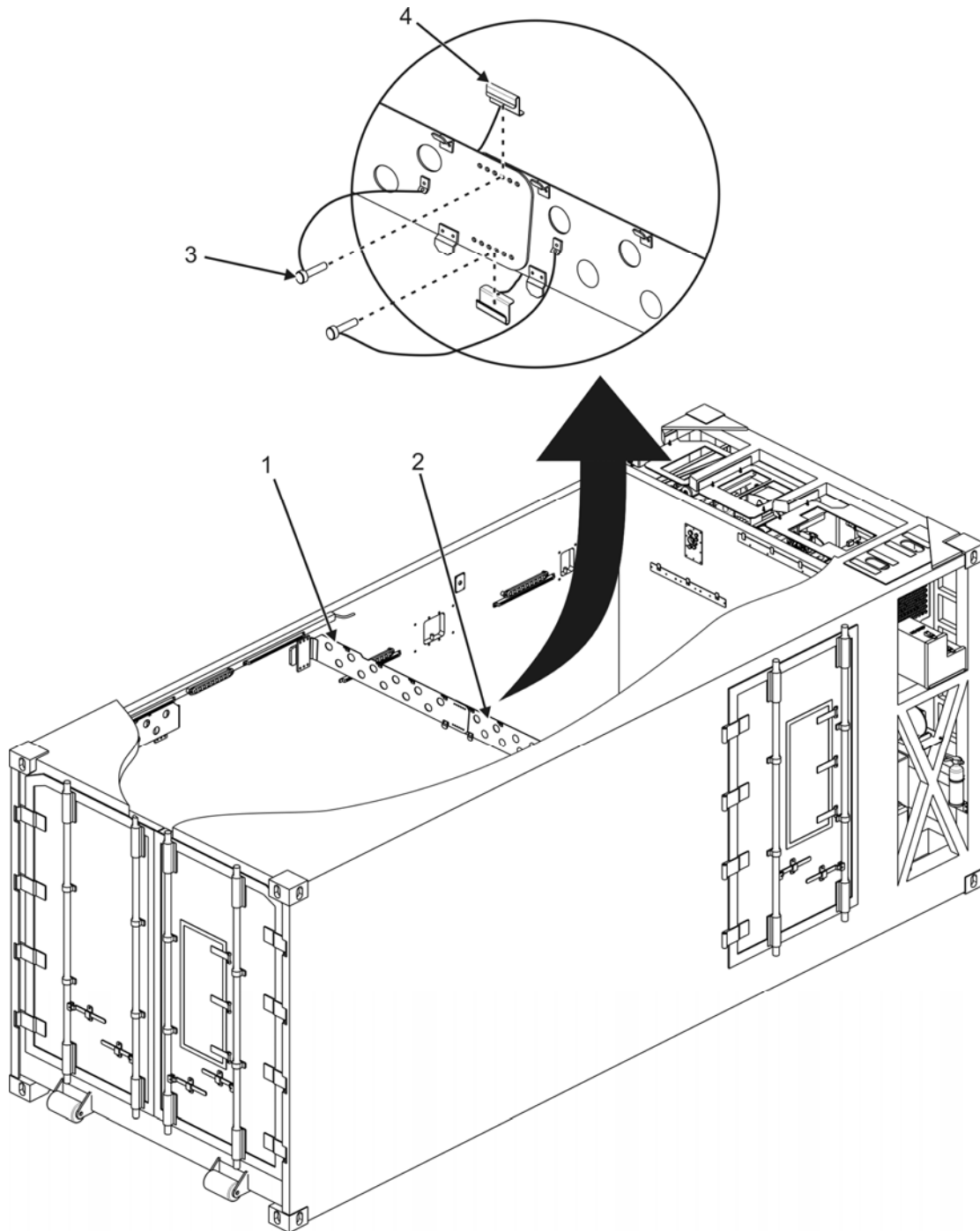


Figure 15. Swing-Out Panels Between Rows 2 and 3.

61. Push swing-out panels (Figure 15, Item 1 and Item 2) against wall and connect them to wall using two pins (Figure 15, Item 3) and two clips (Figure 15, Item 4).

UNLOADING – CONTINUED

- 62. Loosen and disconnect diagonal straps (Figure 16, Item 5) from row 2 cargo net front round rings (Figure 16, Item 6).
- 63. Lay lower diagonal straps along floor and secure upper diagonal straps to row 3 swing out panels where indicated.

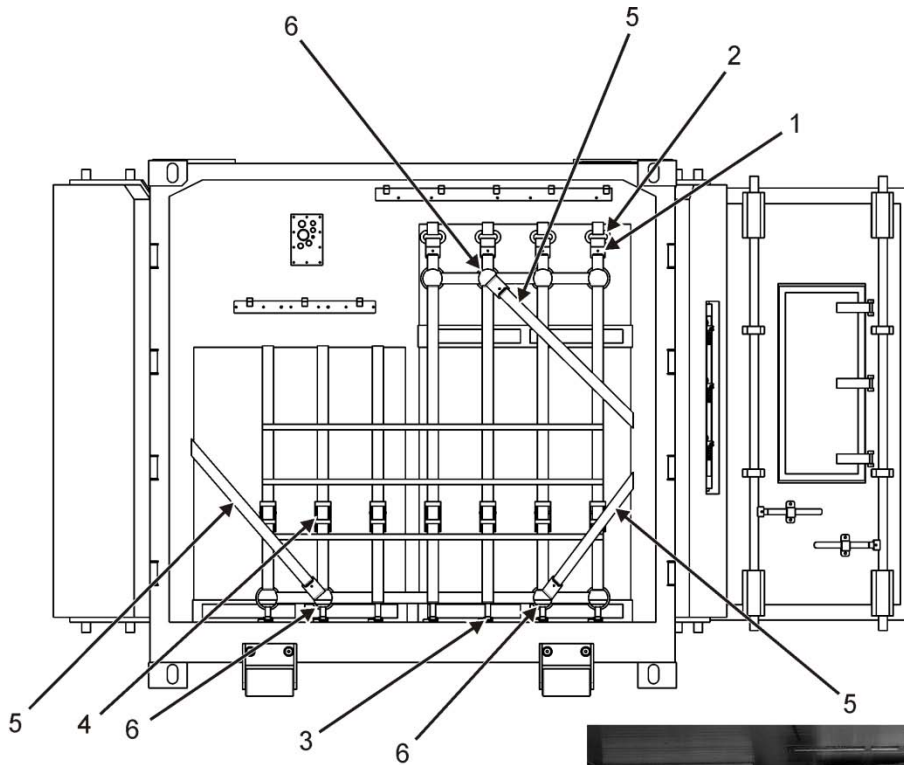


Figure 16. Row 2 Unloading.

- 64. Disconnect hooks (Figure 16, Item 1) from oblong rings (Figure 16, Item 2).

UNLOADING – CONTINUED**NOTE**

Loosening cargo net will allow the removal of the hooks from the rings. Only loosen the ratchets enough to remove the hooks.

65. Loosen ratchets (Figure 17, Item 1) on row 2 cargo net rear (Figure 17, Item 2).

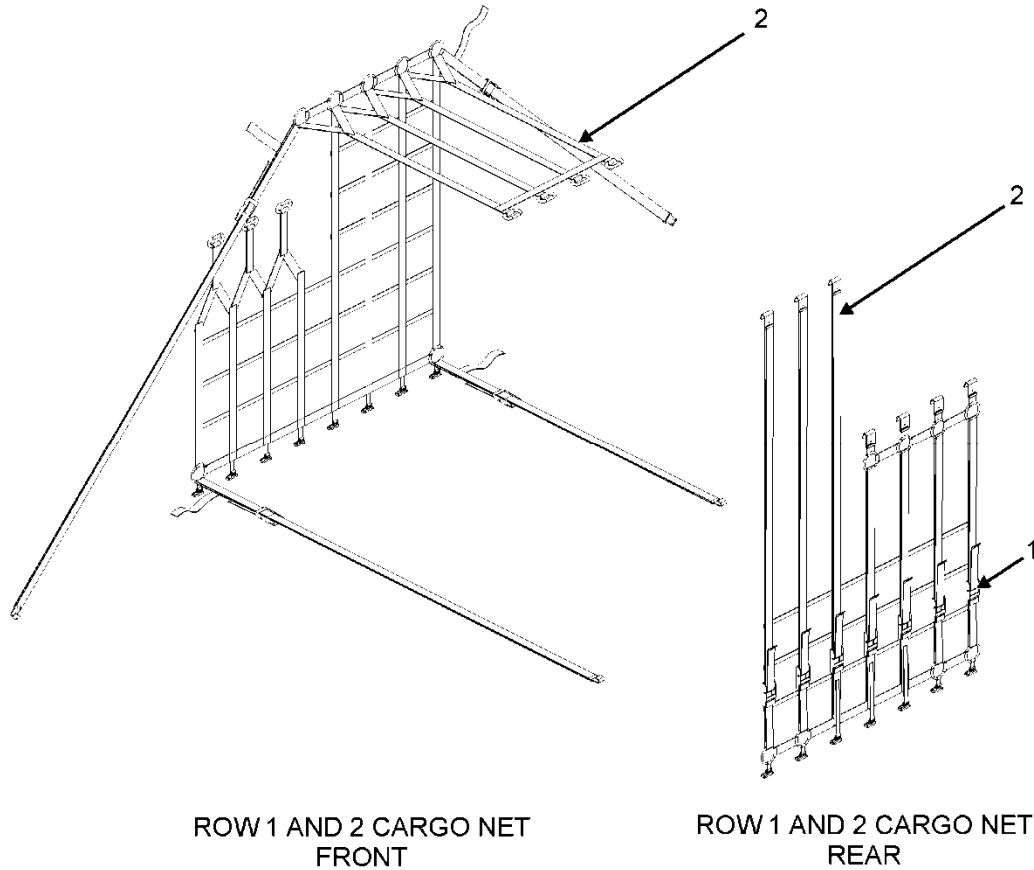


Figure 17. Rows 1 and 2 Cargo Net Assemblies.

66. Loosen and disconnect row 2 cargo net rear (Figure 17, Item 2) from track 4 (Figure 4).
67. Remove row 2 cargo net rear (Figure 17, Item 2) from insulated container.

UNLOADING – CONTINUED

68. Stow row 2 cargo net front oblong rings (Figure 18, Item 7) in ceiling ring boxes (Figure 18, Item 8).

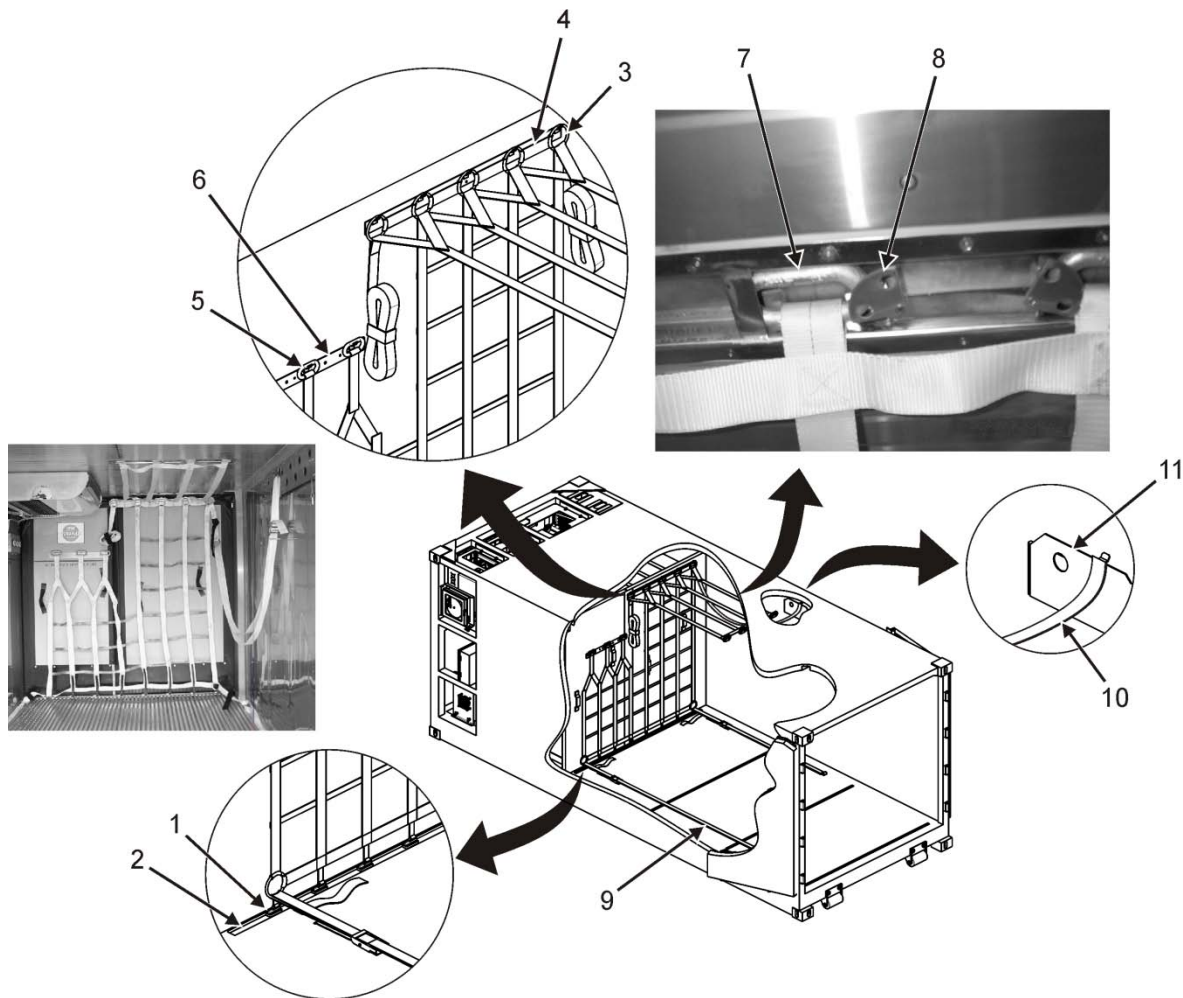


Figure 18. Row 2 Cargo Net.

69. Stow three remaining row 2 cargo net front oblong rings (Figure 18, Item 5) on interior bulkhead wall bracket (Figure 18, Item 6).

70. Lift pallet jack into insulated container.

71. Insert pallet jack fork tines (Figure 13, Item 1) in pallet 5 (Figure 13, Item 2).

72. Lift and pull pallets 6 and 5 (Figure 13, Item 2) to rear of insulated container (Figure 13, Item 3).

73. Lower pallets 6 and 5 (Figure 13, Item 2) onto floor of insulated container (Figure 13, Item 3).

74. Remove pallet jack fork tines (Figure 13, Item 1) from pallet 5 (Figure 13, Item 2).

75. Insert pallet jack fork tines (Figure 13, Item 1) in pallet 4 (Figure 13, Item 2).

UNLOADING – CONTINUED

76. Lift and pull pallet 4 (Figure 13 Item 2) to rear of insulated container (Figure 13, Item 3).
77. Lower pallet 4 (Figure 13, Item 2) onto floor of insulated container (Figure 13, Item 3).
78. Remove pallet jack fork tines (Figure 13, Item 1) from pallet 4 (Figure 13, Item 2).

WARNING

MTRCS unloading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

79. Using forklift (Figure 14, Item 1) remove pallets 4, 5, and 6.
80. Remove row 2 cargo net front oblong rings (Figure 18, Item 5 and Item 7) from ceiling ring boxes (Figure 18, Item 8) and interior bulkhead (Figure 18, Item 6).
81. Disconnect row 2 cargo net front blue strap triple stud fittings (Figure 18, Item 1) from track 3 (Figure 4) blue hook points on floor (Figure 18, Item 2).
82. Remove row 2 cargo net front from insulated container.

UNLOADING – CONTINUED

83. Lay cargo nets (Figure 19, Item 1) out flat on ground with ratchets facing up.

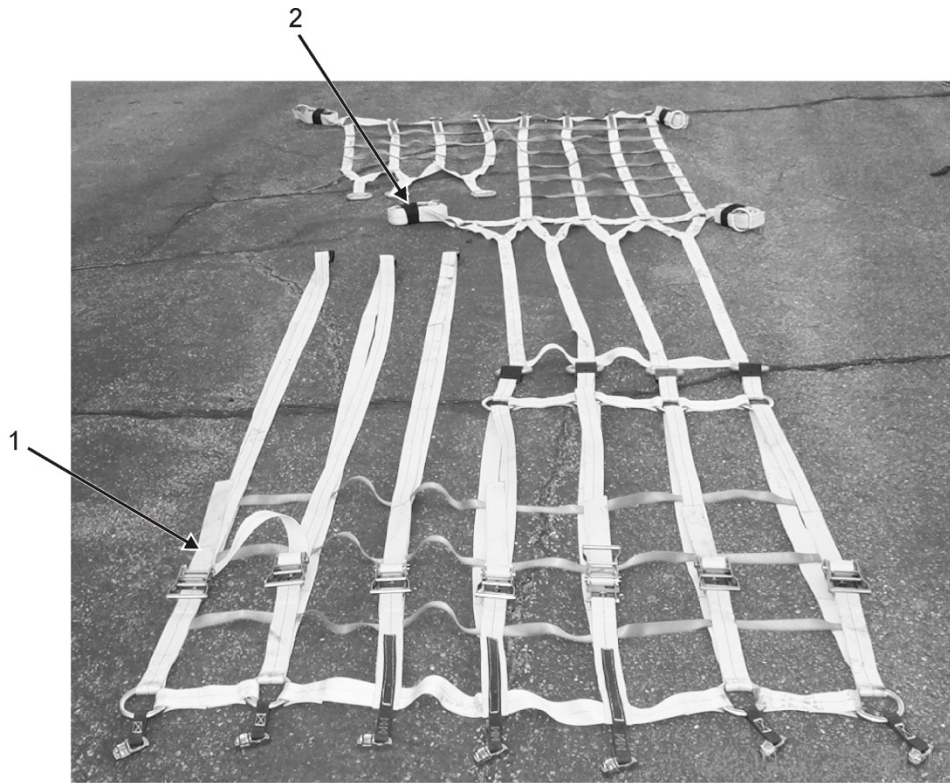


Figure 19. Rows 1 and 2 Net Storage.

84. Roll any diagonal straps (Figure 19, Item 2) up and secure with straps.
85. Attach row 2 cargo net rear hooks (Figure 16, Item 1) to upper round rings (Figure 15, Item 6) on row 2 cargo net front.
86. Position net storage device at red fitting end of net on right side of netting.
87. Attach three right side fittings (Figure 8, Item 1) to net storage device (Figure 8, Item 2).
88. Fold cargo net (Figure 9, Item 1) in half to facilitate rolling net onto net storage device (Figure 9, Item 2).
89. Roll cargo net onto net storage device (Figure 10, Item 1).
90. Remove Interior Bulkheads (WP 0024, Remove).

UNLOADING – CONTINUED

91. Loosen and disconnect diagonal straps (Figure 20, Item 5) from row 1 cargo net rear round rings (Figure 20, Item 6).

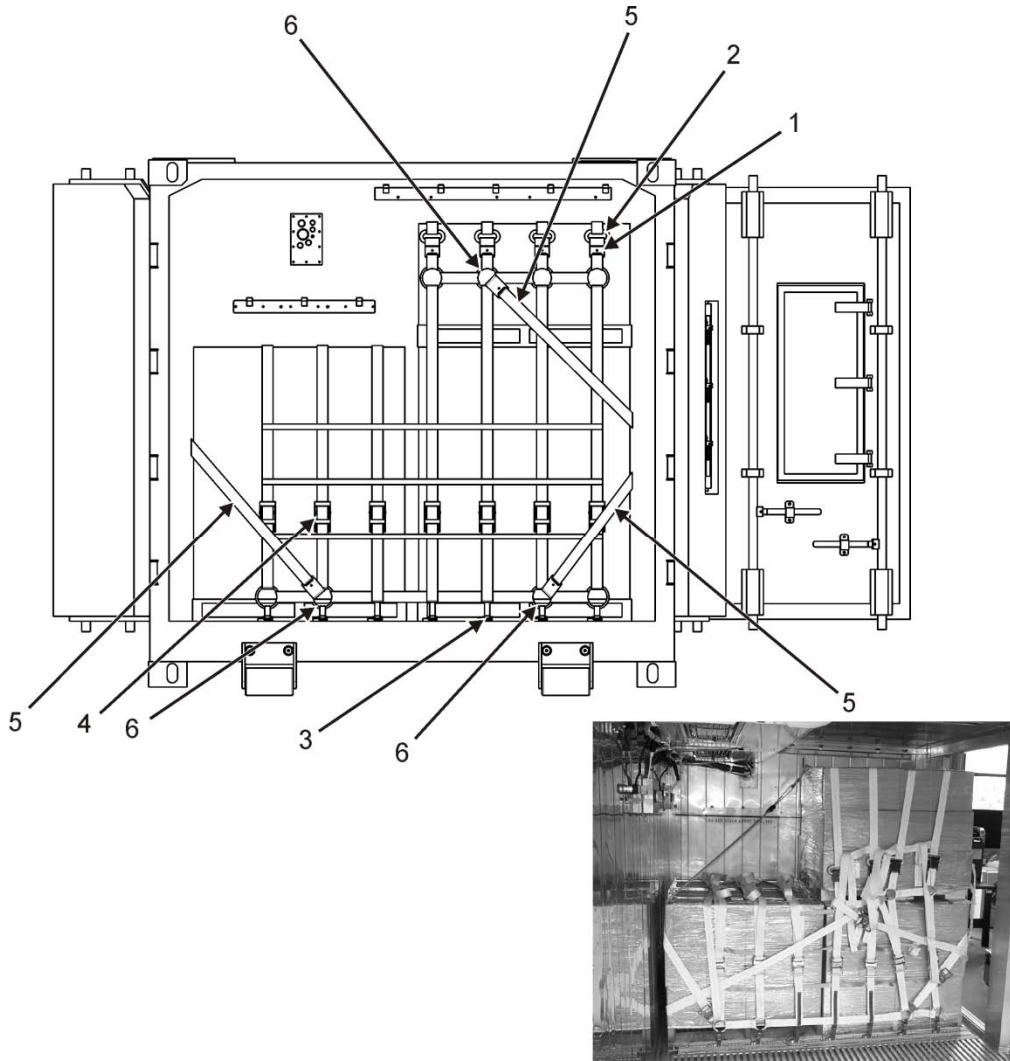


Figure 20. Row 1 Unloading.

NOTE

Loosening cargo net will allow the removal of the hooks from the rings. Only loosen the ratchets enough to remove the hooks.

92. Loosen ratchets (Figure 20, Item 4) on row 1 cargo net rear (Figure 10, Item 1).

93. Disconnect row 1 cargo net rear red strap triple stud fittings (Figure 20, Item 3) from track 2 (Figure 4) red hook points.

UNLOADING – CONTINUED

94. Remove hooks (Figure 20, Item 1) from rings (Figure 20, Item 2) on row 2 cargo net rear.
95. Remove row 2 cargo net rear from insulated container.
96. Retain row 1 cargo net front oblong rings (Figure 21, Item 7) in ceiling ring boxes (Figure 21, Item 8).

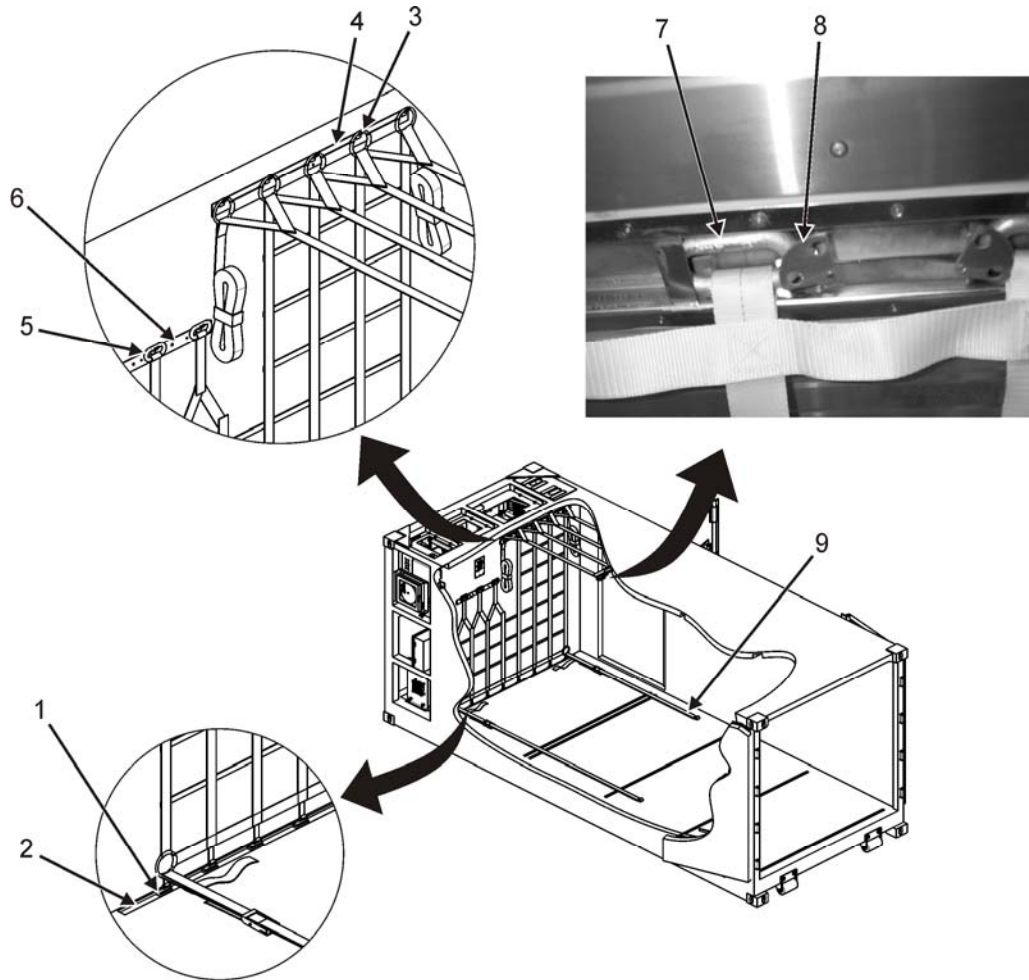


Figure 21. Row 1 Cargo Net Attachment.

97. Place pallet jack fork tines (Figure 13, Item 1) into base of pallet 2 (Figure 13, Item 2).
98. Pull pallet 2 (Figure 13, Item 2) and pallet 3 (Figure 13, Item 2) to rear of insulated container (Figure 13, Item 3).
99. Place pallet jack fork tines (Figure 13, Item 1) into base of pallet 1 (Figure 13, Item 2).

UNLOADING – CONTINUED

100. Pull pallet 1 (Figure 13, Item 2) to rear of insulated container.

WARNING

MTRCS unloading is performed with a forklift and pallet jack. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times.

Never use personnel to act as a guide inside the container while performing loading procedures. Personnel can be crushed causing serious injury or death. The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned outside of the container during loading procedures and use the side door to look through the container to guide the forklift operator.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

101. Remove pallets 1, 2, and 3 from insulated container using forklift (Figure 13, Item 1).
102. Disconnect row 1 cargo net rear oblong rings (Figure 20, Item 2) from ceiling boxes (Figure 21, Item 8) and track 1 blue hook points (Figure 21, Item 2).
103. Remove row 1 cargo net from insulated container.
104. Lay cargo nets (Figure 19, Item 1) out flat on ground.
105. Roll any diagonal straps (Figure 19, Item 2) up and secure with straps.
106. Attach row 1 cargo net front hooks (Figure 16, Item 1) to oblong rings (Figure 16, Item 2) on row 1 cargo net rear.
107. Attach three fittings (Figure 8, Item 1) to net storage device (Figure 8, Item 2).
108. Fold cargo net (Figure 9, Item 1) in half to facilitate rolling net onto net storage device (Figure 9, Item 2).
109. Roll cargo net onto net storage device (Figure 17, Item 1).
110. Place all cargo nets stowed on storage devices into insulated container.

END OF TASK

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
OPERATION UNDER USUAL CONDITIONS – CARGO NET REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Forklift (WP 0109)
Pallet Mobilizer Lift Truck (WP 0109)

Materials/Parts

Rows 1 and 2 cargo net (orange / yellow straps)
(WP 0108, Item 3)
Rows 3 and 4 cargo net (green / yellow straps)
(WP 0108, Item 4)

Personnel Required

Automated Logistical Specialist (3), or
Food Service Specialist (3)

References

WP 0005
WP 0007
WP 0008

Equipment Condition

Refrigeration unit running (WP 0005)
MTRCS stationary on flat level surface (WP 0005)

CARGO NET REPLACEMENT**WARNING**

Do not operate the MTRCS with faulty or damaged cargo nets, and do not attempt to replace nets in any way other than unloading and reloading IAW the referenced WP's. Failure to observe these precautions may result in an unstable or unsecured load condition, with the possibility serious injury or death to personnel.

Cargo nets may be replaced individually by unloading IAW procedures given in WP 0008, removing the damaged cargo net, and loading IAW procedures given in WP 0007.

END OF TASK**END OF WORK PACKAGE**

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
OPERATION UNDER UNUSUAL CONDITIONS

INITIAL SETUP:**Tools and Special Tools**

Gloves, Leather (WP 0110, Item 22)

Personnel RequiredAutomated Logistical Specialist, or
Food Service Specialist**References**

WP 0004

WP 0005

WP 0026

WP 0039

WP 0041

Equipment Condition

Refrigeration unit shut down (WP 0005)

GENERAL INFORMATION

The MTRCS is designed to operate in an ambient temperature ranging from -25°F to +120°. This work package provides instructions to operate the MTRCS in extreme cold; extreme heat; rainy and humid conditions; and dusty, sandy, and salty environments.

OPERATION IN EXTREME COLD (BELOW 0°F)

Under extremely cold conditions the door seals become hard and brittle. If the doors are left open under these conditions, it may be difficult to close them again. Attempting to force them closed can damage the seals and the door. The refrigeration unit can be warmed sufficiently to allow the doors to be closed without damaging the seals. Observe the following precautions when operating the MTRCS in extreme cold.

Insulated Container (IC)**WARNING**

When operating under extreme cold conditions, wear protective gloves. Do not touch cold metal parts with bare hands as skin may cleave to extremely cold metal parts and cause frostbite. Frostbite can cause permanent injury and may require medical attention.

CAUTION

If doors remain open for a long period of time in extremely cold weather, the door seals will become hard and brittle, causing difficulty in closing and possible damage to seals. Door seals will need to be warmed before attempting to close rear doors.

Warming Rear Door Seals During Extremely Cold Weather

1. Connect power to refrigeration unit using an external power source (WP 0005, Standby Motor Drive Starting/Stopping).
2. Start refrigeration unit and operate at highest setting in heat mode (WP 0005, Compartment Operation and Adjustment).
3. Close rear doors as far as possible without compressing door seals. Do not close door release handles.
4. Allow refrigeration unit to operate in heating mode until door seals are warm.

OPERATION IN EXTREME COLD (BELOW 0°F) – CONTINUED**NOTE**

Door seals become soft and flexible when warm enough to close.

5. Press door seals at various locations to make sure door seals are soft and flexible throughout.
6. Once seals are warm, close left rear door, then right rear door.

Refrigeration Unit

The refrigeration unit is designed to operate under severe conditions and does not require additional precautions.

Engine

1. Keep the engine area free of ice and/or snow accumulation.
2. Keep fuel tank full.
3. Make sure battery is fully charged and free of corrosion.

END OF TASK**OPERATION IN EXTREME HEAT**

Operating the MTRCS in extreme heat puts strain on the MTRCS and possibly inhibits performance. Follow the instructions below to improve the efficiency of the unit and reduce possible strain during operation. Observe the following precautions when operating the MTRCS in extreme heat.

Refrigerated Container**CAUTION**

Do not block air flow to or from the refrigeration unit.

1. If possible, keep insulated container out of direct sunlight.
2. Shade insulated container with a tarp or similar device when possible.

Refrigeration Unit**CAUTION**

Do not block air flow to or from the refrigeration unit.

1. Do not block air circulation around refrigeration unit. Keep area clear of equipment and other obstructions.
2. Periodically inspect refrigeration unit condenser coils. Keep coils clean IAW WP 0039, Service.
3. Periodically inspect evaporator coils found inside container. Perform manual defrosting of refrigeration unit if frost becomes greater than 1/8-inch.

OPERATION IN EXTREME HEAT – CONTINUED**Engine**

1. Check vents and radiator passages for obstructions that could degrade performance. Clear all obstructions immediately.

NOTE

Overheating engine coolant can provide many visible symptoms for you to pay attention to and look for. Some of the most common include puddles of fluid under the condenser or radiator cap, steam rising from the radiator cap as pressure begins to exceed cap rating, and stained metal on the container frame where steam escapes and hits the frame.

You can check engine coolant temperature using the microprocessor controller unit data key WT option. Additionally, an alarm code (ENG HOT) displays on the microprocessor controller when the engine water temperature sensor senses high coolant temperature. WP 0004 provides further explanation of the microprocessor controller codes and faults.

2. Check coolant temperature on MCD often for signs of overheating.
3. Keep area clean and free of dirt.

END OF TASK**OPERATION IN RAINY OR HUMID CONDITIONS**

Observe the following precautions when operating the MTRCS in rainy or humid conditions.

Refrigerated Container

Open rear doors only for loading or unloading to prevent interior of insulated container from frosting.

Refrigeration Unit

1. If possible, shelter unit from rain.
2. Keep access doors closed to prevent rain or moisture intrusion.
3. Periodically inspect evaporator coils found inside container. Perform manual defrosting of refrigeration unit if frost becomes 1/8-inch or thicker.

Fuel Tank

Keep fuel tank full to protect against moisture, condensation, and accumulation of water.

END OF TASK

OPERATION IN SALT ATMOSPHERES

Salt water is a natural corrosion accelerant to bare metal surfaces. Observe the following precautions when operating the MTRCS in salt water areas.

Refrigerated Container

1. Carefully inspect container exterior before use. If bare metal is found, preserve or paint metal as required.

NOTE

Do not get water in refrigeration unit, generator set, or wiring.

Pay particular attention to condenser and radiator areas when rinsing.

2. Rinse outside of insulated container following operation in salt water areas. Use fresh water to remove salt spray and/or deposits.

Refrigeration Unit

Refrigeration unit is designed to operate under severe conditions and does not require additional precautions.

Engine

1. Provide shelter during operation if possible.
2. Keep access doors closed to prevent salt water intrusion.
3. Wash surface areas frequently during periods of non-operation.
4. Check wiring, terminal connection points, and fittings on a regular basis for signs of corrosion. Clean as required.
5. Keep area clean and free of dirt.

END OF TASK

OPERATION IN HIGH ALTITUDES

Elevations Up to 5,000 Feet

Insulated container and refrigeration unit are designed to operate at elevations up to 5,000 feet above sea level without special servicing or adjustments.

Refrigeration unit will operate at elevations up to 5,000 feet (1219.1 meters) above sea level without special adjustment or reduction in load.

Elevations Above 5,000 Feet

At elevations greater than 5,000 feet above sea level, performance is reduced by approximately 3.5% for each additional 1,000 feet (304.8 meters). Refrigeration unit output is reduced at elevations greater than 5,000 feet above sea level. Refrigeration unit takes longer to cool down during startup and runs longer during each cooling cycle.

END OF TASK

OPERATION IN DUSTY OR SANDY AREAS**Refrigerated Container**

Keep doors closed. Before opening doors, cover access area. Monitor and restrict access and opening doors.

Refrigeration Unit

Keep cooling coils clean and free of dust build up.

Engine

1. Provide as much shelter from blowing dust and sand as possible. Make use of natural surroundings to enhance shelter if possible.
2. Keep areas nearby wetted down to cut down on the amount of dust and blowing sand.
3. Keep access doors closed.
4. Clean surface areas frequently to remove buildup of dust and sand.
5. Service the engine air filter more frequently IAW WP 0026.
6. Drain sediment from fuel tank and use precaution during refuel so as not to allow dust or sand into tank.

END OF TASK**LUBRICATION SERVICE INTERVALS – UNUSUAL CONDITIONS**

The MTRCS requires more frequent lubrication when operating under unusual conditions. Extreme temperatures, both high and low, long periods of hard use, or continued use in sand, water, mud, or snow will break down the lubricant, requiring you to add or change the lubricant on a more frequent basis IAW WP 0041.

END OF TASK**END OF WORK PACKAGE**

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
EMERGENCY OPERATION

INITIAL SETUP:

Not applicable

EMERGENCY OPERATION

The MTRCS is equipped with two emergency escape hatches. One escape hatch is located on the side door. One escape hatch is located on the rear door. Each of the doors provides anyone who becomes trapped inside the container with an emergency exit. Each of the two escape hatches operates the same way and is easily found in the dark by luminescent arrows on each of the four sides of each escape hatch.

Emergency Escape Hatch**NOTE**

There are two emergency escape hatches located in the container, one for each MTRCS compartment. When the partition panels are installed in the MTRCS container to separate the two compartments, compartment 1 access from compartment 2, and compartment 2 access from compartment 1, will not be possible. Operation of the two emergency escape hatches is identical.

1. Locate escape hatch door (Figure 1, Item 1) using luminescent arrows (Figure 1, Item 2).

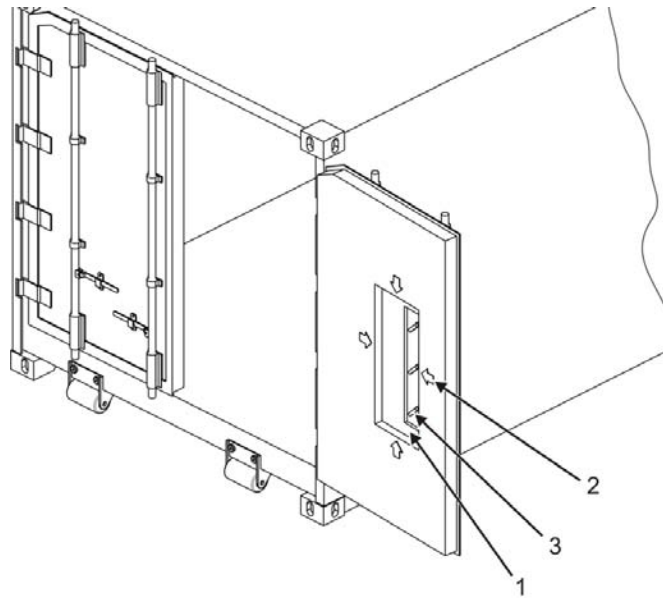


Figure 1. Escape Hatch (View from Inside Container).

2. Rotate three levers (Figure 1, Item 3) in clockwise direction to release hatch door (Figure 1, Item 1).
3. Push emergency hatch door (Figure 1, Item 1) open to escape.

END OF TASK

EMERGENCY OPERATION – CONTINUED**Emergency Shutdown**

On control panel (Figure 2, Item 1), press POWER ON/DOWN switch (Figure 2, Item 2) to DOWN position.

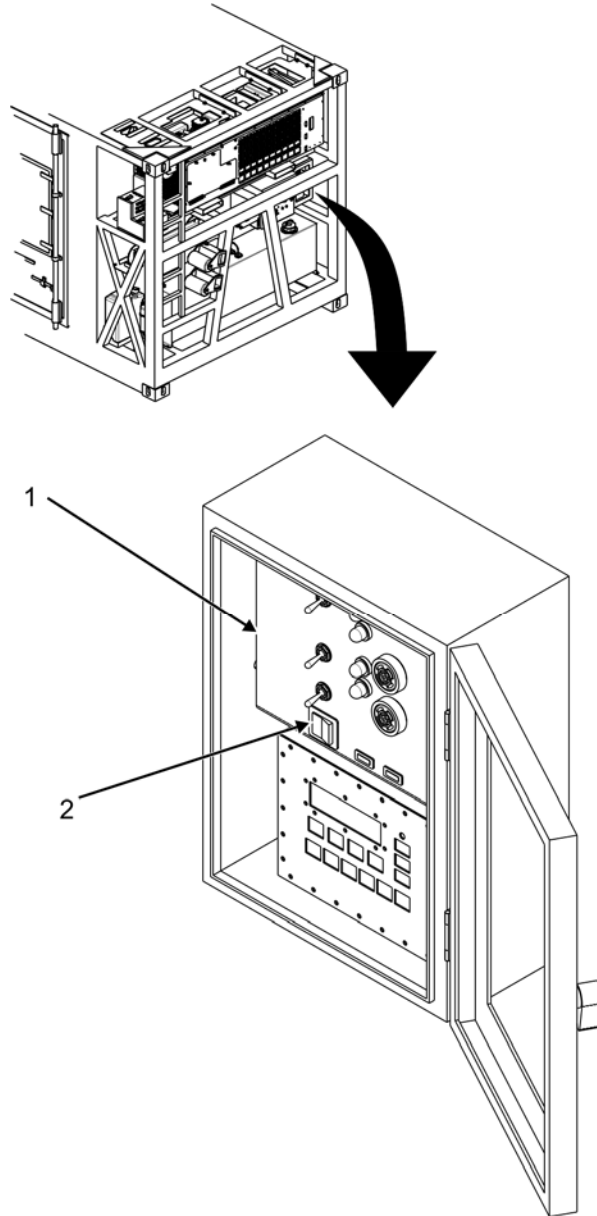


Figure 2. Microprocessor Controller Display.

END OF TASK

END OF WORK PACKAGE

CHAPTER 3
TROUBLESHOOTING PROCEDURES
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
TROUBLESHOOTING INDEX

INTRODUCTION

This work package contains crew, service, and field level troubleshooting information for locating and correcting most of the operating malfunctions that may develop in the MTRCS. Each malfunction for a part, assembly, or subassembly is followed by a list of tests or inspections which will help you to determine corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

CREW TROUBLESHOOTING MALFUNCTION/SYMPATOM INDEX

Table 1. Crew Troubleshooting Malfunction/Symptom Index.

MTRCS Will Not Operate Using External Power	WP 0013-2
MTRCS Will Not Operate Using Engine Power Mode	WP 0013-4
Diesel Engine Will Not Start	WP 0013-6
Temperature Chart Recorder Does Not Record Insulated Container Temperature	WP 0013-8
Evaporator Has No, or Limited, Airflow	WP 0013-9
Refrigeration Unit Operates But Will Not Heat or Provides Inadequate Heat.....	WP 0013-10
Refrigeration Unit Operates But Will Not Cool or Provides Inadequate Cooling	WP 0013-11

SERVICE AND FIELD MAINTENANCE TROUBLESHOOTING MALFUNCTION/SYMPTOM INDEX

Many of the troubleshooting procedures to be performed will involve either voltage or resistance checks on various system components. The refrigeration unit microprocessor controller uses numerous plug and play socket type relays (Figure 1). Each of the plug and play socket type relays is identical in operation and physical makeup. Figure 1 provides a pin out of the relays and a schematic representation of the relay circuitry. Pin 30 is always hot and provides control power to normally closed (NC) pin 87a or normally open (NO) contact 87, depending upon energized status of the relay. Pin 86 is always hot and provides power to the relay coil. Pin 85 is the microprocessor control ground.

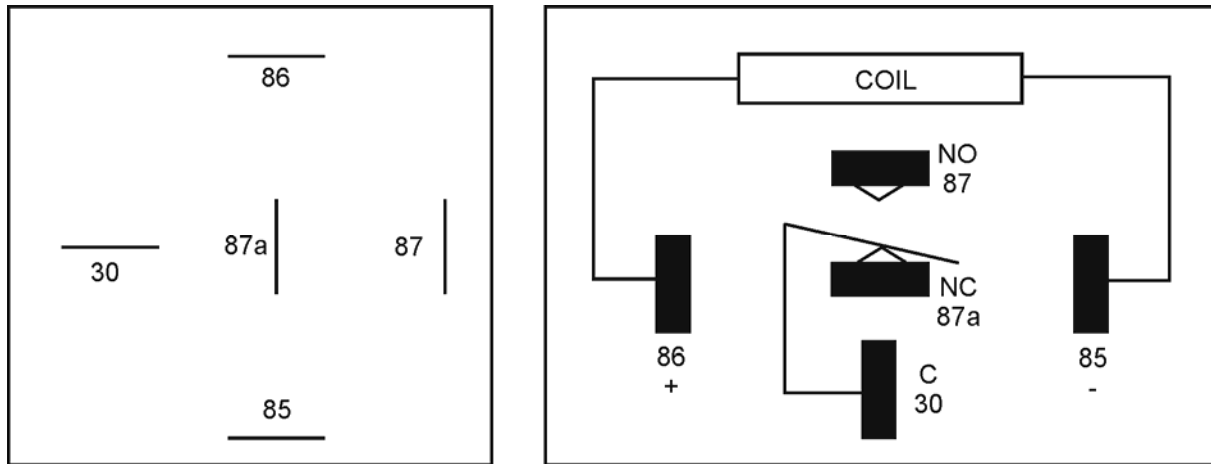


Figure 1. Relay Pin Out and Schematic.

SERVICE AND FIELD MAINTENANCE TROUBLESHOOTING MALFUNCTION/SYMPTOM INDEX – CONTINUED

This manual cannot list all possible malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed (except when the malfunction or cause is obvious) or is not corrected by listed corrective actions, it may be necessary to use wiring diagrams to isolate the fault. MTRCS malfunctions are indexed (Table 2) below to provide a quick reference to corrective actions located in WP 0014. Also refer to Table 3 for the sensor voltage chart and Table 4 for sensor resistance chart.

Table 2. Service and Field Maintenance Troubleshooting Malfunction/Symptom Index.

Engine Will Not Start	WP 0014-7
Fault AL8 (STARTER).....	WP 0014-8
Fault AL0 (ENG OIL).....	WP 0014-10
Fault AL1 (ENG HOT).....	WP 0014-12
Fault AL2 (HI PRESS).....	WP 0014-18
Fault AL3 (STARTFAIL).....	WP 0014-21
Fault AL4 (LOW BATT).....	WP 0015-2
Fault AL5 (HIGH BATT).....	WP 0015-3
Fault AL6 (DEFRFAIL).....	WP 0015-4
Fault AL7 (ALT AUX).....	WP 0015-5
Fault AL9 (1RA SENSOR).....	WP 0015-6
Fault AL10 (2RA SENSOR).....	WP 0015-7
Fault AL11 (WT SENSOR).....	WP 0015-8
Fault AL12 (HIGH CDT).....	WP 0015-9
Fault AL13 (CD SENSOR).....	WP 0015-13
Fault AL14 (SBY MOTOR).....	WP 0015-14
Fault AL15 (FUSE BAD) F4.....	WP 0015-16
Fault AL15 (FUSE BAD) F4.....	WP 0015-17
Fault AL15 (FUSE BAD) F5.....	WP 0015-19
Fault AL15 (FUSE BAD) F7.....	WP 0015-20
Fault AL15 (FUSE BAD) F8.....	WP 0015-24
Fault AL17 (DISPLAY).....	WP 0016-2
Fault AL20 (1RA OUT).....	WP 0016-3
Fault AL21 (2RA OUT).....	WP 0016-9
Fault AL23 (NO POWER).....	WP 0016-15
Refrigeration Unit Runs But Will Not Heat	WP 0016-16
No Microprocessor Display	WP 0016-26
Compartment 1 Evaporator Has No, or Limited, Airflow.....	WP 0017-2
Compartment 2 Evaporator Has No, or Limited, Airflow.....	WP 0017-8
Both Compartment Evaporators Have No Airflow	WP 0017-14
Standby Motor Will Not Come On (NO ALARM)	WP 0017-16

MAINTAINER TROUBLESHOOTING MALFUNCTION/SYMPTOM INDEX – CONTINUED

Table 3. Sensor Voltage Chart for Suction Pressure Transducer.

NOTE

Due to variations and inconsistencies in test equipment, the headings taken should approach the table values. Also, an accurate low pressure gauge will give an idea of how accurate the pressure transducer is at responding to the true suction pressure.

PSIG	Voltage	PSIG	Voltage	PSIG	Voltage
20" hg.	0.369	30	0.761	70	1.155
10" hg.	0.417	35	0.81	75	1.204
0	0.466	40	0.86	80	1.253
5	0.515	45	0.909	85	1.303
10	0.564	50	0.958	90	1.352
15	0.614	55	1.007	95	1.401
20	0.663	60	1.056	100	1.45
25	0.712	65	1.106		

Table 4. Sensor Resistance Chart for Air Temperature, Return Air, Supply Air, and Water Temperature Sensor.

NOTE

Due to variations and inaccuracies in test equipment, a reading within two percent of the chart value would indicate a good sensor.

Temperature		Ohms	Temperature		Ohms
°F	°C		°F	°C	
-20	-28.9	165.3K	40	4.4	26.1K
-18	-27.8	154.0K	42	5.5	24.7K
-16	-26.7	144.0K	44	6.7	23.4K
-14	-25.6	134.4K	46	7.8	22.1K
-12	-24.4	126.1K	48	8.9	21.0K
-10	-23.3	117.8K	50	10.0	19.9K
-8	-22.2	110.5K	52	11.1	18.9K
-6	-21.1	103.7K	54	12.2	18.0K
-4	-20.0	97.1K	56	13.3	17.0K
-2	-18.9	91.0K	58	14.4	16.1K
0	-17.8	82.8K	60	15.6	15.3K
2	-16.7	80.2K	62	16.7	14.5K
4	-15.6	75.3K	64	17.8	13.8K

Table 4. Sensor Resistance Chart for Air Temperature, Return Air, Supply Air, and Water Temperature Sensor – Continued.

NOTE

Due to variations and inaccuracies in test equipment, a reading within two percent of the chart value would indicate a good sensor.

Temperature		Ohms	Temperature		Ohms
°F	°C		°F	°C	
6	-14.4	70.8K	66	18.9	13.2K
8	-13.3	66.5K	68	20.0	12.5K
10	-12.2	62.5K	70	21.1	11.8K
12	-11.1	58.8K	72	22.2	11.3K
14	-10.0	55.3K	74	23.3	10.6K
16	-8.9	52.1K	76	24.4	10.3K
18	-7.8	49.1K	78	25.6	9.8K
20	-6.7	46.3K	80	26.7	9.3K
22	-5.5	41.1K	90	32.2	7.3K
24	-4.4	38.8K	100	37.8	5.8K
26	-3.3	36.6K	110	43.3	4.7K
28	-2.2	34.6K	120	48.9	3.8K
30	-1.1	32.7K	194	90	915
32	0.0	32.7K	212	100	680
34	1.1	30.8K	266	130	301
36	2.2	29.2K	302	150	186
38	3.3	27.6K			

END OF WORK PACKAGE

CREW MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
CREW TROUBLESHOOTING PROCEDURES

INITIAL SETUP:**Equipment Condition**

MTRCS prepared for use (WP 0005)
Compartment start attempted (WP 0005)

Personnel Required

Automated Logistical Specialist, or
Food Service Specialist

References

WP 0004
WP 0005
WP 0027
WP 0028

INTRODUCTION

This work package contains crew level troubleshooting information for locating and correcting most of the operating malfunctions that may develop in the MTRCS. Each malfunction for a part, assembly, or subassembly is followed by a list of tests or inspections which will help you to determine corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

This manual cannot list all possible malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed (except when the malfunction or cause is obvious) or is not corrected by listed corrective actions, refer the problem to your supervisor.

CREW TROUBLESHOOTING PROCEDURES

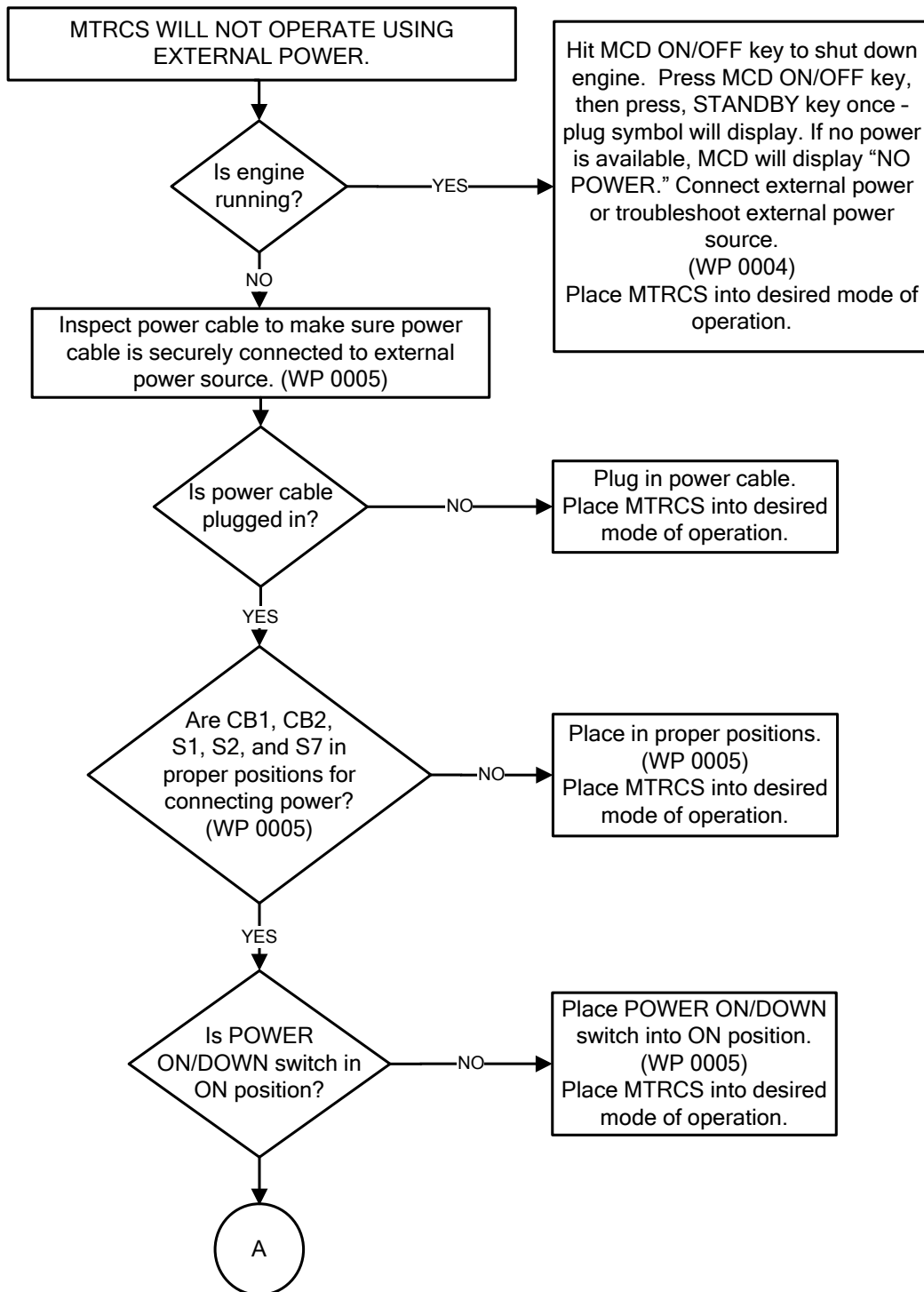


Figure 1. MTRCS Will Not Operate Using External Power (Sheet 1 of 2).

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

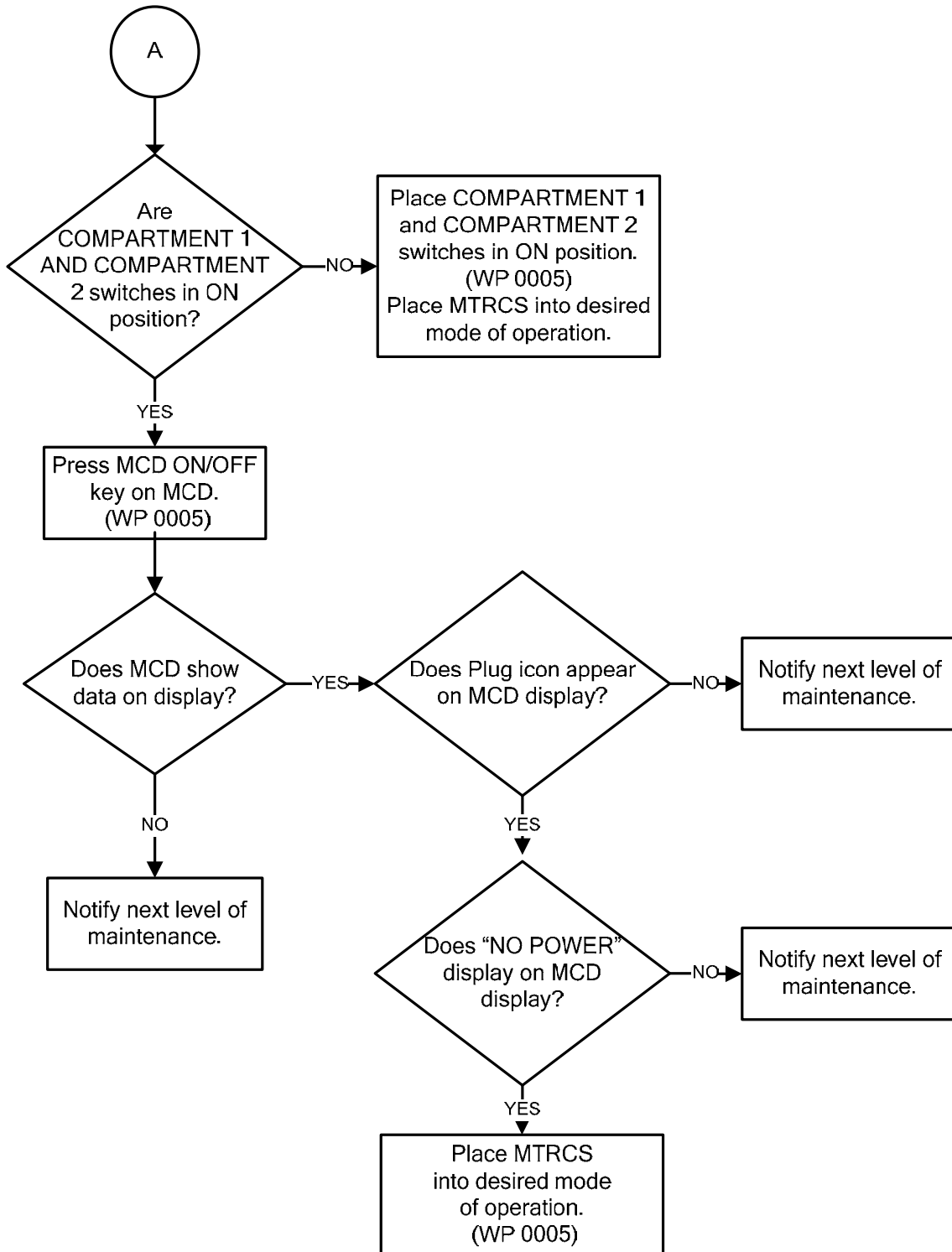


Figure 1. MTRCS Will Not Operate Using External Power (Sheet 2 of 2).

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

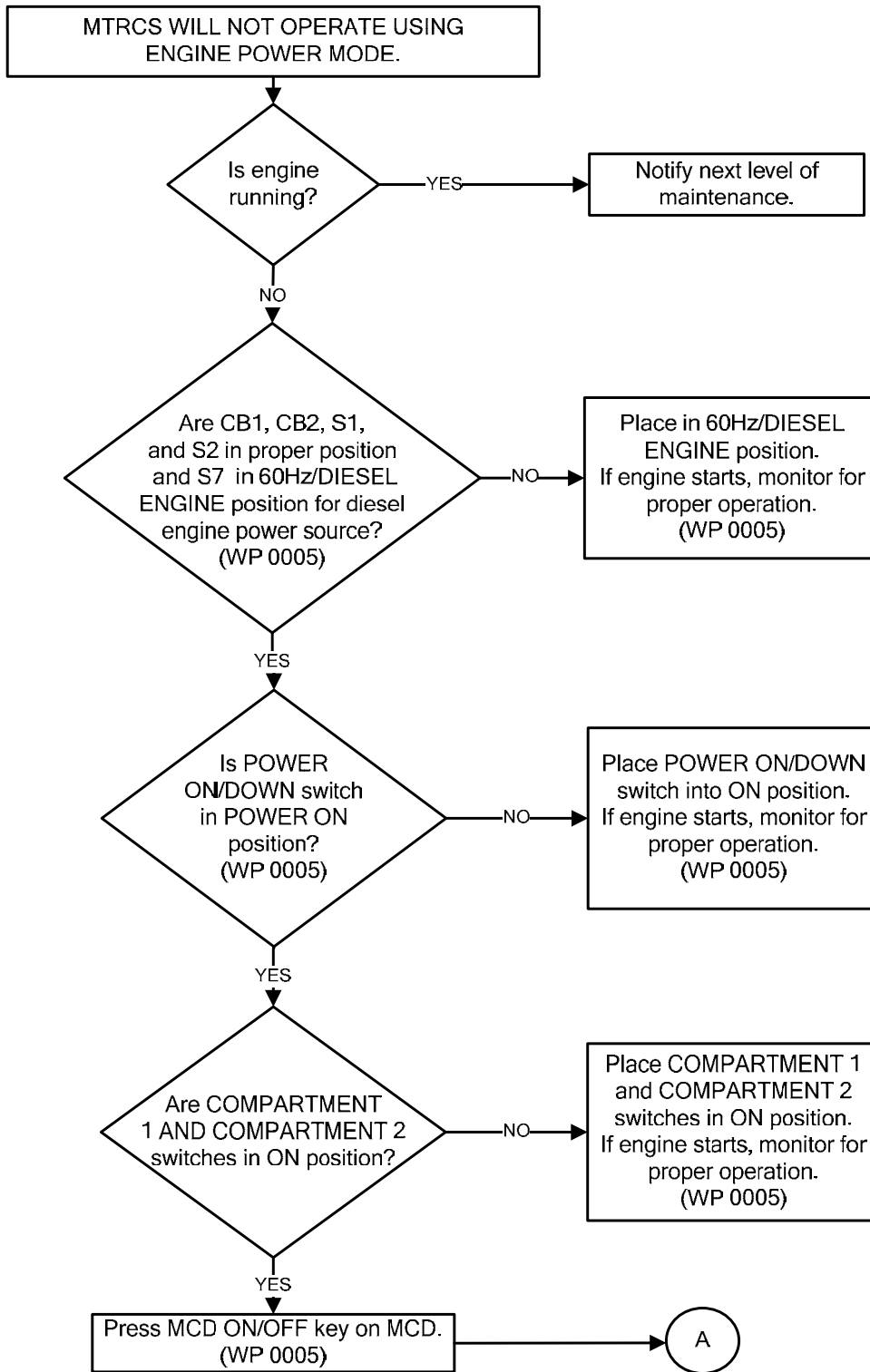


Figure 2. MTRCS Will Not Operate Using Engine Power Mode (Sheet 1 of 2).

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

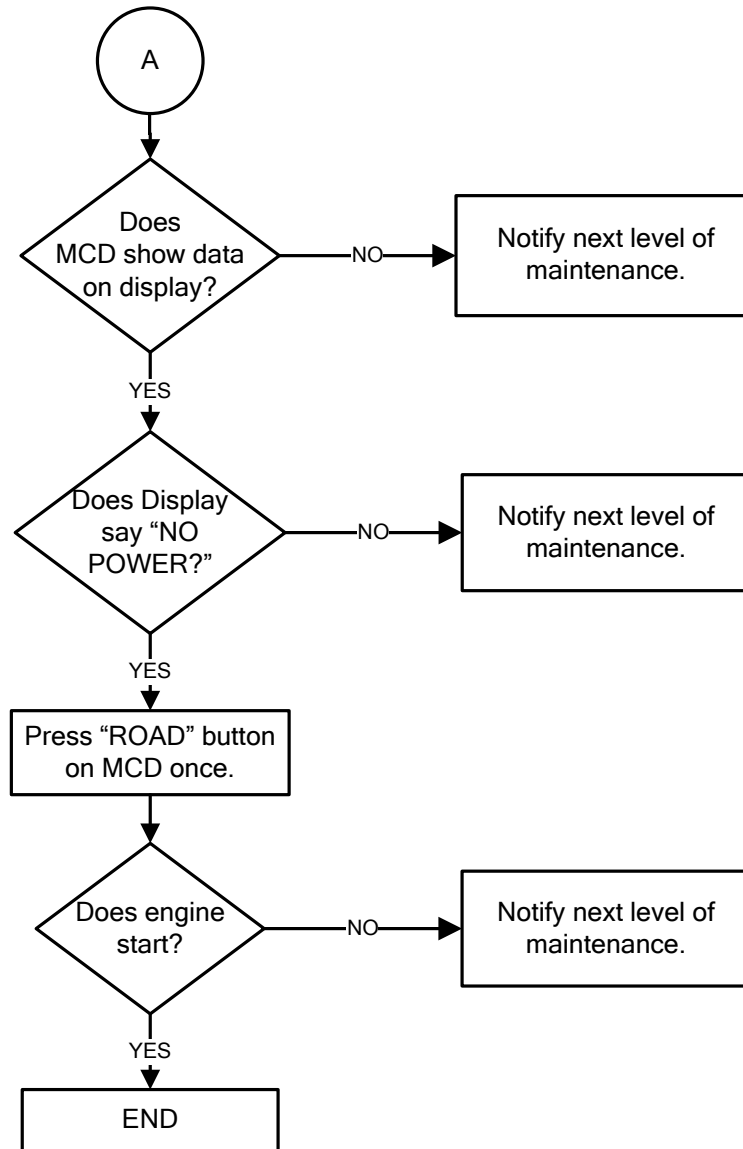


Figure 2. MTRCS Will Not Operate Using Engine Power Mode (Sheet 2 of 2).

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

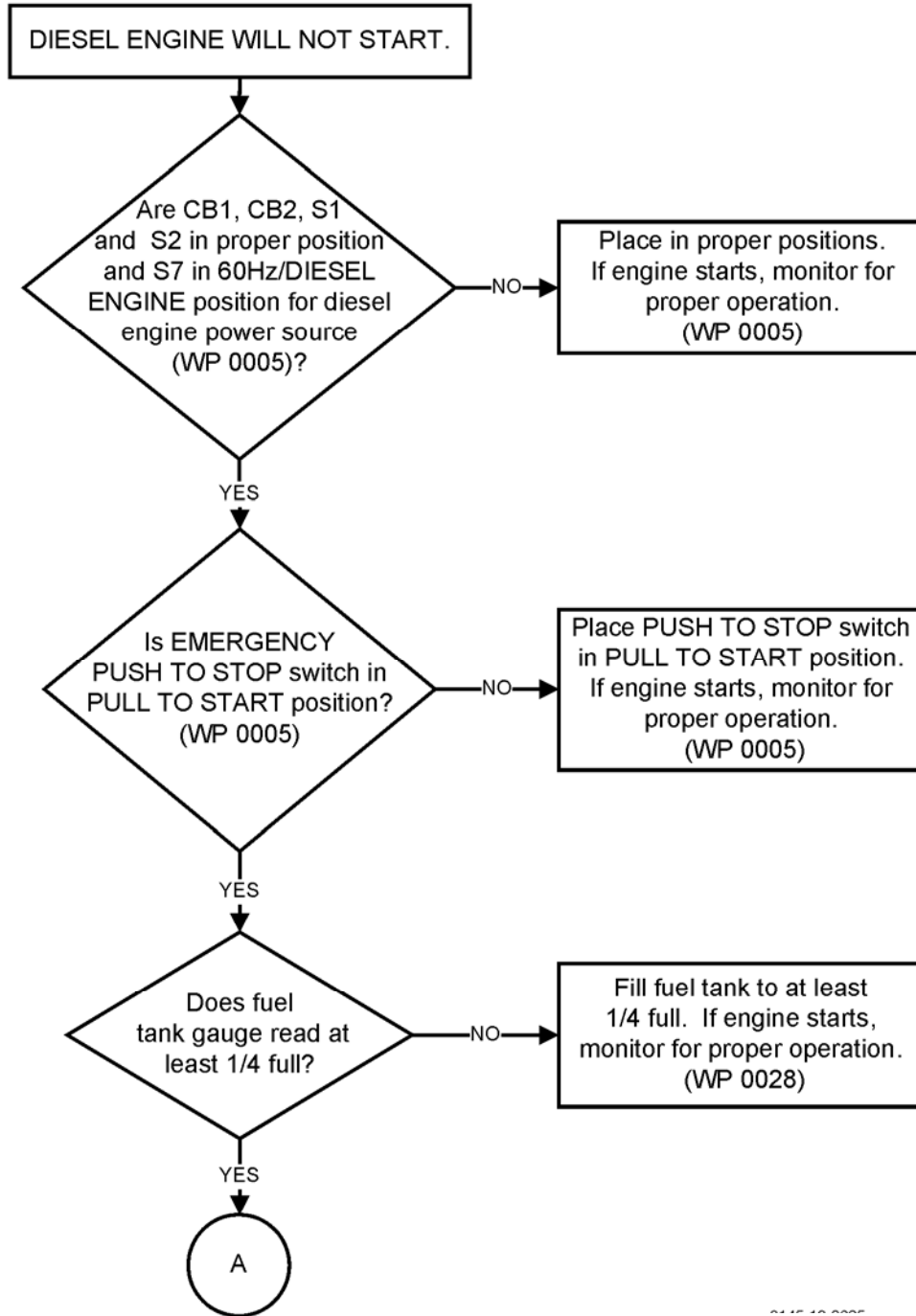


Figure 3. Diesel Engine Will Not Start (Sheet 1 of 2).

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

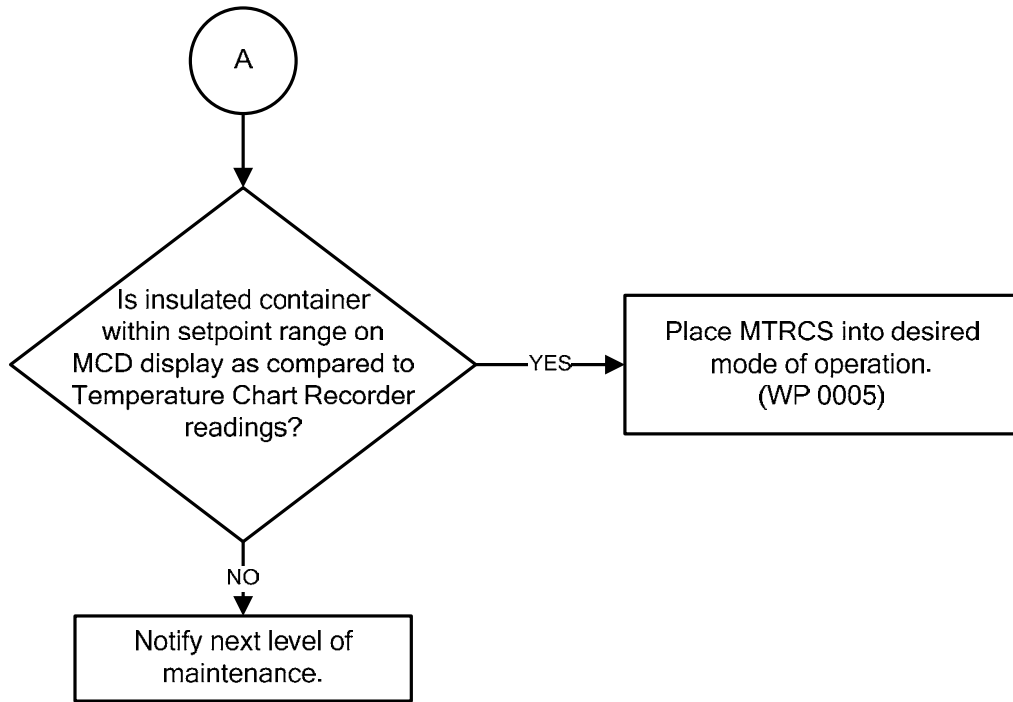


Figure 3. Diesel Engine Will Not Start (Sheet 2 of 2).

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

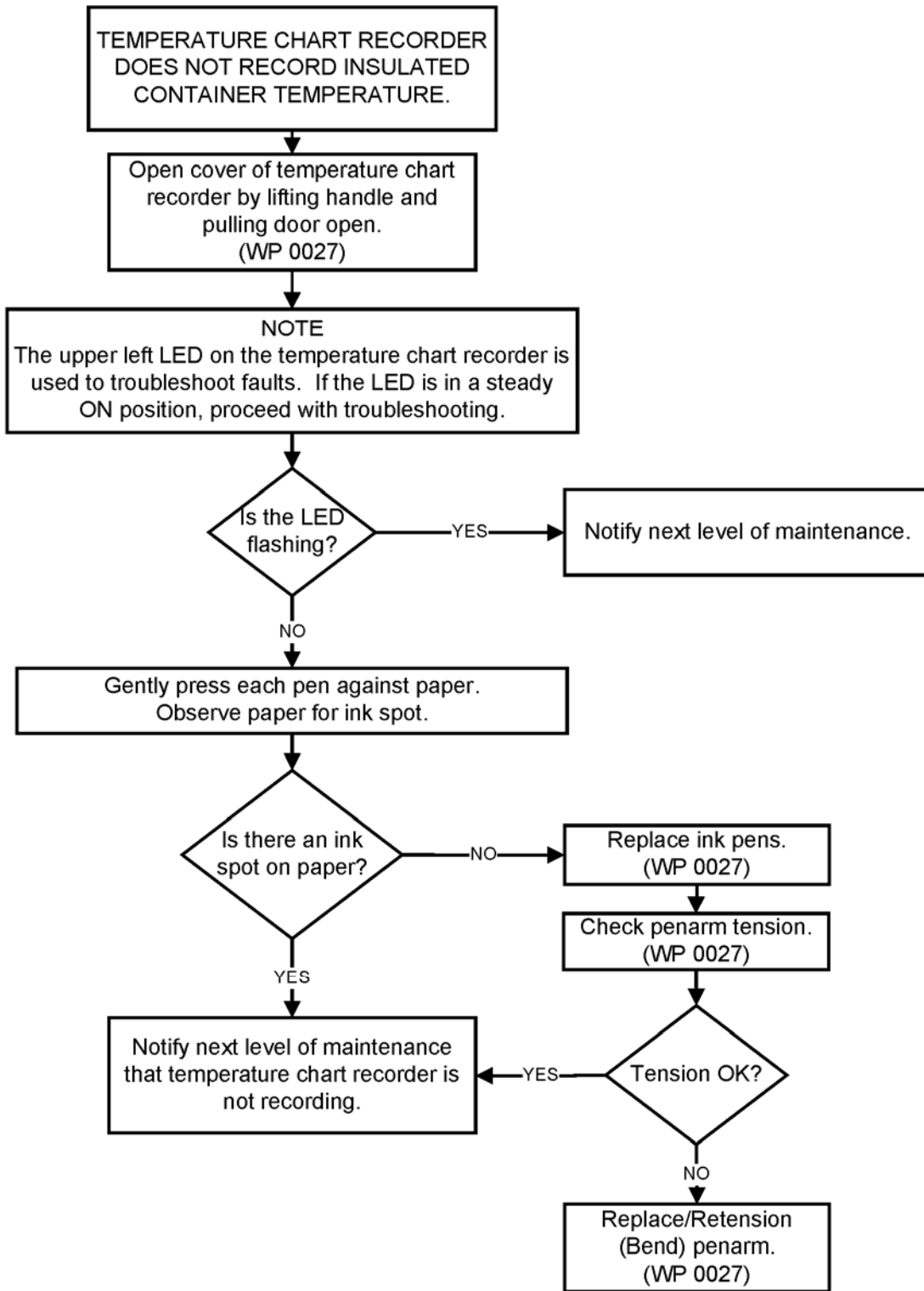


Figure 4. Temperature Chart Recorder Does Not Record Insulated Container Temperature.

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

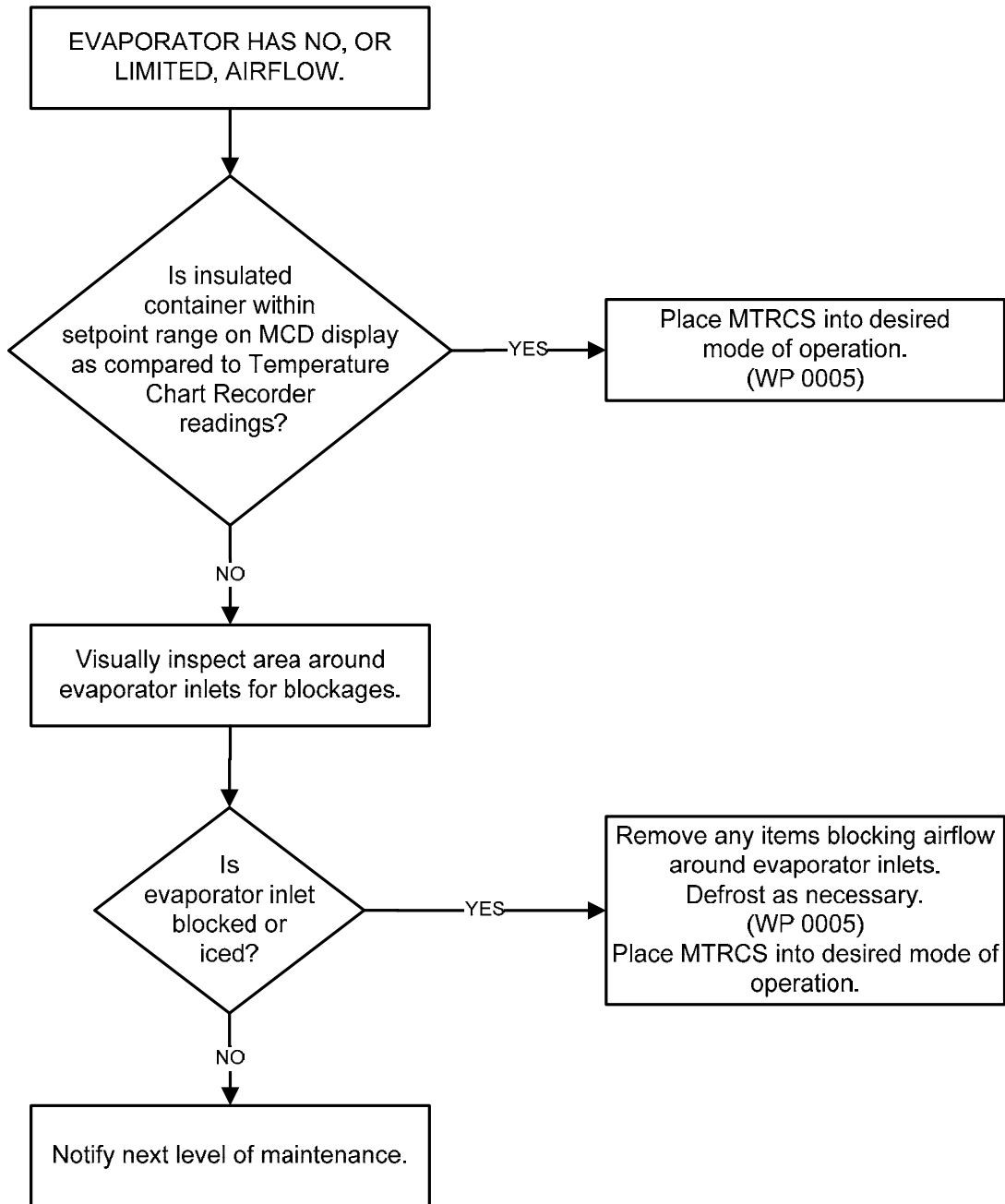


Figure 5. Evaporator Has No, Or Limited, Airflow.

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

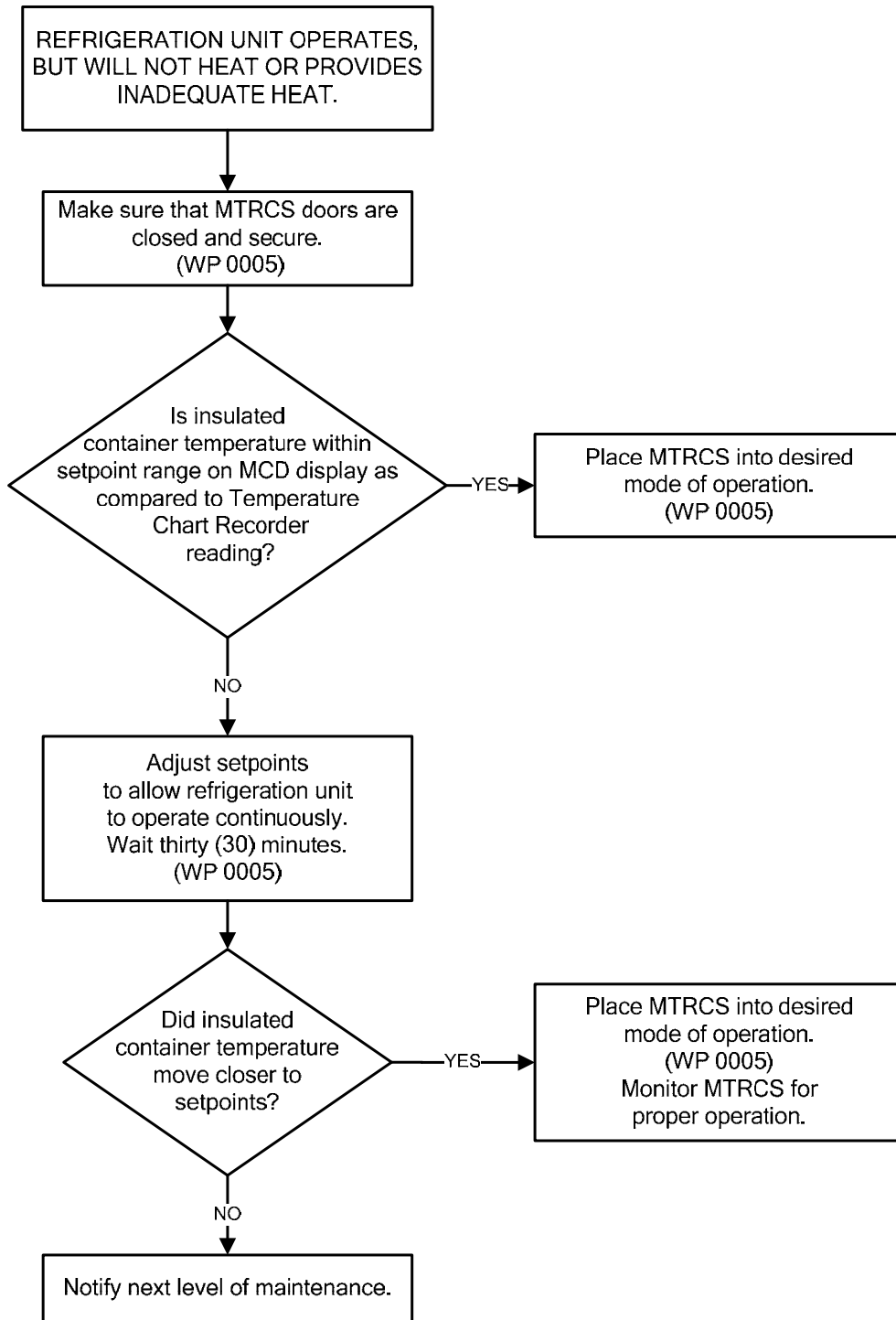


Figure 6. Refrigeration Unit Operates But Will Not Heat or Provides Inadequate Heat.

CREW TROUBLESHOOTING PROCEDURES – CONTINUED

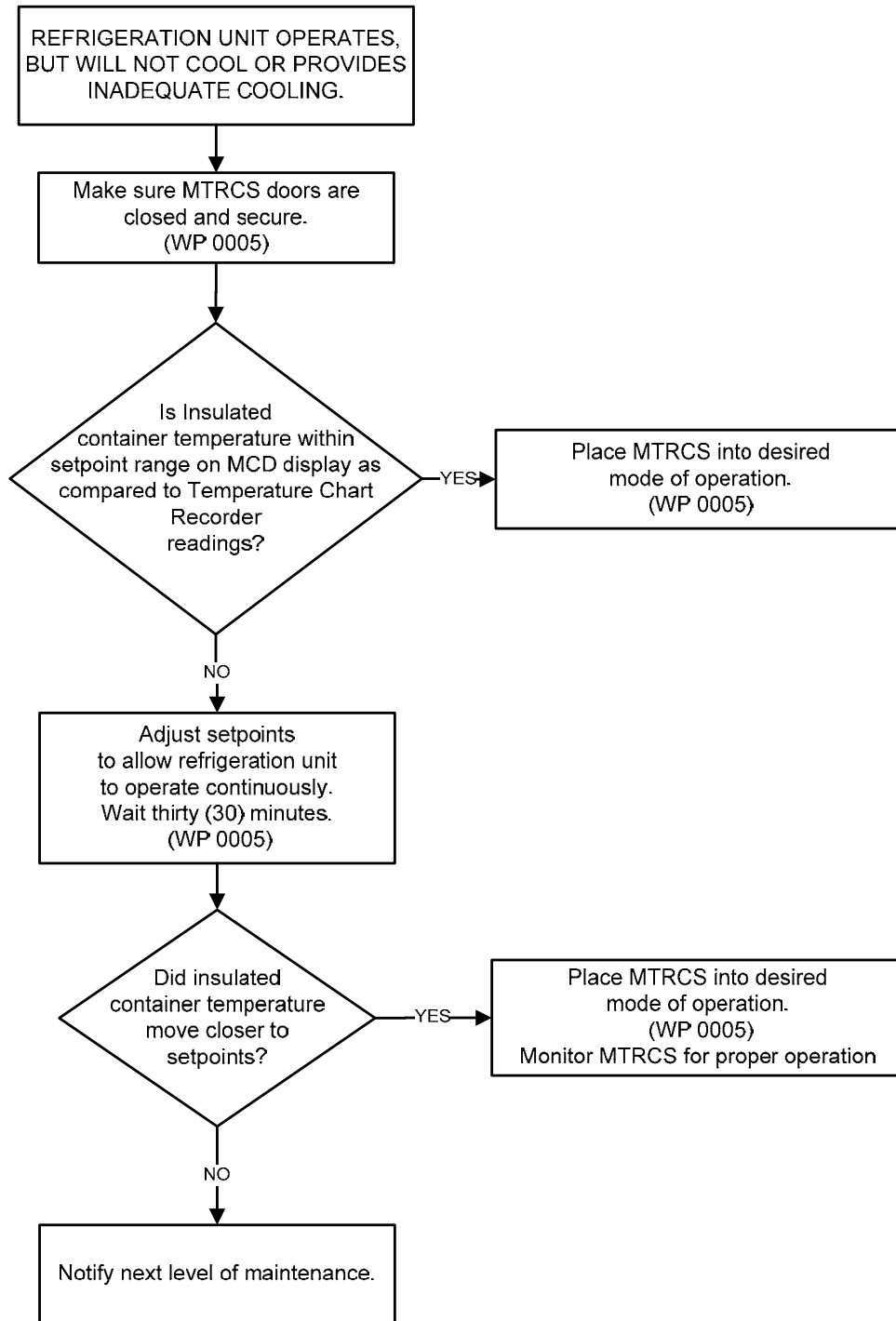


Figure 7. Refrigeration Unit Operates But Will Not Cool or Provides Inadequate Cooling.

END OF WORK PACKAGE

FIELD MAINTENANCE

**MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8)**

INITIAL SETUP:

Tools and Special Tools

Service Refrigeration Ordnance Tool Kit
(WP 0107, Item 6)
Refrigeration Equipment Tool Kit
(WP 0107, Item 7)

Equipment Condition

MTRCS prepared for use (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005	WP 0012	WP 0014
WP 0016	WP 0019	WP 0030
WP 0031	WP 0032	WP 0035
WP 0037	WP 0039	WP 0040
WP 0041	WP 0042	WP 0043
WP 0044	WP 0045	WP 0046
WP 0047	WP 0048	WP 0049
WP 0050	WP 0051	WP 0052
WP 0053	WP 0054	WP 0055
WP 0057	WP 0058	WP 0074
WP 0076	WP 0077	WP 0086
WP 0087	WP 0091	WP 0092
WP 0098	WP 0103	

INTRODUCTION

This Work Package contains troubleshooting procedures for the engine, including fault codes AL0 – AL 3, and AL8. A troubleshooting index is contained in WP 0012.

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8)**

Microprocessor Control Box Component Identification

Table 1 and Figures 1, 2, and 3 provides identification and location information for all components contained within the microprocessor control box.

Table 1. Microprocessor Control Box Component Identification.

Figure	Item	Component	MPC Box Location	Nomenclature
1	1	Fuse	Back Wall	F11-4A
1	2	Fuse	Back Wall	F2-5A
1	3	Fuse	Back Wall	F3-25A
1	4	Fuse	Back Wall	F4-15A
1	5	Fuse	Back Wall	F5-7.5A
1	6	Fuse	Back Wall	F7-10A
1	7	Fuse	Back Wall	F8-10A
1	8	Relay	Back Wall	Run Control Relay (RCR)
1	9	Relay	Back Wall	Speed Relay (SR)
1	10	Relay	Back Wall	Defrost Relay Compartment 1 (1DR)
1	11	Relay	Back Wall	Run Relay Compartment 1 (1RR)
1	12	Relay	Back Wall	Cool Relay Compartment 1 (1CR)
1	13	Relay	Back Wall	Hot Gas Relay Compartment 1 (1HGR)
1	14	Relay	Back Wall	Glow Plug Relay (GPR)
1	15	Relay	Back Wall	Diesel Electric Relay (DER)
1	16	Relay	Back Wall	Defrost Relay Compartment 2 (2DR)
1	17	Relay	Back Wall	Run Relay Compartment 2 (2RR)
1	18	Relay	Back Wall	Cool Relay Compartment 2 (2CR)
1	19	Relay	Back Wall	Hot Gas Relay Compartment 2 (2HGR)
1	20	Relay	Back Wall	Starter Solenoid Relay (SSR)
1	21	Relay	Back Wall	Main Heat Relay (MHR)
1	22	Diode Block	Back Wall	Diode Block 1 (DB1)
1	23	Diode Block	Back Wall	Diode Block 2 (DB2)
1	24	Diode Block	Back Wall	Diode Block 3 (DB3)
1	25	Relay	Back Wall	Run Relay (RR)
1	26	Relay	Back Wall	Run Control Relay (RCR1)
1	27	Protector	Back Wall	Overload Protector (OP)
1	28	Relay	Bottom	Capacitor Alternator Relay (CAR)

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

Table 1. Microprocessor Control Box Component Identification – Continued.

Figure	Item	Component	MPC Box Location	Nomenclature
1	29	Buzzer	Bottom	Buzzer (B)
1	30	Capacitor	Bottom	C4
1	31	Capacitor	Bottom	C5
2	1	Relay	Forward Wall	Defrost Compartment Relay (DCR)
2	2	Detector	Forward Wall	Detector Power Supply (DPS)
2	3	Shunt	Door	Shunt (SH)
2	4	Relay	Door	Flash Relay (FLR)
2	5	Switch	Door	Run-stop Switch (RS)
2	6	Junction Block	Door	Junction Block
2	7	Relay	Door	Electric Heat Relay (Compartment 1)
2	8	Relay	Door	Electric Heat Relay (Compartment 2)
2	9	Relay	Door	Unloader Front Relay (UFR1)
2	10	Relay	Door	Unloader Front Relay (UFR2)
2	11	Board	Door	Microprocessor Board (MP)
2	12	Connector	Door	P1 L-Y Connector
2	13	Connector	Door	P1 A-K Connector
3	1	Resistor	Aft Wall	Resistor (R)
3	2	Fuse	Aft Wall	F1-80A

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

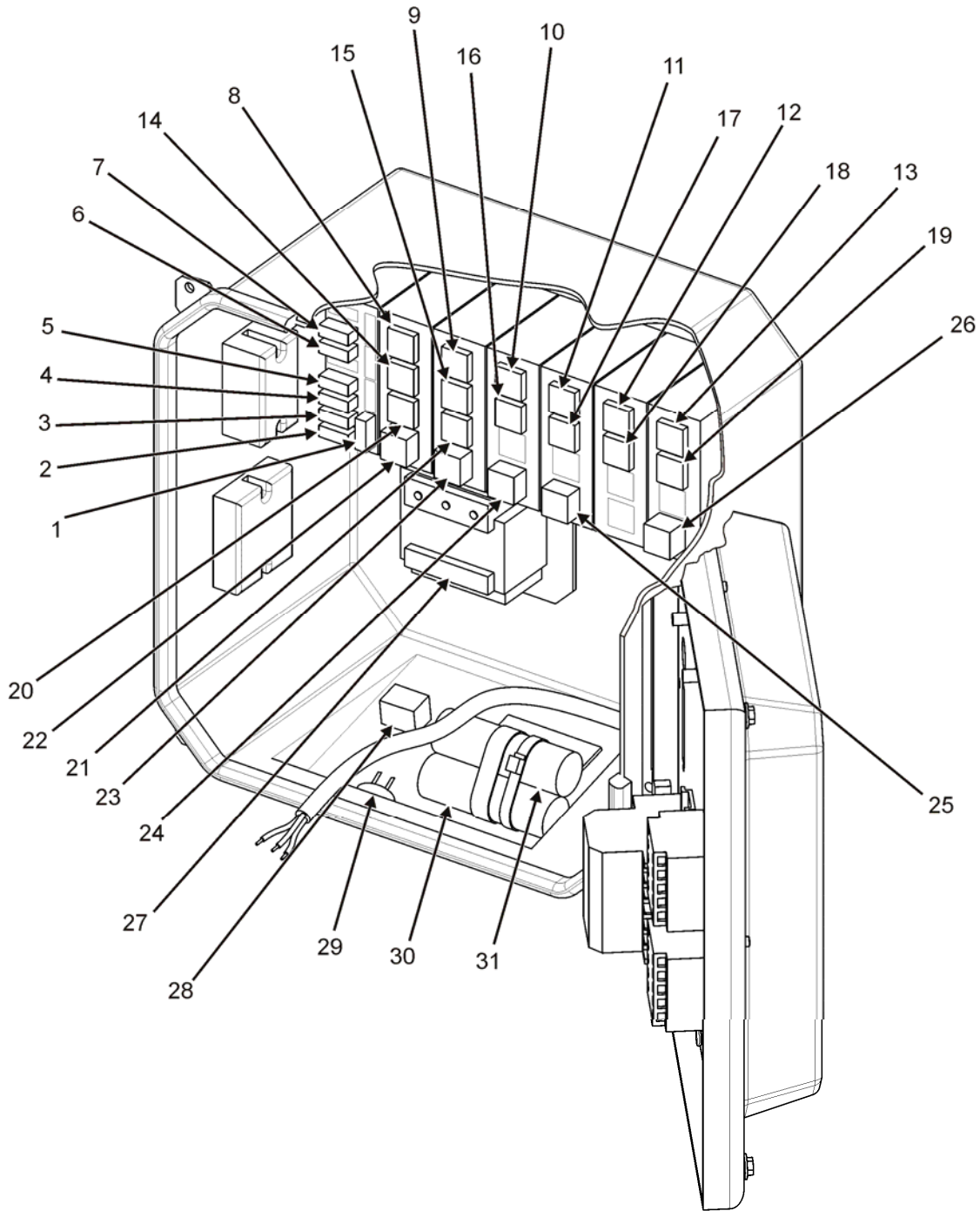


Figure 1. Microprocessor Control Box Back Wall and Bottom.

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

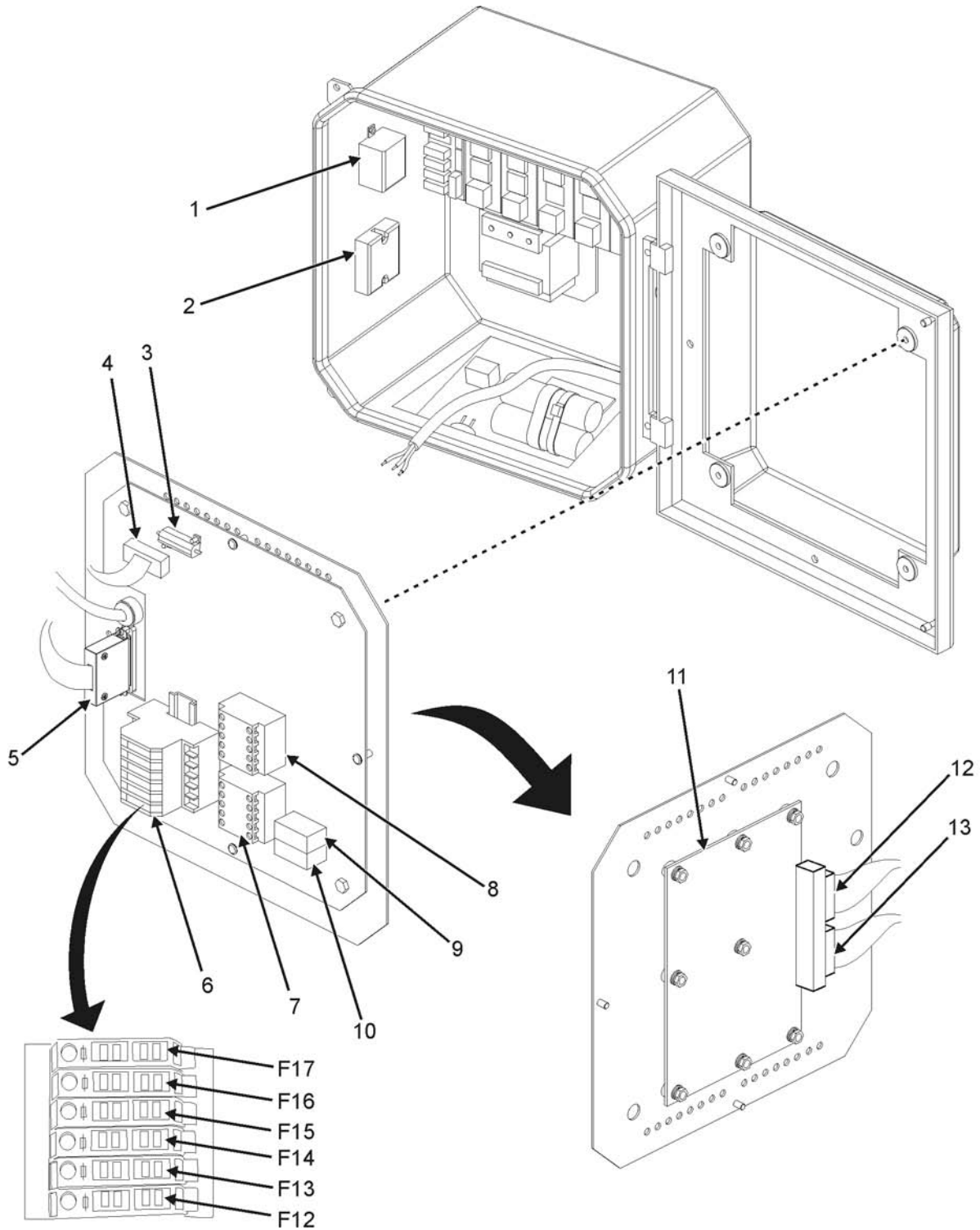


Figure 2. Microprocessor Control Box Door and Forward Wall.

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

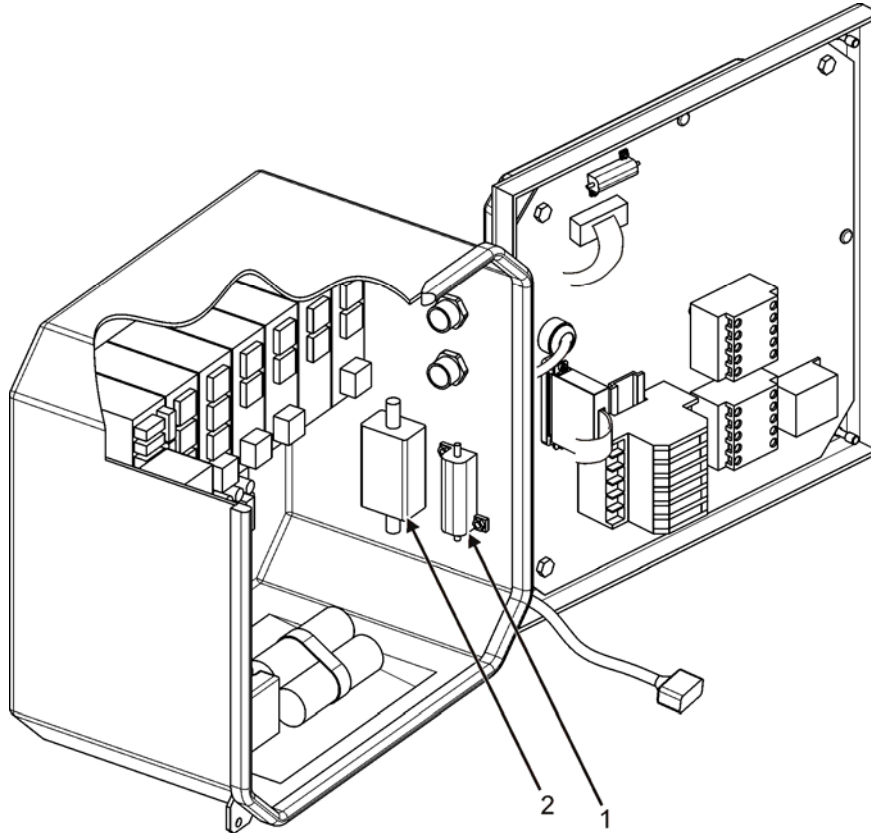


Figure 3. Microprocessor Control Box Aft Wall.

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

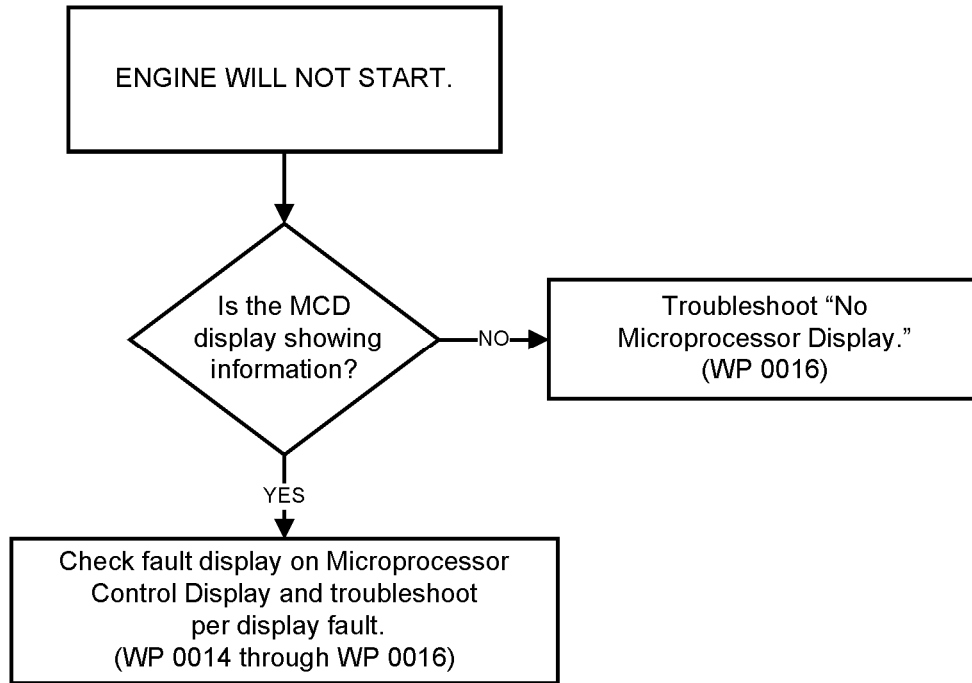


Figure 4. Engine Will Not Start.

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

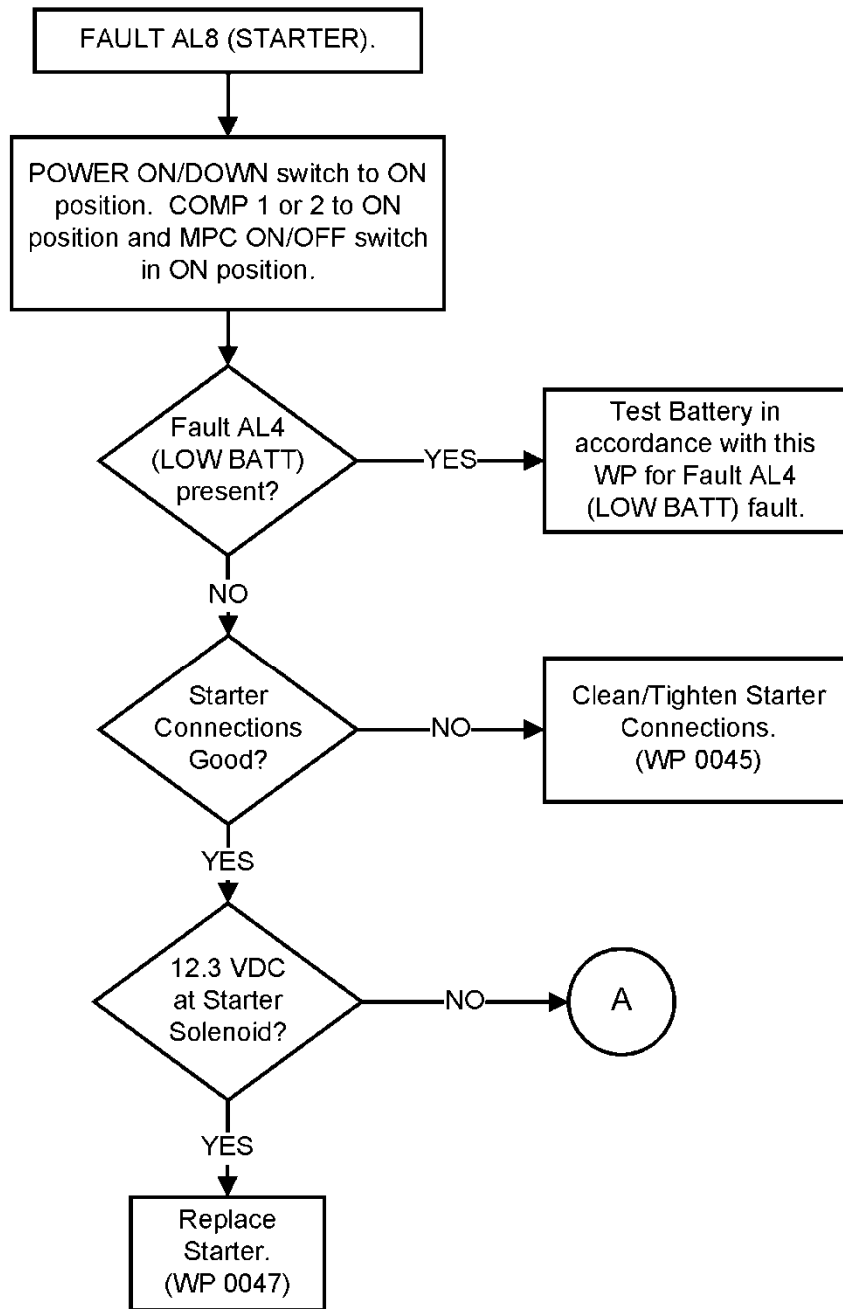


Figure 5. Fault AL8 (STARTER) (Sheet 1 of 2).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

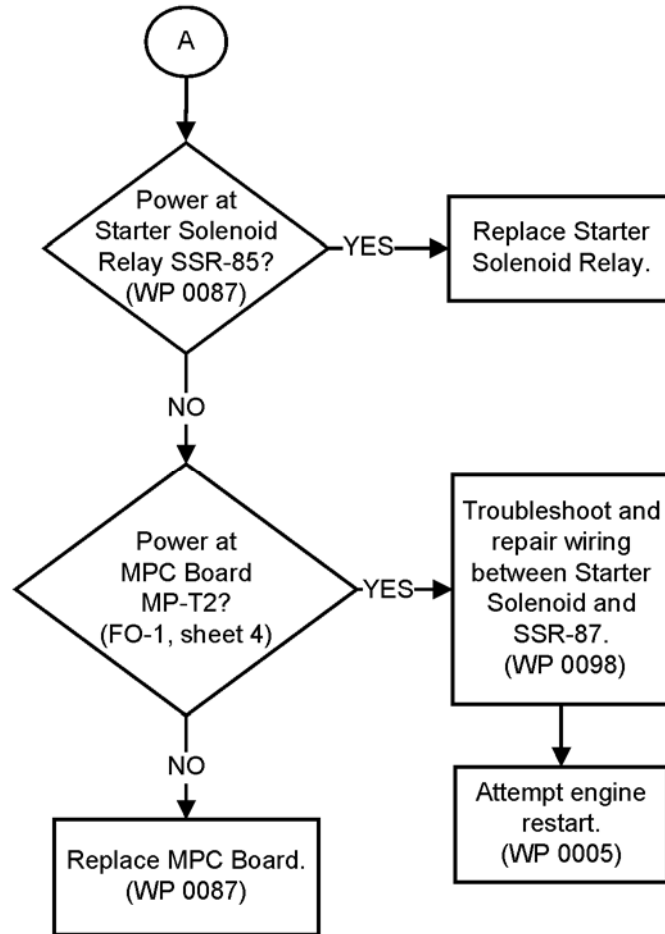


Figure 5. Fault AL8 (STARTER) (Sheet 2 of 2).

END OF TASK

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED

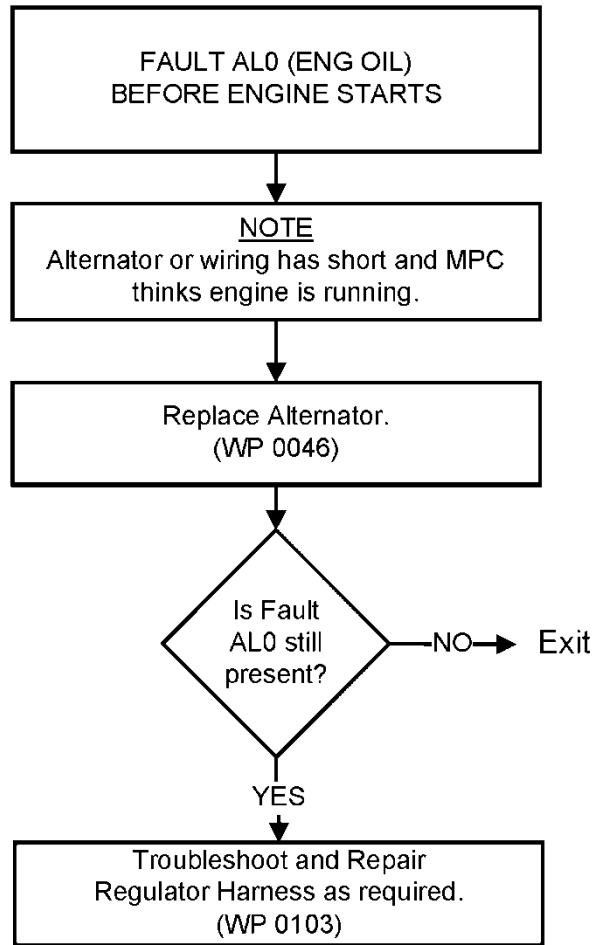


Figure 6. Fault AL0 (ENG OIL) (Sheet 1 of 2).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

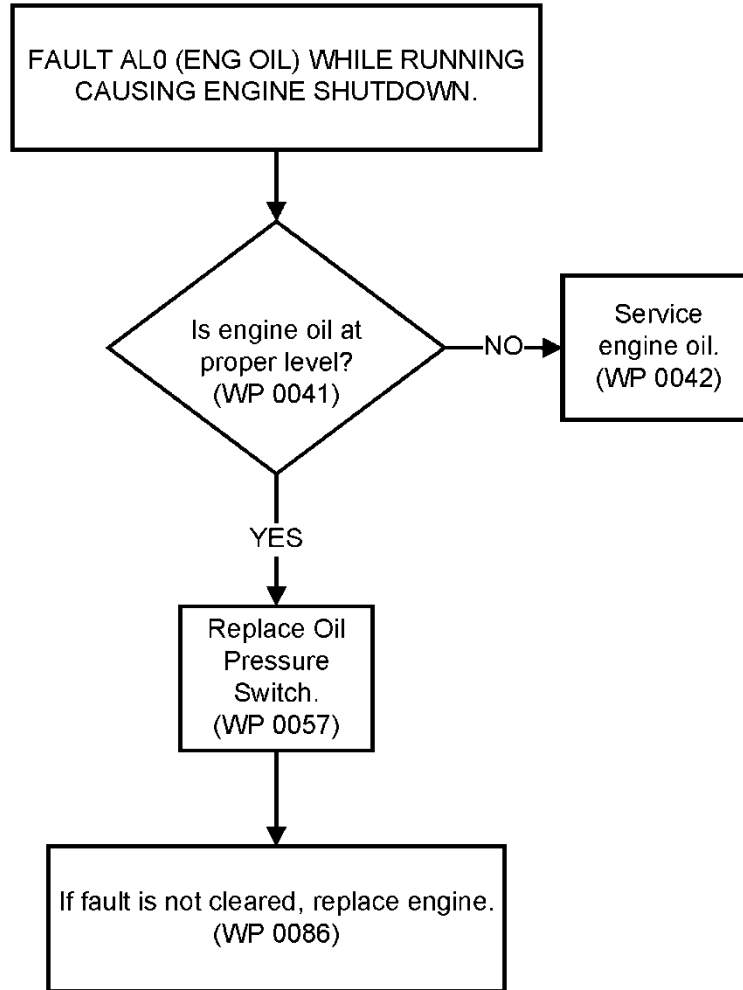


Figure 6. Fault AL0 (ENG OIL) (Sheet 2 of 2).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

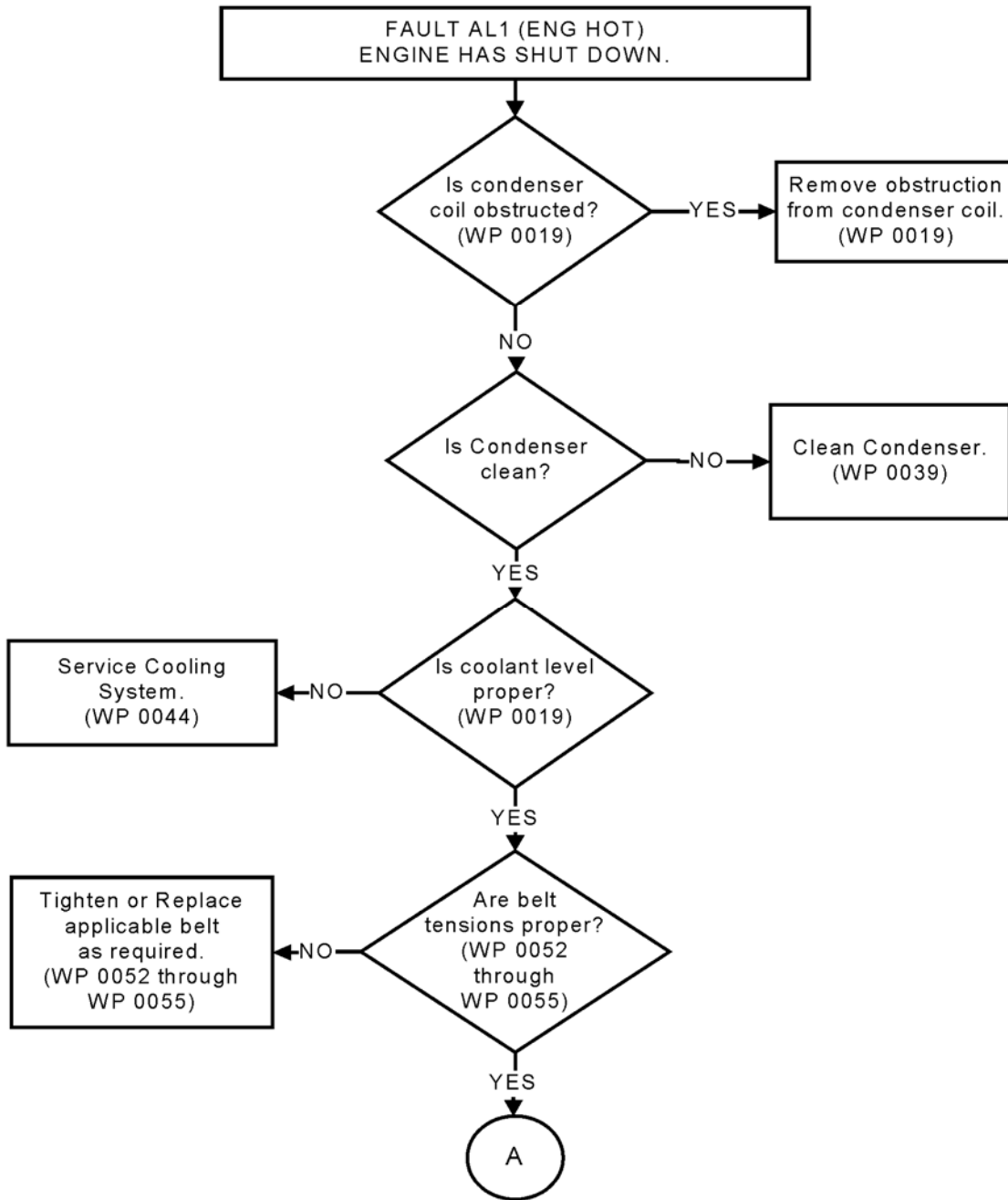


Figure 7. Fault AL1 (ENG HOT) (Sheet 1 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

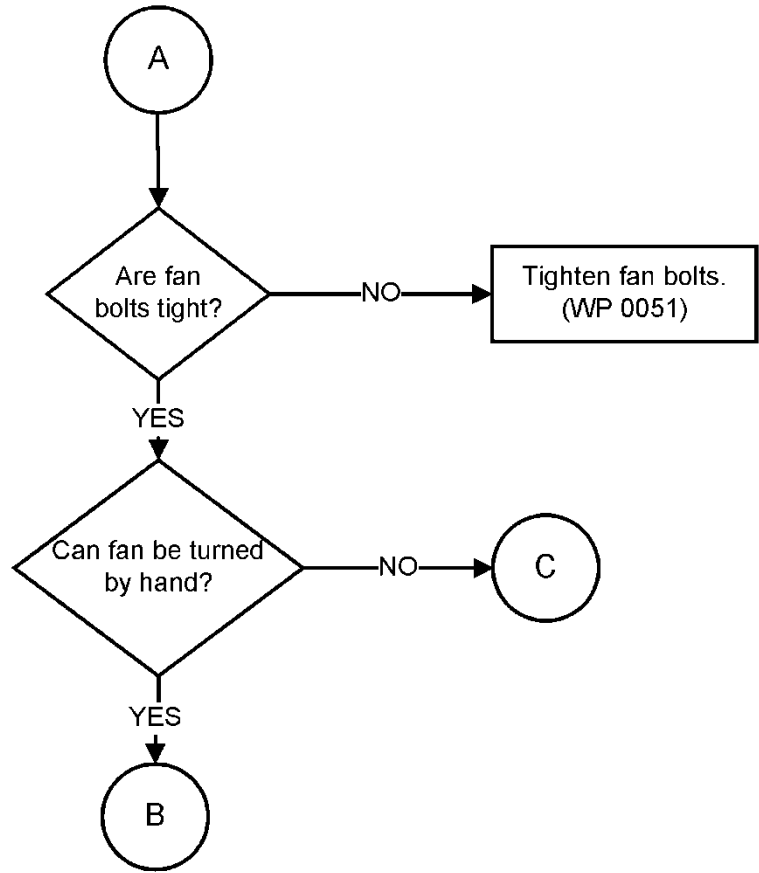


Figure 7. Fault AL1 (ENG HOT) (Sheet 2 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED

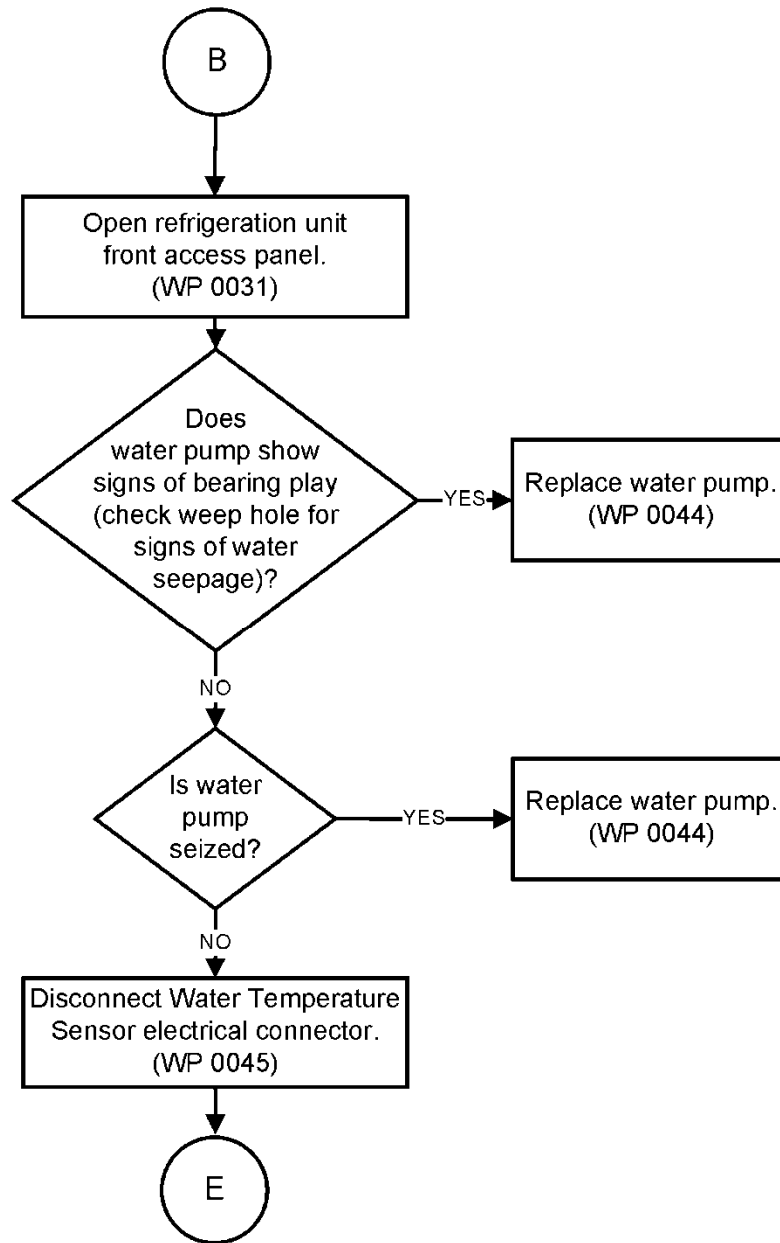


Figure 7. Fault AL1 (ENG HOT) (Sheet 3 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

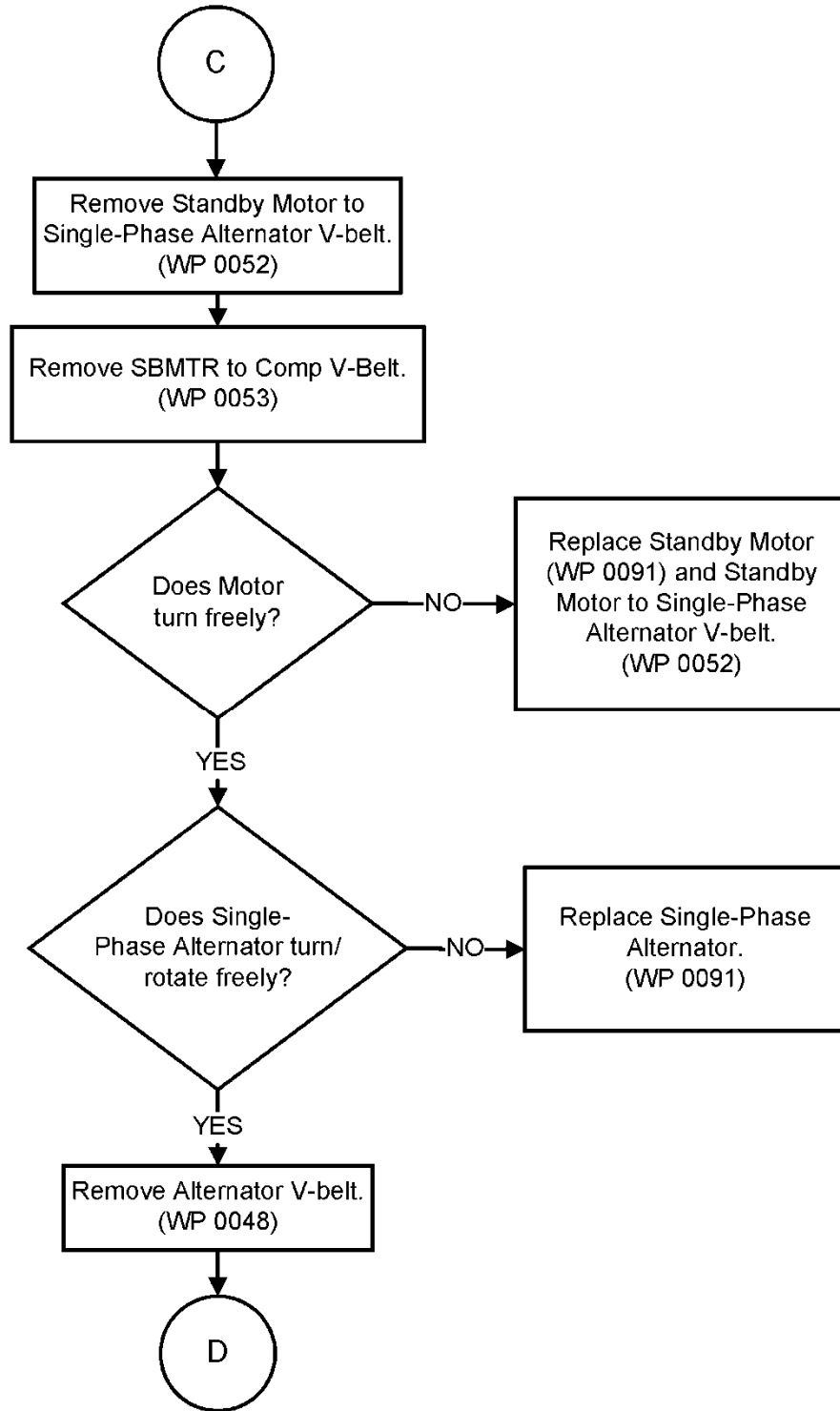


Figure 7. Fault AL1 (ENG HOT) (Sheet 4 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

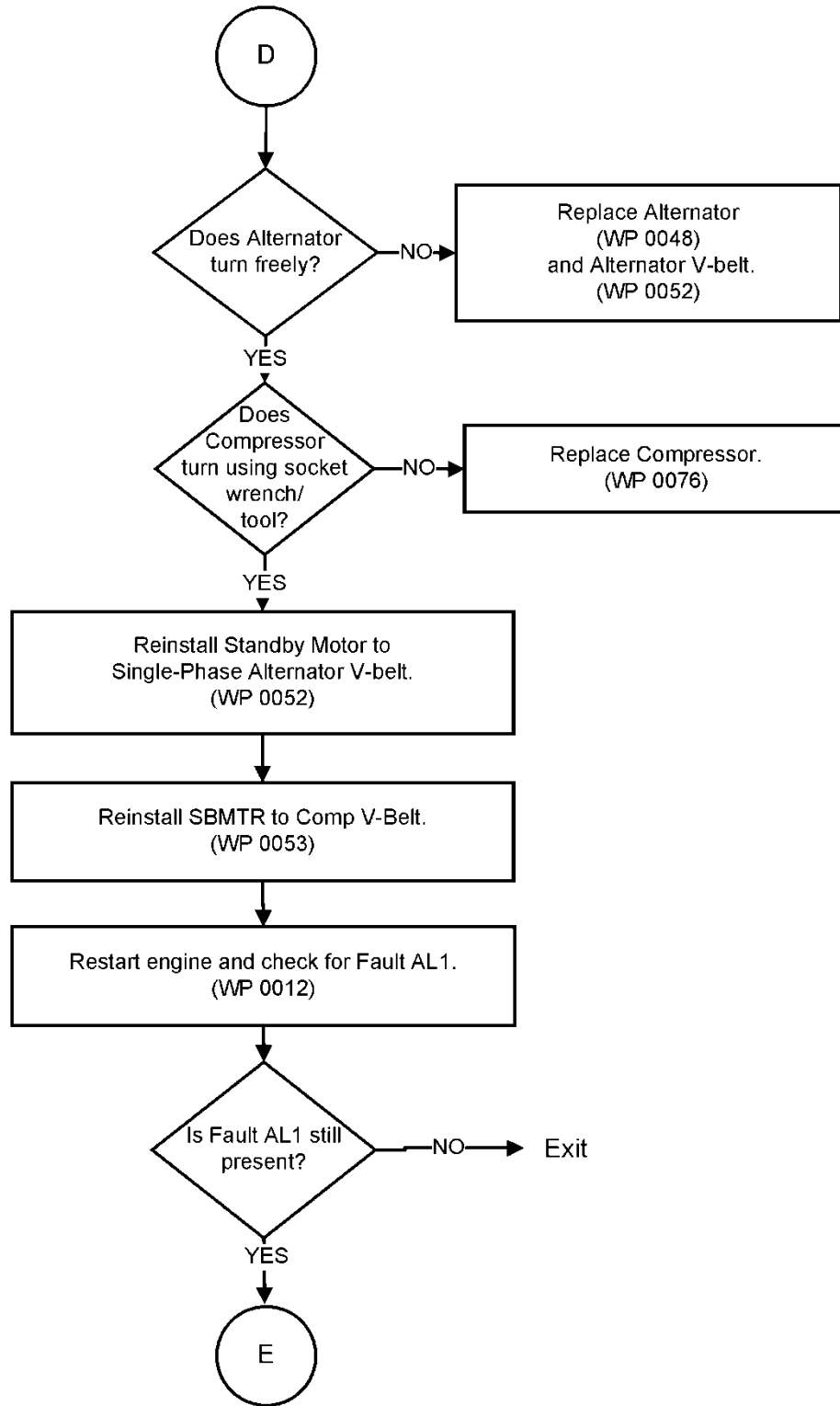


Figure 7. Fault AL1 (ENG HOT) (Sheet 5 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

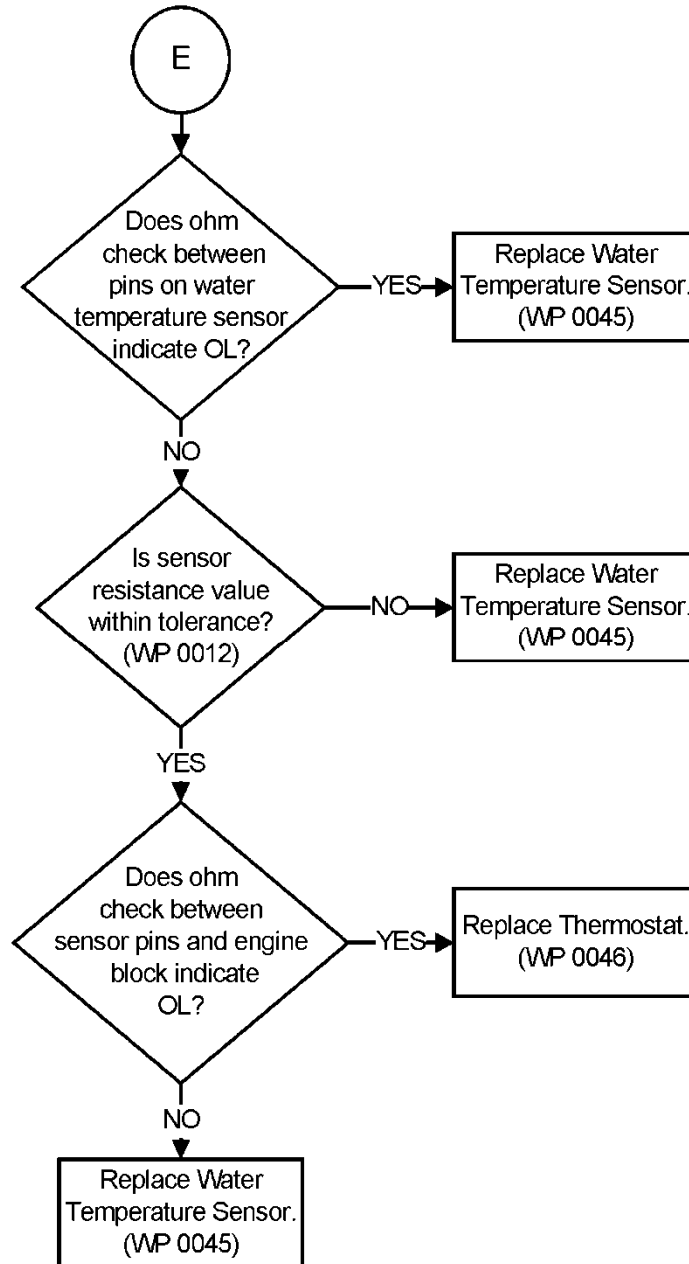


Figure 7. Fault AL1 (ENG HOT) (Sheet 6 of 6).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

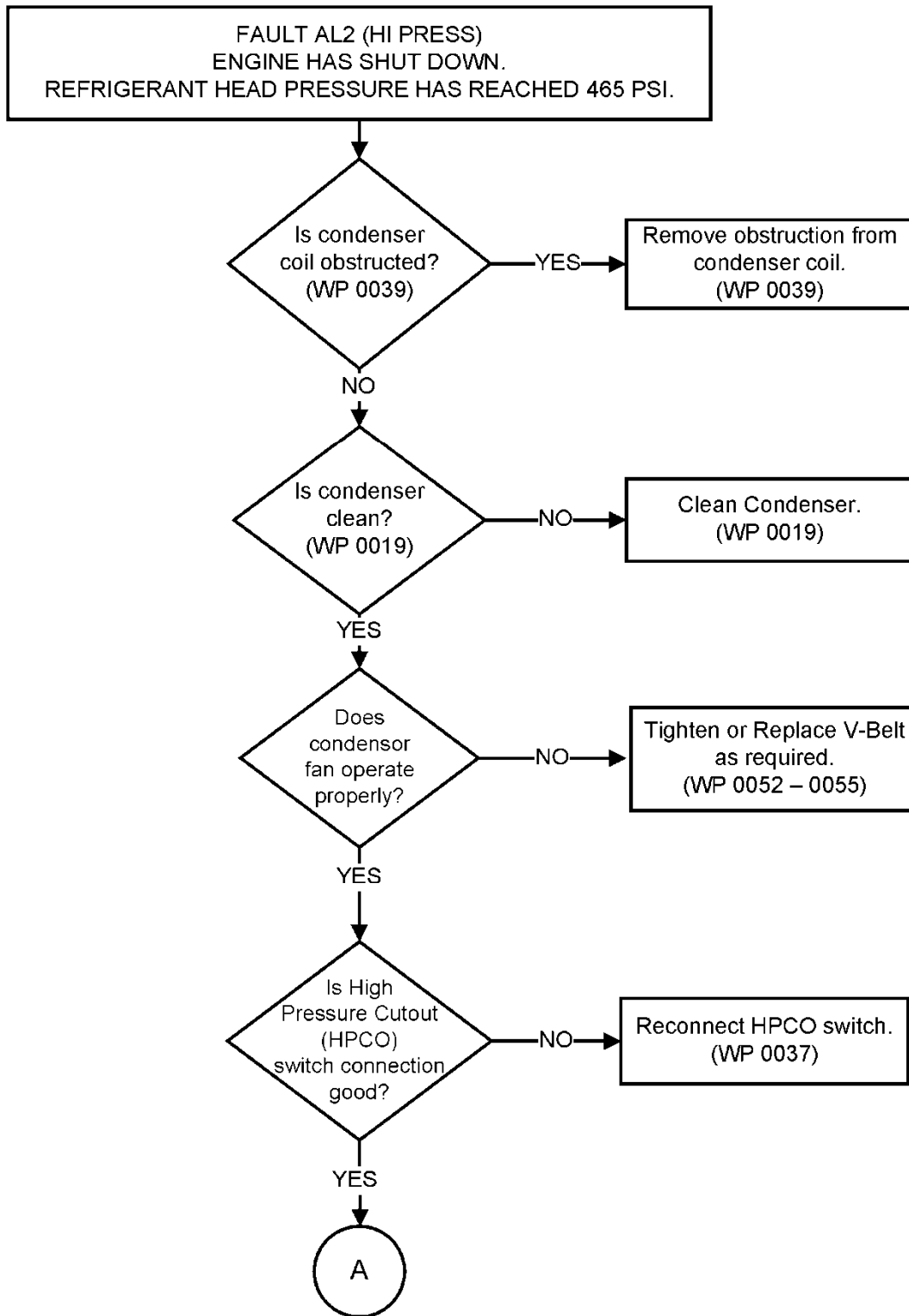


Figure 8. Fault AL2 (HI PRESS) (Sheet 1 of 3).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

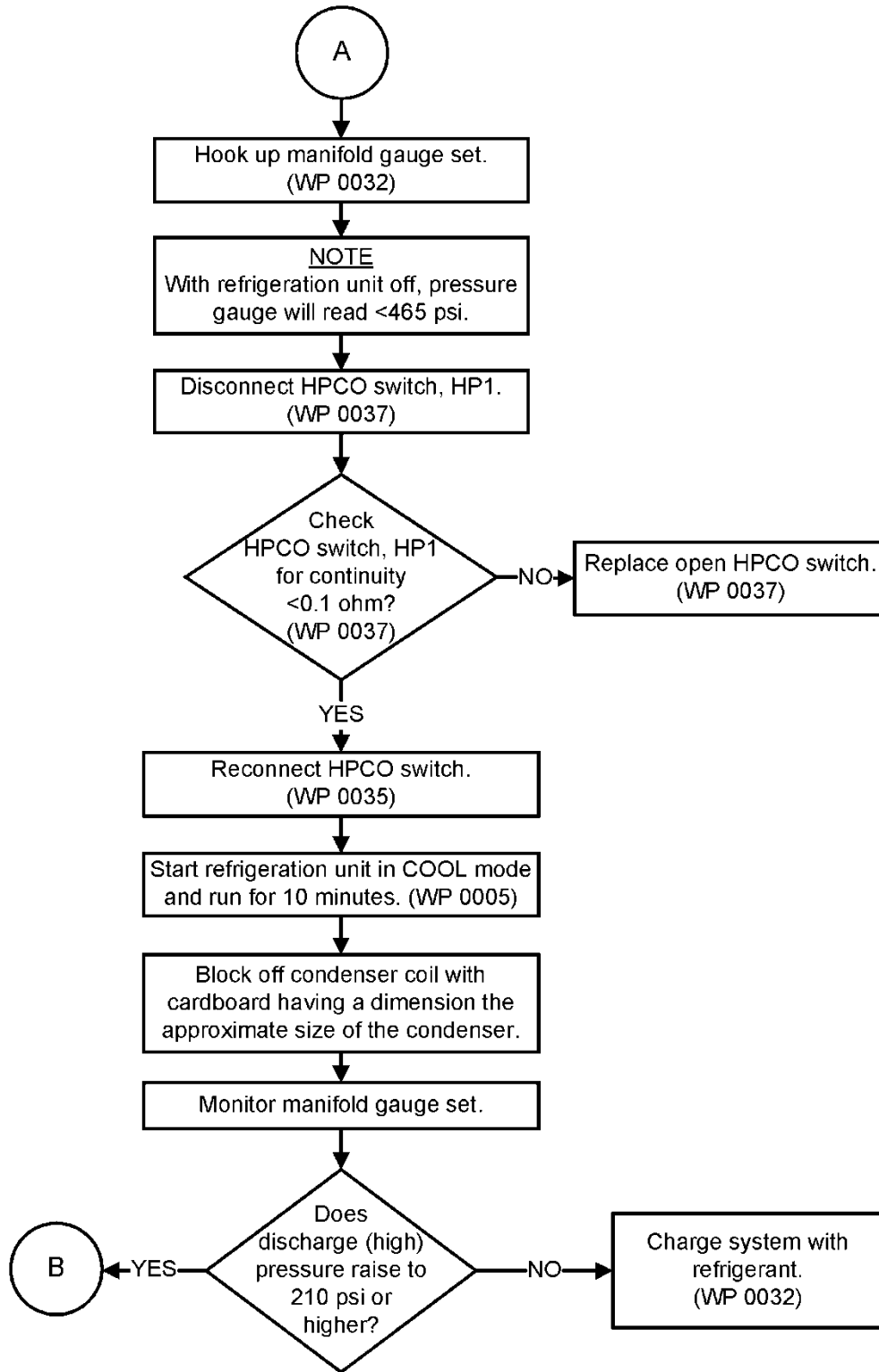


Figure 8. Fault AL2 (HI PRESS) (Sheet 2 of 3).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

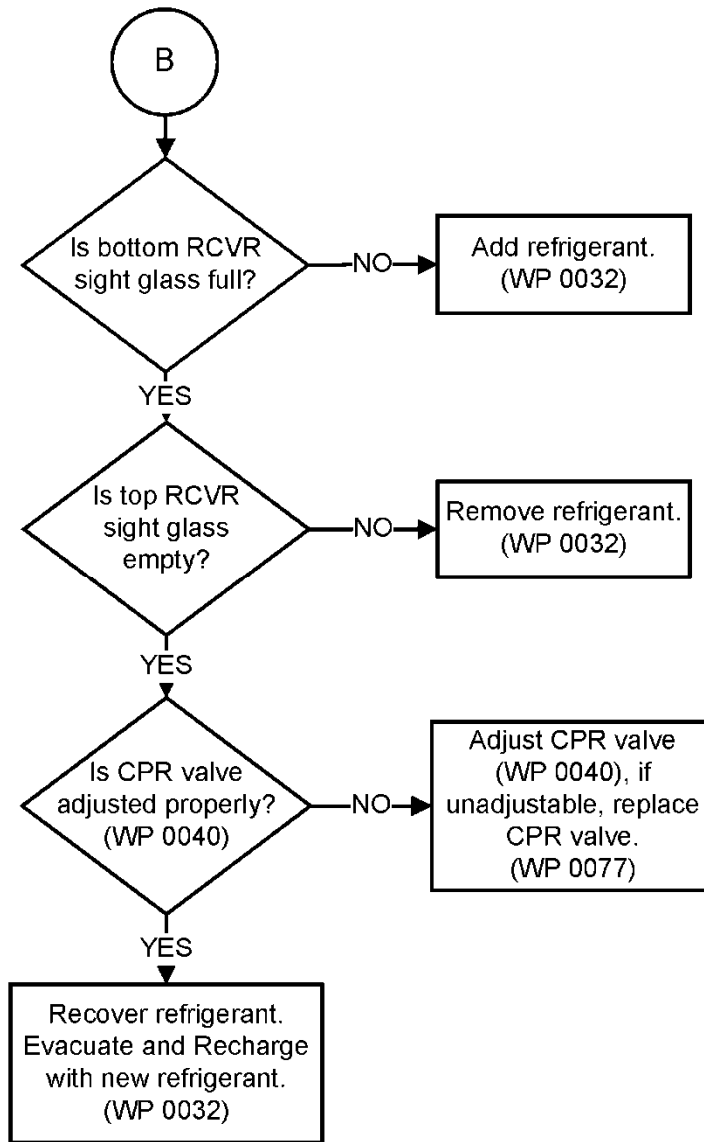


Figure 8. Fault AL2 (HI PRESS) (Sheet 3 of 3).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

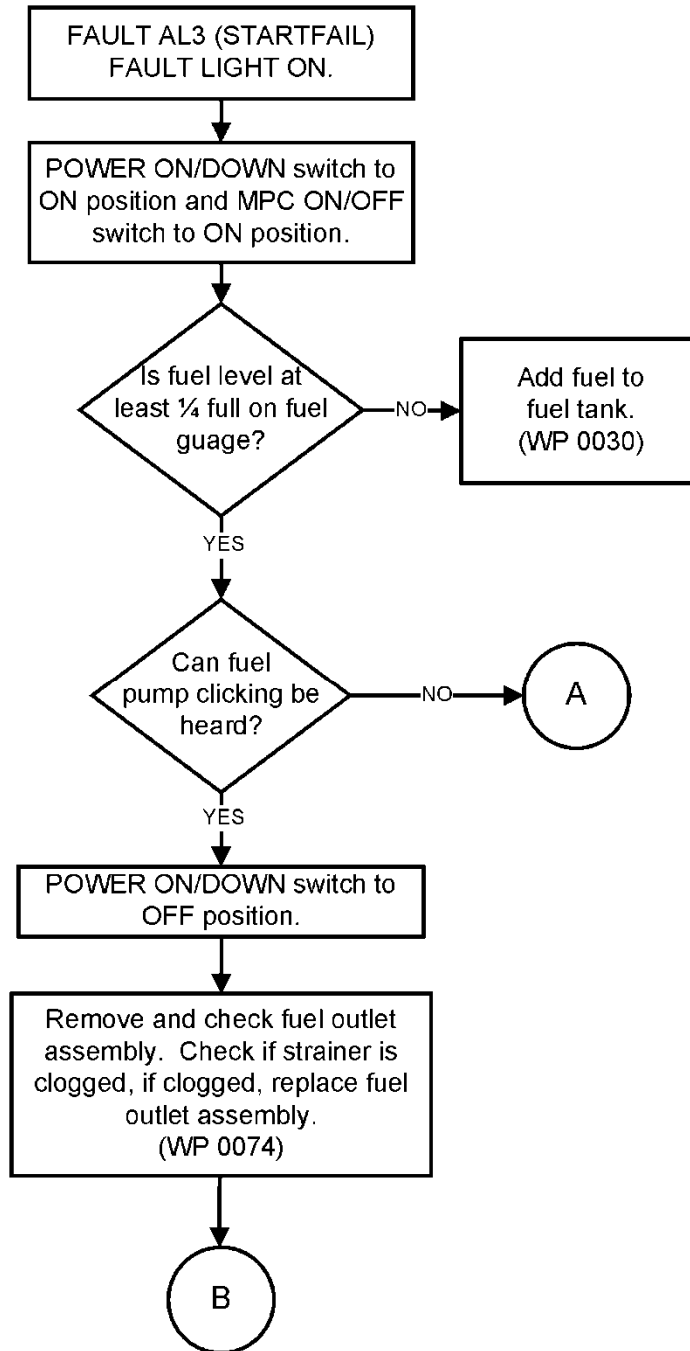


Figure 9. Fault AL3 (STARTFAIL) (Sheet 1 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

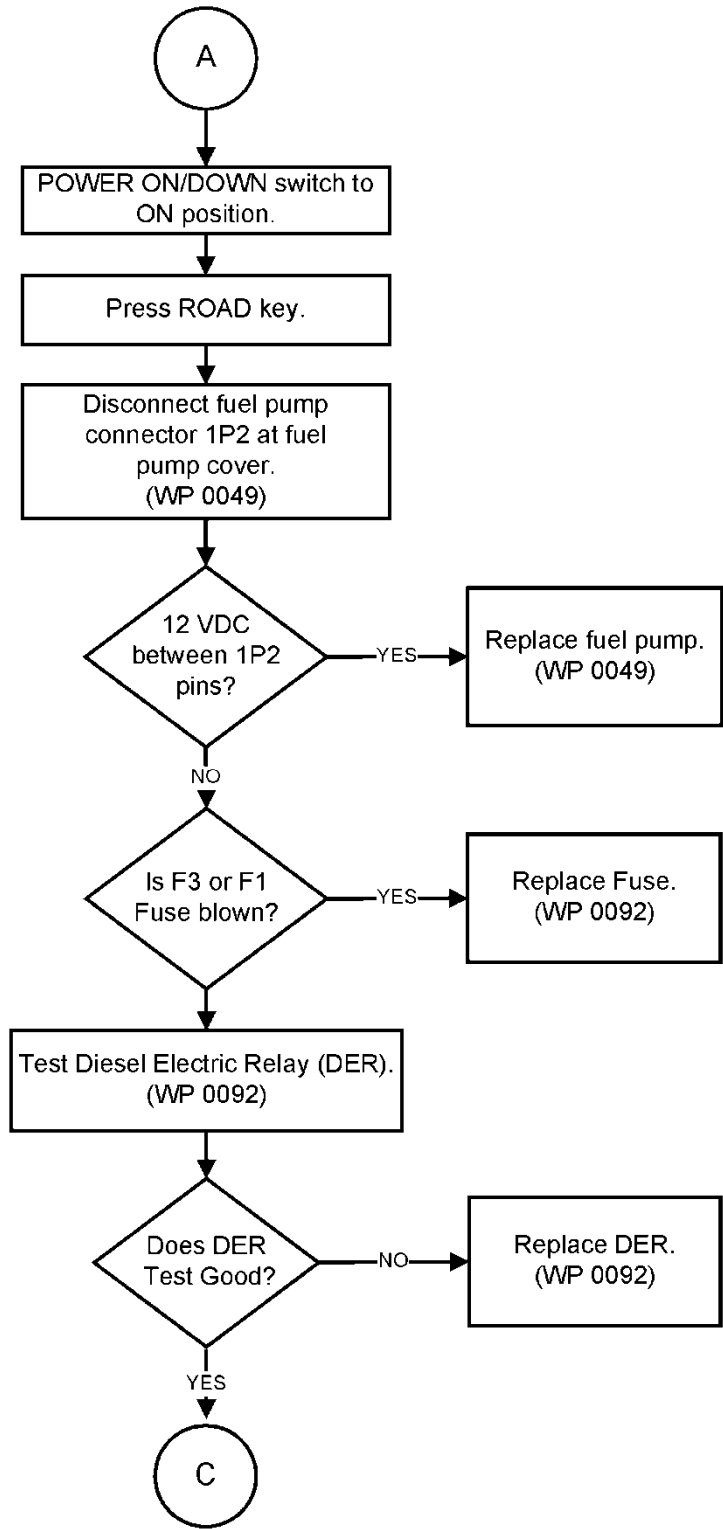


Figure 9. Fault AL3 (STARTFAIL) (Sheet 2 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

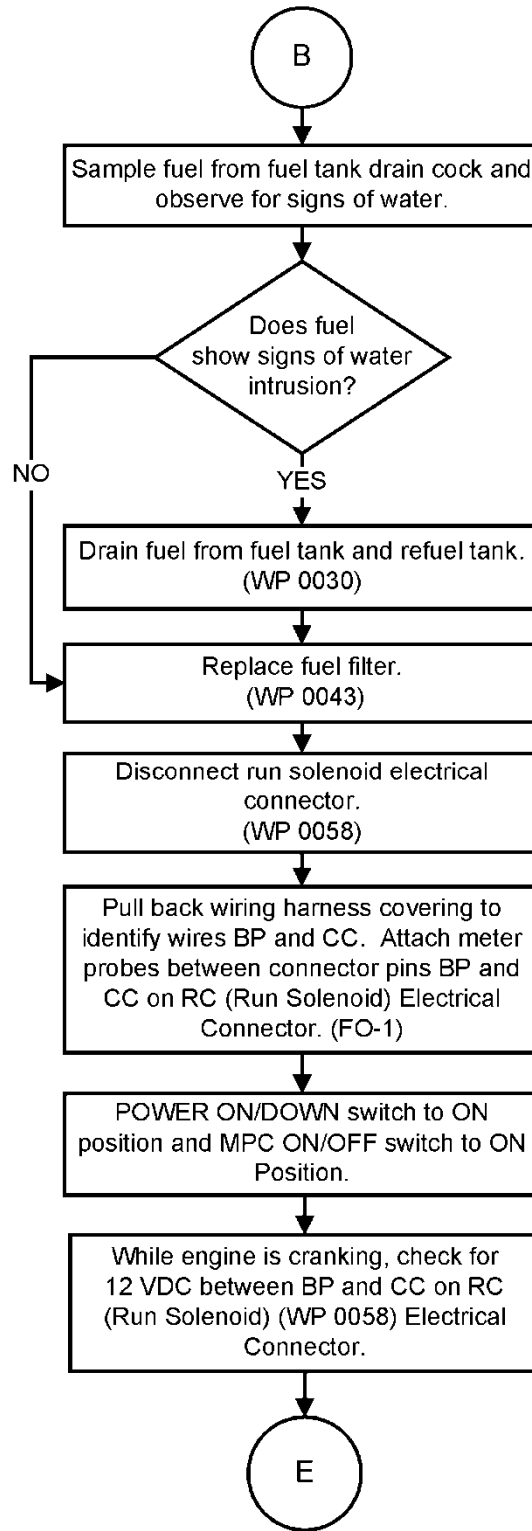


Figure 9. Fault AL3 (STARTFAIL) (Sheet 3 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

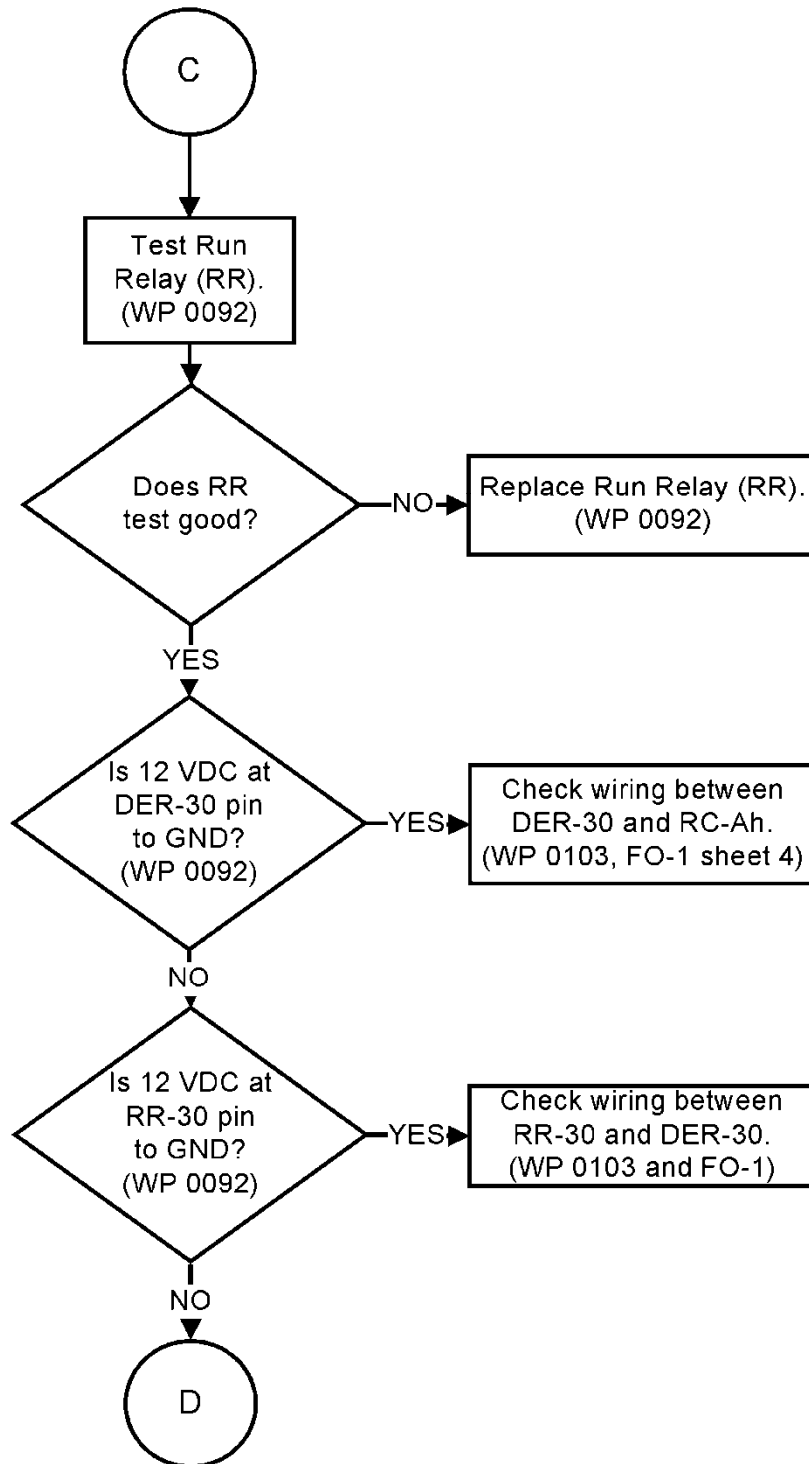


Figure 9. Fault AL3 (STARTFAIL) (Sheet 4 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

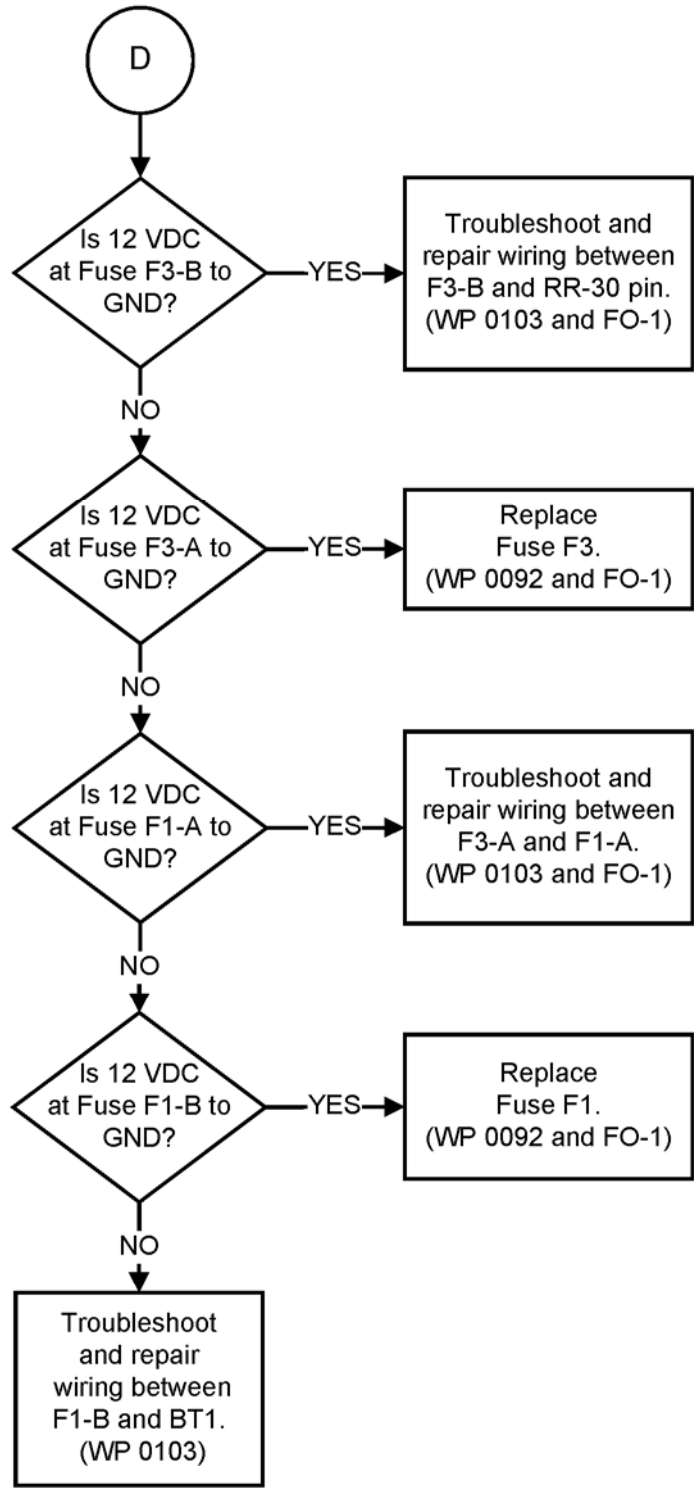


Figure 9. Fault AL3 (STARTFAIL) (Sheet 5 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL0 – AL3, AL8) – CONTINUED**

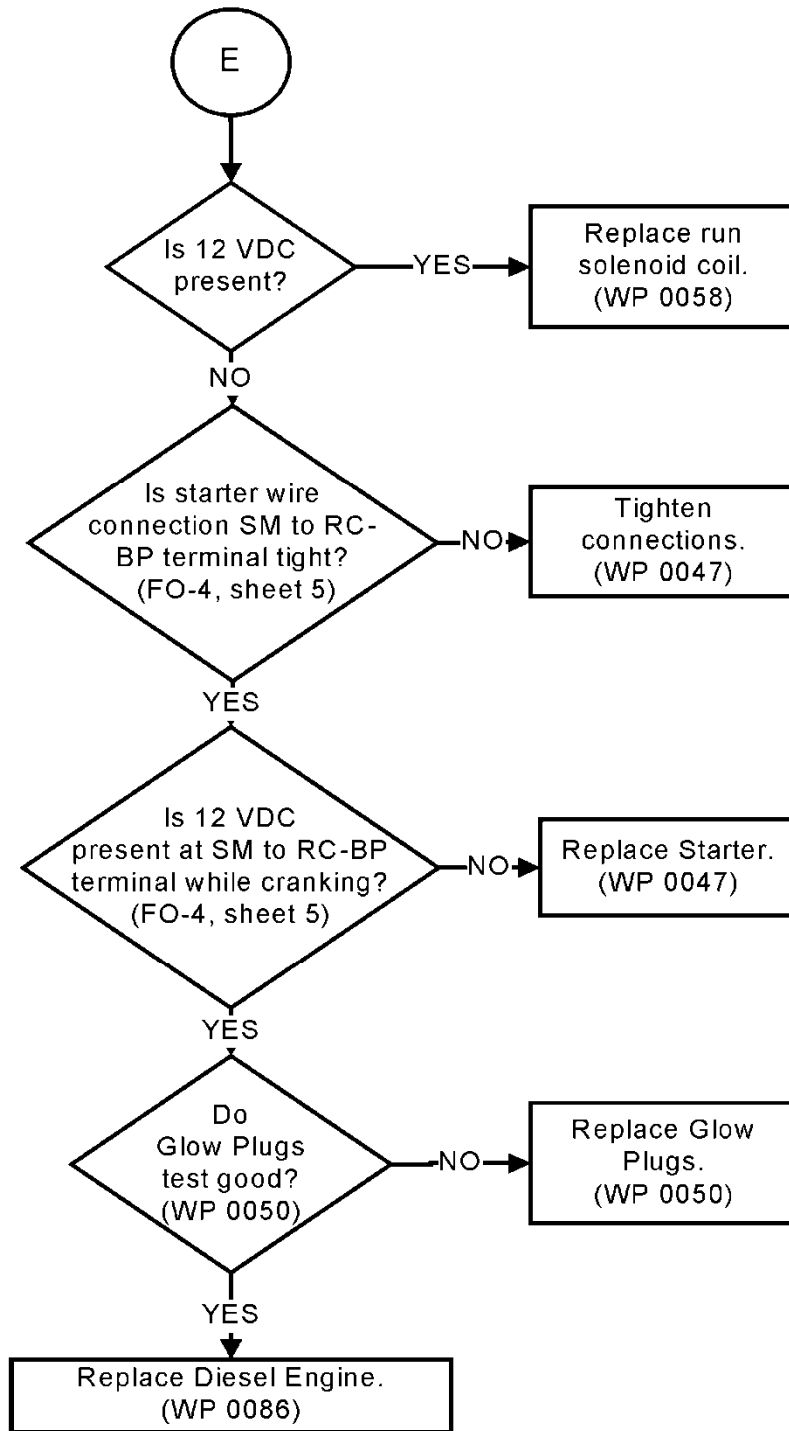


Figure 9. Fault AL3 (STARTFAIL) (Sheet 6 of 6).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE

**MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15)**

INITIAL SETUP:

Tools and Special Tools

Service Refrigeration Ordnance Tool Kit
(WP 0107, Item 6)
Refrigeration Equipment Tool Kit
(WP 0107, Item 7)

References

WP 0005	WP 0012	WP 0014
WP 0015	WP 0017	WP 0019
WP 0032	WP 0035	WP 0036
WP 0038	WP 0045	WP 0048
WP 0052	WP 0053	WP 0054
WP 0055	WP 0059	WP 0062
WP 0064	WP 0065	WP 0066
WP 0070	WP 0076	WP 0078
WP 0079	WP 0088	WP 0091
WP 0092	WP 0094	WP 0100
WP 0101	WP 0103	

Equipment Condition

MTRCS prepared for use (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)

INTRODUCTION

This Work Package contains troubleshooting procedures for the electrical system and electrical sensors, including fault codes AL4 – AL7 and AL9 – AL15. A troubleshooting index is contained in WP 0012. Refer to WP 0014 for microprocessor control box component identification.

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15)**

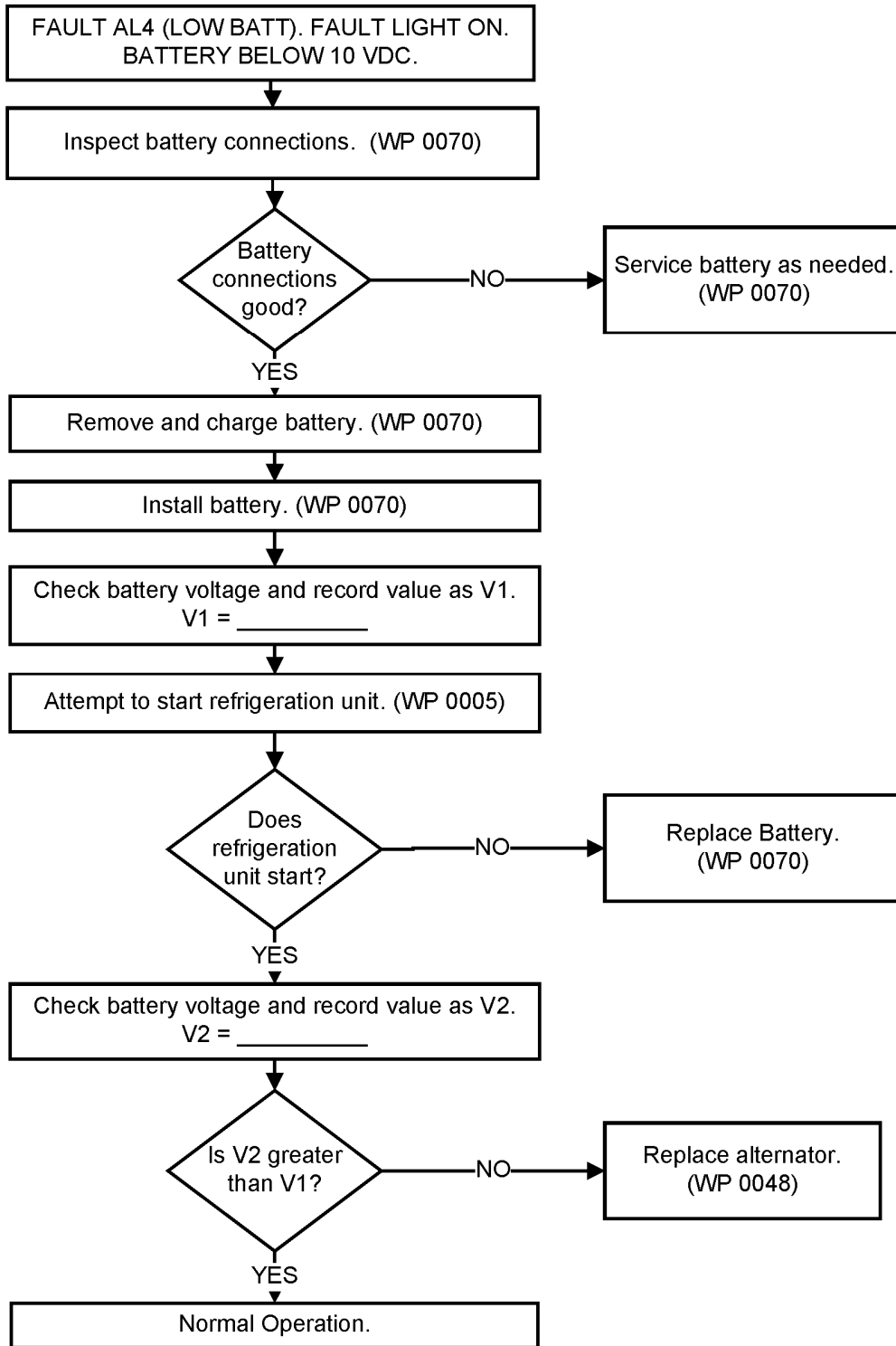


Figure 1. Fault AL4 (LOW BATT).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

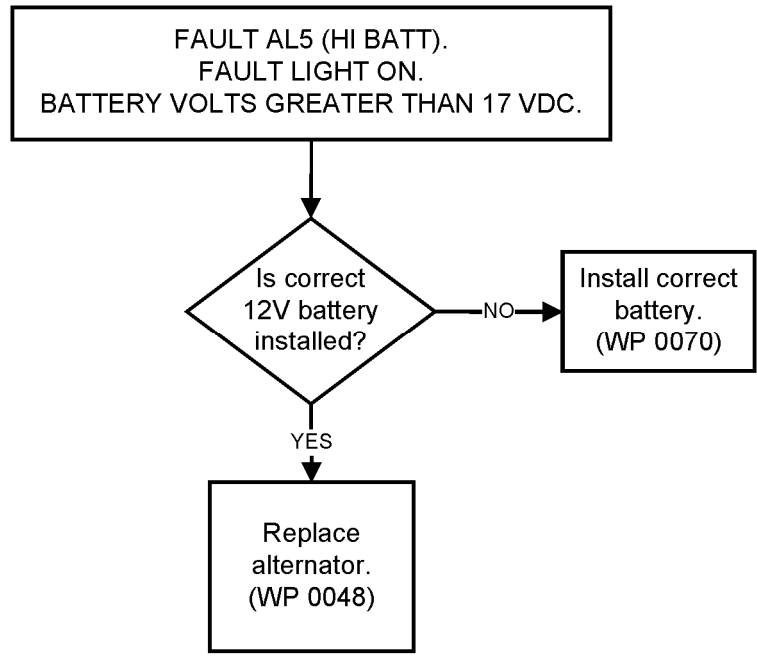


Figure 2. Fault AL5 (HIGH BATT).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

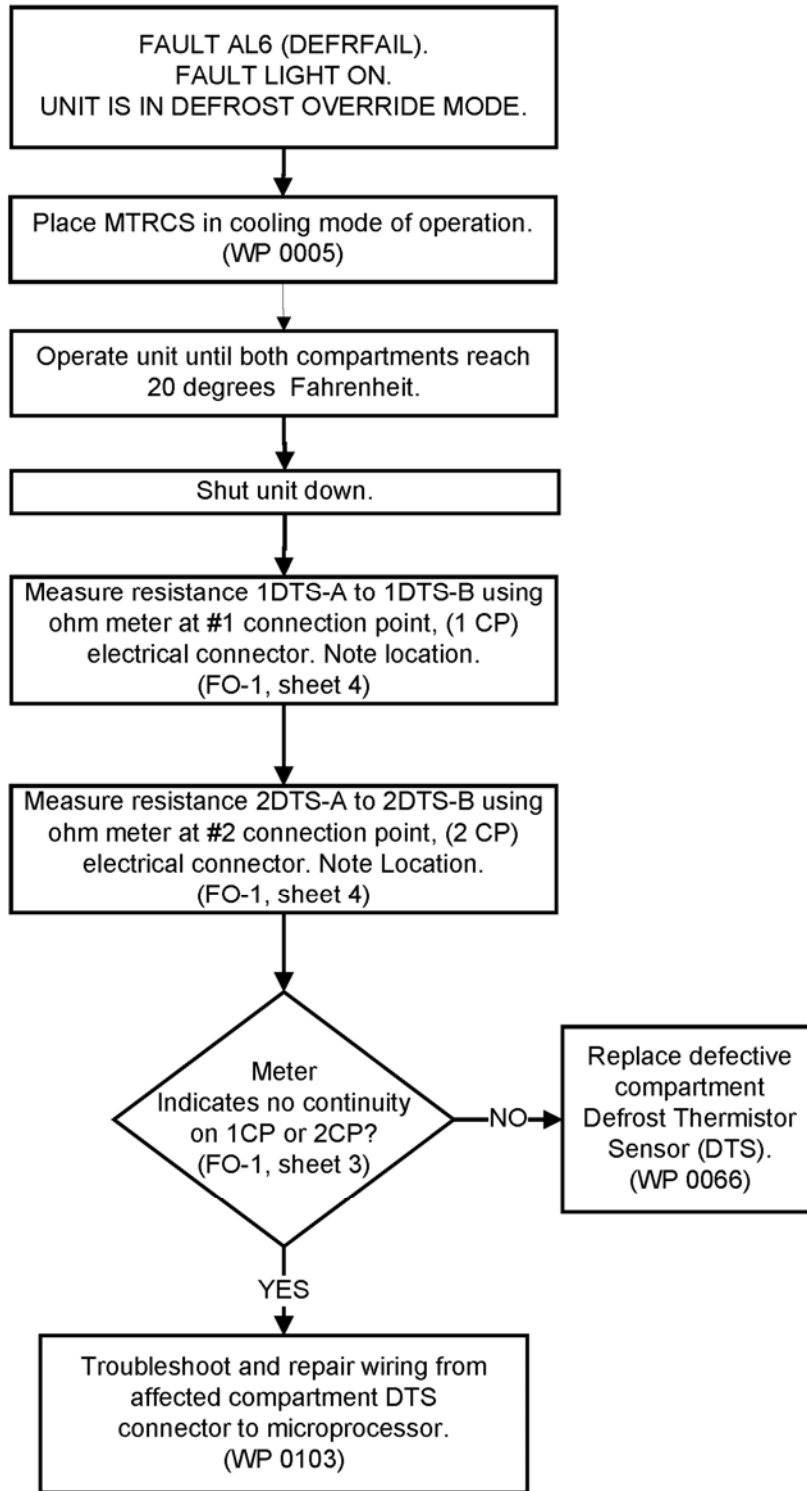


Figure 3. Fault AL5 (DEFRRFAIL).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

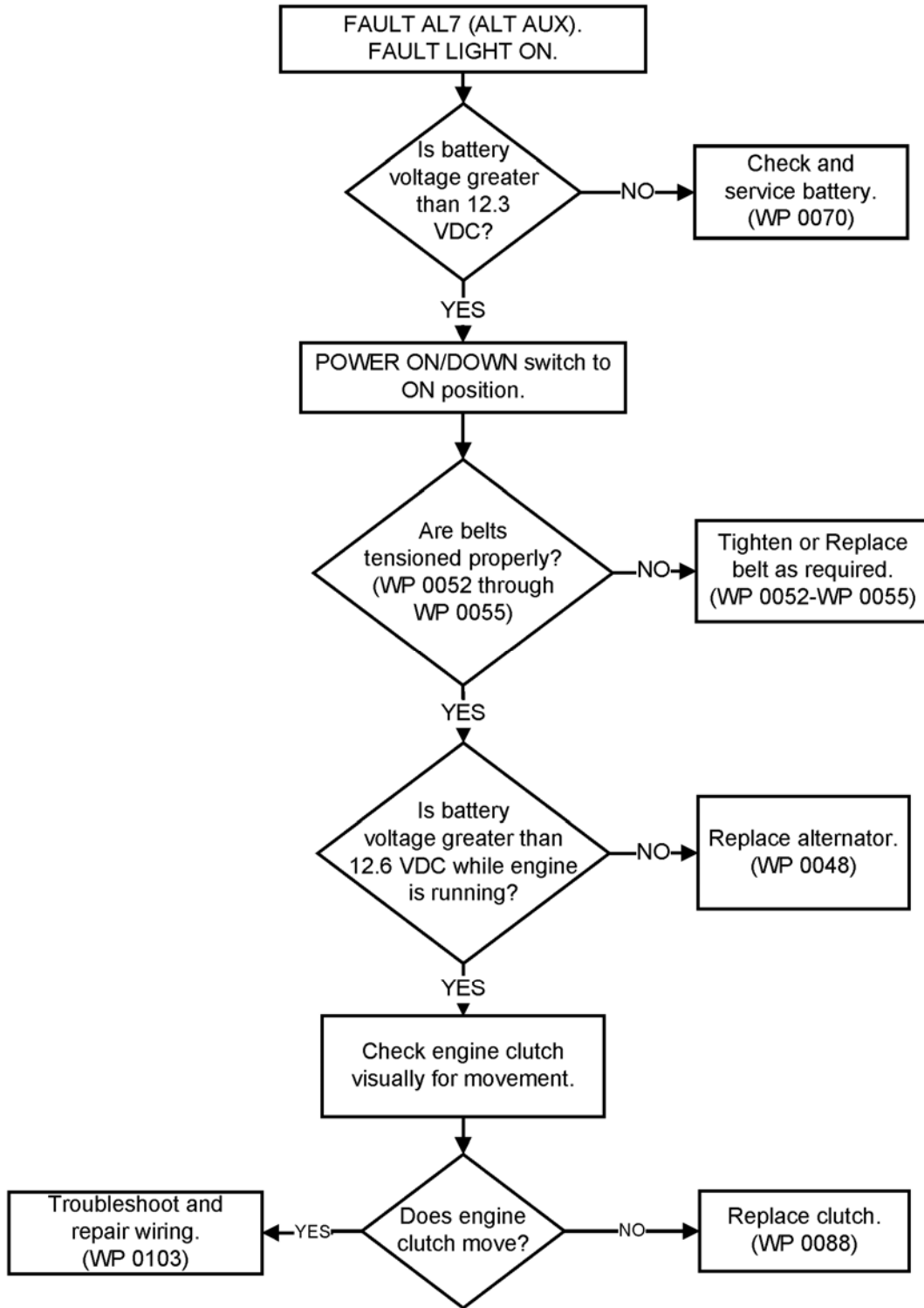


Figure 4. Fault AL7 (ALT AUX).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

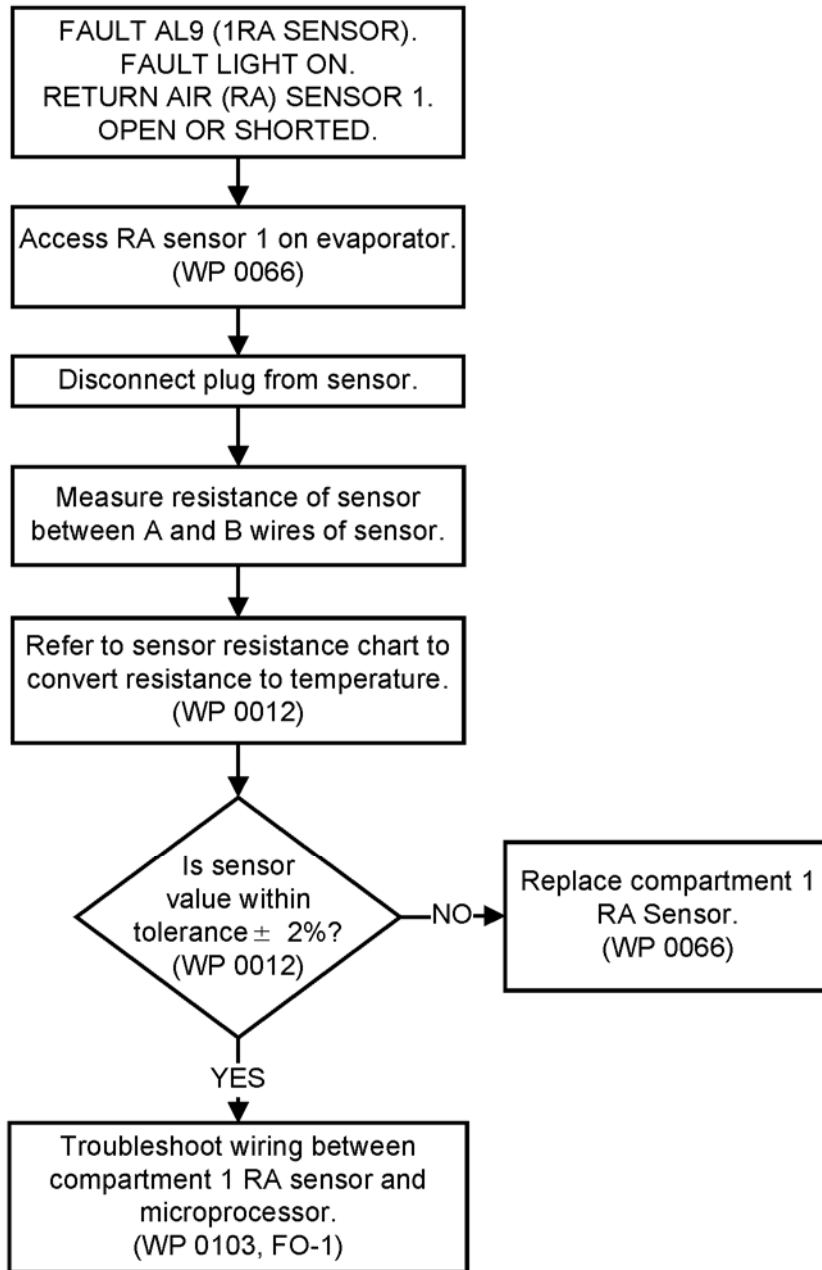


Figure 5. Fault AL9 (1RA SENSOR).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

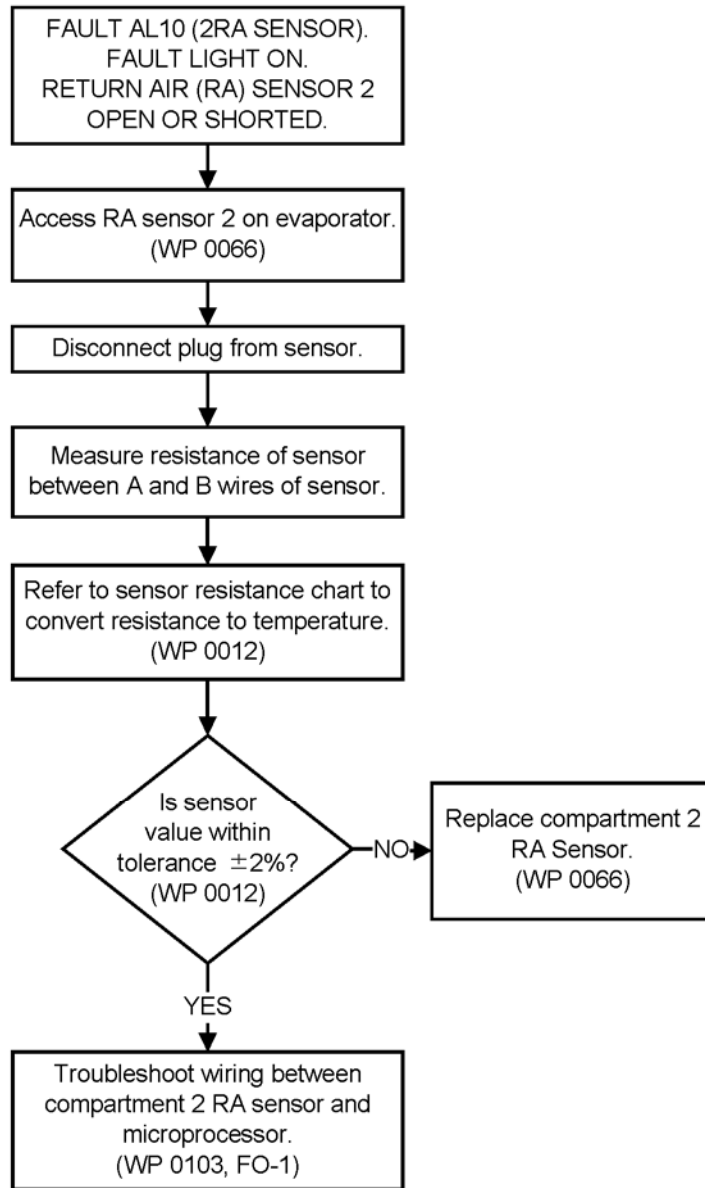


Figure 6. Fault AL10 (2RA SENSOR).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

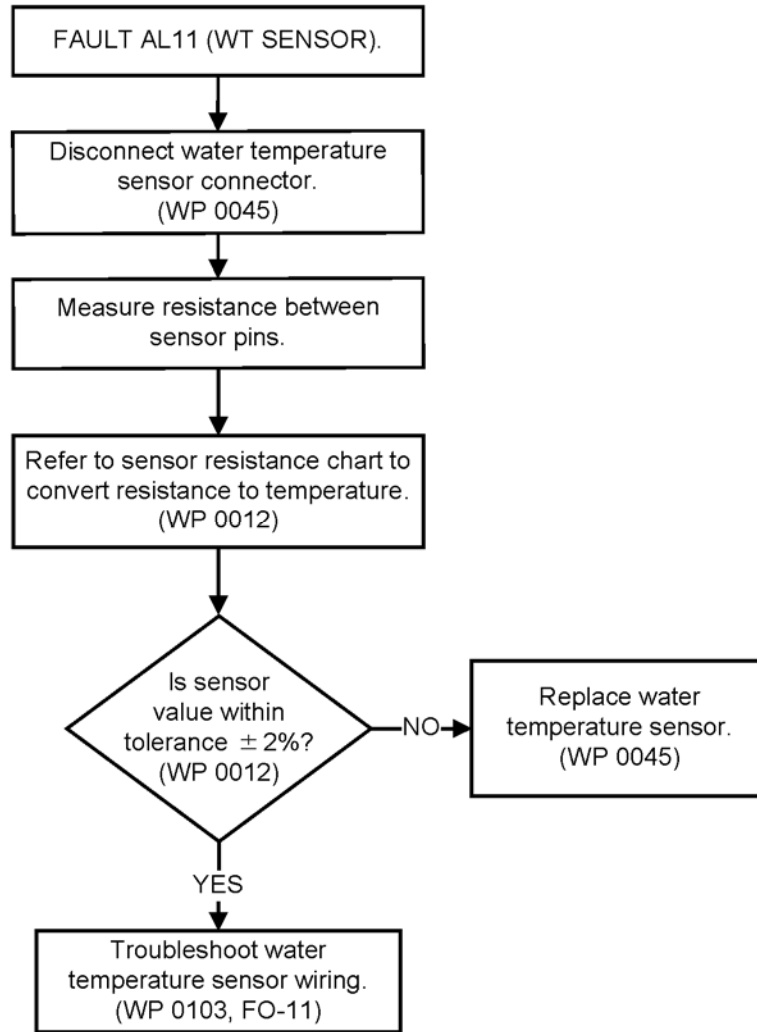


Figure 7. Fault AL11 (WT SENSOR).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

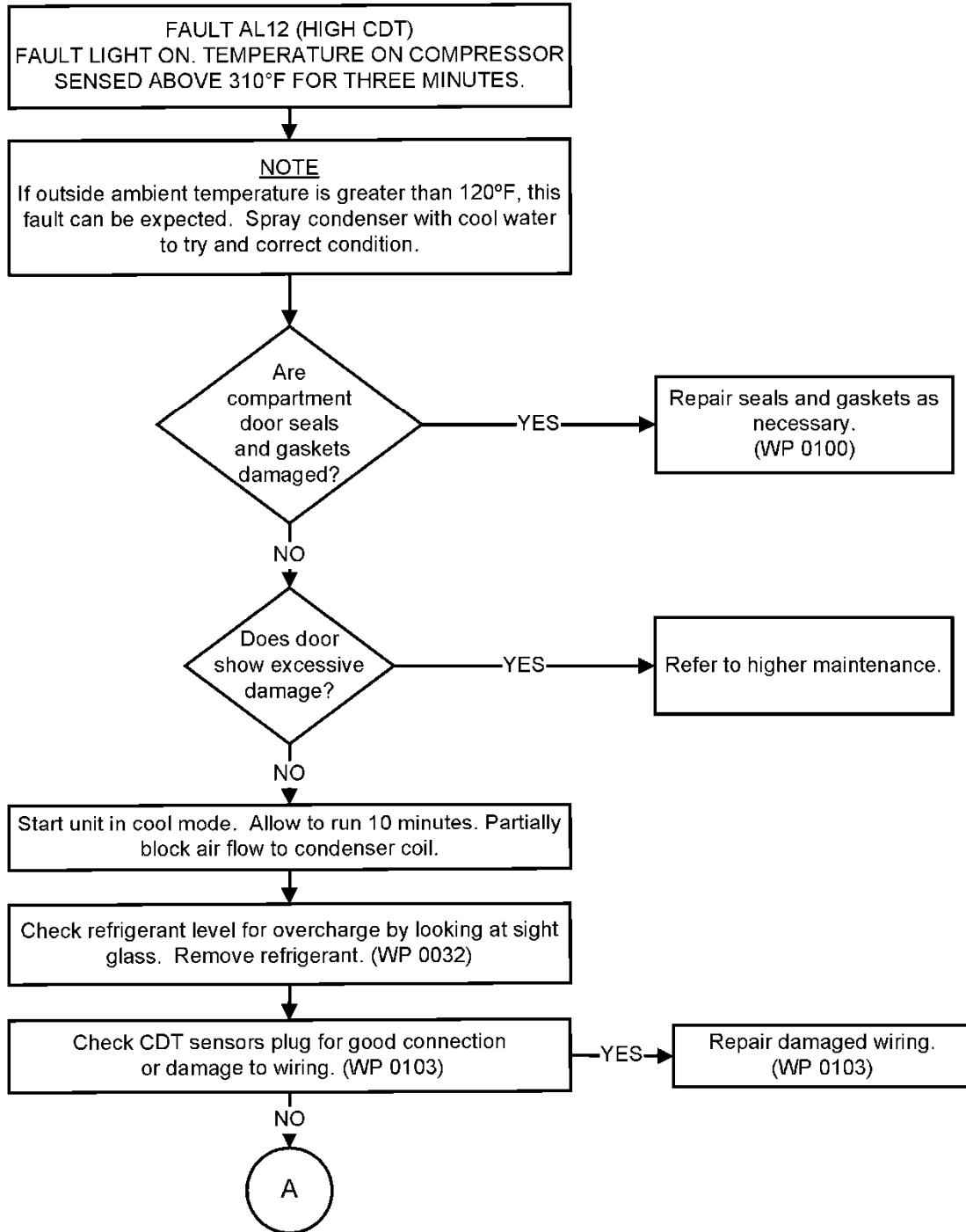


Figure 8. Fault AL12 (HIGH CDT) (Sheet 1 of 4).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

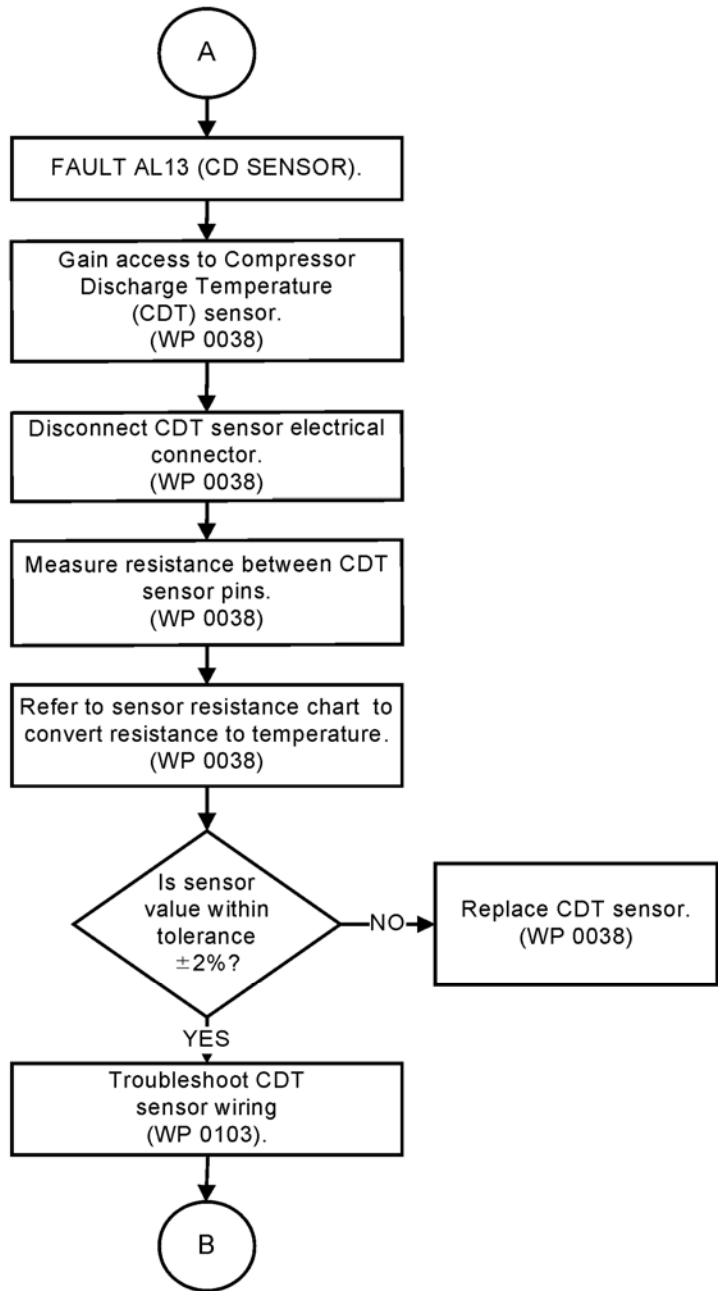


Figure 8. Fault AL12 (HIGH CDT) (Sheet 2 of 4).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

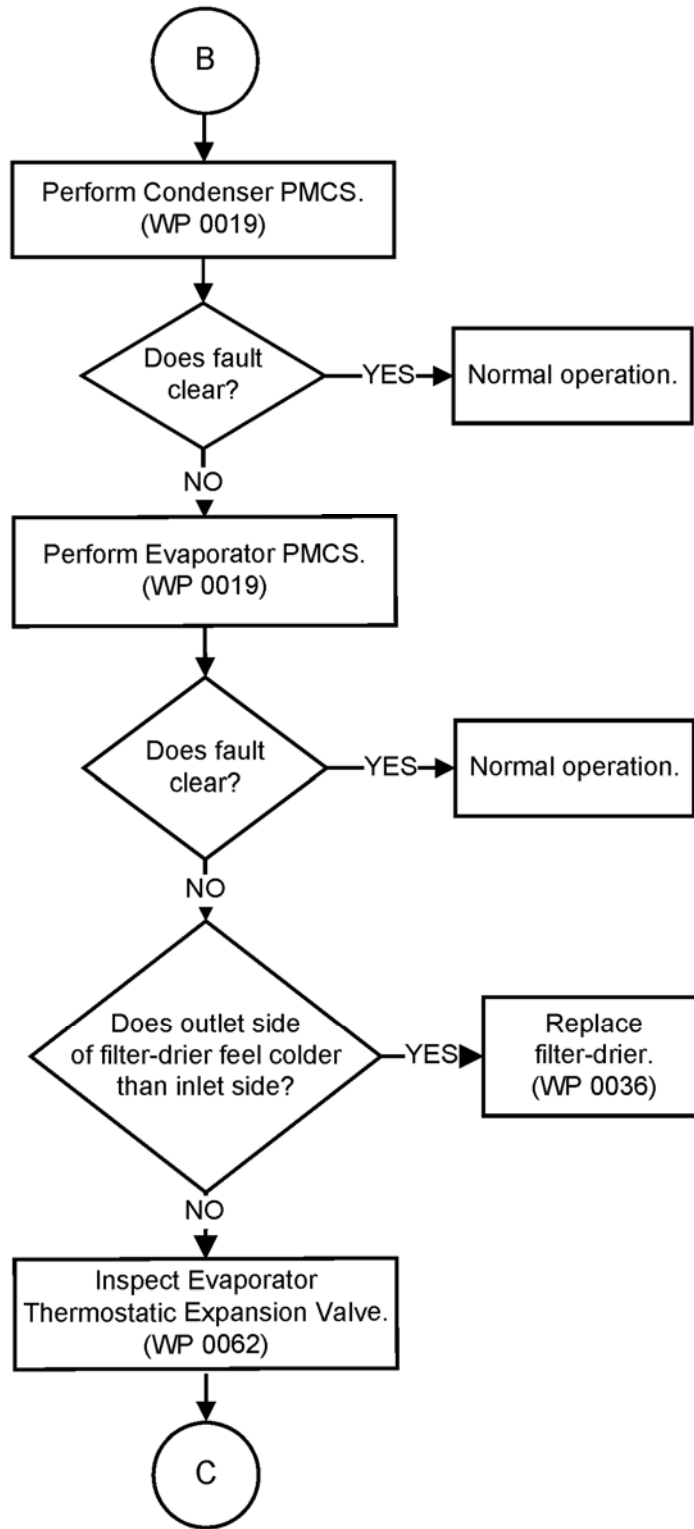


Figure 8. Fault AL12 (HIGH CDT) (Sheet 3 of 4).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

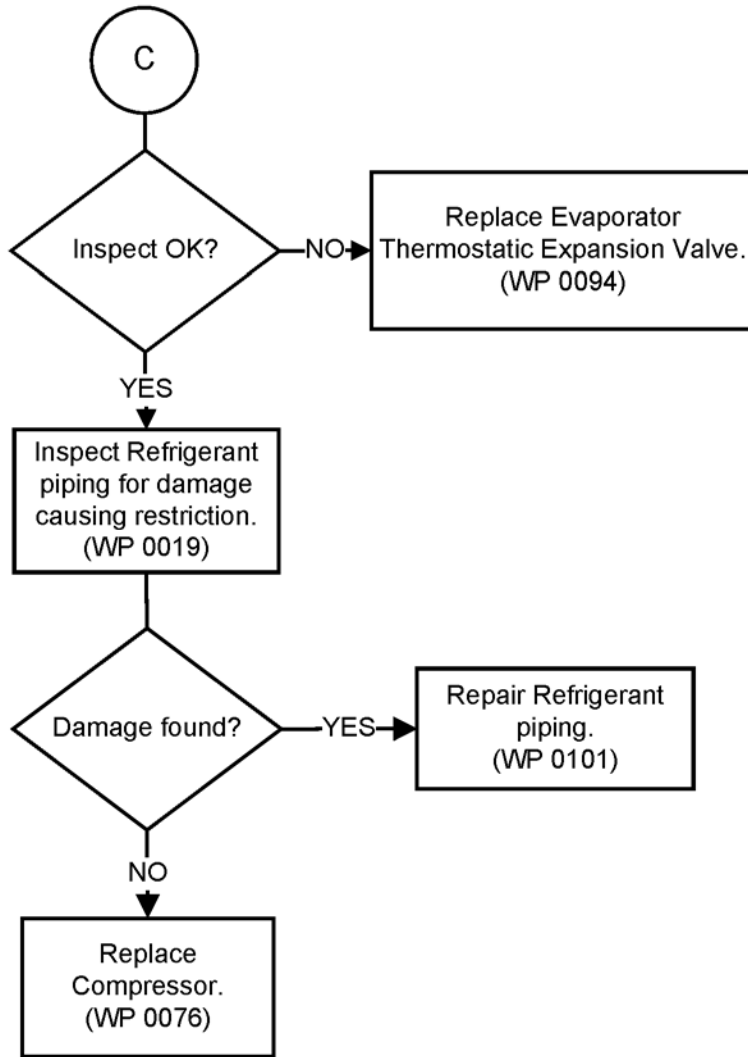


Figure 8. Fault AL12 (HIGH CDT) (Sheet 4 of 4).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

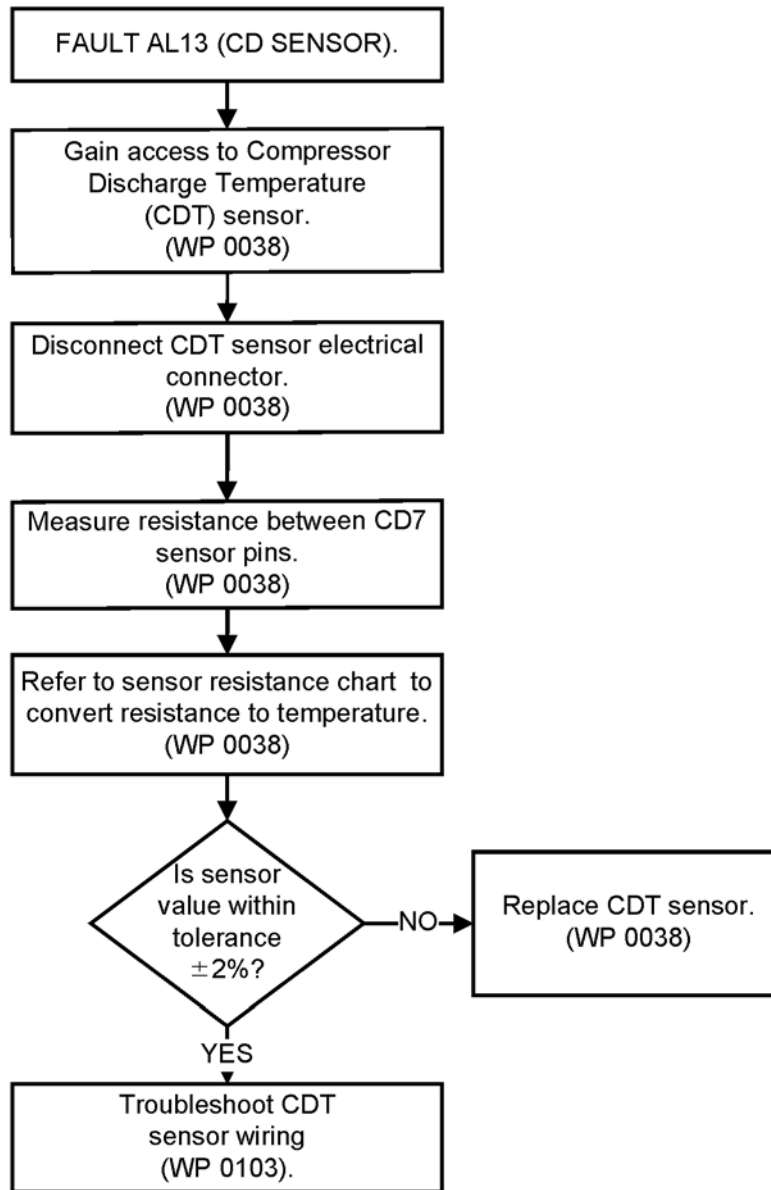


Figure 9. Fault AL13 (CD Sensor).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

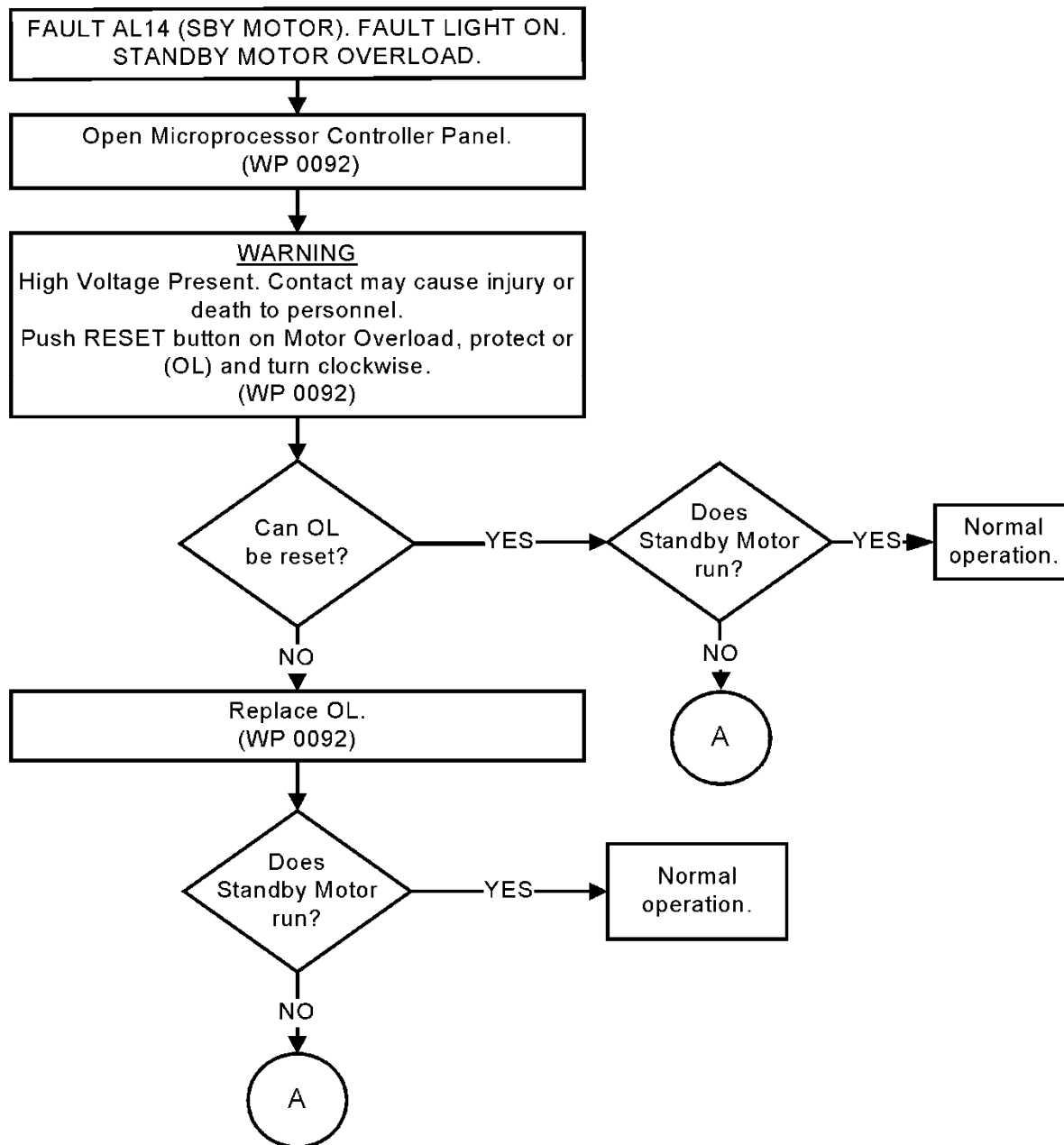


Figure 10. Fault AL14 (SBY MOTOR) (Sheet 1 of 2).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

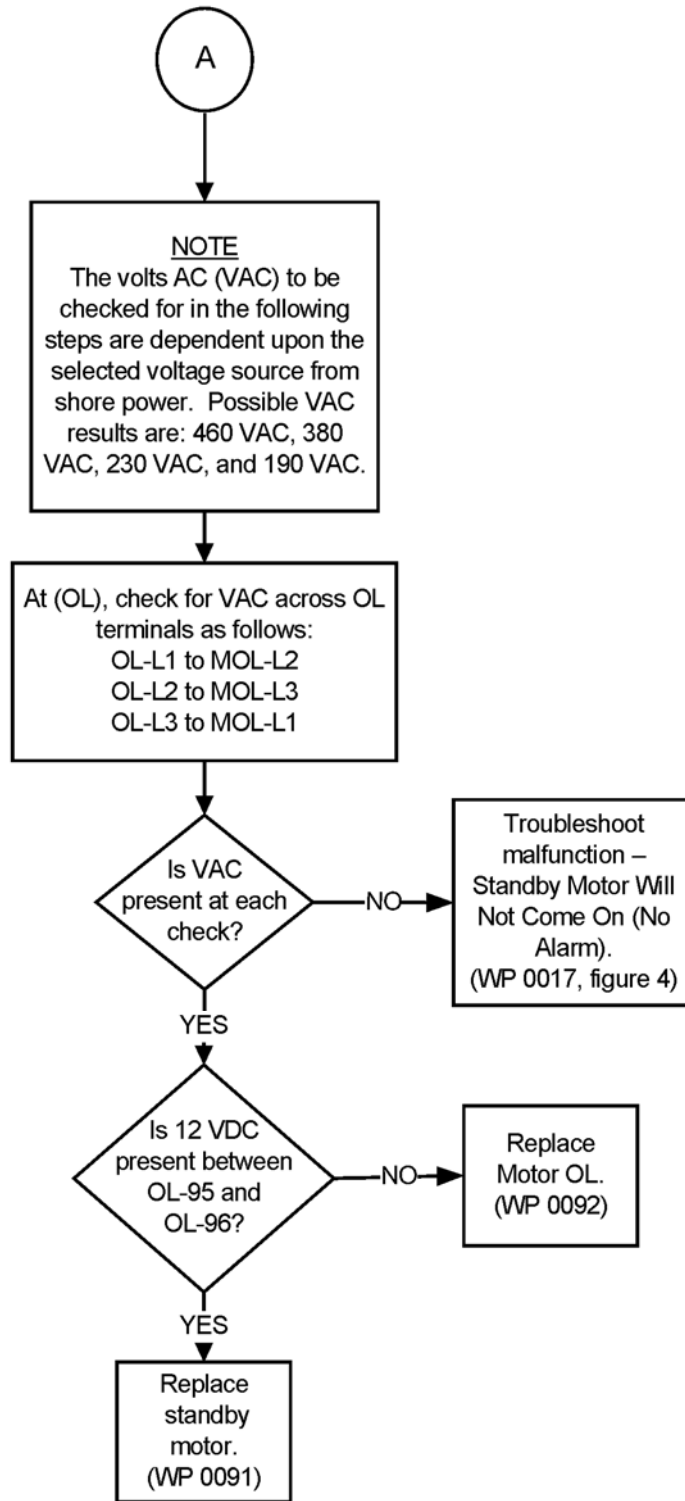


Figure 10. Fault AL14 (SBY MOTOR) (Sheet 2 of 2).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

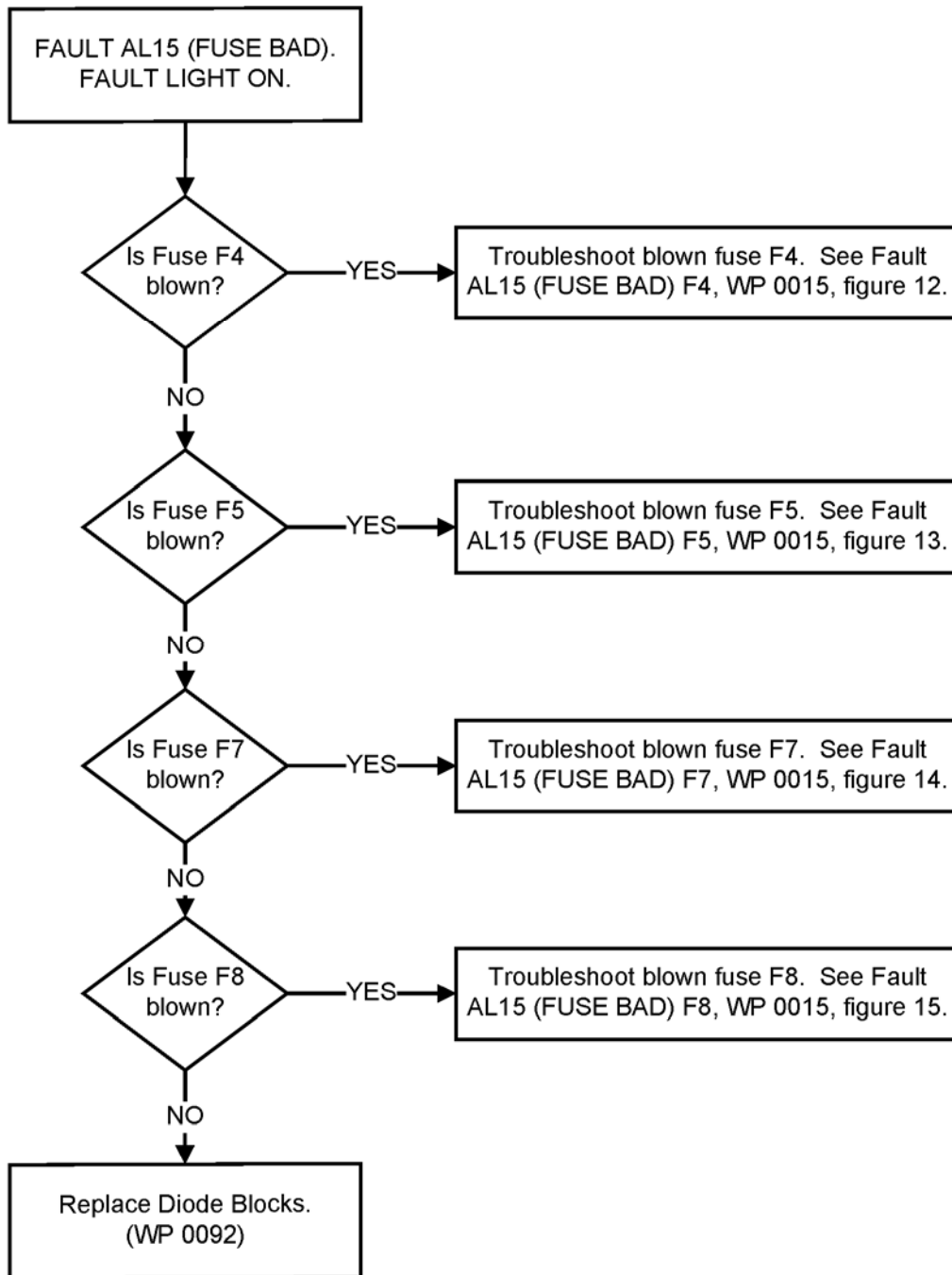


Figure 11. Fault AL15 (FUSE BAD).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

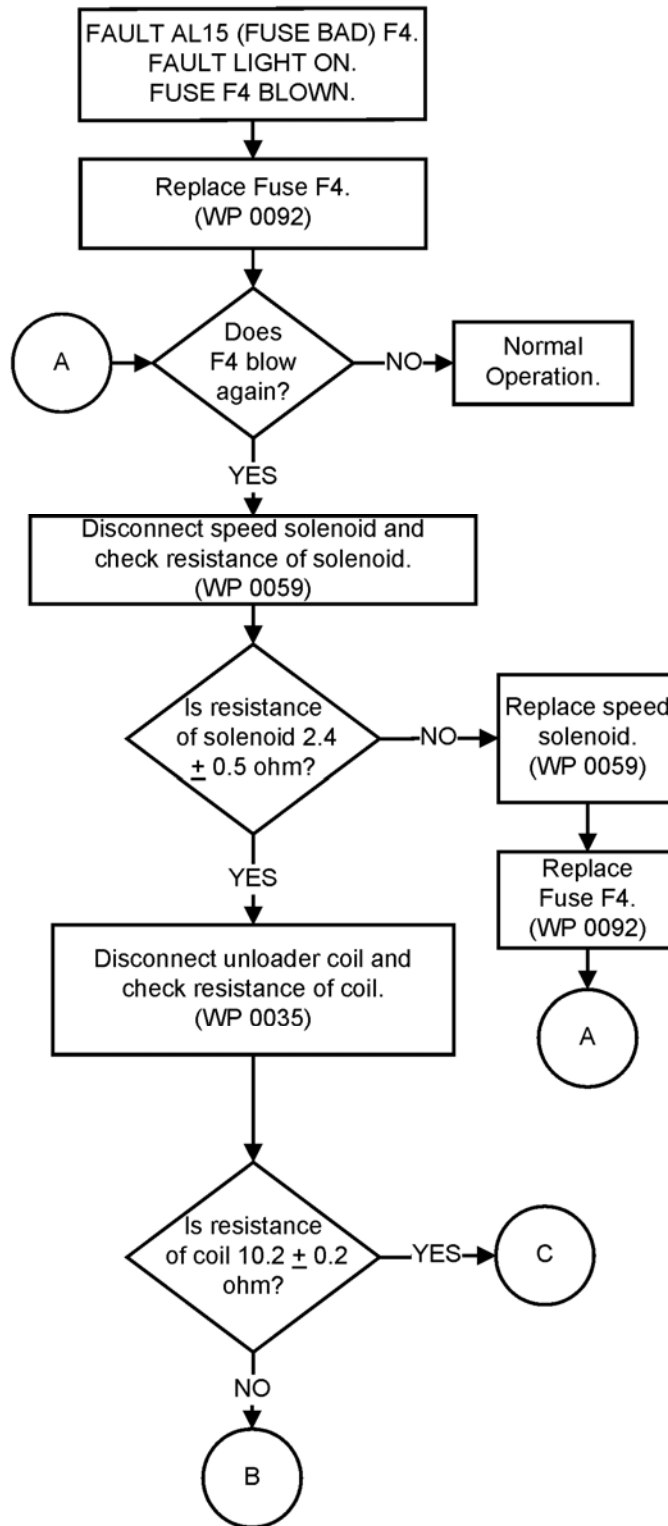


Figure 12. Fault AL15 (FUSE BAD) F4 (Sheet 1 of 2).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

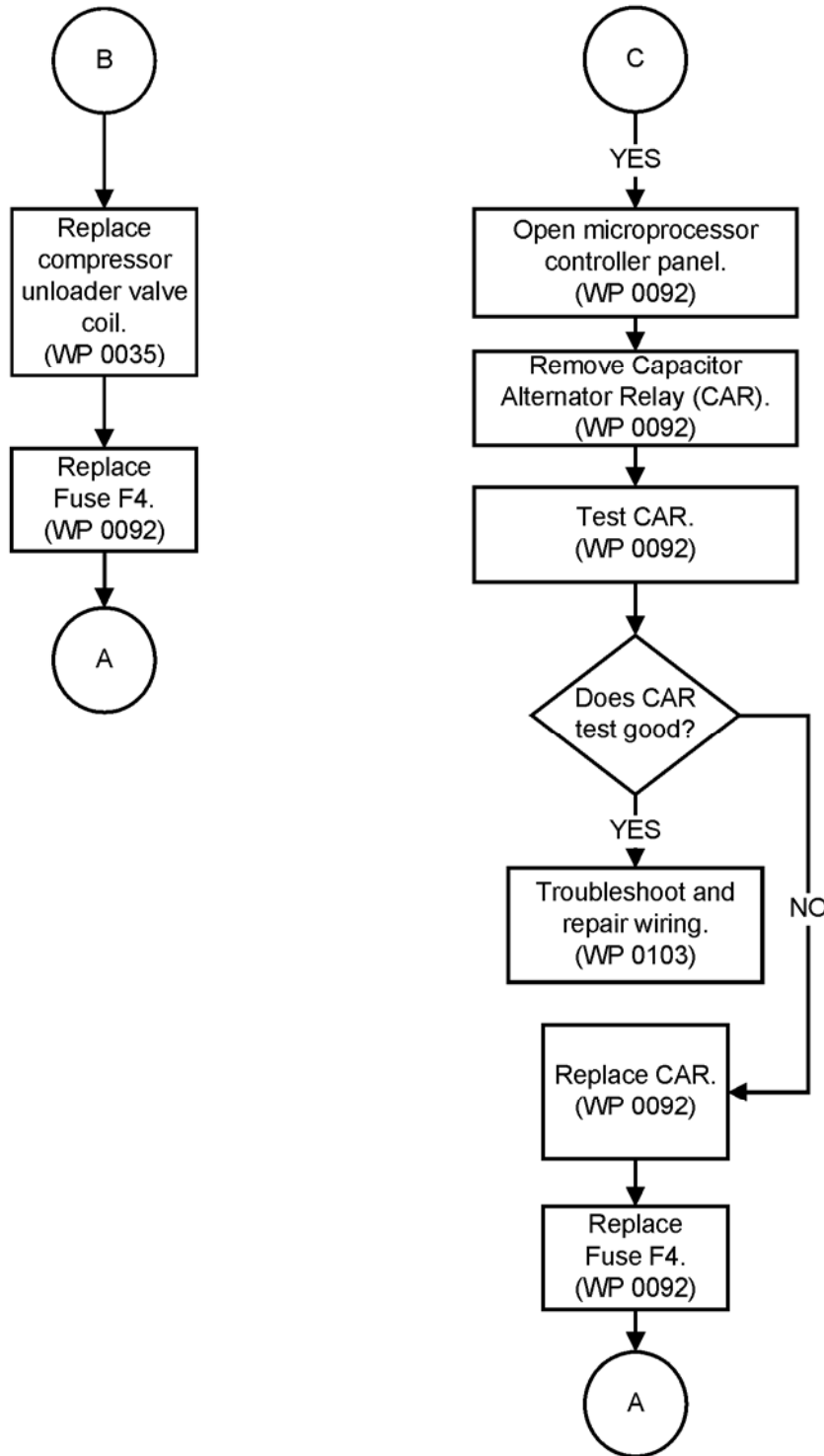


Figure 12. Fault AL15 (FUSE BAD) F4 (Sheet 2 of 2).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

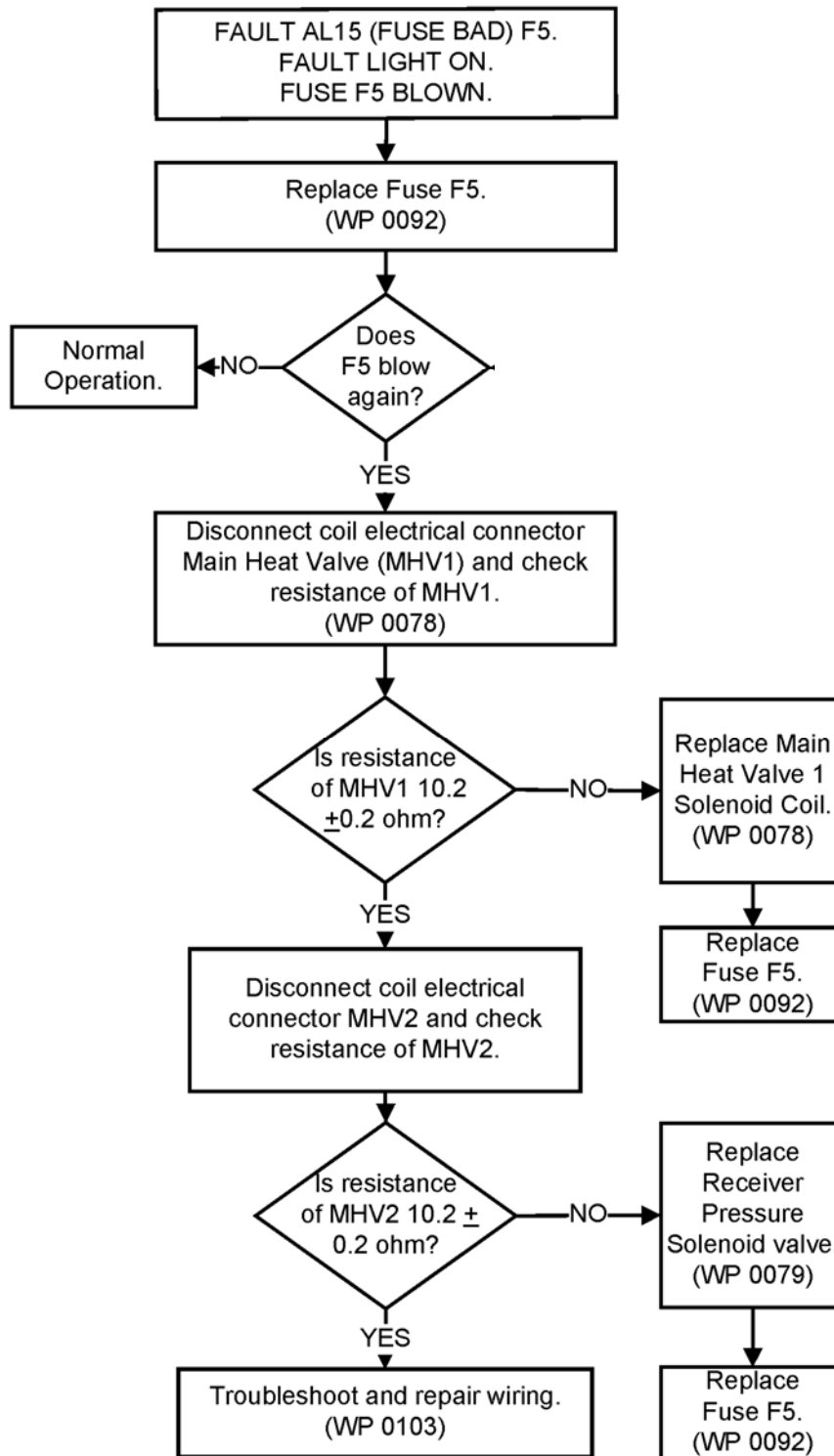


Figure 13. Fault AL15 (FUSE BAD) F5.

END OF TASK

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED

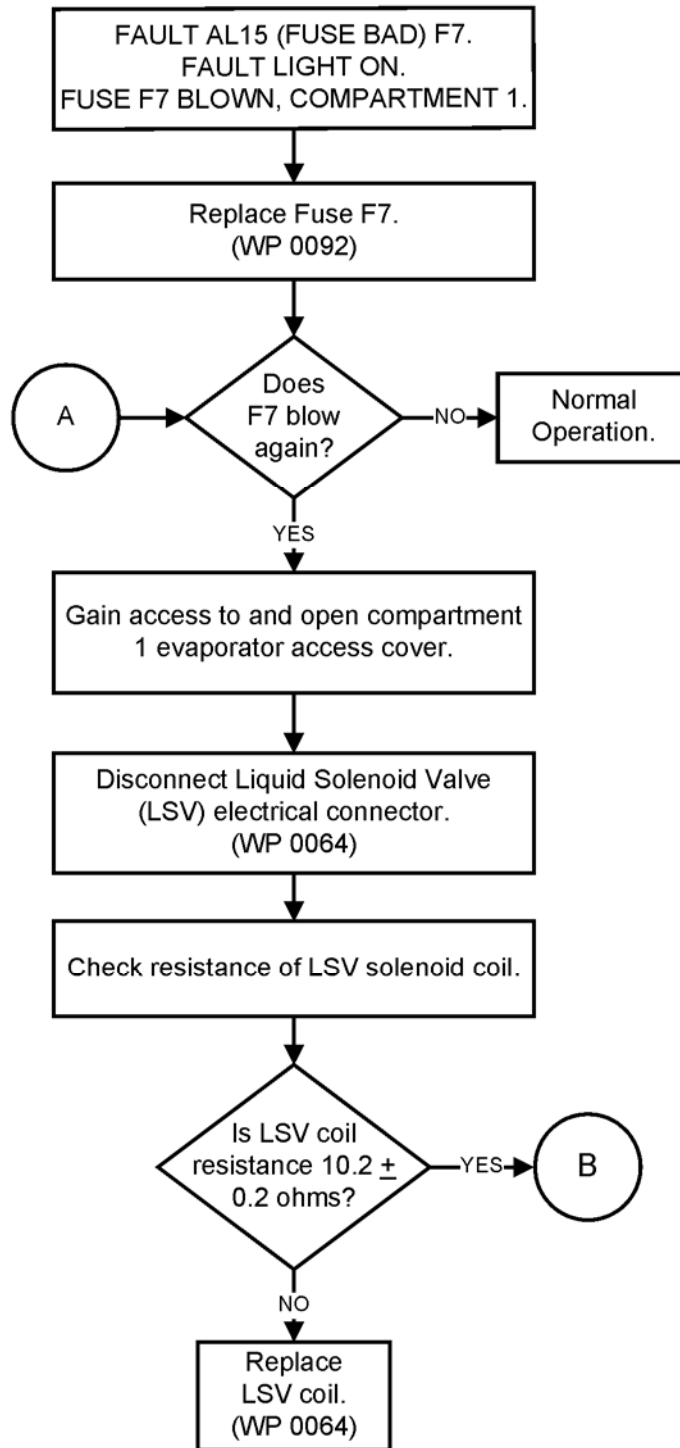


Figure 14. Fault AL15 (FUSE BAD) F7 (Sheet 1 of 4).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED

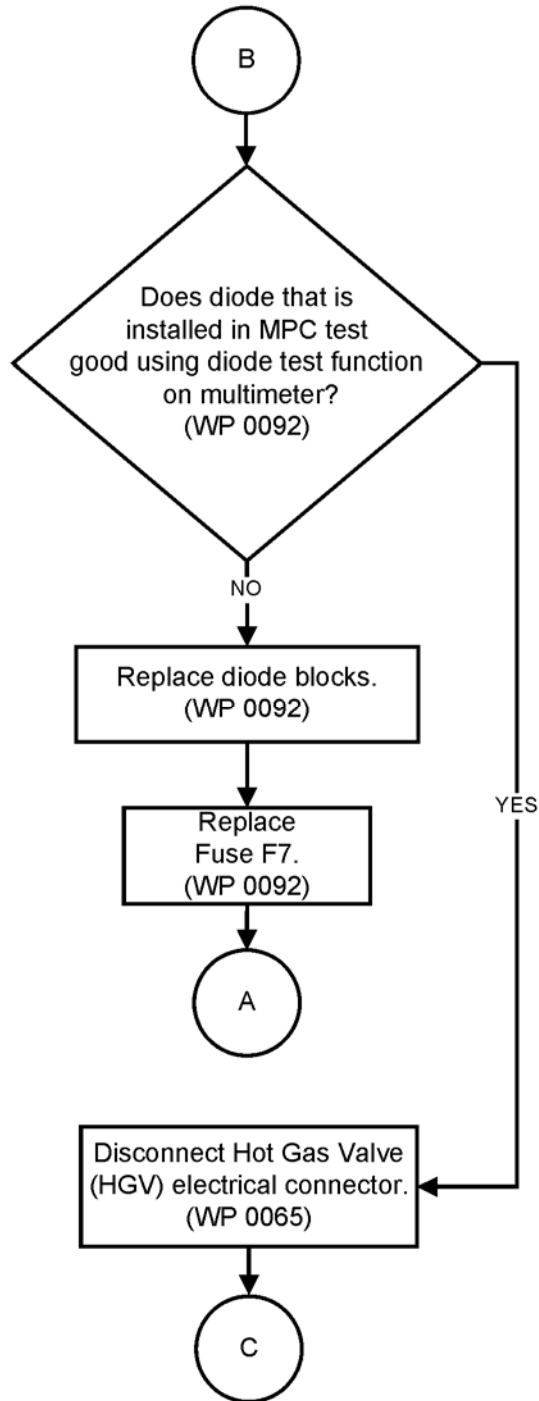


Figure 14. Fault AL15 (FUSE BAD) F7 (Sheet 2 of 4).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED

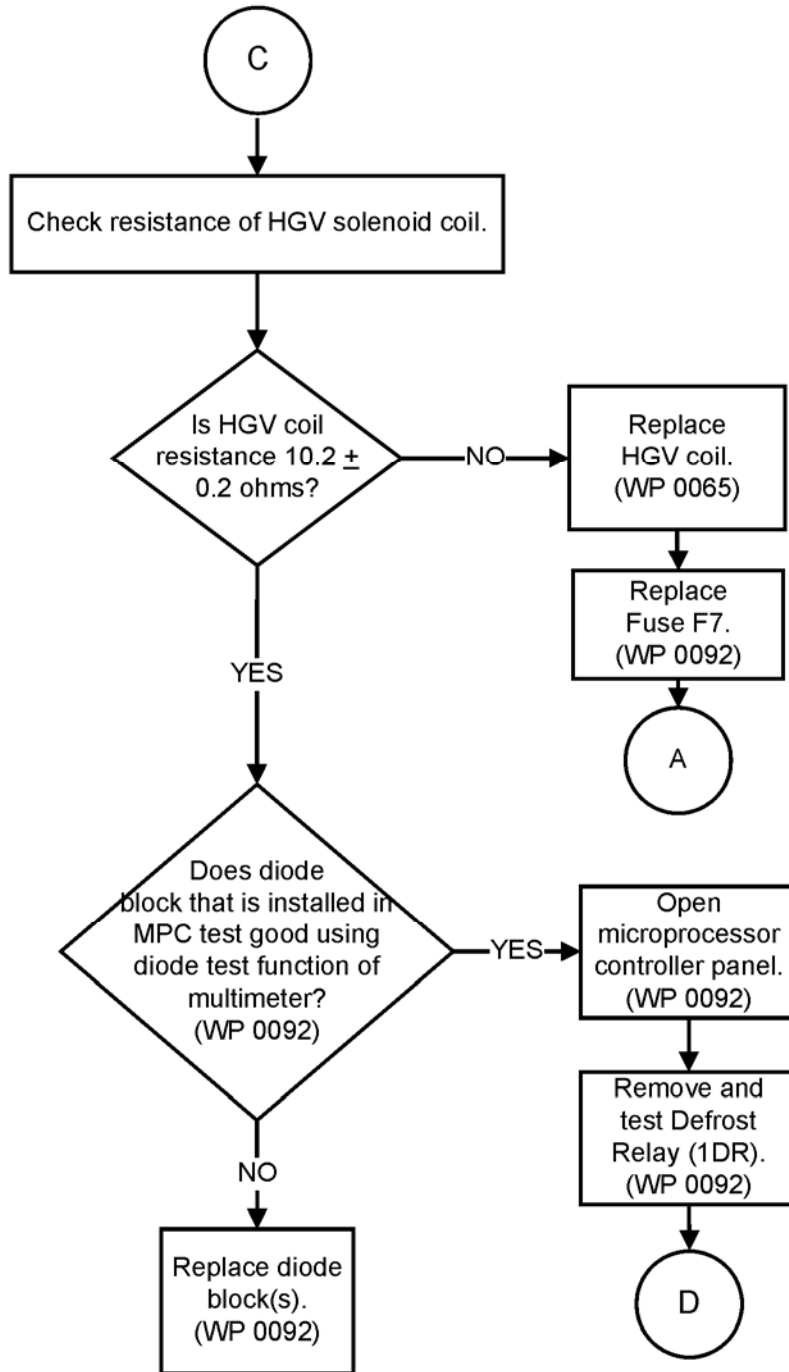


Figure 14. Fault AL15 (FUSE BAD) F7 (Sheet 3 of 4).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

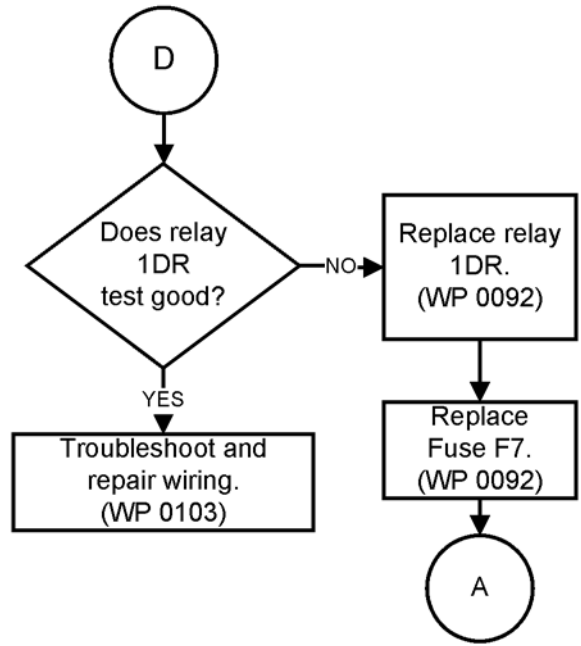


Figure 14. Fault AL15 (FUSE BAD) F7 (Sheet 4 of 4).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

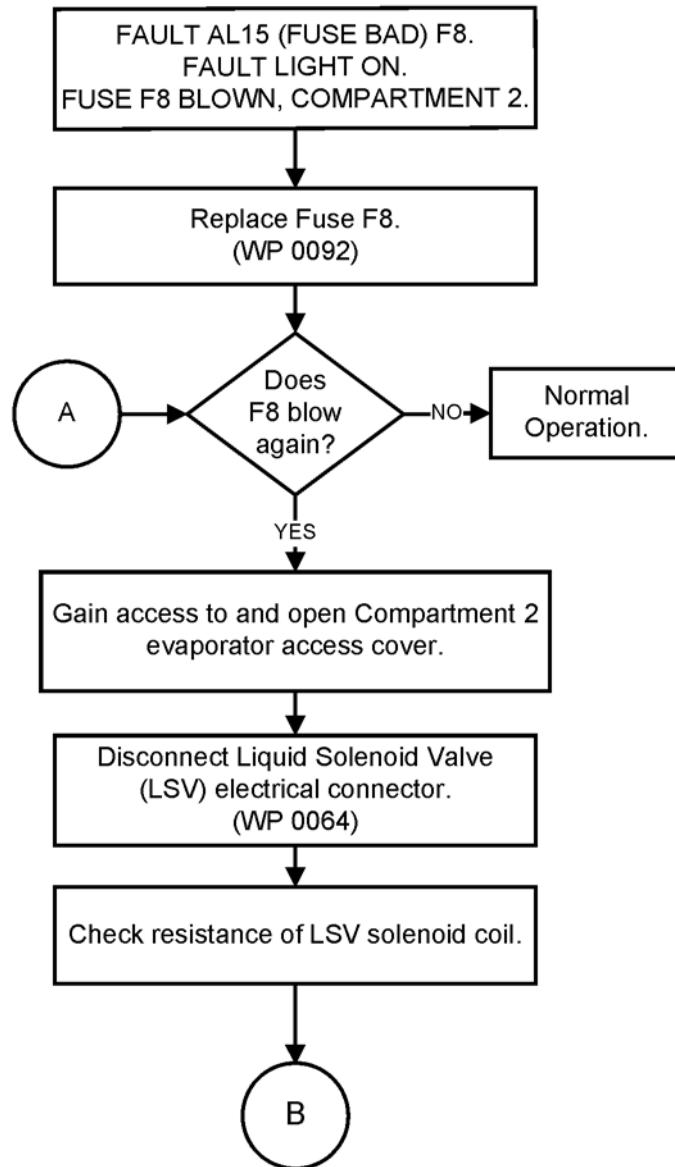


Figure 15. Fault AL15 (FUSE BAD) F8 (Sheet 1 of 4).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED

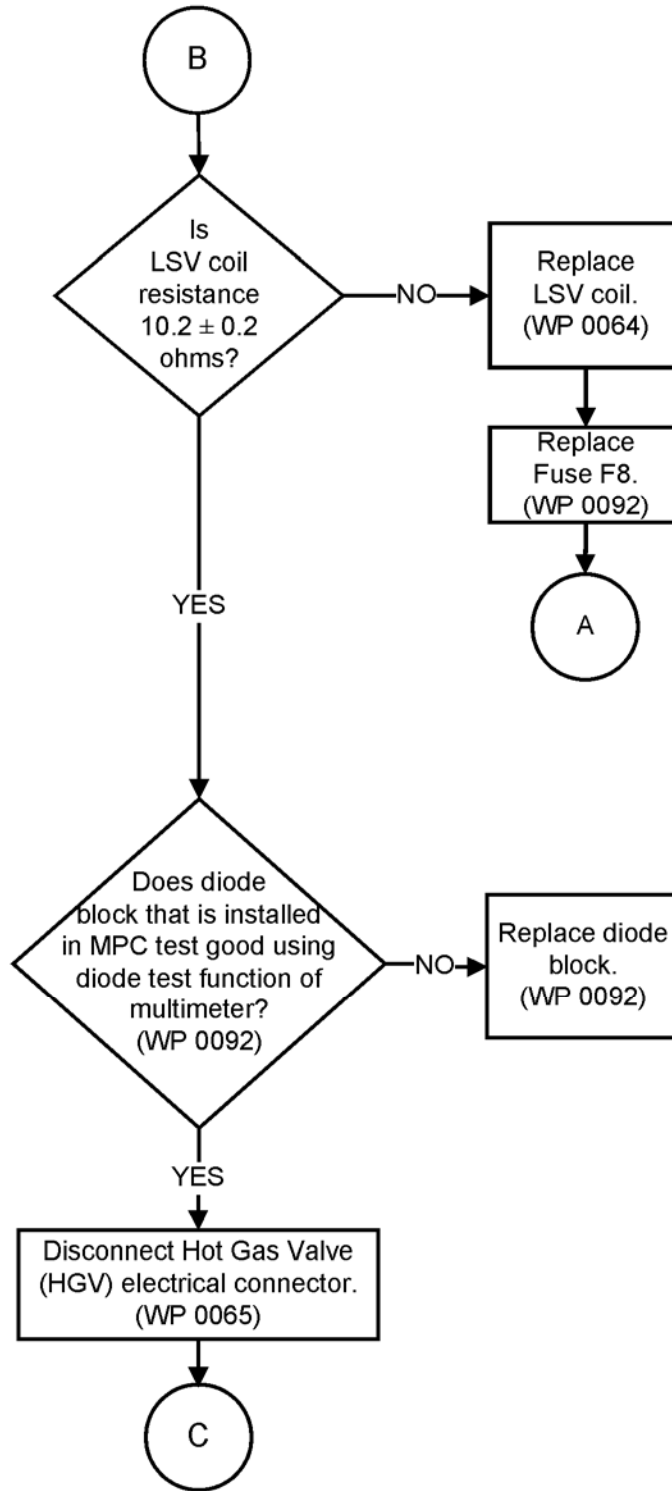


Figure 15. Fault AL15 (FUSE BAD) F8 (Sheet 2 of 4).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED

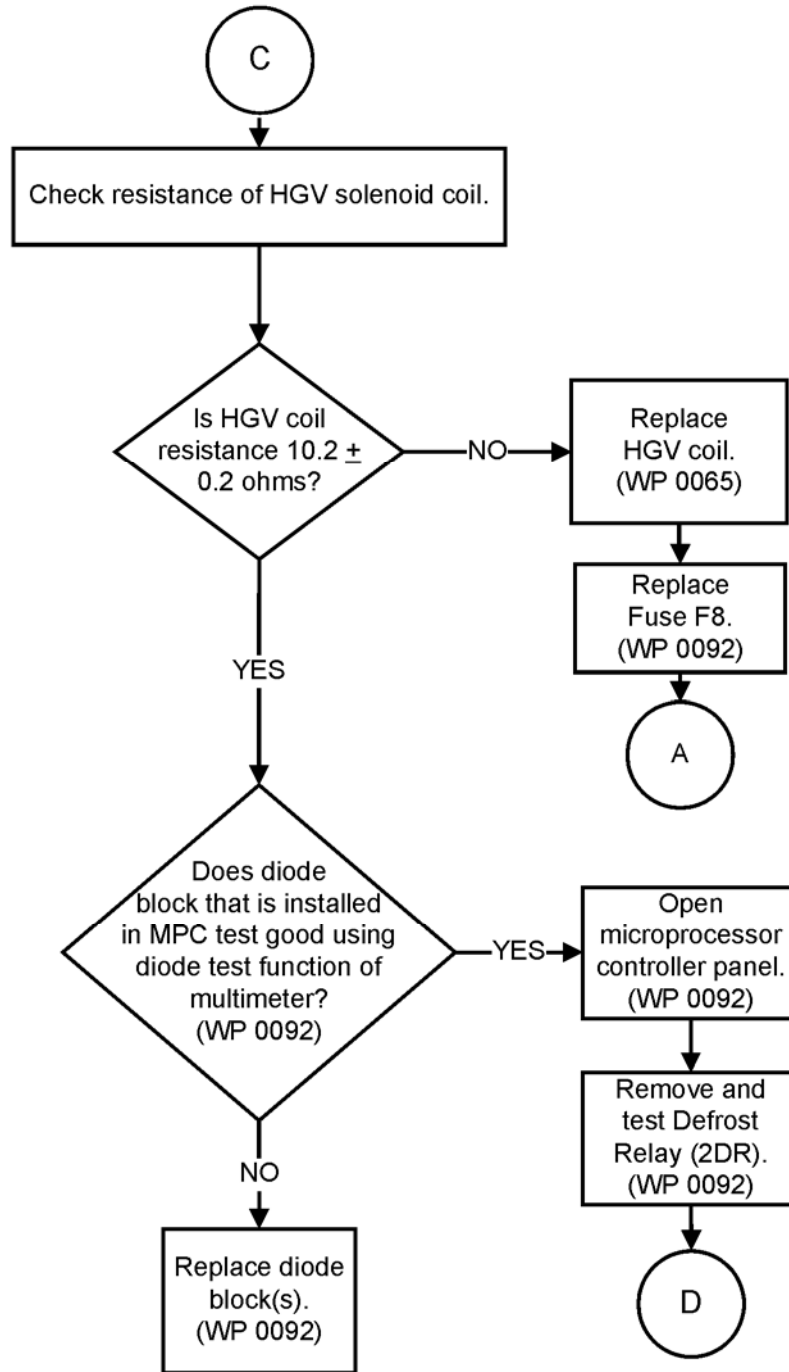


Figure 15. Fault AL15 (FUSE BAD) F8 (Sheet 3 of 4).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL4 – AL7, AL9 – AL15) – CONTINUED**

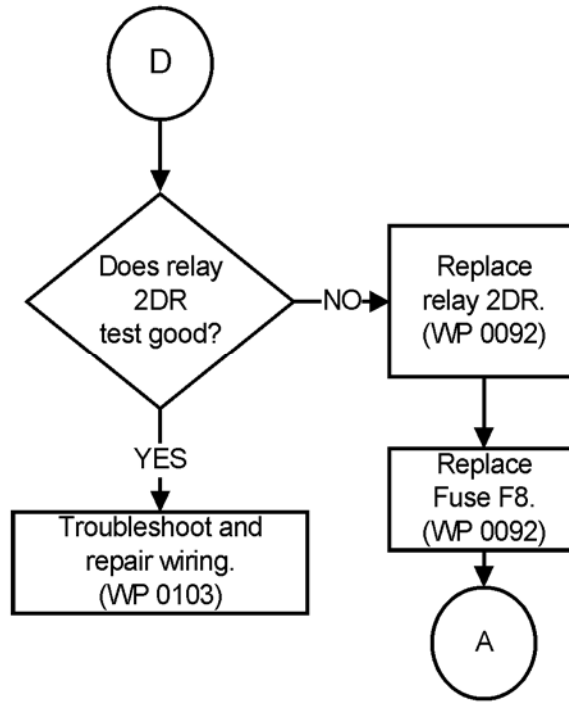


Figure 15. Fault AL15 (FUSE BAD) F8 (Sheet 4 of 4).

**END OF TASK
END OF WORK PACKAGE**

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23)

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance Tool Kit
(WP 0107, Item 6)
Refrigeration Equipment Tool Kit
(WP 0107, Item 7)

Equipment Condition

MTRCS prepared for use (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005	WP 0007	WP 0012
WP 0014	WP 0017	WP 0019
WP 0032	WP 0033	WP 0035
WP 0037	WP 0039	WP 0040
WP 0052	WP 0053	WP 0054
WP 0055	WP 0063	WP 0065
WP 0070	WP 0076	WP 0077
WP 0078	WP 0088	WP 0089
WP 0092	WP 0095	WP 0099
WP 0103		

INTRODUCTION

This Work Package contains troubleshooting procedures for the microprocessor display and refrigeration unit, including fault codes AL17 – AL23. A troubleshooting index is contained in WP 0012. Refer to WP 0014 for microprocessor control box component identification.

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23)**

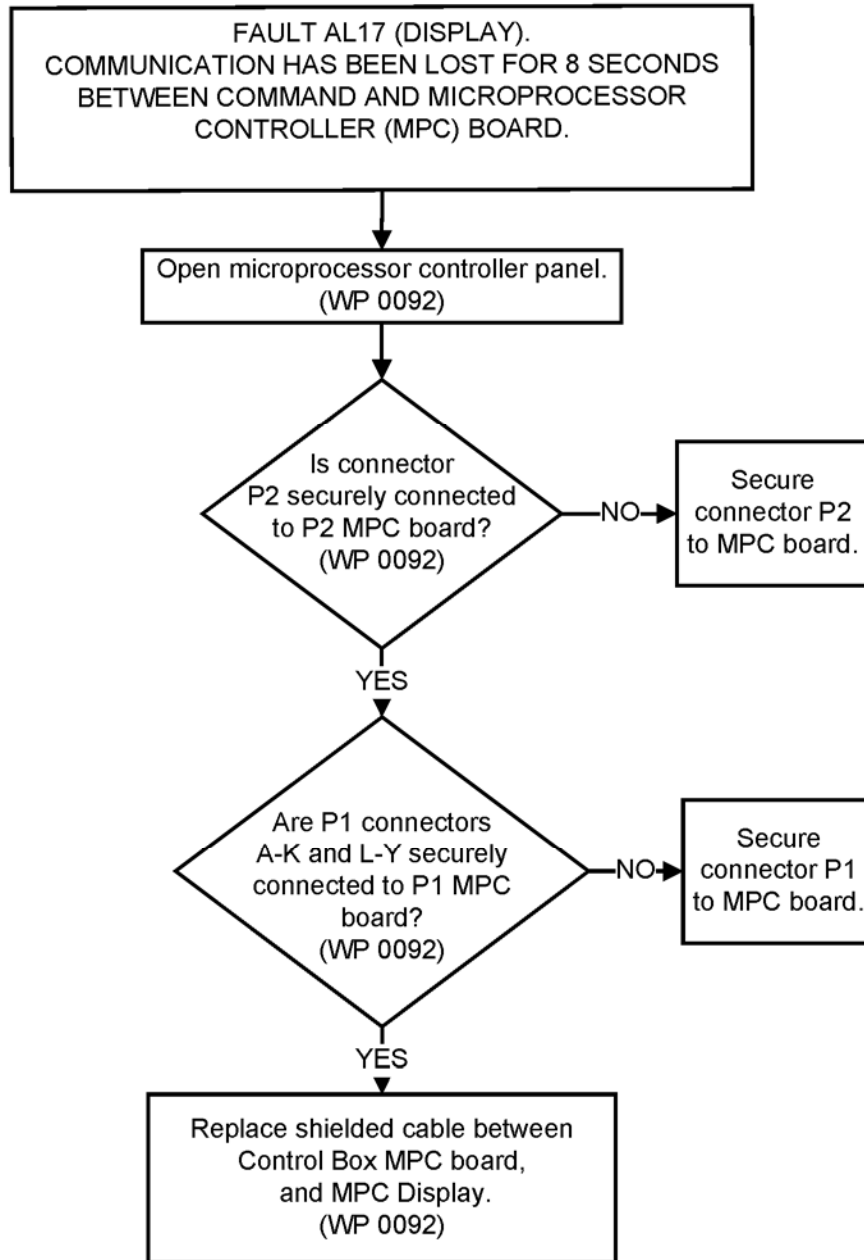


Figure 1. Fault AL17 (DISPLAY).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

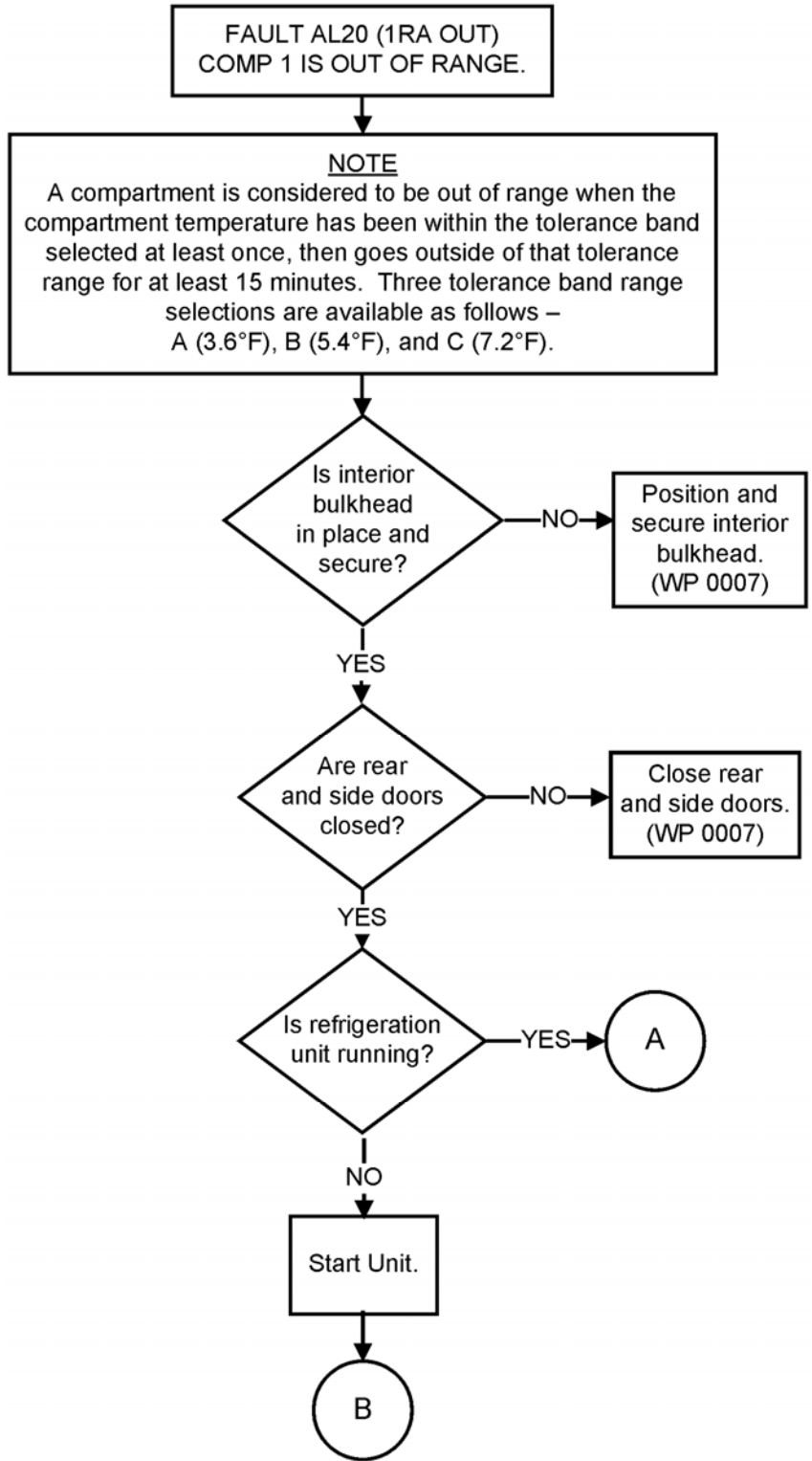


Figure 2. Fault AL20 (1RA 7Out) (Sheet 1 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

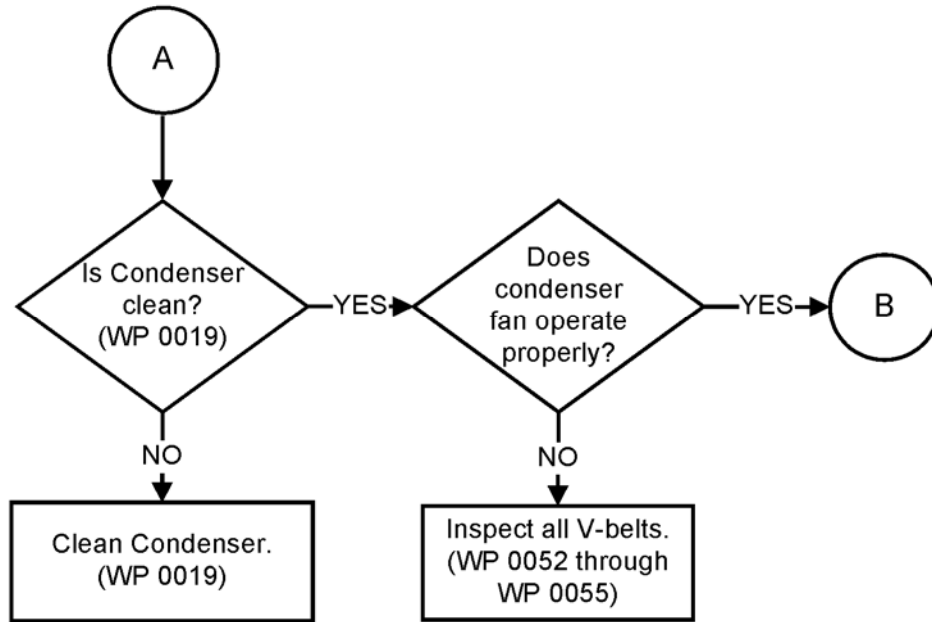


Figure 2. Fault AL20 (1RA Out) (Sheet 2 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

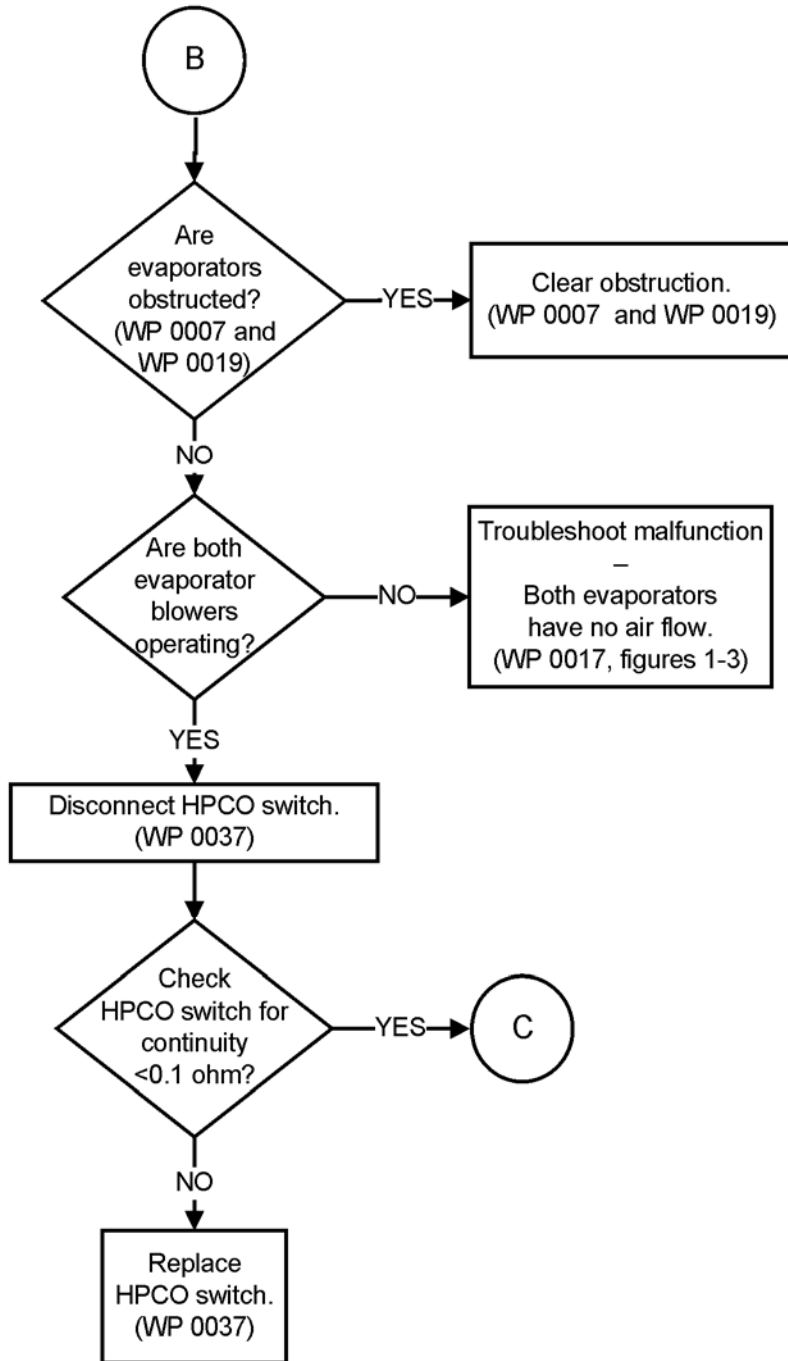


Figure 2. Fault AL20 (1RA Out) (Sheet 3 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

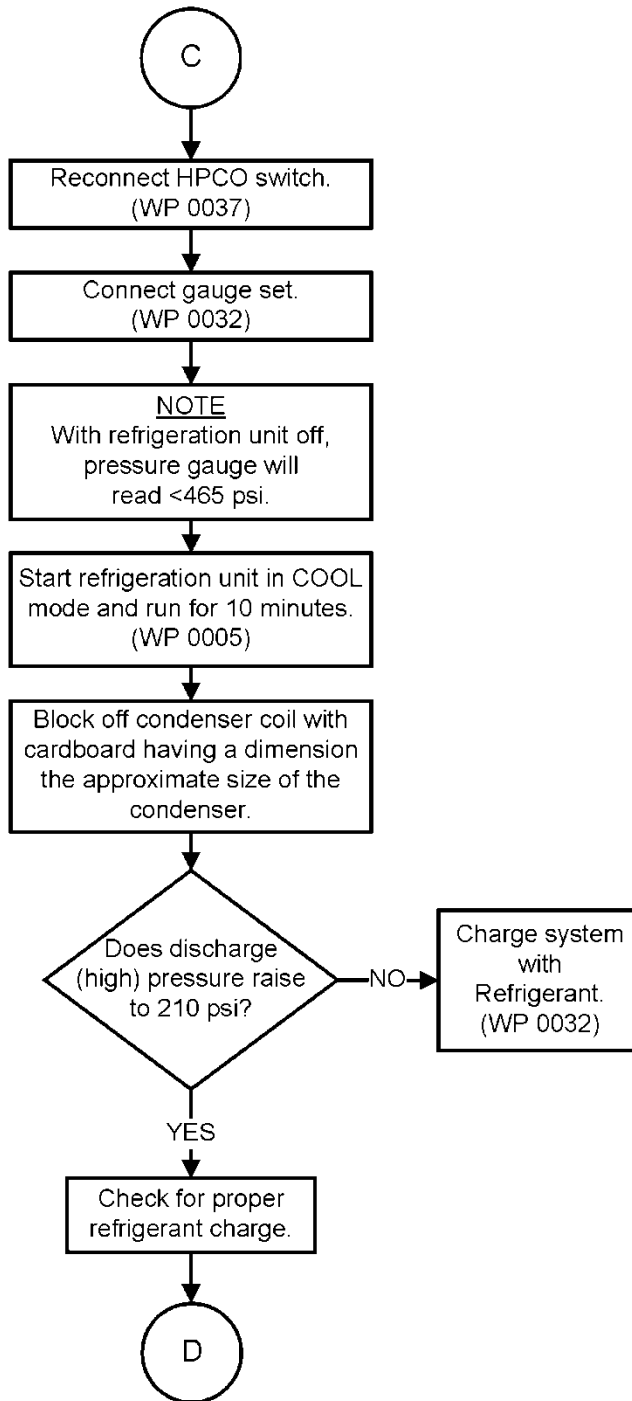


Figure 2. Fault AL20 (1RA Out) (Sheet 4 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

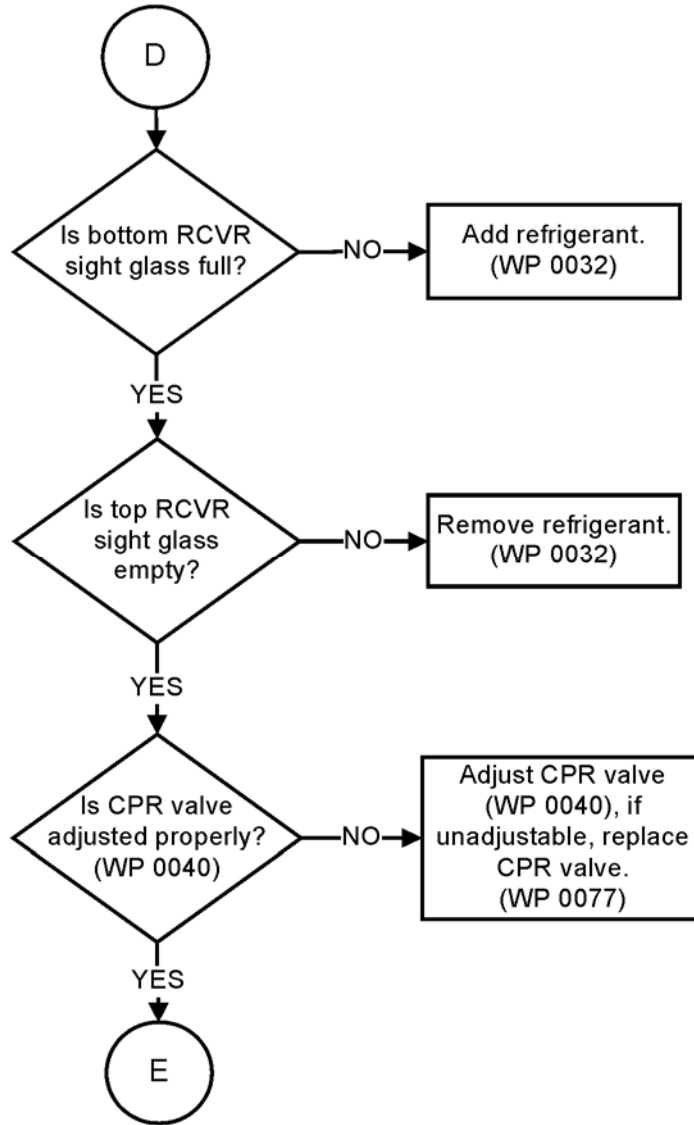


Figure 2. Fault AL20 (1RA Out) (Sheet 5 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

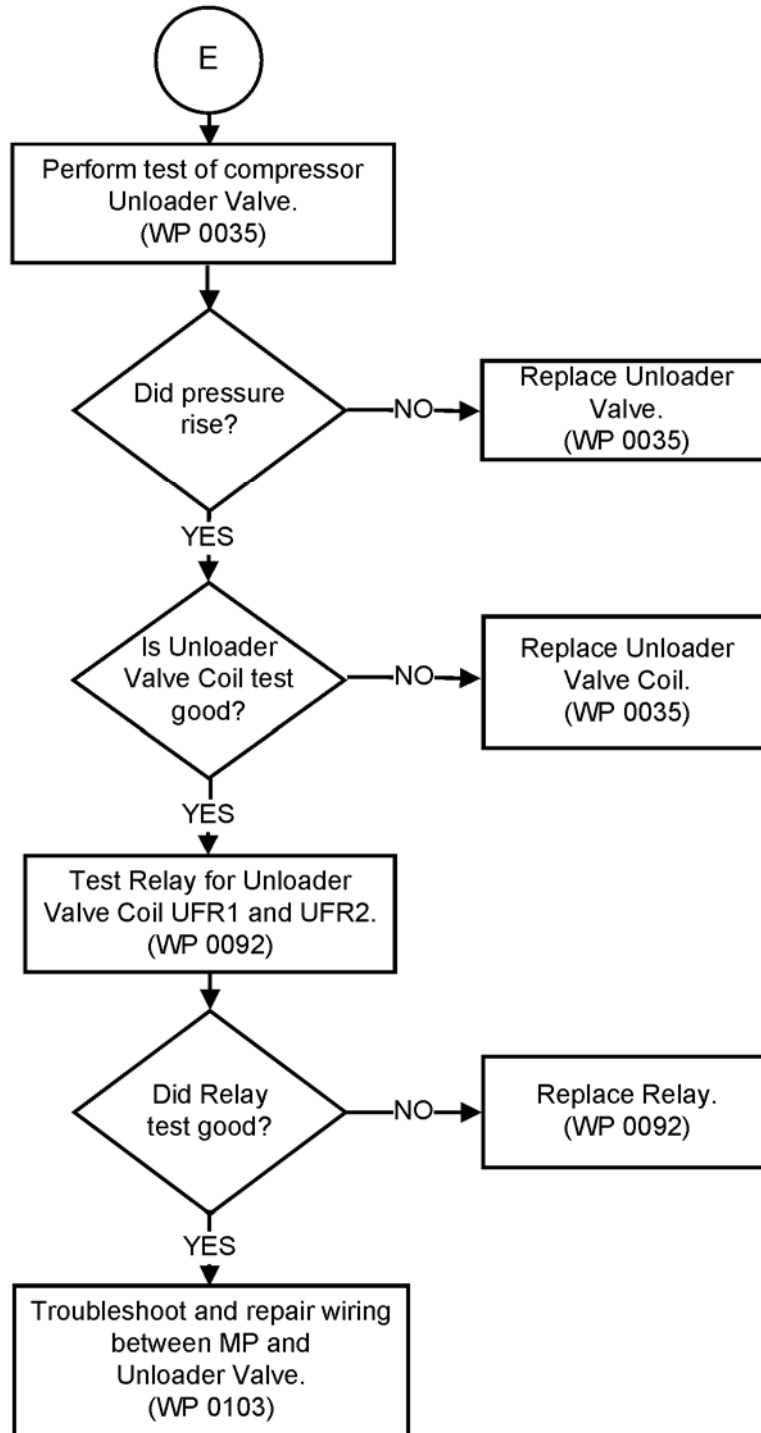


Figure 2. Fault AL20 (1RA Out) (Sheet 6 of 6).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

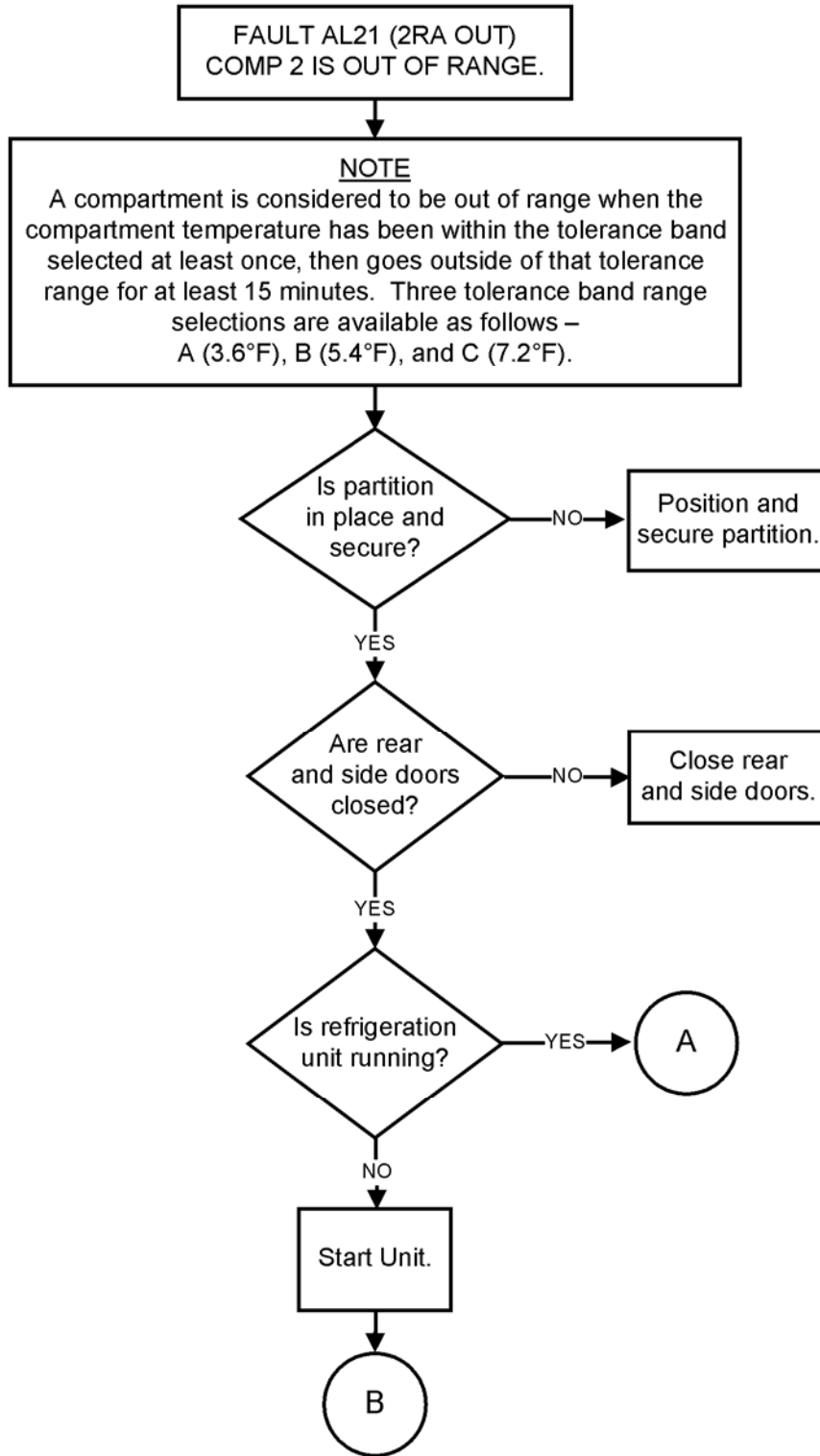


Figure 3. Fault AL21 (2RA Out) (Sheet 1 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

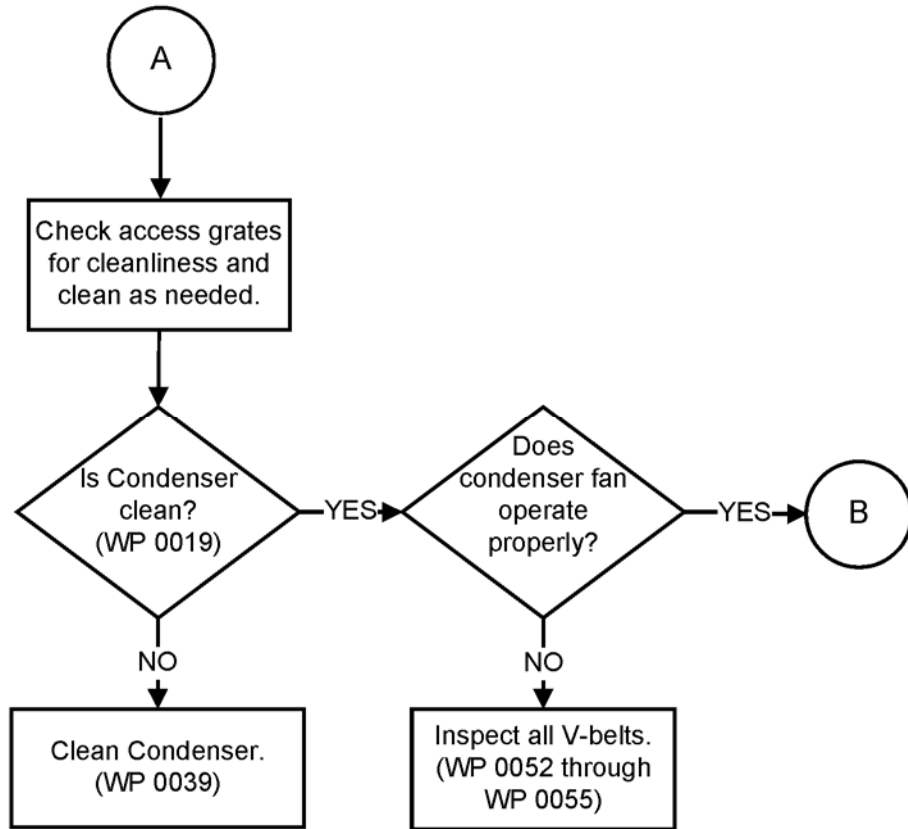


Figure 3. Fault AL21 (2RA Out) (Sheet 2 of 6).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

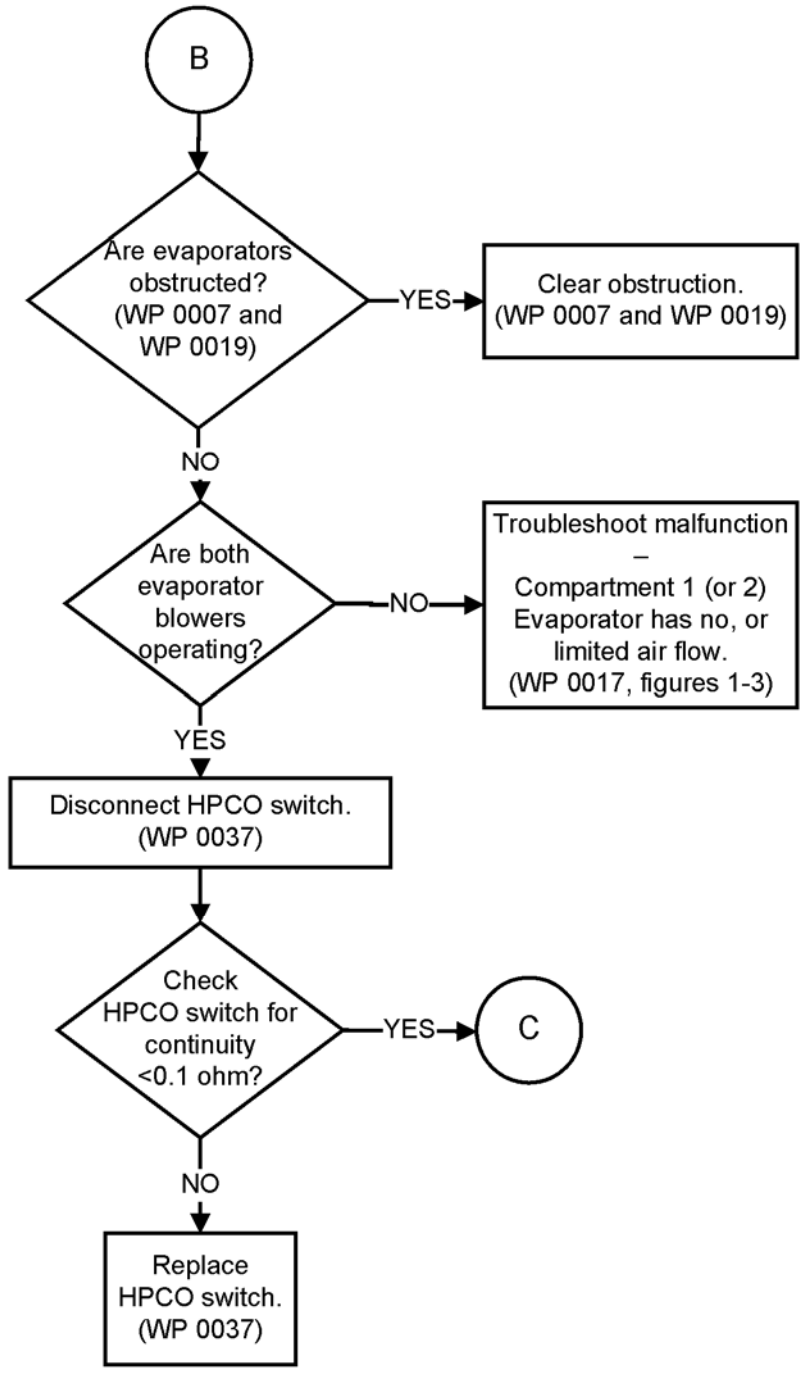


Figure 3. Fault AL21 (2RA Out) (Sheet 3 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED

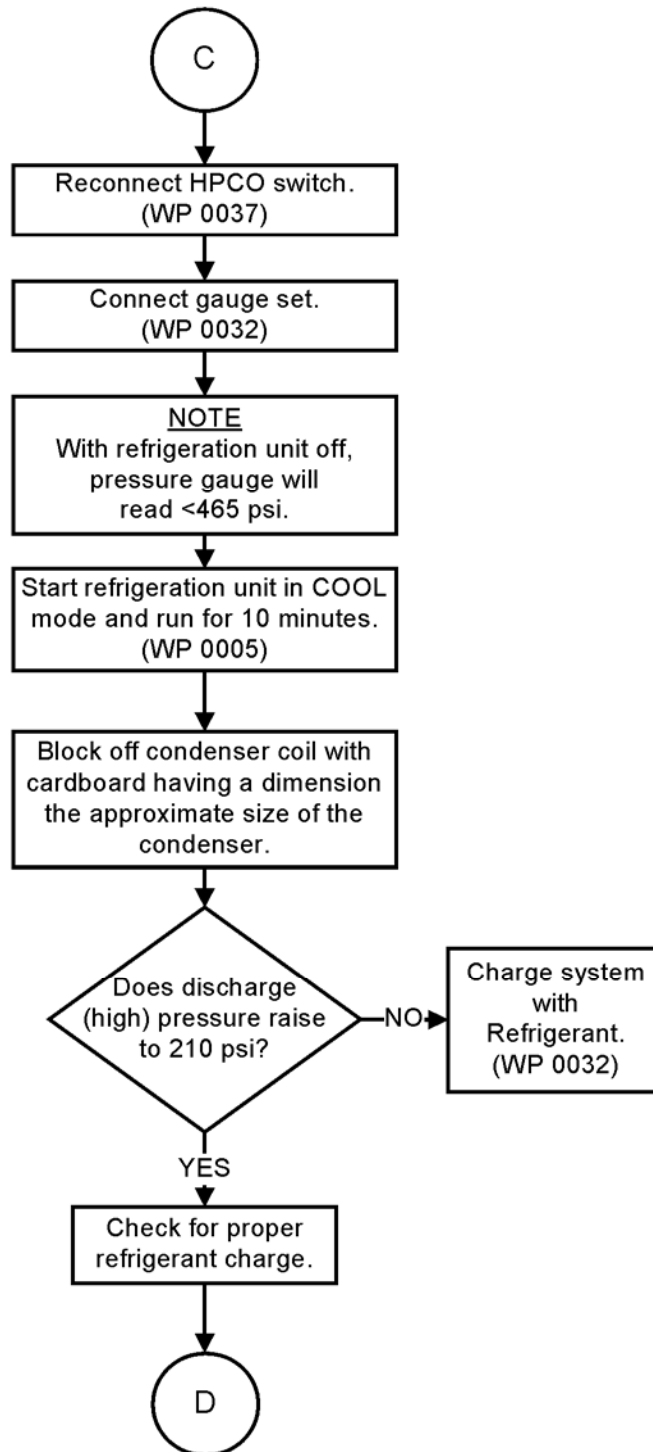


Figure 3. Fault AL21 (2RA Out) (Sheet 4 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED

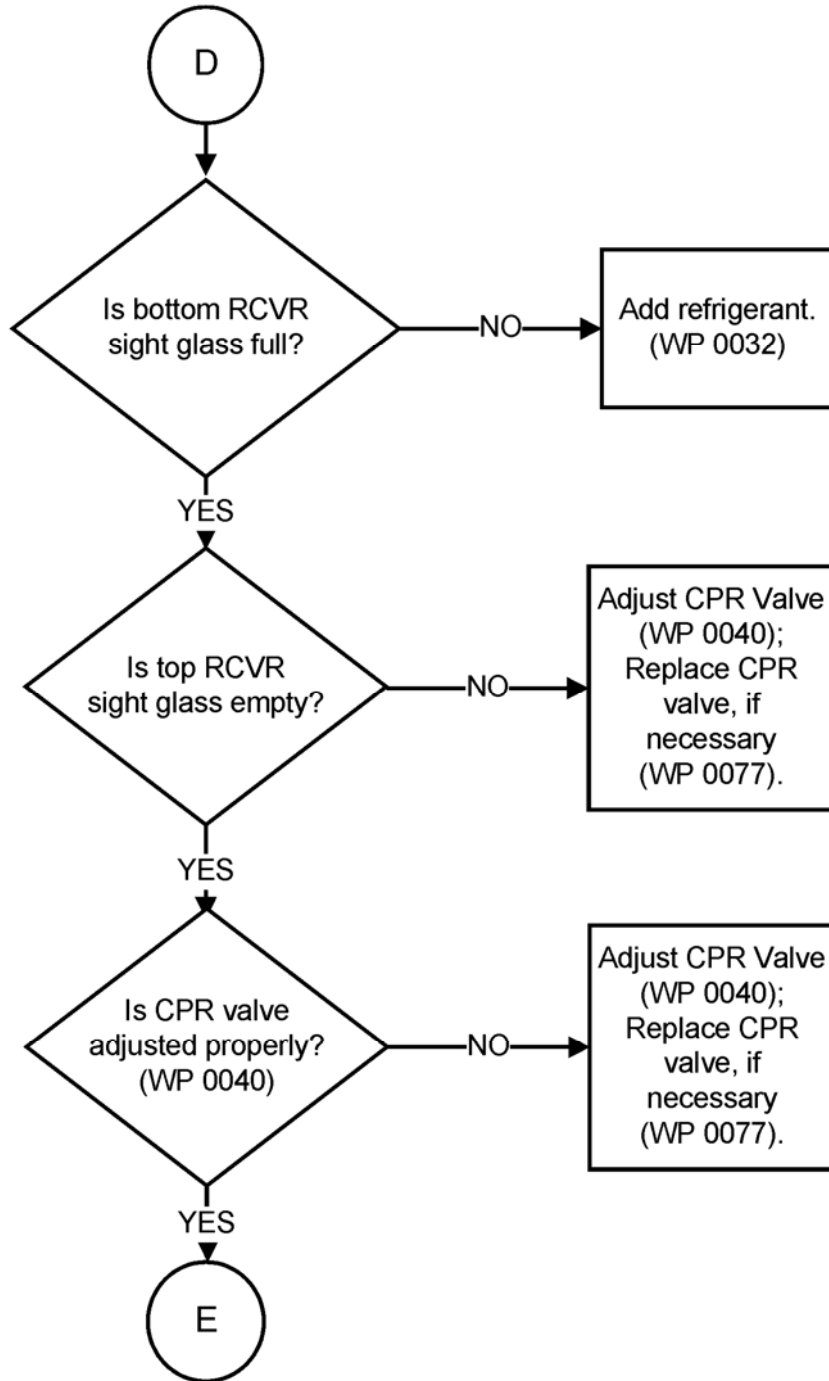


Figure 3. Fault AL21 (2RA Out) (Sheet 5 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED

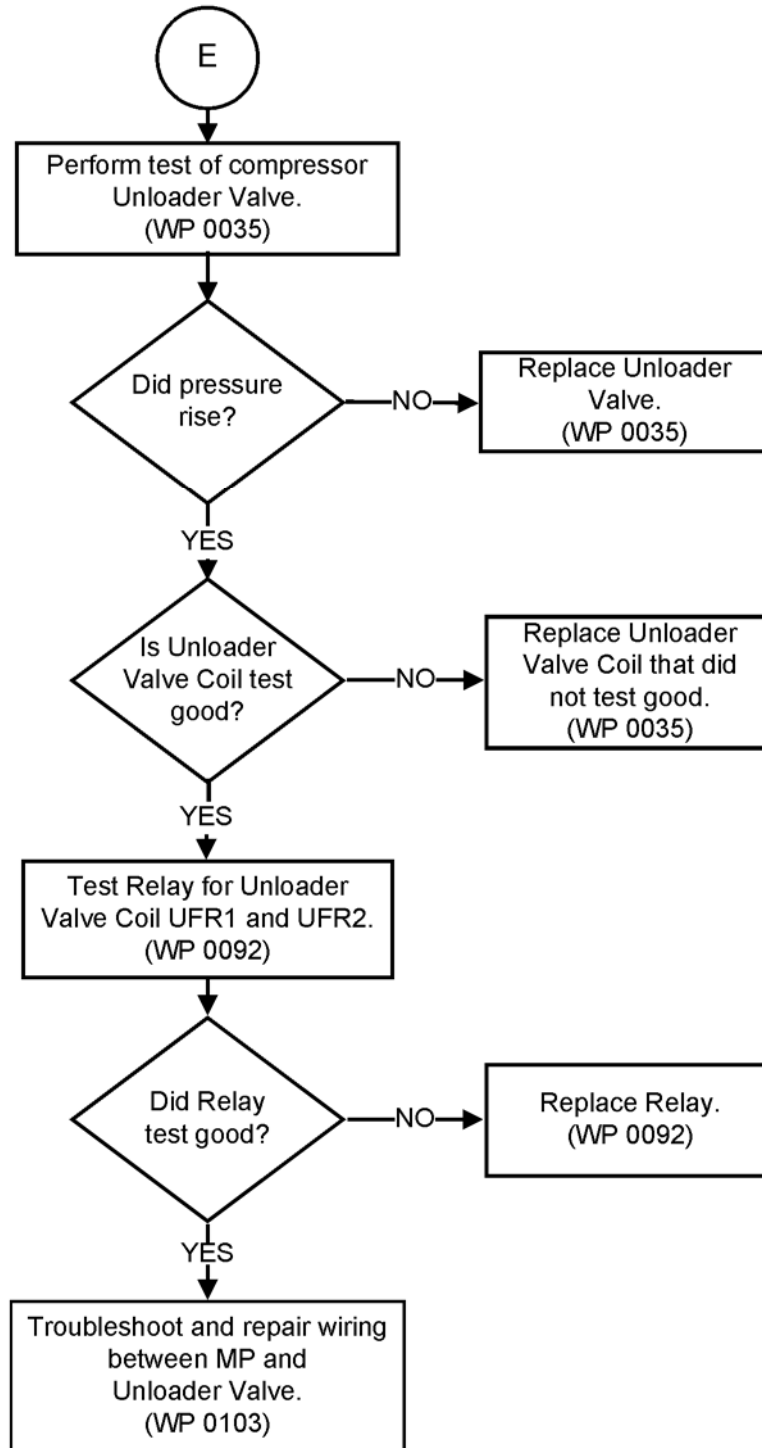


Figure 3. Fault AL21 (2RA Out) (Sheet 6 of 6).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

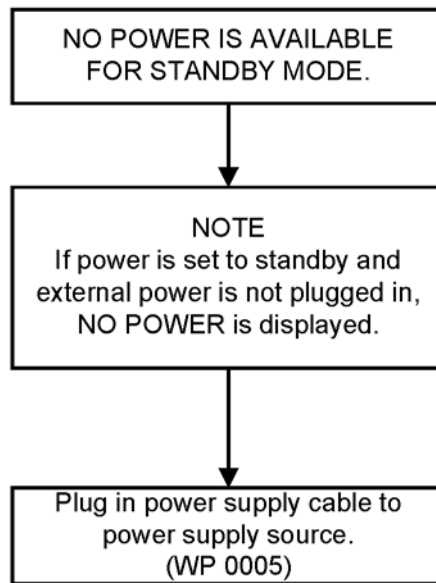


Figure 4. Fault AL23 (NO POWER).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

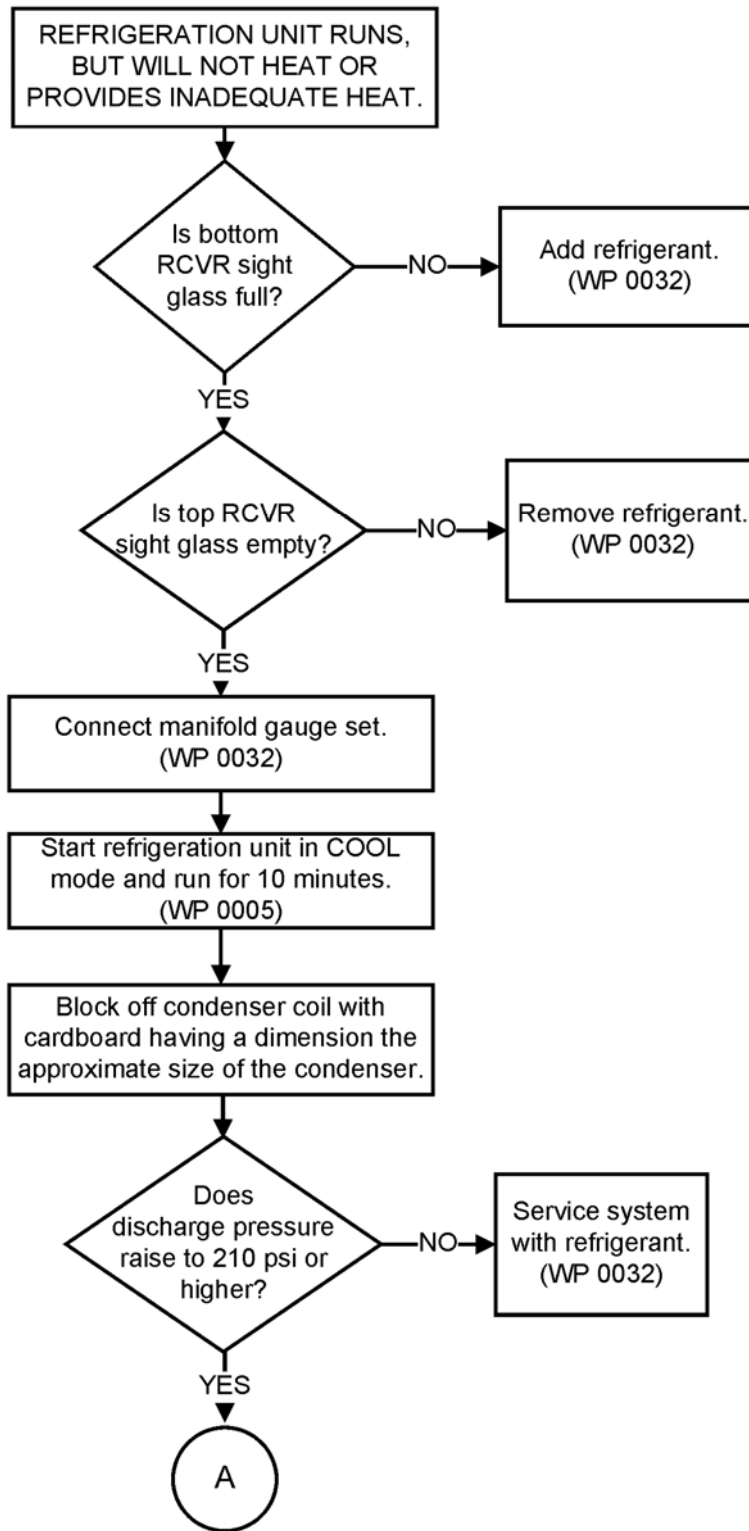


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 1 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

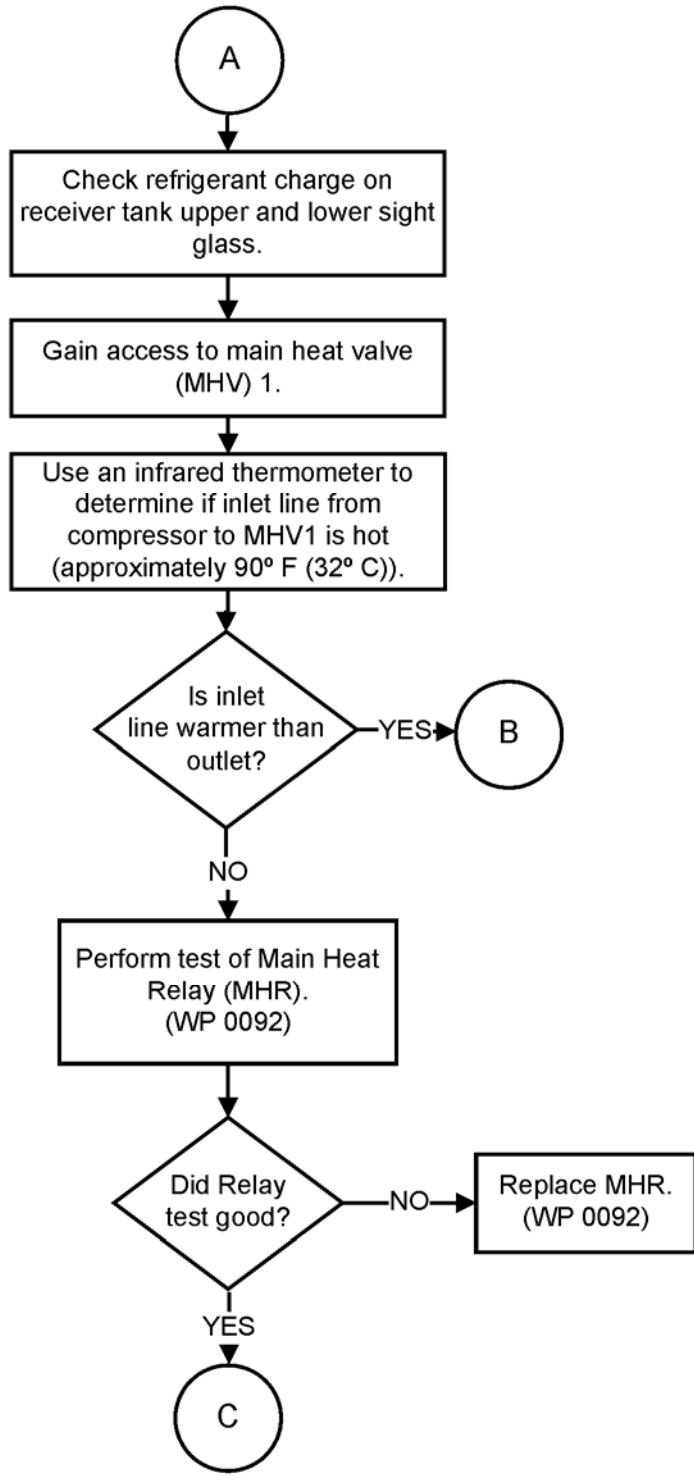


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 2 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

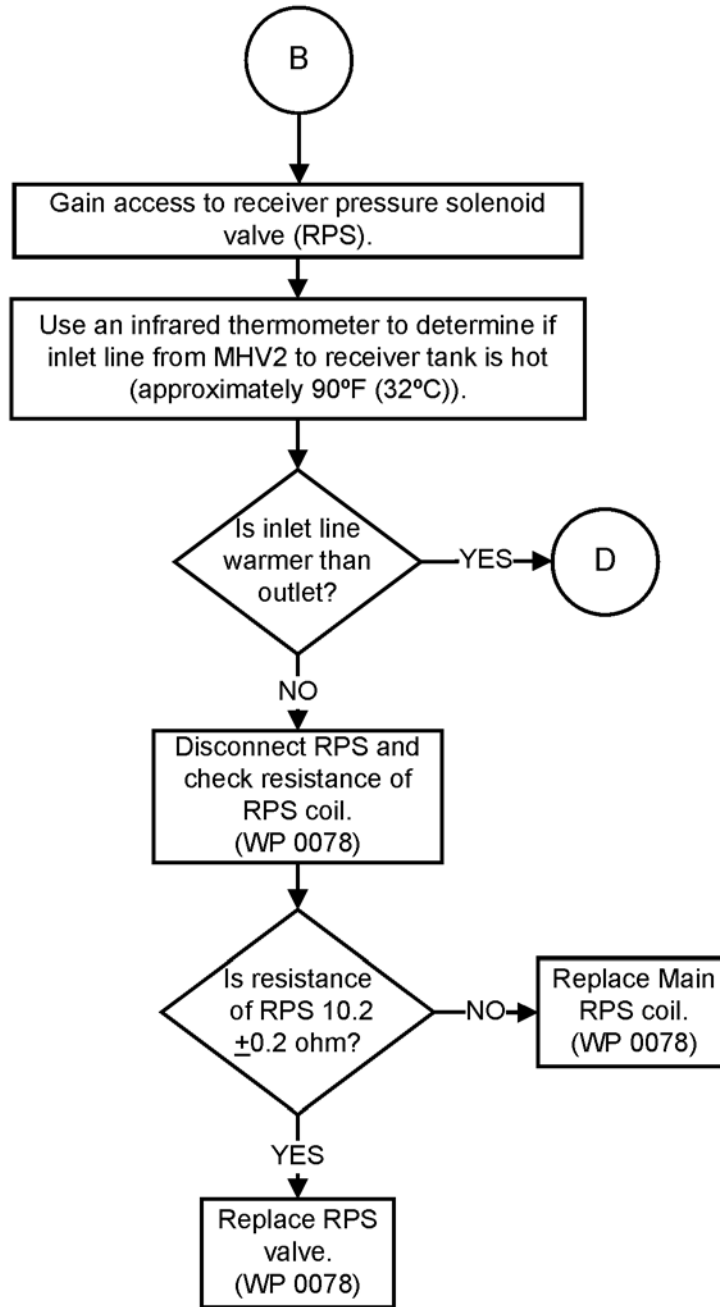


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 3 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

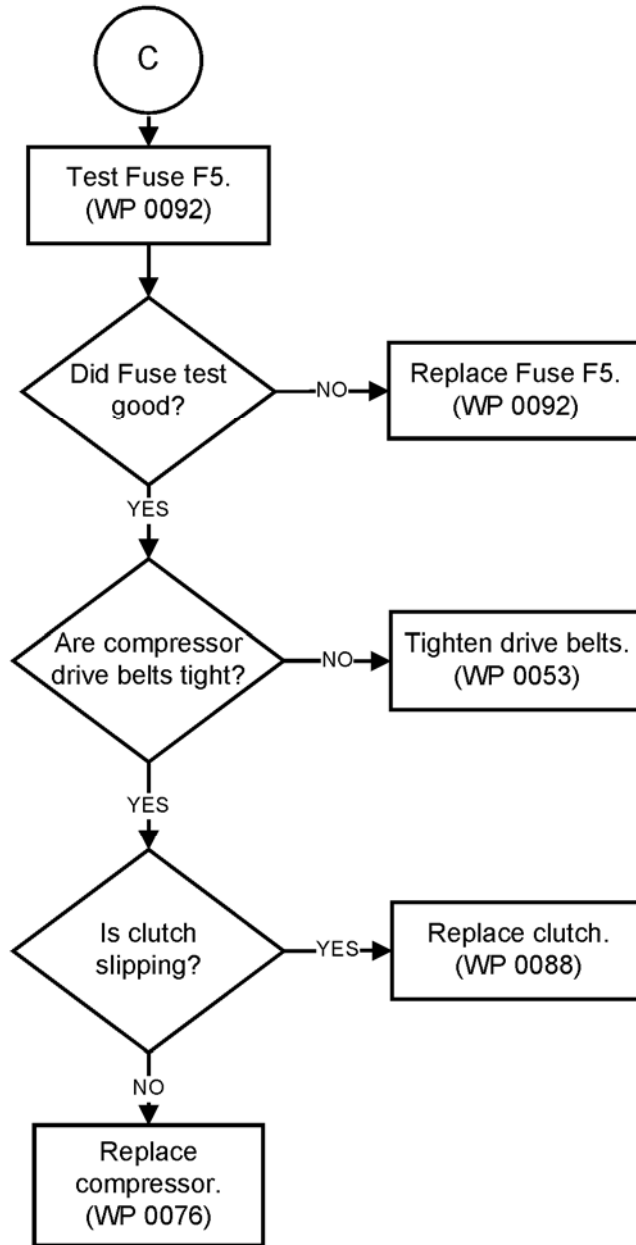


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 4 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

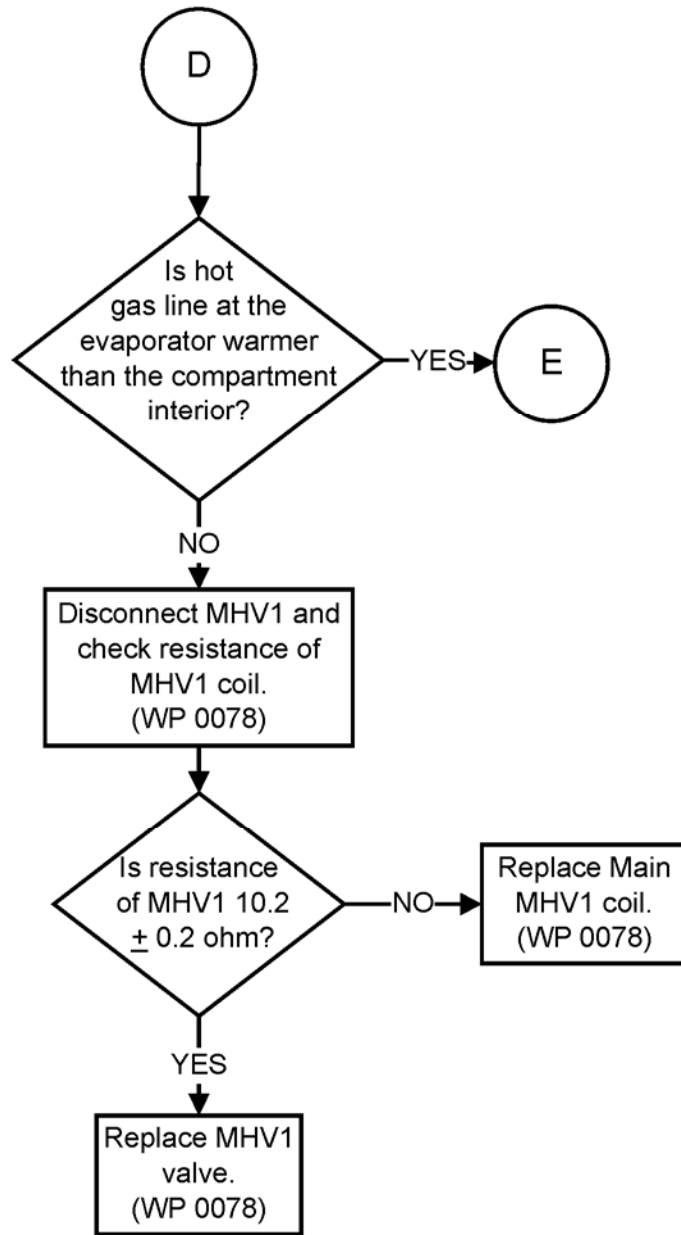


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 5 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

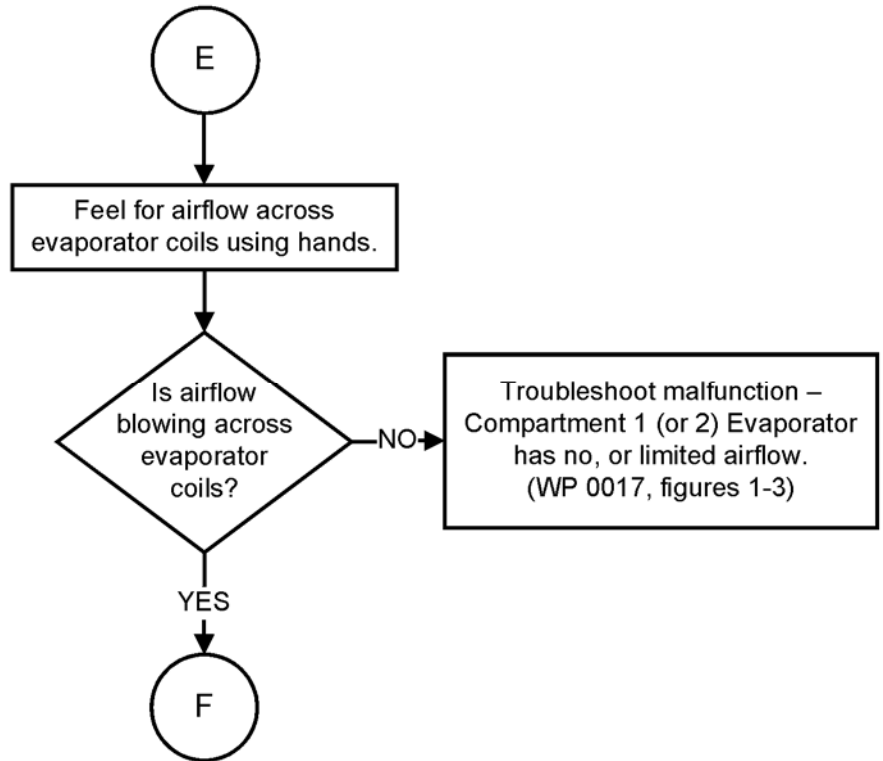


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 6 of 10).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED

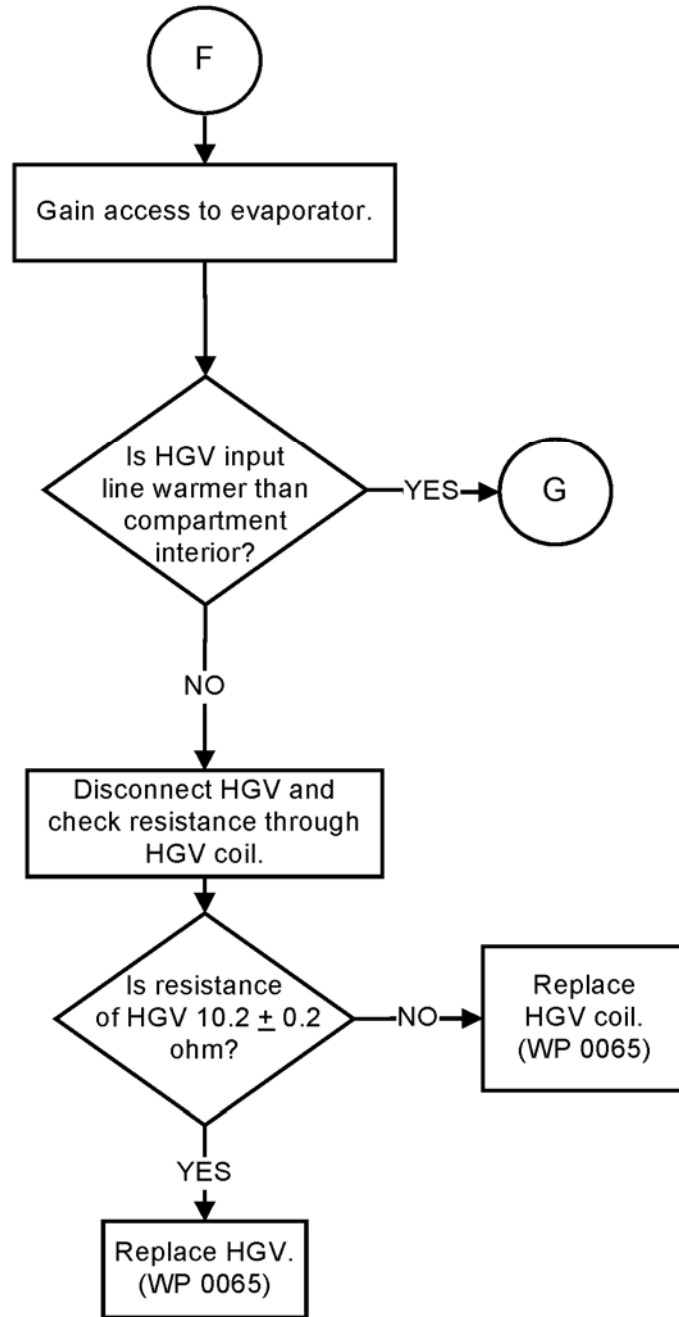


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 7 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

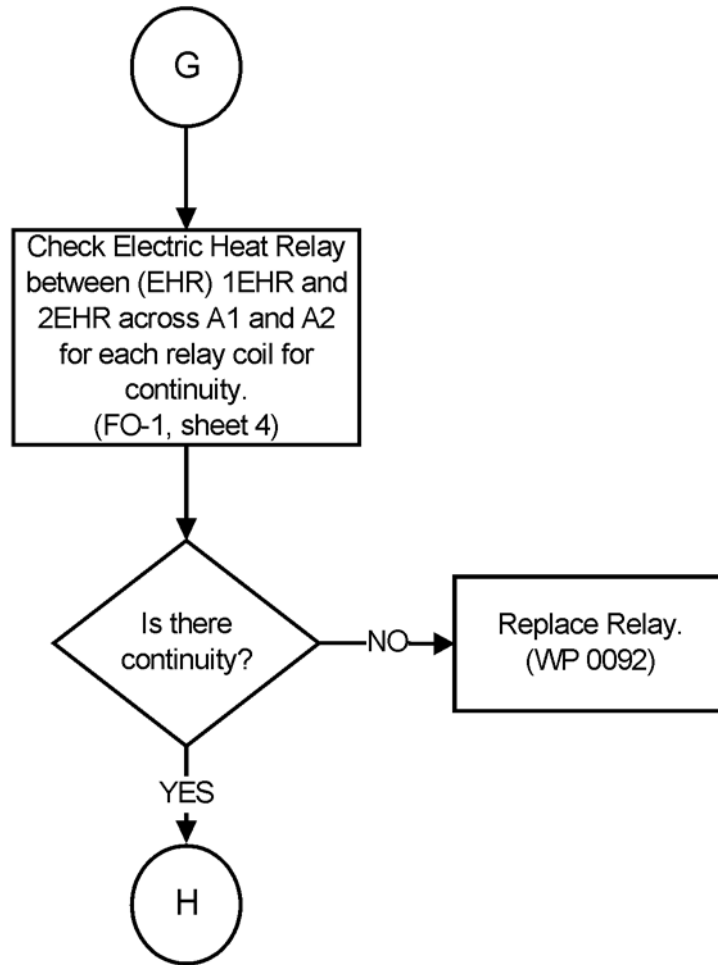


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 8 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

WARNING

Capacitors are electrical storage devices that are designed to hold a charge after power is disconnected from them. For this reason, extreme care must be taken when working on or around capacitors. Discharge capacitors with a shorting plug before performing maintenance on capacitors. Failure to comply with this warning can result in severe electrical shock resulting in serious injury or death.

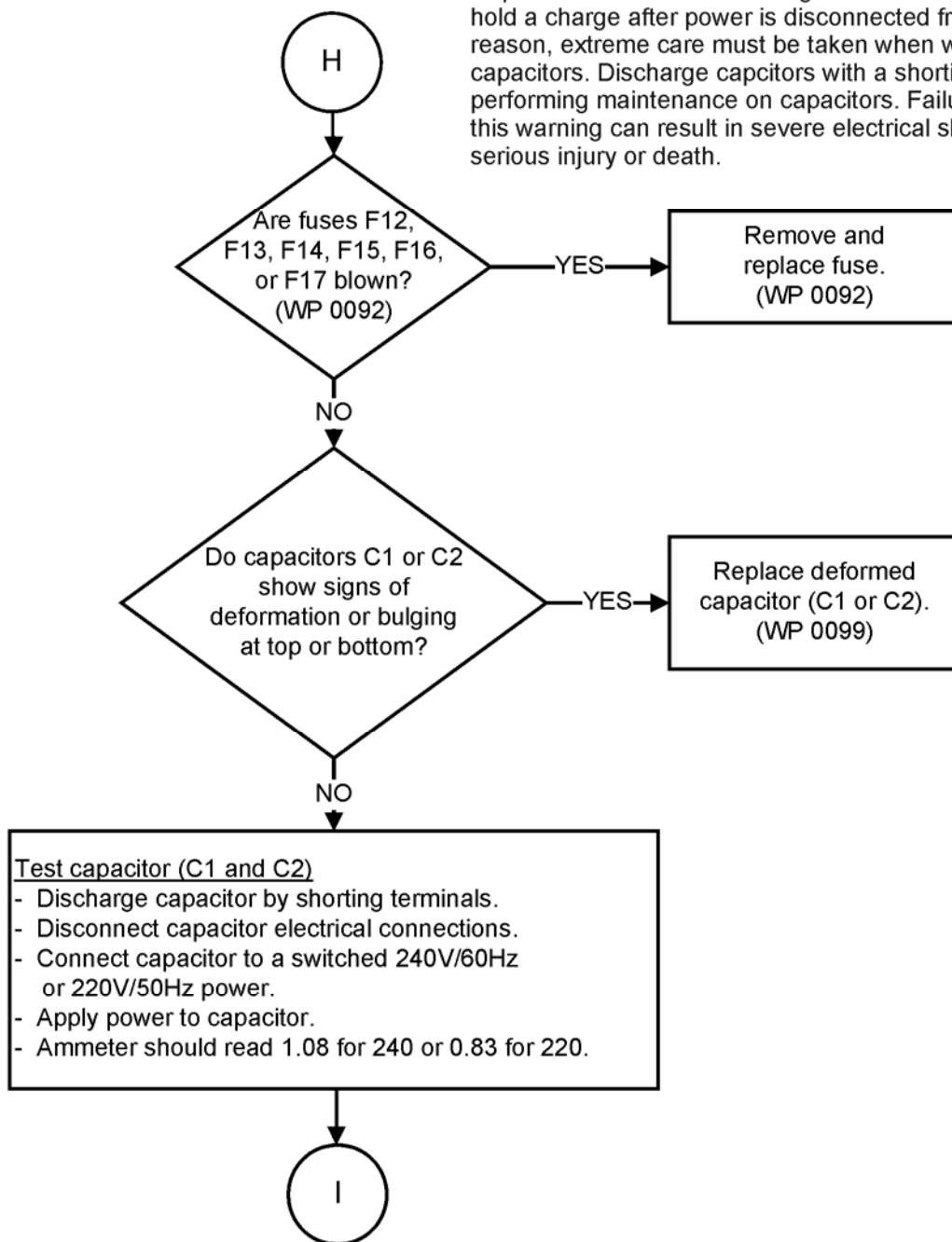


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 9 of 10).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

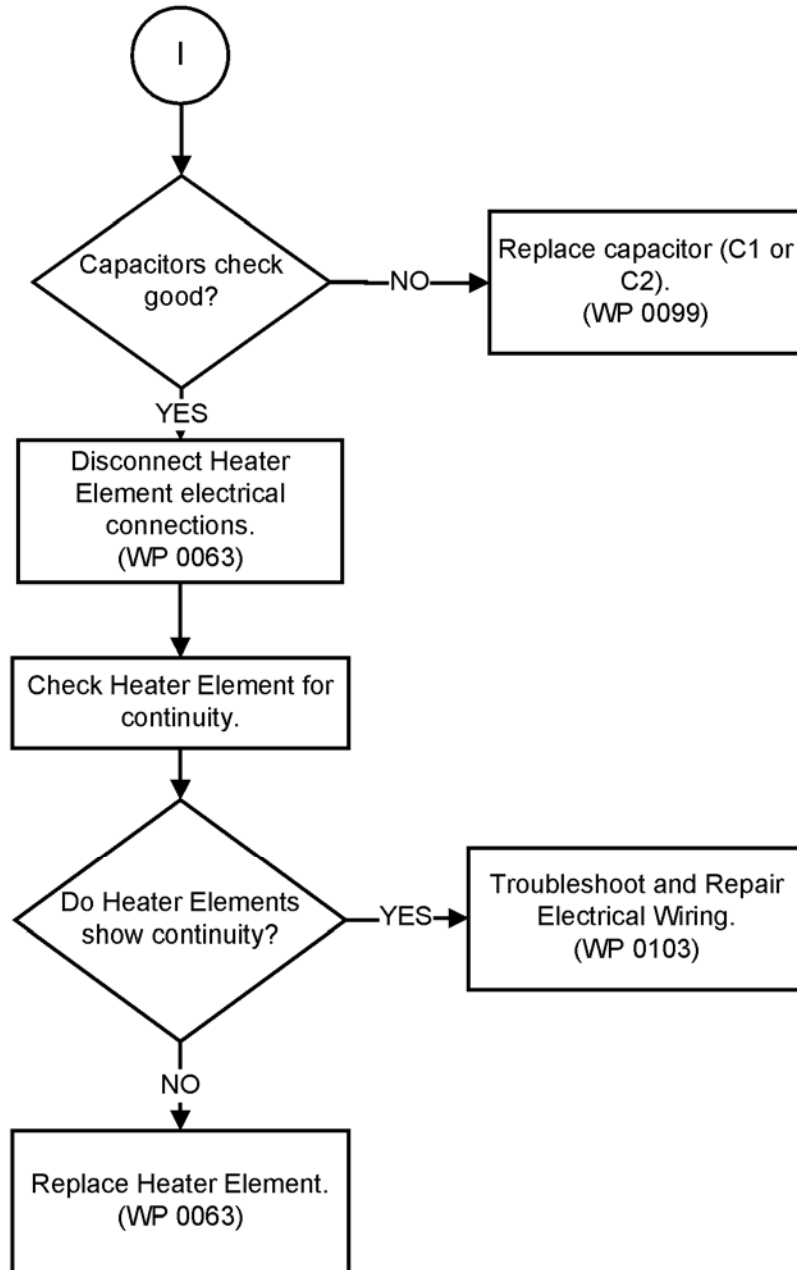


Figure 5. Refrigeration Unit Runs But Will Not Heat (Sheet 10 of 10).

END OF TASK

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

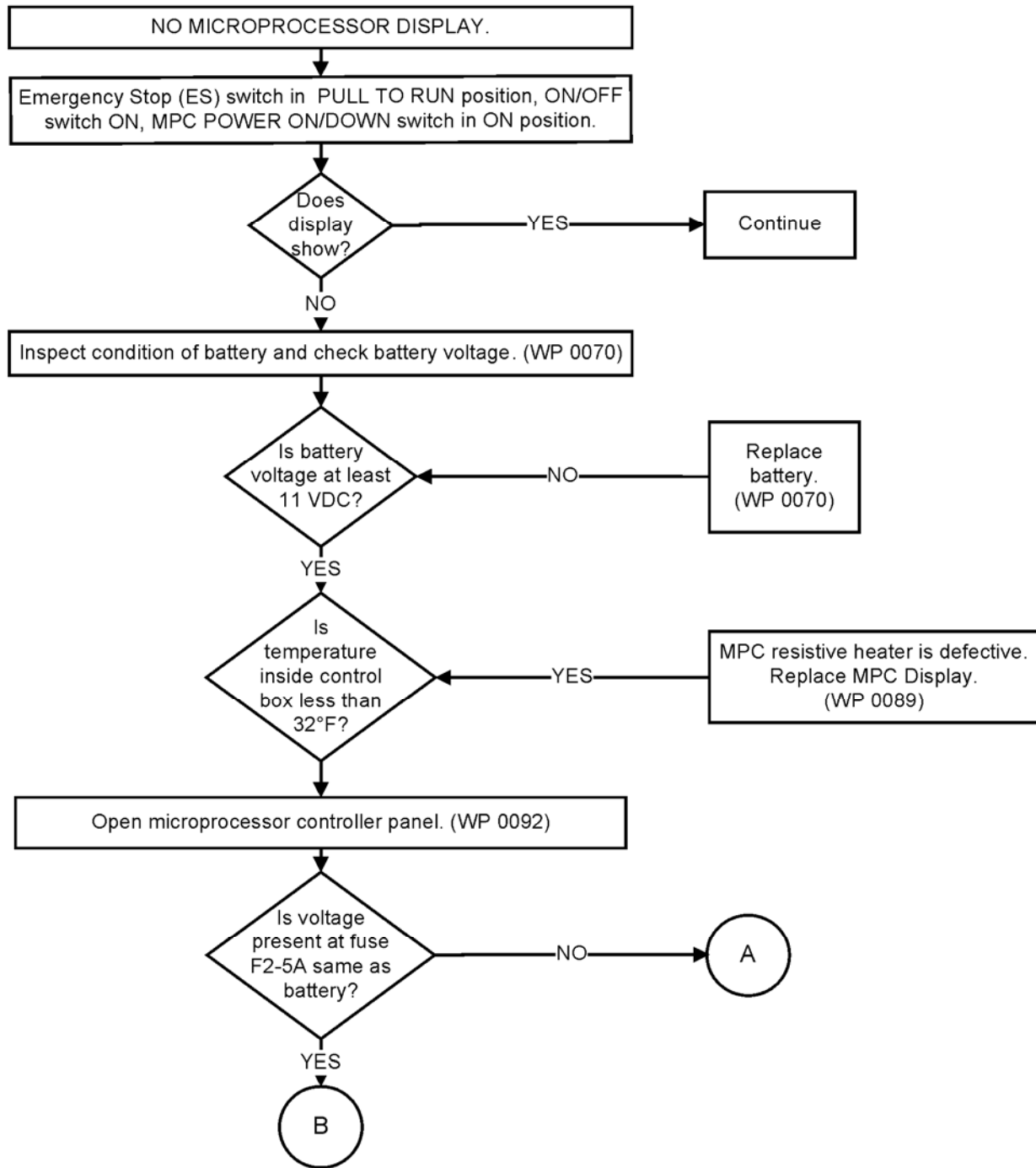


Figure 6. No Microprocessor Display (Sheet 1 of 7).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

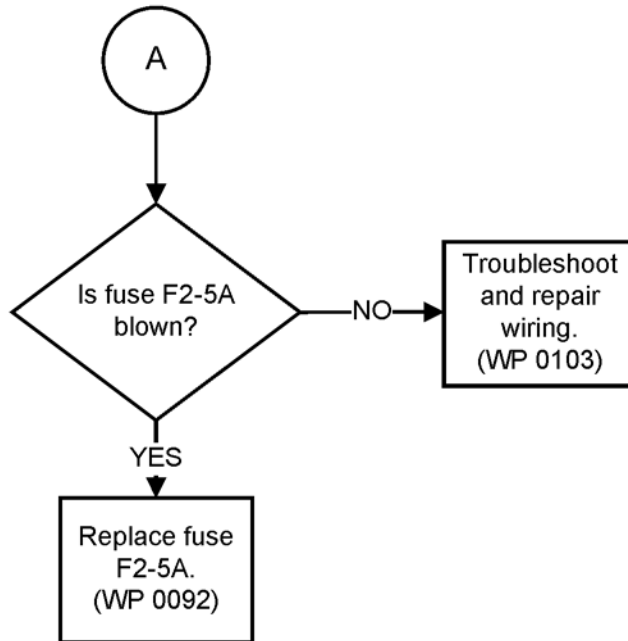


Figure 6. No Microprocessor Display (Sheet 2 of 7).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

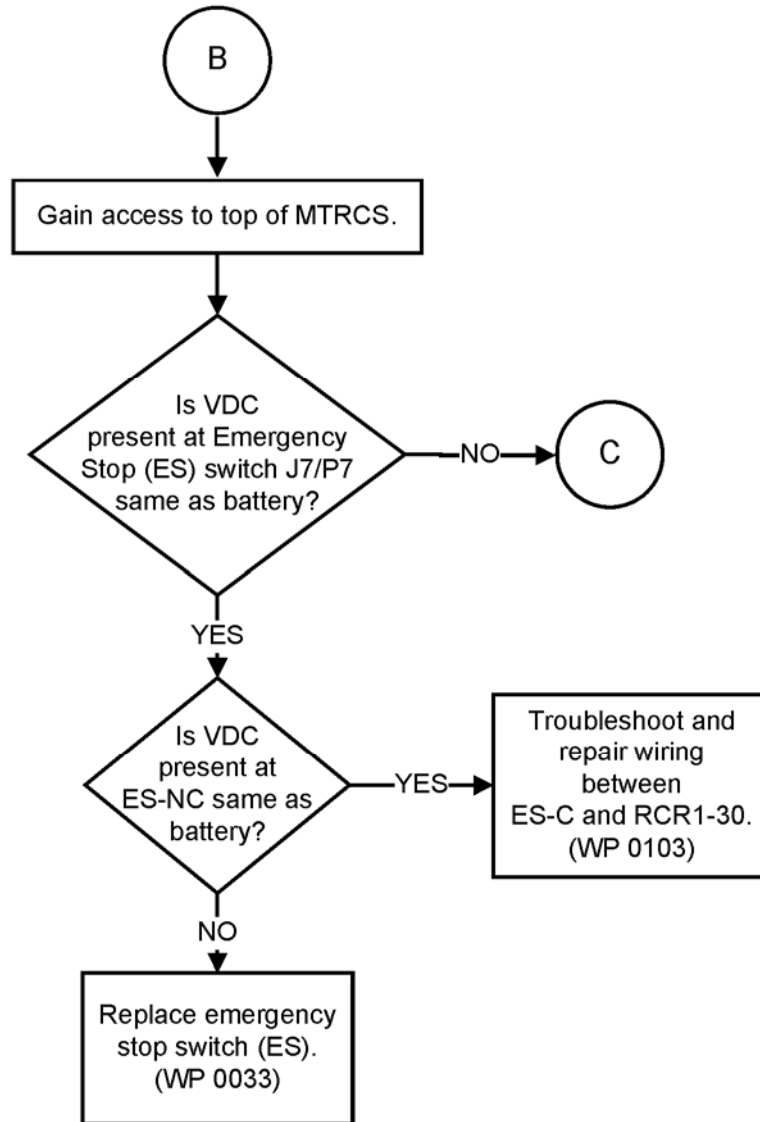


Figure 6. No Microprocessor Display (Sheet 3 of 7).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

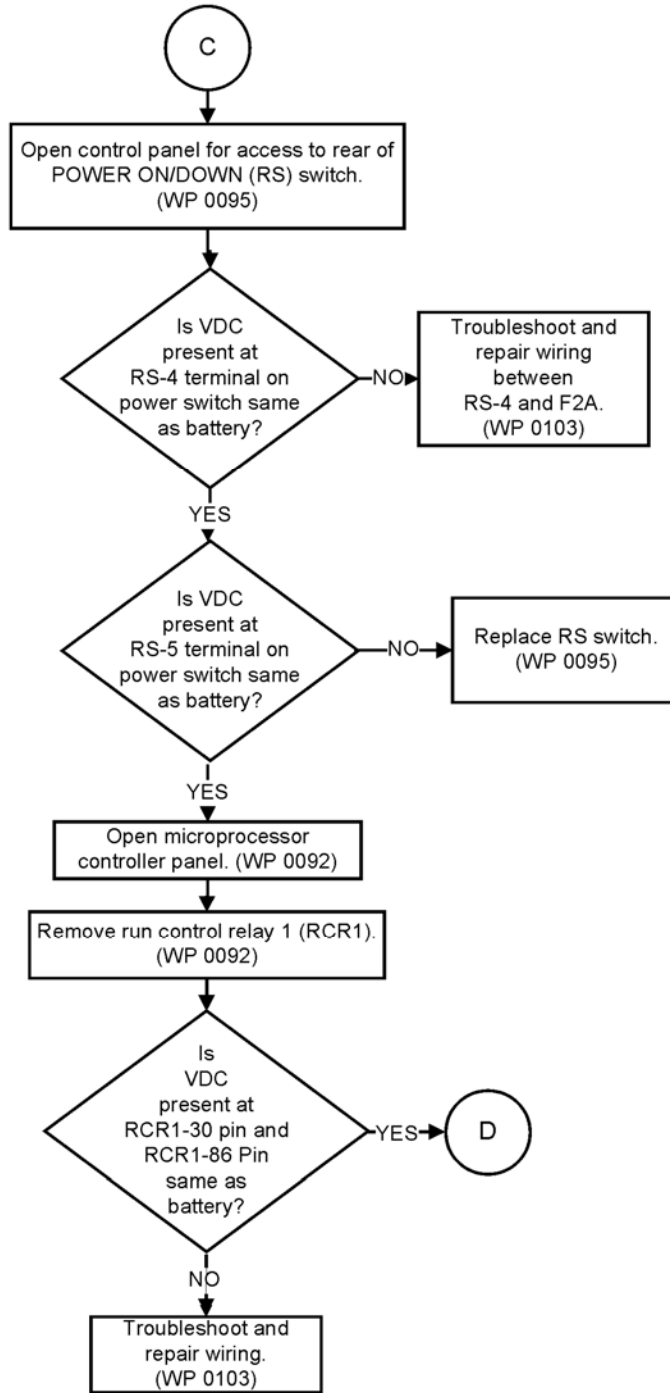


Figure 6. No Microprocessor Display (Sheet 4 of 7).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

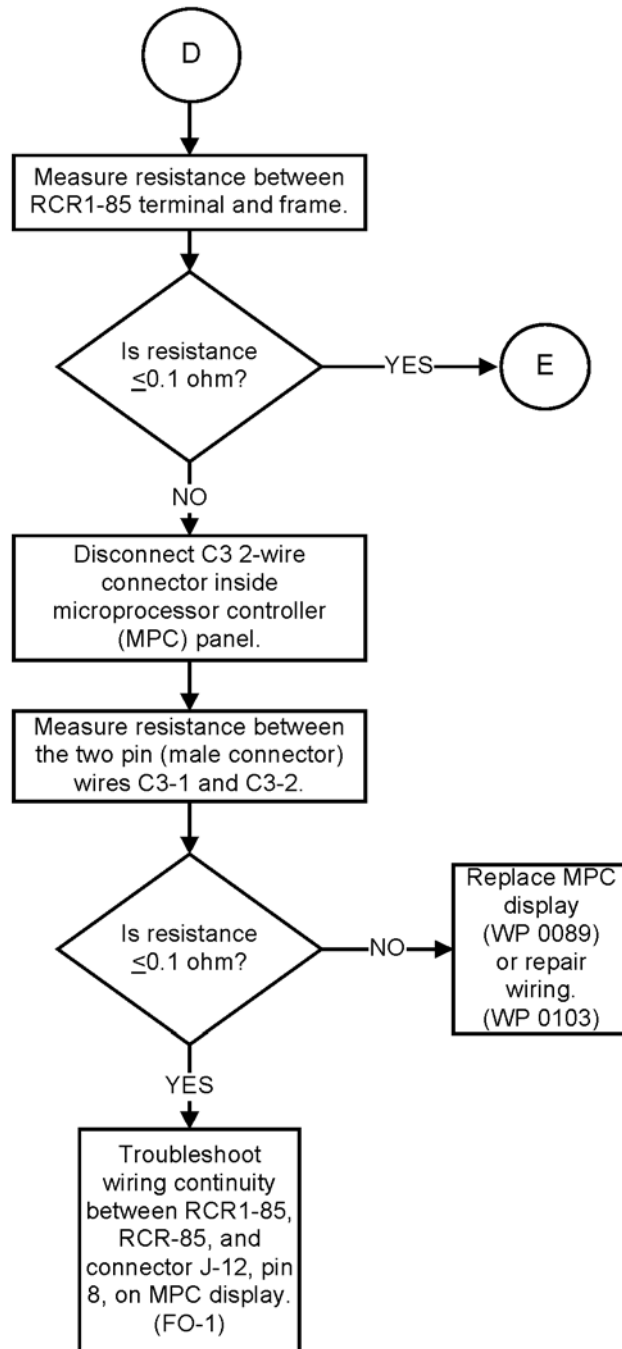


Figure 6. No Microprocessor Display (Sheet 5 of 7).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

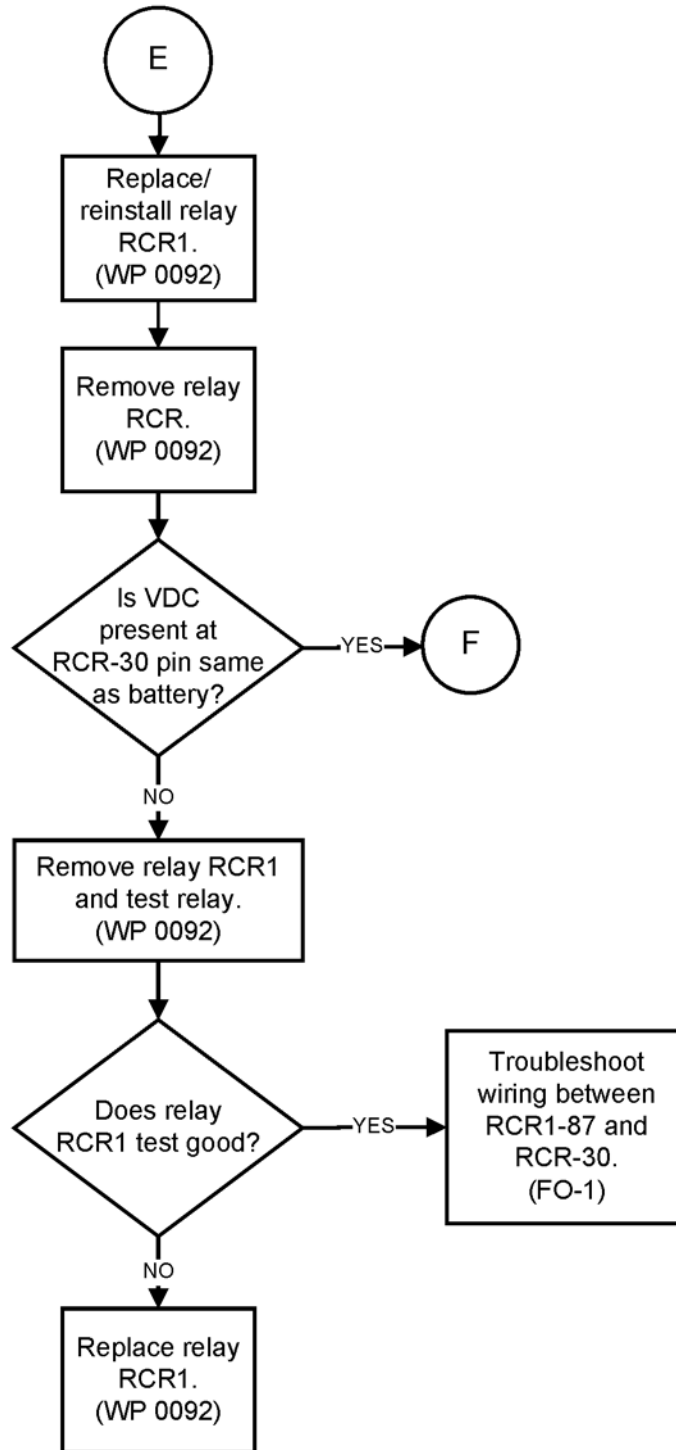


Figure 6. No Microprocessor Display (Sheet 6 of 7).

**SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES
(FAULT CODES AL17 – AL23) – CONTINUED**

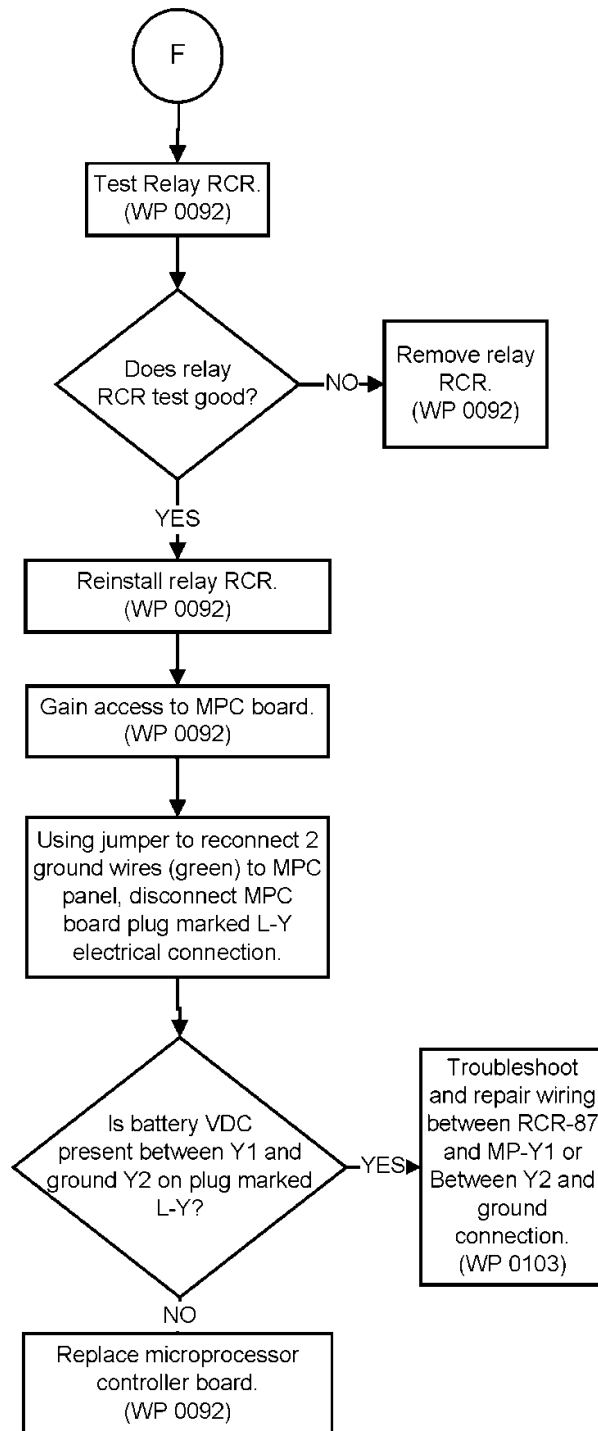


Figure 6. No Microprocessor Display (Sheet 7 of 7).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
**MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance Tool Kit
(WP 0107, Item 6)
Refrigeration Equipment Tool Kit
(WP 0107, Item 7)
SATS (WP 0107, Item 8)

References

WP 0005	WP 0012	WP 0014
WP 0019	WP 0060	WP 0061
WP 0091	WP 0092	WP 0093
WP 0099	WP 0103	

Equipment Condition

MTRCS prepared for use (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)
Quartermaster and Chemical Equipment Repairer (2)

INTRODUCTION

This Work Package contains troubleshooting procedures for the compartment airflow and standby motor. A troubleshooting index is contained in WP 0012. Refer to WP 0014 for microprocessor control box component identification.

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES

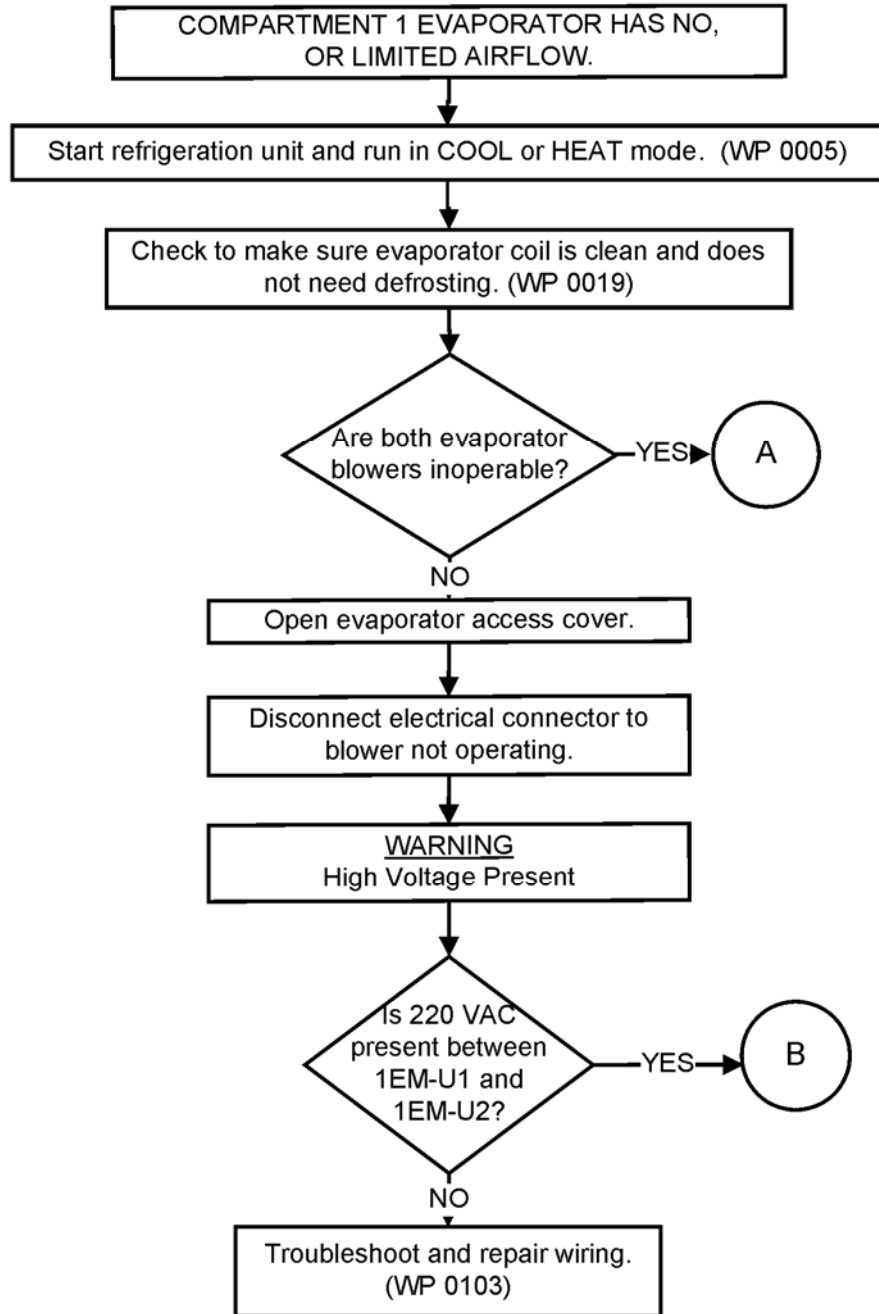


Figure 1. Compartment 1 Evaporator Has No, or Limited, Airflow (Sheet 1 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

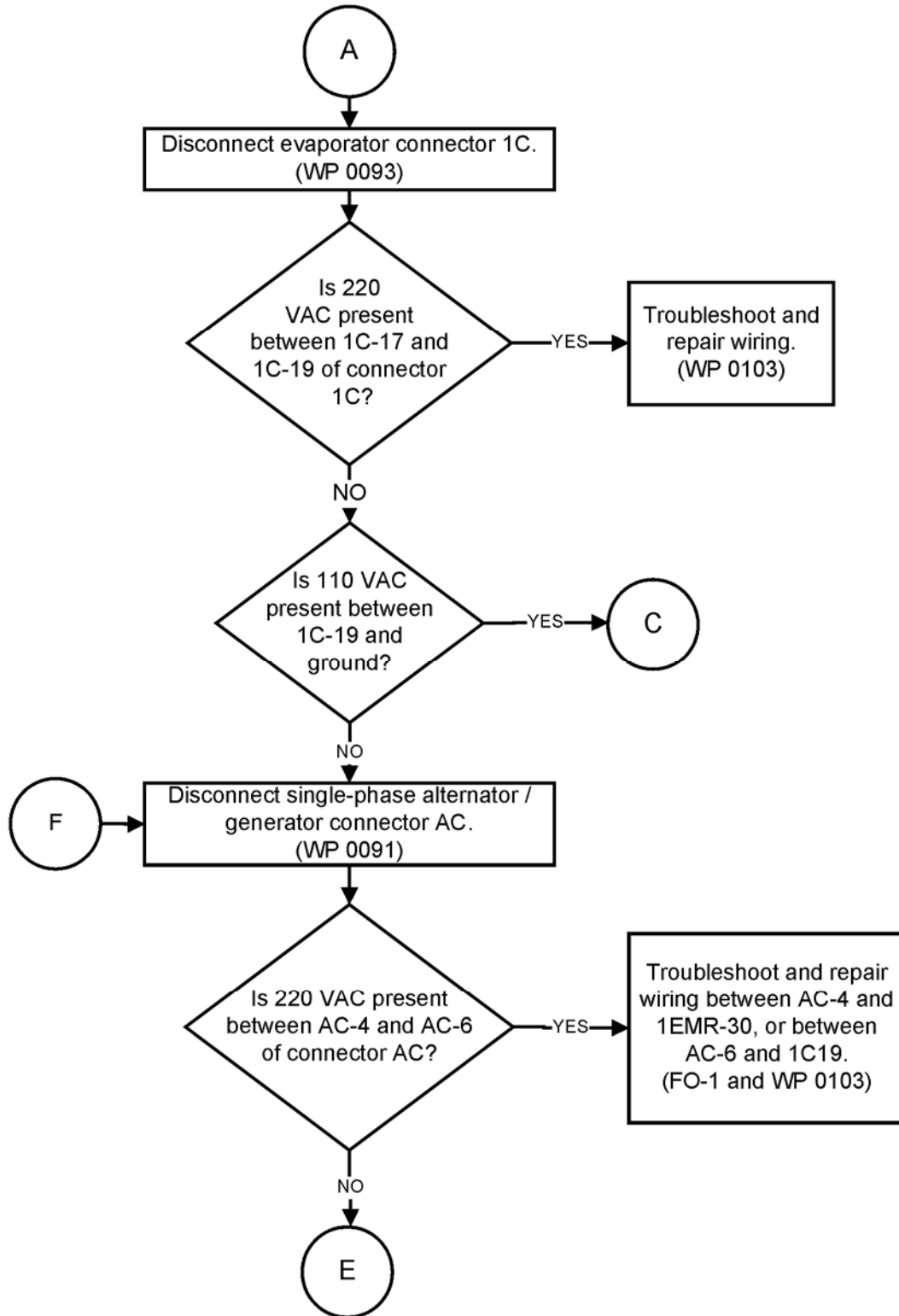


Figure 1. Compartment 1 Evaporator Has No, or Limited, Airflow (Sheet 2 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

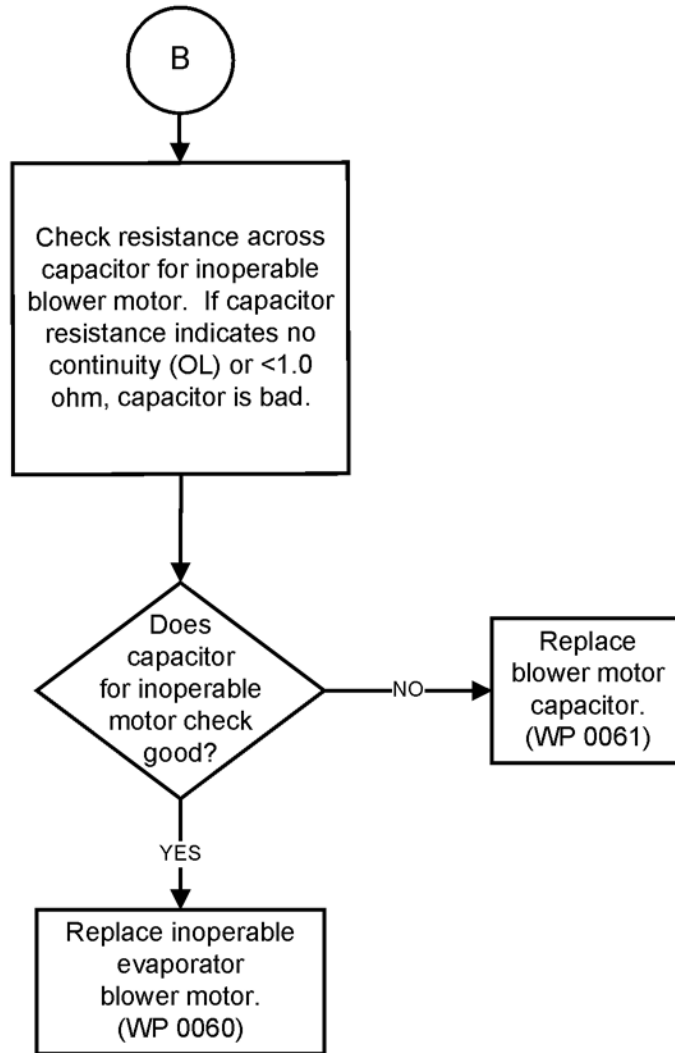


Figure 1. Compartment 1 Evaporator Has No, or Limited, Airflow (Sheet 3 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

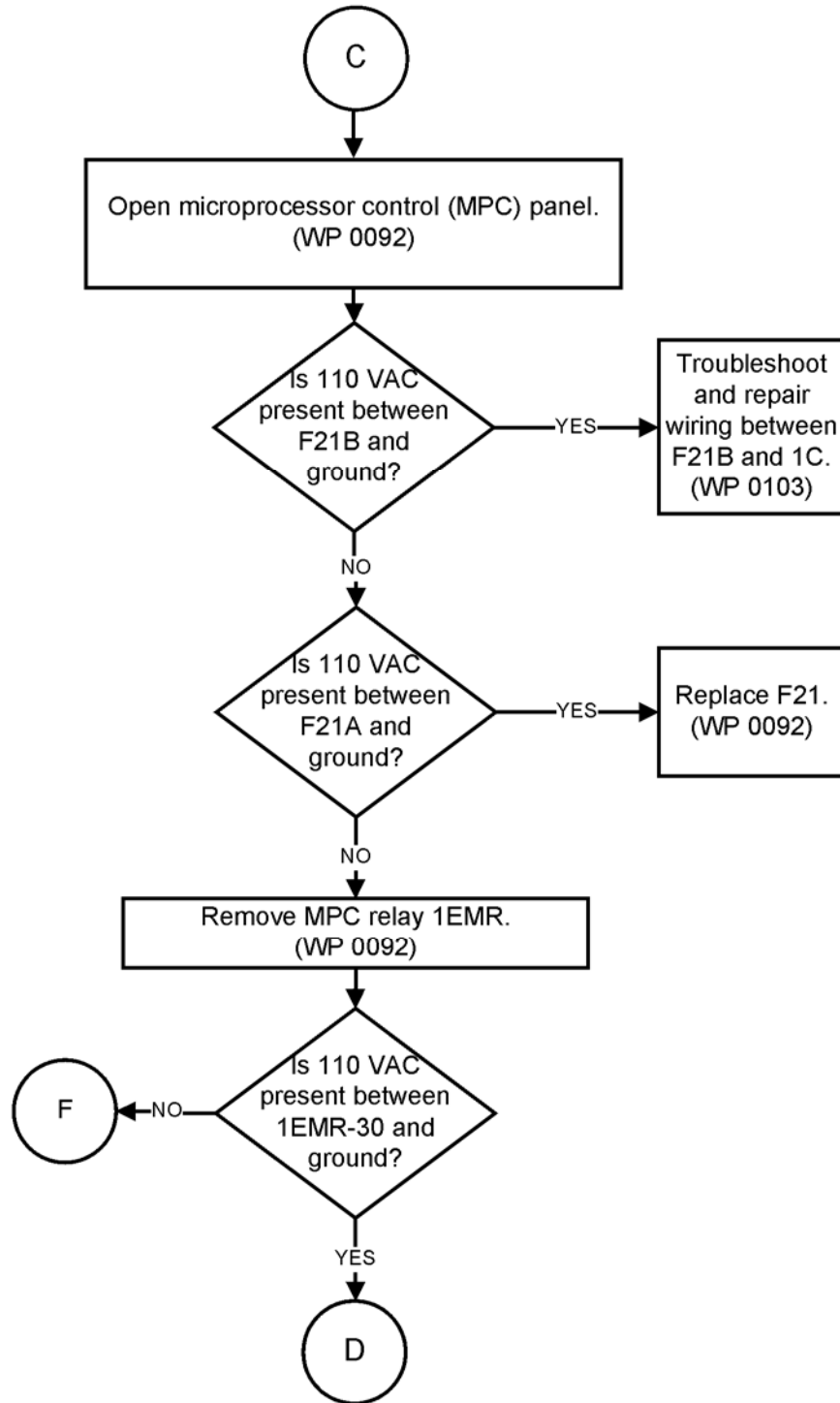


Figure 1. Compartment 1 Evaporator Has No, or Limited, Airflow (Sheet 4 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

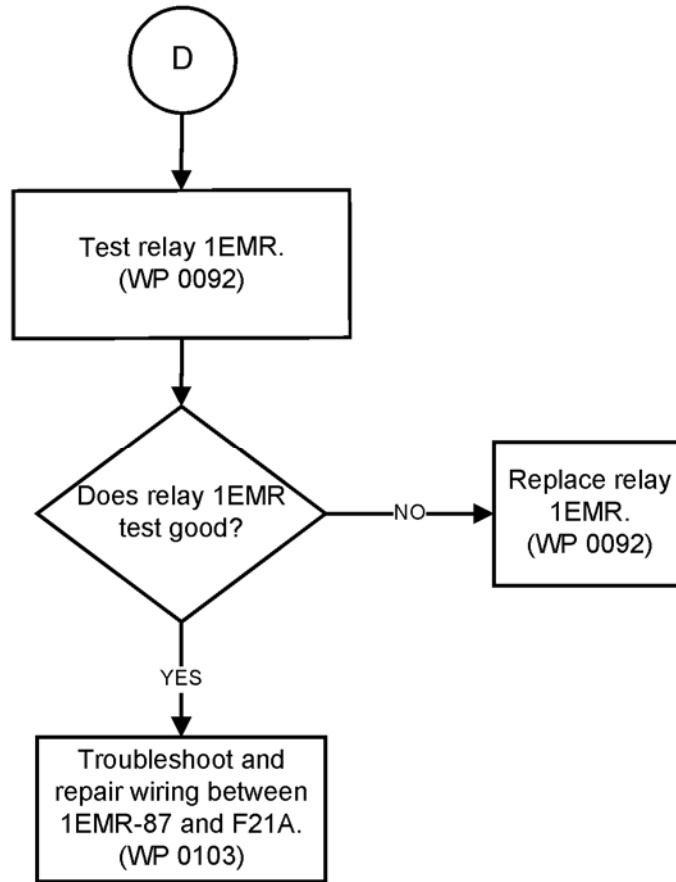


Figure 1. Compartment 1 Evaporator Has No, or Limited, Airflow (Sheet 5 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

WARNING

Capacitors can store electrical power for extended periods of time. Do not touch capacitors for the first five minutes after power has been removed.

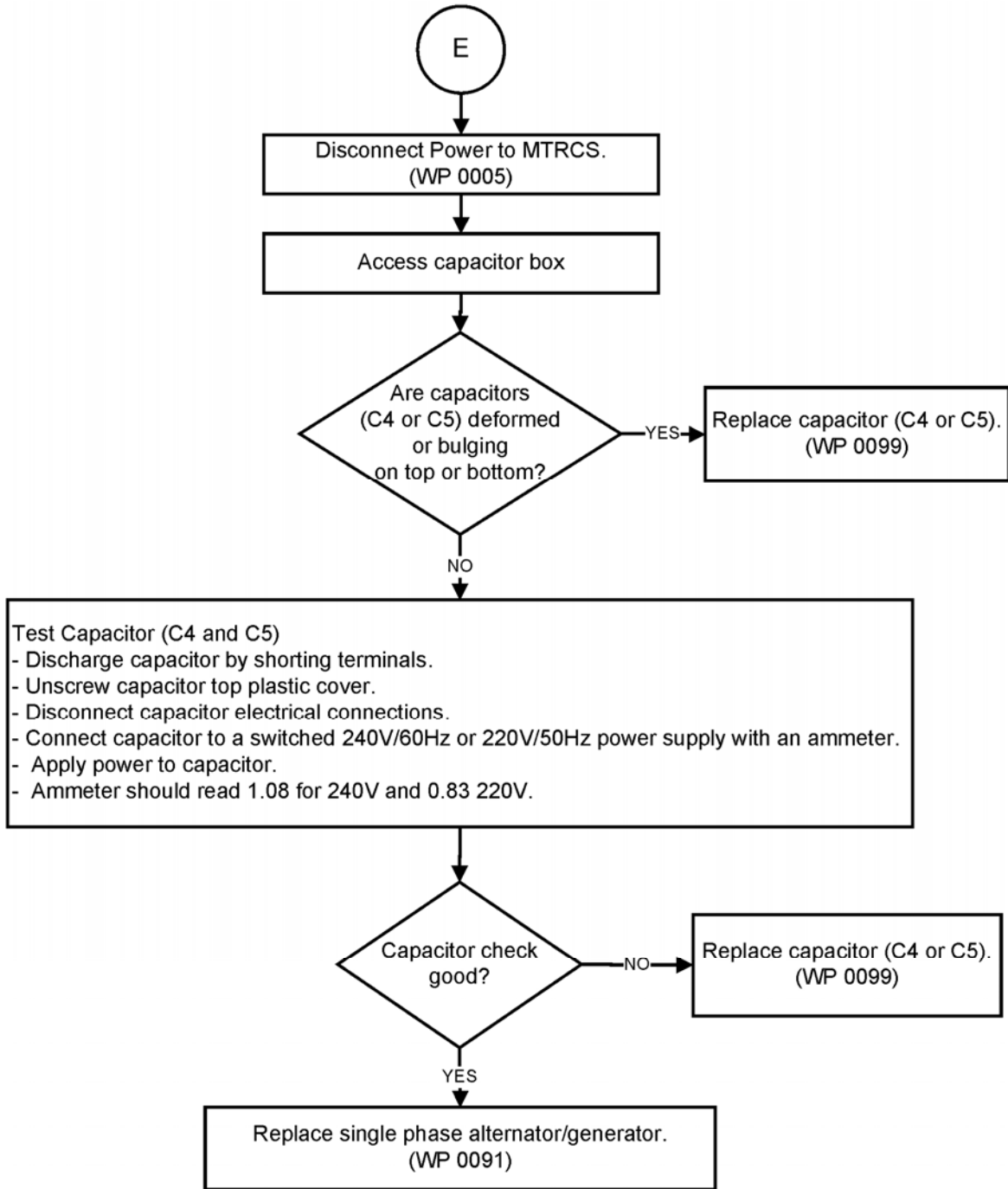


Figure 1. Compartment 1 Evaporator Has No, or Limited, Airflow (Sheet 6 of 6).

END OF TASK

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

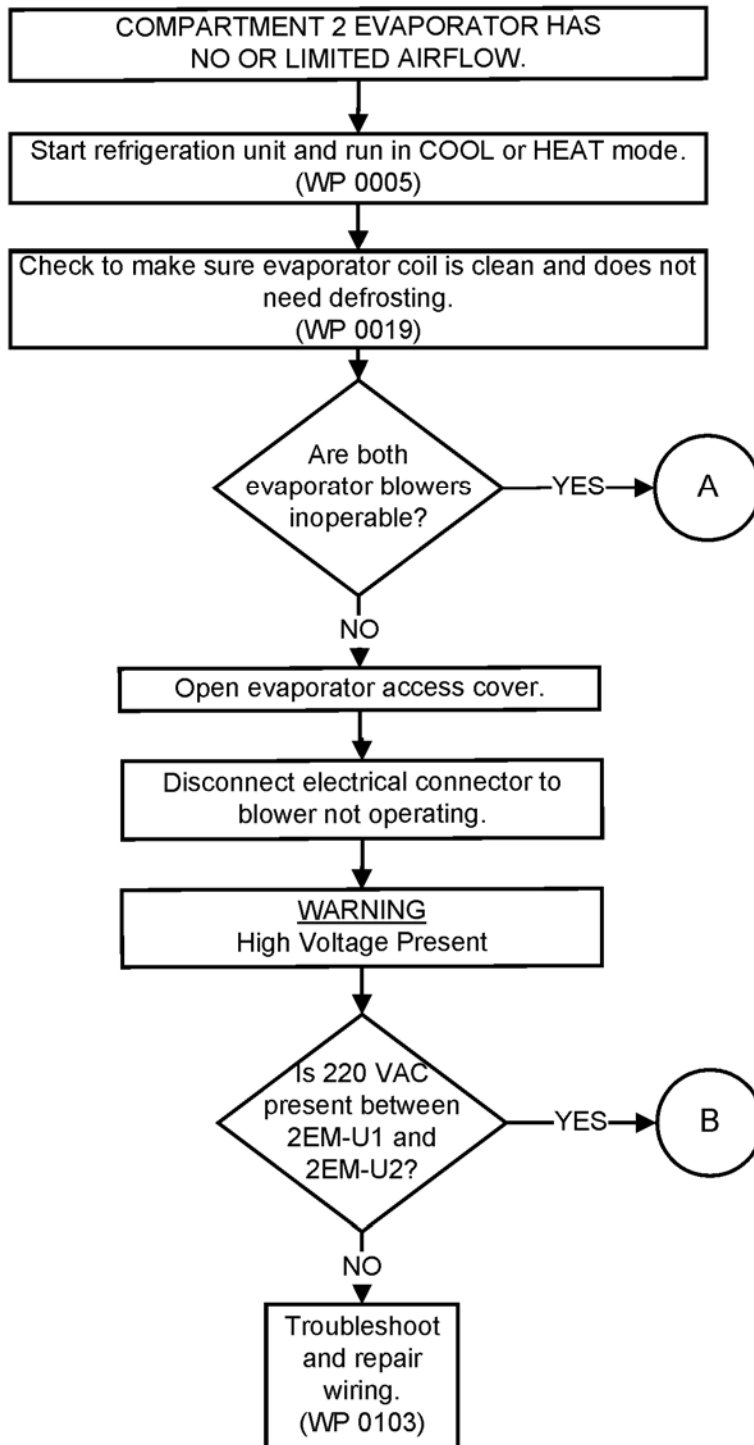


Figure 2. Compartment 2 Evaporator Has No, or Limited, Airflow (Sheet 1 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

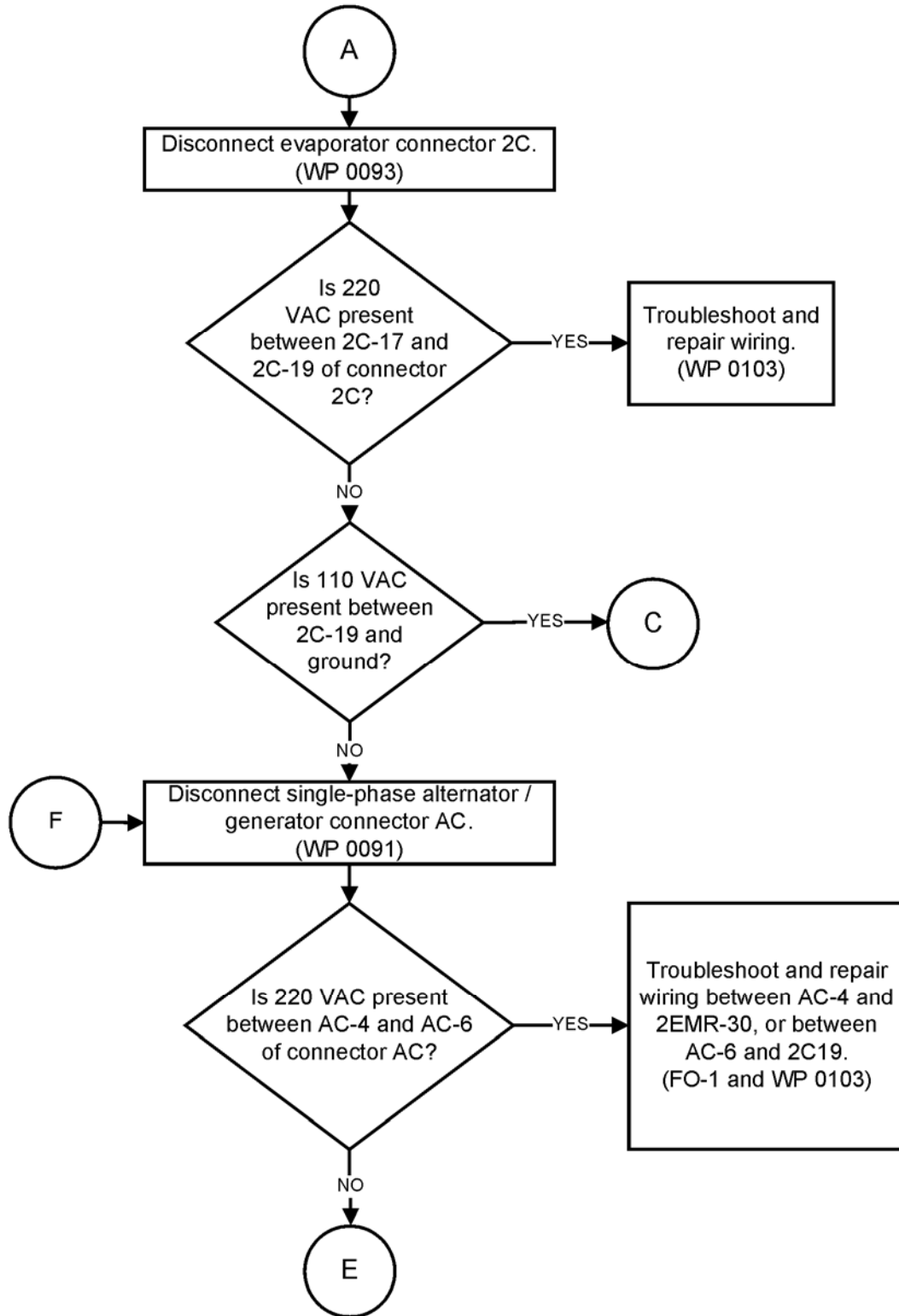


Figure 2. Compartment 2 Evaporator Has No, or Limited, Airflow (Sheet 2 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

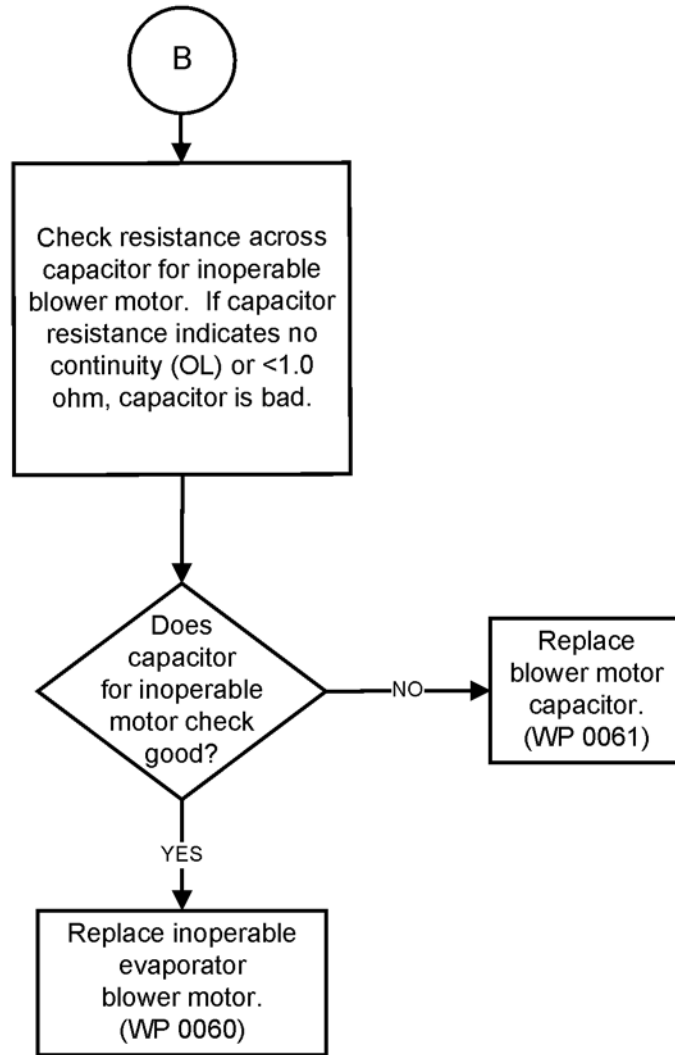


Figure 2. Compartment 2 Evaporator Has No, or Limited, Airflow (Sheet 3 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

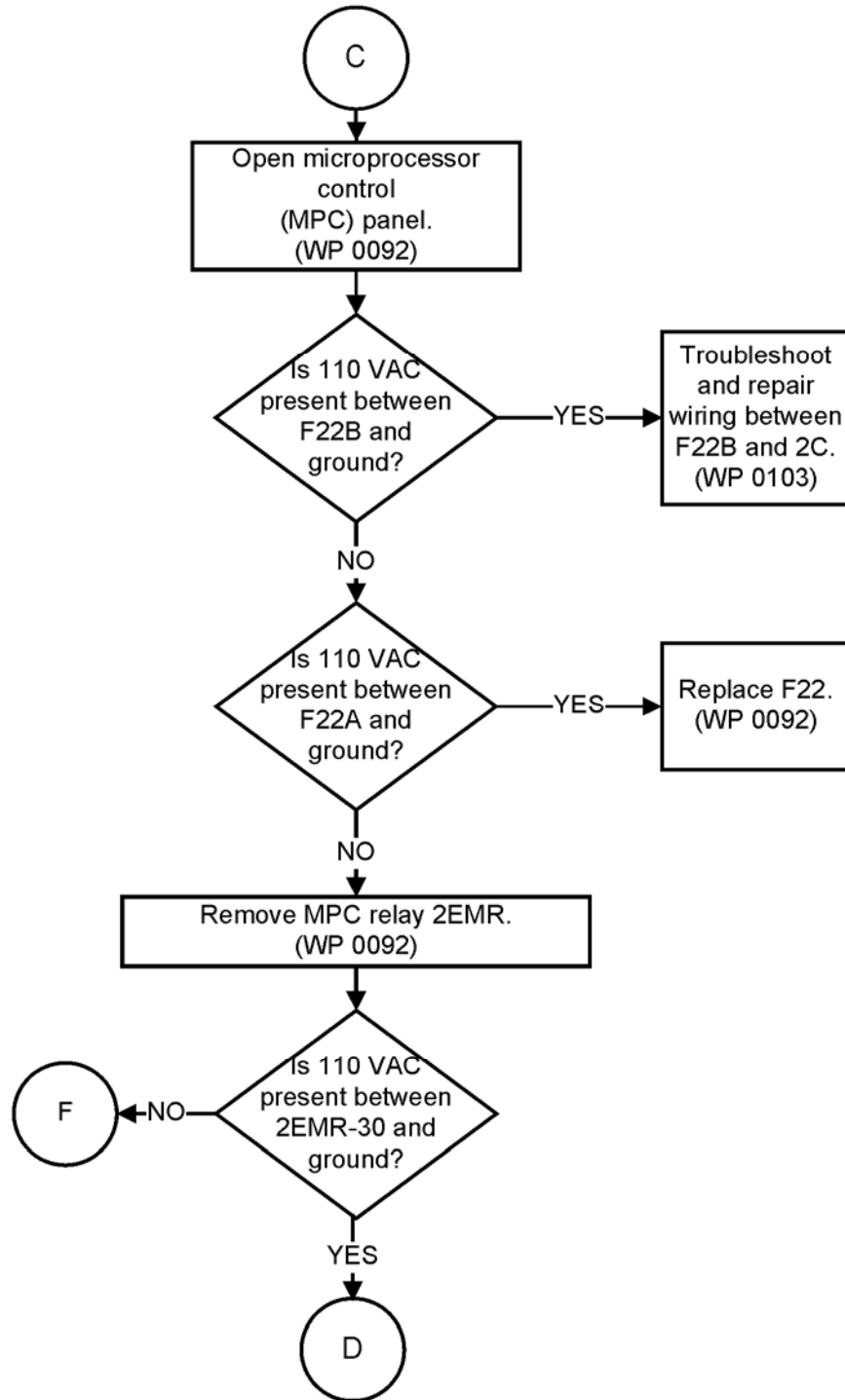


Figure 2. Compartment 2 Evaporator Has No, or Limited, Airflow (Sheet 4 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

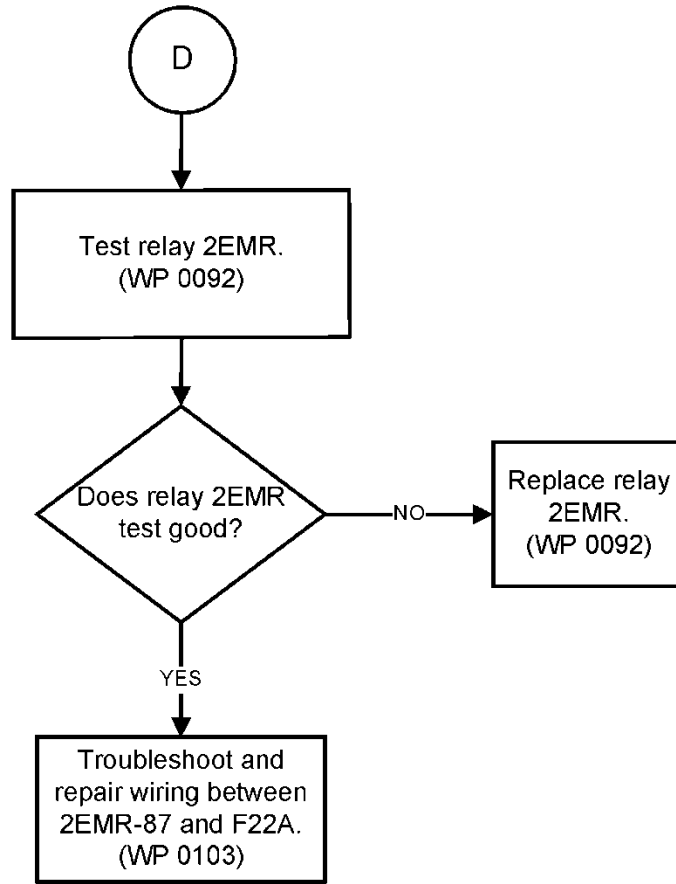


Figure 2. Compartment 2 Evaporator Has No, or Limited, Airflow (Sheet 5 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

WARNING

Capacitors can store electrical power for extended periods of time. Do not touch capacitors for the first five minutes after power has been removed.

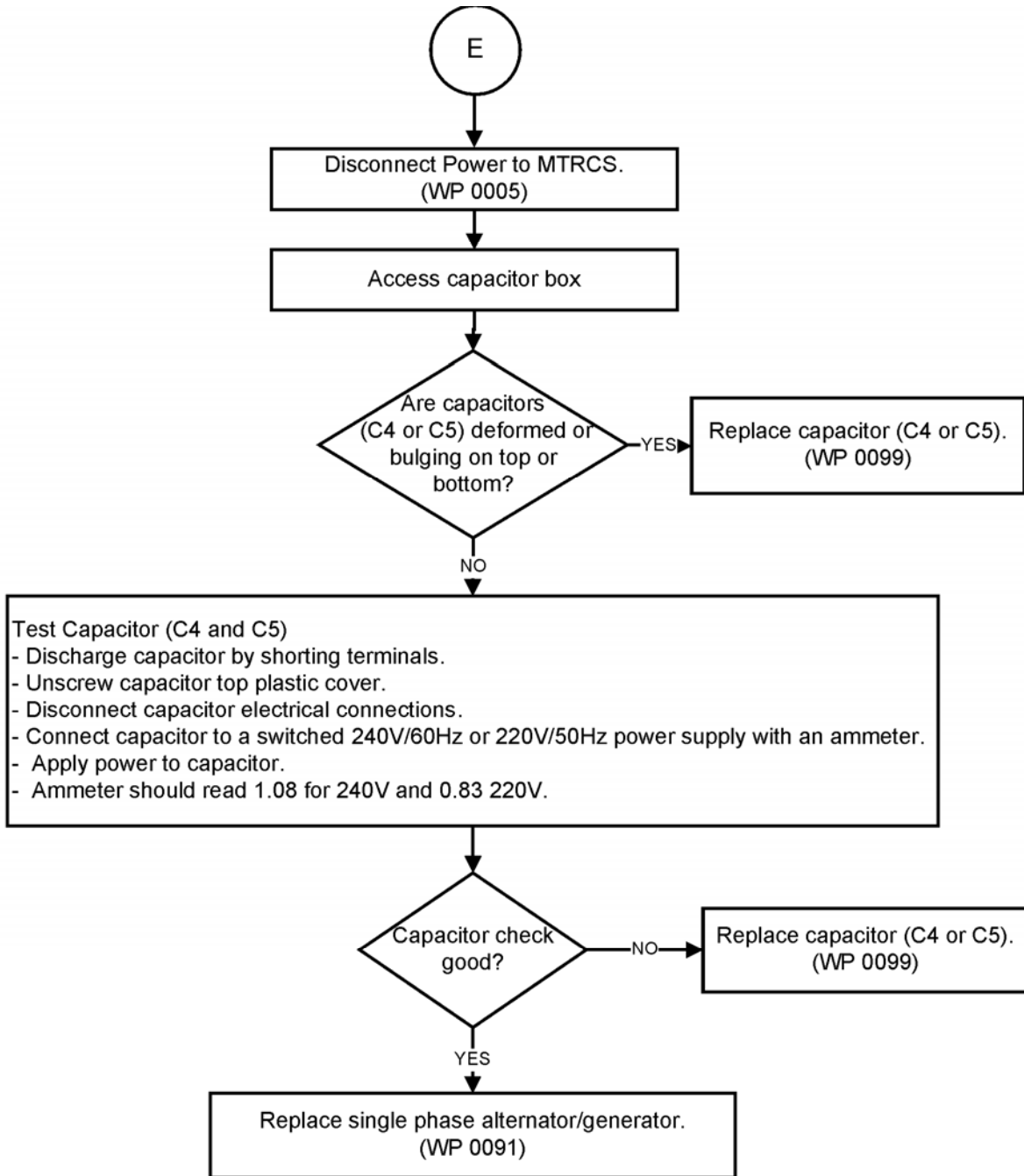


Figure 2. Compartment 2 Evaporator Has No, or Limited, Airflow (Sheet 6 of 6).

END OF TASK

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

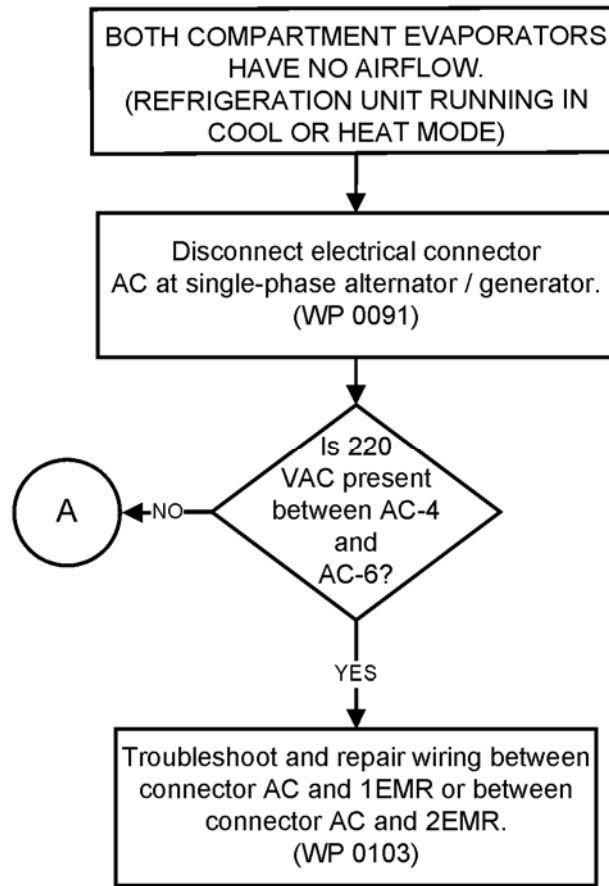


Figure 3. Both Compartment Evaporators Have No Airflow (Sheet 1 of 2).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

WARNING

Capacitors can store electrical power for extended periods of time. Do not touch capacitors for the first five minutes after power has been removed.

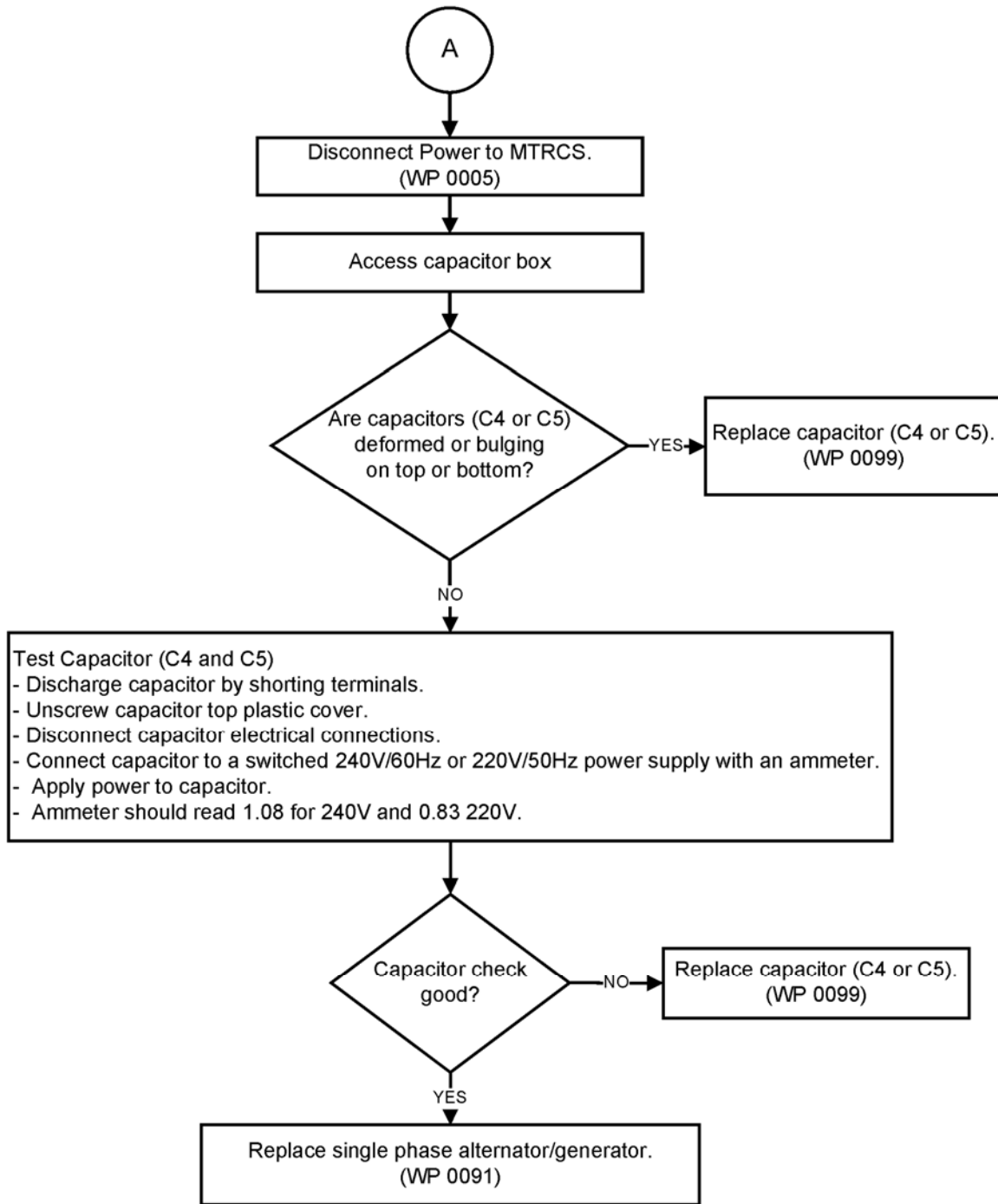


Figure 3. Both Compartment Evaporators Have No Airflow (Sheet 2 of 2).

END OF TASK

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

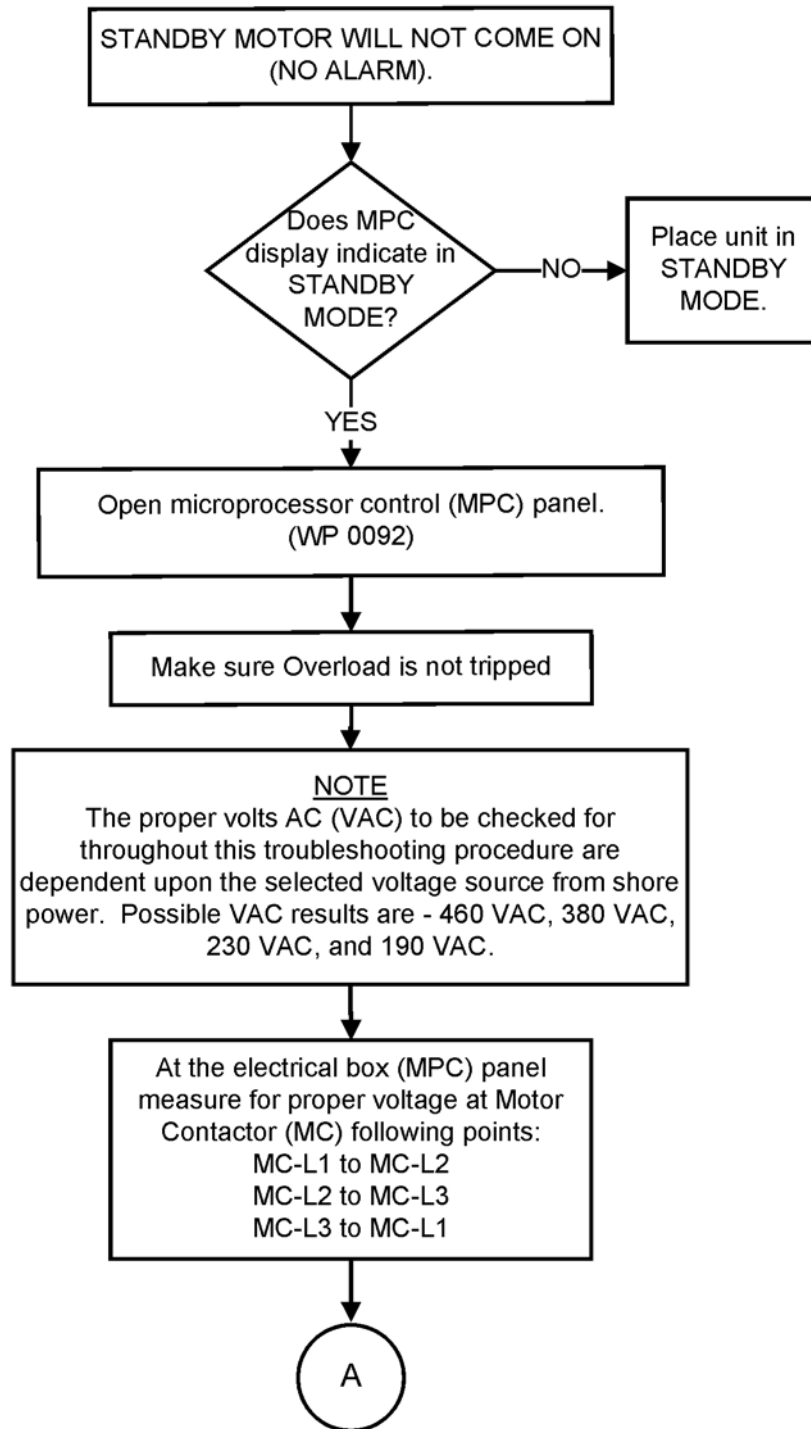


Figure 4. Standby Motor Will Not Come ON (NO ALARM) (Sheet 1 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

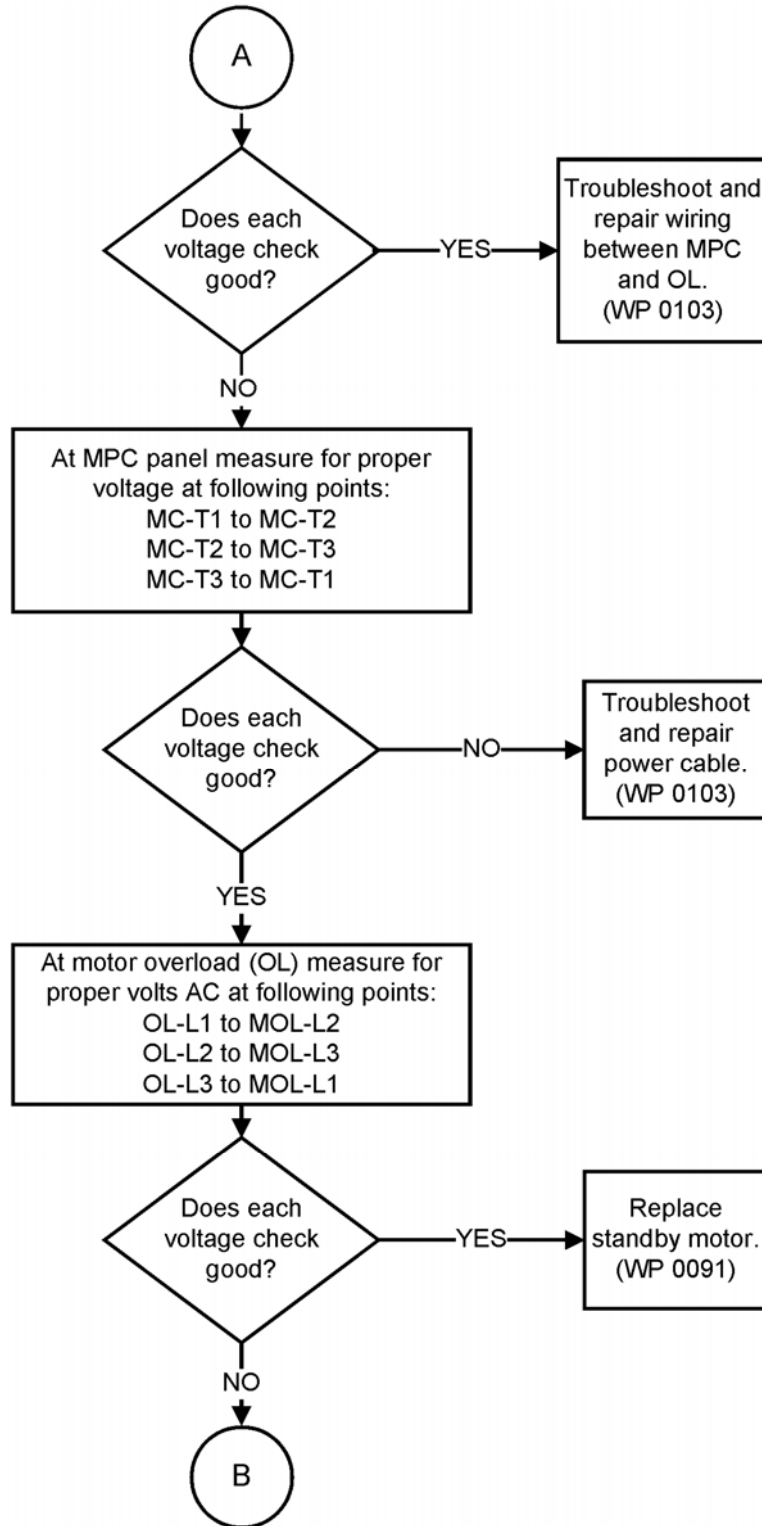


Figure 4. Standby Motor Will Not Come ON (NO ALARM) (Sheet 2 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

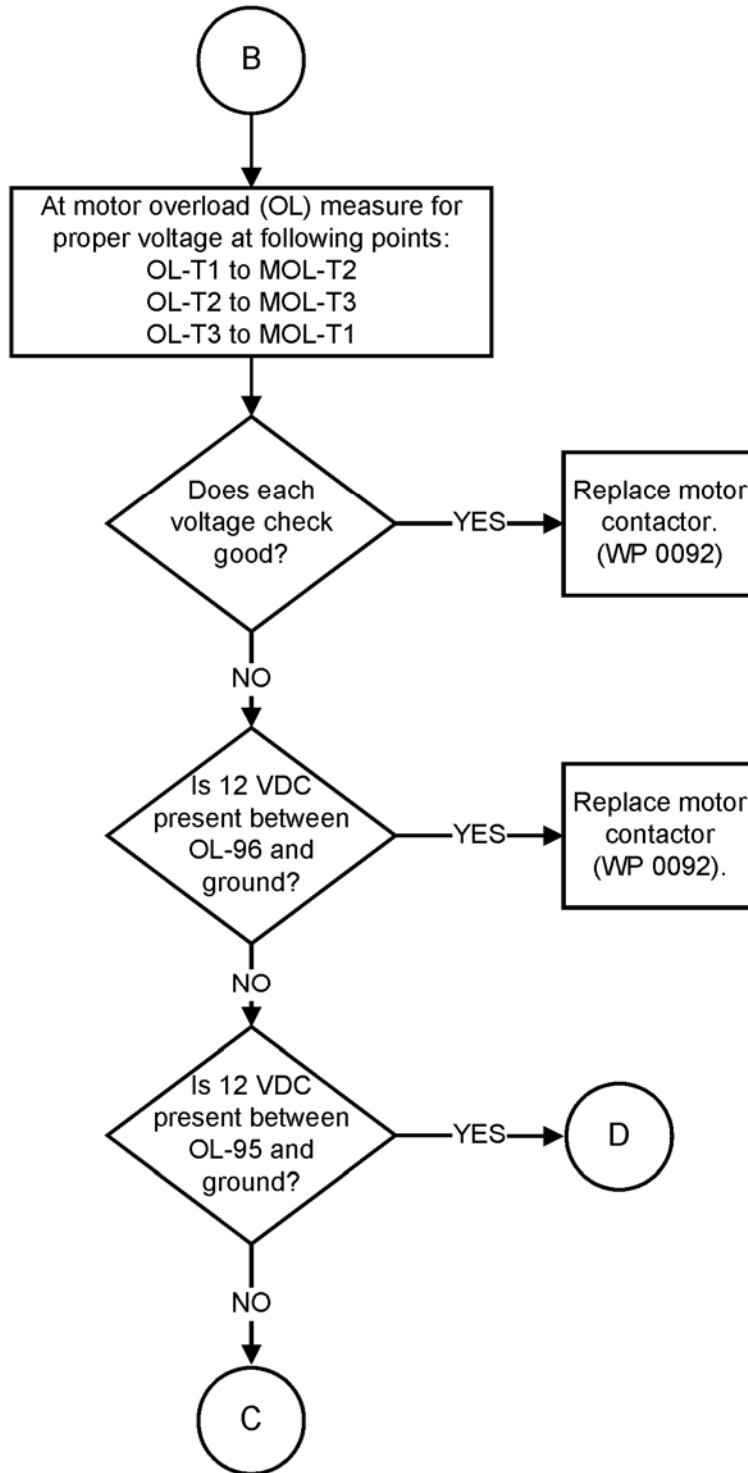


Figure 4. Standby Motor Will Not Come ON (NO ALARM) (Sheet 3 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

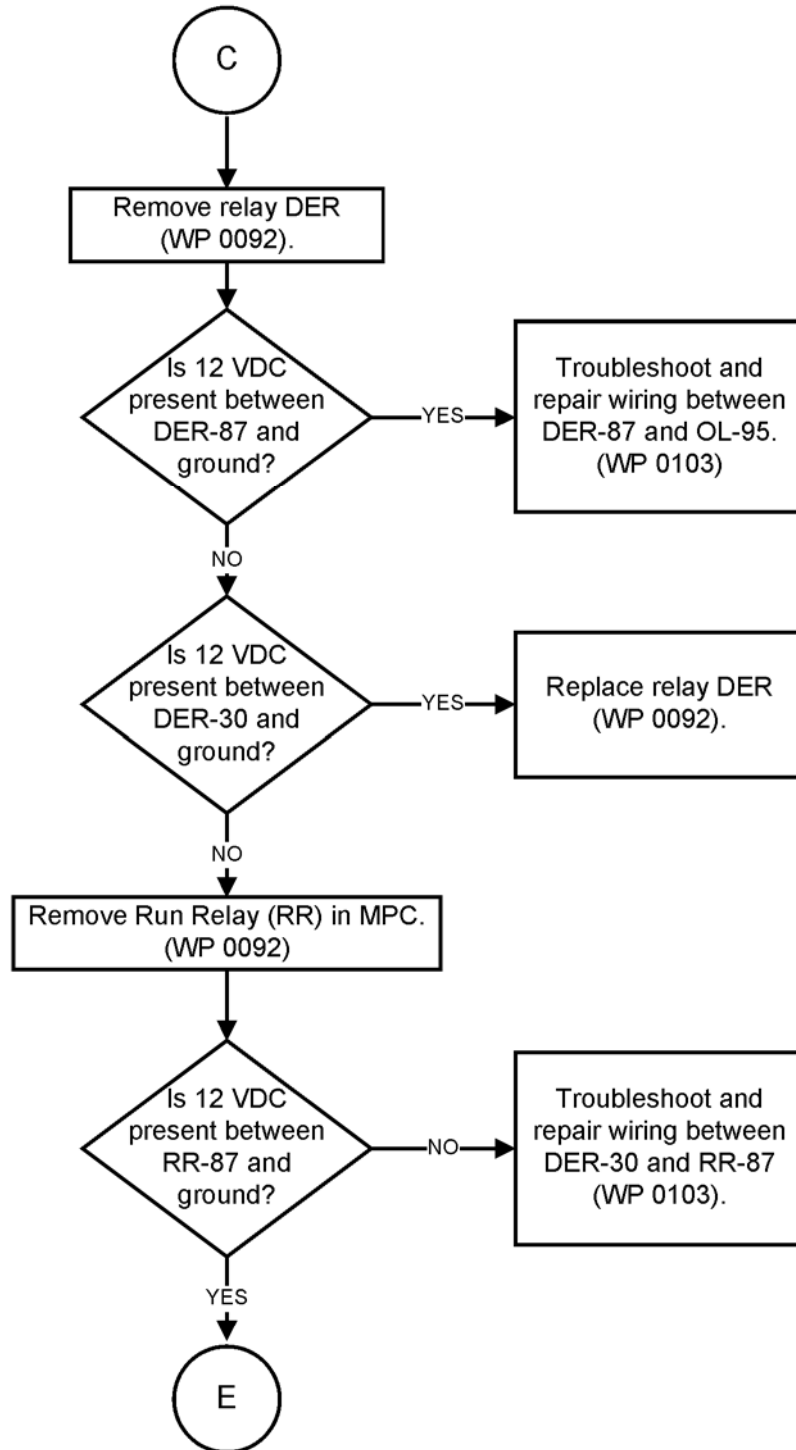


Figure 4. Standby Motor Will Not Come ON (NO ALARM) (Sheet 4 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

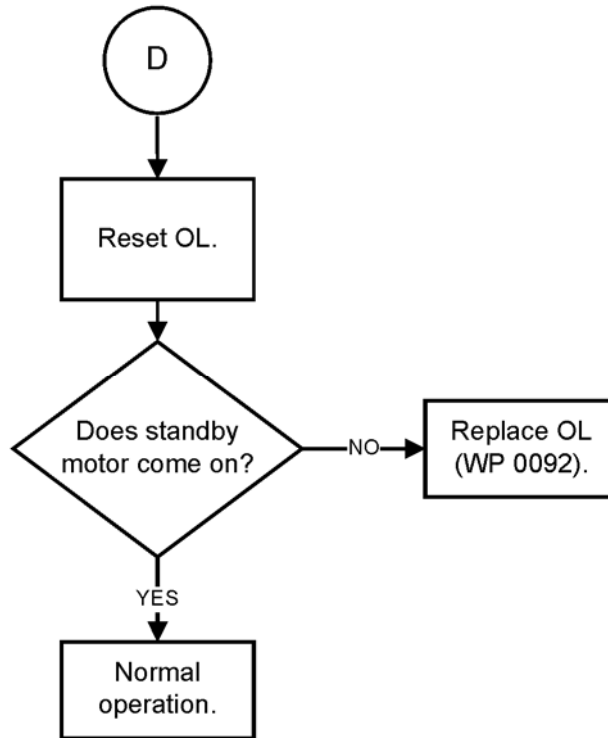


Figure 4. Standby Motor Will Not Come ON (NO ALARM) (Sheet 5 of 6).

SERVICE AND FIELD MAINTENANCE REFRIGERATION UNIT TROUBLESHOOTING PROCEDURES – CONTINUED

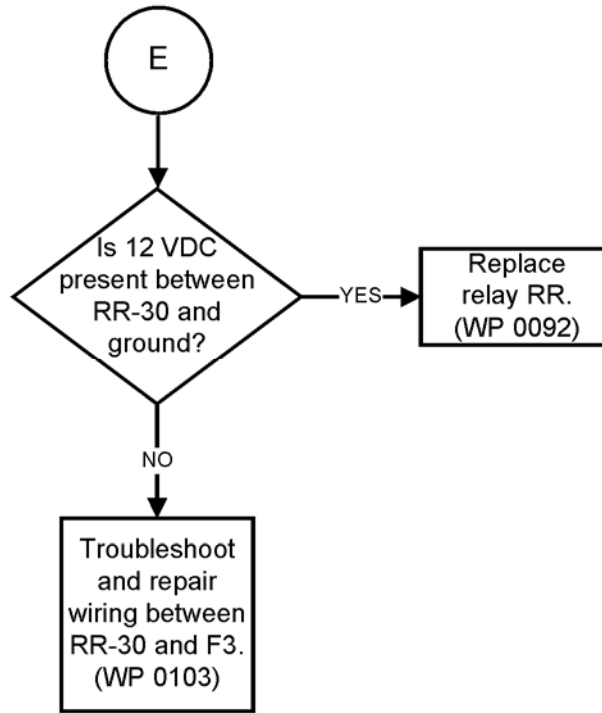


Figure 4. Standby Motor Will Not Come ON (NO ALARM) (Sheet 6 of 6).

END OF TASK

END OF WORK PACKAGE

CHAPTER 4
CREW MAINTENANCE INSTRUCTIONS
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

CREW MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

INITIAL SETUP:**Personnel Required**

Automated Logistical Specialist, or
 Food Service Specialist

References

WP 0025
 SF 368
 DA PAM 738-750
 DA 2404
 DA 5998E

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

GENERAL

The table in WP 0019 has been provided so you can keep the MTRCS in good operating condition and ready for its primary mission.

Always observe the WARNINGS and CAUTIONS appearing in your PMCS table. WARNINGS and CAUTIONS appear before applicable procedures. You must observe these WARNINGS and CAUTIONS to prevent serious injury to yourself and others or to prevent the MTRCS from being damaged.

PMCS PROCEDURES TABLE

Item Number Column. Numbers in this column are for reference. When completing DA Form 2404, Equipment Inspection and Maintenance Worksheet, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

Interval Column. This column tells you when you must do the procedure in the Procedure column.

BEFORE (B) – Checks and services performed prior to the equipment leaving its containment area or performing its intended mission.

DURING (D) – Checks begins when the equipment is being used in its intended mission.

AFTER (A) – Checks and services begin when the equipment is taken out of its mission mode or returned to its containment area.

MONTHLY (M) – Checks and services to be performed on a monthly basis.

SEMIANNUALLY (S) – Checks and services to be performed on a semiannual basis.

Item To Be Checked Or Serviced Column. This column provides the item to be checked or serviced.

Procedure Column. This column gives the procedure you must do to check or service the item listed in the Item to be Checked or Serviced column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the INTERVAL column.

Equipment Not Ready/Available If Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If a fault occurs that is listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control (CPC) of Army material is a continuing concern. It is Important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.

Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.

SF Form 368, Product Quality Deficiency Report, should be submitted to the address specified in DA PAM 738-750, Functional User Manual for the Army Maintenance Management System (TAMMS).

Warranty Hardtime Statement. For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (such as longer-than-usual operating hours, extended idling periods, extreme dust).

FLUID LEAKAGE

It is necessary for you to know how fluid leakage affects the status of the MTRCS. Following are types/classes of leakage you need to know to be able to determine the status of the MTRCS. Learn these leakage definitions and remember - when in doubt, notify your supervisor. Equipment operation is allowed with minor leakage (Class I or II). Consideration must be given to fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.

- (1) Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
- (2) Class II Leakage of fluid great enough to form drops, but not enough to cause drops to drip from item being checked/inspected.
- (3) Class III Leakage of fluid great enough to form drops that fall from item being checked/inspected.

When operating with Class I or II leaks, continue to check fluid levels as required in the PMCS.

Class III leaks should be reported immediately to your supervisor.

INSPECTION

As an operator of the MTRCS, you must remain constantly alert to signs of malfunction or approaching failure. Many troubles can be avoided by taking appropriate response to minimal maintenance needs in a timely manner.

Before, during, and after operation of the MTRCS, perform inspections to make sure all items are in good working condition. Maintain an awareness to make sure items are correctly assembled, stowed properly, and secure. Look for items that may be indicating excessive wear, leakage, corrosion, or improper lubrication. Correct any problems you find, or notify Service Maintenance so that the problem can be scheduled for maintenance and correction.

CLEANING AND LUBRICATION**CAUTION**

Follow all cleaning and lubricating instructions carefully. Failure to do so can result in damage to equipment.

1. Refer to WP 0025 for insulated container cleaning.
2. Do not roll and store cargo nets when wet; allow nets to dry.

END OF TASK**END OF WORK PACKAGE**

CREW MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (PMCS) –
BEFORE OPERATION

INITIAL SETUP:

Tools and Special Tools

Gloves, Welders (WP 0110, Item 23)
 Tester, Belt Tension (WP 0108, Table 2, Item 5)

References

WP 0005 WP 0056
 WP 0008 WP 0070
 WP 0026 WP 0073
 WP 0027 WP 0074
 WP 0030 WP 0100
 WP 0031 WP 0110
 WP 0039
 WP 0041
 WP 0042
 WP 0052
 WP 0055

Personnel Required

Automated Logistical Specialist (2), or
 Food Service Specialist (2)

Equipment Condition

MTRCS stationary and on flat level surface (WP 0005)
 Refrigeration unit as required (WP 0005)
 E-stop switch in PUSH TO STOP as required (WP 0005)

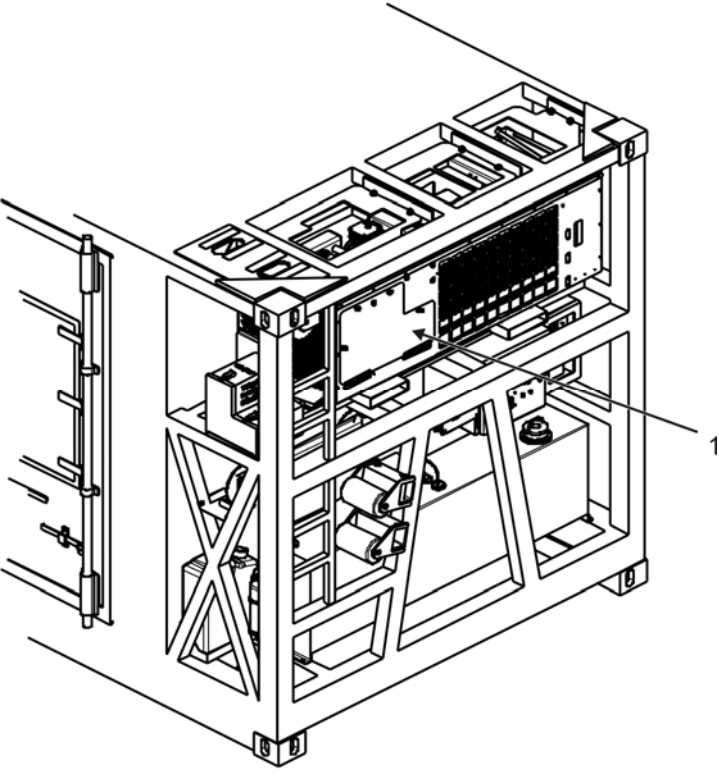
PMCS

WARNING

Do not perform Crew Preventative Maintenance Checks and Services (PMCS) on the MTRCS while the MTRCS is mounted on a carrying vehicle. Failure to comply with this warning can result in serious injury or death to personnel.

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
1	Before	Refrigeration Unit	<p style="text-align: center;"><u>WARNING</u></p> <p>The BEFORE interval PMCS is accomplished before starting the diesel engine. Do not start the diesel engine during the BEFORE interval PMCS, as serious injury or death to personnel may result.</p> <p style="text-align: center;">NOTE</p> <p>Several components make up the refrigeration unit system, many of which are contained within the refrigeration unit housing and a few are located elsewhere on the MTRCS.</p> <p>a. Open front panel access cover (1) and visually check for evidence of any leaks around oil filters, fittings, hoses, refrigerant lines, and components. If any visible leak is identified, notify next level of maintenance.</p> 	Class II or class III leak present.

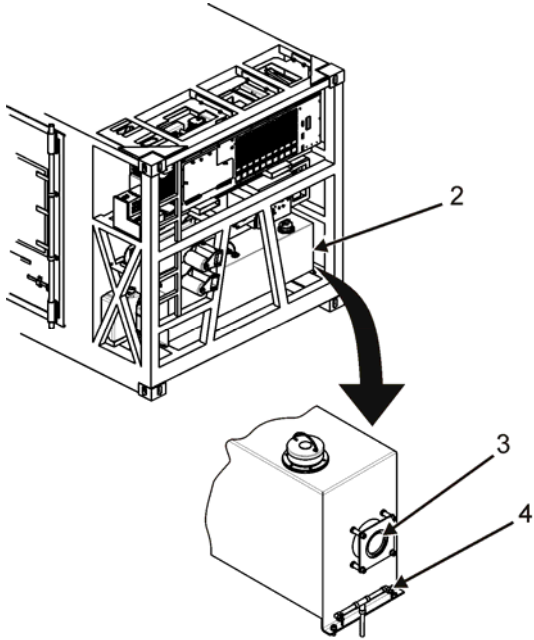
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
2	Before	Fuel Tank	<p style="text-align: center;"><u>WARNING</u></p> <p>The JP-8 and diesel fuels used with the MTRCS are combustible. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.</p> <p>The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If contact is made with skin or clothing, remove contaminated clothing immediately, clean skin with mild soap or cleanser, and flush with clean water.</p> <ol style="list-style-type: none"> a. Check fuel tank (2) fuel level gauge (3) and fill fuel tank with diesel fuel or JP-8 if needed (WP 0030, Service). If fuel level gauge is inoperable, notify next level of maintenance to replace fuel level gauge (WP 0074, Repair). b. Visually check fuel tank (2) welded seams, fittings, hoses, and seals for leaks. If any visible leak is identified, notify next level of maintenance. c. Drain a small amount of fuel from the fuel tank drain into an approved container (4). If tank will not drain, notify next level of maintenance. If excess water or sediment is present, discard contaminated fuel in accordance with unit Standard Operating Procedure (SOP). Drain another sample of fuel to inspect and continue until clean uncontaminated fuel is drawn. If excessive contamination or water is present in sampled fuel, notify next level of maintenance to drain tank completely, rinse tank internally with diesel fuel to flush contaminants, and refill (WP 0030, Service). 	<p>Tank is less than 3/4 full; Fuel level gauge is inoperable.</p> <p>Class I, II or III leak present.</p> <p>Tank will not drain; excess water or sediment found in fuel.</p>

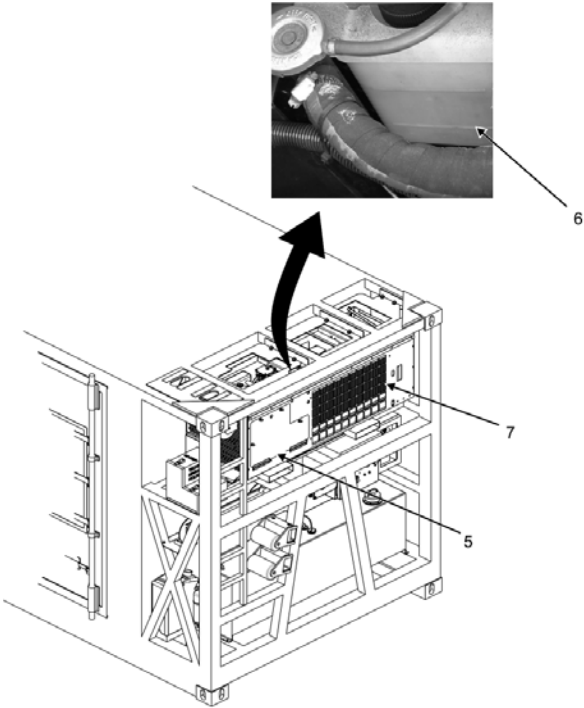
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
2	Before	Fuel Tank (continued from previous page)	<p style="text-align: center;">NOTE</p> <p>There are two fuel tank drains on the fuel tank, either one may be used to drain the tank, or take a fuel sample.</p> 	Tank will not drain; excess water or sediment found in fuel.
3	Before	Cooling System	<p style="text-align: center;"><u>WARNING</u></p> <p>Radiator coolant is a skin and eye irritant. Use care when adding coolant so that it does not splash. Wear appropriate face shield and gloves. If coolant gets into your eyes, flush immediately and seek medical attention. If coolant gets on your skin, wash your skin immediately.</p> <p>Do not remove radiator cap when checking coolant level. Coolant may be hot and/or under pressure. Failure to comply may result in serious personal injury or burns.</p> <p>a. Open front panel assembly access cover (5).</p>	

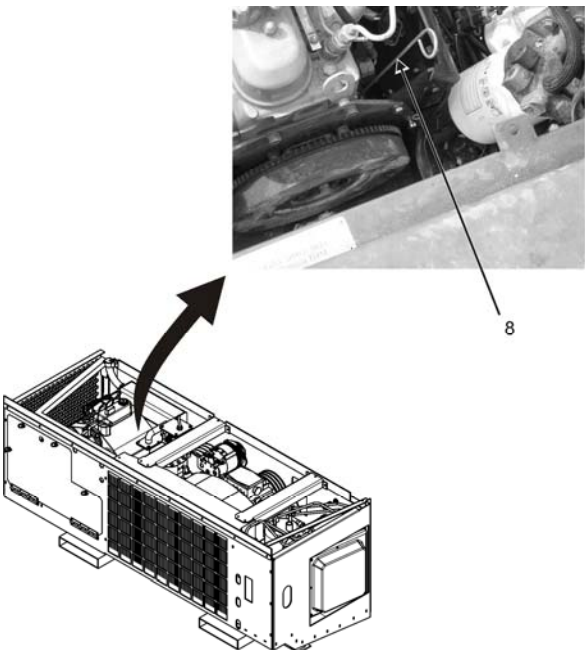
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
3	Before	Cooling System (continued from previous page)	<p style="text-align: center;">NOTE</p> <p>The white plastic engine coolant reservoir tank is marked with minimum and maximum ribs for ease in checking coolant level. Any level below minimum or above maximum requires servicing by next level of maintenance.</p> <p>b. Check radiator reservoir (6) coolant level. If coolant level is low, add coolant as required.</p> <p style="text-align: center;">CAUTION</p> <p>Condenser and radiator coil fins are easily damaged. Use care not to damage coil fins when working with or near the coils. Never use a pressure washer to clean cooling coils.</p> <p>c. Visually check condenser coil (7) for accumulation of dirt. If dirty, use a standard water hose to spray the radiator and condenser coils surfaces clean. If coil has excessive dirt or foreign matter build up, notify next level of maintenance to clean coils (WP 0039, Service).</p> <div style="text-align: center;">  </div>	<p>Coolant level low.</p> <p>Coils are dirty.</p>

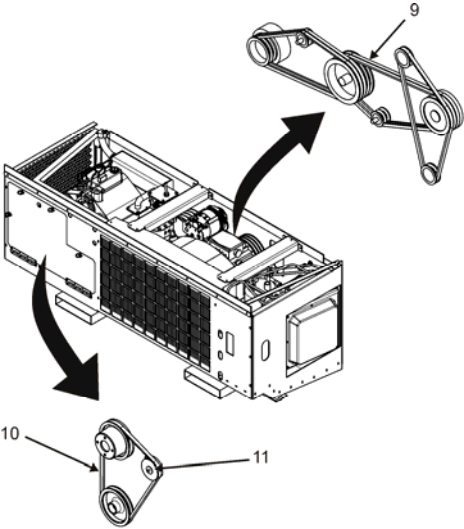
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
4	Before	Engine Oil	<p style="text-align: center;"><u>WARNING</u></p> <p>Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.</p> <ol style="list-style-type: none"> a. Access top of MTRCS using roof access. b. Notify next level of maintenance to remove top-right panel and top-middle panel (WP 0031, Remove). c. Visually check engine oil lines and fittings, filters, and connections for leaks. If signs of leakage are found, notify next level of maintenance to repair or tighten connections (WP 0041, Service). d. Check engine oil level. <ol style="list-style-type: none"> 1. Remove engine oil dipstick (8) from engine. 2. Wipe oil from indicator end with towel. 3. Reinsert engine oil dipstick (8) and remove to check that oil level is within safe operating marks. 4. If below safe operating mark, add oil to a level that is within safe operating marks (WP 0042, Service). 5. Reinsert engine oil dipstick (8) making sure it is completely seated in engine. <div style="text-align: center;">  </div>	<p>Class III leak present.</p> <p>Oil level is below the acceptable level.</p>

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
5	Before	V-belts	<p>a. Check refrigeration unit V-belts (9) for fraying, cuts, signs of looseness, or cracks. Notify next level of maintenance if any of the above conditions exist.</p> <p style="text-align: center;">NOTE</p> <p>When checking V-belt tension using the V-belt tension gauge, place the tension gauge as close to midpoint as possible between sheaves.</p> <p>Tension of V-belts on the backside of the refrigeration unit should all be 30-50 pounds. The water pump V-belt on the front of the engine has a built-in tensioner that automatically keeps the water pump V-belt properly tensioned.</p> <p>b. Check V-belts (9) for excessive looseness. If belts seem loose, notify next level of maintenance to check refrigeration unit V-belts for proper tension using belt tension gauge from BII (WP 0052 through WP 0055).</p> <p>c. Check water pump V-belt (10) for fraying, cuts, signs of looseness, or cracks. Notify next level of maintenance if any of the above conditions exist.</p> <p>d. Check water pump V-belt (10) for excessive looseness. If belt seems loose, check tension by checking that automatic tensioner (11) has not fully relaxed. If tensioner is fully relaxed or if any of the above conditions exist, notify next level of maintenance.</p> 	<p>V-belts show signs of fraying, cuts, loose, or cracking.</p> <p>V-belts are not properly tensioned.</p> <p>V-belts show signs of fraying, cuts, loose, or cracking.</p> <p>Automatic tensioner is fully relaxed.</p>

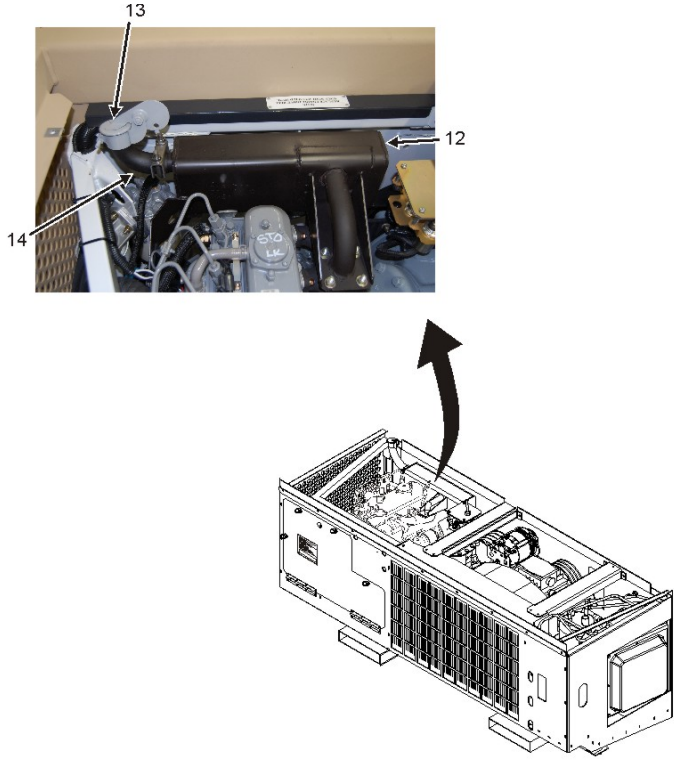
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
5	Before	V-belts (continued from previous page)	e. Check surrounding components (engine, compressor, standby motor, alternator, and single-phase alternator) that are operated by V-belts (9 and 10) for evidence of damage, paint discoloration, or blistering that would be a sign of overheating. If signs of overheating are observed, notify next level of maintenance to assess damage.	Surrounding components show signs of overheating.
6	Before	Muffler	<p style="text-align: center;"><u>WARNING</u></p> <p>The muffler will become extremely hot when the engine is operating. Severe burns can result from touching a hot muffler. Make sure engine has been allowed time to cool for 30-minutes prior to working around muffler.</p> <p style="text-align: center;">NOTE</p> <p>The refrigeration unit diesel engine uses a muffler to quiet the exhaust during operation. The muffler is located just below the top-right panel and has a pivoting rain cap that protrudes just above the panel cutout.</p> <p>a. Inspect muffler (12) for any visible damage, missing hardware, and that pivoting rain cap (13) is in place. If muffler is damaged or rain cap is missing, notify next level of maintenance (WP 0056, Repair).</p> <p>b. Using heat resistant gloves, check that rain cap (13) pivots freely without binding. If rain cap binds, notify next level of maintenance (WP 0056, Repair).</p> <p>c. Using heat resistant gloves, carefully check that muffler is secure by attempting to gently move muffler (12) and exhaust pipe (14) extending out of panel grill. If muffler or exhaust pipe is loose, notify next level of maintenance (WP 0056, Repair).</p>	<p>Muffler is damaged; hardware or rain cap is missing.</p> <p>Rain cap binds.</p> <p>Muffler or exhaust pipe is loose.</p>

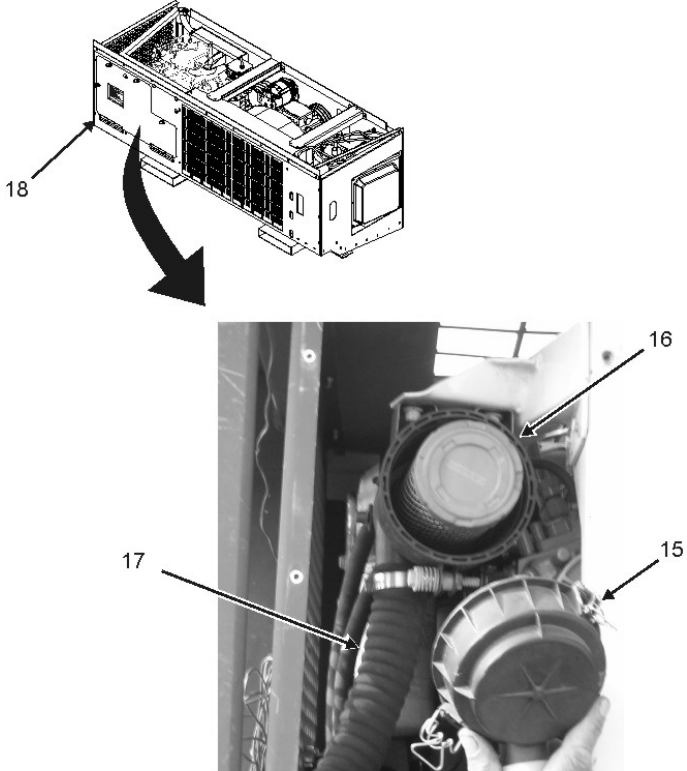
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
6	Before	Muffler (continued from previous page)	 <p>d. Install top panels.</p> <p>e. Exit top of MTRCS using roof access.</p>	
7	Before	Air Cleaner	<p>a. Remove air cleaner cap (15) and check for cracks or fractures. Replace if necessary (WP 0026, Replace).</p> <p>b. Check filter element gaskets for swelling or distortion. Replace filter element if necessary (WP 0026, Replace).</p> <p>c. Remove engine air filter element (16) and check for cleanliness. Replace element if dirty (WP 0026, Replace).</p> <p>d. Check air cleaner outlet hose (17) for cleanliness and for cracks or fractures. Clean or replace as necessary.</p>	<p>Air cleaner cap has cracks or fractures.</p> <p>Gaskets swelled or distorted.</p> <p>Air filter element is dirty.</p> <p>Outlet hose dirty, cracked, or fractured.</p>

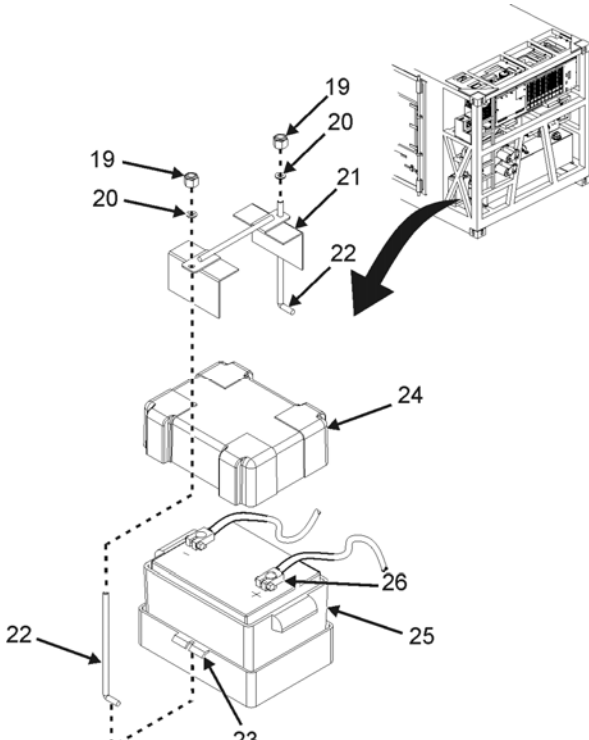
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
7	Before	Air Cleaner (continued from previous page)	 <p>e. Install air cleaner cap (15), secure with two clips, and check that cap drain tube is pointed in downward direction.</p> <p>f. Close and front panel assembly access cover (18).</p>	<p>Cap not installed and drain tube not pointed downward.</p> <p>Access cover not closed and secure.</p>

PMCS – CONTINUED

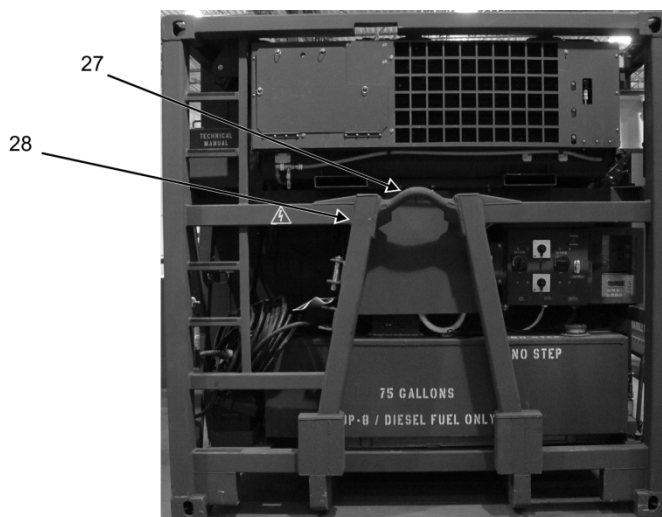
Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
8	Before	Battery Box	<p style="text-align: center;"><u>WARNING</u></p> <p>Storage batteries contain a high current potential and can explode if short circuited. Never allow any metal to cross between the battery terminals or between the positive terminal and any part of the MTRCS frame. Personal injury could result.</p> <p style="text-align: center;"><u>NOTE</u></p> <p>The battery used to start the diesel engine is housed in a protective plastic box to contain acid spills and protect the power terminals from accidentally being short circuited. The battery box is located on the lower right side of the MTRCS frame.</p> <p>a. Loosen lock nuts (19) and washers (20) securing battery box top bracket (21) and J-bolts (22) to lower bracket (23) enough to slip J-bolts free from lower bracket. Remove top bracket (21).</p> 	

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
8	Before	Battery Box (continued from previous page)	b. Remove top cover (24) and visually inspect box (25) and cover (24) for any cracks or breaks. If cracks or breaks are found, notify next level of maintenance to replace (WP 0070, Replace). c. Check battery terminal connections (26) for cleanliness and tightness. If excessive corrosion or loose terminal connections, notify next level of maintenance to service battery as required (WP 0070, Service). d. Install top cover (24), top bracket (21), and J-bolts (22) and secure to lower bracket (23) using lock nuts (19) and washers (20). Do not over-tighten lock nuts.	Top cover or box broken or cracked. Excessive corrosion on terminals; loose connections. Top cover not installed.
9	Before	Insulated Container – Exterior	a. Check exterior walls and doors for holes and corrosion. Notify next level of maintenance to repair holes or remove corrosion buildup (WP 0073, Repair; WP 0100, Repair). b. Check bale bar (27) and railing (28) for broken weld seams, holes, and rust. Notify next level of maintenance to repair weld seams, holes, or remove corrosion buildup.	Holes or corrosion are present to extent that will cause lack of efficient operation. Any weld seams appear to be fractured; holes or rust are present in bale bar.



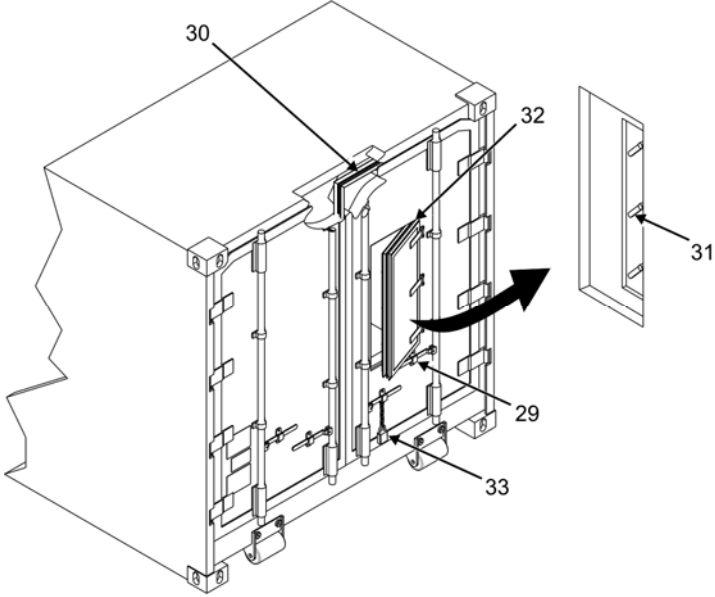
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
10	Before	Doors	<p style="text-align: center;"><u>WARNING</u></p> <p>The MTRCS doors are very heavy. Make sure to use two persons when opening and closing doors to avoid serious injury.</p> <p>Make sure doors are secured to container frame when in the open position. A gust of wind can cause severe injury or death to personnel.</p> <p style="text-align: center;">NOTE</p> <p>The MTRCS has a left and right rear door and a side door. An emergency escape hatch is available on one rear door and the side door. During this PMCS, examine each door as instructed.</p> <ol style="list-style-type: none"> a. Open both rear container doors and side container door and secure to container frame with door hold chains. b. Check that door handles (29) move freely without binding. If door handles do not move freely, lubricate the rotational portion of the handle hinge with lubricating grease (WP 0110, Item 18). If door handles remain difficult to move, notify next level of maintenance for repair. c. Check that door handles (29) have no missing or damaged parts. If parts are missing or damaged, notify next level of maintenance to repair or replace. d. Visually inspect rubber door seals (30) for tears and loose mounting. If seals appear torn or loose, notify next level of maintenance for repair. e. Check that escape hatch door handles (31) move freely without binding. If doors handles do not move freely, lubricate the ball area of the hinge assembly with lubricating oil (WP 0110, Item 25). If escape hatch door handles remain difficult to move, notify next level of maintenance for repair. f. Check that escape hatch door handles (31) have no missing or damaged parts. If parts are missing or damaged, notify next level of maintenance to repair or replace. 	<p>Door handles are excessively hard to rotate or bind.</p> <p>Door handles are missing parts or are damaged.</p> <p>Door seals torn or loose.</p> <p>Escape hatch door handles are excessively hard to rotate or bind.</p> <p>Escape hatch door handles are missing parts or are damaged.</p>

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
10	Before	Doors (continued from previous page)	 <p> g. Visually inspect escape hatch door seals (32) for tears and loose mounting. If seals appear torn or loose, notify next level of maintenance for repair. h. Inspect padlocks (33) and lanyards for damage or missing parts. i. Using appropriate key unlock and lock padlocks, checking for smooth operation. If padlock is difficult to open or cannot be unlocked, replace padlock. </p>	<p>Escape hatch door seals torn or loose.</p> <p>Padlocks or lanyards damaged or missing.</p> <p>Padlock is difficult to unlock or cannot be unlocked.</p>
11	Before	Fire Extinguisher	<p>a. Check that fire extinguisher (34) is present and all parts are serviceable and free of dents or damage. If fire extinguisher is not present or is damaged, notify next level of maintenance for replacement.</p> <p>b. Check that fire extinguisher (34) has been serviced and is fully charged. If not charged, have fire extinguisher recharged in accordance with local standard operating procedures.</p>	<p>Fire extinguisher is missing, damaged, or missing parts.</p> <p>Fire extinguisher is not fully charged.</p>

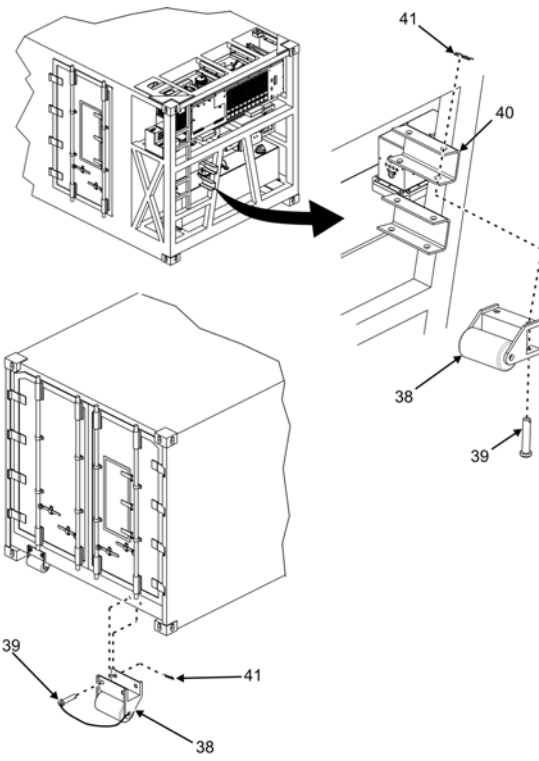
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
12	Before	Document Holder	<p>a. Check document holder (35) for any visible damage or dents. If damaged, notify next level of maintenance.</p> <p>b. Inspect cover gasket seal (37) for any cuts or damage. If damaged or missing, notify next level of maintenance.</p> <p>c. Check that latch fasteners (36) hold cover securely closed. If latch fastener is missing or damaged, notify next level of maintenance.</p> <div style="text-align: center;"> </div> <p>d. Check that MTRCS bulkhead retaining straps, technical manual, and a supply of blank chart recorder papers are secured inside document holder. If missing, notify supervisor for replacement.</p>	<p>Document holder damaged beyond capability to hold documentation.</p> <p>Gasket cut, damaged, or missing.</p> <p>Hinged fastener will not securely close door.</p> <p>Technical manual or chart recorder papers are missing.</p>

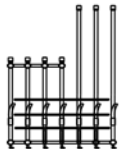
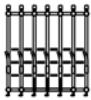
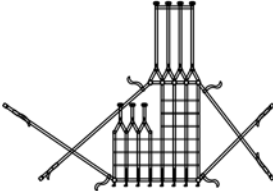
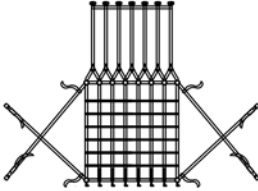
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
13	Before	PLS Rollers	<p style="text-align: center;"><u>WARNING</u></p> <p>The two PLS rollers weigh approximately 75 pounds each. Do not attempt to lift a PLS roller alone. Two-person lift is required. Failure to comply can result in serious injury to personnel.</p> <p style="text-align: center;"><u>NOTE</u></p> <p>The PLS rollers can be installed in the stowed position on the front of the container or in the movement position on the rear underside of the container. Perform this PMCS at the current installed position of the PLS rollers.</p> <ol style="list-style-type: none"> a. Check that PLS rollers (38) and locking pins (39) are present and free of damage. If damaged or missing, notify supervisor. b. Check that mount bracket (40) is not dented, bent, or damaged. If damaged, notify next level of maintenance. 	<p>Roller or locking pin missing or damaged.</p> <p>Mount bracket damaged.</p>

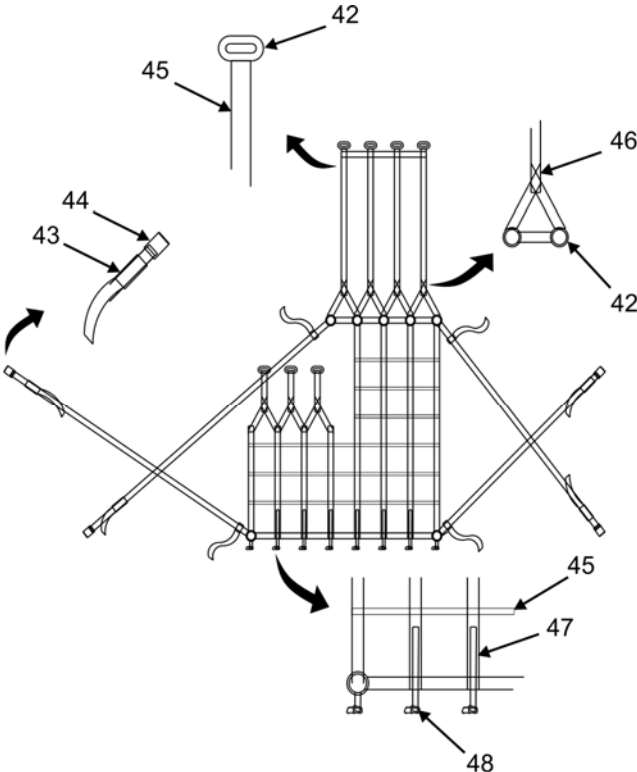
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
13	Before	PLS Rollers (continued from previous page)	c. Check that locking clips (41) are not missing from pins or damaged. If missing or damaged, replace locking clip.	Locking clip is missing or damaged.
14	Before	Cargo Nets (front and rear)	<p style="text-align: center;"><u>WARNING</u></p> <p>Lifting or moving heavy equipment incorrectly can cause serious injury. The rolled cargo netting weighs approximately 70 pounds and a two-person lift is required when moving the netting. Do not try to lift or move more than 42 pounds by yourself. Bend legs while lifting and do not support heavy weight with your back.</p> <p style="text-align: center;"><u>NOTE</u></p> <p>There are four styles of cargo nets used on the unit. Hardware for each style is the same and can be inspected using the methods provided below.</p> <p>Inspection of cargo netting is required only before use of netting.</p> <ol style="list-style-type: none"> a. Remove netting from stowed position. b. Place netting outside MTRCS on a flat surface sufficient to completely unroll netting. c. Unroll netting to lay flat. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>REAR NET ROW 1 AND 2</p>  </div> <div style="text-align: center;"> <p>REAR NET ROW 3 AND 4</p>  </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <p>FRONT NET ROW 1 AND 2</p>  </div> <div style="text-align: center;"> <p>FRONT NET ROW 3 AND 4</p>  </div> </div>	

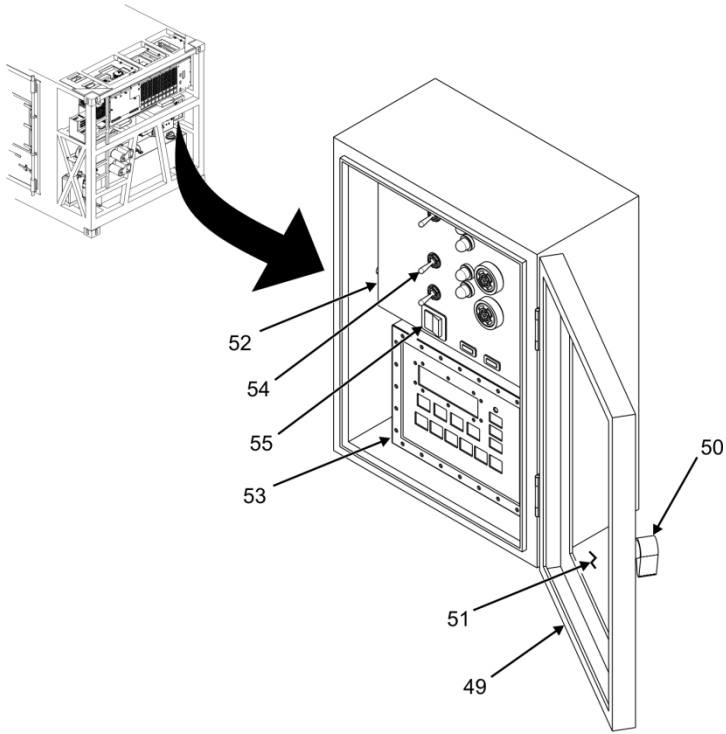
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
14	Before	Cargo Nets (front and rear) (continued from previous page)	<p>d. Check rings (42), buckles (43), and hooks (44) for cracks, excessive wear, or any other deformity in metal and that webbing is securely attached.</p> <p>e. Check webbing (45), triangular seams (46), and straps (47) for cuts, fraying, excessive wear, damage to stitching, or any other deformity in material.</p> <p>f. Check triple stud fittings (48) for signs of wear, bends, or cracks in metal, and that each is securely attached to strap (47).</p> 	<p>Rings, buckles, or hooks are missing or damaged and webbing is not securely attached.</p> <p>Webbing, seams, or straps are damaged.</p> <p>Fittings show signs of wear or other damage; fitting not securely attached to strap.</p>

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
14	Before	Cargo Nets (front and rear) (continued from previous page)	g. Roll netting for storage (WP 0008, Cargo Net Replacement). h. Replace netting back into stowed position (WP 0008, Cargo Net Replacement).	Netting not rolled for storage on net storage devices. Netting not in stowed position.
15	Before	Control Panel Assembly	<p style="text-align: center;"><u>WARNING</u></p> <p>Electrical voltage and current cannot be seen, and when contacted can result in death, render you unconscious, or severely burn you. Never perform maintenance on electrical equipment unless power is removed.</p> <p>a. Check to make sure control panel assembly door (49) is closed and secured by latch handle (50).</p> 	Control panel assembly door is not securely closed.

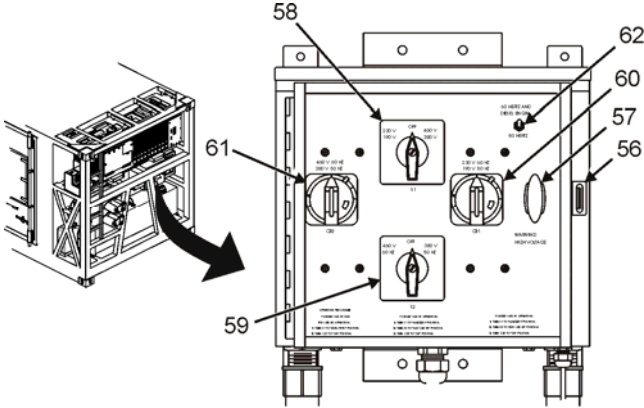
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
15	Before	Control Panel Assembly (continued from previous page)	b. Check latch handle (50) and clear cover (51) for damage. If latch handle is damaged or clear cover is cracked or excessively scratched preventing adequate viewing of control indicators, notify next level of maintenance. c. Open control panel assembly door (49) and visually inspect control panel (52) and microprocessor controller (53) for any missing parts, loose switches (54), or damage. If there is any visual damage, or loose or missing parts, notify next level of maintenance. d. Make sure POWER ON/DOWN switch (55) is in DOWN position. e. Close control panel assembly door (49) and secure with latch handle (50).	Latch handle damaged or clear cover scratched or cracked. Parts are missing or damaged. Power switch not in DOWN position. Control panel assembly door is not securely closed.
16	Before	Power Box	<p style="text-align: center;"><u>WARNING</u></p> <p>High voltage is used in the operation of the MTRCS. Personal injury or death can occur if accessing the inside of the power box when power is connected. The power box should be locked to prevent access to it.</p> <p style="text-align: center;">NOTE</p> <p>The power box contains manual switches that are used to control the external electric power configuration. The power box is located above the fuel tank.</p> a. Check power box door to make sure latch (56) is not bent or broken and secure holding door closed. If the door is not secure, secure door closed. Do not open door.	Door is not securely closed.

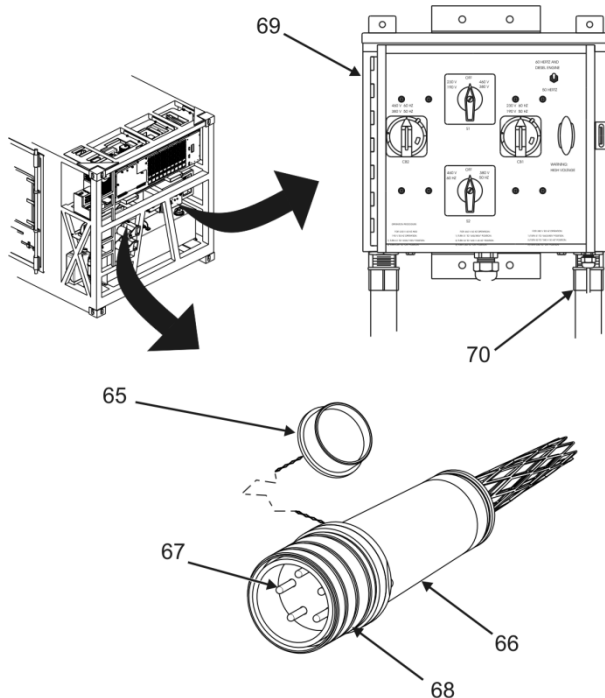
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
16	Before	Power Box (continued from previous page)	 <p>b. Inspect power box door for damage to latch handle (57) and any loose or missing parts. If there is any visible damage or loose or missing parts, notify next level of maintenance. Ensure door is secured. Do not open the door.</p> <p style="text-align: center;">CAUTION</p> <p>The refrigeration unit electrical system can be short circuited causing extensive damage if the power box switches are not configured properly.</p> <p>c. Check to make sure power supply switches S1 (58) and S2 (59), and circuit breakers CB1 (60) and CB2 (61) are in OFF position. Position S1, S2, CB1, and CB2 to OFF if not already done.</p> <p style="text-align: center;">NOTE</p> <p>Toggle switch S7 should always be in the 60 HERTZ AND DIESEL ENGINE (up) position until power source is determined.</p> <p>d. Check to make sure toggle switch S7 (62) is in up (60 HERTZ AND DIESEL ENGINE) position. Place switch S7 in up position if not accomplished.</p>	<p>Power box door damaged or missing parts.</p> <p>S1, S2, CB1, or CB2 are not in OFF position.</p> <p>Switch S7 not in 60 Hz position.</p>

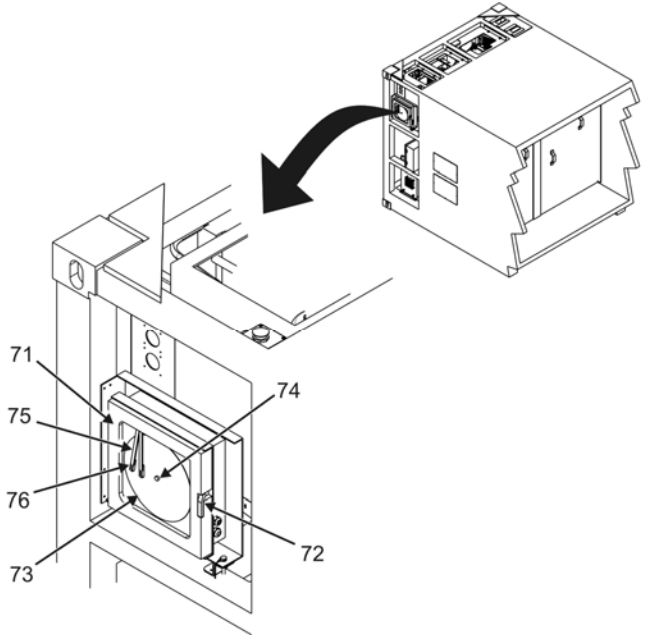
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
17	Before	External Power Supply Cables (continued from previous page)	 <p>d. Check connectors (66) for foreign matter, bent pins (67), and that the connector locking ring (68) rotates freely. Clean foreign matter as required or notify next level of maintenance to repair connector.</p> <p>e. Install covers (65) onto both power supply cable connectors (66) by twisting in clockwise direction.</p> <p>f. Inspect power supply cable connections to power box assembly (69).</p> <p>1. Inspect strain relief connections (70) at bottom of power box assembly (69) for looseness, damage, or exposed wires. Notify next level of maintenance to tighten connections or repair wiring.</p> <p>g. Make sure power supply cables (63) are stored on cable hooks (64).</p>	<p>Foreign matter exists in twist lock end, pins are bent or otherwise damaged, or connector will not freely turn.</p> <p>Covers are not installed.</p> <p>Hardware is loose or jacket is frayed or cut.</p> <p>Cables not properly stored on hooks.</p>

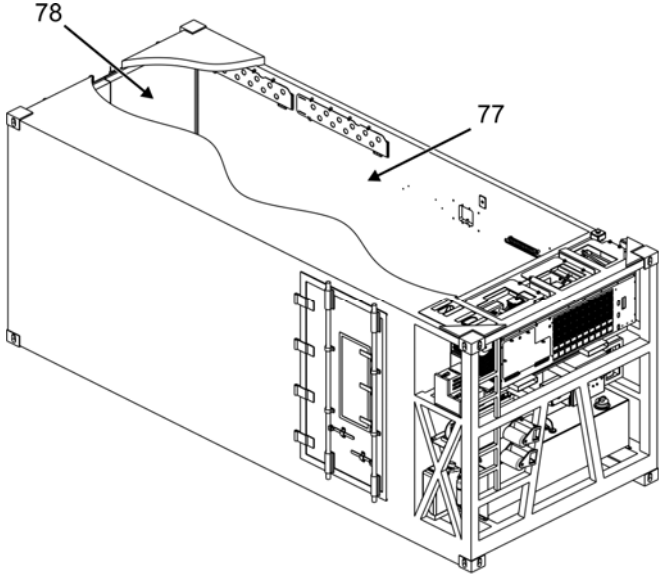
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
18	Before	Temperature Chart Recorder (TCR)	<p>a. Check to make sure that chart recorder (71) access door (72) locks into position when closed.</p>  <p>b. Visually check to make sure chart paper (73) is installed and held in place with hub knob (74) if MTRCS has been in operation. If there are no temperature marks on chart paper, notify next level of maintenance. If chart paper is full or missing, replace chart paper (WP 0027, Change Chart Paper).</p> <p>c. Open chart recorder (71) access door (72).</p> <p>d. If pen caps are installed over pens (75), remove pen caps.</p> <p>e. Check that pens (75) have ink. Gently press and release stylus (76) to make sure pen will mark on chart. Replace pens if needed.</p> <p>f. Close and secure chart recorder (71) access door (72).</p>	<p>Door will not close properly.</p> <p>Chart paper is not installed or is not secured properly.</p> <p>Chart recorder door will not open.</p> <p>Pen caps are installed over pens.</p> <p>Pens out of ink. Pen will not mark.</p> <p>Chart recorder door will not close and secure.</p>

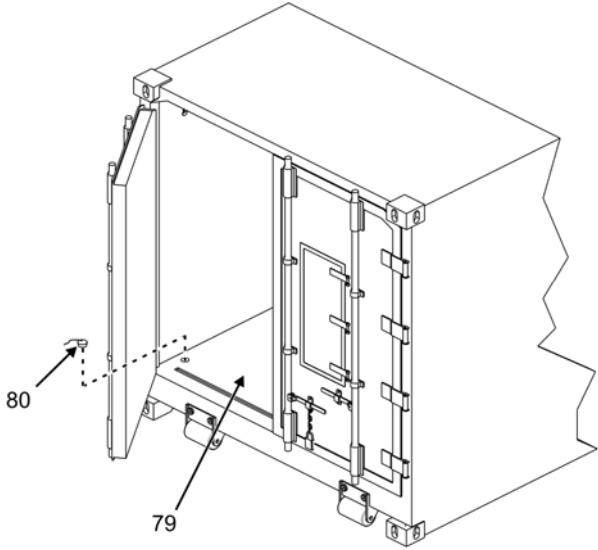
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
19	Before	Insulated Container – Interior	<p style="text-align: center;"><u>WARNING</u></p> <p>Make sure that all container doors are secured to container frame using the provided chain hooks. A gust of wind can cause unsecured doors to slam shut with great force, possibly causing severe injury or death to personnel.</p> <p>The MTRCS doors are very heavy. Make sure to use two persons when opening and closing doors to avoid serious injury.</p> <ol style="list-style-type: none"> a. Open and secure both rear container doors and side container doors. b. Check interior walls (77) and interior doors (78) for holes and corrosion. Notify next level of maintenance to repair holes (WP 0073, Repair) or remove corrosion buildup. <div style="text-align: center;">  </div> <ol style="list-style-type: none"> c. Check that flooring (79) rails are clean and free of bends, punctures, dents, or any other damage. Clean flooring rails as required. If damage is found, notify supervisor to assess damage. 	<p>Holes or corrosion are present to extent that will cause lack of efficient operation.</p> <p>Flooring rails are not clean and free of foreign matter; flooring is damaged.</p>

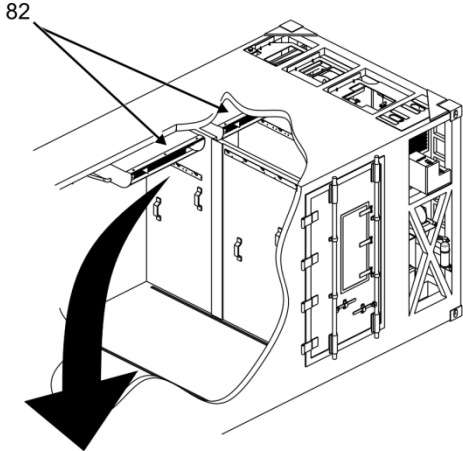

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
19	Before	Insulated Container – Interior (continued from previous page)	<p>d. Check for missing floor drain plugs (80) or obstructed floor drains in each of four container corners. Replace drain plugs if missing. Clean floor drains of foreign matter as required.</p> 	Drain plug is missing or drain is obstructed.
20	Before	Evaporators	<p style="text-align: center;">NOTE</p> <p>The insulated container contains two evaporators; one for compartment 1 and one for compartment 2 operations. Each of the evaporators has a system of drain hoses provided to carry condensate outside of the container through hoses internal to the container wall. During this PMCS, check all hoses and hose connection points contained within the condensate drain system.</p> <p>a. Check evaporator drain hoses (81) and connections for cracks, build-up of foreign matter, or ice buildup. Clean as required or notify next level of maintenance for repair.</p>	Drain hoses are cracked; foreign matter or ice buildup is present in drain hoses.

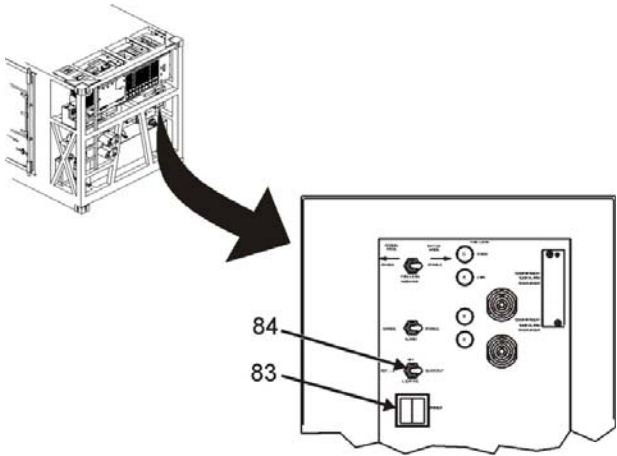
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
20	Before	Evaporators (continued from previous page)	  <p> b. Check that evaporator drain hose (81) mounting hardware is tight and not missing any parts from exit point on evaporators to entry points in wall. Notify next level of maintenance to tighten or replace hardware as required. c. Check that evaporators (82) have no obvious signs of physical damage and that they are securely mounted to ceiling. Notify next level of maintenance to tighten evaporators as required. d. Check that there are no obstructions. </p>	<p>Drain hose hardware missing or loose.</p> <p>Evaporators are damaged or are not securely attached to ceiling.</p>

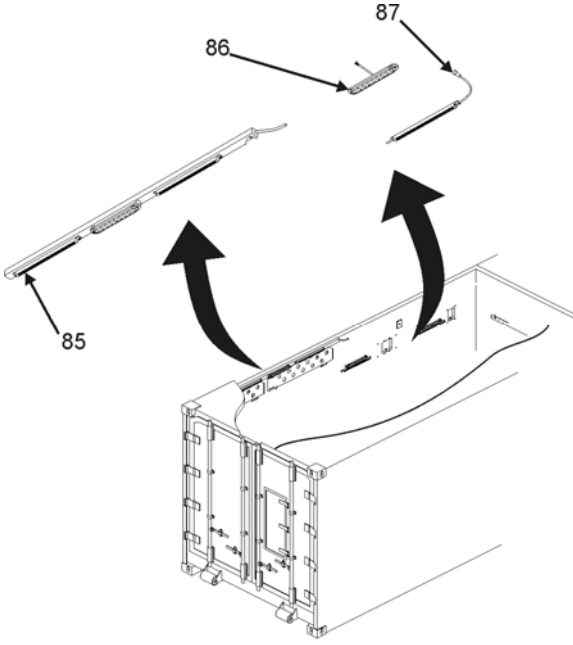
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
21	Before	Interior Lights	<p style="text-align: center;">NOTE</p> <p>The insulated container interior lights are made from a cluster of Light Emitting Diodes (LEDs) that provide normal (white) and blackout (red) illumination. The light will be visible when cargo is loaded; however, the lighting strips may not be accessible depending on the amount of cargo in the container.</p> <p>Two sets of lights (normal and blackout) are provided in each compartment to provide illumination. Control of these lights is provided at the control panel assembly.</p> <p>a. Position POWER ON/DOWN switch (83) to ON.</p> <p>b. Position control panel LIGHTING switch (84) to NORMAL position. Check that white lights (85) are illuminated in each compartment. If both compartment white lights do not illuminate, notify next level of maintenance.</p>  <p>c. Position control panel LIGHTING switch (84) to BLACKOUT position. Check that red lights (86) are illuminated in each compartment. If both compartment red lights do not illuminate, notify next level of maintenance.</p>	<p>Both compartment white lights are not on.</p> <p>Both compartment red lights are not on.</p>

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), Before – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
			<p>d. Position control panel LIGHTING switch (84) to OFF position. Check that all lights are out in each compartment. If any compartment light is on, notify next level of maintenance.</p> <p>e. Check that all strip lighting (85 and 86) mounting hardware is present and tight. If loose or missing, notify next level of maintenance.</p>  <p>f. Check strip lighting wiring conduits (87) and connections for looseness or damage. Tighten connections as needed. Notify next level of maintenance if damaged.</p> <p>g. Close both container rear doors and container side door.</p>	<p>Both compartment lights are on.</p> <p>Hardware loose or missing.</p> <p>Wiring conduits or connections are loose or damaged.</p> <p>Doors not closed.</p>

END OF WORK PACKAGE

CREW MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (PMCS) –
DURING OPERATION

INITIAL SETUP:**Personnel Required**

Automated Logistical Specialist (2), or
Food Service Specialist (2)

References

WP 0005
WP 0032

Equipment Condition

MTRCS stationary and on flat level surface (WP 0005)
Refrigeration unit as required (WP 0005)

PMCS

WARNING

Do not perform Crew Preventative Maintenance Checks and Services (PMCS) on the MTRCS while the MTRCS is mounted on a carrying vehicle. Failure to comply with this warning can result in serious injury or death to personnel.

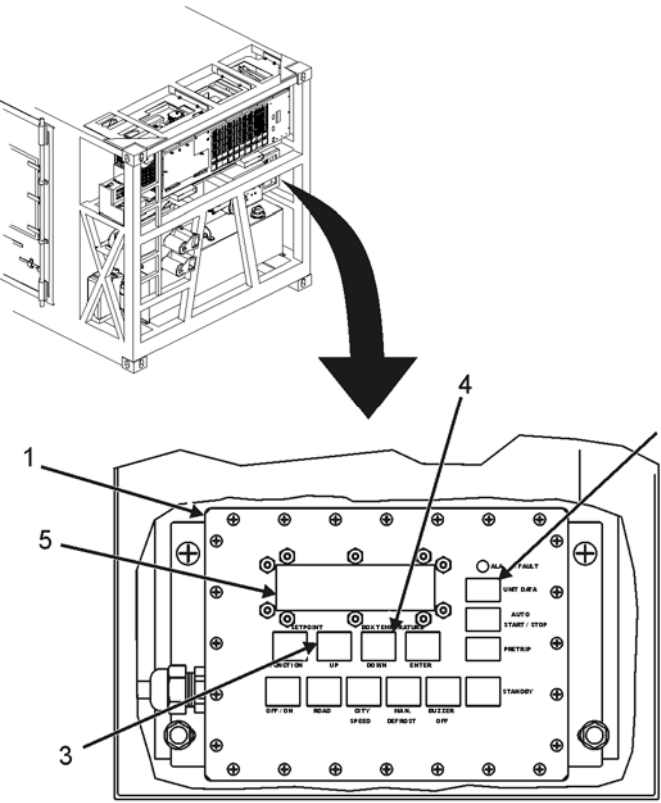
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
1	During	Refrigeration Unit	<p style="text-align: center;"><u>WARNING</u></p> <p>Carbon monoxide occurs in the exhaust fumes of fuel-burning internal combustion engines, as with the MTRCS diesel engine. Carbon monoxide has no color or smell, but can kill you. Never operate the diesel engine if the MTRCS is sited indoors (unless properly vented) or where adequate ventilation is not available.</p> <p style="text-align: center;">NOTE</p> <p>During PMCS is considered to be anytime the unit is in any type of operational mode.</p> <p>a. After starting:</p> <p style="text-align: center;">NOTE</p> <p>This portion of PMCS is performed while the diesel engine is running.</p> <p>Initial starting of refrigeration unit diesel engine is set to low RPM (1,800) for 15 seconds. High RPM (2,300) will be initiated when required by microprocessor. The increase from low to high RPM can be detected audibly.</p> <ol style="list-style-type: none"> 1. Listen for engine speed to increase from low RPM to high RPM after approximately 15 seconds. If engine speed does not increase, notify next level of maintenance to troubleshoot. 2. After five minutes of operation, check water temperature at microprocessor controller (1). <ol style="list-style-type: none"> (a) On microprocessor controller (1), press UNIT DATA (2) key and hold until display changes. (b) Press UP (3) or DOWN (4) key to scroll displayed parameter in display window (5) until WT is displayed. (c) Make sure displayed data indicates water temperature 65°C to 82°C (150°F to 180°F). 	<p>Engine speed does not increase to high RPM.</p> <p>Water temperature less than 65°C (150°F) or greater than 82°C (180°F).</p>

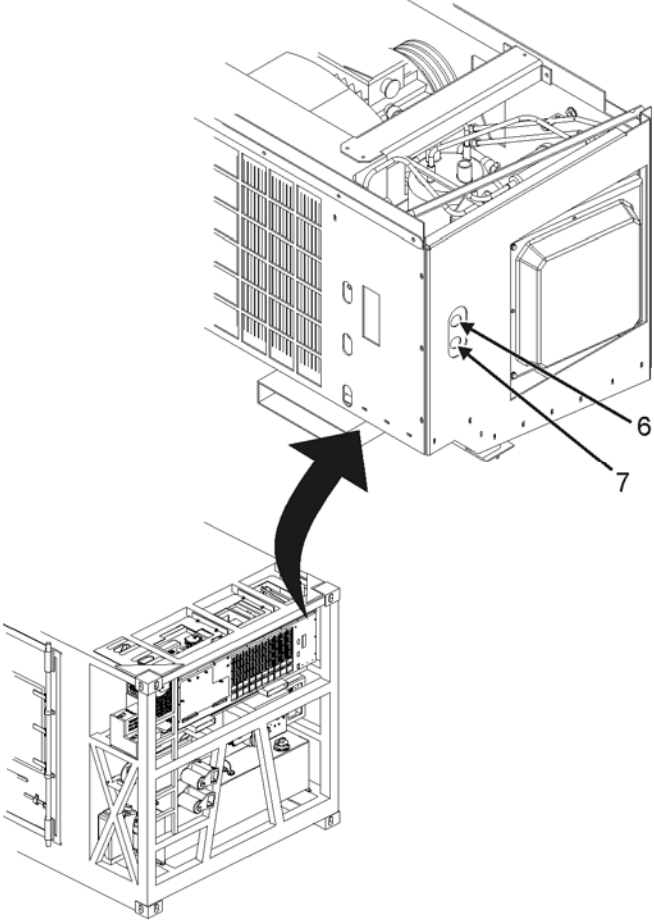
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
			 <p>3. Listen for abnormal engine noises that could indicate potential failure. Listen for sluggish running of diesel engine, vibrating or tapping of metal, belt slapping, or excessive noise and vibration from idler pulley. If abnormal noises are heard, shut diesel engine down and notify next level of maintenance.</p> <p>4. Visually check for signs of fuel and oil leaks. Class II or III leaks will be reported to next level of maintenance for repair.</p>	<p>Unusual noises are heard from the engine.</p> <p>Class II or III leak present.</p>
2	During	Refrigerant Level	<p style="text-align: center;">NOTE</p> <p>The refrigeration unit will need to operate for 10 minutes to allow pressure to rise before checking receiver sight glass refrigerant levels.</p> <p>There are two receiver sight glasses on the receiver. The sight glasses are visible through cutout in the refrigeration unit left-side panel.</p> <p>It may be necessary to swing the chart recorder door open to better view the sight glass.</p>	

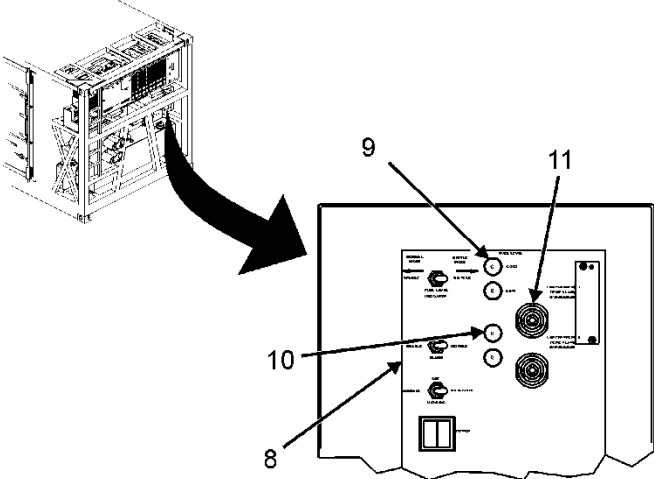
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
2	During	Refrigerant Level (continued from previous page)	<p>a. Perform a visual check of refrigerant level by checking that receiver top sight glass (6) is not full and receiver bottom sight glass (7) is not empty. If not within described tolerances, notify next level of maintenance to service refrigeration system (WP 0032, Service).</p>  <p>The diagram shows a detailed view of the receiver unit with two sight glasses labeled 6 and 7. A large black arrow points from this detailed view to an inset showing the receiver installed within a metal equipment rack.</p>	Receiver top sight glass indicates full or bottom sight glass indicates empty.

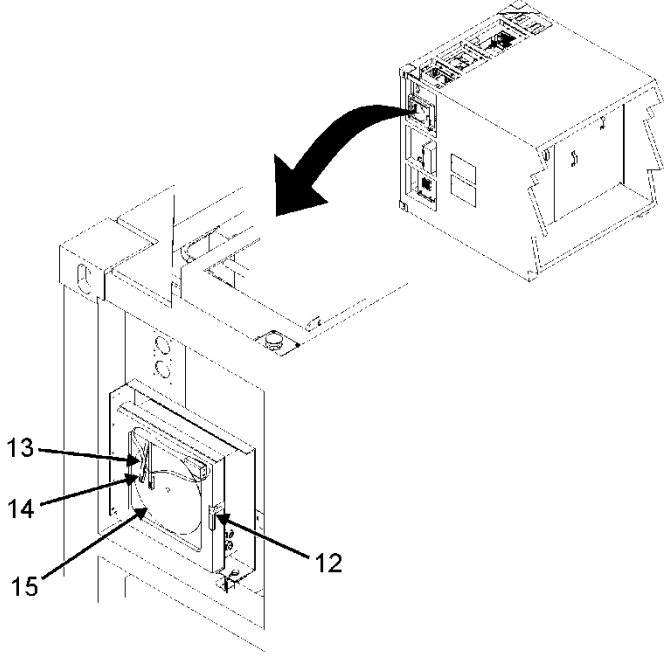
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
3	During	Control Panel Assembly	<p style="text-align: center;">NOTE</p> <p>There are two FUEL LEVEL alarm lights. One is red, indicating fuel level is low when lit, and the other is green, indicating fuel level is good when lit.</p> <p>There are two COMPARTMENT TEMP OVER/UNDER lights; one for compartment 1 and one for compartment 2, that illuminate if compartment temperature is outside the setpoint range. Additionally, there are two horns that will sound for out of temperature ranges.</p> <p>a. Visually inspect control panel (8) for any FUEL LEVEL (9) and COMPARTMENT OVER/UNDER TEMP (10) alarm fault lights. Notify supervisor if alarms are visible.</p>  <p>The diagram shows a perspective view of a control panel assembly on the left, with a large arrow pointing to a detailed front view of the panel on the right. Callout 8 points to the panel's frame, 9 to a fuel level indicator light, 10 to a compartment temperature indicator light, and 11 to an alarm horn.</p> <p>b. Listen for COMPARTMENT OVER/UNDER TEMP (10) audible alarm horns (11). Notify supervisor if alarms are heard.</p>	<p>Visual alarms are present.</p> <p>Audible alarms are present.</p>
4	During	Insulated Container – Interior	<p>a. Check that blackout and normal lighting are operational inside container. If lighting does not operate, notify next level of maintenance.</p> <p>b. Check for accumulation of frost on evaporators. If a significant amount of frost is accumulated, initiate a manual defrost and consider resetting the time interval on automatic defrost mode (WP 0005, Compartment Operation and Adjustment).</p>	<p>Any lighting is inoperable.</p> <p>Amount of frost accumulation is enough to degrade performance of refrigeration unit.</p>

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
5	During	Temperature Chart Recorder	<p>On temperature chart recorder (12) check that stylus arms (13) are moving and pens (14) are marking chart (15). If pens are not moving or marking chart, notify next level of maintenance.</p> 	Pens are not moving or are not marking chart.

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
6	During	Refrigeration Unit	<p>a. Perform check of engine operating hours at microprocessor controller.</p> <ol style="list-style-type: none"> 1. On microprocessor controller (16), press UNIT DATA (17) key and hold until display changes. 2. Press UP (18) or DOWN (19) key as required until display (20) indicates ENG XXXH, where XXX is hours in operation. <div style="text-align: center;"> </div> <ol style="list-style-type: none"> 3. Notify next level of maintenance to perform interval maintenance functions as required based on hours indicated on display. <ol style="list-style-type: none"> (a) If display indicates less than ENG 400H, service interval checks are not required. (b) If display indicates between ENG 400H and 1500H and forms indicate not yet accomplished, perform 400 hours interval checks. (c) If display indicates between ENG 1500H and 3000H and forms indicate not yet accomplished, perform 1500 hours interval checks. 	Appropriate service interval checks have not been performed.

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), During – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
6	During	Refrigeration Unit (continued from previous page)	(a) If display indicates between ENG 3000H and 6000H and forms indicate not yet accomplished, perform 3000 hours interval checks. (b) If display indicates greater than ENG 6000H and forms indicate not yet accomplished, perform 6000 hours interval checks.	Appropriate service interval checks have not been performed.

END OF WORK PACKAGE

CREW MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (PMCS) –
AFTER OPERATION

INITIAL SETUP:**Tools and Special Tools**

Shield, Face (WP 0110, Item 20)
Spill Kit (WP 0110, Item 49)

Personnel Required

Automated Logistical Specialist (2), or
Food Service Specialist (2)

Equipment Condition

MTRCS stationary and on flat level surface (WP 0005)
Refrigeration unit as required (WP 0005)

References

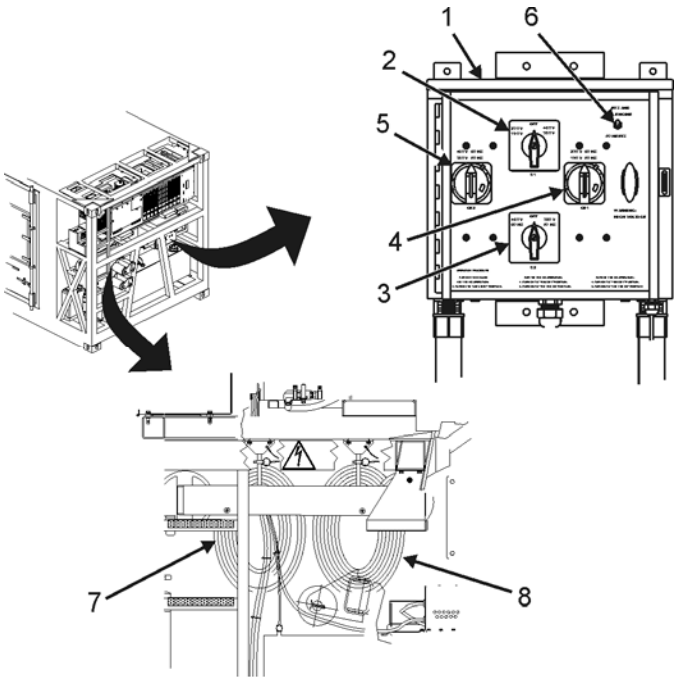
WP 0005
WP 0025
WP 0026
WP 0027
WP 0030
WP 0031
WP 0110

PMCS**WARNING**

Do not perform Crew Preventative Maintenance Checks and Services (PMCS) on the MTRCS while the MTRCS is mounted on a carrying vehicle. Failure to comply with this warning can result in serious injury or death to personnel.

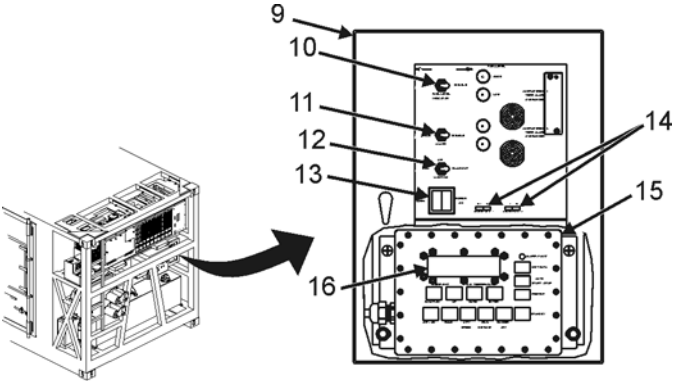
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
1	After	Power Box	<p style="text-align: center;">NOTE</p> <p>After PMCS is considered to be when the entire MTRCS is empty and the refrigeration unit has been shut down so as not to be used for storage of perishable goods. During operation is considered to be anytime there are stored goods in the unit and it is in any type of operational mode.</p> <ol style="list-style-type: none"> a. Make sure power box (1) switches S1 (2) and S2 (3) are in OFF position. b. Make sure power box (1) power breakers CB1 (4) and CB2 (5) are in OFF position. c. Make sure power box switch S7 (6) is in 60 HERTZ AND DIESEL ENGINE (UP) position. 	<p>S1, S2 not in OFF position.</p> <p>CB1, CB2 not in OFF position.</p> <p>Switch S7 is not in UP position.</p>

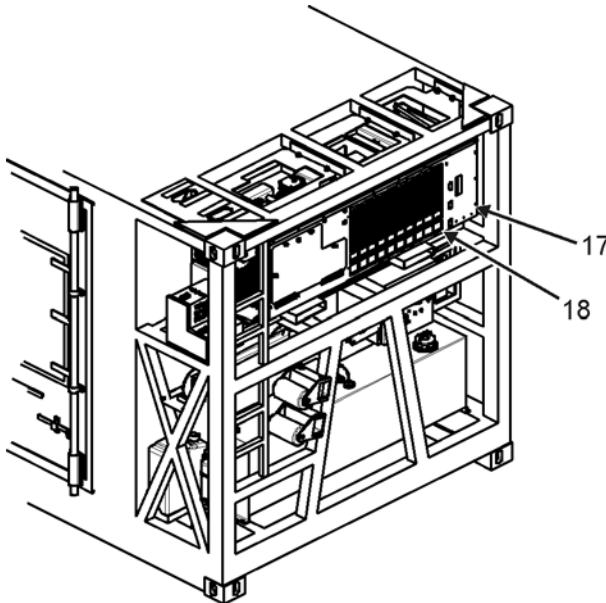
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
1	After	Power Box (continued from previous page)	d. Make sure external power supply cables (7) are disconnected and stored on hooks (8) and secured with lanyards.	External power supply cables not properly stored on hooks.
2	After	Control Panel Assembly	<p>a. Make sure control panel (9) FUEL LEVEL INDICATOR switch (10) is in ENABLE position.</p> <p>b. Make sure control panel (9) ALARM switch (11) is in ENABLE position.</p> <p>c. Make sure control panel (9) LIGHTING switch (12) is in OFF position.</p> <p>d. Make sure control panel (9) POWER rocker switch (13) is in DOWN position.</p> <p>e. Make sure control panel (9) COMPARTMENT 1 and 2 switches (14) are in OFF position.</p> <p>f. Make sure microprocessor control panel (15) display (16) is blank.</p> 	<p>Switch not in ENABLE position.</p> <p>Switch not in ENABLE position.</p> <p>Switch not in OFF position.</p> <p>Switch not in DOWN position.</p> <p>Switches not in OFF position.</p> <p>Display is not blank.</p>
3	After	Refrigeration Unit	<p>a. Access top of MTRCS using roof access provided.</p> <p>b. Notify service maintenance to remove three top panels (WP 0031).</p> <p>c. Visually check through sides and front of refrigeration unit (17) housing covers for evidence of any leaks around oil filters, fittings, hoses, refrigerant lines, and components. If any visible leak is identified, notify next level of maintenance.</p>	Any fuel leak or Class III oil leak.

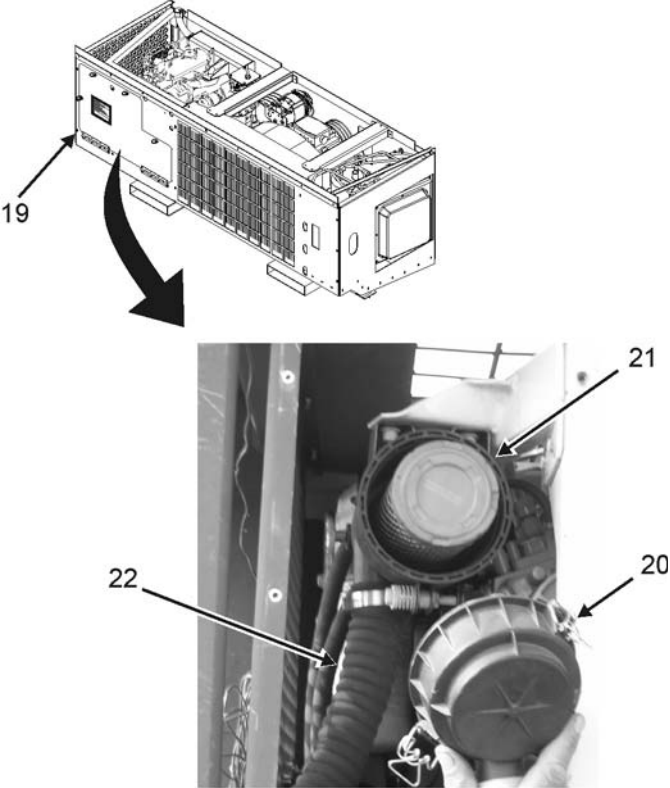
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
3	After	Refrigeration Unit (continued from previous page)	<p>d. Visually check condenser coil for ice buildup. If ice buildup is present, rinse with hose until melted.</p> <p>e. Visually check condenser coil (18) for cleanliness. If foreign matter is found or coil is dirty, clean as required.</p> 	<p>Ice buildup is present.</p> <p>Condenser coil is dirty.</p>
4	After	Air Cleaner	<p>a. Open front panel assembly access cover (19).</p> <p>b. Remove air cleaner cap (20) and check for cracks or fractures. Ensure clips are in place. Replace if necessary.</p> <p>c. Remove engine air filter element (21) and check for cleanliness. Replace element if dirty (WP 0026).</p> <p>d. Check air cleaner outlet pipe (22) for cleanliness and for cracks or fractures. Clean or replace as necessary.</p> <p>e. Install air cleaner cap (23), secure with two clips, and check that cap drain tube is pointed in downward direction.</p>	<p>Air cleaner cap has cracks or fractures.</p> <p>Clips missing or damaged.</p> <p>Air filter element is dirty.</p> <p>Outlet pipe dirty, cracked, or fractured.</p> <p>Cap not installed and drain tube not pointed downward.</p>

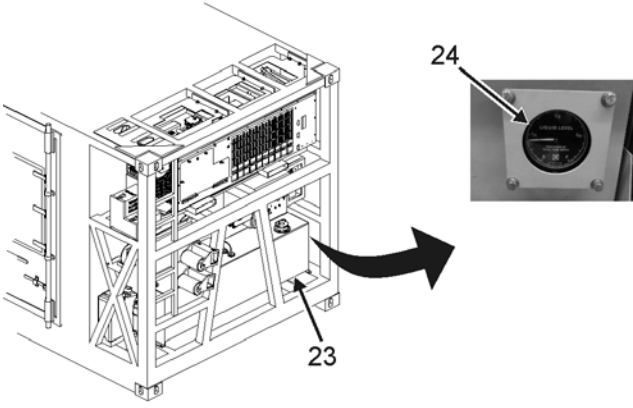
PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
4	After	Air Cleaner (continued from previous page)	 <p>f. Close and secure front panel assembly access cover (19).</p>	Access cover not closed and secure.

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
5	After	Fuel Tank	<p style="text-align: center;"><u>WARNING</u></p> <p>Fuel is toxic and combustible. Always wear eye, face, and hand protection when working with or around fuel. Avoid contact with skin and clothes, and do not breathe vapors. If contact with eyes or skin is made, immediately flush with clean water and get immediate medical aid for eyes. If contact with clothing or skin is made, immediately remove contaminated clothing and clean skin with mild soap or cleanser, and flush with clean water.</p> <p>Do not overfill fuel tank. Movement during transport may cause a fuel spill to an overfilled tank. Make sure a fire extinguisher is available when fueling procedures are taking place.</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>Do not use gasoline or any other unapproved fuel type in the MTRCS. Use only JP-8 or diesel fuel in the MTRCS.</p> <p>Visually inspect fuel tank (23) fuel level indicator (24). Notify service maintenance to add fuel as required (WP 0030).</p> 	<p>Fuel tank indicator reads less than 3/4 full.</p>

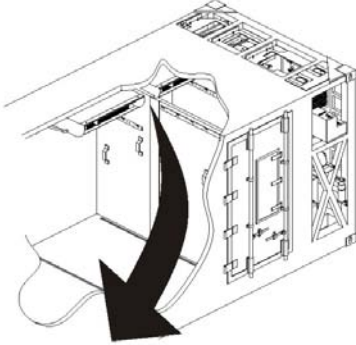

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
6	After	Insulated Container (IC) – Interior	<p style="text-align: center;">CAUTION</p> <p>When cleaning the floor of the insulated container, use care not to allow water to get into the evaporators. Never use a pressure wash to clean evaporators.</p> <p>Check flooring for foreign matter. Clean as necessary (WP 0025, Service).</p>	Floor not clean.
7	After	Evaporators	<p>a. Check evaporator drain hoses (25) and connections for build-up of foreign matter or ice buildup. Clean as required or notify next level of maintenance for repair.</p> <p style="text-align: center;">CAUTION</p> <p>Ice buildup on the evaporator can reduce the efficiency of the evaporator and must be removed. Never attempt to remove ice buildup from an evaporator by chipping or knocking it away as damage to the evaporator can result from this action. Always use a defrost procedure to remove ice buildup.</p> <p>b. Inspect evaporator coils (26) for frost or ice buildup. If frost or ice buildup is greater than one-eighth to one-half inch thick, perform manual defrosting of refrigeration unit (WP 0005, Compartment Operation and Adjustment).</p> <p>c. Check evaporator coils (26) for cleanliness. If excessive foreign matter is present, clean as necessary (WP 0025, Service).</p>	<p>Foreign matter or ice buildup is present in drain hoses.</p> <p>Frost or ice buildup on evaporator coils is greater than one-eighth to one-half inch thick.</p> <p>Evaporator coils are dirty.</p>

PMCS – CONTINUED

Table 1. Crew Preventative Maintenance Checks and Services (PMCS), After – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
8	Weekly	Temperature Chart Recorder	<div style="text-align: center;">   </div> <p>a. Visually inspect paper chart to make sure chart paper is attached and is not full. If missing or full, replace chart paper (WP 0027, Change Chart Paper)</p> <p>b. Check pens and replace if necessary (WP 0027, Change Cartridge Pen).</p>	Paper chart is missing or full.

END OF WORK PACKAGE

CREW MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
SERVICE UPON RECEIPT

INITIAL SETUP:

Equipment Condition

Refrigeration unit shut down (WP 0005)

References

WP 0002	WP 0108
WP 0005	DA Pam 738-750
WP 0019	DA Pam 750-8
WP 0027	SF 361
WP 0030	

Personnel Required

Automated Logistical Specialist (2), or
 Food Service Specialist (2)

SITING

When operating the unit at a fixed site, select an area that is flat and level. The site should provide good water drainage away from the container. If refrigeration is powered by an external electrical source, locate container within forty feet of the electrical source.

SHELTER REQUIREMENTS

The MTRCS does not require any special sheltering. Storing the container under cover, if available, will minimize routine maintenance and improve overall temperature control.

SERVICE UPON RECEIPT OF MATERIAL

1. Inspect equipment for damage incurred during shipment. If equipment is damaged, report damage on SF 361, Transportation Discrepancy Report.
2. Check equipment against packing slip to see if shipment is complete. Report all discrepancies following the instructions of DA Pam 738-750 or DA Pam 750-8 as applicable.
3. Check equipment for unauthorized modification (WP 0002) and if modified report to your commander.

END OF TASK

INSTALLATION INSTRUCTIONS

Check provided components against Components of End Item (COEI) and Basic Issue Items (BII) lists (WP 0108).

END OF TASK

PRELIMINARY SERVICE OF EQUIPMENT**Initial Equipment Inspection**

1. Inspect container frame, corner posts, and upper/lower fittings for damage. Do not use containers damaged in those areas (WP 0019).
2. Inspect exterior wall panels of container for punctures, tears, cracks, and loose or missing fasteners (WP 0019).
3. Inspect doors for loose, missing, or broken hardware (WP 0019).
4. Inspect container interior for tears, cracks to ceiling and wall panels, and any other damage (WP 0019).
5. Inspect container stencils, markings, and information plates. All items should be legible (WP 0005).
6. Notify service maintenance to fill fuel tank to appropriate level (WP 0030, Fuel).
7. Check engine oil in accordance with PMCS procedures (WP 0019).
8. Load paper in temperature chart recorder (WP 0027, Change Chart Paper).

WARNING

Electrical voltage and current cannot be seen, and when contacted can result in death, render you unconscious, or severely burn you. Use extreme care when working around or with energized equipment. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning. To ensure your safety and that of other maintenance personnel, do not make electrical connections unless you are trained and qualified to do so.

9. If using an external electrical source, make sure that power cable assemblies have been connected by qualified personnel.
10. Start unit to ensure proper operation (WP 0005, Operating Procedures).
11. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

CREW MAINTENANCE
PALLETIZED LOAD SYSTEM (PLS) ROLLERS
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Forklift (WP 0109)

Materials/Parts

Rollers, PLS (WP 0108, Table 1, Item 6)

Pin, Roller Mount (WP 0108, Table 1, Item 5)

Personnel Required

Automated Logistical Specialist (3), or
Food Service Specialist (3)

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

GENERAL

There are two PLS rollers on the MTRCS. In the installed position, one roller is located on each side of the rear end of the MTRCS. In the stored position, each of the rollers is located on the front of the MTRCS midway behind the bale bar.

REPLACE**Remove From Stored Position**

Perform the following steps to remove the PLS rollers from the MTRCS when in the stored position:

WARNING

Each PLS roller weighs 75 pounds and is a two-person lift. Do not attempt to remove the PLS roller alone. A third person will be needed to remove the mount pins while the other two persons support the weight of the PLS roller.

1. Remove two locking clips (Figure 1, Item 1) from inner side of two PLS roller mount pins (Figure 1, Item 2).
2. Partially remove each mount pin (Figure 1, Item 2) from mount bracket (Figure 1, Item 3).
3. With two persons supporting weight of PLS roller (Figure 1, Item 4), fully remove each mount pin (Figure 1, Item 2) from mount bracket (Figure 1, Item 3).
4. Remove PLS roller (Figure 1, Item 4).

REPLACE – CONTINUED

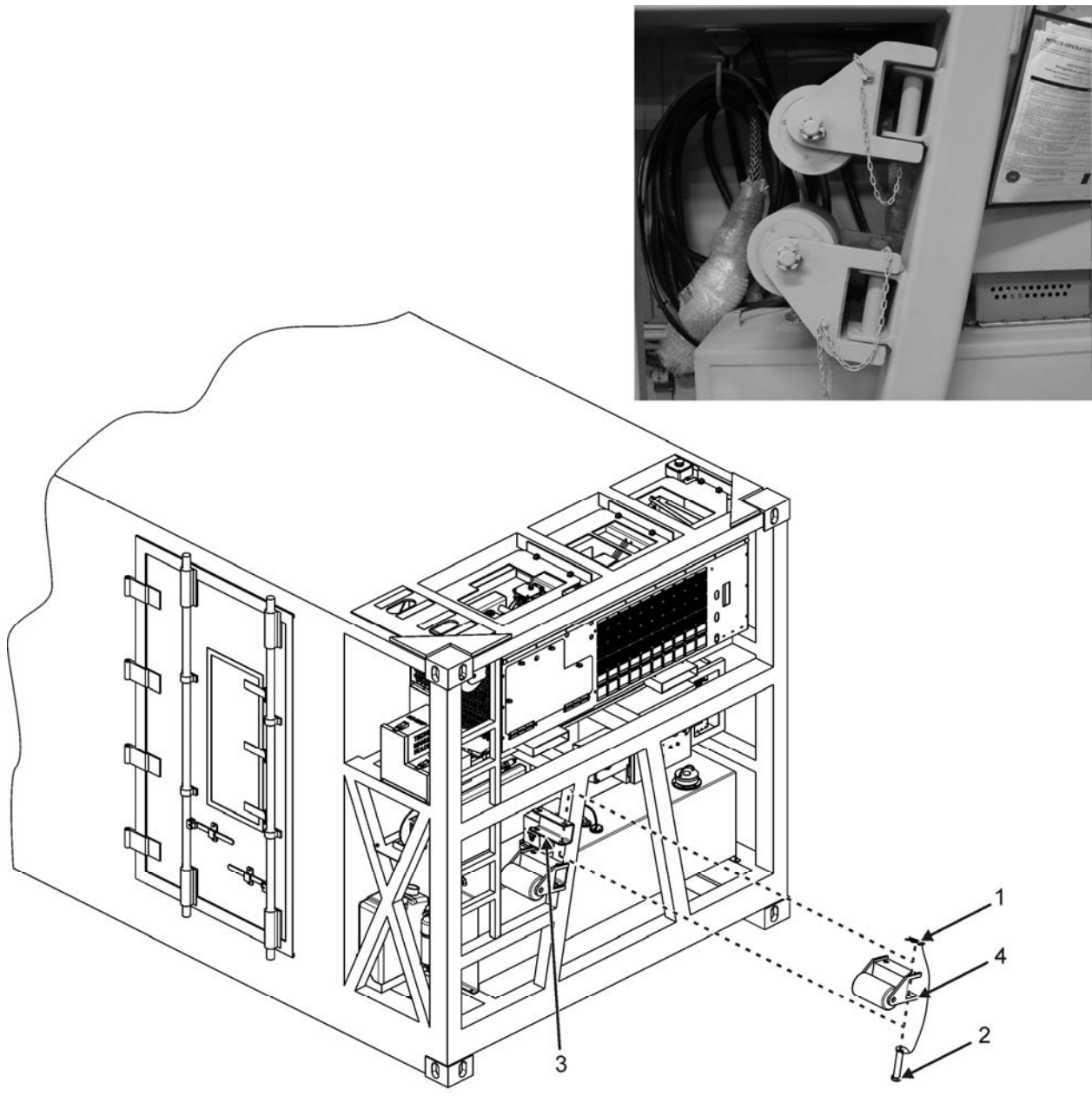


Figure 1. PLS Roller Mount Pins.

REPLACE – CONTINUED**Store**

Store the PLS rollers when not in the installed position as follows:

WARNING

Each PLS roller weighs 75 pounds and is a two-person lift. Do not attempt to remove the PLS roller alone. A third person will install the mount pins in place while the other two persons hold the PLS roller in position.

1. Position first PLS roller (Figure 1, Item 4), with angled portion of bracket (Figure 1, Item 4) facing up, on top mount bracket (Figure 1, Item 3) at MTRCS front.
2. Insert two mount pins (Figure 1, Item 2) through bottom of mount bracket (Figure 1, Item 3), PLS roller (Figure 1, Item 4), and top of mount bracket (Figure 1, Item 3) so that pin heads are flush with bottom of top mount bracket (Figure 1, Item 3).

NOTE

In order to install locking clips, it may be necessary to rotate the mounting pins.

3. Install two locking clips (Figure 1, Item 1) in bottom side of PLS roller mount pins (Figure 1, Item 2).
4. Position second PLS roller (Figure 1, Item 4), with angled portion of bracket (Figure 1, Item 3) facing up, on bottom mount bracket (Figure 1, Item 3) at MTRCS front.
5. Insert two mount pins (Figure 1, Item 2) through top of mount bracket (Figure 1, Item 3), PLS roller (Figure 1, Item 4), and bottom of mount bracket (Figure 1, Item 3) so that pin heads are flush with top of bottom mount bracket (Figure 1, Item 3).

NOTE

In order to install locking clips, it may be necessary to rotate the mounting pins.

6. Install two locking clips (Figure 1, Item 1) in bottom side of PLS roller mount pins (Figure 1, Item 2).

REPLACE – CONTINUED**Install**

Perform the following steps to install the PLS rollers onto the MTRCS for movement:

WARNING

Each PLS roller weighs 75 pounds and is a two-person lift. Do not attempt to remove the PLS roller alone. A third person will install the mount pins in place while the other two persons hold the PLS roller in position.

1. Remove PLS rollers from stored position per this WP.
2. Position PLS roller (Figure 2, Item 1) so that it is aligned with mount holes in mount bracket on rear of MTRCS.
3. Slide two mount pins (Figure 2, Item 2) through outside of mount bracket, PLS roller (Figure 2, Item 1), and inside of mount bracket so that pin heads are flush with outside mount bracket. Ensure that alignment marking (Figure 2, Item 1) is vertical on pin (Figure 2, Item 2) after installation in order to ease installation of locking clips (Figure 2, Item 3).

NOTE

In order to install locking clips, it may be necessary to rotate the mounting pins.

4. Install two locking clips (Figure 2, Item 3) through inside of PLS roller mount pins (Figure 2, Item 2).

Remove From Installed Position

Perform the following steps to remove the PLS rollers from the MTRCS when in the installed position:

WARNING

Each PLS roller weighs 75 pounds and is a two-person lift. Do not attempt to remove the PLS roller alone. A third person will remove the mount pins while the other two persons support the weight of the PLS roller.

1. Use forklift to lift rear of MTRCS approximately six inches off the ground and place a solid piece of dunnage under each side to support container.
2. Remove two locking clips (Figure 2, Item 3) from back side of two PLS roller mount pins (Figure 2, Item 2).
3. Use a piece of dunnage to relieve hanging pressure of PLS roller.

REPLACE – CONTINUED

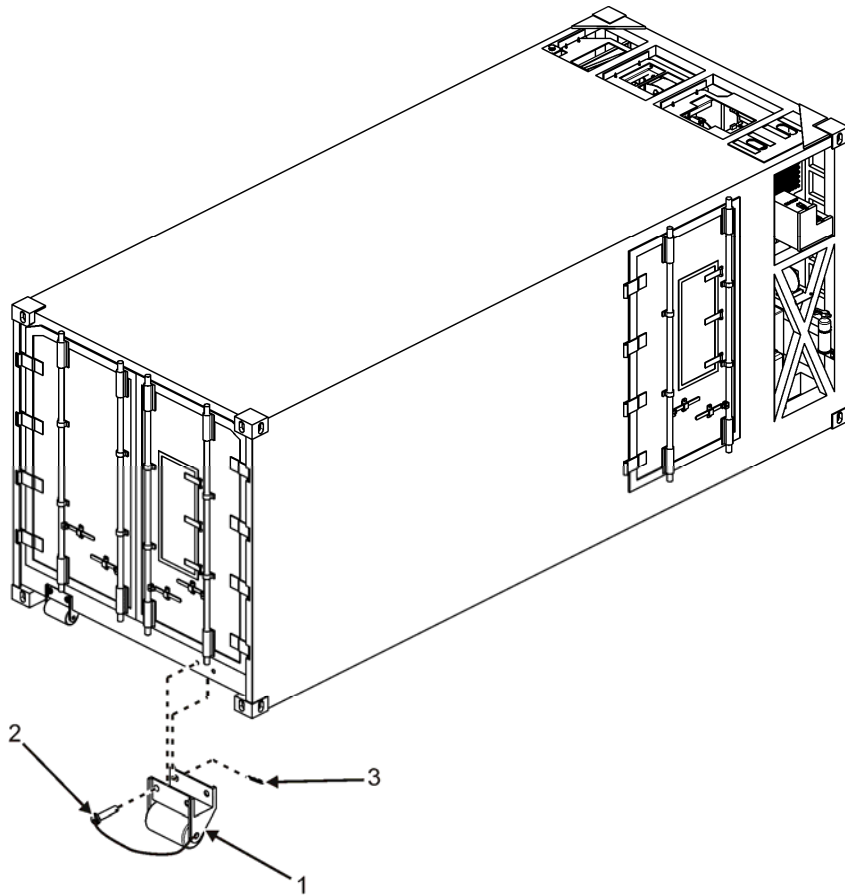


Figure 2. PLS Roller Installation.

WARNING

Do not allow hands or feet to become trapped under the PLS rollers during removal. When the two pins are removed, the roller will drop to the ground if not supported.

4. Remove two mount pins (Figure 2, Item 2).
5. Remove PLS roller (Figure 2, Item 1).
6. Install each PLS roller in stored position per this WP.

END OF TASK**END OF WORK PACKAGE**

OPERATOR MAINTENANCE
INTERIOR BULKHEAD
REPLACE

INITIAL SETUP:**Materials/Parts**

Panel, Body, Vehicular (Left) (WP 0108, Item 1)
Panel, Body, Vehicular (Right) (WP 0108, Item 2)

Personnel Required

Automated Logistical Specialist, or
Food Service Specialist

References

WP 0007
WP 0008

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

REPLACE**Remove**

Perform the following steps to remove the interior bulkhead from the insulated container.

1. Remove cargo from container to extent necessary for access to interior bulkheads (WP 0008, Unloading).
2. Roll back hook and pile fastener flap (Figure 1, Item 1) securing left and right interior bulkhead (Figure 1, Item 2) together.
3. Remove right interior bulkhead (Figure 1, Item 2) by pulling right interior bulkhead handle straps (Figure 1, Item 3) toward you until partition top flexes away from left interior bulkhead (Figure 1, Item 4) and container ceiling.
4. Lift right interior bulkhead (Figure 1, Item 2) straight up from between left interior bulkhead (Figure 1, Item 4) and side wall.
5. Remove right interior bulkhead from insulated container.

CAUTION

While removing the left interior bulkhead, use care to avoid hitting the evaporator.

6. Use left interior bulkhead handle straps (Figure 1, Item 3) to slide left interior bulkhead (Figure 1, Item 4) a few inches right.
7. Pull handle straps (Figure 1, Item 3) toward you until left interior bulkhead top flexes away from container ceiling.
8. Remove left interior bulkhead from insulated container.

REPLACE – CONTINUED

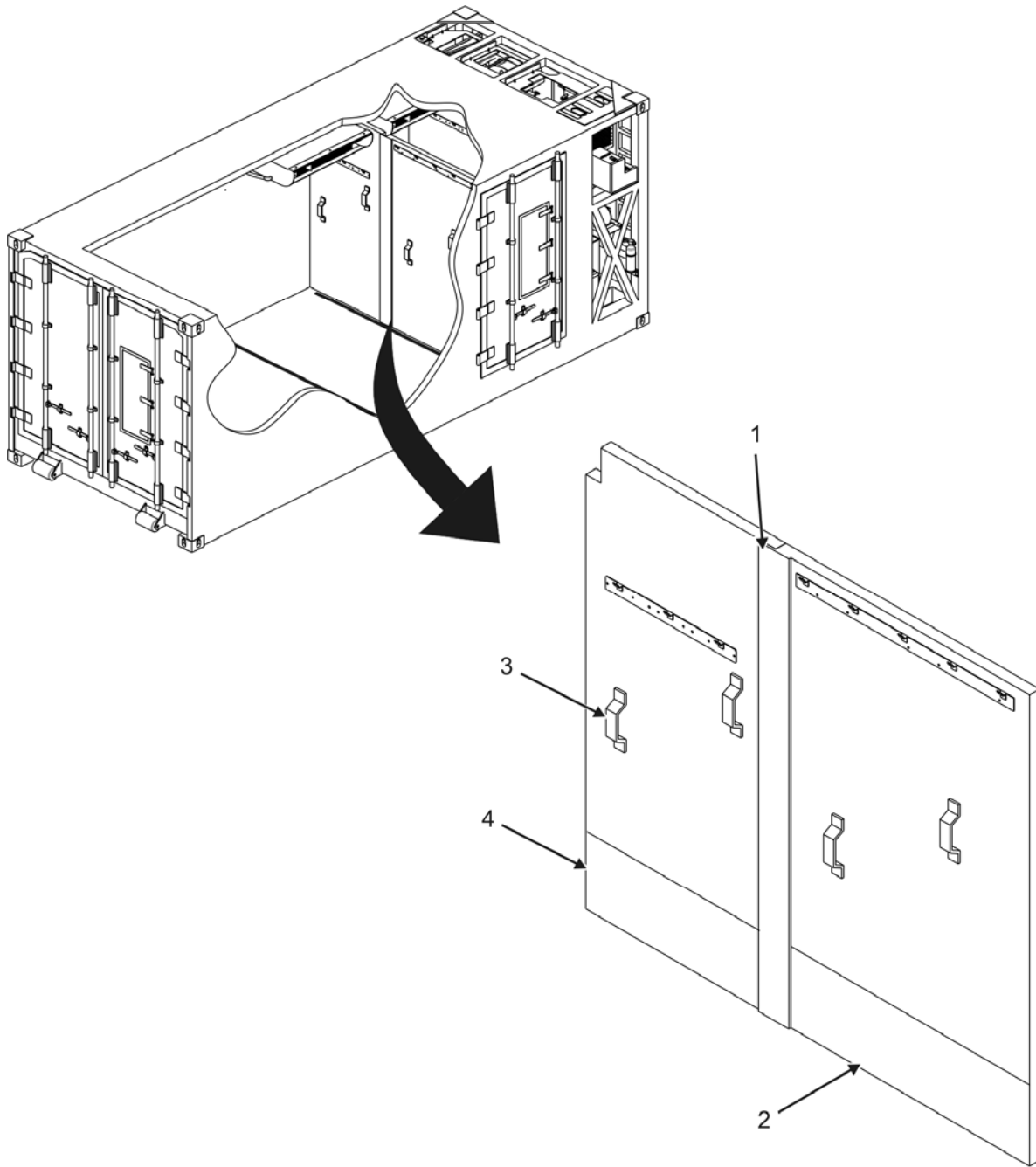


Figure 1. Interior Bulkhead.

REPLACE – CONTINUED**Store**

Store the left and right interior bulkhead as follows during transportation of the empty MTRCS.

NOTE

When stacking interior bulkheads, make sure right interior bulkhead is on the bottom and hooks on each interior bulkhead are facing up.

1. If transporting the MTRCS unloaded, stack left and right interior bulkhead (Figure 2, Item 1) inside insulated container laying flat between tracks 2 and 4.
2. Secure interior bulkheads (Figure 2, Item 1) using two adjustable straps (Figure 2, Item 2) connected to scalloped rails (Figure 2, Item 3).



Figure 2. Interior Bulkhead Storage.

REPLACE – CONTINUED**Install**

Perform the following steps to install the interior bulkheads inside the insulated container.

NOTE

The interior bulkhead panels are not fastened to the container. Installation requires that the individual panels be held in place using a flexible seal against the container ceiling, floor, and side walls. The interior bulkhead panels are placed between the first and second rows of cargo.

1. Hold left interior bulkhead (Figure 1, Item 4) by strap handles (Figure 1, Item 3) to maneuver it into place.

NOTE

While positioning left interior bulkhead, position it so that it is a few inches from container's left side to avoid hitting the evaporator. There will be slight resistance during installation due to friction.

2. With top leaning toward installer, place bottom left interior bulkhead (Figure 1, Item 4) edge on floor between rail tracks 2 and 3.
3. Flex left interior bulkhead (Figure 1, Item 4) while pushing top until partition panel is straight and holds itself in place against container ceiling.
4. Slide panel to left between evaporators until firmly seated against left side wall.

NOTE

The left interior bulkhead panel will be properly positioned when it is lined up with the plastic block located near the ceiling and evaporators.

5. Hold right interior bulkhead panel (Figure 1, Item 2) by strap handles to maneuver it into place.
6. With top leaning toward installer, position bottom right interior bulkhead (Figure 1, Item 2) edge on floor between rail tracks 2 and 3.
7. Push bottom right interior bulkhead (Figure 1, Item 2) in place between the left interior bulkhead (Figure 1, Item 4) and side wall.

REPLACE – CONTINUED**NOTE**

There will be slight resistance during installation due to friction.

8. Flex right interior bulkhead (Figure 1, Item 2) while pushing top until panel is straight and holds itself in place between left interior bulkhead (Figure 1, Item 4), container ceiling, and side wall.
9. Check that left and right interior bulkheads (Figure 1, Item 2 and Item 4) are aligned and straight.

NOTE

It may be necessary to slip your hand in between the two interior bulkheads (Figure 1, Item 2 and Item 4) to properly align them with each other.

The right interior bulkhead has a hook and pile fastener flap (Figure 1, Item 1) that secures left and right interior bulkheads together. The hook and pile fastener flap (Figure 1, Item 1) must be attached to prevent undesired movement of interior bulkheads (Figure 1, Item 2 and Item 4) during transportation.

10. Secure hook and pile fastener flap (Figure 1, Item 1), attached to right interior bulkhead (Figure 1, Item 2), onto left interior bulkhead (Figure 1, Item 4) to join interior bulkheads (Figure 1, Item 2 and Item 4).
11. Reload any removed cargo into container (WP 0007, Loading).

END OF TASK**END OF WORK PACKAGE**

CREW MAINTENANCE
CONTAINER
SERVICE

INITIAL SETUP:**Tools and Special Tools**

Face Shield, Industrial (WP 0110, Item 20)
Gloves, Chemical and Oil Protective (WP 0110, Item 21)
Pail, Utility, Plastic (WP 0110, Item 35)
Safety Glasses (WP 0110, Item 39)

Materials/Parts

Bleach, Laundry (WP 0110, Item 6)
Detergent, General Purpose (WP 0110, Item 18)
Hose Assembly (WP 0110, Item 25)
Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Automated Logistical Specialist (2), or
Food Service Specialist (2)

References

CFR 1910.146
TB MED 530
WP 0005
WP 0007

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)
Cargo removed/container empty (WP 0007)

SERVICE**Clean Insulated Container****WARNING**

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

Servicing and cleaning of the inside of the insulated container must be done with all doors opened and secured to the container. In the event it becomes necessary to clean the inside of the container with the doors closed, all personnel must comply with procedures contained in 29 CFR 1910.146.

1. Open left and right rear doors by first pushing cam handles away from each other (WP 0007, Preparation).
2. Open right door completely and secure to side of container with attached door chain and padlock (WP 0007, Preparation).
3. Open left door completely and secure to side of container with attached door chain and padlock (WP 0007, Preparation).
4. Open side door and secure to side of container with attached door chain and padlock (WP 0007, Preparation).
5. Confirm insulated container is empty.
6. Place interior bulkheads against container walls.

SERVICE – CONTINUED

7. Remove any foreign debris in or around evaporator coils.
8. Remove any accumulated debris and clean container door opening sealing surfaces.
9. Remove all floor drain plugs from drains to allow water to escape.
10. Confirm drain holes are free of obstructions.
11. Remove all loose dirt from crevasses in floor of insulated container with broom.

WARNING

Detergent may cause irritation to eyes and skin. Wear eye protection and gloves when using detergent.

12. Mix cleaning solution of detergent and water in clean bucket.

CAUTION

Make sure that the insulated container is empty of cargo before spraying the interior and cleaning the interior. Failure to comply with this can result in damage to cargo and cargo storage containers.

Do not spray excessive or high pressure water into evaporators. Failure to comply can cause damage to evaporators.

13. Spray evaporator coils to loosen and remove any dirt buildup.
14. Spray inside of insulated container and interior bulkheads with water from hose.
15. Use clean towel to wipe all sides and floor of insulated container and interior bulkheads with cleaning solution.
16. Remove bucket of cleaning solution from insulated container.
17. Remove towel containing cleaning solution from insulated container.
18. Rinse container interior and interior bulkheads with fresh clean water until free of detergent suds.
19. Properly dispose of used cleaning towels and bucket of cleaning solution.

SERVICE – CONTINUED**WARNING**

Do not inhale, swallow, or allow bleach to come in contact with eyes or skin. If inhaled, swallowed, or contaminated with bleach, get medical aid immediately. Always wear protective clothing, gloves, and eye protection when working with bleach. Bleach is also harmful if inhaled, and causes eye and skin burns if contact is made. Bleach will also cause digestive tract burns if ingested. Failure to obey this warning may result in serious injury or death to personnel.

NOTE

The normal mixture of two tablespoons (1 ounce) of household-type chlorine bleach in 4 gallons of water provides a starting solution of approximately 100-ppm.

20. Mix sanitizing solution of bleach and water in clean bucket.
21. Use clean towel to wipe all sides and floor of insulated container and interior bulkheads with sanitizing solution.
22. Remove bucket of sanitizing solution from insulated container.
23. Remove towels containing sanitizing solution from insulated container.
24. Rinse container interior and interior bulkheads with fresh clean water until free of sanitizing solution.
25. Properly dispose of used cleaning towels and bucket of sanitizing solution.
26. Remove hose from insulated container.
27. Return hose to the proper storage location.
28. Allow container interior and interior bulkheads to air dry completely.
29. Reinstall drain plugs into the drains.
30. Close and secure side and rear doors using two persons.
31. Stow interior bulkheads as required.

SERVICE – CONTINUED**Clean Fuel Tank****WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

Detergent may cause irritation to eyes and skin. Wear eye protection and gloves when using detergent.

1. Make cleaning solution by mixing small amount of commercial detergent and water in cleaning bucket.
2. Dampen cleaning rag with wash solution and wipe top and all sides of fuel tank.
3. Use brush if necessary to remove any accumulated dirt or residue.
4. Dampen cleaning rag with clean water and rinse fuel tank.

NOTE

If available, use a hose and clean water source to rinse outside of fuel tank.

5. Wipe fuel tank with clean dry cleaning rag until dry.
6. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

CREW MAINTENANCE
AIR FILTER ELEMENT
REPLACE

INITIAL SETUP:**Personnel Required**

Automated Logistical Specialist, or
Food Service Specialist

Equipment Condition

Refrigeration unit shut down (WP 0005)

References

WP 0005
TM 10-8145-222-23P

REPLACE**CAUTION**

A damaged air cleaner assembly can have serious adverse effects on the performance and life of the engine. The air cleaner assembly removes air contaminants and prevents them from entering the engine where they cause the greatest amount of damage. As the air filter collects the contaminants, they build up on the air filter and gradually reduce the effectiveness of the air filter.

NOTE

A step aid may be required to access equipment.

1. Open front panel assembly access cover (Figure 1, Item 1).
2. Unhook two clips (Figure 1, Item 2) securing air cleaner dust cap (Figure 1, Item 3) to air cleaner body (Figure 1, Item 4).
3. Remove air cleaner dust cap (Figure 1, Item 3).
4. Remove filter element (Figure 1, Item 5) from air cleaner body (Figure 1, Item 4) and dispose of IAW unit SOP.
5. Install new filter element (Figure 1, Item 5) into air cleaner body (Figure 1, Item 4).

NOTE

Moisture can build up in the air cleaner body. A drain tube is built into the dust cap that will evacuate the moisture from the air cleaner body. When installing the dust cap onto the air cleaner body, make sure that the moisture drain tube is pointed in the down position.

6. Install dust cap (Figure 1, Item 3) over air cleaner body (Figure 1, Item 4) and secure with two clips (Figure 1, Item 2).
7. Close and secure front panel access cover (Figure 1, Item 1).

REPLACE – CONTINUED

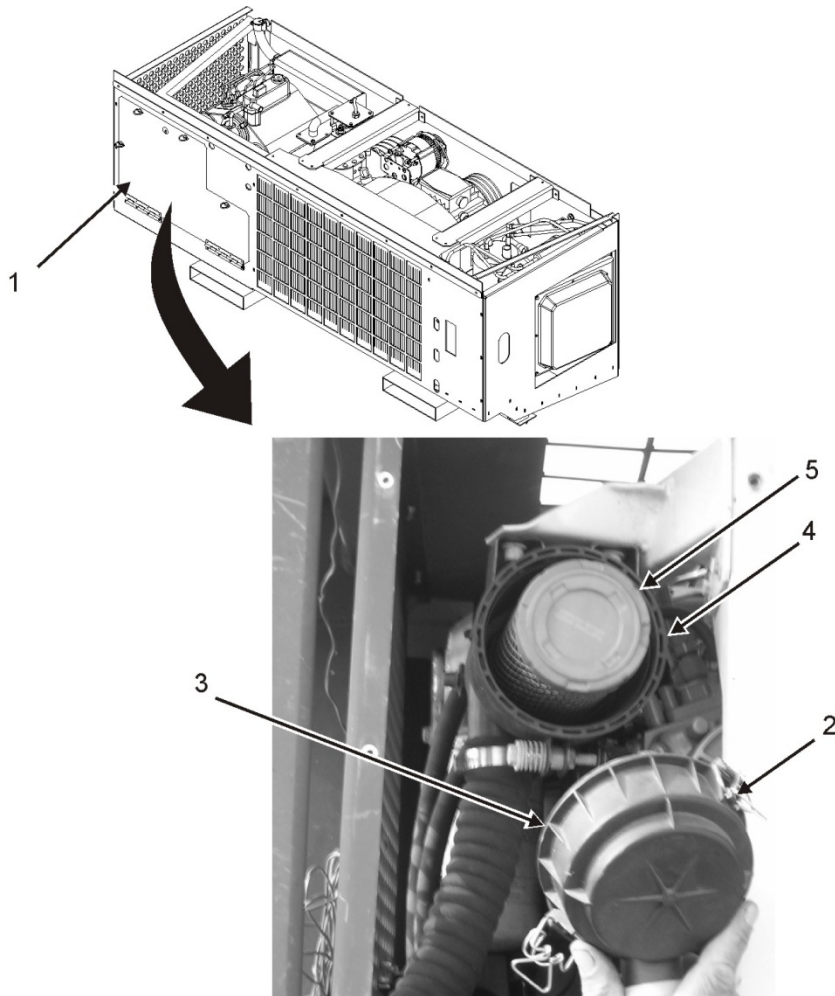


Figure 1. Replace Air Filter Element.

- 8. Place MTRCS back into desired mode of operation (WP 0005).

END OF TASK

END OF WORK PACKAGE

CREW MAINTENANCE
TEMPERATURE CHART RECORDER
ADJUST, SERVICE

INITIAL SETUP:**Materials/Parts**

Cartridge Pen, Green, R25-5 (WP 0110, Item 10)
Cartridge Pen, Red, R25-6 (WP 0110, Item 11)
Recording Instrument Chart (WP 0110, Item 13)
Recording Instrument Setup Charts CCW (WP 0110, Item 14)

Personnel Required

Automated Logistical Specialist (2), or
Food Service Specialist (2)

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

ADJUST**NOTE**

The temperature chart recorder provides a record of the insulated container compartment temperatures over time. Temperatures are recorded onto a rotating circular paper chart by two fiber tipped replaceable cartridge pens. The circular chart paper will need to be changed with each revolution of recording.

Adjust pen arm, if needed, as follows:

1. Open temperature chart recorder door (Figure 1, Item 1) by lifting handle up and pulling door open.

CAUTION

Do not allow the pen arm to snap back into place on the chart paper. Doing so will cause the fiber tip on the pen to flatten out and it will no longer supply a fine line.

NOTE

The objective of the pen to paper is to create a very fine line on the chart paper to record temperature. When bending the pen arm to adjust it, use only enough pressure to create a fine line mark on the chart paper.

2. If caps are installed on pens, remove caps and retain in chart paper box.
3. Gently lift metal pen arm at center and carefully bend stylus end of arm towards chart paper (Figure 2).
4. If pen does not mark chart paper after it has been adjusted or if line is very faint, replace cartridge pen as described in Change Cartridge Pen per this WP.
5. Close temperature chart recorder door (Figure 1, Item 1) and secure by lowering handle.

ADJUST – CONTINUED

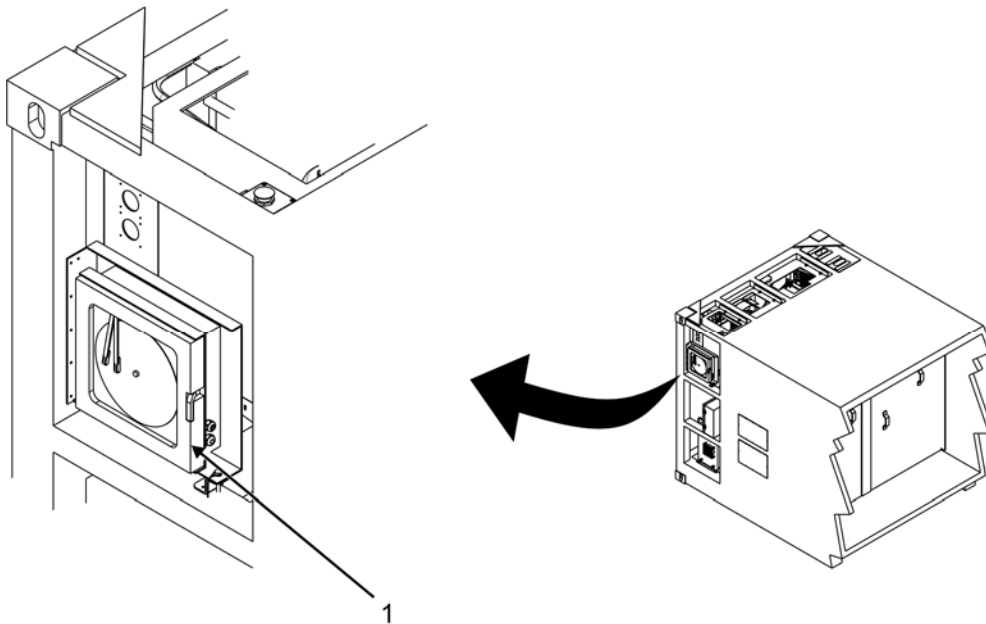


Figure 1. Temperature Chart Recorder.

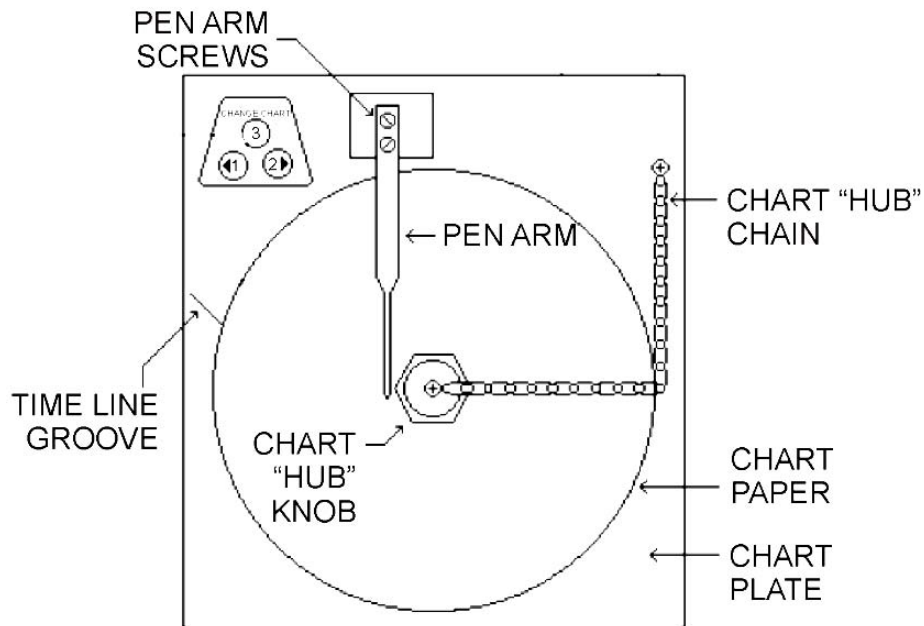


Figure 2. Temperature Chart Recorder Faceplate.

END OF TASK

SERVICE

Change Chart Paper

Change the chart paper for the temperature chart recorder as follows:

1. Open temperature chart recorder door (Figure 1, Item 1) by lifting handle up and pulling door open.
2. Press and release CHANGE CHART key (3) on temperature chart recorder keypad (Figure 3).
 - Both pens begin moving towards left outside area of chart.

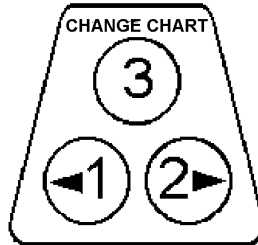


Figure 3. Temperature Chart Recorder Keypad.

3. When both pens have stopped above outer ring, unscrew chart hub knob counterclockwise from center of chart.
 - Green LED is on steady.
4. Remove old chart paper from center hub.
5. Install new chart paper over center hub.
6. Position chart paper so that correct time line coincides with time line groove on chart plate (Figure 2).
7. Reattach chart hub knob to center of chart and secure by turning in a clockwise direction until hand tight.
8. Press and release CHANGE CHART key (3) on temperature chart recorder keypad.
 - Both pens move to outer ring and then pause.
 - Red pen moves to 0° trigger set point.
 - Green pen moves to 35° trigger set point.
 - Both pens move to current recorder temperature value.
9. Make sure both pens are marking on chart paper.
 - Adjust pen arm if required in accordance with instructions in this WP.

NOTE

Each time the chart paper or fiber tip pen cartridge is changed, make sure that each pen stops at the current temperature of the chart paper. Otherwise, this pen offset can cause the unit to record an incorrect temperature on the chart.

10. Close temperature chart recorder door and secure by lowering handle.

SERVICE – CONTINUED**Change Cartridge Pen**

Change either cartridge pen as follows:

NOTE

Each time the fiber tip pen cartridge is changed, make sure that each pen stops at the current temperature of the chart paper. Otherwise, this pen offset can cause the unit to record an incorrect temperature on the chart.

1. Open temperature chart recorder door (Figure 4, Item 1) by lifting handle up and pulling door open.

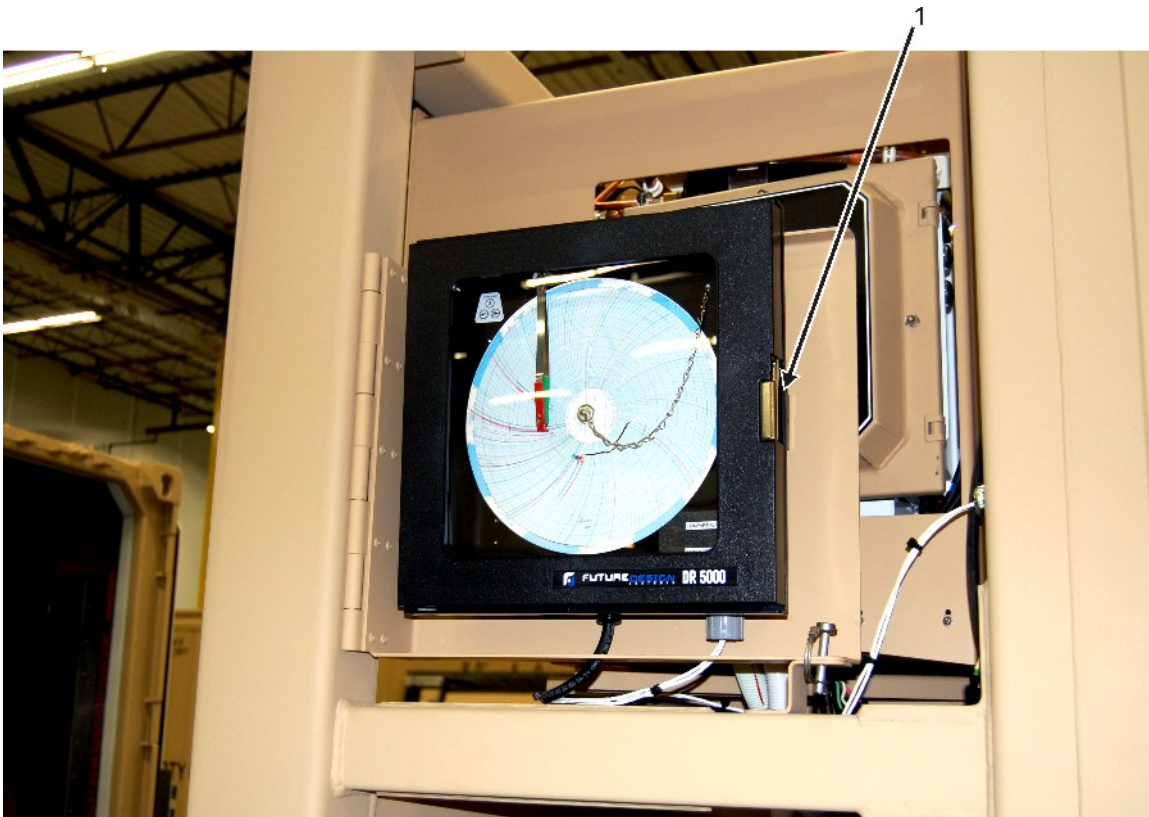


Figure 4. Temperature Chart Recorder Access.

SERVICE – CONTINUED**CAUTION**

The pen arm is a very thin strip of metal and can be easily damaged. When lifting the pen arm off of the chart paper, use care not to bend the pen arm.

- Carefully lift pen arm off paper enough to remove cartridge pen (Figure 5).

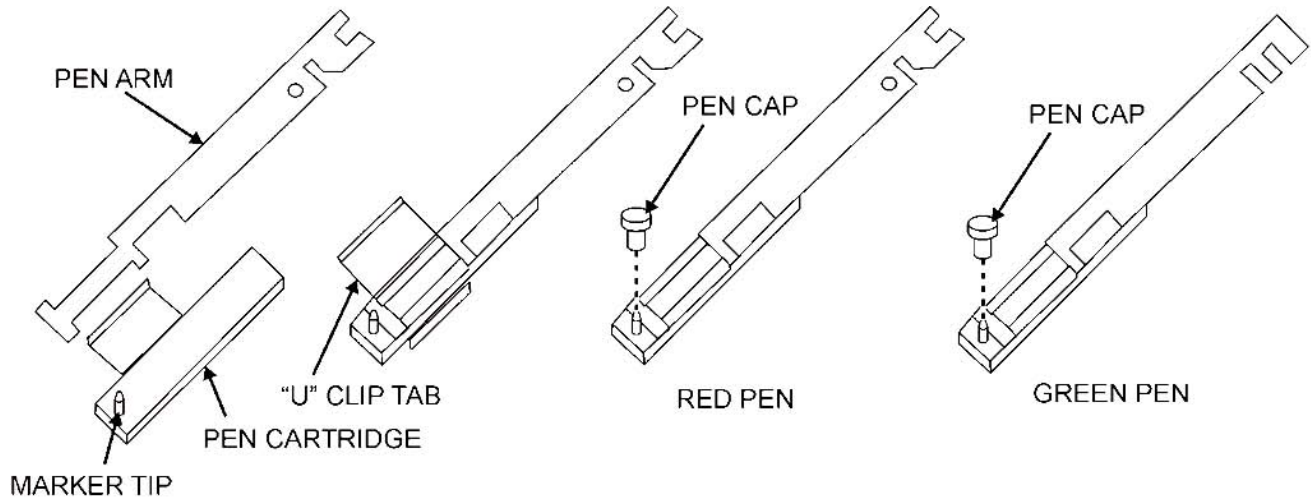


Figure 5. Changing Cartridge Pen.

- Release "U" clip tab and lift cartridge off of metal pen arm.
- Dispose of old cartridge pen.
- Position new cartridge pen onto metal pen arm.
- Wrap "U" clip tab around pen arm and snap into place.
- Remove protective pen cap.

CAUTION

Do not allow the pen arm to snap back into place on the chart paper. Doing so will cause the fiber tip on the pen to flatten out and it will no longer supply a fine line.

- Carefully let metal pen arm lay back on chart paper without snapping.

NOTE

Each time the fiber tip pen cartridge is changed, make sure that each pen stops at the inner and outer most temperature graduation of the chart paper. Otherwise, this pen offset can cause the unit to record an incorrect temperature on the chart.

- If pen does not touch the paper, adjust it as described in Adjust per this WP.

SERVICE – CONTINUED**Alarm Setting**

Alarm Setting is achieved by positioning the pen to the desired temperature settings on the recording chart during the alarm setting procedure described below. Alarm setting accuracy can be viewed during chart change, recorder setup, or during initial power up. Alarm setting for the temperature chart recorder can be achieved by the following steps:

NOTE

Alarm setting can be achieved by simultaneously pressing CHANGE CHART key (3) and powering on the system.

The alarm settings are preset from the temperature chart recorder manufacturer. The red pen corresponds to compartment 1 and the green pen corresponds to compartment 2.

Calibration and setting of alarms is done simultaneously. This is accomplished by first calibrating the chart through selecting and setting the inner and outer band limits. Immediately after calibration, the unit will proceed into the alarm setting function.

It is critical to perform the steps of this task consecutively and without delay. If during the calibration portion of the task, the pens do not respond to commands, the window available to make changes has passed. The unit will need to be shut down, and the procedure will have to be reattempted from the beginning.

When pressing the LEFT (1) key, the pen will move toward the outer portion of the chart. When pressing the RIGHT (2) key, the pen will move toward the inner portion of the chart.

1. On control panel (Figure 6, Item 1) place POWER ON/DOWN switch (Figure 6, Item 2) to ON position and wait 5 minutes.
2. Place POWER ON/DOWN switch (Figure 6, Item 2) to DOWN position and wait 15 seconds before continuing.

NOTE

Steps 3 through 8 provide instruction for calibrating the outer band.

3. Open temperature chart recorder door by lifting handle (Figure 7, Item 3) up and pulling door open.
4. Press and hold CHANGE CHART key (3) (Figure 7, Item 4).
5. While holding CHANGE CHART key (3), place POWER ON/DOWN switch (Figure 7, Item 2) to ON position.

SERVICE – CONTINUED

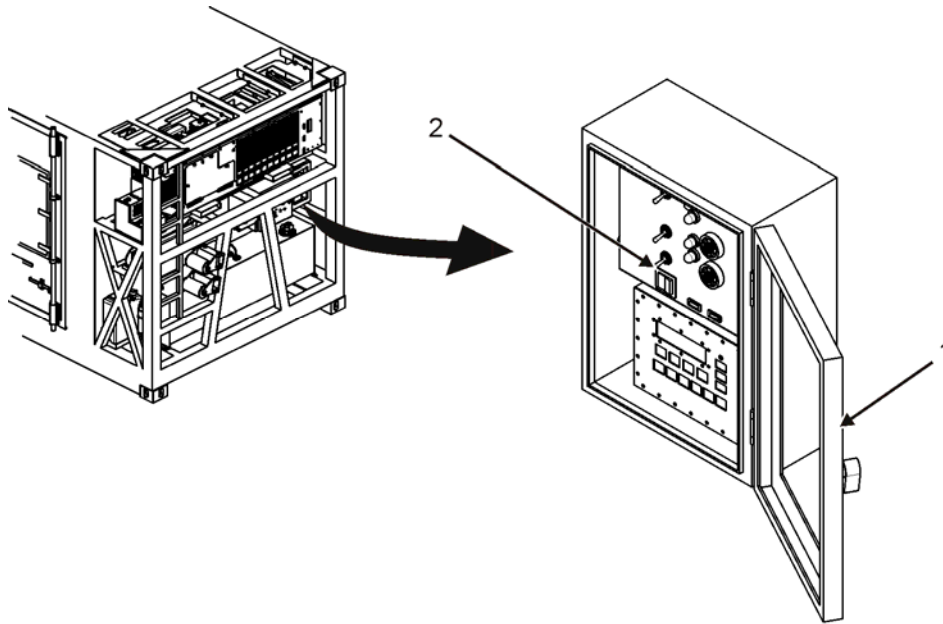


Figure 6. POWER ON/DOWN Switch.

6. Release CHANGE CHART key (3) after 5 seconds.
 - Green LED flashes quickly.
 - Red pen moves off scale into the deadband area of the chart and stops.
 - Green pen moves off scale into the deadband area of the chart and stops.
 - Green LED is on steady.
 - Red pen moves toward the outer ring (-10°F) and stops
 - Green pen moves toward the outer ring (-10°F) and stops.
 - Green pen will now move to the inner ring (90°F) and stop.
 - Green pen returns to the outer ring (-10°F) and stops.
 - Red pen will now move to the inner ring (90°F) and stop.
 - Red pen returns the outer ring (-10°F) and stops.
7. Red pen will now move to the alarm set point 0°F. Green LED turns off. Adjustment of the alarm set point is made using the LEFT (1) or RIGHT (2) keys. When the red pen stops at or near the 0°F alarm set point, you will have approximately 3 seconds in which to adjust the pen.
 - Green LED is on steady.
8. Green pen will now move to the alarm set point 35°F. Green LED turns off. Adjustment of the alarm set point is made using the LEFT (1) or RIGHT (2) keys. When the green pen stops at or near the 35°F alarm set point, you will have approximately 3 seconds in which to adjust the pen.
 - Green LED is on steady.
 - Red pen will now move to the actual chart recorder temperature for the red pen.
 - Green pen will now move to the actual chart recorder temperature for the green pen.

SERVICE – CONTINUED**Pen Calibration**

Pen calibration is achieved by positioning the pen to the outer ring (-10°F) and inner ring (90°F) on the recording chart during the calibration procedure described below. Pen setting accuracy to the outer ring (-10°F only) can be viewed during chart change, recorder setup or during initial power up. Pen calibration for the temperature chart recorder can be achieved by the following steps:

NOTE

Pen calibration can be achieved by simultaneously pressing CHANGE CHART key (3) and powering on the system.

The pen calibration settings are preset from the temperature chart recorder manufacturer. The red pen corresponds to compartment 1 and the green pen corresponds to compartment 2.

Calibration and setting of alarms is done simultaneously. This is accomplished by first calibrating the chart through selecting and setting the inner and outer band limits. Immediately after calibration, the unit will proceed into the alarm setting function.

It is critical to perform the steps of this task consecutively and without delay. If during the calibration portion of the task, the pens do not respond to commands, the window available to make changes has passed. The unit will need to be shut down, and the procedure will have to be reattempted from the beginning.

When pressing the LEFT (1) key, the pen will move toward the outer portion of the chart. When pressing the RIGHT (2) key, the pen will move toward the inner portion of the chart.

1. Place POWER ON/DOWN switch (Figure 6, Item 2) to ON position and wait 5 minutes.
2. Place POWER ON/DOWN switch (Figure 6, Item 2) to DOWN position and wait 15 seconds before continuing.
3. Open temperature chart recorder door by lifting handle (Figure 7, Item 3) up and pulling door open.
4. Press and hold CHANGE CHART key (3) (Figure 7, Item 4).
5. While holding CHANGE CHART key (3), place POWER ON/DOWN switch (Figure 7, Item 2) to ON position.
6. Release CHANGE CHART key (3) after 5 seconds.
 - Green LED flashes quickly.
 - Red pen moves off scale into the deadband area of the chart and stops.
 - Green pen moves off scale into the deadband area of the chart and stops.
 - Green LED is on steady.
 - Red pen moves toward the outer ring (-10°F) and stops. Adjustment of red pen to outer ring is made using the LEFT (1) or RIGHT (2) key. When the red pen stops at or near the -10°F ring, you will have approximately 3 seconds in which to adjust the pen.
 - Green pen moves toward the outer ring (-10°F) and stops. Adjustment of green pen to outer ring is made using the LEFT (1) or RIGHT (2) key. When the green pen stops at or near the -10°F ring, you will have approximately 3 seconds in which to adjust the pen.

SERVICE – CONTINUED



Figure 7. Pen Calibration.

NOTE

Steps 3 through 10 provide instruction for calibrating the outer band.

SERVICE – CONTINUED

7. Green pen will now move to the inner ring (90°F) and stop. If it does not stop on 90°F, press RIGHT (2) key if it stops below 90°F and press LEFT (1) key if it stops above 90°F. Once the pen stops above or below, there is a very short time span in which you can adjust the setting.
 - Green LED is on steady.
8. Green pen will now move to the outer ring (-10°F) and stop. If it does not stop on -10°F, press RIGHT (2) key if it stops below -10°F and press LEFT (1) key if it stops above -10°F. Once the pen stops above or below, there is a very short time span in which you can adjust the setting.
 - Green LED is on steady.
9. Red pen will now move to the inner ring (90°F) and stop. If it does not stop on 90°F, press RIGHT (2) key if it stops below 90°F and press LEFT (1) key if it stops above 90°F. Once the pen stops above or below, there is a very short time span in which you can adjust the setting.
 - Green LED is on steady.
10. Red pen will now move to the outer ring (-10°F) and stop. If it does not stop on -10°F, press RIGHT (2) key if it stops below -10°F and press LEFT (1) key if it stops above -10°F. Once the pen stops above or below, there is a very short time span in which you can adjust the setting.
 - Green LED is on steady.
 - Red pen will now move to alarm setpoint 0°F.
 - Green pen will now move to alarm setpoint 35°F.
 - Red pen will now move to the actual chart recorder temperature for the red pen.
 - Green pen will now move to the actual chart recorder temperature for the green pen.

END OF TASK**END OF WORK PACKAGE**

CHAPTER 5
SERVICE MAINTENANCE INSTRUCTIONS
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

SERVICE MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PMCS INTRODUCTION

INITIAL SETUP:

Personnel Required

Quartermaster and Chemical Equipment Repairer, or
 Utilities Equipment Repairer

References

WP 0025
 WP 0029
 SF 368
 DA PAM 738-750
 DA 2404

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

GENERAL

The table in WP 0029 has been provided so you can keep the MTRCS in good operating condition and ready for its primary mission.

Always observe the WARNINGS and CAUTIONS appearing in your PMCS table. WARNINGS and CAUTIONS appear before applicable procedures. You must observe these WARNINGS and CAUTIONS to prevent serious injury to yourself and others or to prevent the MTRCS from being damaged.

PMCS PROCEDURES TABLE

Item Number Column. Numbers in this column are for reference. When completing DA Form 2404, Equipment Inspection and Maintenance Worksheet, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

Interval Column. This column tells you when you must do the procedure in the Procedure column.

BEFORE (B) – Checks and services performed prior to the equipment leaving its containment area or performing its intended mission.

DURING (D) – Checks begins when the equipment is being used in its intended mission.

AFTER (A) – Checks and services begin when the equipment is taken out of its mission mode or returned to its containment area.

MONTHLY (M) – Checks and services to be performed on a monthly basis.

SEMIANNUALLY (S) – Checks and services to be performed on a semiannual basis.

Item To Be Checked Or Serviced Column. This column provides the item to be checked or serviced.

Procedure Column. This column gives the procedure you must do to check or service the item listed in the Item to be Checked or Serviced column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the INTERVAL column.

Equipment Not Ready/Available If Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If a fault occurs that is listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

CORROSION PREVENTION AND CONTROL (CPC)

CPC of Army material is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.

Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.

SF Form 368, Product Quality Deficiency Report, should be submitted to the address specified in DA PAM 738-750, Functional User Manual for the Army Maintenance Management System (TAMMS).

Oil Filter Statement. Oil filters shall be serviced/cleaned/changed as applicable when:

- They are known to be contaminated or clogged,
- Service is recommended by AOAP laboratory analysis, or
- At prescribed hard time intervals.

This MTRCS is not enrolled in the AOAP. HARDTIME INTERVALS APPLY.

Warranty Hardtime Statement. For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (such as longer-than-usual operating hours, extended idling periods, extreme dust).

FLUID LEAKAGE

It is necessary for you to know how fluid leakage affects the status of the MTRCS. Following are types/classes of leakage you need to know to be able to determine the status of the MTRCS. Learn these leakage definitions and remember – when in doubt, notify your supervisor. Equipment operation is allowed with minor leakage (Class I or II). Consideration must be given to fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.

When operating with Class I or II leaks, continue to check fluid levels as required in the PMCS.

Class III leaks should be reported immediately to your supervisor.

- (1) Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
- (2) Class II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
- (3) Class III Leakage of fluid great enough to form drops that fall from item being checked/inspected.

INSPECTION

As an operator of the MTRCS, you must remain constantly alert to signs of malfunction or approaching failure. Many troubles can be avoided by taking appropriate response to minimal maintenance needs in a timely manner.

Before, during, and after operation of the MTRCS, perform inspections to make sure all items are in good working condition. Maintain an awareness to make sure items are correctly assembled, stowed properly, and secure. Look for items that may be indicating excessive wear, leakage, corrosion, or improper lubrication. Correct any problems you find, or notify Service Maintenance so that the problem can be scheduled for maintenance and correction.

CLEANING AND LUBRICATION**CAUTION**

Follow all cleaning and lubricating instructions carefully. Failure to do so can result in damage to equipment.

1. Refer to WP 0025 for insulated container cleaning instructions.
2. Do not roll and store cargo nets when wet; allow nets to dry.

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE

**MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

INITIAL SETUP:

Tools and Special Tools

- Gloves, Welders (WP 0110, Item 23)
- Shield, Face (WP 0110, Item 20)
- Spill Kit (WP 0110, Item 49)
- Tester, Belt Tension (WP 0108, Table 2, Item 5)

References

- WP 0005 WP 0053
- WP 0019 WP 0054
- WP 0039 WP 0055
- WP 0042 WP 0070
- WP 0043 WP 0074
- WP 0044 WP 0093
- WP 0049 WP 0096
- WP 0052 WP 0102

Personnel Required

- Quartermaster and Chemical Equipment Repairer (2)
- Utilities Equipment Repairer (2)

Equipment Condition

- MTRCS stationary and on flat level surface (WP 0005)
- Refrigeration unit shut down (WP 0005)
- E-stop switch in PUSH TO STOP position (WP 0005)
- External electrical power disconnected (WP 0005)

PMCS

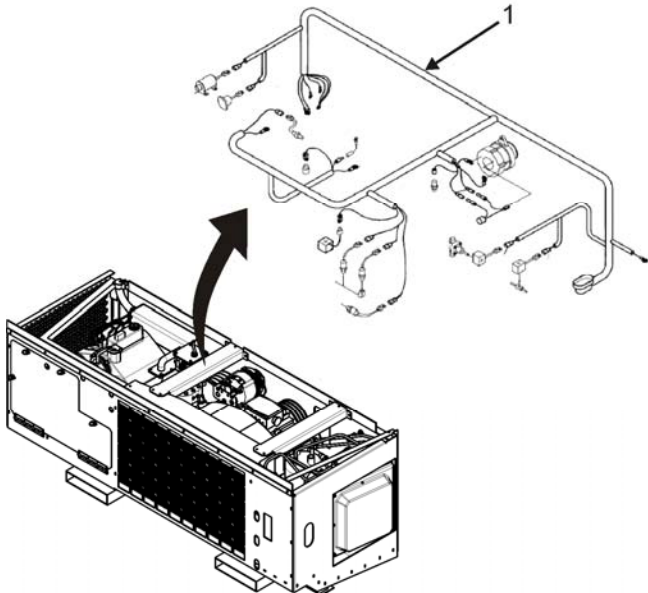
WARNING

Do not perform Service Maintenance Preventative Maintenance Checks and Services (PMCS) on the MTRCS while the MTRCS is mounted on a carrying vehicle. Failure to comply with this warning can result in serious injury or death to personnel.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

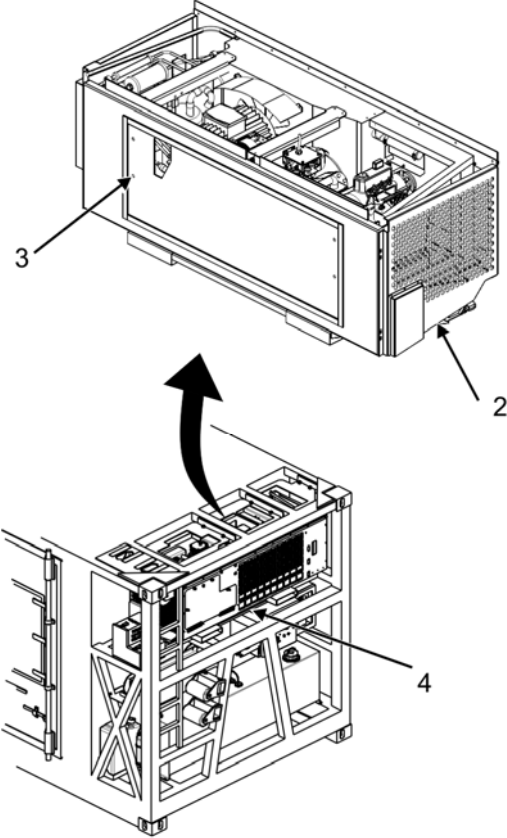
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS).

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
1	Weekly	Battery	Verify refrigeration unit battery is present and fully charged by performing voltage check (WP 0070, Service).	Battery not fully charged or missing.
2	400 Hours	Refrigeration Unit	<p>a. Perform all Operator PMCS Before checks (WP 0019).</p> <p style="text-align: center;">NOTE</p> <p>The engine wire harness is integrated through the refrigeration unit compartment and frame; and terminates at numerous components on the engine, compressor, alternator, standby motor, and single-phase alternator.</p> <p>b. Check engine wiring harness (1) exposed areas for signs of chafing, overheating, and loose terminals. If damage is found to harness, repair, and/or tighten as necessary.</p> 	<p>Before PMCS checks are not performed.</p> <p>Wiring harness shows signs of chafing or overheating; loose terminals.</p>

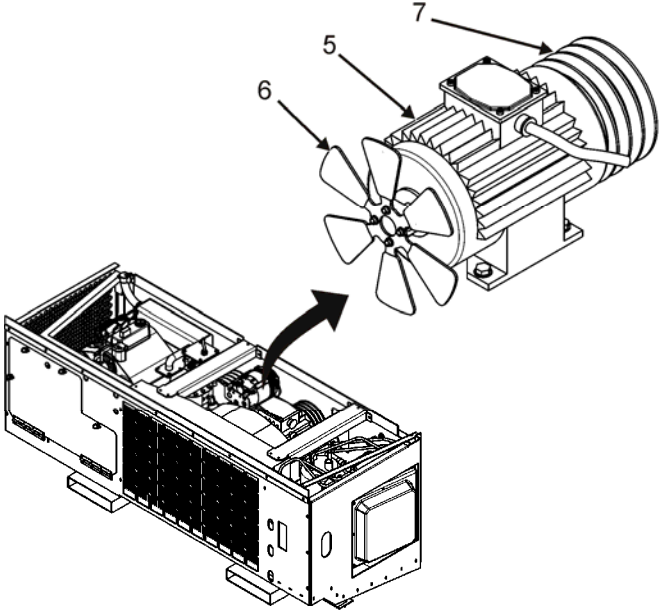
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
2	400 Hours	Refrigeration Unit (continued from previous page)	<p>c. Check refrigeration unit (2) mount bolts (3, 4) for loose or missing hardware. Tighten or replace hardware as required.</p> 	Mounting bolts loose; hardware missing.

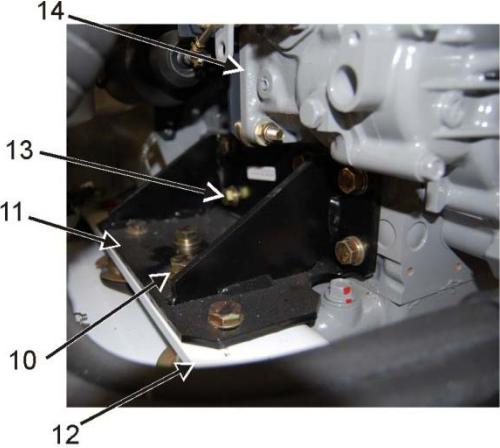
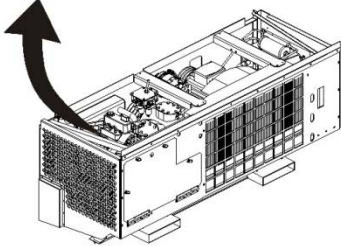
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
2	400 Hours	Refrigeration Unit (continued from previous page)	<p>d. Check standby motor (5) bearings for pulley and fan movement. If pulley (7) or fan (6) shows signs of wobbling, notify next level of maintenance to remove and replace standby motor (WP 0093, Replace).</p>  <p>e. Change diesel engine oil, oil filter (WP 0042, Service), and fuel filter (WP 0043, Replace).</p> <p>f. Clean fuel pump filter (WP 0049, Service).</p>	<p>Pulley or fan shows signs of wobbling.</p> <p>Oil, oil filter, and fuel filter not changed at required interval.</p> <p>Fuel pump filter not cleaned at required interval.</p>

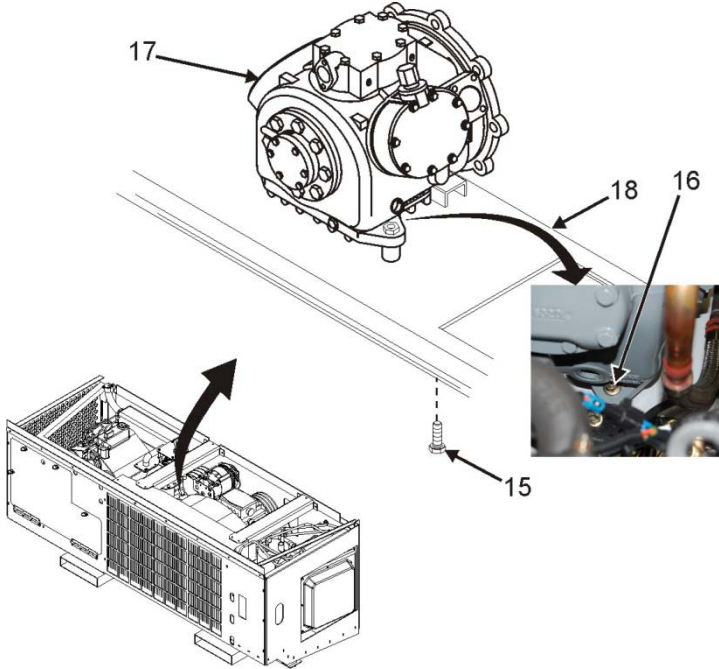
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
3	1500 Hours	MTRCS Mounting Bolts	<p>a. Perform 400-hour PMCS.</p> <p>b. Re-torque engine, compressor, and refrigeration unit mounting bolts.</p> <p>1. Re-torque ten mount bracket bolts (10) securing engine mount bracket (11) to refrigeration unit frame (12) to 50 foot-pounds (WP 0102).</p>   <p>2. Re-torque 16 mount bracket bolts (13) securing engine mount bracket (11) to engine (14) to 40 foot-pounds (WP 0102).</p>	<p>400-hour interval maintenance not performed.</p> <p>Proper torque not applied to each mount bolt.</p> <p>Proper torque not applied to each mount bolt.</p>

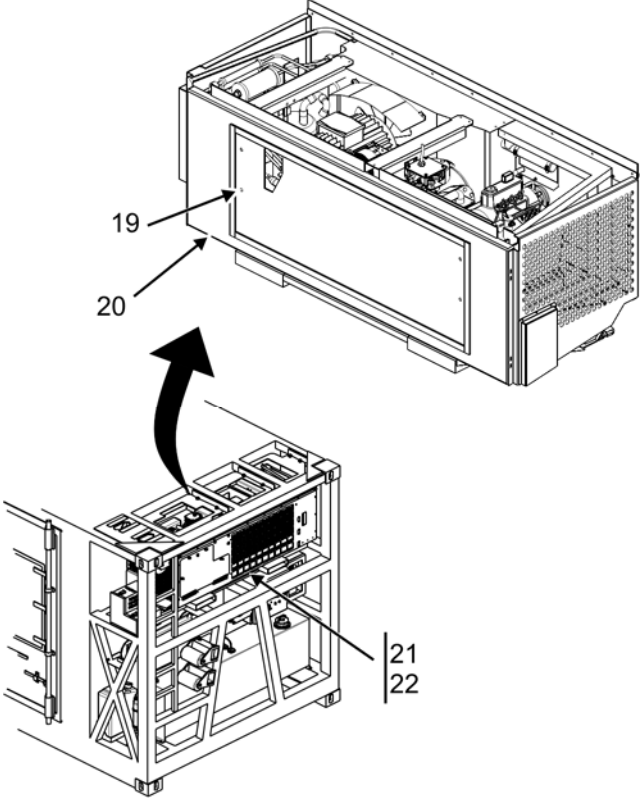
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
3	1500 Hours	Mounting Bolts (continued from previous page)	<p>3. Re-torque two aft compressor mount bolts (15) and two forward compressor mount bolts (16) securing compressor (17) to refrigeration unit frame (18) to 40 foot-pounds (WP 0102).</p> 	Proper torque not applied to each mount bolt.

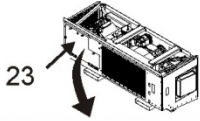
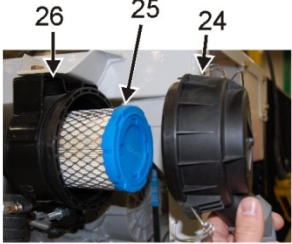
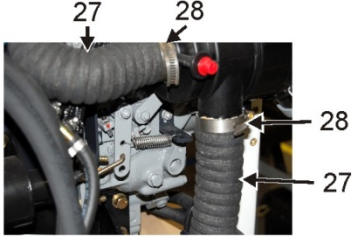
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
3	1500 Hours	Mounting Bolts (continued from previous page)	<p>4. Re-torque four refrigeration unit mount bolts (19) securing refrigeration unit (20) to container wall to 80 foot-pounds (WP 0102).</p> <p>5. Re-torque three refrigeration unit mount bolts (21) securing refrigeration unit (20) to support angle (22) to 36 foot-pounds (WP 0102).</p> 	<p>Proper torque not applied to each mount bolt.</p> <p>Proper torque not applied to each mount bolt.</p>

PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
4	1500 Hours	Air Cleaner	<p>a. Open refrigeration unit front panel access cover (23).</p> <ol style="list-style-type: none"> 1. Remove air cleaner cap (24). 2. Remove filter element (25). 3. Clean air cleaner housing (26). 4. Check hoses (27) and hose connections (28) for damage or loose connection. Repair damage or tighten as required. 5. Install new filter element (25). 6. Install air cleaner cap (24). <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>23</p> </div> <div style="text-align: center;">  <p>26 25 24</p> </div> <div style="text-align: center;">  <p>27 28</p> </div> </div>	<p>Air cleaner housing dirty.</p> <p>Hoses damaged or clogged; hose connections loose.</p> <p>Filter element not installed.</p> <p>Air cleaner cap not installed.</p>

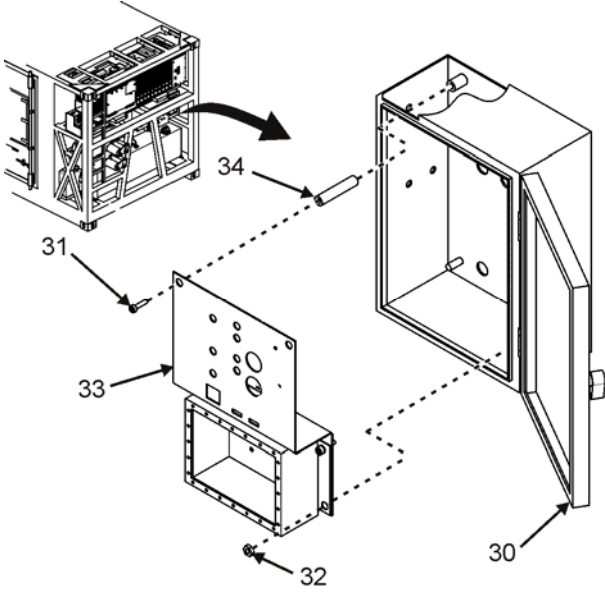
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
5	1500 Hours	Water Pump	<p>a. Check water pump (29) bearing shaft for movement. If shaft movement is excessive, replace water pump (WP 0044, Repair).</p> <p>b. Close front panel assembly access cover (23).</p> <div style="text-align: center;"> </div>	<p>Shaft movement has excessive wobbling or binds.</p> <p>Access cover not closed.</p>

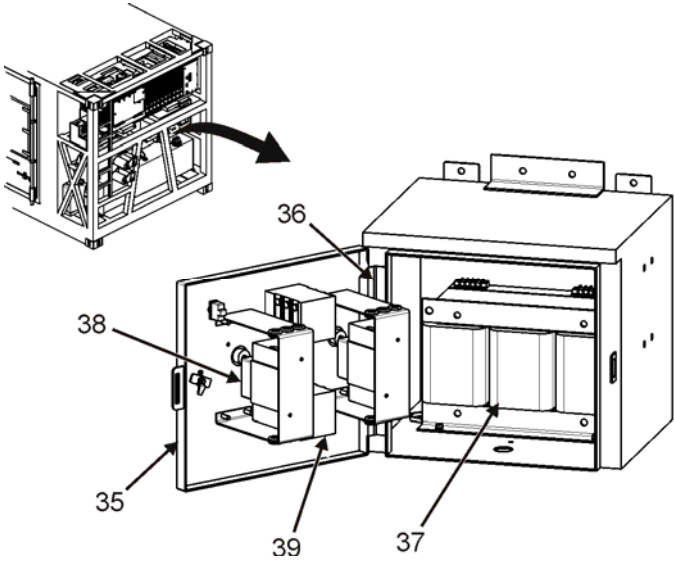
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
6	1500 Hours	Control Box Control Panel	<p>a. Disconnect battery (WP 0070, Disconnect).</p> <p>b. Open and secure control box door (30).</p> <p>c. Remove two screws (31) and two nuts (32) securing control panel (33).</p> <p>d. Carefully pull control panel (33) and two standoffs (34) out and away from control panel assembly to access wiring for inspection.</p> <p>e. Check electrical connections for looseness and tighten as needed.</p> <p>f. Check electrical connections for discoloration indicating possible hidden corrosion. If found, tag and disconnect wiring; clean and reconnect as tagged.</p> <p>g. Check electrical connections and wiring for signs of overheating or arcing. Repair wiring as needed.</p> <p>h. Reinstall two standoffs (34) and control panel (33) and secure using two screws (31) and two nuts (32).</p> <p>i. Close and secure control box door (30).</p> 	<p>Electrical connections loose.</p> <p>Discoloration or corrosion found.</p> <p>Signs of overheating or arcing found.</p> <p>Control panel not installed.</p> <p>Control box door not closed.</p>

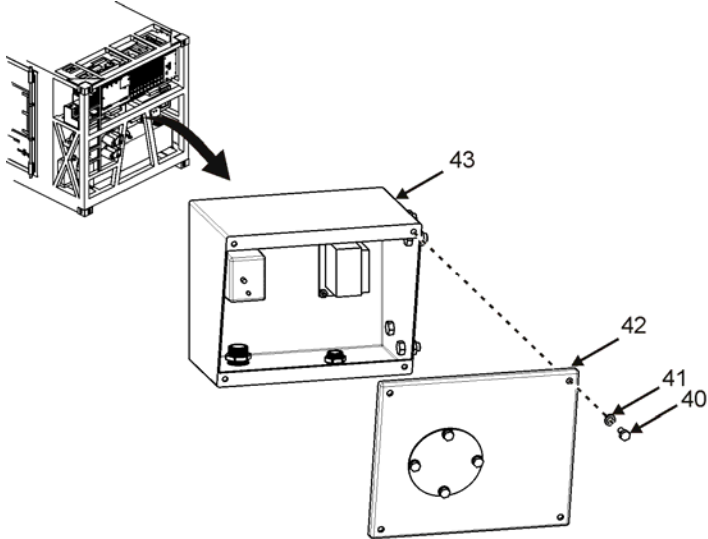
PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
7	1500 Hours	Power Box	<p>a. Open and secure power box door (35).</p> <p>b. Apply a small amount of lubricating oil to door hinges (36).</p> <p>c. Check electrical connections for looseness and tighten as needed.</p> <p>d. Check electrical connections for discoloration indicating possible hidden corrosion. If found, tag and disconnect wiring; clean and reconnect as tagged.</p> <p>e. Check electrical connections and wiring for signs of overheating or arcing. Repair wiring as needed.</p> <p>f. Check transformer (37), circuit breakers (38), and switches (39) for signs of overheating. If evidence of overheating exists, replace component (WP 0096, Repair).</p> <p>g. Close and secure power box door (35).</p> 	<p>Electrical connections loose.</p> <p>Discoloration or corrosion found.</p> <p>Signs of overheating or arcing found.</p> <p>Signs of overheating or arcing found.</p> <p>Control box door not closed.</p>

PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
8	1500 Hours	Electrical Box	<p>a. Remove four screws (40) and washers (41) securing electrical box cover (42) to electrical box (43), and remove cover (42).</p> <p>b. Check electrical connections for looseness and tighten as needed.</p> <p>c. Check electrical connections for discoloration indicating possible hidden corrosion. If found, tag and disconnect wiring; clean and reconnect as tagged.</p> <p>d. Check electrical connections and wiring for signs of overheating or arcing. Repair wiring as needed.</p> <p>e. Install cover (42) on electrical box (43) and secure using four screws (40) and washers (41).</p> <p>f. Reconnect battery (WP 0070, Reconnect).</p> 	<p>Electrical connections loose.</p> <p>Discoloration or corrosion found.</p> <p>Signs of overheating or arcing found.</p> <p>Control box door not closed.</p> <p>Control box door not closed.</p>

PMCS – CONTINUED

Table 1. Service Maintenance Preventative Maintenance Checks and Services (PMCS) – Continued.

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Equipment Not Ready/ Available If
9	1500 Hours	Evaporator	Clean compartment 1 and compartment 2 evaporator coils by removing any debris from coils and rinsing with low pressure water.	Evaporator coils not cleaned.
10	1500 Hours	Condenser	Clean condenser coil (WP 0039, Service).	Condenser coil not cleaned.
11	1500 Hours	Fuel Filter	Replace fuel pump filter element (WP 0049, Service).	Fuel pump filter element not replaced.
12	1500 Hours	Fuel Tank Strainer	Replace fuel tank filler flange/strainer (WP 0074, Repair).	Fuel tank strainer not replaced.
13	3000 Hours	Belts	Replace V-belts. <ul style="list-style-type: none"> a. Standby Motor to Single-Phase Alternator V-belt (WP 0052, Replace). b. Standby Motor to Compressor V-belt (WP 0053, Replace). c. Engine to Compressor V-belt (WP 0054, Replace). d. Water Pump V-belt (WP 0055, Replace). 	All V-belts not replaced.
14	6000 hours	Cooling System	Drain and flush cooling system (WP 0044, Service).	Cooling system not drained and flushed.

END OF WORK PACKAGE

SERVICE MAINTENANCE
FUEL TANK
SERVICE

INITIAL SETUP:**Tools and Special Tools**

Brush (WP 0110, Item 7)
Funnel (WP 0109)
Glasses, Safety (WP 0110, Item 39)
Gloves, Chemical and Oil Protective
(WP 0110, Item 21)
Pail, Utility (Metal) (WP 0110, Item 34)
Shield, Face (WP 0110, Item 20)

Personnel Required

Quartermaster and Chemical Equipment Repairer, or
Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power disconnected (WP 0005)

Materials/Parts

Detergent, General Purpose (WP 0110, Item 18)
Fuel, JP-8 (WP 0110, Item 54)
Towel, Machinery Wiping (WP 0110, Item 52)

SERVICE**Drain****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

1. Remove fuel tank filler cap (Figure 1, Item 1).
2. Position drain pail under fuel tank drain hose (Figure 1, Item 3).
3. Open two drain cocks (Figure 1, Item 2) and drain fuel into drain pail.
4. When drain pail approaches full, close two drain cocks (Figure 1, Item 2).
5. Transfer fuel from drain pail into suitable storage container.
6. Repeat steps 2 through 5 as necessary until fuel tank is empty.
7. Close fuel tank drain cocks (Figure 1, Item 2).
8. Install fuel tank filler cap (Figure 1, Item 1).

SERVICE – CONTINUED

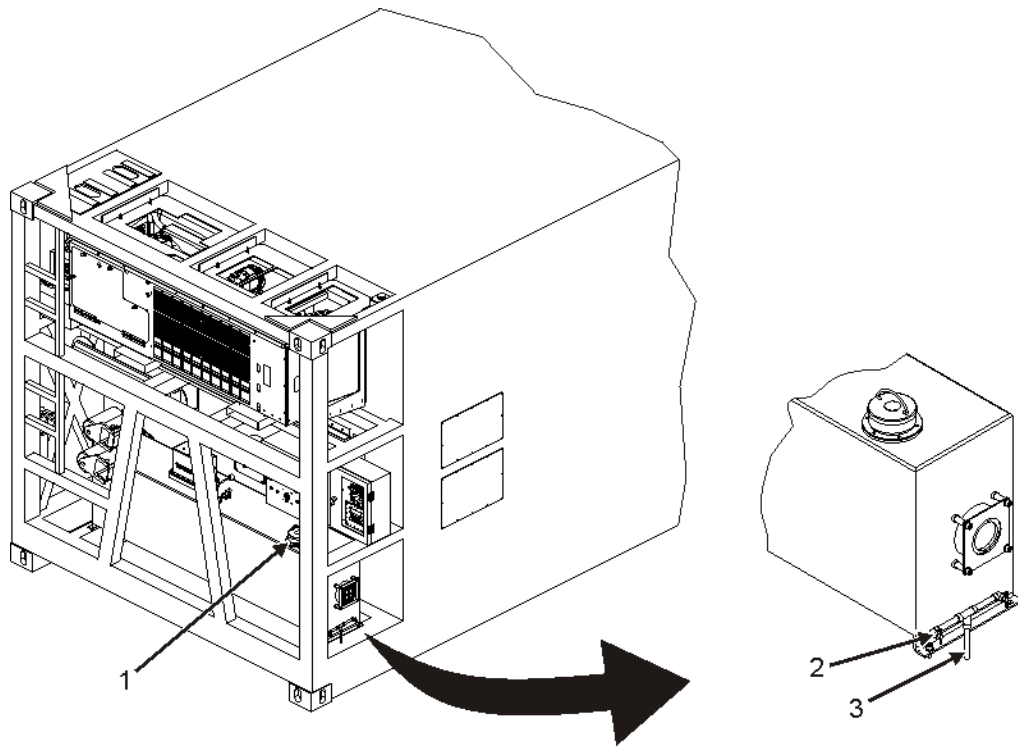


Figure 1. Fuel Drain Cock.

SERVICE – CONTINUED**Fuel****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

1. Remove fuel tank filler cap (Figure 1, Item 1).

CAUTION

The refrigeration unit can operate using JP-8 or diesel fuel only. Do not use any other fuel type. Do not use gasoline. Use of an unapproved fuel type will result in damage to the refrigeration unit.

2. Using funnel, if needed, fill fuel tank with JP-8 or diesel fuel until fuel gauge indicates full.
3. Install fuel tank filler cap (Figure 1, Item 1).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
ACCESS PANELS
REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit
(WP 0107, Table 2, Item 5)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Lock Washer (WP 0111, Item 10)

Personnel Required

Quartermaster and Chemical Equipment Repairer (2), or
Utilities Equipment Repairer (2)

Equipment Condition

Refrigeration unit shut down (WP 0005)

REPLACE**WARNING**

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

Remove Top-Left Panel

1. Access top of MTRCS using roof access provided.
2. Rotate four quarter-turn fasteners (Figure 1, Item 1) securing top-left panel (Figure 1, Item 2) counterclockwise 1/4-turn until loose.
3. Remove top-left panel (Figure 1, Item 2) from MTRCS.

Remove Top-Middle Panel

1. Access top of MTRCS using roof access provided.
2. Rotate four quarter-turn fasteners (Figure 1, Item 3) securing top-middle panel (Figure 1, Item 4) counterclockwise 1/4-turn until loose.
3. Remove top-middle panel (Figure 1, Item 4) from MTRCS.

Remove Top-Right Panel

1. Access top of MTRCS using roof access provided.
2. Rotate four quarter-turn fasteners (Figure 1, Item 5) securing top-right panel (Figure 1, Item 6) counterclockwise 1/4-turn until loose.
3. Remove top-right panel (Figure 1, Item 6) from MTRCS.

REPLACE – CONTINUED

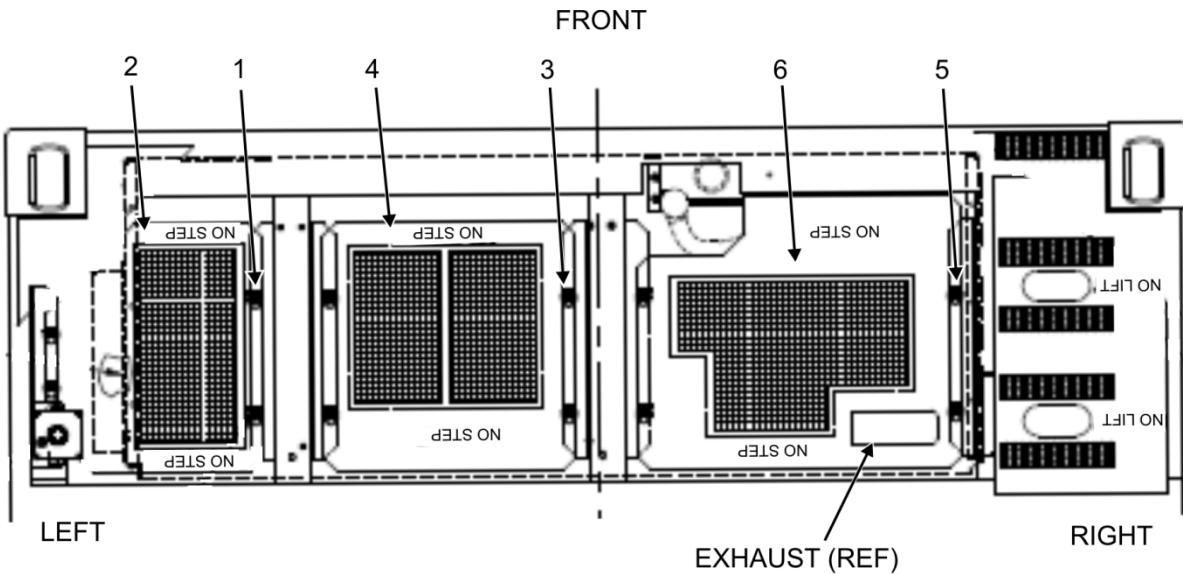


Figure 1. Top Panels Looking Down.

- Exit top of MTRCS using roof access provided.

Remove Front Panel Assembly

NOTE

There are nine screws securing the metal strip and seal to the top of the front panel assembly. These nine screws do not need to be removed to remove the front panel assembly. The seal and metal strip will come off with the front panel assembly when removed.

- Remove six screws (Figure 2, Item 1), lock washers (Figure 2, Item 2), and washers (Figure 2, Item 3) from right side and left side of front panel assembly (Figure 2, Item 6). Discard lock washers.
- Remove three screws (Figure 2, Item 1), lock washers (Figure 2, Item 2), and washers (Figure 2, Item 3) from bottom left corner of front panel assembly (Figure 2, Item 6). Discard lock washers.
- Remove five cap screws (Figure 2, Item 4) and washers (Figure 2, Item 5) securing front panel assembly (Figure 2, Item 6).

WARNING

The front panel assembly is awkward to handle and is bulky. Use two persons when removing the front panel assembly.

- Remove front panel assembly (Figure 2, Item 6).

REPLACE – CONTINUED

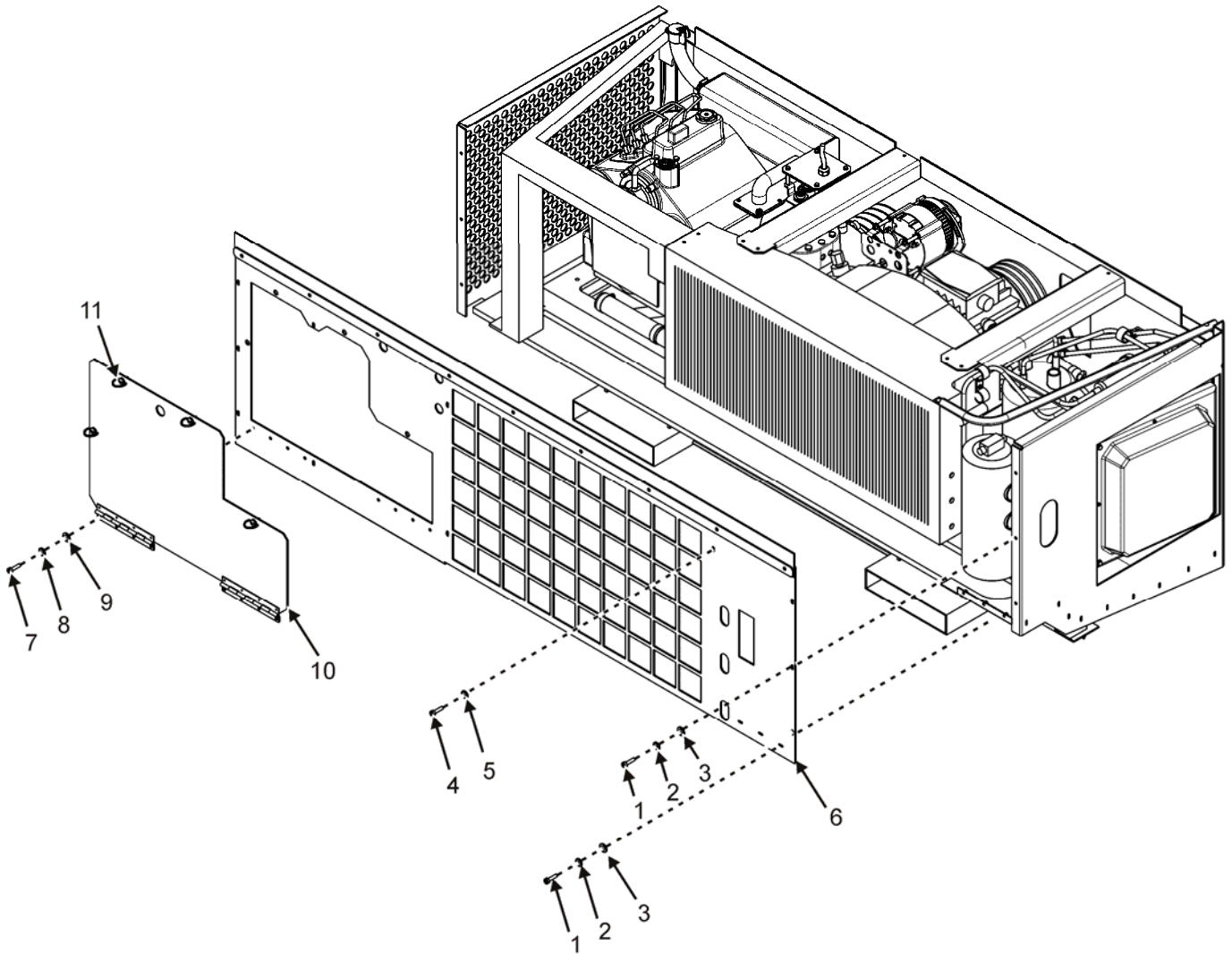


Figure 2. Front Panel Assembly.

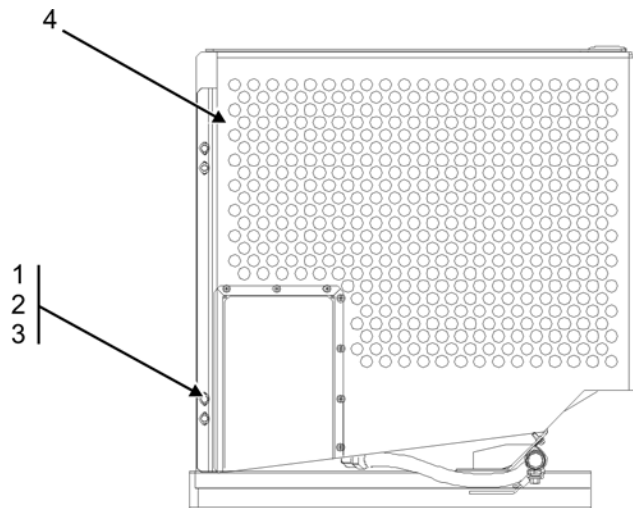
Remove Front Panel Access Cover Assembly

Perform the following steps to remove the hinged front panel cover assembly.

1. Remove eight screws (Figure 2, Item 7), lock washers (Figure 2, Item 8), and flat washers (Figure 2, Item 9). Discard lock washers.
2. Rotate four quarter-turn fasteners (Figure 2, Item 11) securing front panel cover assembly (Figure 2, Item 10) 1/4-turn counterclockwise until loose.
3. Lower front panel cover assembly (Figure 2, Item 10).

REPLACE – CONTINUED**Remove Right-Side Panel**

1. Remove front panel assembly per this WP.
2. Remove four hex head screws (Figure 3, Item 1), lock washers (Figure 3, Item 2), and washers (Figure 3, Item 3) securing rear flange of right-side panel (Figure 3, Item 4) to frame. Discard lock washers.
3. Remove right-side panel (Figure 3, Item 4).

**Figure 3. Right-Side Panel.****Remove Left-Side Panel****NOTE**

It will be easier to access hardware by swinging open the temperature chart recorder.

1. Remove three screws (Figure 4, Item 1), lock washers (Figure 4, Item 2), and washers (Figure 4, Item 3) securing left-side panel (Figure 4, Item 7) to front panel assembly and frame. Discard lock washers.
2. Remove eight screws (Figure 4, Item 4), lock washers (Figure 4, Item 5), and washers (Figure 4, Item 6) securing left-side panel (Figure 4, Item 7) to frame. Discard lock washers.
3. Remove two hex head screws (Figure 4, Item 8), lock washers (Figure 4, Item 9), and washers (Figure 4, Item 10) securing left-side panel (Figure 4, Item 7) to frame. Discard lock washers.
4. Remove left-side panel (Figure 4, Item 7).

REPLACE – CONTINUED

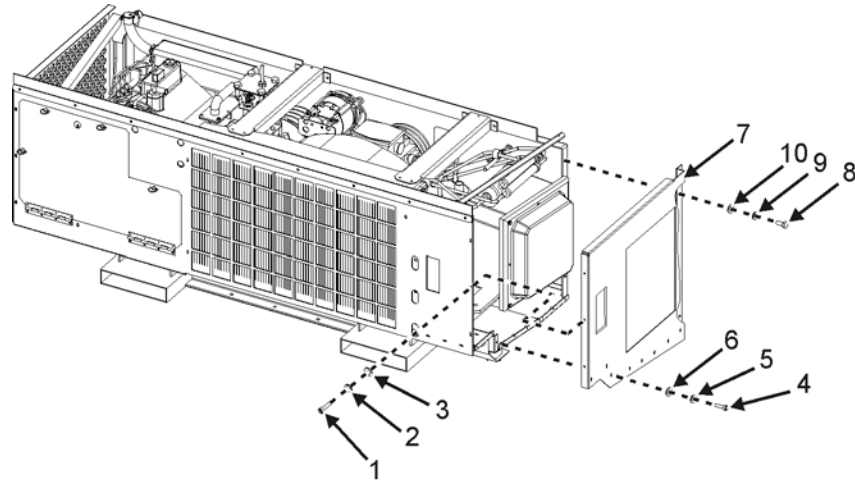


Figure 4. Left-Side Panel.

Install Top-Left Panel

1. Place top-left panel (Figure 1, Item 2) on top of MTRCS.
2. Rotate four quarter-turn fasteners (Figure 1, Item 1) clockwise 1/4-turn until tight to secure top-left side panel (Figure 1, Item 2) to top of MTRCS.

Install Top-Middle Panel

1. Place top-middle panel (Figure 1, Item 4) on top of MTRCS.
2. Rotate four quarter-turn fasteners (Figure 1, Item 3) clockwise 1/4-turn until tight to secure top-middle panel (Figure 1, Item 4) to top of MTRCS.

Install Top-Right Panel

1. Place top-right panel (Figure 1, Item 6) on top of MTRCS.
2. Rotate four quarter-turn fasteners (Figure 1, Item 5) clockwise 1/4-turn until tight to secure top-right panel (Figure 1, Item 6) to top of MTRCS.

REPLACE – CONTINUED**Install Right-Side Panel**

1. Hold right-side panel (Figure 3, Item 4) in place.

NOTE

Three screws securing front flange of right-side panel are installed when the front panel assembly is installed.

2. Install four hex head screws (Figure 3, Item 1), new lock washers (Figure 3, Item 2), and washers (Figure 3, Item 3) to secure rear flange of right-side panel (Figure 3, Item 4) to frame.
3. Install front panel assembly per this WP.

Install Left-Side Panel

1. Install left-side panel (Figure 4, Item 7) to frame and secure using two hex head screws (Figure 4, Item 8), new lock washers (Figure 4, Item 9), and washers (Figure 4, Item 10).
2. Install eight screws (Figure 4, Item 4), lock washers (Figure 4, Item 5), and washers (Figure 4, Item 6) to secure left-side panel (Figure 4, Item 7) to frame.
3. Install three screws (Figure 4, Item 1), lock washers (Figure 4, Item 2), and washers (Figure 4, Item 3) to secure left-side panel (Figure 4, Item 7) to front panel assembly and frame.

Install Front Panel Assembly**WARNING**

The front panel assembly is awkward to handle and is bulky. Use two persons when installing the front panel assembly.

1. Lift and hold front panel assembly (Figure 2, Item 6) in place on frame.
2. Install five cap screws (Figure 2, Item 4) and washers (Figure 2, Item 5) to secure front panel assembly (Figure 2, Item 6) to frame.
3. Install three screws (Figure 2, Item 1), lock washers (Figure 2, Item 2), and washers (Figure 2, Item 3) to secure bottom left corner of front panel assembly (Figure 2, Item 6) to frame.

REPLACE – CONTINUED**NOTE**

Three screws are installed on each side of the front panel assembly and secure the front panel assembly and left and right panel front flanges to the frame.

4. Install six screws (Figure 2, Item 1), new lock washers (Figure 2, Item 2), and washers (Figure 2, Item 3) to secure right side and left side of front panel assembly (Figure 2, Item 6) to frame.

Install Front Panel Cover Assembly

1. Place front panel cover assembly (Figure 2, Item 10) on front panel cover assembly (Figure 2, Item 6).
2. Install eight screws (Figure 2, Item 7), new lock washers (Figure 2, Item 8), and flat washers (Figure 2, Item 9).

WARNING

Be sure to maintain control of front panel cover assembly when opening or closing cover. Failure to maintain control of cover could result in serious injury or death of personnel.

3. Hold front panel cover assembly in place while rotating four quarter-turn fasteners (Figure 2, Item 11) 1/4-turn clockwise.

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
REFRIGERATION UNIT
SERVICE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

R 404a Refrigerant (WP 0110, Item 32)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Top-left panel removed (WP 0031)
 Top-middle panel removed (WP 0031)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
 WP 0031
 WP 0036
 WP 0064
 WP 0065
 WP 0077
 WP 0093
 WP 0094

SERVICE**WARNING**

Sudden and irreversible tissue damage can result from freezing. Wear gloves and face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Compressor lubricating oil used in this equipment is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

Dangerous chemical refrigerant under pressure is used in this equipment. Use great care to avoid contact with liquid refrigerant. Work in a well ventilated area. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.

NOTE

Refrigeration system repairs must be performed by a technician certified to perform such duties in accordance with EPA restrictions. Performing repairs without proper certification may be a violation of public law and subject to severe penalties.

SERVICE – CONTINUED**Pump Refrigeration Unit Down**

Pumping the unit down can be accomplished to perform maintenance on the filter-drier (WP 0036), thermostatic expansion valve (WP 0094), liquid line solenoid valve (WP 0064), CPR valve (WP 0077), or evaporator coil (WP 0093). The majority of the refrigerant is pumped into the condenser coil and receiver as follows:

NOTE

The suction valve has a larger tube that connects to the accumulator and the discharge valve has a smaller tube that connects to the condenser coil.

1. Close off service valves by turning compressor suction (Figure 1, Item 1) and discharge (Figure 1, Item 2) service valves counterclockwise to backseat (open) them.
2. Attach manifold gauges (Figure 1, Item 3) to compressor suction (Figure 1, Item 1) and discharge (Figure 1, Item 2) service valves.
3. Open (backseat) suction (Figure 1, Item 1) and discharge (Figure 1, Item 2) service valves two turns in clockwise direction.
4. Purge gauge line by unscrewing the line from bottom of manifold gauges (Figure 1, Item 3).

SERVICE – CONTINUED

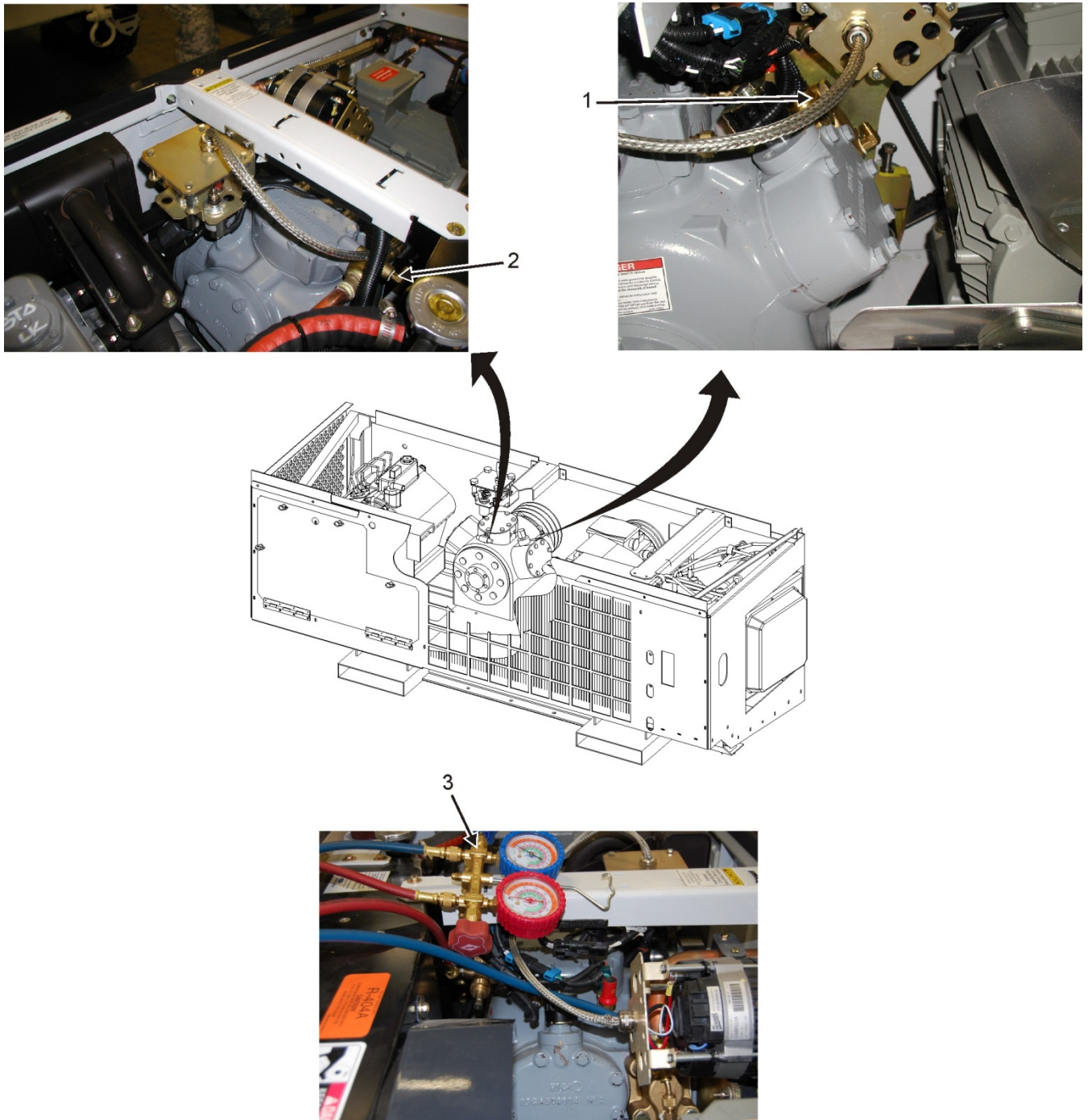


Figure 1. Suction and Discharge Service Valves.

SERVICE – CONTINUED

5. Close (frontseat) receiver outlet valve (Figure 2, Item 1) by turning clockwise.

WARNING

The MTRCS contains parts that rotate and vibrate. Keep hands, feet, clothing, and any loose personal items clear of the equipment while it is operating.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

6. Start refrigeration unit (WP 0005, Operating Procedures).
7. Run refrigeration unit in high speed cooling mode until unit reaches 1 psig suction pressure; then shut down unit using emergency stop switch. Refer to Conversion Table 1 in WP 0094.

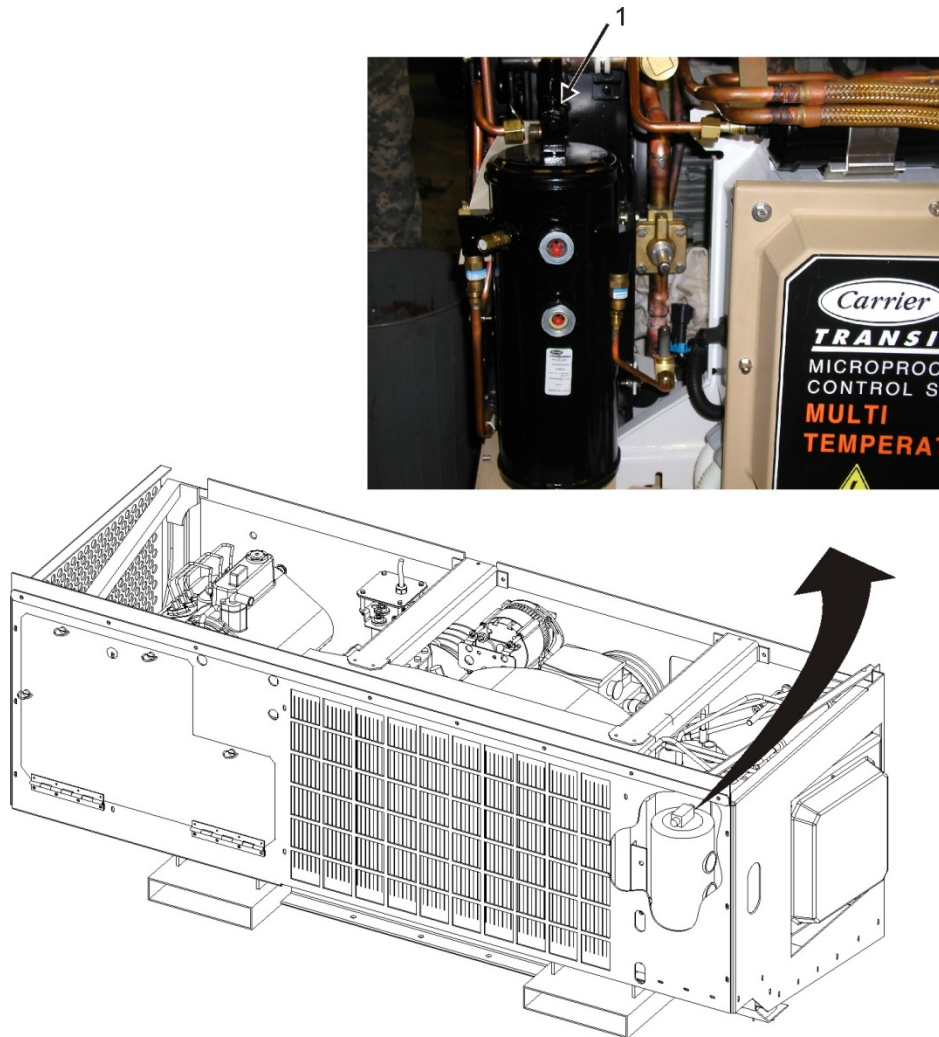
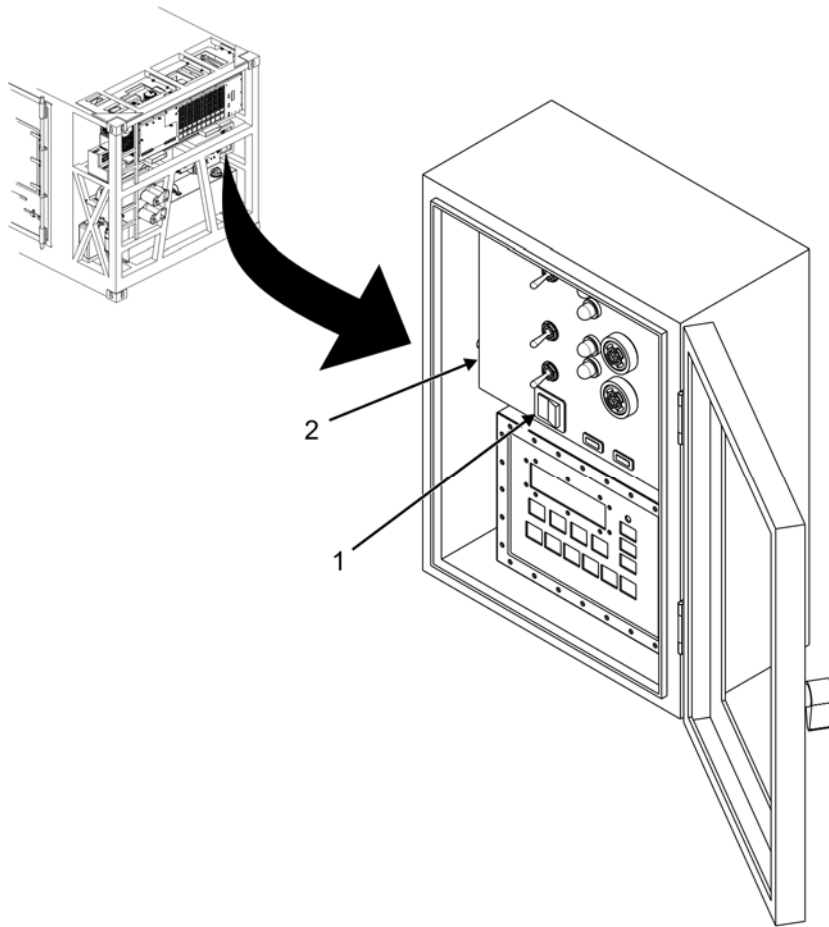


Figure 2. Receiver Outlet Valve.

SERVICE – CONTINUED

8. Place POWER DOWN/ON switch (Figure 3, Item 1) on control panel (Figure 3, Item 2) to DOWN position.

**Figure 3. Control Panel.**

9. Backseat suction (Figure 1, Item 1) and discharge (Figure 1, Item 2) service valves by turning counterclockwise.
10. Remove manifold gauges from compressor suction (Figure 1, Item 1) and discharge (Figure 1, Item 2) service valves.
11. Close compressor suction service valve (Figure 1, Item 1) by turning clockwise and trap refrigerant between compressor suction service valve (Figure 1, Item 1) and receiver outlet valve (Figure 2, Item 1).

SERVICE – CONTINUED**Release Refrigerant into System**

1. Backseat (open) receiver outlet valve (Figure 2, Item 1) by turning counterclockwise.
2. Frontseat (close) compressor suction service valve by turning clockwise then open gauge port by turning two turns in clockwise direction..
3. Perform refrigerant leak check.
4. Start refrigeration unit in cooling mode (WP 0005, Operating Procedures).
5. Run refrigeration unit for 10 minutes.
6. Close compressor suction (Figure 4, Item 1) and discharge (Figure 4, Item 2) service valves by turning counterclockwise.

Recover Refrigerant

Recover refrigerant as follows:

CAUTION

Refrigerant is damaging to the environment. Always use a refrigerant reclaimer when removing refrigerant from a system.

Whenever the refrigeration system is opened, it must be evacuated and dehydrated to remove moisture from the system that could damage it.

Venting refrigerant into the atmosphere rather than recovering it is subject to EPA restrictions. Venting the refrigerant may be a violation of public law and subject to severe penalties.

NOTE

If the system is opened between the compressor discharge valve and the receiver, store the refrigerant charge in an evacuated container.

1. Connect reclaimer hoses to compressor suction (Figure 4, Item 1) and receiver (Figure 2, Item 1) service valves.

CAUTION

Follow instructions for specific refrigerant recovery unit being used to avoid compressor oil loss. Loss of oil could result in compressor damage.

Make sure that the refrigerant reclaimer is compatible with R404A refrigerant.

2. Open side and rear doors and secure using attached door chain.

SERVICE – CONTINUED

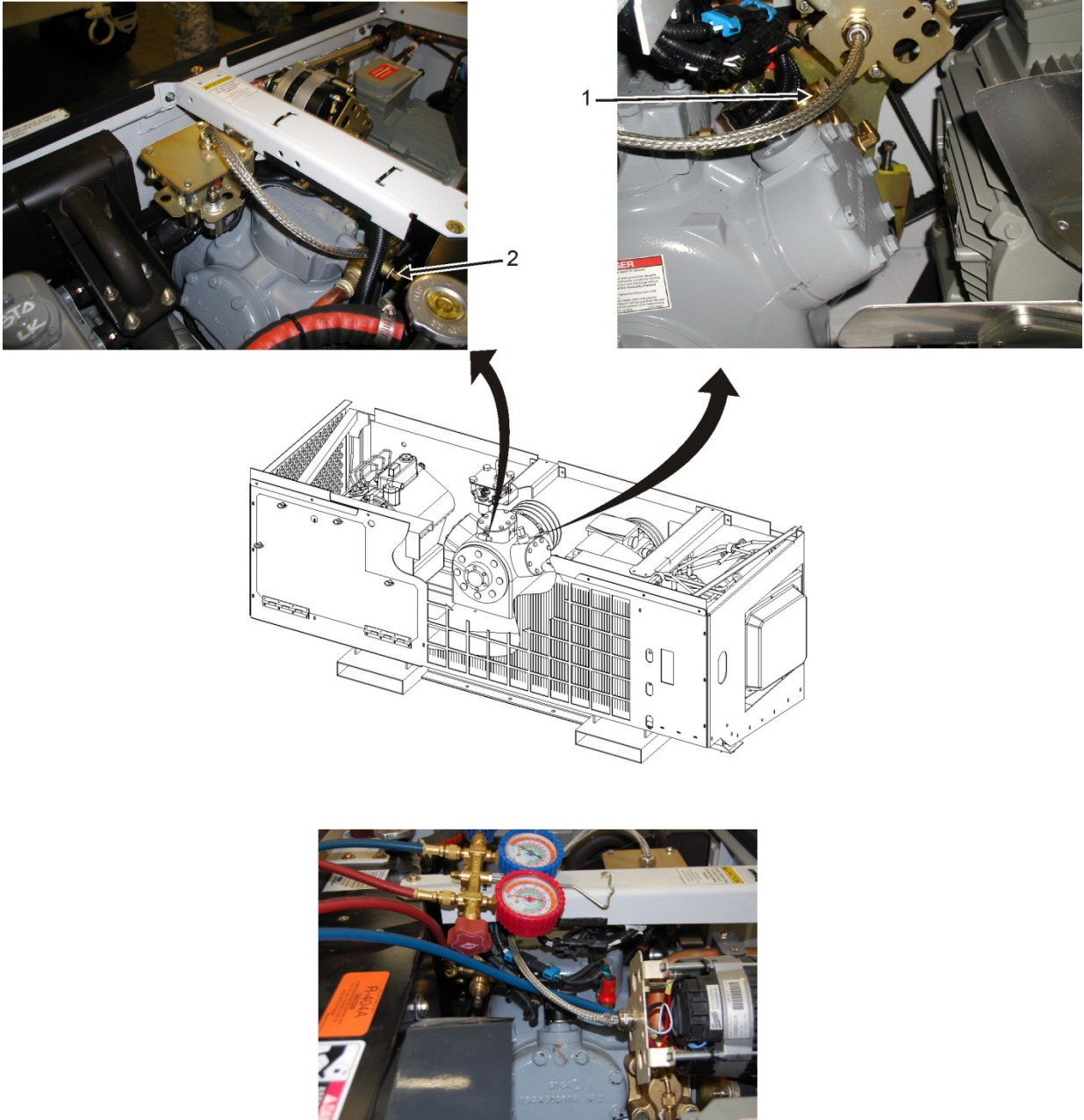


Figure 4. Refrigerant Reclaimer.

SERVICE – CONTINUED**NOTE**

The evaporator cover is hinged to the evaporator front cover and swings down after removal of mounting hardware. After removal of the sensors attached to the cover, the cover can be completely removed by unhooking it from the front panel, if desired.

3. Remove two bolts (Figure 5, Item 1) and washers (Figure 5, Item 2) securing evaporator cover (Figure 5, Item 3) closed and carefully allow evaporator cover to swing down. Repeat for other evaporator cover.

NOTE

The hot gas solenoids may be removed if necessary. Tag to prevent confusion.

4. Remove compartment 1 and compartment 2 evaporator liquid solenoid valve coils (Figure 5, Item 4), (WP 0064, Replace) and hot gas solenoid coils (Figure 5, Item 7), (WP 0065).
5. Install doughnut magnet (Figure 5, Item 5) over compartment 1 and compartment 2 liquid solenoid valve (Figure 5, Item 6) and hot gas solenoid valve (Figure 5, Item 7).
 - Each solenoid will energize and an audible clicking will be heard signifying the valves open.
 - Doughnut magnet remains installed on compartment 1 and compartment 2 evaporator liquid and hot gas solenoid valve coils for entire procedure, and during Evacuation and Dehydration procedure.
6. Recover refrigerant.
7. Disconnect refrigerant reclaimer hoses from compressor suction (Figure 4, Item 1) and receiver (Figure 2, Item 1).
8. Perform evacuation and dehydration following directions in this WP.
9. Introduce a small vapor refrigerant holding charge of 1-2 psig to relieve the vacuum in the system.
10. Close manifold gauges.

SERVICE – CONTINUED**Refrigerant Leak Check**

Perform a refrigerant leak check on the refrigeration system if the system was opened for any reason and after all repairs as follows:

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

NOTE

In order to get a complete leak check on the system, and subsequently pull a complete vacuum, it will be necessary to manually open compartment 1 and compartment 2 liquid solenoid valves using a doughnut magnet. These valves will remain open for the entire procedure.

1. Open side and rear doors and secure using attached door chain.

NOTE

The evaporator cover is hinged to the evaporator front cover and swings down after removal of mounting hardware. After removal of the sensors attached to the cover, the cover can be completely removed by unhooking it from the front panel, if desired.

2. Remove two bolts (Figure 5, Item 1) and washers (Figure 5, Item 2) securing evaporator cover (Figure 5, Item 3) closed and carefully allow evaporator cover to swing down. Repeat for other evaporator cover.

NOTE

The hot gas solenoids may be removed if necessary. Tag to prevent confusion.

3. Remove compartment 1 and compartment 2 evaporator liquid solenoid valve coils (Figure 5, Item 4), (WP 0064, Replace) and hot gas solenoid coils (Figure 5, Item 7), (WP 0065).
4. Install doughnut magnet (Figure 5, Item 5) over compartment 1 and compartment 2 liquid solenoid valve (Figure 5, Item 6) and hot gas solenoid valve (Figure 5, Item 7).
 - Each solenoid will energize and an audible clicking will be heard signifying the valves open.
 - Doughnut magnet remains installed on compartment 1 and compartment 2 evaporator liquid and hot gas solenoid valve coils for entire procedure, and during Evacuation and Dehydration procedure.

SERVICE – CONTINUED

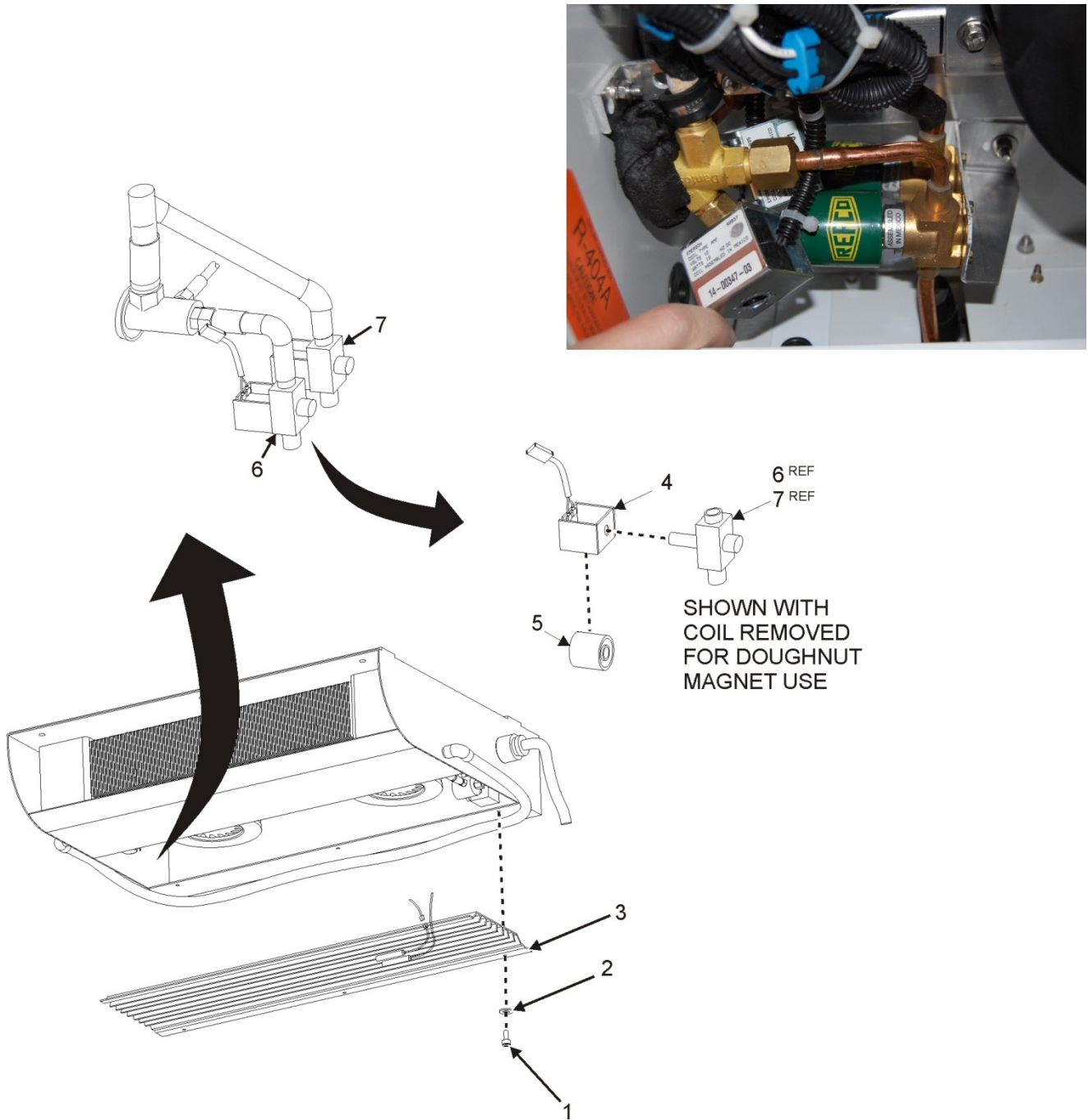


Figure 5. Liquid Solenoid Valve (Typical).

SERVICE – CONTINUED**CAUTION**

In order to prevent possible contamination to the system and additional maintenance, use only the correct refrigerant cylinder to pressurize the system. Any other gas or vapor will contaminate the system and require additional purging and dehydration.

NOTE

Before performing a leak check on the system, it must be charged with refrigerant. If the system is without refrigerant, charge the system with refrigerant to build pressure to 30 to 50 psig.

5. Make sure system is charged with refrigerant to a level of 30 to 50 psig.

NOTE

If leak detector is not available, or location of the leak is known as in a repair, use Nitrogen to pressurize the system and determine with a bubble test.

6. Perform a leak check on all refrigeration system connections using an electronic leak detector to detect hydrofluorocarbons (HFCs).
7. If any leaks are found, remove refrigerant, repair leaks, and recheck for leaks.
8. If no leaks are found, evacuate and dehydrate the refrigeration unit in accordance with Evacuation and Dehydration paragraph per this WP.
9. Charge refrigeration unit with refrigerant in accordance with Charge System with Refrigerant paragraph per this WP.
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

SERVICE – CONTINUED**Evacuation and Dehydration**

Perform an evacuation and dehydration of the refrigerant system as follows:

CAUTION

Moisture in the refrigeration system can cause copper plating, acid sludge formation, freeze-up, and formation of acids that result in metal corrosion. It is very important to make sure that no moisture is in the refrigerant system before it is charged.

1. Perform a pressure leak check.

NOTE

Ambient temperatures below 60°F may cause the formation of ice before moisture removal is completed. It may be necessary to use heat lamps, or other alternate source of heat, to raise and keep temperature above 60°F.

2. Keep ambient air temperature above 60°F to speed up evaporation of moisture and prevent system damage.

CAUTION

Refrigerant is damaging to the earth ozone layer. Always use a refrigerant reclaimer when removing refrigerant from a system.

3. Connect refrigerant reclaimer, if not already connected, using four evacuation hoses.
4. Remove refrigerant using an approved refrigerant reclaimer.

CAUTION

Standard service hoses are not suitable for evacuation procedures. Do not use standard service hoses as damage to the system may occur. Use only evacuation hoses when performing evacuation and dehydration procedures.

5. Connect one evacuation hose between vacuum pump manifold and compressor discharge service valve.
6. Connect second evacuation hose between vacuum pump manifold and compressor suction service valve.
7. Connect third evacuation hose between vacuum pump manifold and receiver outlet valve.
8. Connect one evacuation hose between vacuum pump and vacuum gauge manifold.
9. Connect one evacuation hose between vacuum gauge and vacuum gauge manifold.
10. Close compressor suction service valve (Figure 1, Item 1) by turning counterclockwise.

SERVICE – CONTINUED

11. Close compressor discharge service valve (Figure 1, Item 2) by turning counterclockwise.
12. Open two vacuum gauge manifold valves by turning clockwise.
13. Open vacuum pump manifold valve.

NOTE

Steps 14 and 15 are performed to test the evacuation setup for leaks. If the vacuum holds, the setup has no leaks and it is okay to proceed with step 14. If the vacuum does not hold, there is a leak, or leaks, in the setup that will have to be repaired before continuing with the evacuation and dehydration procedure.

A deep vacuum is defined as 500 microns or more with a tolerance of +1/-0 while being held in that state for a minimum of 30-minutes.

14. Start vacuum pump and draw a deep vacuum (500 +1/-0 microns).
15. Shut off vacuum pump and make sure vacuum holds for 30-minutes.
16. Open compressor suction service (Figure 1, Item 1) valve by turning clockwise.
17. Open compressor discharge service (Figure 1, Item 2) valve by turning clockwise.
18. Open receiver valve by turning clockwise.
19. Open two vacuum gauge manifold valves by turning clockwise, if not already open.
20. Open vacuum pump manifold valve by turning clockwise, if not already open.
21. Start vacuum pump to start evacuation of refrigerant in system.
22. Evacuate refrigeration unit until vacuum gauge indicates 2,000 (± 25) microns.
23. Close two vacuum gauge manifold valves by turning counterclockwise.
24. Close vacuum pump manifold valve by turning counterclockwise.
25. Turn off vacuum pump.
26. Wait three to five minutes and observe that vacuum holds. If vacuum does not hold, perform a leak check. It could be an indication that there is still moisture in the system or a leak.
27. Break vacuum with clean, dry refrigerant.
28. Raise system pressure to approximately 2 psig.
29. Remove refrigerant using refrigerant reclaimer.
30. Repeat steps 16 through 26 one time.
31. Start vacuum pump.

SERVICE – CONTINUED

32. Evacuate refrigeration unit until vacuum gauge indicates 500 (+1/-0) microns.
33. Close vacuum pump manifold valve.
34. Turn off vacuum pump.
35. Wait five minutes and observe vacuum holds at 500 microns to check for residual moisture and/or leaks. Perform refrigerant charging, or release refrigerant into system, immediately while system is still in deep vacuum per this WP.
36. Remove doughnut magnet (Figure 5, Item 5) from compartment 1 and compartment 2 liquid and hot gas solenoid valves (Figure 5, Item 6).
 - Each solenoid will de-energize, and an audible clicking will be heard signifying the valves close.
37. Install compartment 1 and compartment 2 evaporator liquid and hot gas solenoid valve coils (Figure 5, Item 4), (WP 0064, Replace). If the hot gas solenoids were removed, reinstall as tagged.
38. Close evaporator cover (Figure 5, Item 3) and secure using two bolts (Figure 5, Item 1) and washers (Figure 5, Item 2).

Purge

1. Connect service hose to nitrogen tank.
2. Make sure gauge set service valve is closed.
3. Open nitrogen tank valve.
4. Open gauge set discharge valve and pressurize system to at least 350 psi.
5. Close gauge set discharge valve and nitrogen tank valve.
6. Disconnect service hose from nitrogen tank.

Charge System with Refrigerant

Charge the refrigerant system as follows:

CAUTION

Do not use vapor charge R-404A refrigerant. Use only liquid charging through liquid line valve.

1. If refrigeration unit is not in deep vacuum from evacuation and dehydration, perform evacuation and dehydration.
2. Place refrigerant cylinder (Figure 6, Item 1) on scale (Figure 6, Item 2).
3. Connect charging line (Figure 6, Item 3) from cylinder (Figure 6, Item 1) to receiver outlet valve (Figure 6, Item 4) and open cylinder vapor valve.

SERVICE – CONTINUED

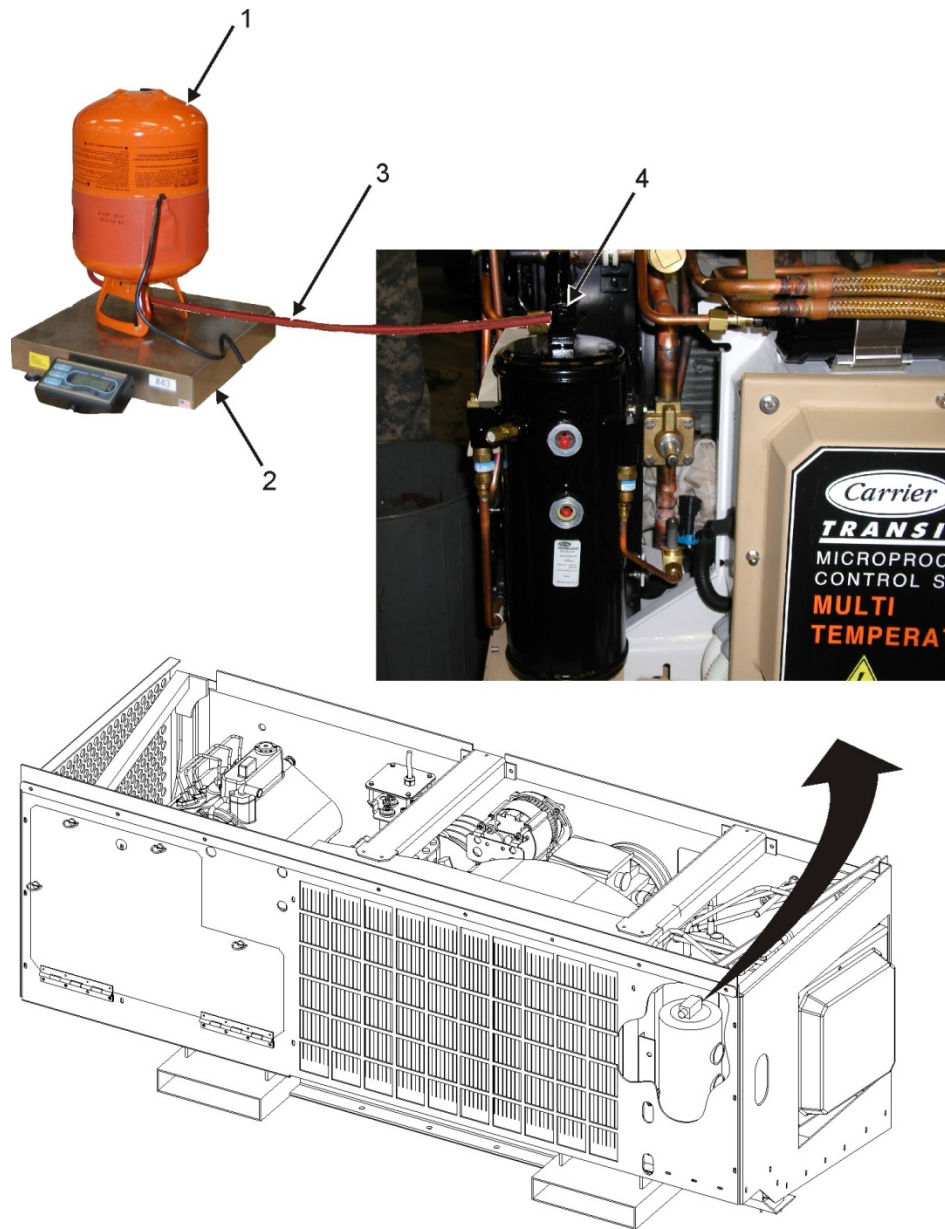


Figure 6. Charging System at Receiver Outlet Valve.

SERVICE – CONTINUED

4. Purge charging line (Figure 6, Item 3) at outlet valve (Figure 6, Item 4).
5. Note weight of refrigerant cylinder (Figure 6, Item 1).
6. Open liquid valve on refrigerant cylinder (Figure 6, Item 1).
7. Open receiver outlet valve (Figure 6, Item 4) by turning clockwise 3 to 4 full turns.
8. Allow liquid refrigerant to flow into refrigeration unit until scale (Figure 6, Item 2) indicates correct weight of 15-pounds of refrigerant has been charged into the system.

NOTE

All of the liquid refrigerant may not be pulled into the receiver. If this happens, frontseat (close) the receiver outlet valve and the liquid refrigerant will be pulled into the system, providing the system is operating in the cooling mode.

9. Close liquid valve on refrigerant cylinder (Figure 6, Item 1).
10. Close receiver outlet valve (Figure 6, Item 4) by turning counterclockwise.
11. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
EMERGENCY STOP SWITCH
REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Materials/Parts

Lock Washer (WP 0111, Item 11)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005

WP 0031

WP 0070

TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)

External power cables disconnected (WP 0005)

REPLACE

1. On control panel (Figure 1, Item 1), place POWER ON/DOWN switch (Figure 1, Item 2) to DOWN position.
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

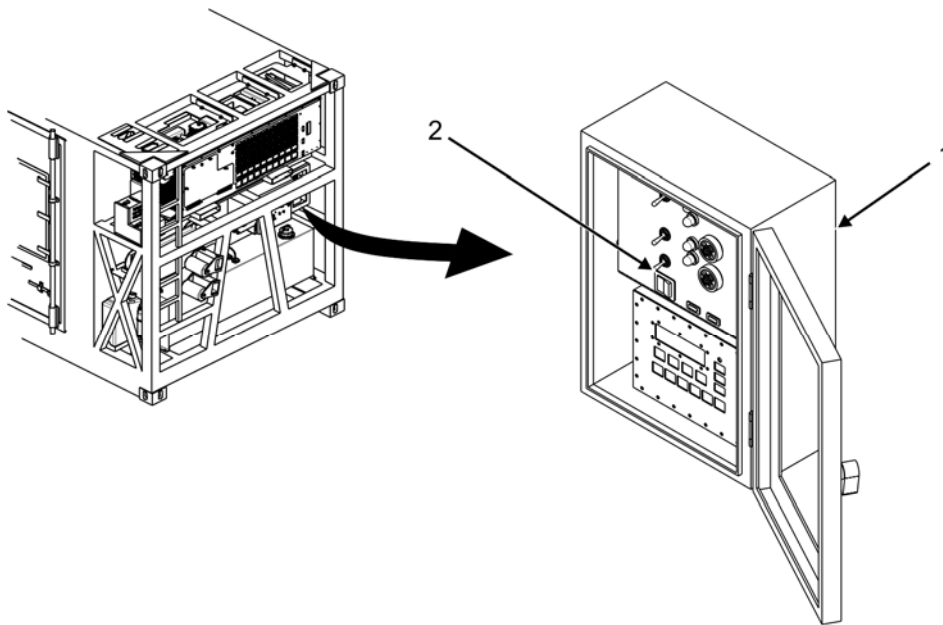


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

3. Access top of MTRCS using roof access provided.
4. Remove top-left panel (WP 0031, Remove).
5. Disconnect emergency stop switch electrical connector (Figure 2, Item 1).

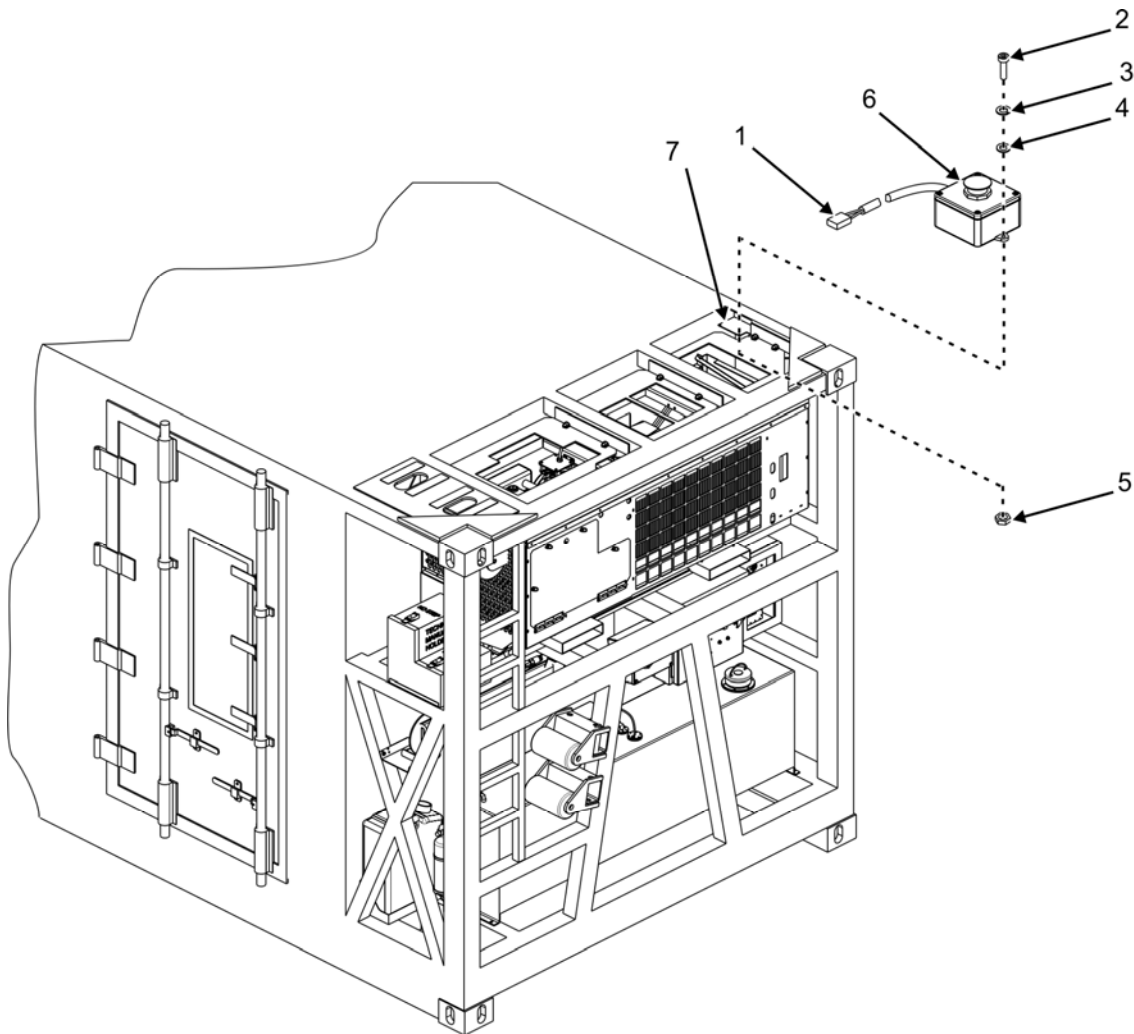


Figure 2. Emergency Stop Switch.

REPLACE – CONTINUED

6. Remove two screws (Figure 2, Item 2), lock washers (Figure 2, Item 3), washers (Figure 2, Item 4), and nuts (Figure 2, Item 5) securing emergency stop switch (Figure 2, Item 6) to container frame (Figure 2, Item 7). Discard lock washers.
7. Remove emergency stop switch (Figure 2, Item 6).
8. Install new emergency stop switch (Figure 2, Item 6) to container frame (Figure 2, Item 7) and secure using two screws (Figure 2, Item 2), new lock washers (Figure 2, Item 3), washers (Figure 2, Item 4), and nuts (Figure 2, Item 5).
9. Place emergency stop switch (Figure 2, Item 6) in PULL TO START position.
10. Reconnect emergency stop switch electrical connector (Figure 2, Item 1).
11. Install top-left panel (WP 0031, Install)
12. Climb off roof using roof access provided.
13. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
14. On control panel (Figure 1, Item 1), place POWER ON/DOWN switch (Figure 1, Item 2) to ON position.
15. Start refrigeration unit (WP 0005, Operating Procedures).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

16. Access top of MTRCS using roof access provided.

WARNING

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

17. Place emergency stop switch (Figure 2, Item 6) in PUSH TO STOP position and verify refrigeration unit shuts down.
18. Place emergency stop switch (Figure 2, Item 6) in PULL TO START position.
19. Climb off roof using roof access provided.
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
COMPRESSOR
SERVICE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Oil Charge, 8 pints (WP 0110, Item 29)
 Tubing, four feet, cut to length (WP 0110, Item 53)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0032
 WP 0062
 WP 0076

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Top-middle panel removed (WP 0031)
 Top-left panel removed (WP 0031)

SERVICE

Perform the following tasks to properly service the compressor. This work package will provide instructions for checking compressor oil level, adding oil to an in-system compressor and new compressor, and for removing oil from a compressor that has been over-serviced.

WARNING

Sudden and irreversible tissue damage can result from freezing. Wear gloves and face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Compressor lubricating oil used in this equipment is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

Dangerous chemical refrigerant under pressure is used in this equipment. Use great care to avoid contact with liquid refrigerant. Work in a well ventilated area. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.

NOTE

Refrigeration system repairs must be performed by a technician certified to perform such duties in accordance with EPA restrictions. Performing repairs without proper certification may be a violation of public law and subject to severe penalties.

SERVICE – CONTINUED**Check Compressor Oil Level**

Check compressor oil level as follows:

1. Start refrigeration unit and operate in high speed cooling for 20 minutes (WP 0005, Operating Procedures).

WARNING

The diesel engine exhaust system will become extremely hot after a short period of operating time. Use extreme care when working around a hot engine. Serious burns can result. Allow engine to cool for 30-minutes before performing maintenance.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure to use extreme care when working on the MTRCS while the engine is operating. Beware of V-belts and engine driven components. Failure to comply with this warning can result in serious injury or death to personnel.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

2. Open front panel assembly access cover (WP 0031, Remove).

NOTE

The compressor has two oil sight glass indicators, one on each side. When the compressor is installed in the system, the easiest one to check is on the side nearest the front panel assembly access cover.

3. Check oil level sight glass (Figure 1, Item 1) to make sure no oil foaming is present using a mirror.

CAUTION

Excessive engine oil foaming after 20 minutes of operation indicates probable liquid refrigerant flood-back. Check refrigerant system for flood-back and if present, perform an inspection of the two thermostatic expansion valves contained within the two evaporators (WP 0062, Inspect).

NOTE

Certain versions of the compressor installed on the MTRCS refrigeration unit contain minimum and maximum indicator lines by the compressor sight glass. Other versions of the compressor do not.

4. With compressor operating, check oil level in oil level sight glass (Figure 1, Item 1).
 - Oil level in sight glass should indicate oil level is halfway between minimum and maximum.

SERVICE – CONTINUED

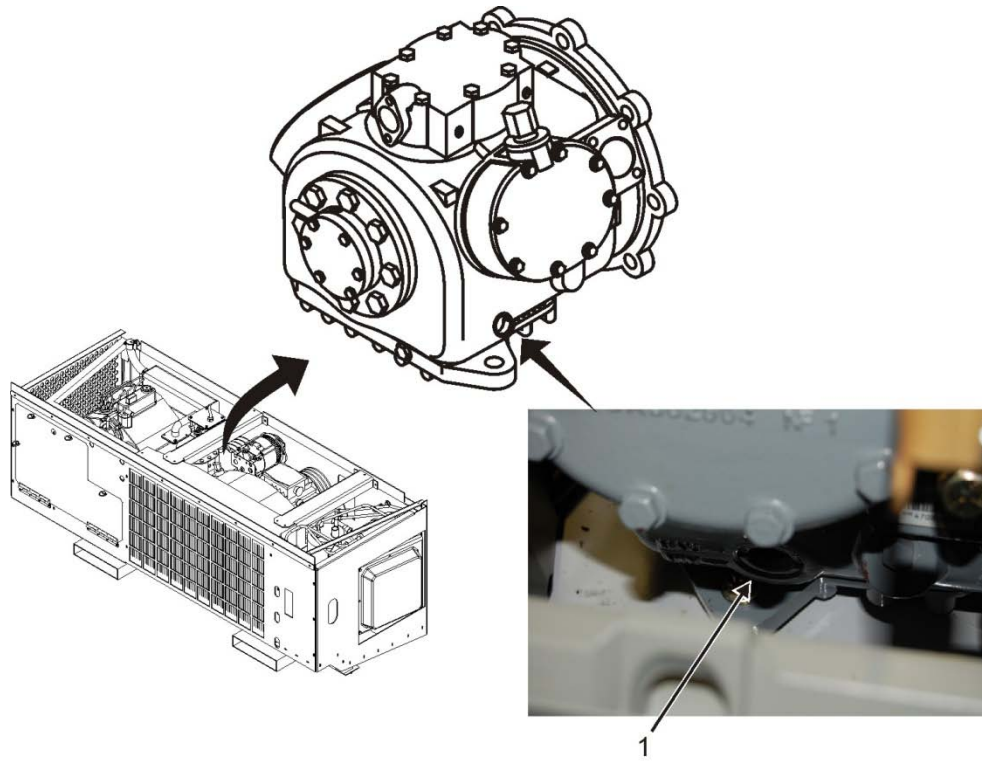


Figure 1. Compressor Oil Level Sight Glass (Typical).

5. Shut down MTRCS (WP 0005, Operating Procedures).
6. Install top-middle panel (WP 0031, Install).
7. Install top-left panel (WP 0031, Install).

SERVICE – CONTINUED**Adding Oil to Compressor in System****WARNING**

Refrigerant system discharge pressure will cause refrigerant oil container to burst causing personal injury. Never connect oil pump or container to the discharge side of compressor.

Add oil to the compressor in system as follows:

CAUTION

This procedure is for adding oil to a compressor currently being used by the MTRCS and is not intended as instruction for adding oil to a replacement compressor. Do not use this procedure to add oil to a replacement compressor. Use the procedure titled Adding Oil to Replacement Compressor located in this WP.

Adding Compressor Oil Using Closed System. The following steps provide a method of adding oil to an in-system compressor. Another method of adding oil using an oil pump can also be found in this work package.

1. Remove suction (Figure 2, Item 1) service valve protective cover.
2. Connect one end of service hose to compressor suction service valve port (Figure 2, Item 5).
3. Connect other end of service hose to manual pump.

CAUTION

Extreme care must be taken to make sure that the manifold common connection remains immersed in oil at all times. If the common manifold connection does not remain immersed at all times during the procedure, air and moisture will be drawn into the compressor and contaminate the system.

4. Immerse manual oil pump in open container of refrigeration oil.
5. Backseat (open) suction (Figure 2, Item 1) service valve 1/4-turn.
6. Crack service hose connection to manual pump to vent small amount of refrigerant through common connection and oil to purge air from lines.
7. Tighten service hose connection to manual pump.
8. Fully frontseat (close) suction (Figure 2, Item 1) service valve to pull vacuum in compressor crankcase.
9. Start refrigeration unit (WP 0005, Operating Procedures).
10. Manually add oil as required until oil level in sight glass (Figure 2, Item 6) is halfway between minimum and maximum (Figure 1) while in operation.

SERVICE – CONTINUED

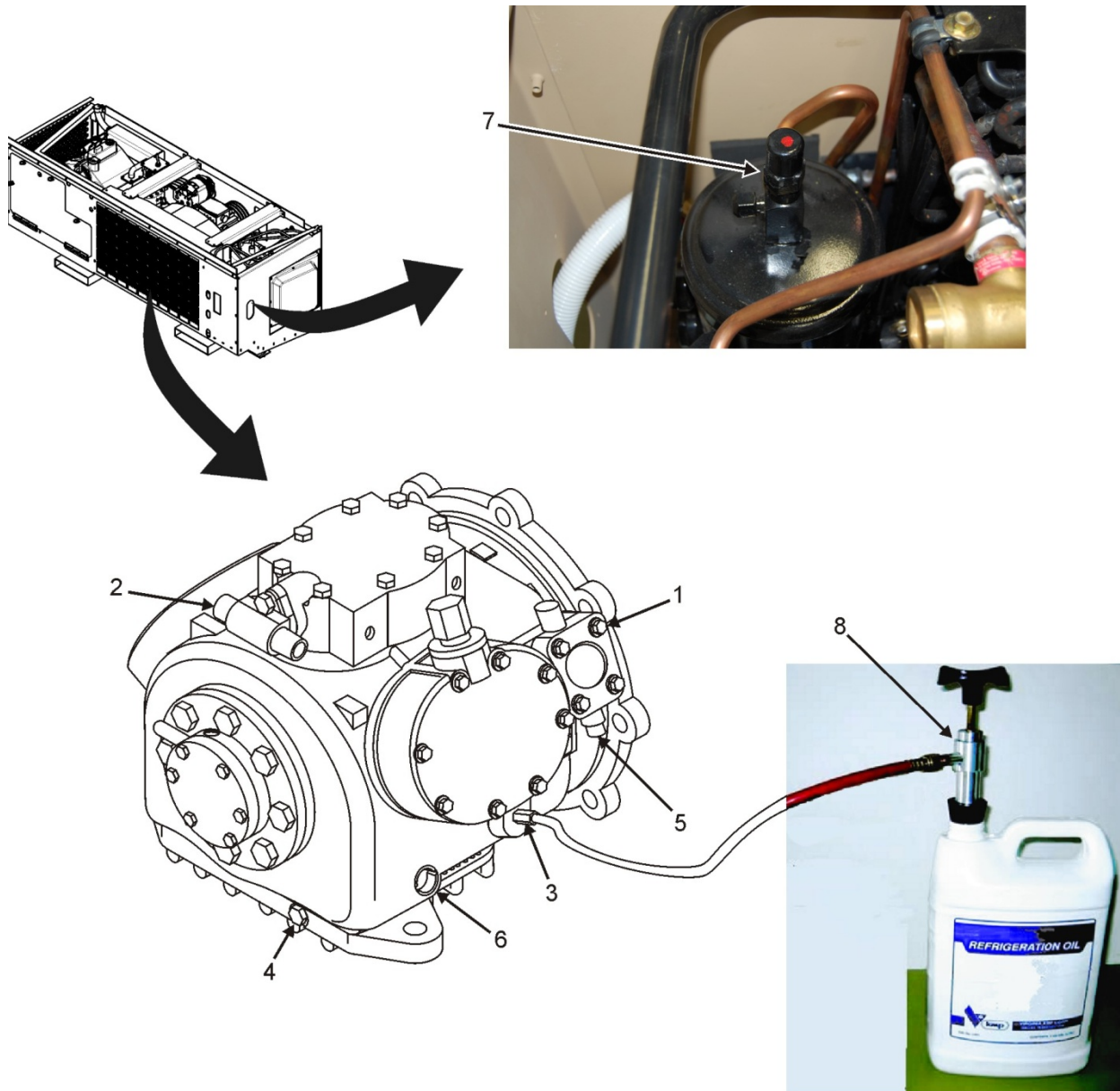


Figure 2. Compressor Suction and Discharge Service Valves.

11. Shut down refrigeration unit (WP 0005, Operating Procedures).
12. Backseat (open) suction (Figure 2, Item 1) service valve.
13. Disconnect hose from suction (Figure 2, Item 1) service valve and pump.
14. Replace protective cap on suction (Figure 2, Item 1) service valve.

SERVICE – CONTINUED

15. Install top-middle panel (WP 0031, Install).
16. Install top-left panel (WP 0031, Install).

Adding Compressor Oil Using Oil Pump. The following steps describe how to add oil to the compressor using an oil pump.

1. Remove protective caps (Figure 2, Item 5) from suction (Figure 2, Item 1) and discharge (Figure 2, Item 2) service valves.
2. Install manifold gauges.
3. Pump refrigerant unit down (WP 0032, Service).
4. Frontseat (close) suction (Figure 2, Item 1) and discharge (Figure 2, Item 2) service valves.

NOTE

There may be some residual pressure in the compressor. Equalizing the pressure will allow for easier removal of fill plug and prevent excessive pressure release.

5. Equalize pressure by fully opening manifold gauge valves.
6. Remove compressor oil fill plug (Figure 2, Item 3).
7. Insert one hose from pump (Figure 2, Item 8) into oil container and one hose into compressor oil fill hole.

NOTE

Certain versions of the compressor installed on the MTRCS refrigeration unit contain minimum and maximum indicator lines by the compressor sight glass. Other versions of the compressor do not.

8. Using oil pump (Figure 2, Item 8), add oil as needed through oil fill plug (Figure 2, Item 3) opening. Oil level in sight glass should indicate oil level is halfway between minimum and maximum when ambient.
9. Install and tighten compressor oil fill plug (Figure 2, Item 3).
10. Perform evacuation and dehydration (WP 0032, Service).
11. Fully close manifold gauges.
12. Fully backseat (open) suction (Figure 2, Item 1) and discharge (Figure 2, Item 2) service valves.
13. Frontseat (close) suction (Figure 2, Item 1) and discharge (Figure 2, Item 2) service valves 1/4-turn each.
14. Backseat (open) receiver outlet valve (Figure 2, Item 7).
15. Start refrigeration unit (WP 0005, Operating Procedures).
16. Charge system with refrigerant as needed (WP 0032, Service).

SERVICE – CONTINUED

17. Shut down refrigeration unit (WP 0005, Operating Procedures).
18. Fully backseat (open) suction (Figure 2, Item 1) and discharge (Figure 2, Item 2) service valves.
19. Remove manifold gauges.
20. Install protective caps on suction and discharge service valves.

Adding Oil to Replacement Compressor

Add oil to a replacement compressor as follows:

NOTE

Replacement compressor may or may not be shipped with oil. Always check oil level before installing a new compressor.

1. Remove oil fill plug (Figure 2, Item 3).

NOTE

The compressor has an oil charge capacity of eight pints.

2. Add correct amount of oil charge.
3. Install oil fill plug (Figure 2, Item 3) and tighten.
4. Perform Check Compressor Oil Level per this WP.
5. Install compressor (WP 0076, Install).
6. Install top-middle panel (WP 0031, Install).
7. Install top-left panel (WP 0031, Install).
8. Start refrigeration unit and let it run for five minutes, then check oil level again (WP 0005, Operating Procedures).

Removing Oil From Compressor

Remove oil from compressor as follows:

NOTE

This procedure for removing oil from the compressor will only be needed if the oil level was overfilled during servicing and the compressor is installed.

1. Frontseat (close) suction (Figure 2, Item 1) service valve.
2. Pump refrigeration unit down to 2 to 4 psig (WP 0032, Service).

SERVICE – CONTINUED

3. Shut refrigeration unit down (WP 0005, Operating Procedures).
4. Frontseat (close) discharge (Figure 2, Item 2) service valve and slowly bleed remaining refrigerant from compressor.
5. Remove oil drain plug (Figure 2, Item 4) from compressor.
6. Drain required amount of oil from compressor and discard in accordance with unit SOP.
7. Install oil drain plug (Figure 2, Item 4) in compressor and tighten.
8. Open discharge (Figure 2, Item 2) and suction (Figure 2, Item 1) service valves.
9. Perform Check Compressor Oil Level per this WP.

NOTE

When the compressor is off, the oil level will usually indicate slightly higher than it actually is. Previous operation can affect the temperature of the oil.

10. Repeat Step 9 procedure as required until compressor oil level is at the proper level.
11. Install top-middle panel (WP 0031, Install).
12. Install top-left panel (WP 0031, Install).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
COMPRESSOR UNLOADER VALVE COIL
TEST, REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
Gloves, Rubber (WP 0110, Item 21)
Refrigeration Equipment
Tool Kit (supplement) (WP 0107, Table 2, Item 7)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0031
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Top-middle panel removed (WP 0031)
Top-left panel removed (WP 0031)

TEST**WARNING**

Sudden and irreversible tissue damage can result from freezing. Wear gloves and face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Compressor lubricating oil used in this equipment is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

Dangerous chemical refrigerant under pressure is used in this equipment. Use great care to avoid contact with liquid refrigerant. Work in a well ventilated area. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.

NOTE

Refrigeration system repairs must be performed by a technician certified to perform such duties in accordance with EPA restrictions. Performing repairs without proper certification may be a violation of public law and subject to severe penalties.

1. Remove protective cap (Figure 1, Item 1) from suction service valve (Figure 1, Item 2).
2. Remove protective cap (Figure 1, Item 3) from discharge service valve (Figure 1, Item 4).
3. Connect manifold gauge to compressor suction service valve (Figure 1, Item 2)
4. Connect manifold gauge to compressor discharge service valve (Figure 1, Item 4).

TEST – CONTINUED

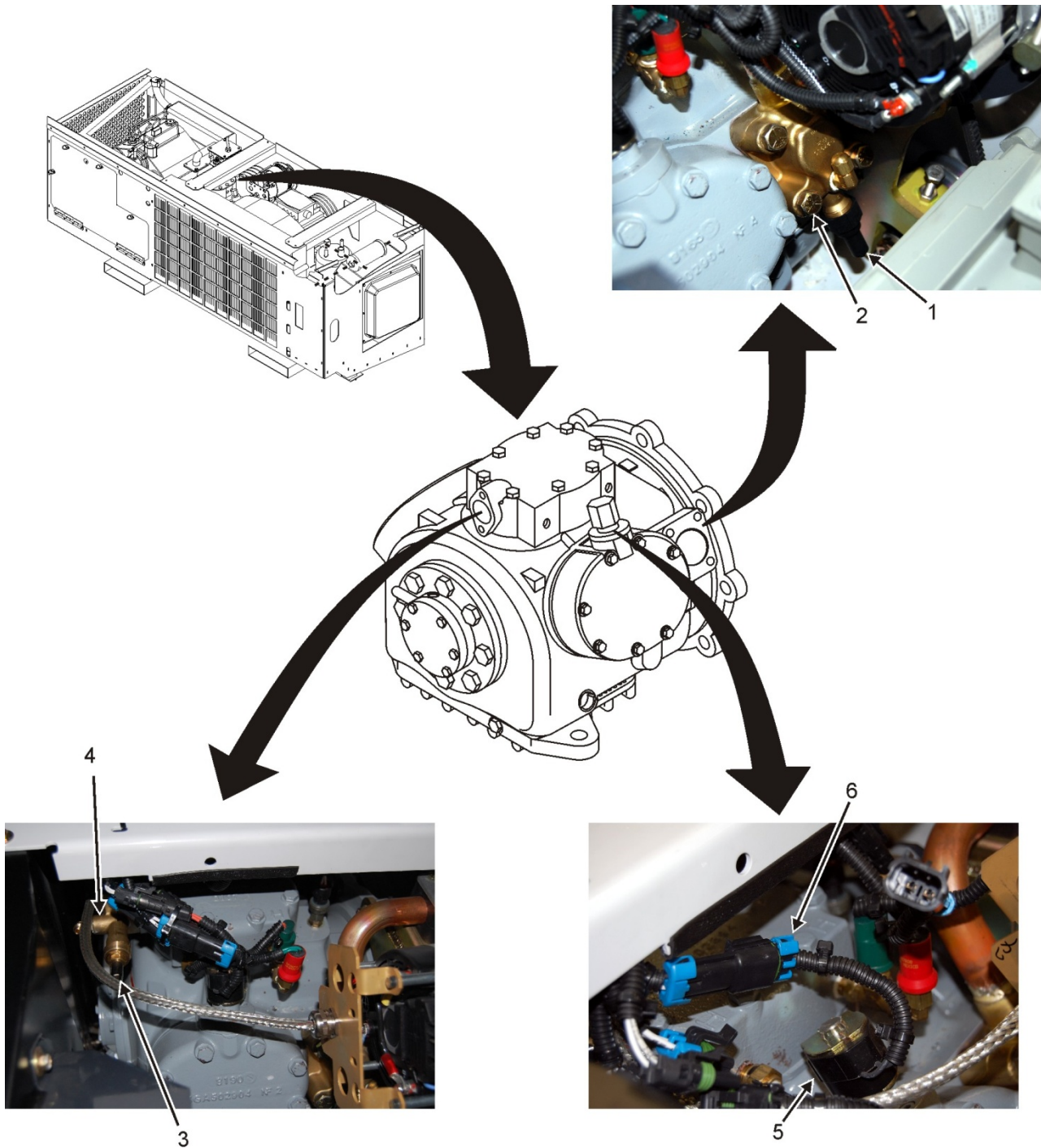


Figure 1. Compressor Unloader Valve Test.

TEST – CONTINUED**WARNING**

Wear welder's gloves and avoid contacting hot metal surfaces with your hands after components have been heated. Allow to cool before performing PMCS. Wear additional protective clothing as required. Failure to comply can cause injury to personnel.

The MTRCS contains parts that rotate and vibrate. Keep hands, feet, clothing, and any loose personal items clear of the equipment while it is operating.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

NOTE

Compressor will be fully loaded at this temperature, indicating both unloader coils are de-energized.

5. Start refrigeration unit in cooling mode with container temperature at least 5°F above setpoint (WP 0005, Operating Procedures).
6. Note suction pressure on gauge.
 - Pressure should rise slightly.
 - If pressure does not rise, check for 12 VDC at unloader valve coil (Figure 1, Item 5) electrical connector (Figure 1, Item 6).
7. Disconnect electrical connector (Figure 1, Item 6) from unloader valve coil (Figure 1, Item 5) coil.
8. On microprocessor controller display, set controller temperature upscale (cooler to warmer).

NOTE

Setting the controller temperature upscale electrically simulates falling temperature. At approximately 2°F below container temperature, the unloader coils will energize, and the rear unloader valve only will unload.

With the unloader valve coil connector disconnected, coil resistance can be checked using an ohmmeter. Coil resistance should read between 10 to 12 ohms.

9. Monitor container temperature on display until controller temperature is approximately 2°F below container temperature.
 - Unloader coils will energize.
 - Rear unloader valve will unload.
10. Note suction pressure on manifold gauge.
 - Suction pressure rise of approximately 3 psig should be indicated on suction pressure gauge.
11. Reconnect electrical connector (Figure 1, Item 6) to unloader valve (Figure 1, Item 5) coil.
 - Front unloader will de-energize.
 - An additional rise of 3 psig should be indicated on suction pressure gauge.
 - Compressor is now fully unloaded.
 - Install top-middle panel (WP 0031, Install).
 - Install top-left panel (WP 0031, Install).

END OF TASK

REPLACE**NOTE**

The compressor unloader valve solenoid coil can be replaced without having to pump the refrigeration unit down.

1. Disconnect electrical connector (Figure 2, Item 6) from unloader coil (Figure 2, Item 5).
2. Remove coil (Figure 2, Item 5) from unloader valve by pulling up on coil.
3. Verify coil type, voltage, and frequency of replacement coil is same as removed coil.

NOTE

A pin on the base of the enclosing tube will catch with the holes in the bottom of the coil to prevent the coil from rotating during operation. Make sure that coil is installed so that electrical connector and harness are pointing away from the valve.

4. Install replacement coil (Figure 2, Item 5) onto unloader valve by pressing onto tube.
5. Reconnect electrical connector (Figure 2, Item 6) to unloader coil (Figure 2, Item 5).
6. Install top-middle panel (WP 0031, Install).
7. Install top-left panel (WP 0031, Install).

REPLACE – CONTINUED

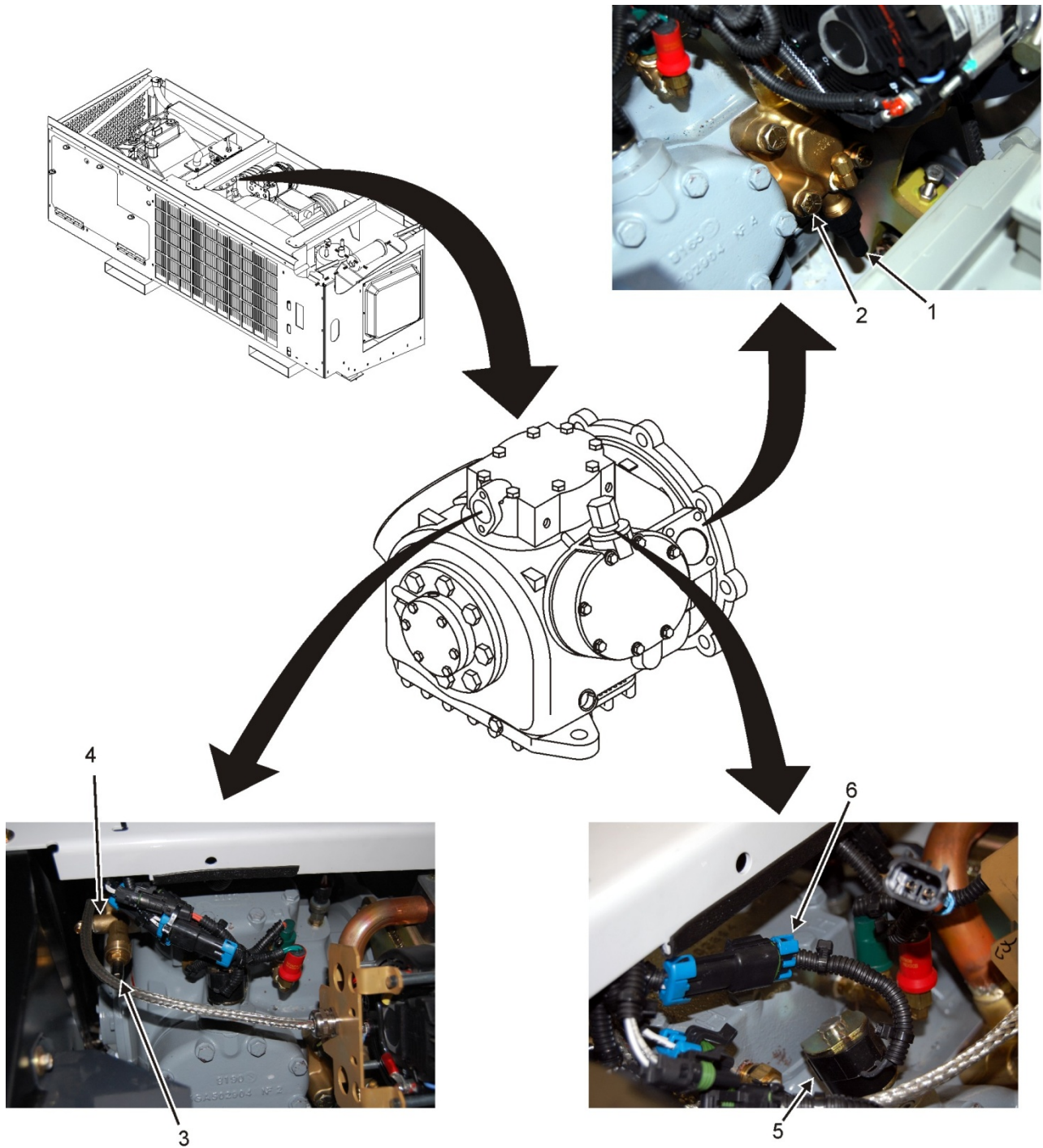


Figure 2. Compressor Unloader Valve Replace.

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE**FILTER-DRIER
TEST, REPLACE****INITIAL SETUP:****Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Detergent, General Purpose (WP 0110, Item 15)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0032
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shutdown (WP 0005)
 Top-left panel removed (WP 0031)

TEST**WARNING**

Sudden and irreversible tissue damage can result from freezing. Wear gloves and face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Compressor lubricating oil used in this equipment is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil contacts skin, wash with soap and water.

Dangerous chemical refrigerant under pressure is used in this equipment. Use great care to avoid contact with liquid refrigerant. Work in a well ventilated area. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

NOTE

Refrigeration system repairs must be performed by a technician certified to perform such duties in accordance with EPA restrictions. Performing repairs without proper certification may be a violation of public law and subject to severe penalties.

Test the integrity of the filter-drier as follows:

1. Start refrigeration unit and operate in cool mode for 30 minutes (WP 0005, Operating Procedures).
2. Physically feel liquid line inlet (Figure 1, Item 1) and outlet (Figure 1, Item 2) connections of the filter-drier cartridge (Figure 1, Item 3).
 - If outlet side feels warmer than inlet side, filter-drier does not require changing.
 - If outlet side feels cooler than inlet side, replace filter-drier per this WP.
3. Install top-left panel (WP 0031, Install).

TEST – CONTINUED

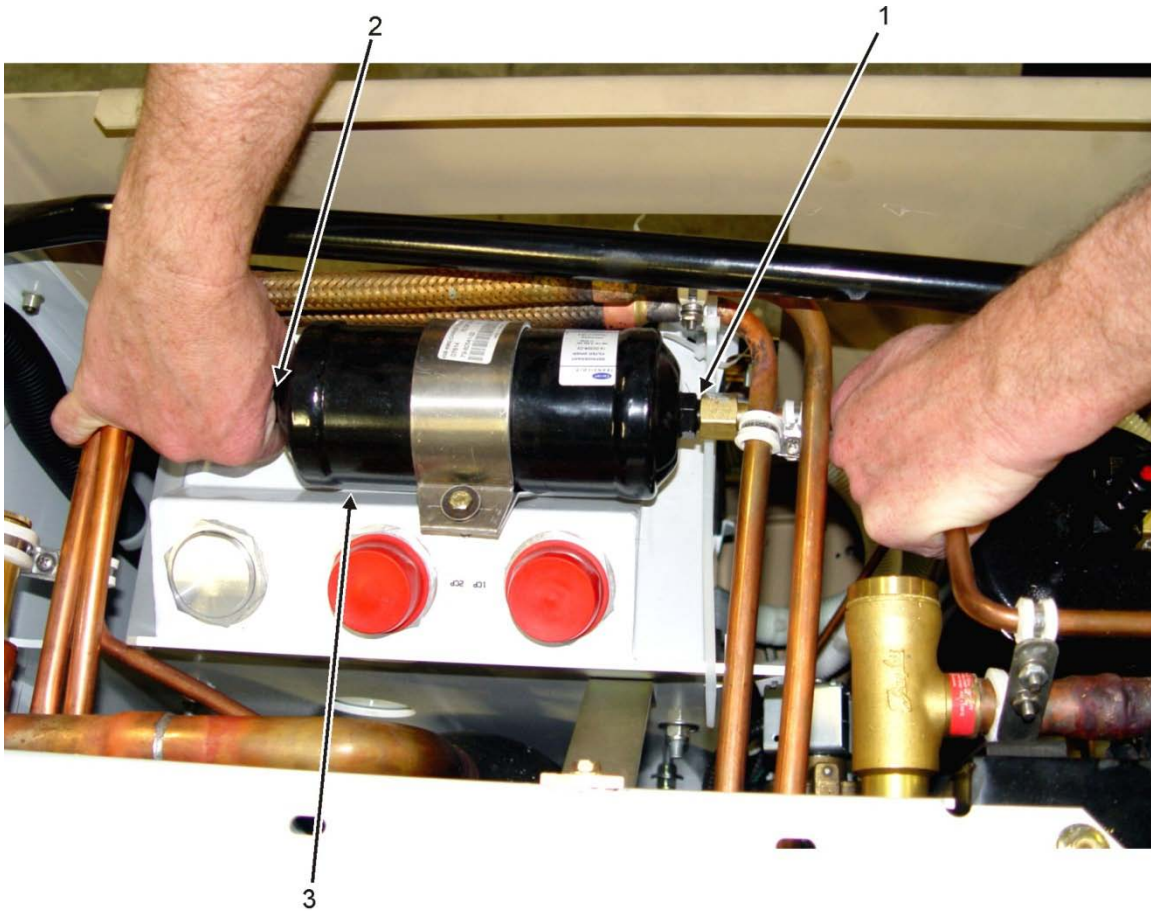


Figure 1. Filter-Drier Test.

END OF TASK

REPLACE

Replace a defective filter-drier as follows:

1. Pump down refrigeration unit (WP 0032, Service).
2. Shut down refrigeration unit (WP 0005, Operating Procedures).

NOTE

It may be necessary to hold filter-drier in place when loosening hex nuts. If so, position wrench on filter hex flange. Be sure to note the directional flow of filter-drier as installed so that replacement filter-drier can be installed in same directional flow.

3. Loosen hex nut (Figure 2, Item 1) securing condenser to filter-drier tube assembly (Figure 2, Item 2) to filter-drier (Figure 2, Item 3).
4. Disconnect condenser to filter-drier tube assembly (Figure 2, Item 2) and remove O-ring (Figure 2, Item 4).
5. Loosen hex nut (Figure 2, Item 5) securing accumulator to filter-drier tube assembly (Figure 2, Item 6) to filter-drier (Figure 2, Item 3).
6. Disconnect accumulator to filter-drier tube assembly (Figure 2, Item 6) and remove O-ring (Figure 2, Item 7).

CAUTION

It is possible to install the filter-drier backwards, or reverse flow. When removing the filter-drier, make note of the flow direction as marked on the filter-drier to aid in replacement.

7. Remove one bolt (Figure 2, Item 8) and one spacer (Figure 2, Item 9) from clamp (Figure 2, Item 10) securing filter-drier (Figure 2, Item 3) to refrigeration unit frame.
8. Remove two ground lugs (Figure 2, Item 11).
9. Remove clamp (Figure 2, Item 10) by sliding to right and removing, and filter-drier (Figure 2, Item 3).
10. Install two new O-rings (Figure 2, Item 4 and Item 7) on each side of new filter-drier (Figure 2, Item 3).
11. Install new filter-drier (Figure 2, Item 3) in direction as noted during removal, making sure flow direction is correct.
12. Install upper clamp (Figure 2, Item 10).
13. Secure clamp (Figure 2, Item 10), filter-drier (Figure 2, Item 3), and two ground lugs (Figure 2, Item 11) in place using one bolt (Figure 2, Item 8) and one spacer (Figure 2, Item 9).

REPLACE – CONTINUED

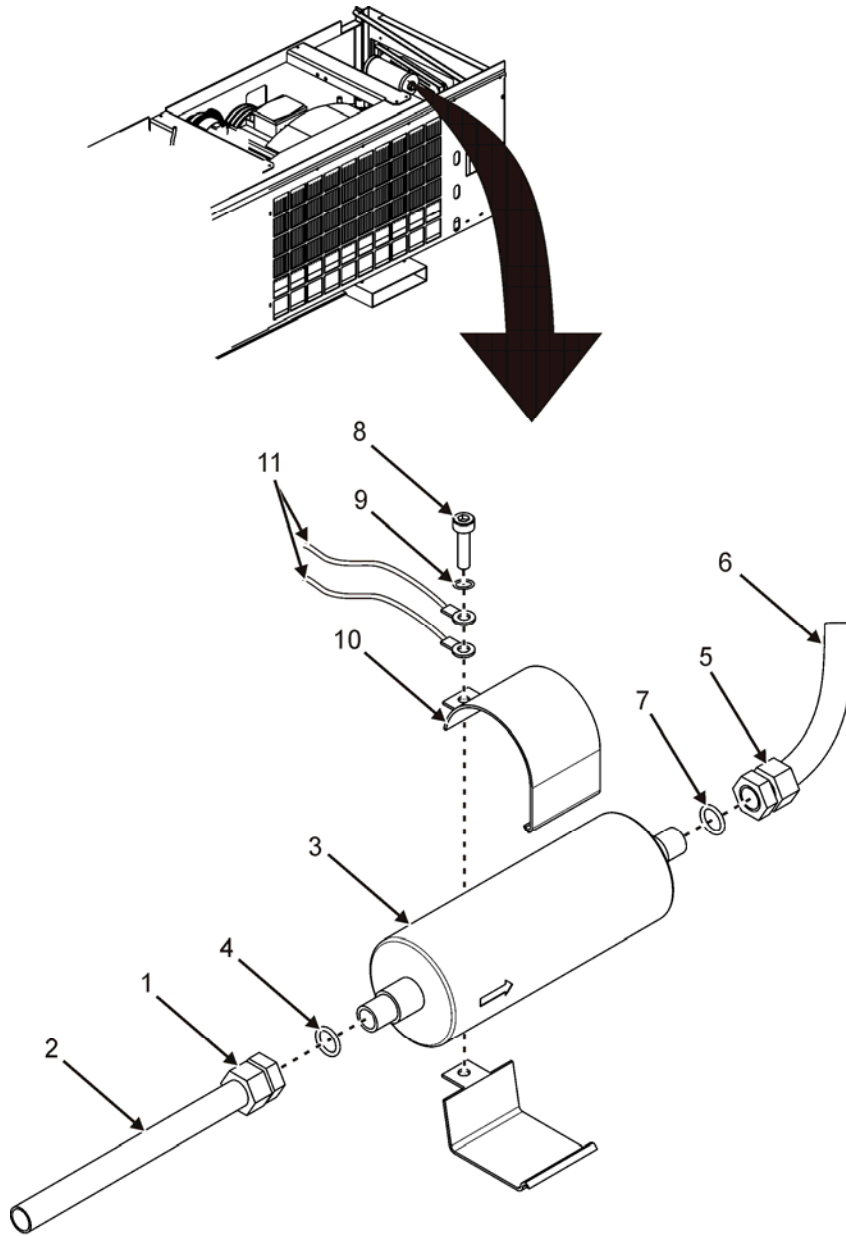


Figure 2. Filter-Drier.

REPLACE – CONTINUED

14. Connect accumulator to filter-drier tube assembly (Figure 2, Item 6) to filter-drier (Figure 2, Item 3) and secure with hex nut (Figure 2, Item 5). Tighten hex nut.
15. Connect condenser to filter-drier tube assembly (Figure 2, Item 2) to filter-drier (Figure 2, Item 3) and secure with hex nut (Figure 2, Item 1). Tighten hex nut.
16. Tighten bolt (Figure 2, Item 8).
17. Perform leak check using soap/water solution.
18. Charge system with refrigerant as required (WP 0032, Service).
19. Install top-left panel (WP 0031, Install).
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
HIGH PRESSURE CUTOUT SWITCH/PRESSURE CONTROL SWITCH
TEST, REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Top-middle panel removed (WP 0031)

Personnel Required

Utilities Equipment Repairer

TEST**WARNING**

Sudden and irreversible tissue damage can result from freezing. Wear gloves and face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.

Compressor lubricating oil used in this equipment is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

Dangerous chemical refrigerant under pressure is used in this equipment. Use great care to avoid contact with liquid refrigerant. Work in a well ventilated area. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.

NOTE

There are two high pressure cutout switches on the compressor, HP1 and HP2. HP1 is green and provides high pressure safety cutout for high head pressure. HP1 has an upper cutout at 469 ± 10 psi and cuts back in when pressure drops to 350 ± 10 psi. HP2 is red and operates the unloader valve on the compressor head. HP2 has an upper cutout 348 ± 10 psi and cuts back in when pressure drops to 312 ± 10 psi.

Test the integrity of either high pressure cutout switch, HP1 or HP2, as follows:

1. Remove applicable high pressure cutout switch in accordance with Replace paragraph in this WP.
2. Connect switch to dry nitrogen cylinder (Figure 1, Item 3) using 1/4-inch connection (Figure 1, Item 6).

TEST – CONTINUED

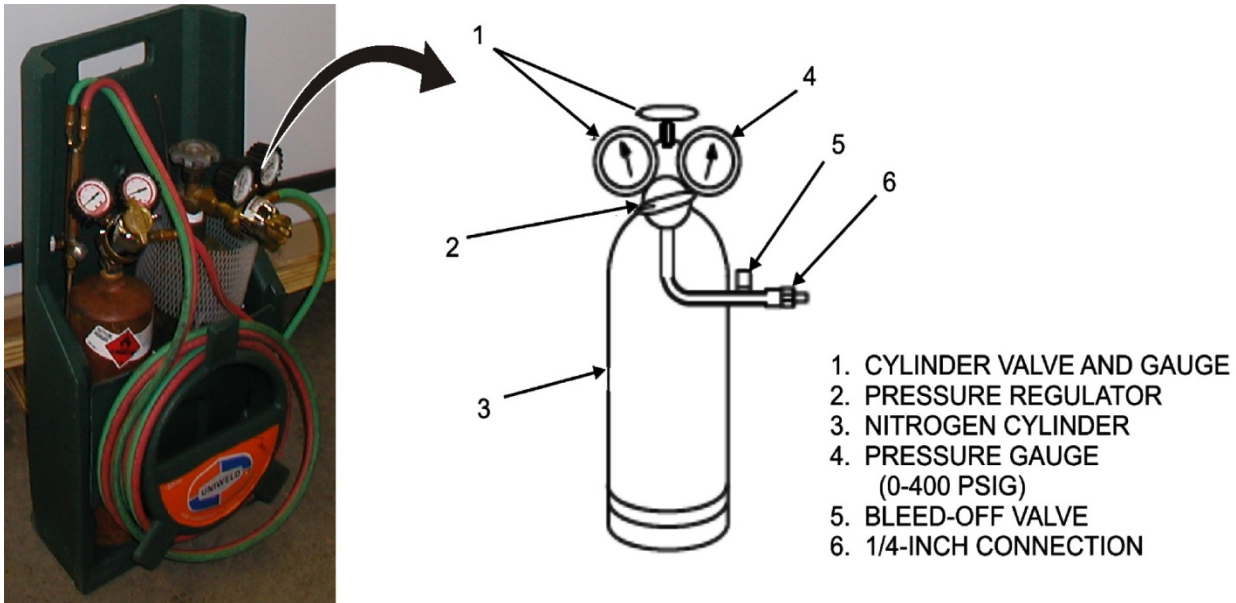


Figure 1. High Pressure Cutout Switch Test Setup.

WARNING

Dry nitrogen cylinder pressure is approximately 2350 psi. Do not use a nitrogen cylinder without using a pressure regulator.

Use of oxygen may cause an explosion that could cause serious injury or death to personnel. Do not use oxygen in or around a refrigerant system.

3. Connect an ohmmeter across cutout switch terminals.
 - Ohmmeter will indicate continuity with switch closed.
4. Set nitrogen pressure regulator (Figure 1, Item 2) to setting higher than cutout point for switch under test (469 \pm 10 psi is cutout for HP1 or 348 \pm 10 psi is cutout for HP2).
 - Ohmmeter will show no continuity when switch is open.
 - If either switch fails to open, or opens before reaching cutout point, switch is defective. Replace switch per this WP.
5. Close dry nitrogen cylinder valve (Figure 1, Item 1).
6. Open bleed-off valve (Figure 1, Item 5).
 - For HP1, ohmmeter will show continuity when switch closes at 350 \pm 10 psi.
 - For HP2, ohmmeter will show continuity when switch closes at 312 \pm 10 psi.
 - If either switch closes before reaching cut-in point or does not close, switch is defective. Replace switch per this WP.
7. Disconnect switch from dry nitrogen cylinder.
8. Install applicable high pressure cutout switch in accordance with Replace paragraph.

END OF TASK

REPLACE

Replace either high pressure cutout switch, HP1 and HP2, as follows:

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

NOTE

There are two high pressure cutout switches attached to the compressor. One of the switches is green in color (HP1) and is installed close to the compressor. The second high pressure cutout switch is red in color (HP2) and is installed adjacent to HP1. HP2 is utilized as a high pressure cycling switch when the refrigeration unit is being operated in heat mode.

In order to ease removal of HP1, removal of HP2 is required first. This task will provide you with instructions for removing and replacing both HP1 and HP2 simultaneously.

1. Pump refrigeration unit down (WP 0032, Service).
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

NOTE

The compressor must be isolated in order to replace high pressure cutout switch. This can be accomplished by frontseating (closing) both compressor service valves.

3. Frontseat (close) compressor suction service valve (Figure 2, Item 7) by turning clockwise until it stops.
4. Frontseat (close) compressor discharge service valve (Figure 2 Item 8) by turning clockwise until it stops.
5. Slowly release compressor pressure through service valve gauge ports.
6. Disconnect electrical connector (Figure 2, Item 1) from high pressure cutout switch 2 (HP2) (Figure 2, Item 2).
7. Disconnect electrical connector (Figure 2, Item 5) from high pressure cutout switch 1 (HP1) (Figure 2, Item 6).
8. Remove HP2 (Figure 2, Item 2) from elbow (Figure 2, Item 3).
9. Remove HP1 (Figure 2, Item 6) from tee (Figure 2, Item 4).

REPLACE – CONTINUED

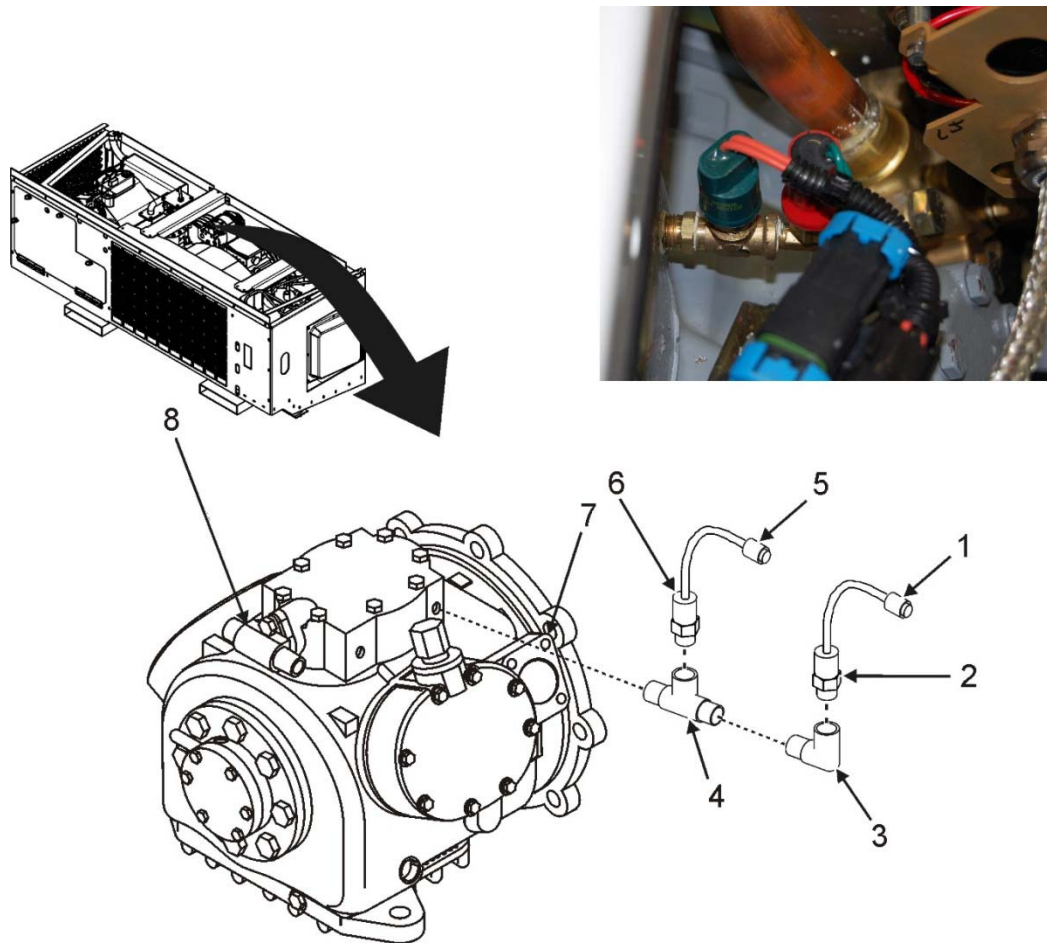


Figure 2. HP1 and HP2.

NOTE

It is necessary to verify replacement cutout switch settings before installing it. Perform the high pressure switch test in accordance with instruction provided in this WP before installing the switch.

10. Perform high pressure cutout switch test on new HP1 and HP2 in accordance with Test paragraph in this WP.
11. Install tested switch HP1 (Figure 2, Item 6) into tee (Figure 2, Item 4) and tighten 1/4-turn past hand tight.
12. Install tested switch HP2 (Figure 2, Item 2) into elbow (Figure 2, Item 3) and tighten 1/4-turn past hand tight.

REPLACE – CONTINUED

13. HP2 – Reconnect electrical connectors (Figure 2, Item 1 and Item 5) to switches (Figure 2, Item 2 and Item 6).
14. Perform evacuation and dehydration (WP 0032, Service).
15. Fully backseat (open) compressor suction (Figure 2, Item 7) and discharge valves (Figure 2, Item 8).
16. Install top-middle panel (WP 0031, Install).
17. Connect battery negative (-) terminal (WP 0070, Reconnect).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
COMPRESSOR SENSORS
REPLACE, TEST

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Pail, Utility (Metal) (WP 0107, Item 34)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Tie Wrap (WP 0110, Item 55)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0032
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Top-middle panel and right side removed (WP 0031)

REPLACE**Compressor Discharge Temperature Sensor****WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Disconnect electrical connector (Figure 1, Item 1) from Compressor Discharge Temperature (CDT) sensor (Figure 1, Item 2). Cut tie wraps as necessary.
2. Remove CDT sensor (Figure 1, Item 2) from compressor (Figure 1, Item 3).
3. Install new CDT sensor (Figure 1, Item 2) to compressor (Figure 1, Item 3).
4. Reconnect electrical connector (Figure 1, Item 1) to CDT sensor (Figure 1, Item 2). Install tie wraps as necessary.
5. Install top-middle panel (WP 0031, Install).

REPLACE – CONTINUED

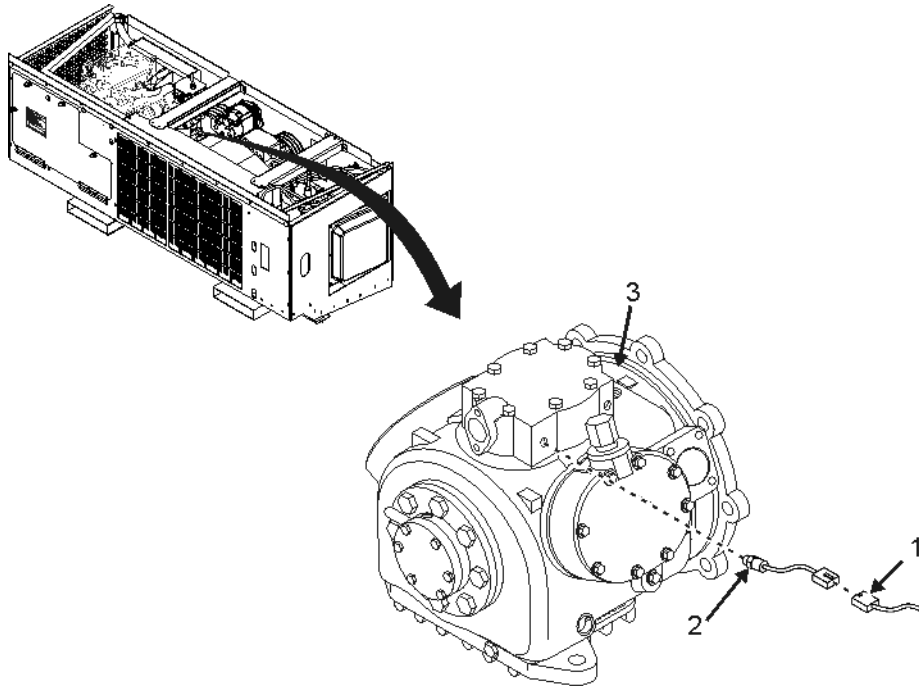


Figure 1. Compressor Discharge Temperature Sensor.

Suction Pressure Transducer

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Disconnect electrical connector (Figure 2, Item 1) from suction pressure transducer (Figure 2, Item 2).

CAUTION

Remove only the suction pressure transducer.

NOTE

The suction pressure transducer has an internal Schrader valve that will prevent refrigerant from escaping the compressor when the transducer is removed.

2. Unscrew suction pressure transducer (Figure 2, Item 2) from Schrader valve (Figure 2, Item 3).

REPLACE – CONTINUED

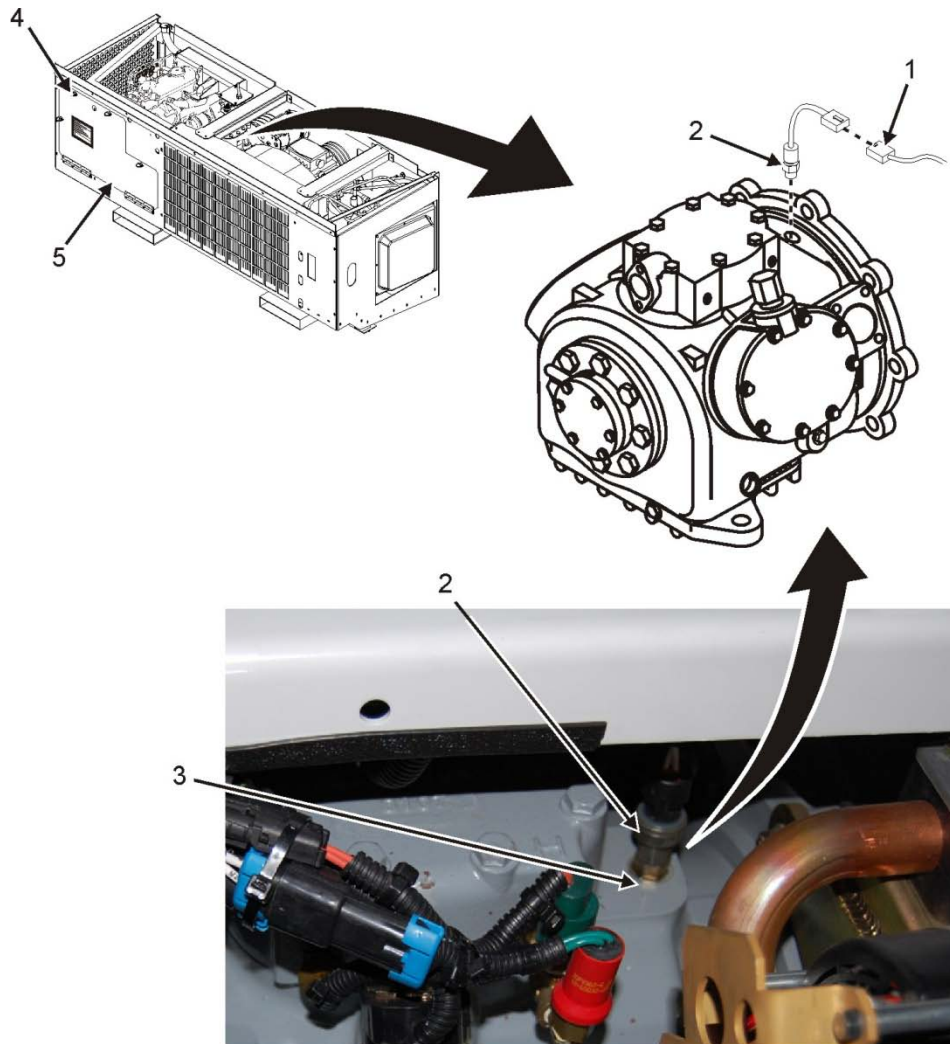


Figure 2. Suction Pressure Transducer.

NOTE

Before installing the replacement suction pressure transducer, it must be calibrated. Calibration of the suction pressure transducer cannot be accomplished if the run relay is energized. The following steps will allow you to calibrate the transducer while the run relay is de-energized.

Calibration of the transducer must be accomplished at atmospheric pressure (0.0 psig or 14.7 psia). If the sensor reading is greater than 20 psig (34.7 psia) or less than -6.7 psig (8 psia), the transducer cannot be calibrated.

3. Rotate four quarter-turn fasteners (Figure 2, Item 4) securing front panel assembly access cover (Figure 2, Item 5) closed and lower cover.

REPLACE – CONTINUED**NOTE**

Disconnecting the starter solenoid wire and allowing the diesel engine to fail at an attempted start will cause the run relay to de-energize.

4. Disconnect starter solenoid wire (Figure 3, Item 1) from starter (Figure 3, Item 2).

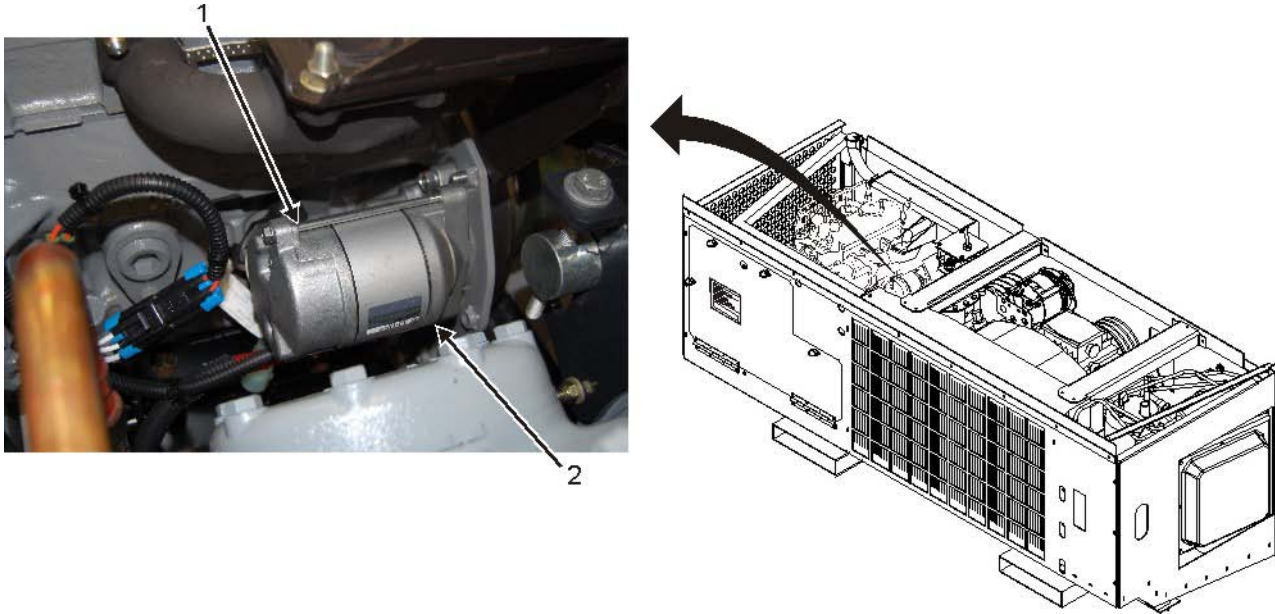


Figure 3. Starter Solenoid Wire.

5. Attempt to start refrigeration unit in diesel engine drive mode (WP 0005, Operating Procedures).
 - Engine will fail to start and cause run relay to de-energize.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

6. Access top of MTRCS using roof access provided.
7. Connect electrical connector (Figure 2, Item 1) to new suction pressure transducer (Figure 2, Item 2), but do not install into compressor at this time.
8. Climb off of MTRCS using roof access provided.
9. On microprocessor display panel (Figure 4, Item 1), press UNIT DATA key (Figure 4, Item 2) until SUCT (or CD1 if using coded display) is shown in display (Figure 4, Item 3). Immediately press and hold ENTER key (Figure 4, Item 4) for three seconds.
 - Display should read 0. If display does not read 0, press and hold ENTER key for three seconds again. If display still does not read 0, replace suction pressure transducer.

REPLACE – CONTINUED

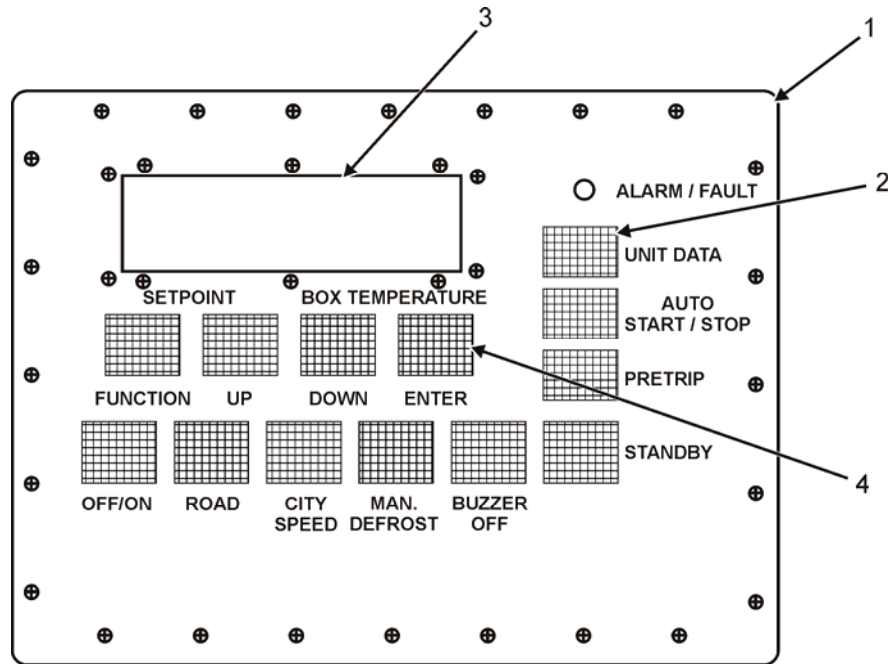


Figure 4. Microprocessor Controller Display.

10. Access top of MTRCS using roof access provided.
11. Reconnect starter solenoid wire (Figure 3, Item 1) onto starter (Figure 3, Item 2).
12. Install calibrated suction pressure transducer (Figure 2, Item 2) into compressor (Figure 2, Item 3).
13. Reconnect electrical connector (Figure 2, Item 1) to suction pressure transducer (Figure 2, Item 2).
14. Install top-middle panel (WP 0031, Install).
15. Raise front panel assembly access cover (Figure 2, Item 5) and secure to front panel assembly using four quarter-turn fasteners (Figure 2, Item 4).

END OF TASK

TEST

Compressor Discharge Temperature Sensor

1. Remove CDT sensor (Figure 1, Item 2) per this WP.
2. Set multimeter to check for ohms.
3. Place sensor in bucket of ice water. Stir rapidly.

NOTE

Due to variations and inaccuracies in ohmmeters, thermometers or other test equipment, a reading within 2% +/- variance of the chart value would indicate a good sensor.

4. Measure ohms and convert to temperature using Table 1.
 - Ohms reading should read about 327,000 or 32°F (0°C). If not, replace CDT sensor per this WP.
 - If ohms reading is within allowable limits, continue to step 5.

Table 1. Resistance Chart (CDT).

Temperature		Resistance	Temperature		Resistance
°F	°C	OHMS	°F	°C	OHMS
-20	-28.9	1,653,000	100	37.8	58,000
-10	-23.3	1,178,000	125	51.7	34,690
0	-17.8	855,000	150	65.6	20,110
10	-12.2	624,000	175	79.4	12,970
20	-6.7	463,000	200	93.3	8,355
30	-1.1	345,000	225	107.2	5,605
32	0	327,000	212	100	7,000
40	4.4	262,000	250	121.1	3,793
50	10	199,000	275	135.6	2,650
60	15.6	153,000	300	149.4	1,895
70	21.1	119,000	325	163.3	1,358
80	26.7	93,000	350	177.8	1,202
90	32.2	73,000			

TEST – CONTINUED**NOTE**

Water boils at a lower temperature at high altitudes, therefore, the ohms reading may be slightly higher at high elevations.

5. Place CDT sensor in bucket of boiling water.
6. Dry sensor before re-installing sensor if it will be re-installed.
7. Measure ohms and convert to temperature using Table 1.
 - Ohms reading should read about 7,000 or 212°F (100°C). If not, replace CDT sensor per this WP.
 - If ohms reading is within allowable limits, CDT sensor is functioning properly; continue to step 8.
8. Reinstall CDT sensor (Figure 1, Item 2) per this WP.

Suction Pressure Transducer**WARNING**

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

1. Start refrigeration unit and operate in cool mode (WP 0005, Operating Procedures).
2. On microprocessor display panel (Figure 4, Item 1), press UNIT DATA key (Figure 4, Item 2) until SUCT (or CD1 if using coded display) is shown in display (Figure 4, Item 3). Immediately press and hold ENTER key (Figure 4, Item 4) for three seconds.
 - Display should read 0. If display does not read 0, press and hold ENTER key for three seconds again. If display still does not read 0, replace suction pressure transducer.
3. Shut down refrigeration unit (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE**CONDENSER COIL
INSPECT, SERVICE****INITIAL SETUP:****Tools and Special Tools**

Brush (WP 0107, Item 21)
 Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Pail, Utility (Plastic) (WP 0107, Item 14)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Detergent, General Purpose (WP 0110, Item 35)
 Hose (WP 0110, Item 25)
 Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0101

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Front panel assembly removed (WP 0031)
 Top-middle panel removed (WP 0031)
 Top-left panel removed (WP 0031)

INSPECT**NOTE**

The engine radiator is in front of the condenser coil and will be inspected and cleaned with the coil.

1. Inspect front of condenser coil (Figure 1, Item 1) for damage to fins, tubes, radiator, and any evidence of leaks.
 - If fins are folded over significantly enough to obstruct air flow, carefully straighten fins using a fin comb.
 - If there is evidence of coolant leaking from radiator, notify next level of maintenance.

WARNING

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

2. Gain access to top of MTRCS using roof access.
3. Place emergency stop switch in PUSH TO STOP position.
4. Inspect rear of condenser coil (Figure 1, Item 1) for damage to fins, tubes, obstructions, and any evidence of leaks.
 - If fins are folded over significantly enough to obstruct air flow, carefully straighten fins using a fin comb.
 - If there is evidence of refrigerant leaking, repair or replace piping (WP 0101).

INSPECT – CONTINUED

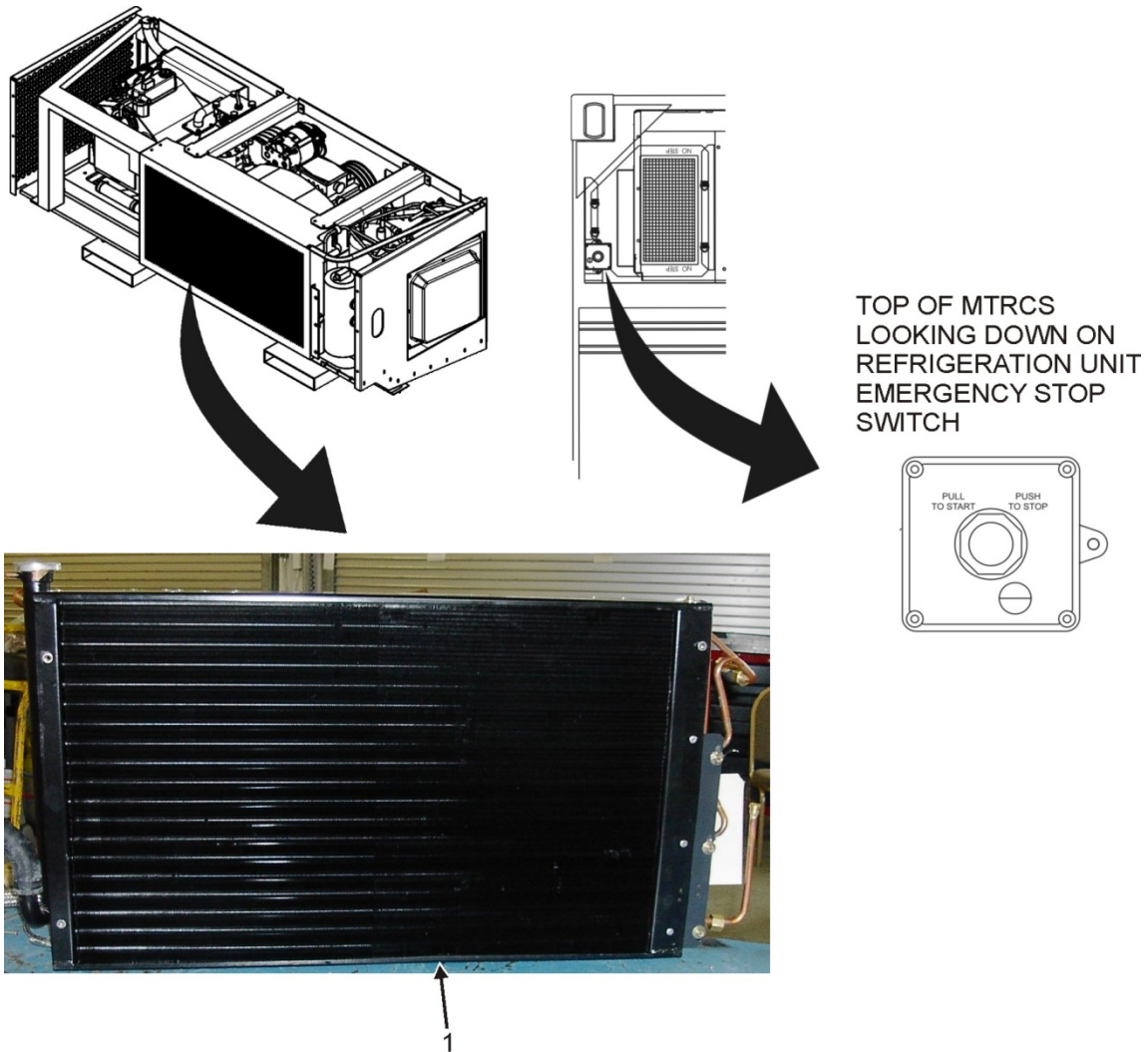


Figure 1. Condenser Coil Location.

5. Install top-middle panel (WP 0031, Install).
6. Install top-left panel (WP 0031, Install).
7. Place emergency stop switch in PULL TO START position.
8. Exit MTRCS roof using roof access.
9. Install front panel assembly (WP 0031, Install).
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

SERVICE**WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Gain access to top of MTRCS using roof access.

WARNING

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

2. Place emergency stop switch in PUSH TO STOP position.
3. Exit top of MTRCS.

WARNING

Detergent may cause irritation to eyes and skin. Wear eye protection and gloves when using detergent.

4. Make cleaning solution by mixing small amount of commercial detergent and water in utility pail.
5. Pour cleaning solution down over condenser coil (Figure 1, Item 1) and radiator to loosen dirt.

CAUTION

When using a brush to clean the coil and radiator, always work in the direction of the fins and never across them. This will allow cleaning between the fins and prevent folding them over.

NOTE

Use low pressure air (< 50 psi) to blow across coils if available from inside of radiator towards the outside of the radiator.

6. Use brush, if necessary, to remove any accumulated dirt or residue from condenser coil (Figure 1, Item 1) and radiator.

SERVICE – CONTINUED**CAUTION**

Condenser coil and radiator cooling fins can be damaged by excessive water pressure. Never use a pressure washer to clean any cooling coil.

7. Use a hose and clean water source to rinse the radiator and condenser coil (Figure 1, Item 1).
8. Gain access to top of MTRCS using roof access.
9. Place emergency stop switch in PULL TO START position.
10. Install top-middle panel (WP 0031, Install).
11. Install top-left panel (WP 0031, Install).
12. Exit top of MTRCS.
13. Install front panel assembly (WP 0031, Install).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
COMPRESSOR PRESSURE REGULATING VALVE
ADJUST

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
Gloves, Rubber (WP 0110, Item 21)

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)
Refrigeration Equipment
Tool Kit (supplement) (WP 0107, Table 2, Item 7)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0031
WP 0032

Equipment Condition

Refrigeration unit shut down (WP 0005)
Top-middle panel removed (WP 0031)
Top-left panel removed (WP 0031)

ADJUST

Perform the following steps to adjust the compressor pressure regulating valve.

NOTE

The compressor pressure regulating valve is pre-set at the factory before it is shipped. Adjustment of the valve, in normal circumstances, should not be required. If a condition arises that would require adjustment of the pressure regulating valve, perform the steps in this WP.

When performing an adjustment to the compressor pressure regulating valve, the refrigeration unit must be running in the high heat or defrost mode to make sure that suction pressure is above the proper compressor regulating valve setting.

1. Install manifold gauge set (WP 0032, Service).

WARNING

Rotating parts and drive belts are present in the refrigeration unit. Extreme care must be taken when servicing the unit during operation to avoid personal injury. Make sure gauge hoses do not interfere with maintenance operations.

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

2. Start MTRCS and operate in high heat or defrost mode (WP 0005, Operating Procedures).
3. Remove cap (Figure 1, Item 1) from compressor pressure regulating valve.

ADJUST – CONTINUED

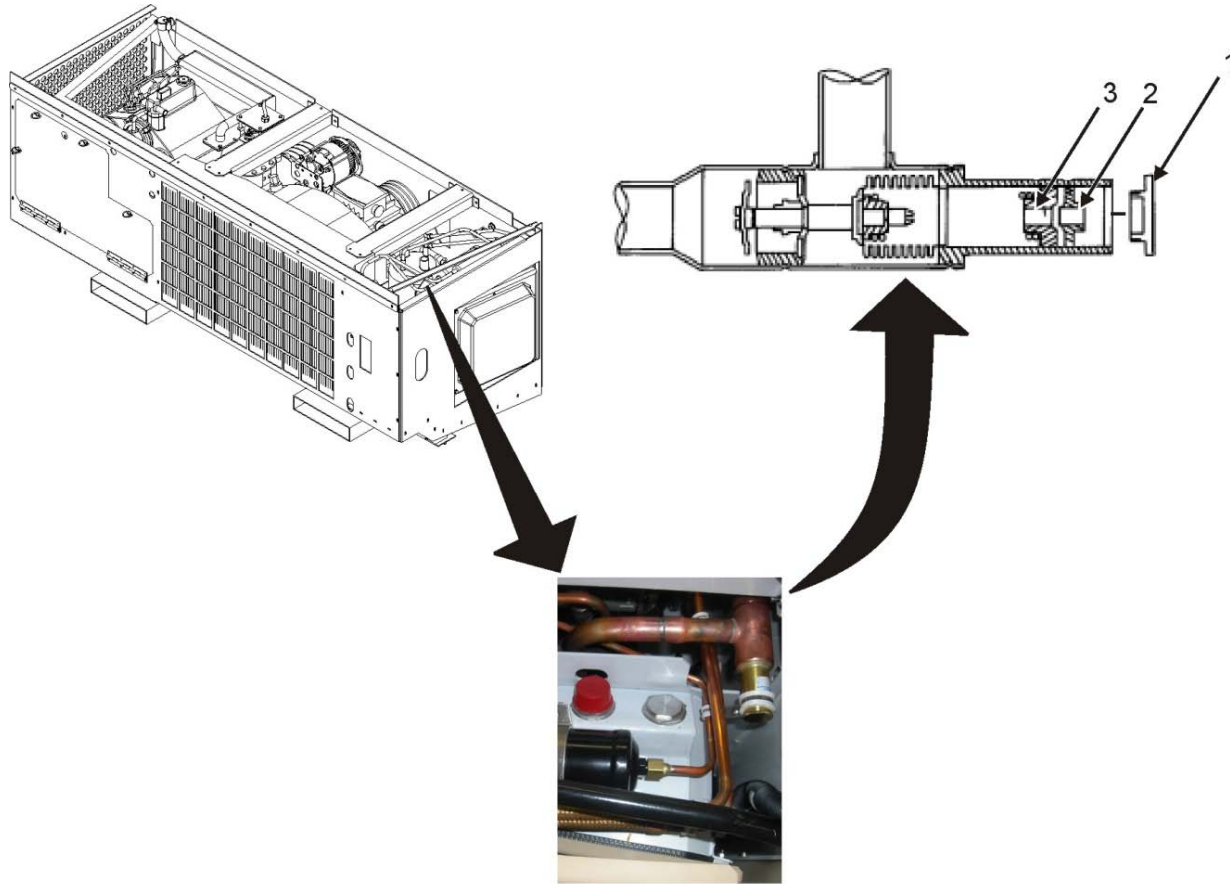


Figure 1. Compressor Pressure Regulating Valve Adjustment.

NOTE

When adjusting the compressor regulating valve set screw, turn the set screw in a clockwise direction to raise the suction pressure, and turn the set screw in a counterclockwise direction to lower the suction pressure.

When jam nut is loosened, hex wrench will slip through jam nut and into adjustment set screw.

4. Loosen (approximately one turn) compressor pressure regulating valve jam nut (Figure 1, Item 2) using 8mm hex wrench to access set screw (Figure 1, Item 3).
5. Carefully use 8mm hex wrench to adjust set screw (Figure 1, Item 3) on compressor regulating valve in proper direction in order to achieve desired pressure setting of 26 ± 1 psig.
6. Remove hex wrench from set screw (Figure 1, Item 3).

ADJUST – CONTINUED**NOTE**

If refrigerant charge is not sufficient, it will have to be serviced to complete this task.
Refrigeration servicing can be found in WP 0032.

7. Tighten compressor pressure regulating valve jam nut (Figure 1, Item 2) against set screw (Figure 1, Item 3) with 8mm hex wrench.
8. Verify pressure (26 ± 1 psig) by reading low side of manifold gauge.
9. Shut down refrigeration unit (WP 0005, Operating Procedures).
10. Close discharge and suction service valves.
11. Replace cap (Figure 1, Item 1) on compressor pressure regulating valve.
12. Remove manifold gauge set (WP 0032, Service).
13. Install top-middle panel (WP 0031, Install).
14. Install top-left panel (WP 0031, Install).
15. Place MTRCS back into normal operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
REFRIGERATION UNIT DIESEL ENGINE
SERVICE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Materials/Parts

Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005

WP 0031

WP 0042

WP 0044

Equipment ConditionRefrigeration unit shut down and cool (WP 0005)
Top-right panel removed (WP 0031)

SERVICE**WARNING**

The diesel engine, surrounding components, and engine fluids become very hot after a short operating time. Make sure engine is cool before performing maintenance. Failure to comply can cause serious injury or burns to personnel.

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Access top of MTRCS using roof access provided.
2. Remove engine oil dip stick (Figure 1, Item 1) and wipe oil from indicator end with cleaning rag.
3. Install dip stick (Figure 1, Item 1) so it is completely seated in engine, then pull it out again to check oil level.

NOTE

The diesel engine has an oil capacity of 11 quarts.

4. If oil level is below safe operation mark, add appropriate oil as necessary (WP 0042, Service).
5. Install dip stick (Figure 1, Item 1) so it is completely seated in engine.
6. Check that coolant level is between minimum and maximum ribbed marks on engine coolant reservoir (Figure 1, Item 2). If coolant level is low, add coolant (WP 0044, Service).

SERVICE – CONTINUED

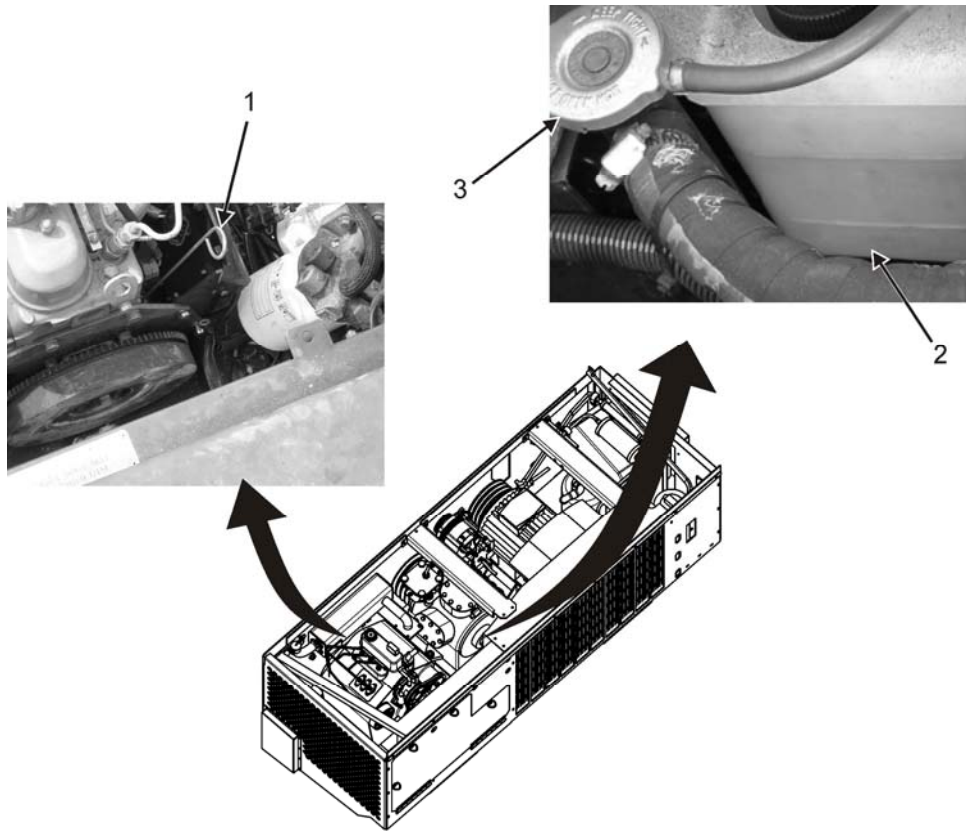


Figure 1. Engine Oil Dipstick, Radiator Overflow, and Cap.

NOTE

The white plastic engine coolant reservoir tank is marked with minimum and maximum rib marks visible from the outside. Proper coolant level will be indicated when between the two ribbed markings.

7. Carefully check that engine radiator is cool to the touch.

WARNING

The engine coolant system is under pressure when the engine is hot. Removing the radiator cap when the engine is hot can cause hot coolant to spew from the cap causing scald injury. Do not remove radiator cap when engine is hot.

8. Slowly loosen radiator cap (Figure 1, Item 3) by turning counterclockwise to safety stop tabs.
9. Wait until any remaining pressure is released, then push cap down and continue turning to remove it.

SERVICE – CONTINUED

10. Inspect gasket on radiator cap (Figure 1, Item 3). Replace cap if damaged.
11. Install radiator cap (Figure 1, Item 3) by pushing down and rotating clockwise until locked in place by safety stop tabs.
12. Install top-right panel (WP 0031, Install).
13. Exit top of MTRCS using roof access provided.
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

**SERVICE MAINTENANCE
OIL FILTER
REPLACE**

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)
Gloves, Rubber (WP 0110, Item 21)
Shield, Face (WP 0110, Item 20)
Spill Kit (WP 0110, Item 49)

Materials/Parts

Drip Pan (WP 0109)
Tie Wrap (WP 0110, Item 55)
Oil (WP 0110, Item 28, Item 30, or Item 31)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
WP 0031
WP 0043
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Top-right panel removed (WP 0031)
External electric power disconnected (WP 0005)

REPLACE**Drain Engine Oil****WARNING**

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

1. If engine is cold, perform engine start, run for five minutes, and perform engine shutdown in order to warm oil (WP 0005, Operating Procedures).
2. Disconnect negative (-) terminal from battery (WP 0070, Disconnect).
3. Remove drain hose (Figure 1, Item 1) from clamps on refrigeration unit.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

4. Access top of MTRCS using roof access provided.

REPLACE – CONTINUED

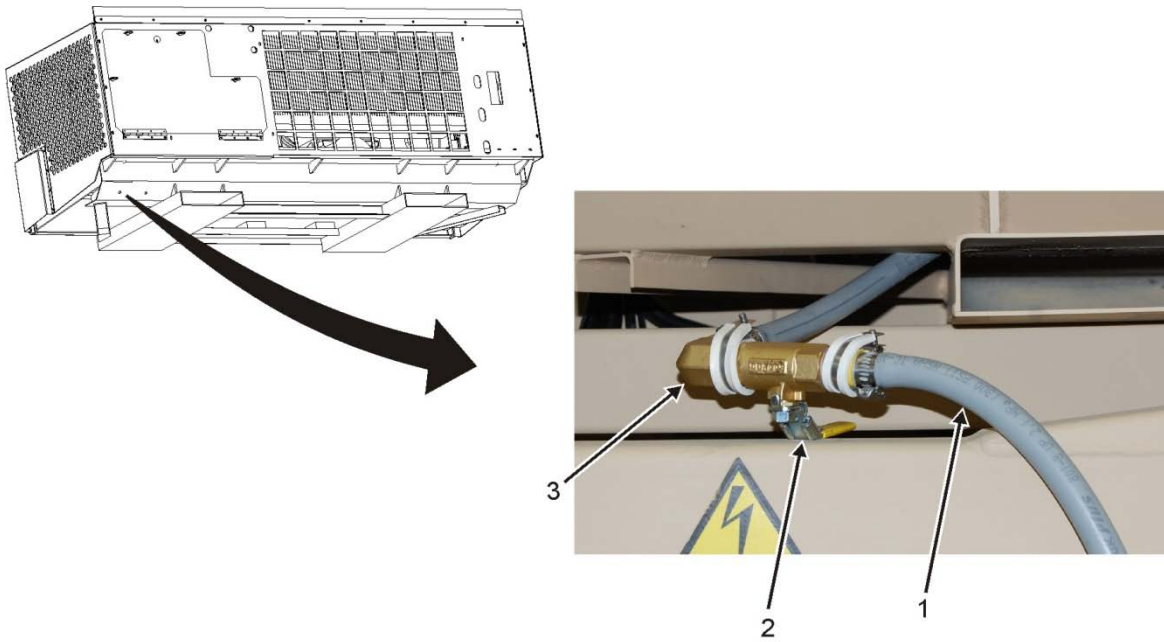


Figure 1. Engine Oil Drain Hose Unclamped.

5. Remove engine oil dipstick (Figure 2, Item 1) from engine.

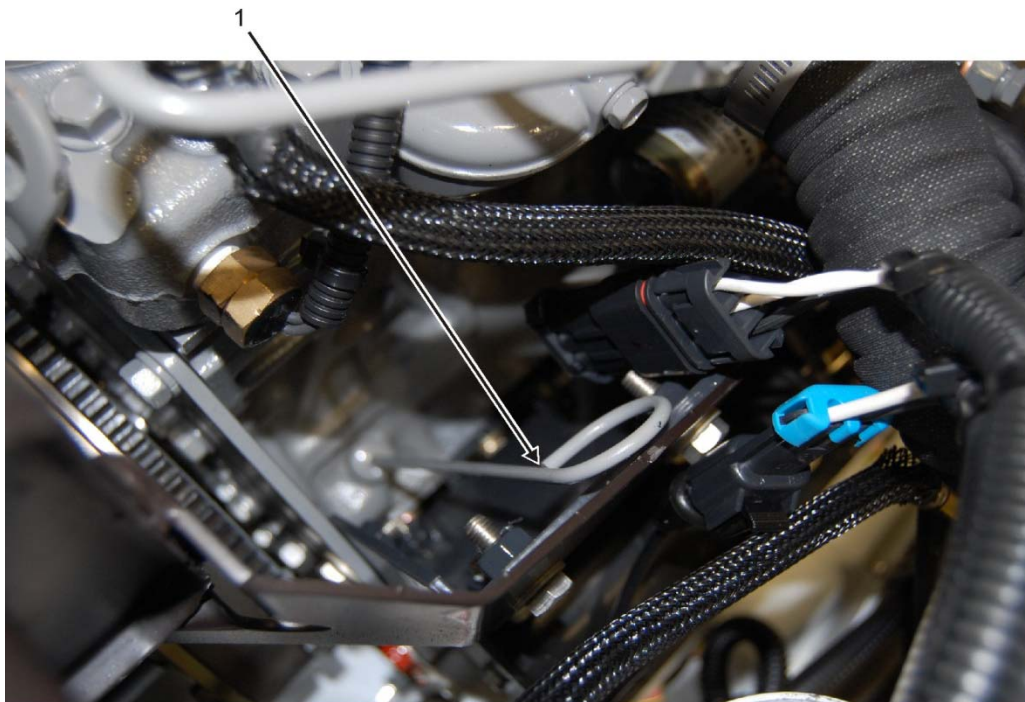


Figure 2. Engine Oil Dipstick.

REPLACE – CONTINUED

6. Place oil drip pan under engine oil drain hose (Figure 1, Item 1).

WARNING

Engine oil temperature rises quickly becoming extremely hot. Hot engine oil can cause severe burns to personnel. Wear proper protective clothing when working with hot fluid.

Engine oil can cause severe skin irritation and burns. Do not work with engine oil products without wearing rubber gloves.

CAUTION

Use a spill mat to keep any excess spillage from falling onto battery and other components.

7. Open engine oil drain line valve handle (Figure 1, Item 2) by positioning handle parallel with valve (Figure 1, Item 3).

NOTE

The engine oil drain valve has a locking mechanism. The valve is closed when the handle is positioned 90° out from the valve itself. When the handle is parallel with the valve, the valve is open.

8. Drain all oil from engine into oil drip pan.
9. Close oil drain valve by positioning handle (Figure 1, Item 2) 90° (perpendicular) to drain valve (Figure 1, Item 3).
10. Wipe up any spilled oil with rags.
11. Discard old oil and oily rags in accordance with unit SOP.
12. Install drain hose (Figure 1, Item 1) back into clamps on refrigeration unit.
13. Perform Replace Oil Filter task in accordance with this WP.

REPLACE – CONTINUED**Replace Oil Filter**

1. If not already accomplished, perform Drain Engine Oil in accordance with this WP.
2. Remove right-side panel if not already accomplished (WP 0031, Remove).

WARNING

The oil filter can hold nearly one quart of potentially hot oil. Spilling oil from the filter can cause severe burns. Use care when removing and disposing of hot oil filter and oil.

NOTE

Two filters are visible from the unit right side. The oil filter is the more accessible filter located toward the front. The other filter is the fuel filter.

3. Rotate oil filter (Figure 3, Item 1) in counterclockwise direction and remove filter from oil pump stem being careful that it does not tip and spill oil onto your hand.
4. Drain oil from removed filter (Figure 3, Item 1) by turning upside down over drip pan.
5. Wipe up any spilled oil with rags.
6. Discard old oil, oil filter, and oily rags in accordance with unit SOP.

CAUTION

The replacement oil filter will not have any oil inside of it. The oil filter must be filled with oil before it is installed onto the engine oil pump stem. Failure to fill the replacement oil filter will cause the engine to operate for a period of time without oil supply to the bearings and will result in damage to the engine.

7. Fill replacement oil filter (Figure 3, Item 1) with oil until approximately 3/4 full.
8. Place light amount of oil around entire surface of oil filter gasket (Figure 3, Item 2).
9. Install replacement oil filter on oil pump stem and turn in clockwise direction until seated.
10. Turn oil filter an additional 1/4-turn after hand tight.
11. Perform Add Engine Oil in accordance with this WP.

REPLACE – CONTINUED

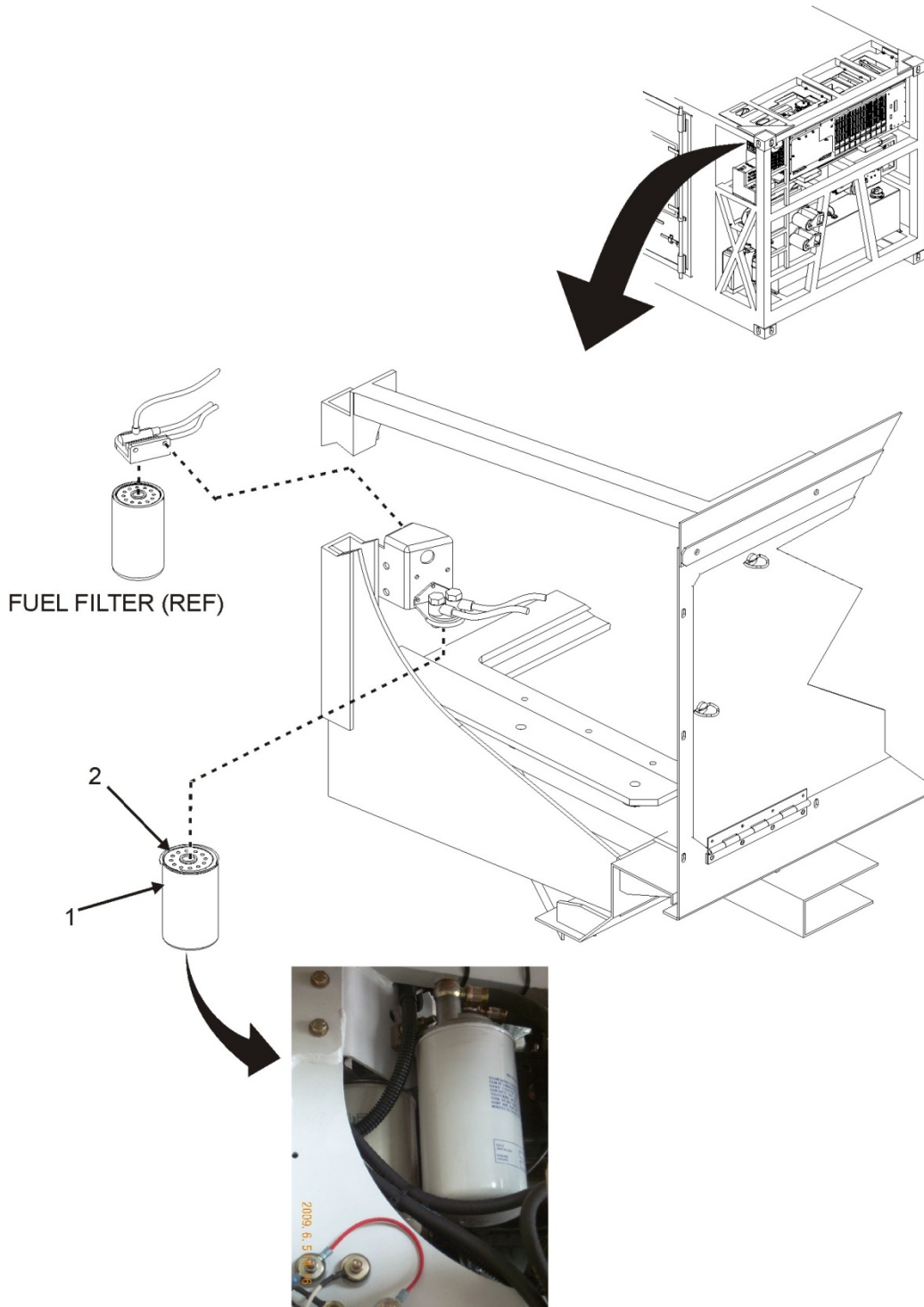


Figure 3. Engine Oil Filter.

REPLACE – CONTINUED

Add Engine Oil

1. Make sure engine oil drain valve handle (Figure 1, Item 2) is closed by checking that handle is 90° (perpendicular) to drain valve (Figure 1, Item 3).
2. Select correct type SAE engine oil in accordance with Table 1.

Table 1. Lube Oil Viscosity.

Outdoor Temperature		SAE	Specification
Fahrenheit	Celsius		
Below 32°	Below 0°	10W or 15W40	MIL-L-2104
32° to 77°	0° to 25°	20W or 15W40	MIL-L-46152
Over 77°	Over 25°	30W or 15W40	A-A-52039

3. Remove oil filler cap (Figure 4, Item 1) by turning counterclockwise from cylinder head cover.

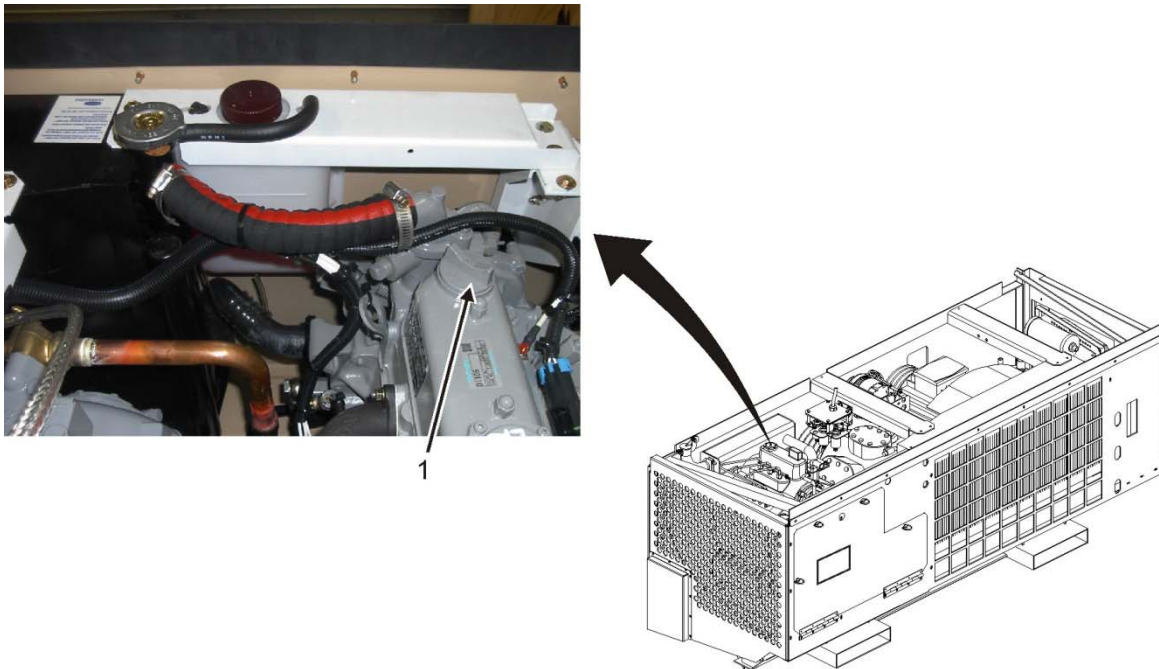


Figure 4. Engine Oil Filler Cap.

REPLACE – CONTINUED

4. Remove engine oil dipstick (Figure 2, Item 1).
5. Open one quart of required engine oil.

NOTE

When adding engine oil into cylinder head, make sure to pour the oil in a slow and constant manner. Pouring oil too quickly can cause oil spillage onto the cylinder head and/or engine block.

6. Insert small end of oil spout or funnel into cylinder head (Figure 4, Item 1) cover and slowly pour oil into cylinder head cover.
7. Remove oil spout or funnel from engine cylinder head cover.
8. Repeat steps 5 through 7 of this procedure until 9 quarts of oil have been added to the engine cylinder head cover.
9. Reinstall engine oil dipstick (Figure 2, Item 1) to check oil level.

NOTE

It will be necessary to wipe the engine oil dipstick clean, then reinsert it and remove it again in order to check the engine oil level.

10. After adding 9 quarts of oil, remove engine oil dipstick (Figure 2, Item 1) and determine that engine oil level is in safe operating zone. Add additional oil as required.
11. Replace engine oil dipstick (Figure 2, Item 1) and make sure it is fully seated.
12. Replace oil filler cap (Figure 4, Item 1) in cylinder head cover and hand tighten in clockwise direction.
13. Exit top of MTRCS using roof access provided.
14. Reconnect battery negative (-) terminal (WP 0070, Reconnect).

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

15. Perform engine start and allow engine to run for 5 minutes (WP 0005, Operating Procedures).

NOTE

If leaks are detected, be sure that the engine oil drain valve handle is fully closed and oil filter is hand tight.

16. Check for leaks around oil filter (Figure 3, Item 1) and drain valve (Figure 1, Item 3).
 - If a leak is detected around oil filter, attempt to tighten oil filter an additional 1/4-turn.
 - If a leak is detected around drain valve, be sure handle is 90° (perpendicular) to drain valve.
17. Perform engine stop (WP 0005, Operating Procedures).

REPLACE – CONTINUED**NOTE**

It will be necessary to wipe the engine oil dipstick clean, then reinsert it and remove it again in order to check the engine oil level.

18. Check engine oil level by removing engine oil dipstick (Figure 2, Item 1) and checking that engine oil level indicates in safe operating zone.
19. Add additional oil as required to bring engine oil level to safe zone.
20. Install top-right panel (WP 0031, Install).
21. Install right-side panel (WP 0031, Install).
22. Install battery cover (WP 0070, Install).
23. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

**SERVICE MAINTENANCE
FUEL FILTER
REPLACE**

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)
 Gloves, Rubber (WP 0110, Item 21)
 Shield, Face (WP 0110, Item 20)
 Spill Kit (WP 0110, Item 49)

Materials/Parts

Filter Element, Fluid (Oil Filter) (WP 0111, Item 4)
 Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
 WP 0031
 WP 0042
 WP 0070
 EPA Regulation 40 CFR 300
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Right-side panel removed (WP 0031)
 Top-right panel removed (WP 0031)

Front panel assembly removed (WP 0031)

REPLACE**NOTE**

The fuel filter is located at the rear of the engine behind the oil filter.

1. Make sure external electrical power is disconnected and cables are secured.
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

NOTE

Replacing fuel filter will require removal and replacement of the engine oil filter. The engine oil does not have to be drained in order to complete this task. Do not drain engine oil.

Two filters are visible from the unit right side. The oil filter is nearer to the side panel. The other filter is the fuel filter.

3. Rotate oil filter (Figure 1, Item 2) in counterclockwise direction and remove filter from oil pump stem being careful that it does not tip and spill oil.
4. Drain oil from filter by turning upside down over drain pan. Discard filter.
5. Wipe up any spilled oil with rags.

REPLACE – CONTINUED

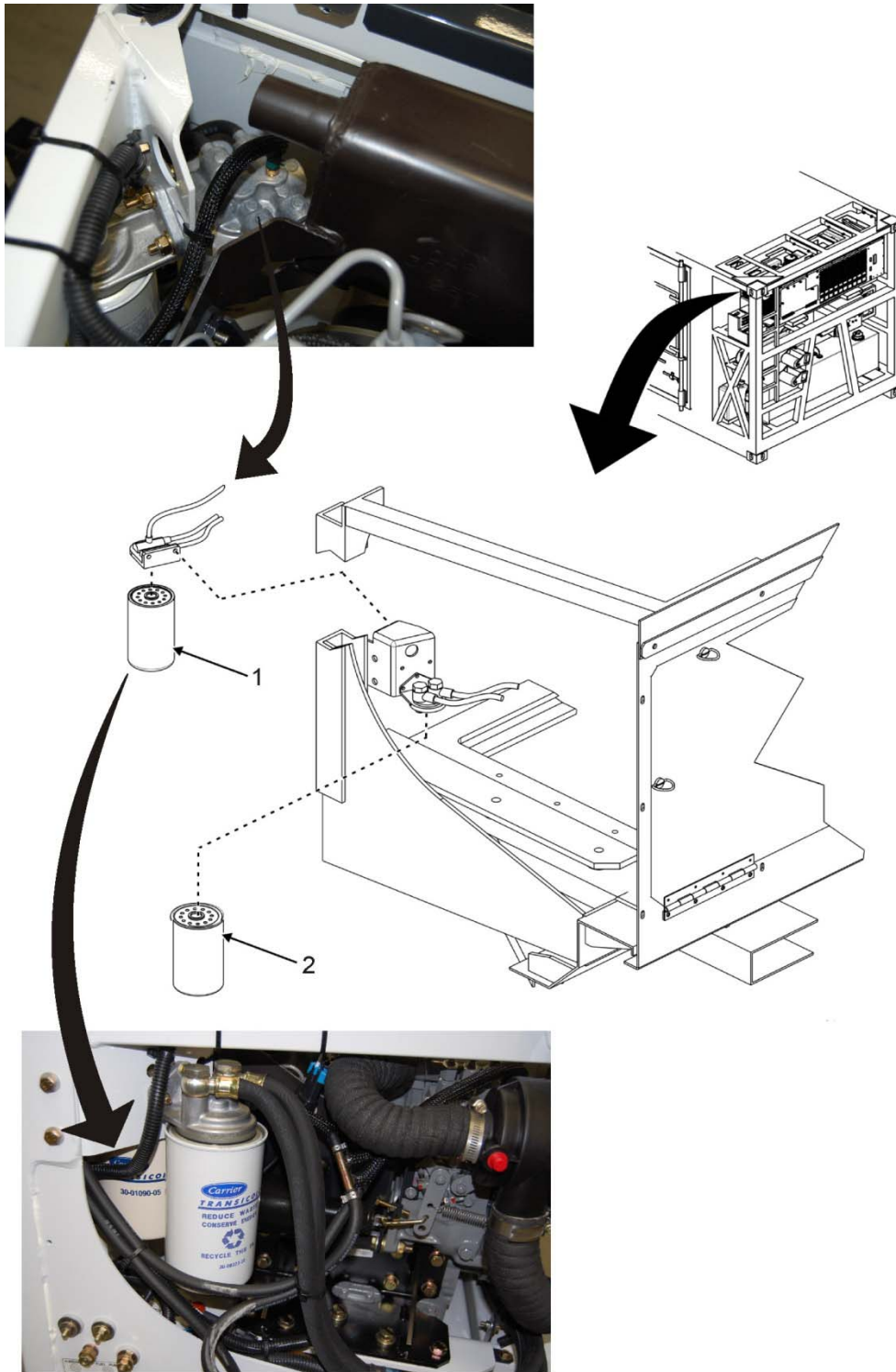


Figure 1. Replace Fuel Filter.

REPLACE – CONTINUED

6. Discard old oil and oily rags in accordance with unit SOP.

WARNING

The JP-8 and diesel fuel used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuel used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

7. Position absorbent material under fuel filter (Figure 1, Item 1) and unscrew filter from fuel head in a counterclockwise direction.
8. Wipe off any excess fuel that may have spilled during removal using cleaning rag.
9. Dispose of rag and fuel filter in accordance with unit SOP.
10. Install replacement fuel filter (Figure 1, Item 1) into fuel head and tighten by screwing in a clockwise direction.

CAUTION

The oil filter must be full of oil before it is installed onto the engine oil pump stem. Failure to fill the oil filter will cause the engine to operate for a period of time without oil supply to the bearings and will result in damage to the engine.

11. If necessary, fill oil filter with oil until approximately 3/4 full.
12. Place light amount of oil around entire surface of oil filter (Figure 1, Item 2) gasket.
13. Install replacement oil filter on oil pump stem and turn in clockwise direction until seated.
14. Turn oil filter an additional 1/4-turn after hand tight.
15. Connect battery negative (-) cable (WP 0070, Reconnect).

CAUTION

Oil filter contains approximately one quart of oil. Make sure oil level is correct prior to starting diesel engine.

NOTE

It may take two to three attempts to start engine after changing fuel filter. Fuel pump will eventually fill fuel filter and allow engine to start.

16. Check engine oil level (WP 0042).
17. Service engine oil as needed (WP 0042, Service).

REPLACE – CONTINUED**WARNING**

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

18. Start refrigeration unit and check for leaks (WP 0005, Operating Procedures).
19. Monitor operation for five minutes to verify no leaks are present.
20. Install top-right panel (WP 0031, Install).
21. Install right-side panel (WP 0031, Install).
22. Install front panel assembly (WP 0031, Install).

END OF TASK**END OF WORK PACKAGE**

**SERVICE MAINTENANCE
COOLING SYSTEM
SERVICE, REPAIR**

INITIAL SETUP:**Tools and Special Tools**

Funnel (WP 0109)
 Hose (WP 0110, Item 25)
 Pail (WP 0110, Item 35)
 SATS (WP 0107, Table 2, Item 8)
 Spill Kit (WP 0110, Item 49)
 Tester, Belt Tension (WP 0108, Table 2, Item 5)

Materials/Parts

Alcohol, Isopropyl (WP 0110, Item 2)
 Anti-Freeze, 50/50 Mixture (WP 0110, Item 3)
 Radiator Cleaner, Alkaline Based (WP 0110, Item 15)
 Scouring Pad (WP 0110, Item 40)
 Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
 WP 0031
 WP 0055
 WP 0102
 EPA Regulation 40 CFR 300
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down and cool
 for at least 30-minutes (WP 0005)
 Front panel assembly removed (WP 0031)
 Top-right panel removed (WP 0031)
 E-STOP switch in PUSH TO STOP position
 (WP 0005)

SERVICE

Service of the cooling system consists of draining, cleaning, flushing, and filling of cooling system. The following procedures should be followed in the order they are written to properly service cooling system.

Drain Cooling System**WARNING**

When removing the radiator cap, wait at least 30 minutes after the engine has stopped running and allowed to cool down. Failure to wait for engine to cool can cause coolant to gush out of the radiator and could result in serious burns. Wear protective clothing when working with radiator coolant systems.

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel (Figure 1, Item 1) to DOWN position.
2. When radiator (Figure 1, Item 3) is cool to touch, remove radiator cap (Figure 1, Item 4).
3. Drain engine block by positioning engine petcock drain hose (Figure 1, Item 6) in drain pail and opening engine petcock (Figure 1, Item 7).
4. Close engine petcock (Figure 1, Item 7).

SERVICE – CONTINUED

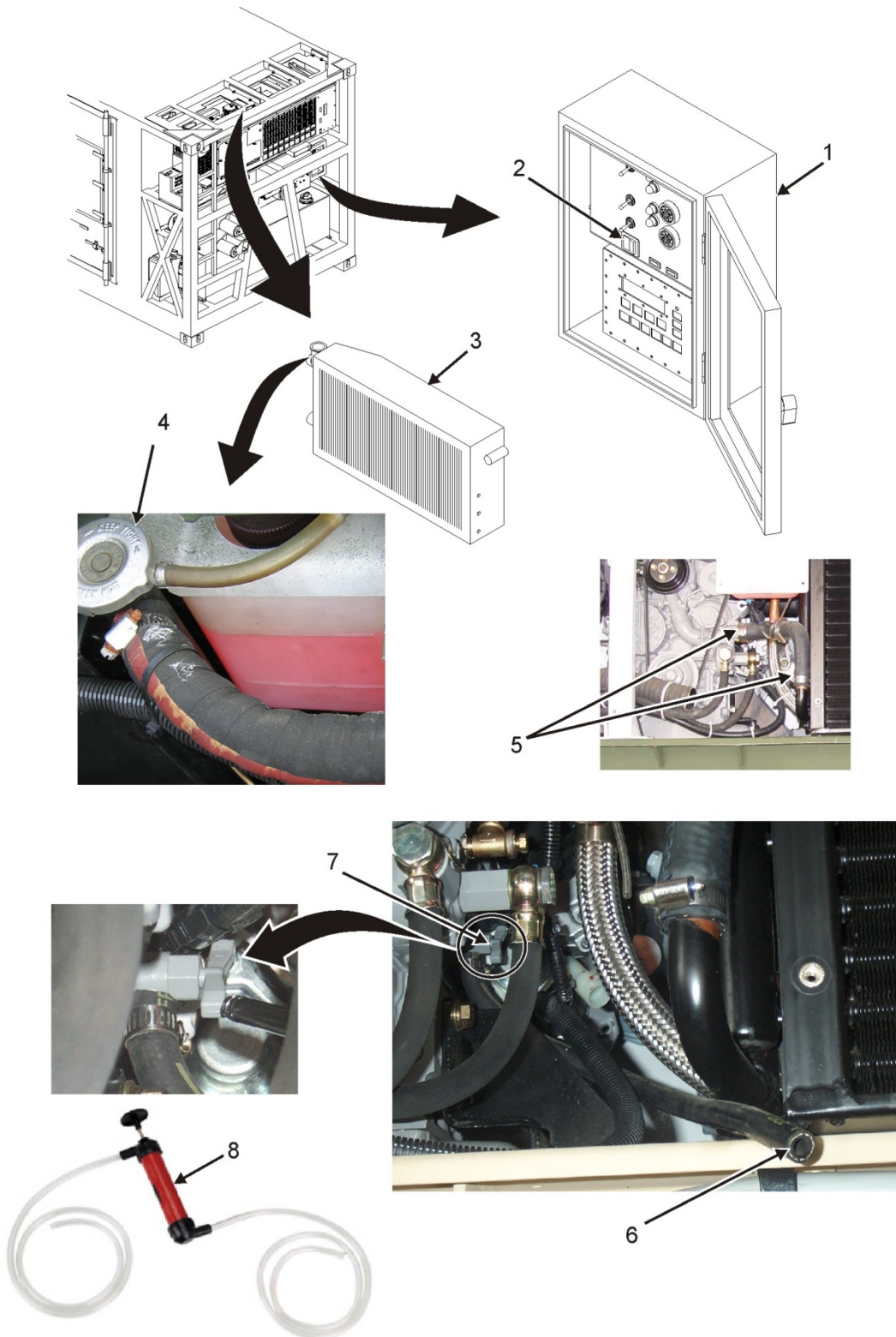


Figure 1. Drain Cooling System.

SERVICE – CONTINUED

5. Position drain pail or absorbent material suitable for collecting coolant under lower radiator hose (Figure 1, Item 5) at lower radiator connection.
6. Disconnect bottom end of lower radiator hose (Figure 1, Item 5) and position hose in drain pail.
7. Allow coolant to drain into pail.
8. Remove remaining coolant from radiator using hand pump (Figure 1, Item 8).
9. Reconnect bottom end of lower radiator hose (Figure 1, Item 5).
10. Dispose of coolant in accordance with SOP and EPA 40 CFR 300.

Clean Cooling System

1. Drain cooling system per this WP.
2. Fill cooling system with clean, untreated water.
3. Add approximately 6 ounces of alkaline-based radiator cleaner to cooling system.
4. Install radiator cap (Figure 2, Item 1).
5. Place POWER ON/DOWN switch (Figure 2, Item 2) on control panel to POWER ON position.
6. Start diesel engine (WP 0005, Operating Procedures).

CAUTION

Do not operate the system any longer than prescribed with radiator cleaner in the system. Damage to system may result.

7. Run engine for 6 to 12 hours.

SERVICE – CONTINUED

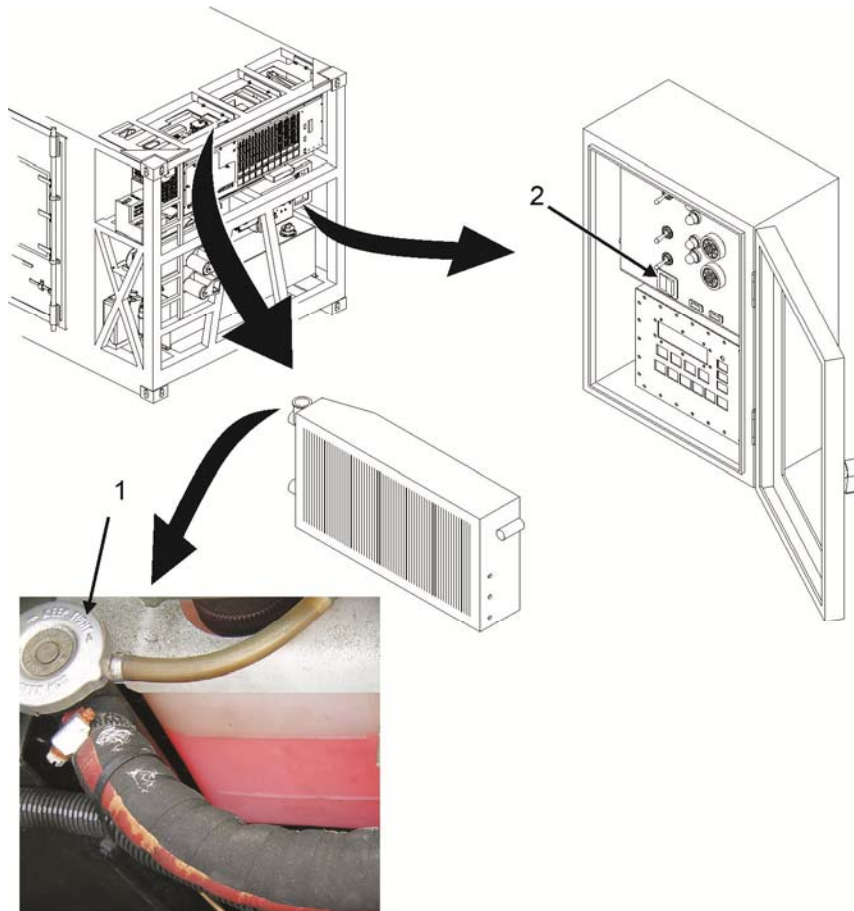


Figure 2. Clean Cooling System.

8. Place POWER ON/DOWN switch (Figure 2, Item 2) on control panel (Figure 1, Item 1) to DOWN position.

WARNING

Diesel engine coolant temperature rises quickly and becomes extremely hot. Hot engine coolant can cause severe burns to personnel. Wear proper protective clothing when working with hot fluids. Allow system to cool for at least 30-minutes.

9. Drain water and cleaner mix from cooling system as described in Drain Cooling System in this WP.
10. Flush cooling system per this WP.

SERVICE – CONTINUED**Flush Cooling System**

1. Place POWER ON/DOWN switch (Figure 3, Item 1) on control panel (Figure 3, Item 2) to DOWN position.
2. Allow engine to cool for at least 30 minutes.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.

WARNING

When removing the radiator cap, wait at least 30-minutes after the engine has stopped running and allowed to cool down. Failure to wait for engine to cool can cause coolant to gush out of the radiator and could result in serious burns.

4. Remove radiator cap (Figure 1, Item 4).

CAUTION

Adding cold water to a hot engine can cause serious damage to the engine, including causing a cracked engine block. Never add cold water to a hot engine. Allow engine to cool sufficiently before adding water to radiator.

5. Make sure lower radiator hose (Figure 1, Item 5) has been connected to radiator (Figure 1, Item 3).
6. Fill radiator with clean untreated water.
7. Install radiator cap (Figure 1, Item 4) onto radiator (Figure 1, Item 3).

SERVICE – CONTINUED**Figure 3. Flush Cooling System.**

8. Exit top of MTRCS using roof access provided.
9. Place POWER ON/DOWN switch (Figure 3, Item 1) on control panel (Figure 3, Item 2) to POWER ON position.
10. Start diesel engine (WP 0005, Operating Procedures).
11. Run engine until warmed to normal operating temperature.
12. Shut down diesel engine (WP 0005, Operating Procedures).

SERVICE – CONTINUED

13. Place POWER ON/DOWN switch (Figure 3, Item 1) on control panel (Figure 3, Item 2) to DOWN position.

WARNING

Diesel engine coolant temperature rises quickly and becomes extremely hot. Hot engine coolant can cause severe burns to personnel. Wear proper protective clothing when working with hot fluids.

14. Drain water from cooling system, as described in Drain Cooling System in this WP, while water is warm.
15. Repeat steps 1 through 14 of this procedure three additional times to properly flush the cooling system.
16. Refill cooling system in accordance with this WP.

Refill Cooling System

1. Place POWER ON/DOWN switch (Figure 4, Item 1) on control panel (Figure 4, Item 2) to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

2. Access top of MTRCS using roof access provided.

WARNING

When removing the radiator cap, wait at least 30 minutes after the engine has stopped running and allowed to cool down. Failure to wait for engine to cool can cause coolant to gush out of the radiator and could result in serious burns.

3. Remove radiator cap (Figure 4, Item 3) from radiator (Figure 4, Item 4).
4. Drain cooling system in accordance with this WP.
5. Allow engine to cool for at least 30 minutes.

SERVICE – CONTINUED



Figure 4. Refill Cooling System.

SERVICE – CONTINUED**CAUTION**

Adding coolant to an overheated engine may cause serious damage to the engine, potentially causing a cracked engine block. Allow engine to cool for at least 30 minutes before adding coolant to radiator.

NOTE

Coolant capacity for the diesel engine coolant system is 3.2 quarts.

6. Fill radiator with coolant anti-freeze mixture.
7. Install radiator cap (Figure 4, Item 3) onto radiator (Figure 4, Item 4).
8. Exit top of MTRCS using roof access provided.
9. Place POWER ON/DOWN switch (Figure 4, Item 1) on control panel (Figure 4, Item 2) to POWER ON position.
10. Start diesel engine and check for leaks (WP 0005, Operating Procedures).
11. Shut down refrigeration unit (WP 0005, Operating Procedures).
12. Refill coolant as needed.
13. Install top-right panel (WP 0031, Install).
14. Install front panel assembly (WP 0031, Install).
15. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**REPAIR****Replace Water Pump**

1. Drain cooling system in accordance with this WP.
2. Place POWER ON/DOWN switch (Figure 4, Item 1) on control panel (Figure 4, Item 2) to DOWN position.
3. Loosen four bolts (Figure 5, Item 1) securing water pump pulley (Figure 5, Item 2), but do not remove bolts at this time.
4. Remove water pump V-belt (WP 0055, Remove).
5. Remove four bolts (Figure 5, Item 1) securing water pump pulley (Figure 5, Item 2) to water pump assembly flange (Figure 5, Item 3).
6. Remove water pump pulley (Figure 5, Item 2) from water pump assembly flange (Figure 5, Item 3).

REPAIR – CONTINUED

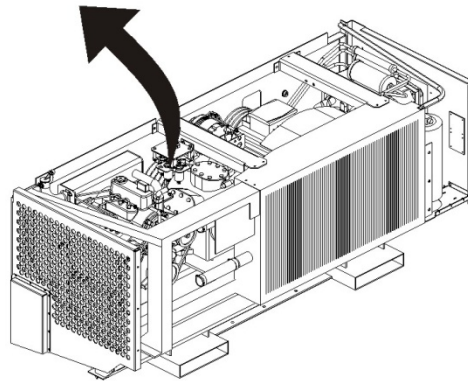
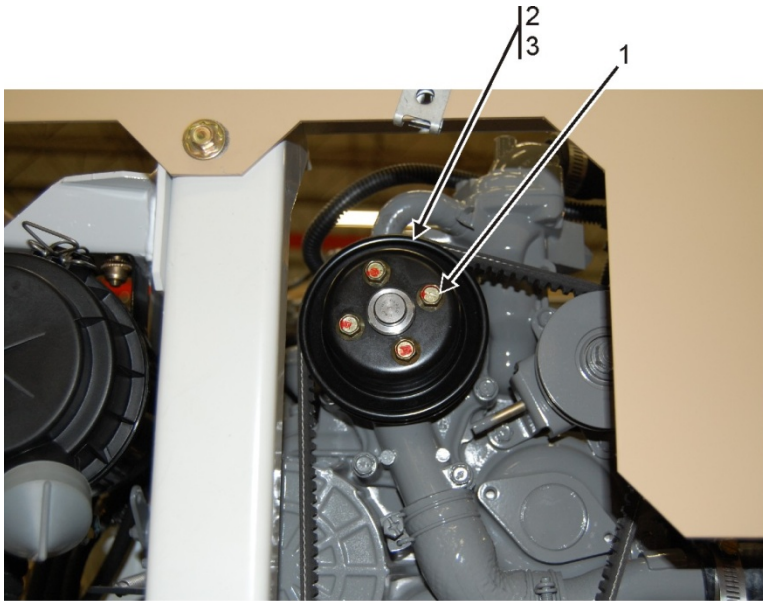


Figure 5. Water Pump Assembly Flange.

7. Remove two long bolts (Figure 6, Item 1) from lower end of water pump (Figure 6, Item 2).
8. Remove remaining four short bolts (Figure 6, Item 3) securing water pump (Figure 6, Item 2) to engine (Figure 6, Item 4).

CAUTION

Residual fluid will likely remain in pump. Use caution when removing pump and be prepared to catch residual fluid. Failure to do so can cause damage to equipment.

9. Remove water pump (Figure 6, Item 2) and water pump gasket (Figure 6, Item 5).

REPAIR – CONTINUED

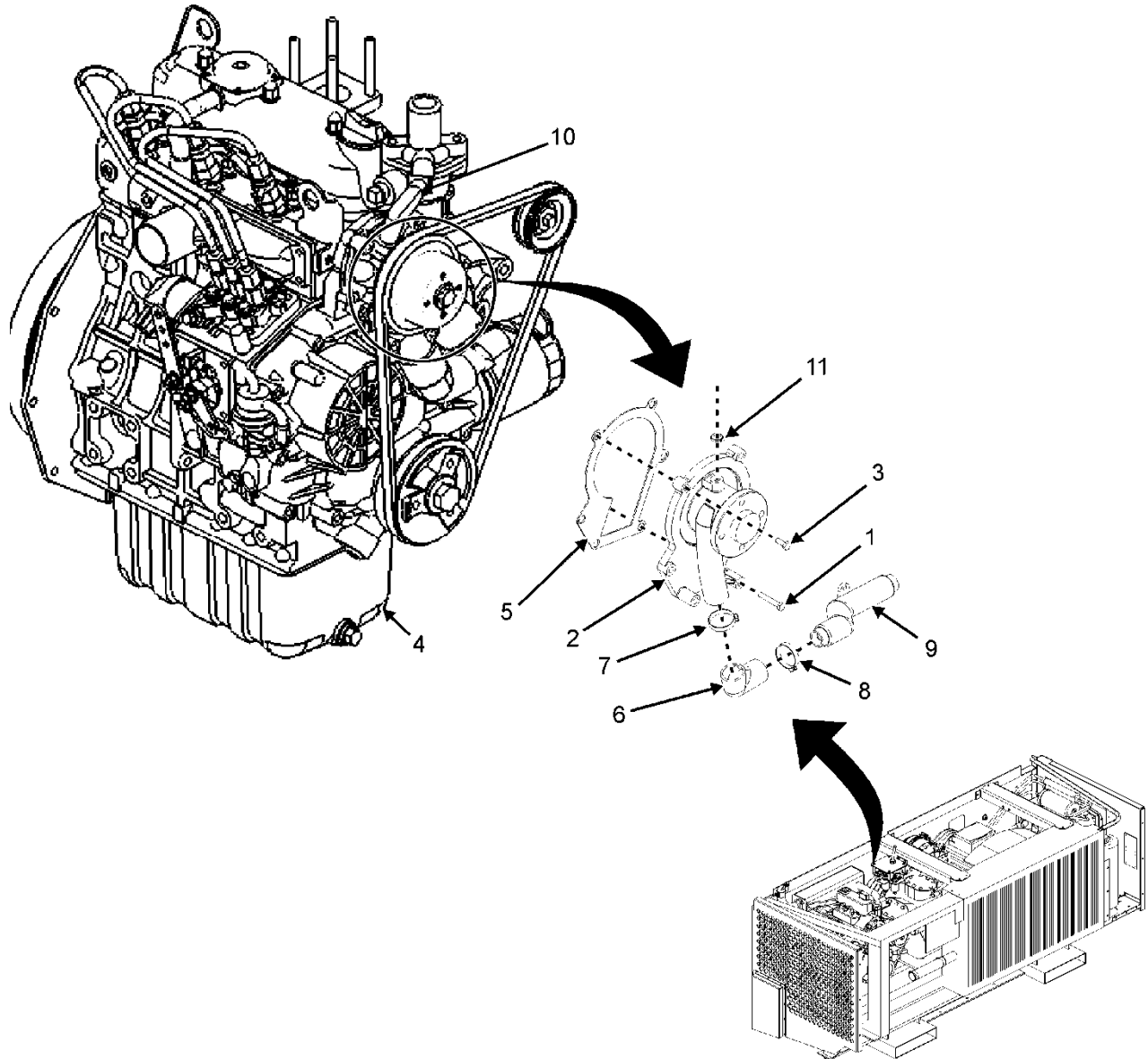


Figure 6. Water Pump.

REPAIR – CONTINUED**NOTE**

With water pump removed from engine mount, supply and return hoses can be twisted and easily removed.

10. Disconnect water pump return hose (Figure 6, Item 6) at water pump (Figure 6, Item 2) by loosening two clamps (Figure 6, Item 7 and Item 8), sliding them back along water pipe (Figure 6, Item 9), and remove water pump return hose (Figure 6, Item 6) from water pump (Figure 6, Item 2).
11. Disconnect water pump supply hose (Figure 6, Item 10) at water pump (Figure 6, Item 2) by loosening clamp (Figure 6, Item 11), sliding it back along water pump supply hose (Figure 6, Item 10), and remove water pump supply hose (Figure 6, Item 10) from water pump (Figure 6, Item 2).

WARNING

Wear protective gloves and eye protection when using isopropyl alcohol. If contact with eyes is made, flush with clean water and seek immediate medical first aid for eyes. Rinse and dry hands immediately after exposure. Failure to observe this warning may result in drying and/or serious damage to the skin.

12. Remove any residue or debris from mounting surface of engine (Figure 6, Item 4) left over from removal of water pump gasket (Figure 6, Item 5) using isopropyl alcohol and scraper.
13. Clean surface area of engine with a scouring pad prior to installing a new gasket.
14. Connect water pump supply hose (Figure 6, Item 10) to new water pump (Figure 6, Item 2) and secure using previously loosened clamp (Figure 6, Item 11).
15. Connect water pump return hose (Figure 6, Item 6) at new water pump (Figure 6, Item 2) and secure using previously loosened clamps (Figure 6, Item 7 and Item 8).
16. Install new water pump (Figure 6, Item 2) and water pump gasket (Figure 6, Item 5) to engine (Figure 6, Item 4).
17. Secure new water pump (Figure 6, Item 2) to engine (Figure 6, Item 4) using four short bolts (Figure 6, Item 3). Tighten bolts in a cross-tightening manner (WP 0102).
18. Install two long bolts (Figure 6, Item 1) to lower end of water pump (Figure 6, Item 2). Tighten bolts (WP 0102).
19. Install water pump pulley (Figure 5, Item 2) to water pump assembly flange (Figure 5, Item 3) and secure using four bolts (Figure 5, Item 1).
20. Tighten clamps on water pump return hose (Figure 6, Item 6) and water pump supply hose (Figure 6, Item 10).
21. Secure water pump pulley (Figure 5, Item 2) to water pump assembly flange (Figure 5, Item 3) using four bolts (Figure 5, Item 1).
22. Install water pump V-belt (WP 0055, Install).
23. Tighten water pump pulley bolts (Figure 5, Item 1) to 7 foot-pounds (WP 0102).

REPAIR – CONTINUED**NOTE**

The water pump V-belt tension should be 30-40 pounds. The water pump belt has an automatic belt tensioner to make sure the belt is at the correct tension.

24. Using V-Belt tension gauge, check that V-belt tension is between 30-40 pounds (WP 0055, Adjust).
25. Clean cooling system in accordance with this WP.
26. Flush cooling system in accordance with this WP.
27. Refill cooling system in accordance with this WP.
28. Operate engine for sufficient time to check all connections for leaks (WP 0005, Operating Procedures).
29. Install top-right panel (WP 0031, Install).
30. Install front panel assembly (WP 0031, Install).
31. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Water Pump Return Hoses

1. Drain cooling system in accordance with this WP.
2. Loosen two clamps (Figure 7, Item 1 and Item 2) securing water pump return hose (Figure 7, Item 3) to water pump (Figure 7, Item 4) and water pipe (Figure 7, Item 5) and slide clamps towards center of hose.
3. Remove bolt (Figure 7, Item 6) and lock washer (Figure 7, Item 7) securing water pipe (Figure 7, Item 5) to engine (Figure 7, Item 8).
4. Remove water pipe (Figure 7, Item 5) from engine (Figure 7, Item 8).
5. Disconnect water pump return hose (Figure 7, Item 3) from water pump (Figure 7, Item 4).
6. Disconnect water pump return hose (Figure 7, Item 3) from water pipe (Figure 7, Item 5).
7. Remove two clamps (Figure 7, Item 1 and Item 2) from water pump return hose (Figure 7, Item 3).
8. Clean and dry water pump (Figure 7, Item 4) and water pipe (Figure 7, Item 5) flanges.
9. Install two clamps (Figure 7, Item 1 and Item 2) on replacement water pump return hose (Figure 7, Item 3) and position loosely towards center of hose.
10. Install one end of replacement water pump return hose (Figure 7, Item 3) onto water pipe (Figure 7, Item 5) flange.
11. Install opposite end of water pump return hose (Figure 7, Item 3) onto water pump (Figure 7, item 4).
12. Install water pipe (Figure 7, Item 5) and secure with one bolt (Figure 7, Item 6) and lock washer (Figure 7, Item 7) to engine (Figure 7, Item 8).

REPAIR – CONTINUED

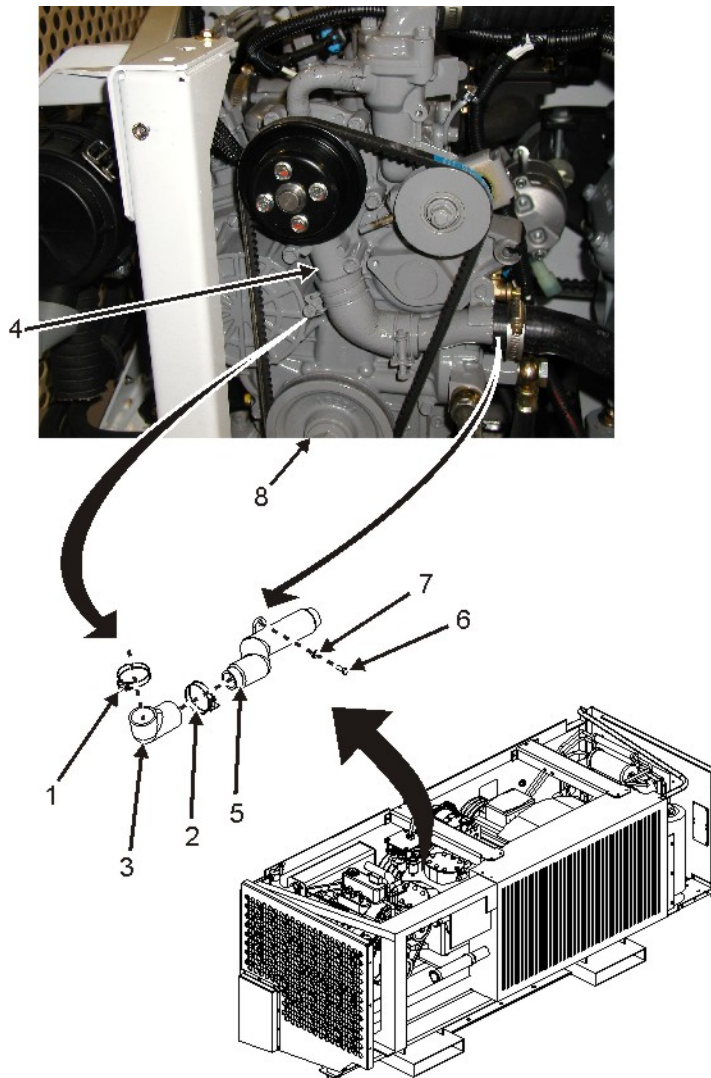


Figure 7. Water Pump Return Hose.

13. Slide one clamp (Figure 7, Item 1) over water pump return hose (Figure 7, Item 3) and tighten securely. Do not over tighten.
14. Slide one clamp (Figure 7, Item 2) over water pump return hose (Figure 7, Item 3) at water pipe (Figure 7, Item 5) and tighten securely. Do not over tighten.
15. Flush cooling system in accordance with this WP.
16. Refill cooling system in accordance with this WP.
17. Operate engine for sufficient time to check all connections for leaks (WP 0005, Operating Procedures).

REPAIR – CONTINUED

18. Install top-right panel (WP 0031, Install).
19. Install front panel assembly (WP 0031, Install).
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Water Pump Supply Hose**WARNING**

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

1. Remove top-right panel (WP 0031, Remove).
2. Compress two clamps (Figure 8, Item 1 and Item 2) securing water pump supply hose (Figure 8, Item 3) to water pump (Figure 8, Item 4) and thermostat housing (Figure 8, Item 5) and slide clamps towards center of hose.
3. Disconnect water pump supply hose (Figure 8, Item 3) from water pump (Figure 8, Item 4).
4. Disconnect water pump supply hose (Figure 8, Item 3) from thermostat housing (Figure 8, Item 5).
5. Remove water pump supply hose (Figure 8, Item 3).
6. Remove two clamps (Figure 8, Item 1 and Item 2) from water pump supply hose (Figure 8, Item 3).
7. Clean and dry water pump (Figure 8, Item 1 and Item 2) and thermostat housing flanges (Figure 8, Item 5).
8. Compress two clamps (Figure 8, Item 1 and Item 2) on replacement water pump supply hose (Figure 8, Item 3) and position loosely towards center of hose.
9. Install one end of replacement water pump supply hose (Figure 8, Item 3) onto thermostat housing flange (Figure 8, Item 5).
10. Compress and slide one clamp (Figure 8, Item 2) over water pump supply hose (Figure 8, Item 3) at thermostat housing flange (Figure 8, Item 5).
11. Install opposite end of water pump supply hose (Figure 8, Item 3) onto water pump (Figure 8, Item 4).
12. Compress and slide one clamp (Figure 8, Item 1) over water pump supply hose (Figure 8, Item 3) at water pump (Figure 8, Item 4) flange.

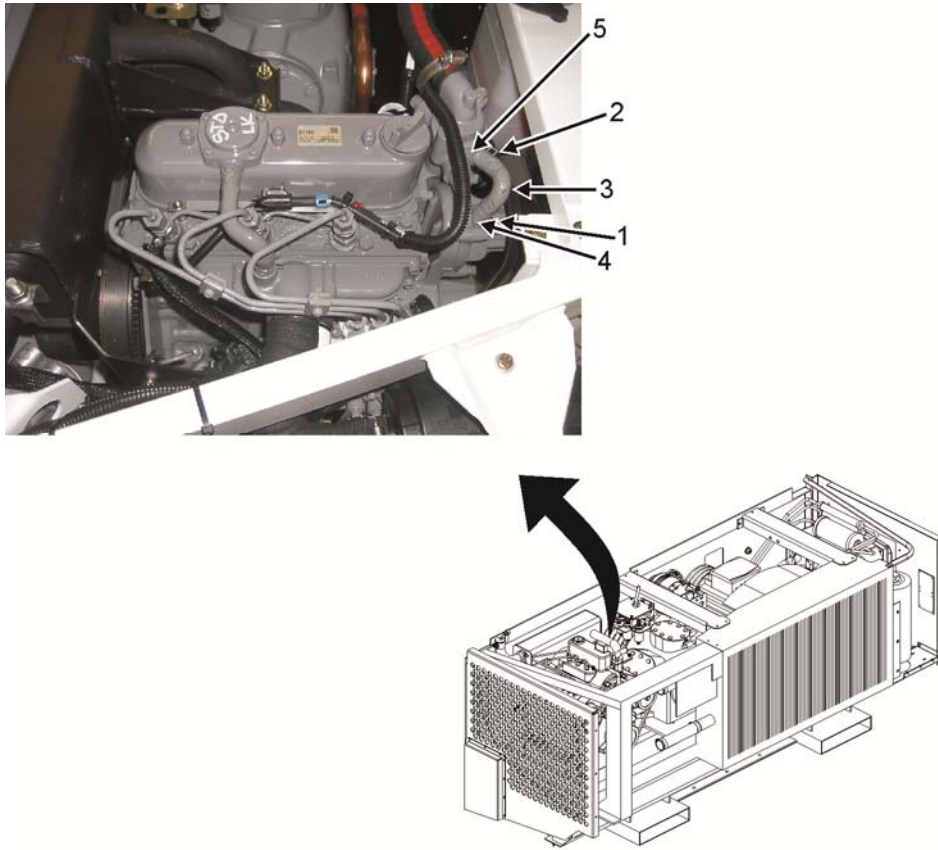
REPAIR – CONTINUED

Figure 8. Water Pump Supply Hose.

13. Refill cooling system in accordance with this WP.
14. Operate engine for sufficient time to check all connections for leaks (WP 0005, Operating Procedures).
15. Shut down refrigeration unit (WP 0005, Operating Procedures).
16. Install top-right panel (WP 0031, Install).
17. Install front panel assembly (WP 0031, Install).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
THERMAL WATER TEMPERATURE RESISTOR
REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005

WP 0031

TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)

External power cables disconnected (WP 0005)

REPLACE

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

3. Access top of MTRCS using roof access provided.

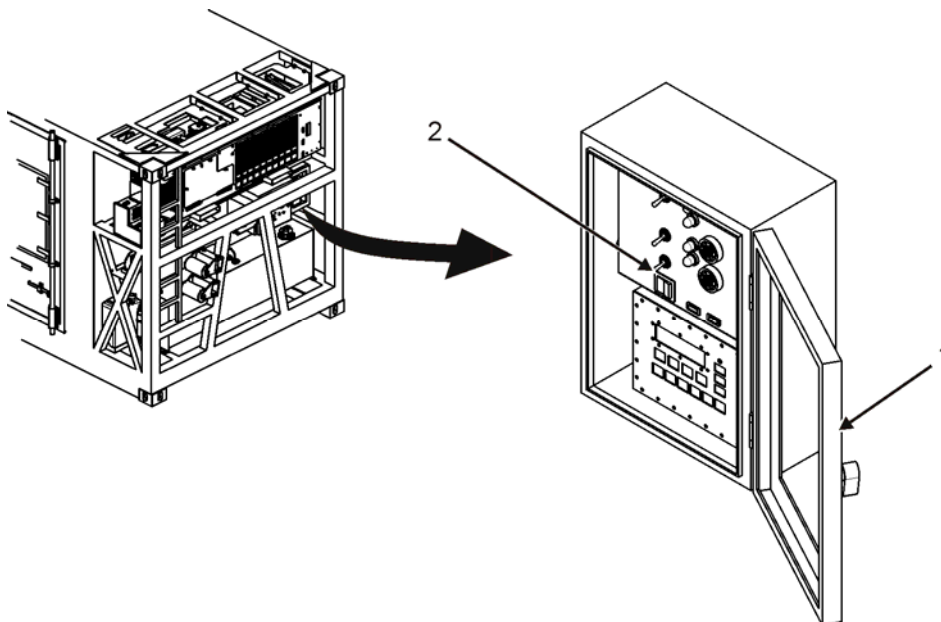


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

- Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.

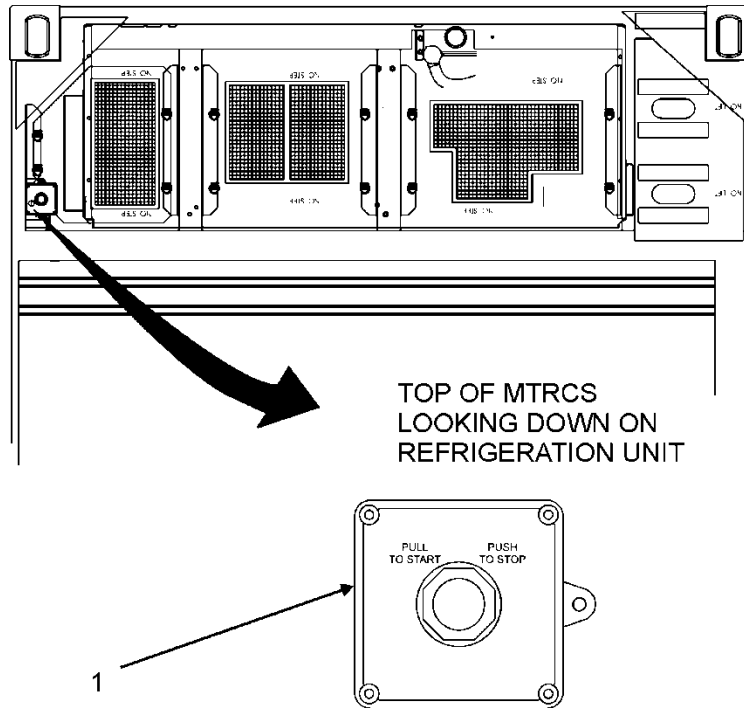


Figure 2. Emergency Stop Switch.

- Remove right-top panel (WP 0031, Remove).

WARNING

The diesel engine exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

- Disconnect thermal water temperature resistor (Figure 3, Item 2) electrical connector (Figure 3, Item 1) from engine harness.

REPLACE – CONTINUED

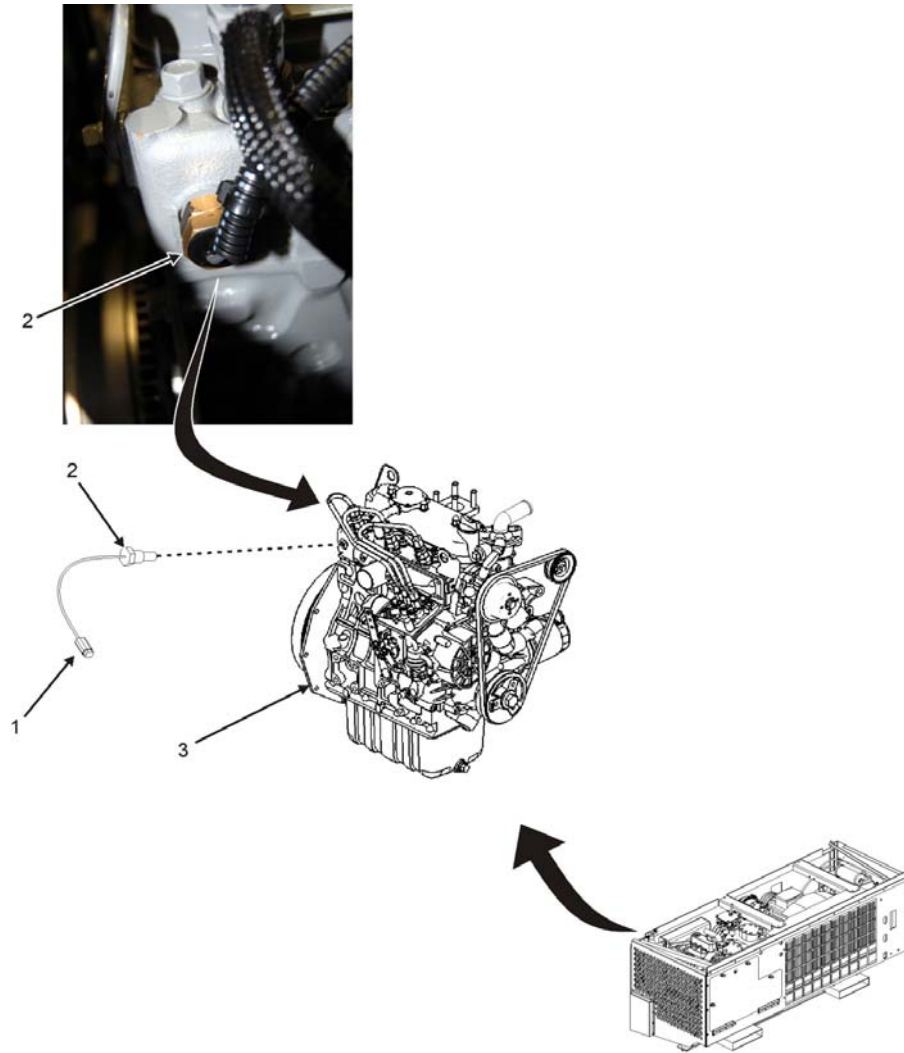


Figure 3. Thermal Water Temperature Resistor.

7. Loosen and remove thermal water temperature resistor (Figure 3, Item 2) from engine (Figure 3, Item 3).
8. Install new thermal water temperature resistor (Figure 3, Item 2) into engine (Figure 3, Item 3)
9. Tighten thermal water temperature resistor (Figure 3, Item 2).
10. Reconnect thermal water temperature resistor (Figure 3, Item 2) electrical connector (Figure 3, Item 1) to engine harness.
11. Install right-top panel (WP 0031, Install).
12. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.
13. Climb off of MTRCS using roof access provided.

REPLACE – CONTINUED

14. Place POWER ON/DOWN switch (Figure 4, Item 2) on control panel to ON position.

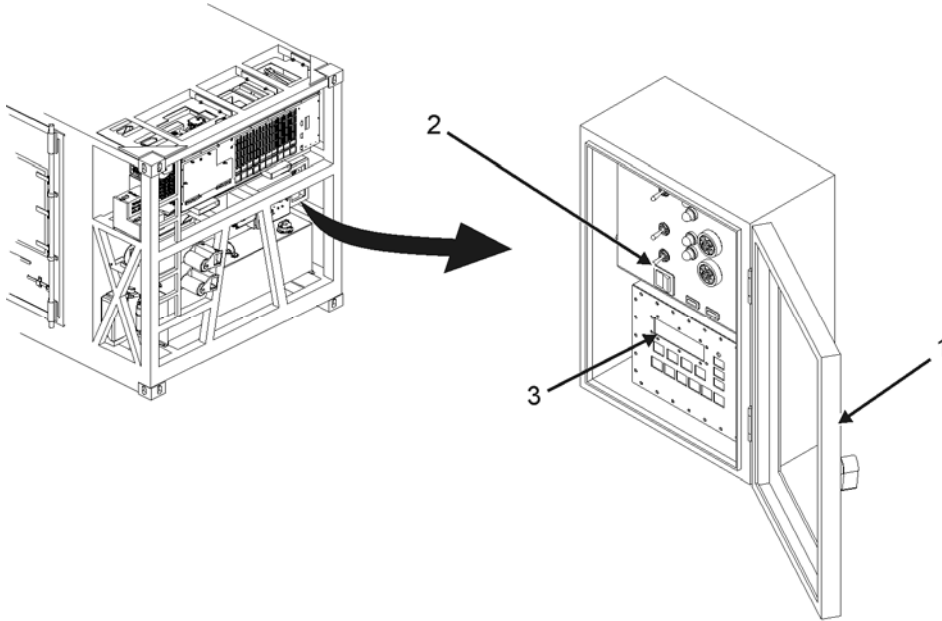


Figure 4. POWER ON/DOWN Switch.

15. Close control panel access door (Figure 4, Item 1).
16. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).
17. Monitor for the absence of AL1 and AL11 fault codes on microprocessor display (Figure 4, Item 3).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
THERMOSTAT
REPLACE

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Item 2)
Spill Kit (WP 0107, Item 23)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
WP 0031
WP 0044
WP 0102
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

REPLACE

1. Open control panel access door (Figure 1, Item 1)
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

3. Access top of MTRCS using roof access provided.

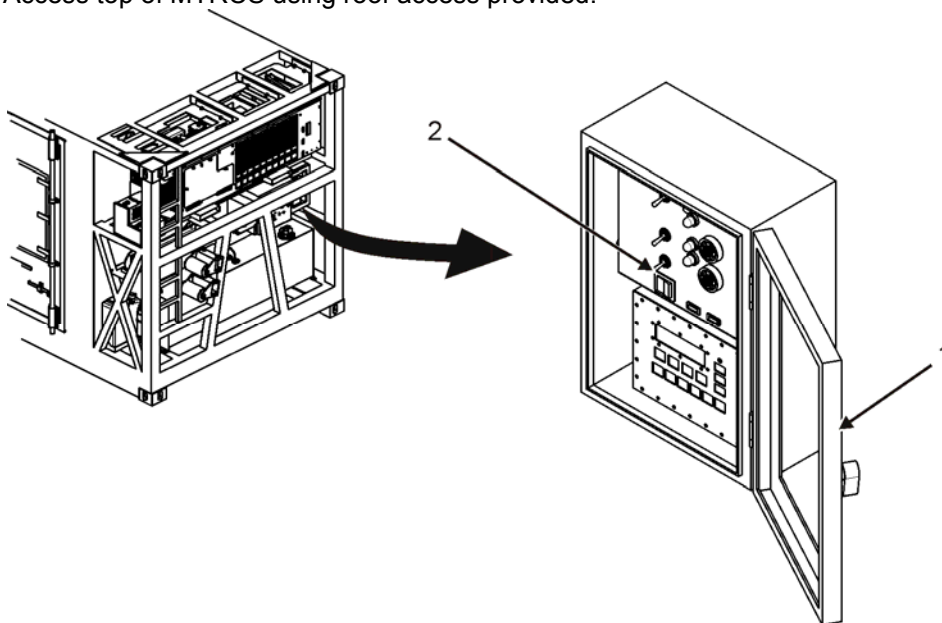


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Remove top-right panel (WP 0031, Remove).

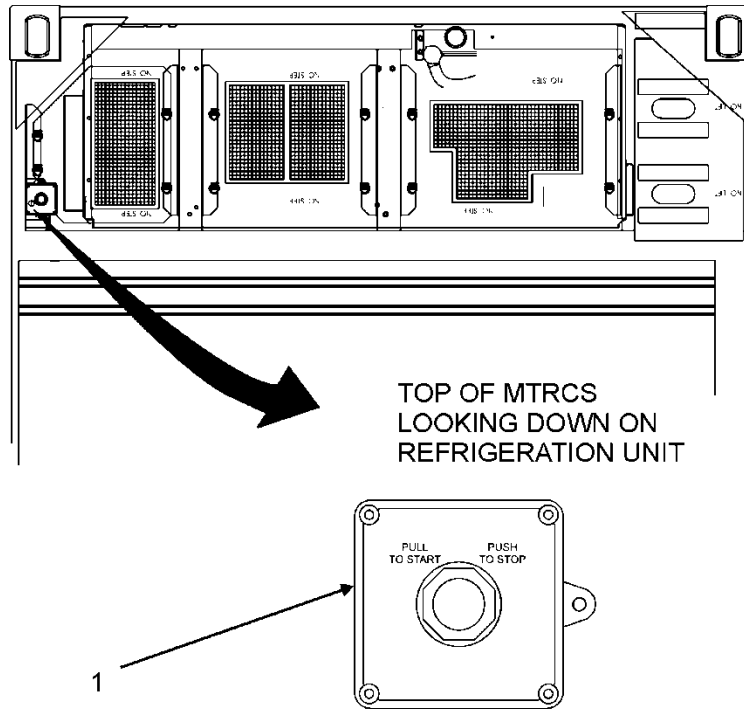


Figure 2. Emergency Stop Switch.

WARNING

Diesel engine coolant temperature rises quickly and becomes extremely hot. Hot engine coolant can cause severe burns to personnel. Wear proper protective clothing when working with hot fluids. Allow engine to cool for 30-minutes before performing maintenance.

6. Loosen top radiator hose clamp (Figure 3, Item 1) securing top radiator hose (Figure 3, Item 2) to thermostat cover (Figure 3, Item 3).
7. Residual fluid will be in top radiator hose (Figure 3, Item 2). Catch residual fluid using spill kit.
8. Carefully pull top radiator hose (Figure 3, Item 2) off thermostat cover (Figure 3, Item 3).
9. Remove two bolts (Figure 3, Item 4) securing thermostat cover (Figure 3, Item 2) to engine (Figure 3, Item 5).
10. Remove thermostat cover (Figure 3, Item 3).
11. Remove gasket (Figure 3, Item 6) and thermostat (Figure 3, Item 7) from engine (Figure 3, Item 5).
12. Carefully clean any excess gasket material off thermostat cover (Figure 3, Item 3) and engine (Figure 3, Item 5) making sure that no debris falls into thermostat housing.

REPLACE – CONTINUED

13. Install new thermostat (Figure 3, Item 7) in engine (Figure 3, Item 5) with copper cylinder oriented (Figure 3, Item 8) toward engine (Figure 3, Item 5) and dome (Figure 3, Item 9) up

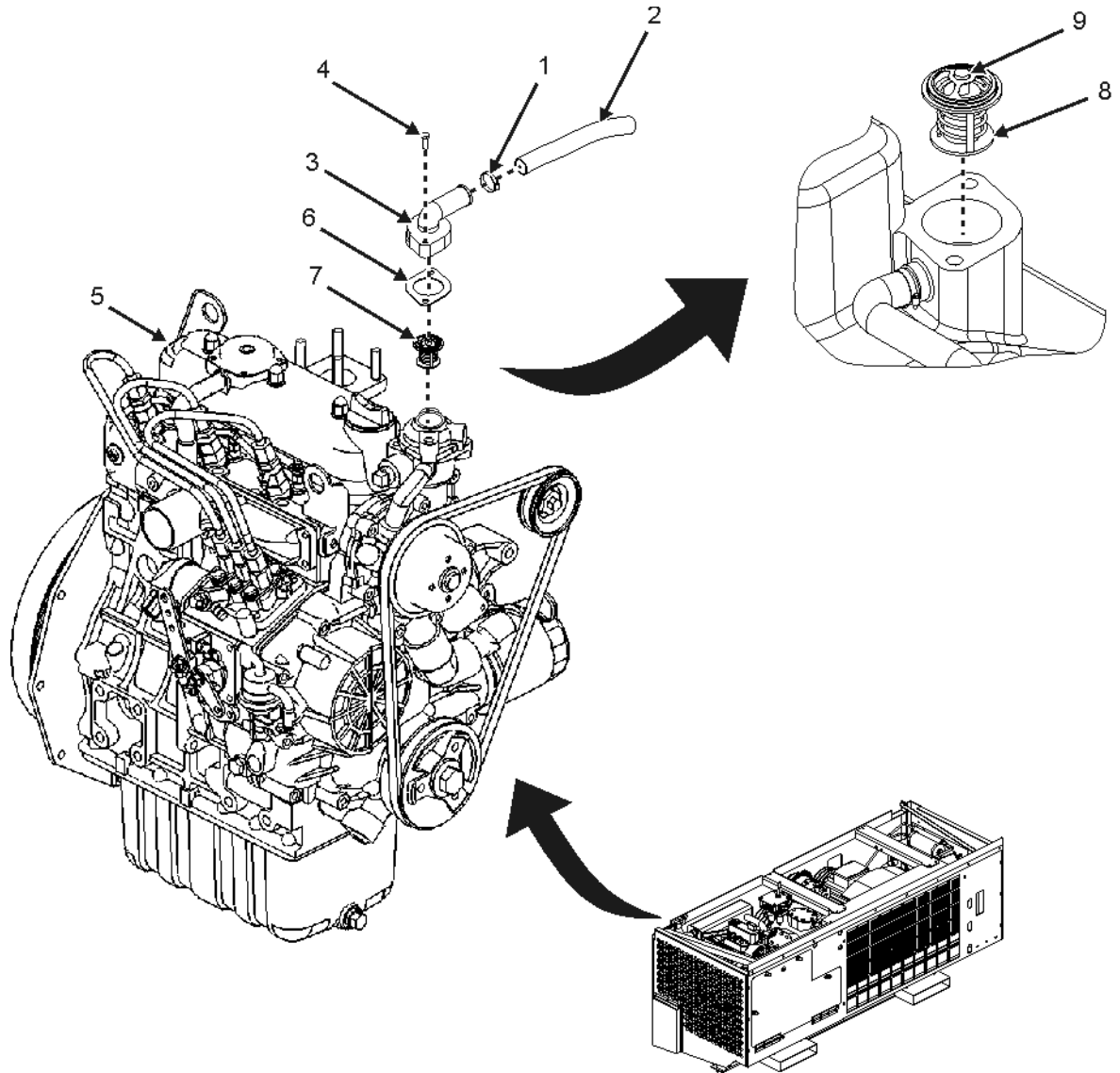


Figure 3. Thermostat.

NOTE

When installing thermostat gasket, the bead side of the gasket must be facing up.

14. Line up holes of new gasket (Figure 3, Item 6) with holes on engine (Figure 3, Item 5) and install new gasket (Figure 3, Item 6) on top of thermostat (Figure 3, Item 7) with bead side facing up.
15. Line up holes of thermostat cover (Figure 3, Item 3) with holes on new gasket (Figure 3, Item 6) and engine (Figure 3, Item 5) and install thermostat cover (Figure 3, Item 3).

REPLACE – CONTINUED

16. Install two bolts (Figure 3, Item 4) to secure thermostat cover (Figure 3, Item 3) to engine (Figure 3, Item 5).
17. Tighten bolts to 15-22 foot-pounds (WP 0102, Introduction).

NOTE

Make sure hose clamp is slid over top radiator hose before connecting top radiator hose to thermostat cover.

18. Reconnect top radiator hose (Figure 3, Item 2) to thermostat cover (Figure 3, Item 3).
19. Position hose clamp (Figure 3, Item 1) and tighten.
20. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.
21. Climb off of MTRCS using roof access provided.
22. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

23. Start diesel engine (WP 0005, Operating Procedures).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

24. Access top of MTRCS using roof access provided.
25. Check thermostat cover (Figure 3, Item 3), top radiator hose (Figure 3, Item 2), and surrounding area for coolant fluid leaks.
26. Climb off of MTRCS using roof access provided.
27. Place POWER ON/DOWN switch on control panel to DOWN position.
28. Close control panel access door (Figure 1, Item 1).
29. Shut diesel engine down (WP 0005, Operating Procedures).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

30. Access top of MTRCS using roof access provided.

REPLACE – CONTINUED**WARNING**

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

31. Check engine coolant level and add as necessary (WP 0044, Service).
32. Install top-right panel (WP 0031, Install).
33. Climb off of MTRCS using roof access provided.
34. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
**STARTER
REPLACE**

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Personnel Required

Quartermaster and Chemical Equipment Repairer (2)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

References

WP 0005
 WP 0031
 WP 0070
 WP 0102
 TM 10-8145-222-23P

REPLACE**WARNING**

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Disconnect battery (WP 0070, Remove).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

4. Access top of MTRCS using roof access provided.

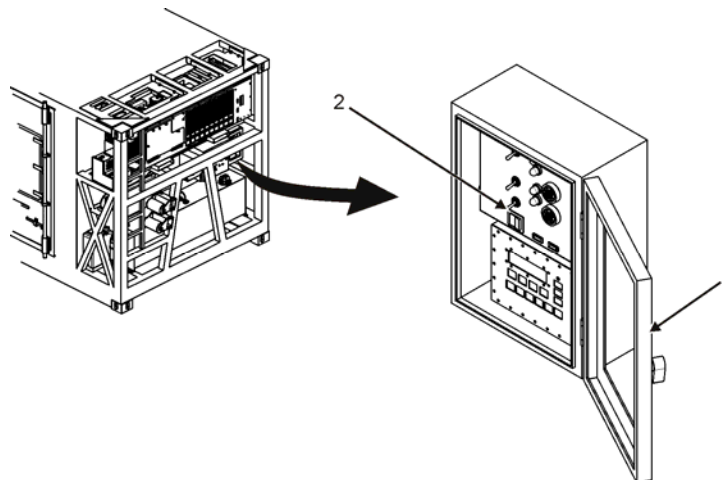


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

- Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.

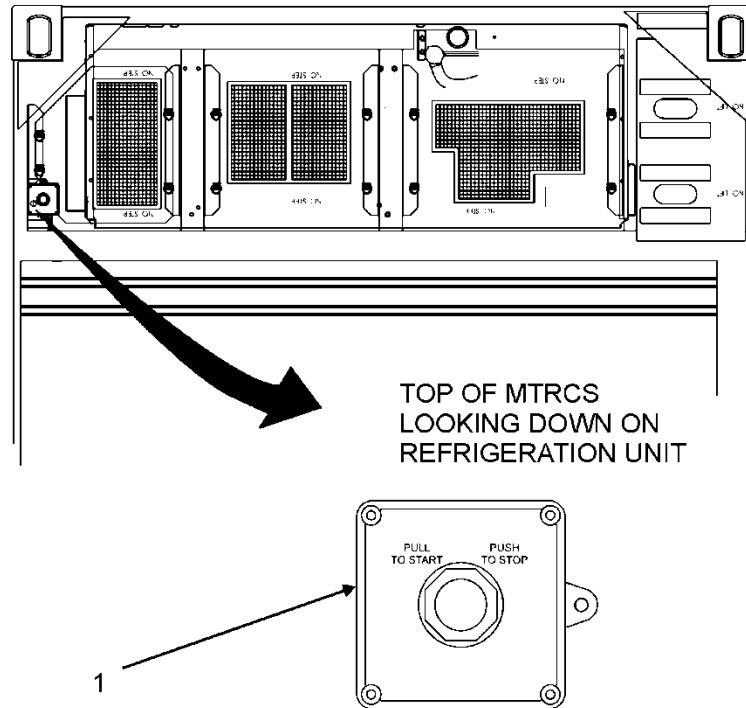


Figure 2. Emergency Stop Switch.

- Remove top-right panel (WP 0031, Remove).
- Climb off of MTRCS using roof access provided.

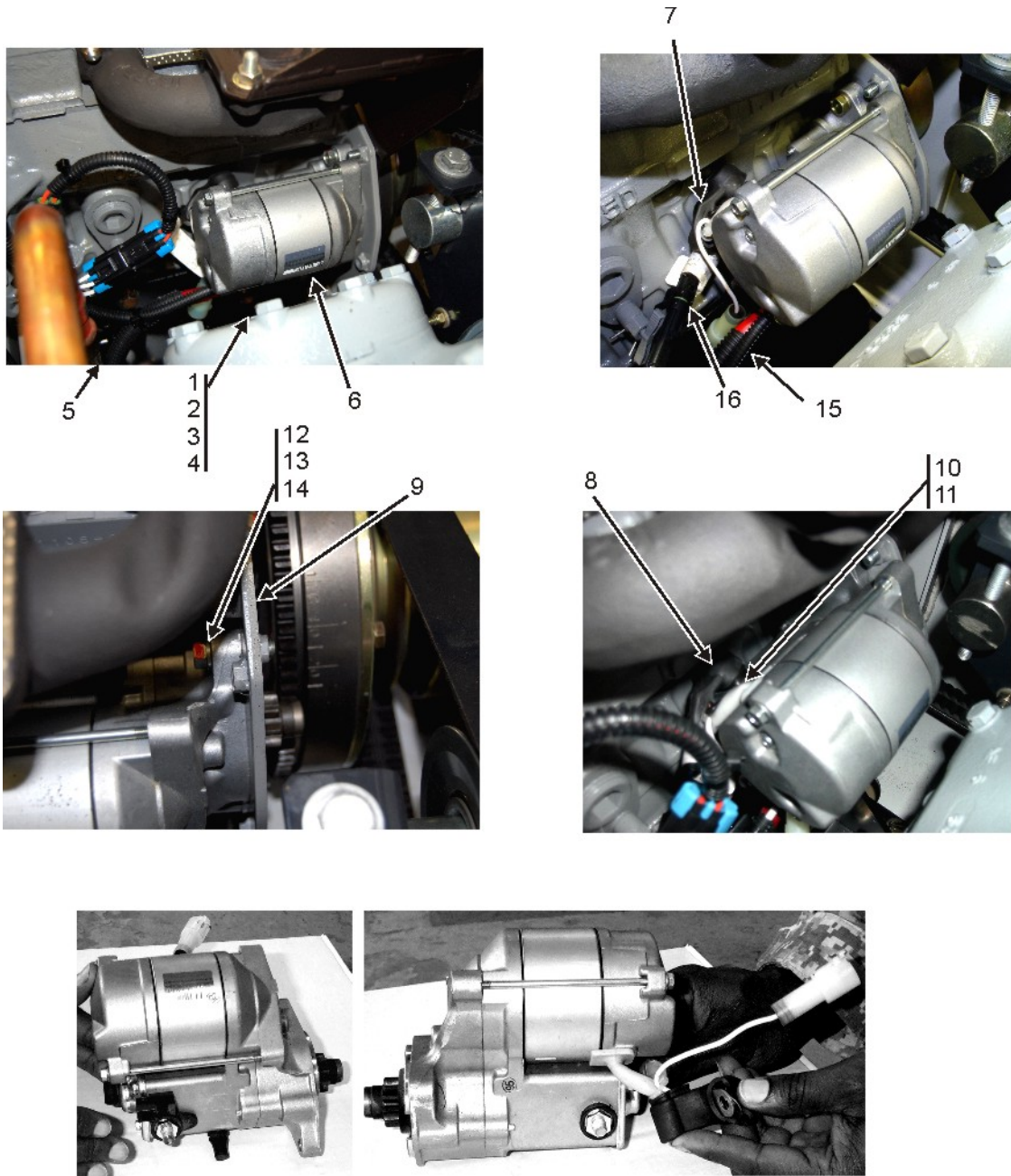
NOTE

Removal of the front panel assembly may provide easier access for removal of the starter.

The heavy red cable is attached to the positive (+) post on the starter.

- Remove one nut (Figure 3, Item 1), lock washer (Figure 3, Item 2), and washer (Figure 3, Item 3) from starter positive stud (Figure 3, Item 4). Replace – continued

REPLACE – CONTINUED



STARTER REMOVED

Figure 3. Starter.

- 9. Tag and disconnect positive lead (Figure 3, Item 5) from starter (Figure 3, Item 6).
- 10. Tag and disconnect electrical connector (Figure 3, Item 15) from starter (Figure 3, Item 6).

REPLACE – CONTINUED

11. Tag and disconnect starter pigtail connector (Figure 3, Item 7) from engine wire harness (Figure 3, Item 16).

NOTE

White lead coming off of starter is not used.

12. Remove two bolts (Figure 3, Item 12), lock washers (Figure 3, Item 13), and washers (Figure 3, Item 14) securing starter (Figure 3, Item 6) to engine block (Figure 3, Item 9). Discard lock washers.
13. Remove starter (Figure 3, Item 6).
14. Remove one nut (Figure 3, Item 10) and lock washer (Figure 3, Item 11) securing starter pigtail connector (Figure 3, Item 8) to starter (Figure 3, Item 6). Retain pigtail connector for replacement starter.
15. Install starter pigtail connector (Figure 3, Item 8) to new starter (Figure 3, Item 6) using one nut (Figure 3, Item 10) and new lock washer (Figure 3, Item 11).
16. Install new starter (Figure 3, Item 6) and secure using two bolts (Figure 3, Item 12), new lock washers (Figure 3, Item 13), and washers (Figure 3, Item 14).
17. Tighten and torque bolts (Figure 3, Item 12) (WP 0102, Introduction).
18. Connect electrical connector (Figure 3, Item 15) to new starter (Figure 3, Item 6) as tagged. Remove tag.
19. Connect starter pigtail connector (Figure 3, Item 17) to engine wire harness (Figure 3, Item 16). Remove tag.
20. Connect positive lead (Figure 3, Item 5) to starter (Figure 3, Item 6) as tagged using nut (Figure 3, Item 1), new lock washer (Figure 3, Item 2), and washer (Figure 3, Item 3).
21. Install top-right panel (WP 0031, Install).
22. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.
23. Climb off of MTRCS using roof access provided.
24. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
25. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
26. Start refrigeration unit to verify proper operation (WP 0005, Operating Procedures).
27. Close control panel access door (Figure 1, Item 1).
28. If removed, install front panel assembly (WP 0031, Install)
29. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
ALTERNATOR
TEST, REPLACE

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Table 2, Item 8)

Personnel Required

Quartermaster and Chemical Equipment Repairer (2)

Materials/PartsLock Washer, $\frac{3}{8}$ -in ID (WP 0111, Item 13)**References**

WP 0005
 WP 0012
 WP 0031
 WP 0052
 WP 0070
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)

TEST

1. Remove two lock nuts (Figure 1, Item 1) and washers (Figure 1, Item 2) securing battery box top bracket (Figure 1, Item 3) and L-bolts (Figure 1, Item 4) to lower bracket (Figure 1, Item 5) enough to slip rods free from lower bracket.
2. Remove bracket (Figure 1, Item 3).

WARNING

Batteries contain high amperage and can explode if short circuited. Never allow any metal to cross between the battery terminals or between the positive terminal and any part of the MTRCS frame. Personal injury or death could result.

3. Remove battery box cover (Figure 1, Item 6) from battery box (Figure 1, Item 7) to access battery terminals.
4. Start refrigeration unit (WP 0005, Operating Procedures).
5. Set multimeter to DC volts scale.
6. Measure voltage across battery terminals by placing red multimeter lead on battery positive (+) terminal (Figure 1, Item 8), and black multimeter lead on battery negative (-) terminal (Figure 1, Item 9).
 - DC voltage on multimeter should read 13.0 to 14.0 volts, indicating steady and sufficient charge into battery.
 - If less than 13.0 volts DC is indicated on multimeter, troubleshoot alternator (WP 0012).
7. Remove multimeter leads from battery terminals and turn multimeter to OFF position.
8. Shut down refrigeration unit (WP 0005, Operating Procedures).
9. Install battery box cover (Figure 1, Item 6) and secure to battery box (Figure 1, Item 7) using bracket (Figure 1, Item 3), two L-bolts (Figure 1, Item 4), washers (Figure 1, Item 2), and lock nuts (Figure 1, Item 1).
10. Tighten lock nuts (Figure 1, Item 1) securely but do not use excessive force that could damage plastic housing.

TEST – CONTINUED

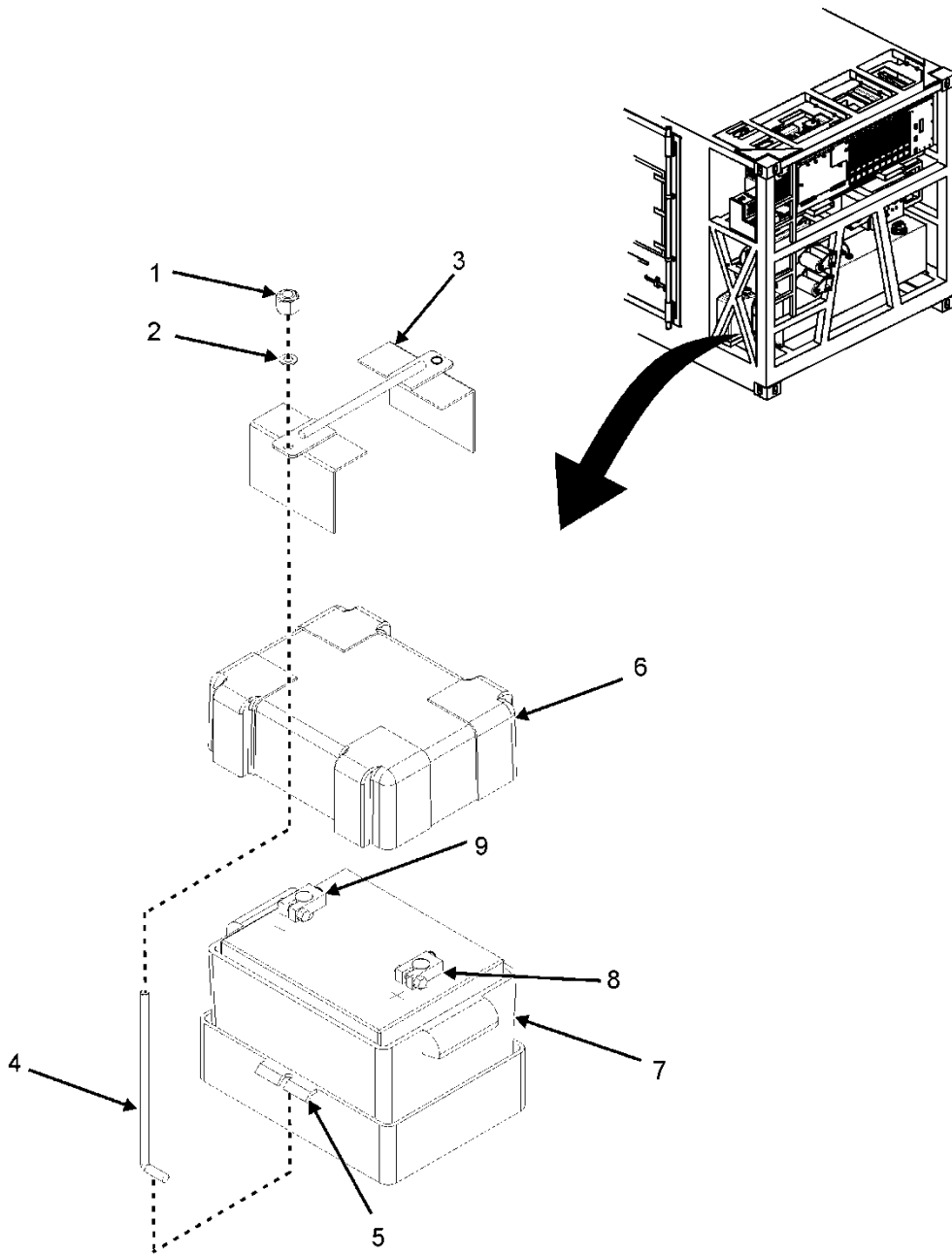


Figure 1. Battery Box.

END OF TASK

REPLACE

1. Open control panel access door (Figure 2, Item 1).

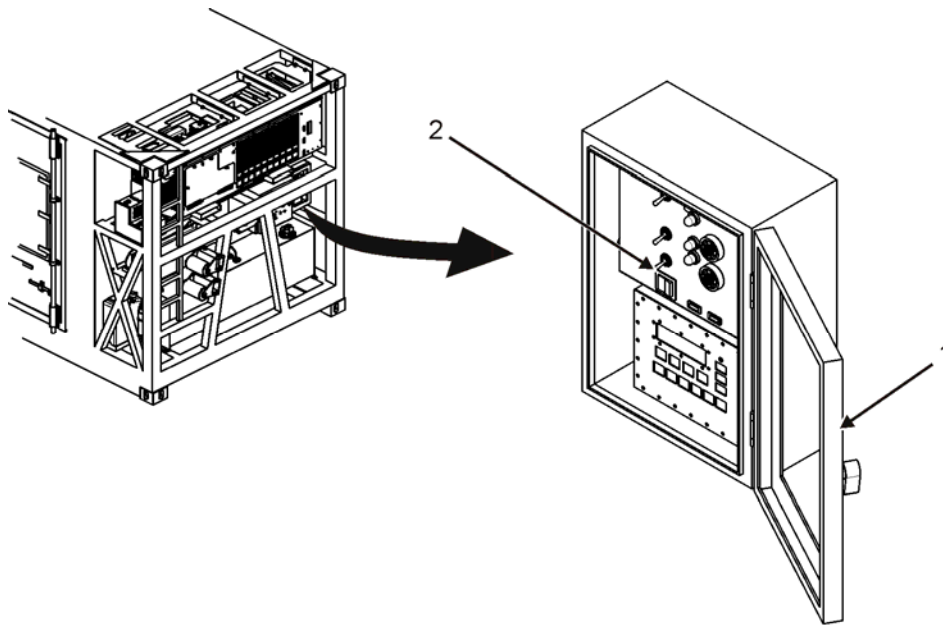


Figure 2. POWER ON/DOWN Switch.

WARNING

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

2. Place POWER ON/DOWN switch (Figure 2, Item 2) on control panel to DOWN position.
3. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

4. Access top of MTRCS using roof access provided.
5. Place emergency stop switch (Figure 3, Item 1) in PUSH TO STOP position.

REPLACE – CONTINUED

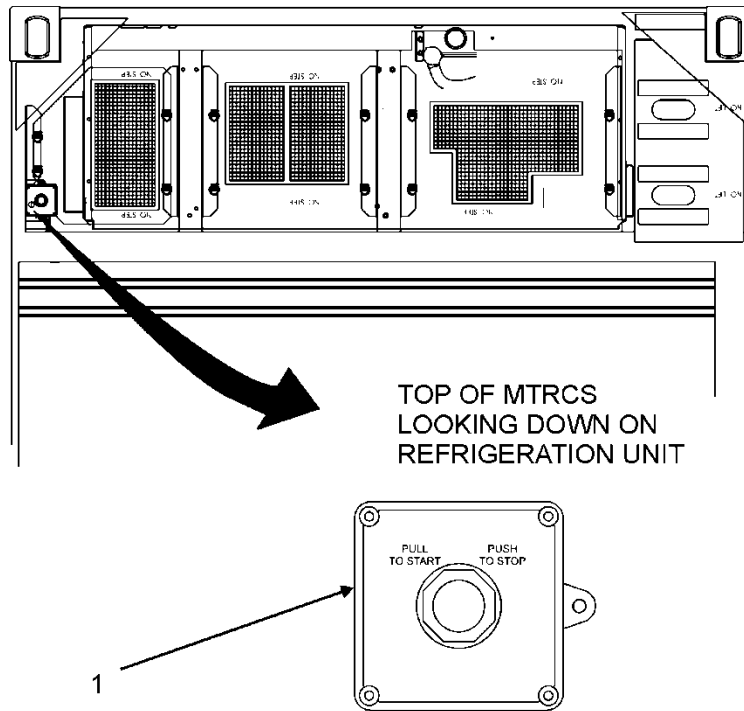


Figure 3. Emergency Stop Switch.

6. Remove top-middle panel (WP 0031, Remove).
7. Loosen alternator mounting bolts (Figure 4, Item 1 and Item 2) and self-locking nut (Figure 4, Item 3) enough that the alternator (Figure 4, Item 4) is free to pivot. Do not remove at this time.
8. Screw alternator adjusting bolt (Figure 4, Item 5) counterclockwise until tension is off V-Belt (Figure 4, Item 6).
9. Push alternator (Figure 4, Item 4) downward to loosen alternator V-belt (Figure 4, Item 5).
10. Remove alternator V-belt (Figure 4, Item 6) from alternator pulley (Figure 4, Item 7).
11. Remove four bolts (Figure 4, Item 8), lock washers (Figure 4, Item 9), and stand-offs (Figure 4, Item 10) securing alternator cover bracket (Figure 4, Item 11) to alternator (Figure 4, Item 4). Discard lock washers.

NOTE

It will be necessary to loosen strain relief nut in order to gain access to alternator wire leads. Once the strain relief nut is loose, the alternator cover bracket cube slides away from the alternator.

12. Loosen strain relief nut (Figure 4, Item 12) if necessary.
13. Remove nuts (Figure 4, Item 13) and washers (Figure 4, Item 14) from alternator (Figure 4, Item 4).

REPLACE – CONTINUED

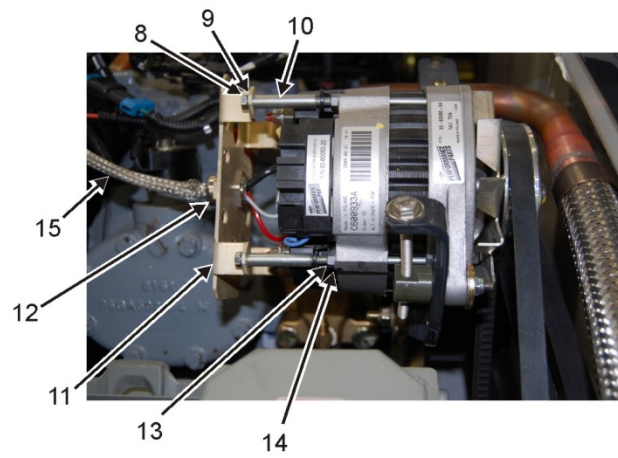
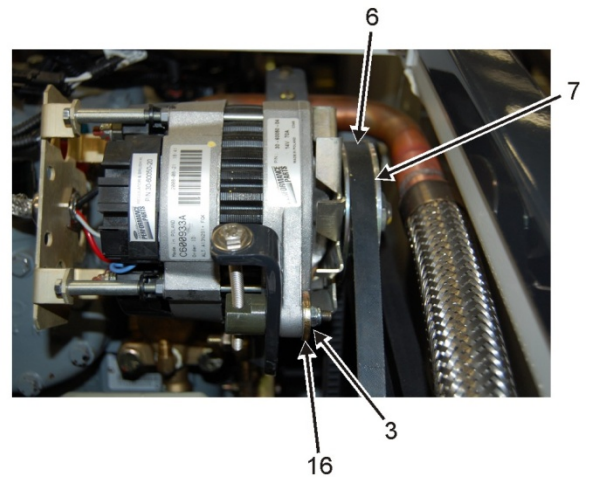
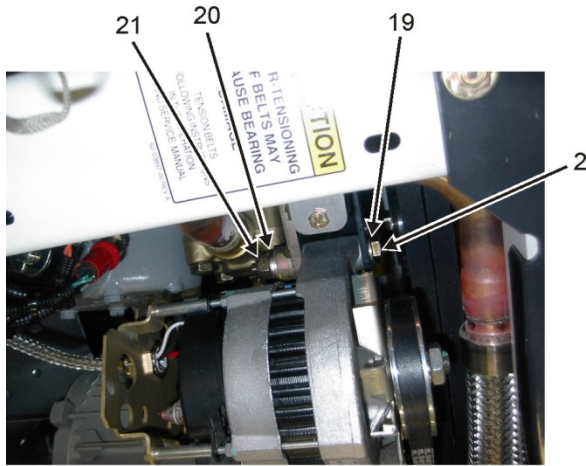
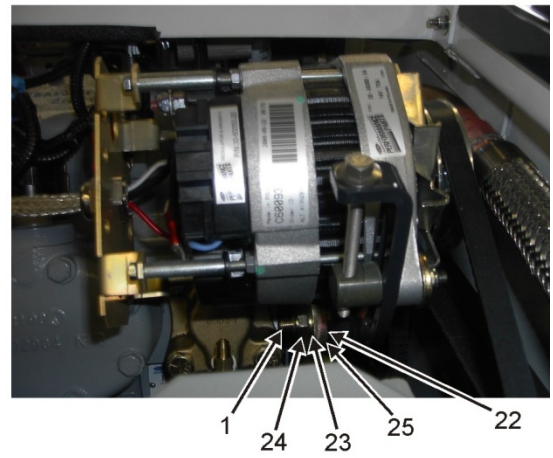
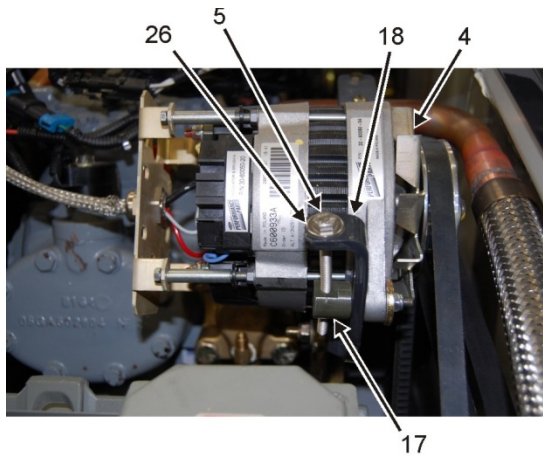


Figure 4. Alternator Removal.

REPLACE – CONTINUED

14. Tag and disconnect wiring harness (Figure 4, Item 15) from alternator (Figure 4, Item 4).
15. Remove self-locking nut (Figure 4, Item 3) and spacer (Figure 4, Item 16) from shaft tensioner (Figure 4, Item 17) mounted on adjusting arm (Figure 4, Item 18). Discard self-locking nut.
16. Remove alternator lower mount bolt (Figure 4, Item 2), washer (Figure 4, Item 19), lock washer (Figure 4, Item 20), and nut (Figure 4, Item 21). Discard lock washer.
17. Remove mounting bolt (Figure 4, Item 1), washers (Figure 4, Item 22 and 23), nut (Figure 4, Item 24), and adjusting arm (Figure 4, Item 18) from mount (Figure 4, Item 25).
18. If necessary, remove adjusting bolt (Figure 4, Item 5), washer (Figure 4, Item 26), and shaft tensioner (Figure 4, Item 17) from adjusting arm (Figure 4, Item 18).
19. If removed, install adjusting bolt (Figure 5, Item 5), washer (Figure 5, Item 26) and shaft tensioner (Figure 5, Item 17) on adjusting arm (Figure 5, Item 18).
20. Position adjusting arm (Figure 5, Item 18) on mount (Figure 5, Item 25) and secure with bolt (Figure 5, Item 1), washers (Figure 5, Item 22 and Item 23), and new self-locking nut (Figure 5, Item 24). Do not tighten at this time.

NOTE

It will be necessary to rotate the alternator to install the V-belt adjust bolt. It is not necessary to install the V-belt adjust bolt in any particular location in the slotted opening in the adjusting arm as long as the adjusting bolt is through the adjusting arm and secured in the shaft tensioner.

21. Position alternator (Figure 5, Item 4) on engine and install shaft tensioner (Figure 5, Item 17) through mounting hole on alternator.
22. Install alternator lower mount bolt (Figure 4, Item 2), washer (Figure 4, Item 19), new lock washer (Figure 4, Item 20), and nut (Figure 4, Item 21). Do not tighten at this time.
23. Install new self-locking nut (Figure 4, Item 3) and spacer (Figure 4, Item 16) on shaft tensioner (Figure 4, Item 17) mounted on adjusting arm (Figure 4, Item 18). Do not tighten at this time.
24. Install alternator V-belt (Figure 5, Item 6) on alternator pulley (Figure 5, Item 7).
25. Ensure alternator V-belt (Figure 5, Item 6) is on other pulleys.

CAUTION

Excessive force when placing tension on the alternator V-belt may cause damage to the alternator bearing. Use hand force only to apply tension. Do not use pry bar or any other mechanical tool to apply tension to the alternator V-belt during installation or adjustment procedures.

26. Pull alternator (Figure 5, Item 4) slightly outward to tighten V-belt (Figure 5, Item 6), then turn the adjusting bolt (Figure 5, Item 5) clockwise to keep tension on the V-belt (Figure 5, Item 6).

REPLACE – CONTINUED

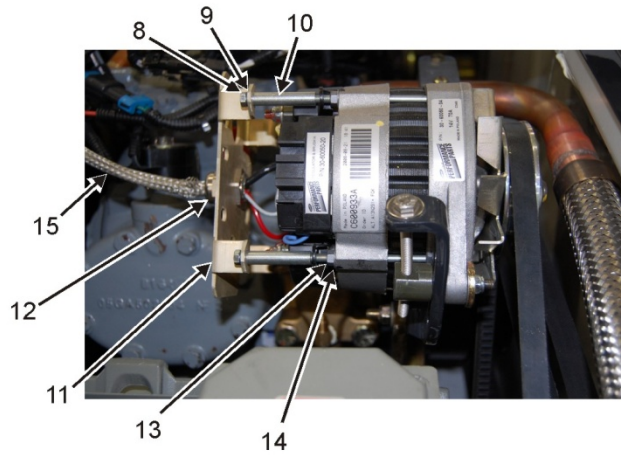
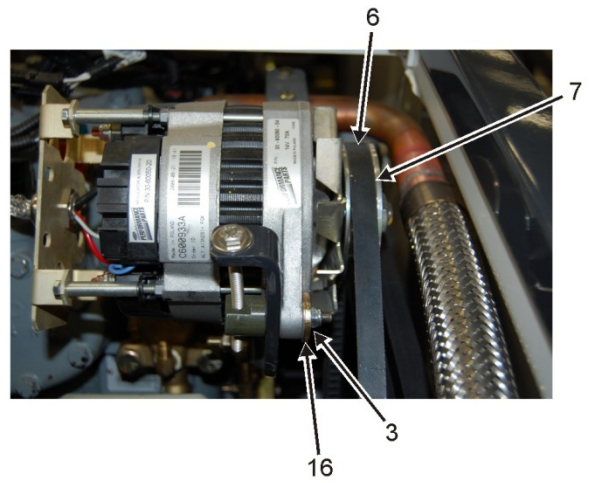
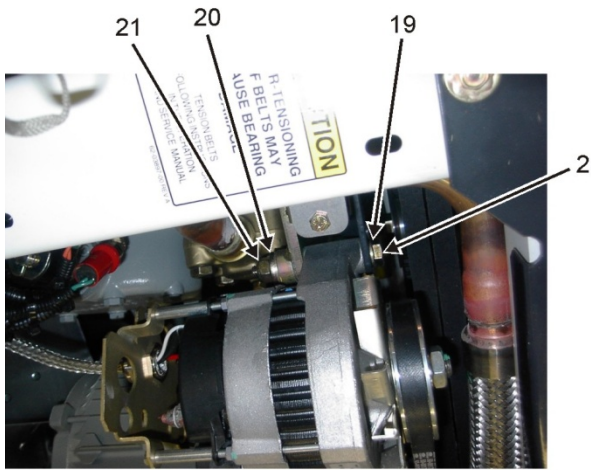
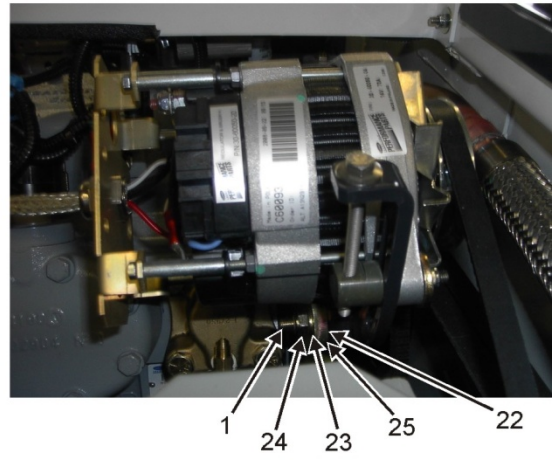
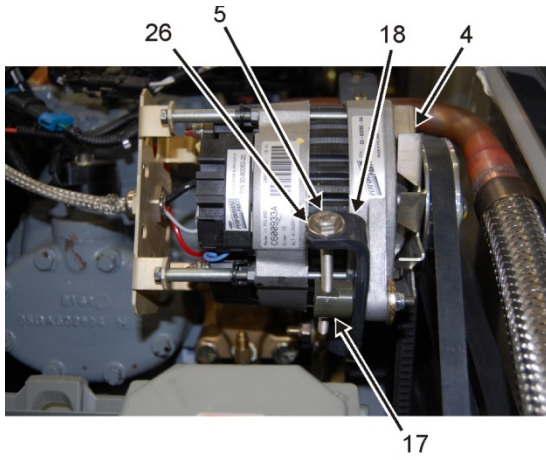


Figure 5. Alternator Installation.

REPLACE – CONTINUED

27. Keeping tension on the alternator (Figure 5, Item 4), tighten self-locking nut (Figure 5, Item 3) and bolts (Figure 5, Item 1 and Item 2).

CAUTION

Overtightening of nuts on studs will cause damage to the alternator.

28. Using tags on wiring harness (Figure 5, Item 15) to identify connection points, connect wiring harness (Figure 5, Item 15) to back of alternator (Figure 5, Item 4) and secure with nuts (Figure 5, Item 13) and washers (Figure 5, Item 14).
29. Position angle bracket (Figure 5, Item 11) on alternator (Figure 5, Item 4) and secure with four bolts (Figure 5, Item 8), new lock washers (Figure 5, Item 9), and stand-offs (Figure 5, Item 10).

NOTE

If strain relief was loosened, then it will be necessary to tighten the strain relief. When selecting a location on cable to tighten the strain relief, it is important to leave enough cable between the alternator cover bracket and the alternator to facilitate future maintenance.

30. Tighten strain relief (Figure 4, Item 12), if necessary.
31. Check alternator V-belt tension (WP 0052, Adjust).
32. Install top-middle panel (WP 0031, Install).
33. Place emergency stop switch (Figure 3, Item 1) in PULL TO START position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

34. Climb off top of MTRCS using roof access provided.
35. Place POWER ON/DOWN switch (Figure 2, Item 2) on control panel to ON position.
36. Start refrigeration unit (WP 0005, Operating Procedures).
37. Test alternator per this WP.
38. Close control panel access door (Figure 2, Item 1).
39. Place MTRCS back into mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
DIESEL ENGINE FUEL FEED PUMP
SERVICE, REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)
 Spill Kit (WP 0107, Item 49)

Materials/Parts

Threadlocking Compound (WP 0110, Item 41)

Personnel Required

Quartermaster and Chemical Equipment Repairer (2)

References

WP 0005
 WP 0070
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

SERVICE

Servicing the fuel feed pump consists of inspecting, cleaning, and replacing, if required, the filter element.

1. Open control panel access door (Figure 1, Item 1).

WARNING

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Disconnect negative (-) battery cable from battery (WP 0070, Disconnect).

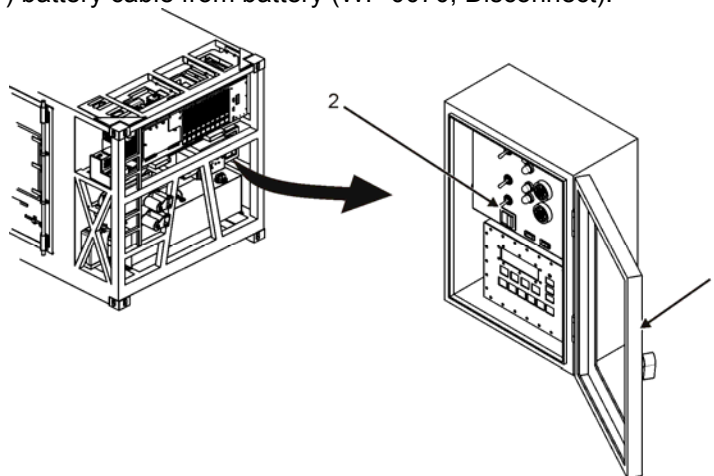


Figure 1. POWER ON/DOWN Switch.

SERVICE – CONTINUED

4. Disconnect electrical connector (Figure 2, Item 1) from Electro-Magnetic Interference (EMI) shield assembly (Figure 2, Item 2) located on top of fuel tank.
5. Remove 18 screws (Figure 2, Item 3), lock washers (Figure 2, Item 4), and washers (Figure 2, Item 5) securing EMI shield assembly (Figure 2, Item 2) to fuel tank (Figure 2, Item 6). Discard lock washers.

NOTE

Use care not to damage EMI shielding on cover.

6. Carefully lift EMI shield assembly (Figure 2, Item 2) from fuel tank (Figure 2, Item 6) and rest on its side to access fuel pump (Figure 2, Item 7).

WARNING

There will be residual fluid when removing this item. Be sure to use spill kit below to catch residual fluid.

7. Remove clear cover (Figure 2, Item 8) and gasket (Figure 2, Item 9) from end of fuel pump (Figure 2, Item 7) using channel locks or strap wrench.
8. Inspect gasket (Figure 2, Item 9) for tears or rips.
 - If gasket appears damaged, replace with new gasket and then continue to next step.
 - If gasket does not appear to be damaged, continue to next step.

NOTE

If filter is being replaced, install the new filter instead of cleaning old filter. The filter should be cleaned every 400 hours of operation.

9. Remove and clean filter element (Figure 2, Item 10) using water and allow to dry.
10. Reinstall filter element (Figure 2, Item 10) into clear cover (Figure 2, Item 8).
11. Reinstall and secure gasket (Figure 2, Item 9) and clear cover (Figure 2, Item 8) to fuel pump (Figure 2, Item 7).
12. Connect battery negative (-) cable to battery (WP 0070, Reconnect).
13. Connect electrical connector (Figure 2, Item 1) to EMI shield assembly (Figure 2, Item 2).
14. Start refrigeration unit in diesel engine drive mode and check for leaks around fuel pump (WP 0005, Operating Procedures).
15. Shut down refrigeration unit (WP 0005, Operating Procedures).
16. Disconnect electrical connector (Figure 2, Item 1) from EMI shield assembly (Figure 2, Item 2).
17. Disconnect battery negative (-) cable from battery (WP 0070, Disconnect).
18. Carefully install EMI shield assembly (Figure 2, Item 2) into place on fuel tank (Figure 2, Item 6).
19. Install 18 screws (Figure 2, Item 3), new lock washers (Figure 2, Item 4), and washers (Figure 2, Item 5) to secure EMI shield assembly (Figure 2, Item 2) to fuel tank (Figure 2, Item 6).

SERVICE – CONTINUED

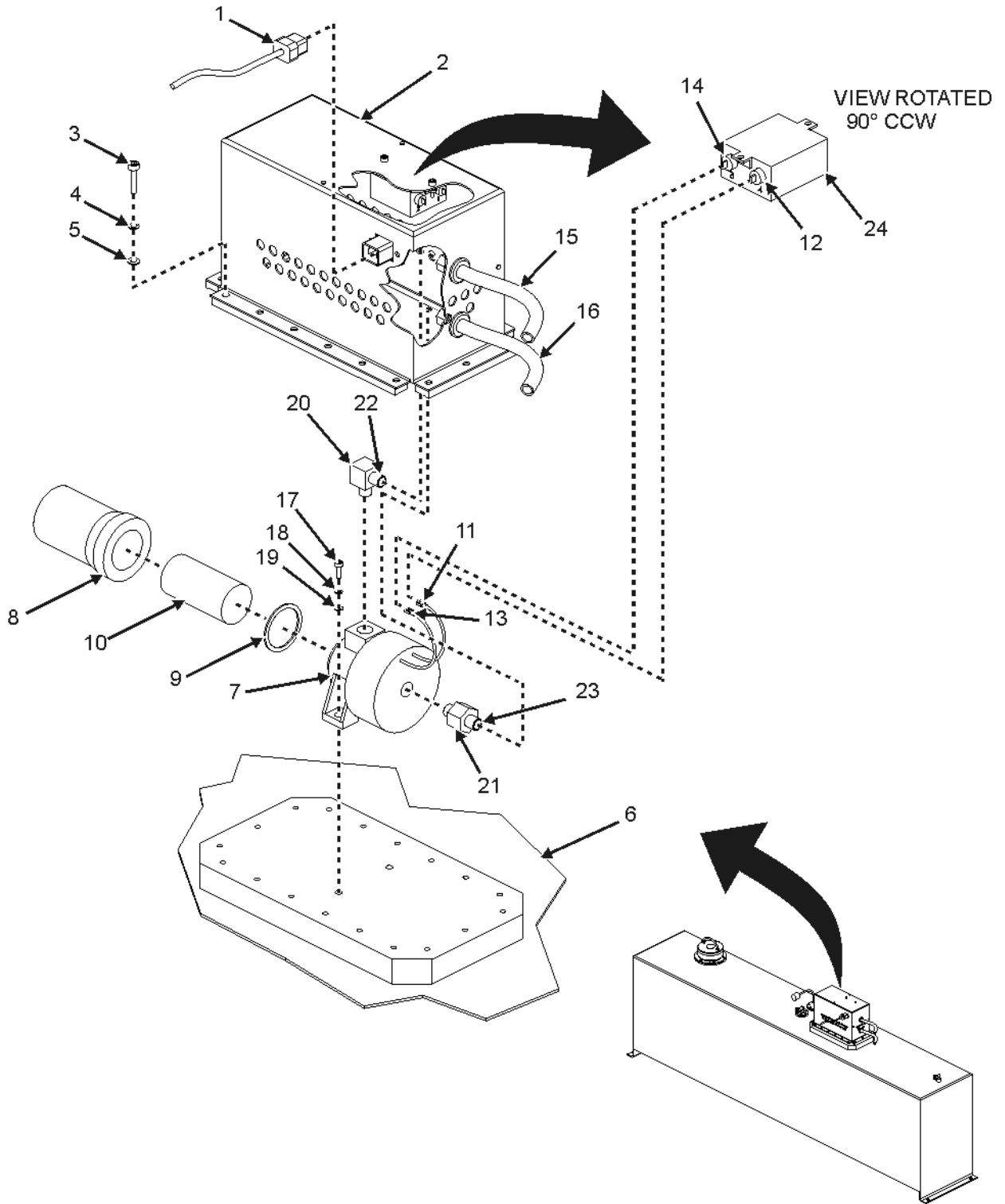


Figure 2. Fuel Pump Service.

SERVICE – CONTINUED

20. Connect electrical connector (Figure 2, Item 1) to EMI shield assembly (Figure 2, Item 2).
21. Connect battery negative (-) cable to battery (WP 0070, Reconnect).
22. Place POWER ON/DOWN switch on control panel to ON position.
23. Close control panel access door (Figure 1, Item 1).
24. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

REPLACE**Remove****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustibile and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

1. Open control panel access door (Figure 3, Item 1).
2. Place POWER ON/DOWN switch (Figure 3, Item 2) on control panel to DOWN position.

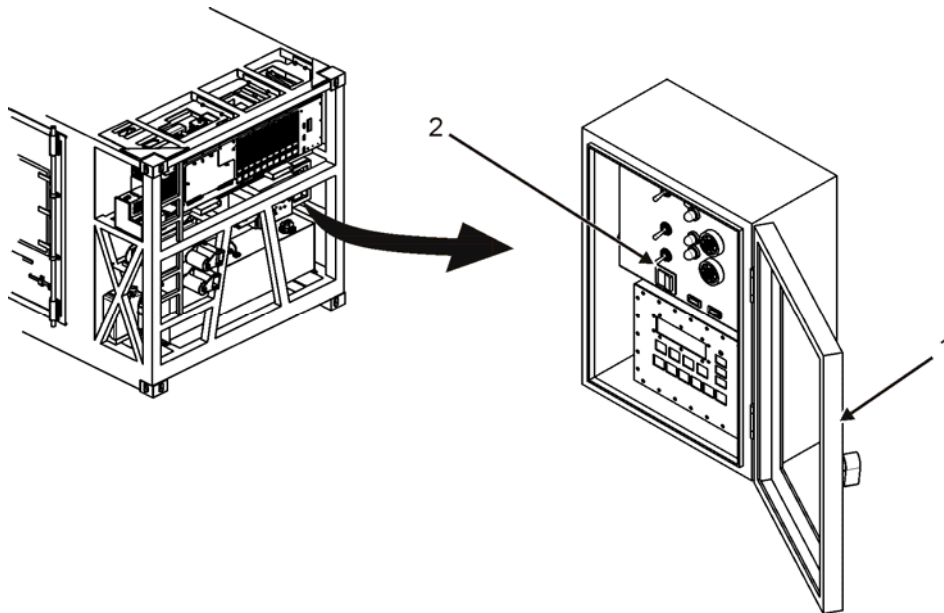


Figure 3. POWER ON/DOWN Switch.

3. Disconnect negative (-) battery cable from battery (WP 0070, Disconnect).
4. Disconnect electrical connector (Figure 4, Item 1) from EMI shield assembly (Figure 4, Item 2).

NOTE

Use care not to damage EMI shielding on cover.

5. Remove 18 screws (Figure 4, Item 3), lock washers (Figure 4, Item 4), and washers (Figure 4, Item 5) securing EMI shield assembly (Figure 4, Item 2) to fuel tank (Figure 4, Item 6). Discard lock washers.

REPLACE – CONTINUED

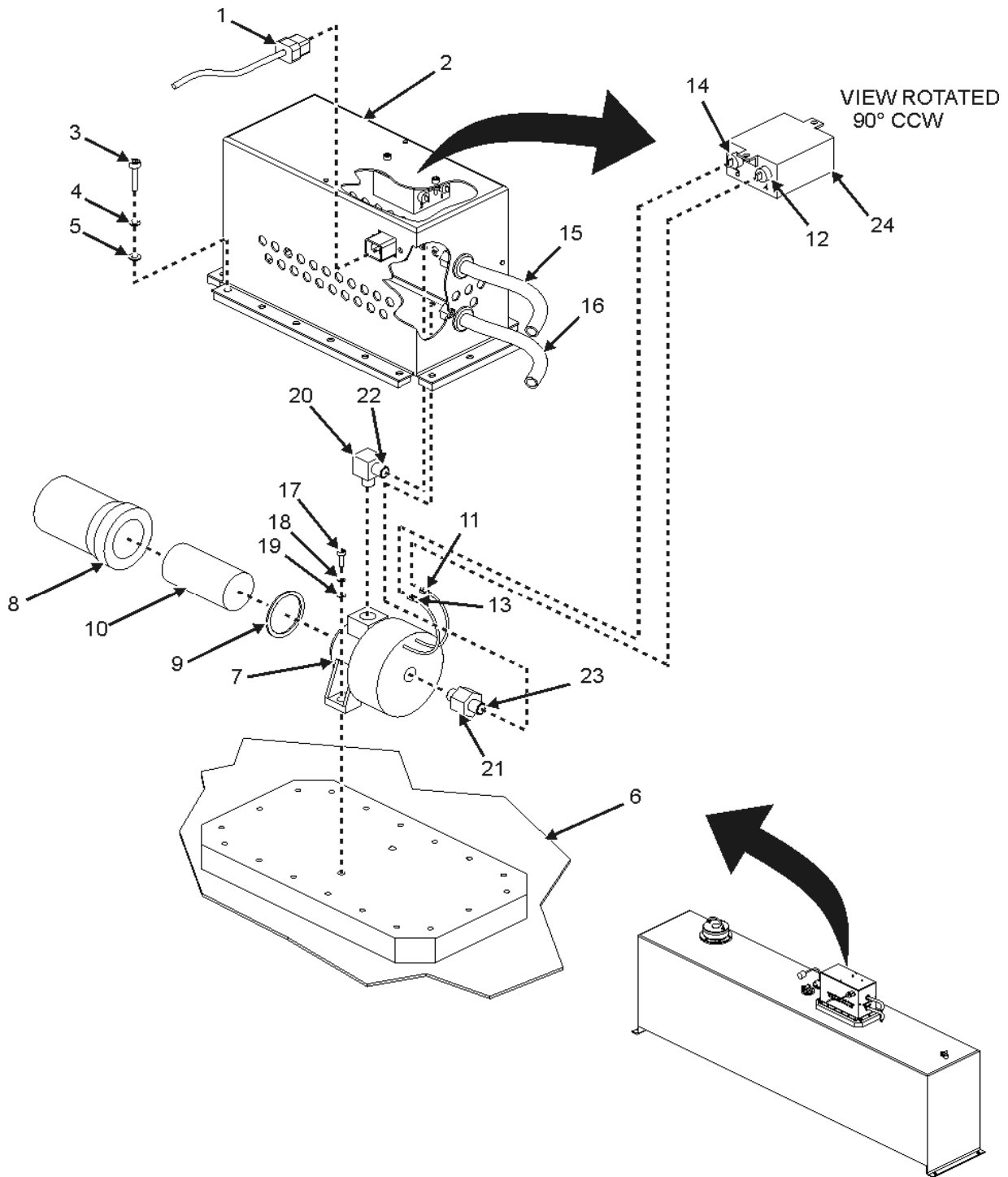


Figure 4. Fuel Pump Removal.

REPLACE – CONTINUED

6. Carefully lift EMI shield assembly (Figure 4, Item 2) from fuel tank (Figure 4, Item 6) and rest on its side to access internal wiring.
7. Tag and disconnect negative (-) (black) fuel pump lead (Figure 4, item 11) from filter terminal 4 (Figure 4, Item 12).
8. Tag and disconnect positive (+) (red) fuel pump lead (Figure 4, item 13) from filter terminal 3 (Figure 4, Item 14) from EMI filter (Figure 4, Item 24).

CAUTION

During disconnection of input and output fuel lines from the fuel pump, residual fuel may drain out of fuel line. Clean any spills with cleaning rags as required.

9. Tag and disconnect input fuel line (Figure 4, Item 15) from fuel pump (Figure 4, Item 7), and clean any spills as required using cleaning rags.
10. Tag and disconnect output fuel line (Figure 4, Item 16) from fuel pump (Figure 4, Item 7), and clean any spills as required using cleaning rags.
11. Remove two screws (Figure 4, Item 17), lock washers (Figure 4, Item 18), and washers (Figure 4, Item 19) securing fuel pump (Figure 4, Item 7) to fuel tank (Figure 4, Item 6). Discard lock washers.
12. Remove fuel pump (Figure 4, Item 7).
13. Remove inlet (Figure 4, Item 20) and outlet (Figure 4, Item 21) fittings. Retain for reinstall.

Install

1. Apply threadlocking compound to threads (Figure 5, Item 22 and Item 23) of inlet (Figure 5, Item 20) and outlet (Figure 5, Item 21) fittings.
2. Reinstall inlet (Figure 5, Item 20) and outlet (Figure 5, Item 21) fittings and tighten.

NOTE

When installing fuel pump onto fuel tank, make sure that fuel filter end of pump is oriented towards the fuel filler cap.

3. Install new fuel pump (Figure 5, Item 7) onto fuel tank (Figure 5, Item 6) using two screws (Figure 5, Item 17), new lock washers (Figure 5, Item 18), and washers (Figure 5, Item 19).
4. Connect output fuel line (Figure 5, Item 16) to fuel pump outlet fitting (Figure 5, Item 21). Remove tag.
5. Connect input fuel line (Figure 5, Item 15) to fuel pump inlet fitting (Figure 5, Item 20). Remove tag.
6. Connect positive (+) (red) fuel pump lead (Figure 5, Item 13) to EMI filter terminal 3 (Figure 5, Item 14) on EMI filter (Figure 5, Item 24). Remove tag.
7. Connect negative (-) (black) fuel pump lead (Figure 5, Item 11) to EMI filter terminal 4 (Figure 5, Item 12) on EMI filter (Figure 5, Item 24). Remove tag.

REPLACE – CONTINUED

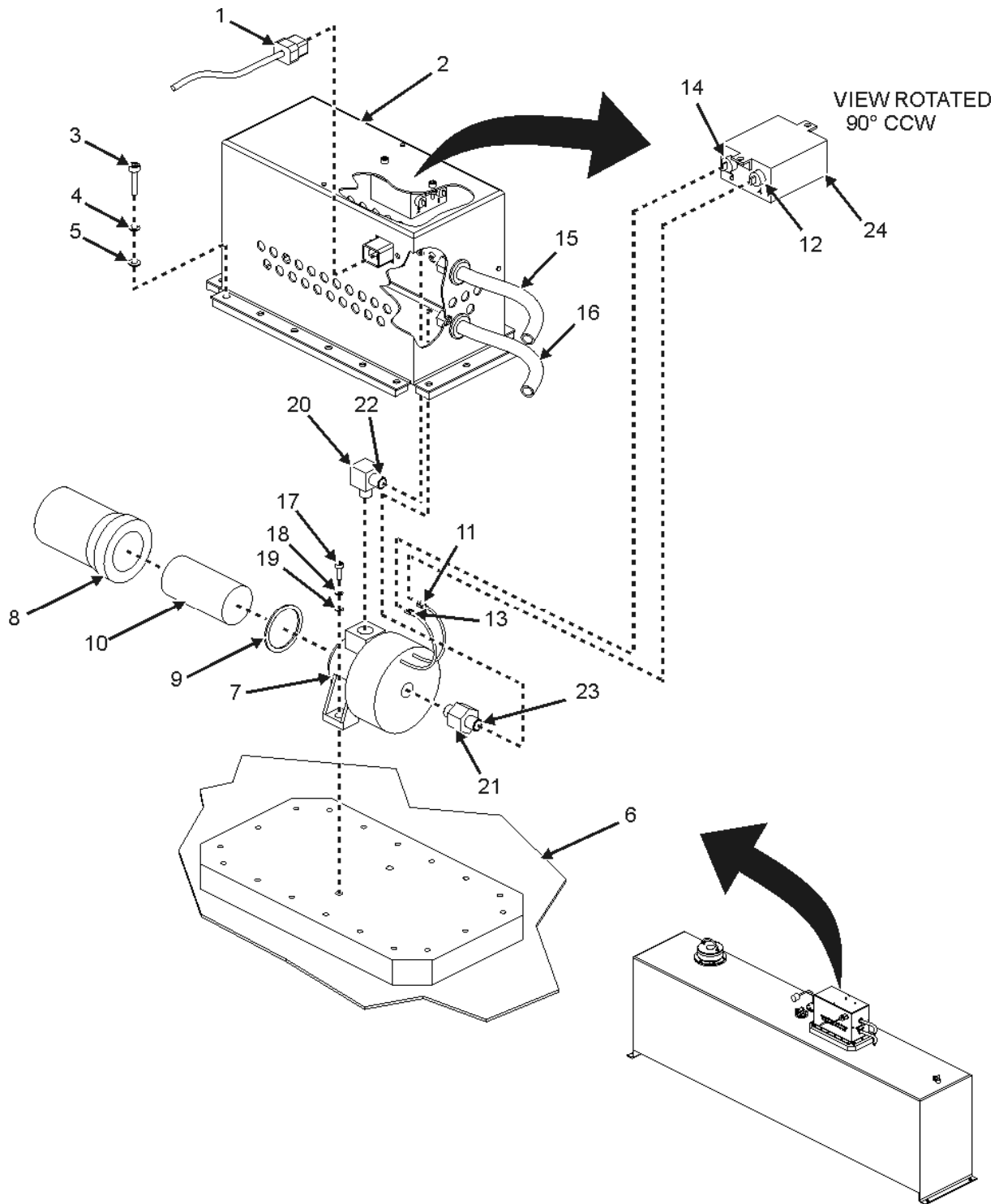


Figure 5. Fuel Pump Installation.

REPLACE – CONTINUED

8. Carefully place EMI shield assembly (Figure 5, Item 2) into place on fuel tank (Figure 5, Item 6). Do not install attaching hardware at this time.
9. Connect electrical connector (Figure 5, Item 1) to EMI shield assembly (Figure 5, Item 2).
10. Connect battery negative (-) cable to battery (WP 0070, Reconnect).
11. Place POWER ON/DOWN switch (Figure 4, Item 2) on control panel to ON position.

NOTE

If testing is performed before installing cover, EMI signals will be emitted from pump.

12. Start refrigeration unit in diesel engine drive mode (WP 0005, Operating Procedures).
 - If no leaks are found, proceed to next step.
 - If a leak is detected, shut down refrigeration unit, clean up spillage and tighten loose connection fitting, re-check for leaks, then proceed to next step.
13. Install 18 screws (Figure 5, Item 3), new lock washers (Figure 5, Item 4), and washers (Figure 5, Item 5) to secure EMI shield assembly (Figure 5, Item 2) to fuel tank (Figure 5, Item 6).
14. Close control panel access door (Figure 4, Item 1).
15. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
DIESEL ENGINE GLOW PLUGS
TEST, REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Personnel Required

Quartermaster and Chemical Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Battery disconnected (WP 0070)

References

WP 0005
 WP 0031
 WP 0070
 WP 0102
 TM 10-8145-222-23P

TEST**WARNING**

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

3. Access top of MTRCS using roof access provided.
4. Remove top-right panel (WP 0031, Remove).

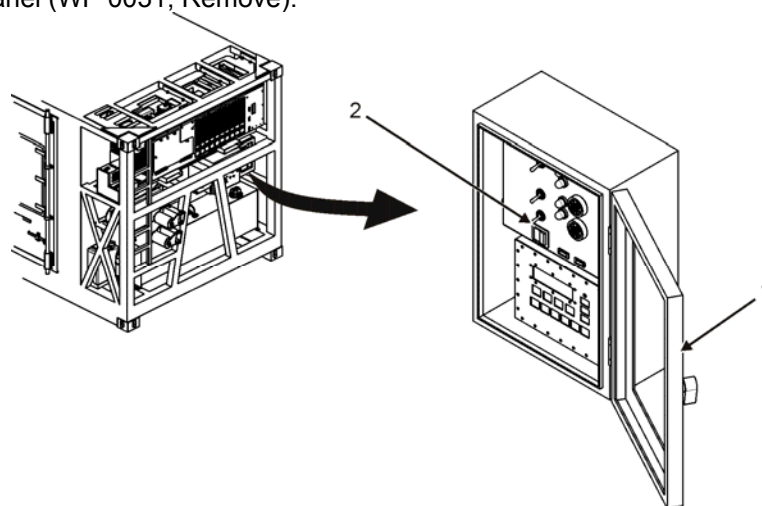


Figure 1. POWER ON/DOWN Switch.

TEST – CONTINUED

5. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.

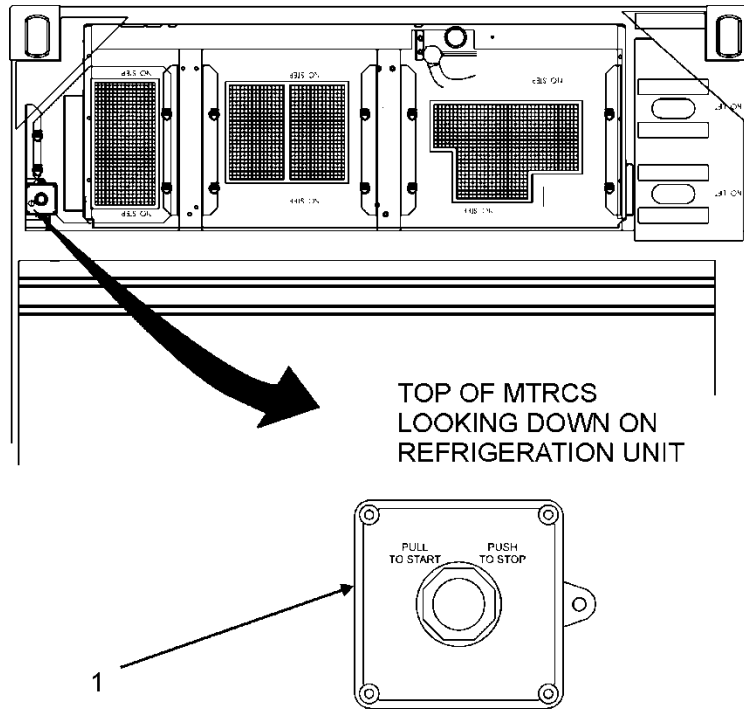


Figure 2. Emergency Stop Switch.

6. Remove three nuts (Figure 3, Item 1) securing glow plug lead assembly (Figure 3, Item 2) to three glow plugs (Figure 3, Item 3).
7. Disconnect electrical lead (Figure 3, Item 4) from forward glow plug.
8. Remove glow plug lead assembly (Figure 3, Item 2).

NOTE

There are three glow plugs associated with this engine. An ohm reading check must be performed on each glow plug to assess if a plug is faulty and needs to be replaced.

9. Place positive multimeter lead on top tip of glow plug (Figure 3, Item 3) and negative multimeter lead on engine block ground.
 - Resistance indicated on meter should be between 0.7 and 1.2 ohms.

TEST – CONTINUED

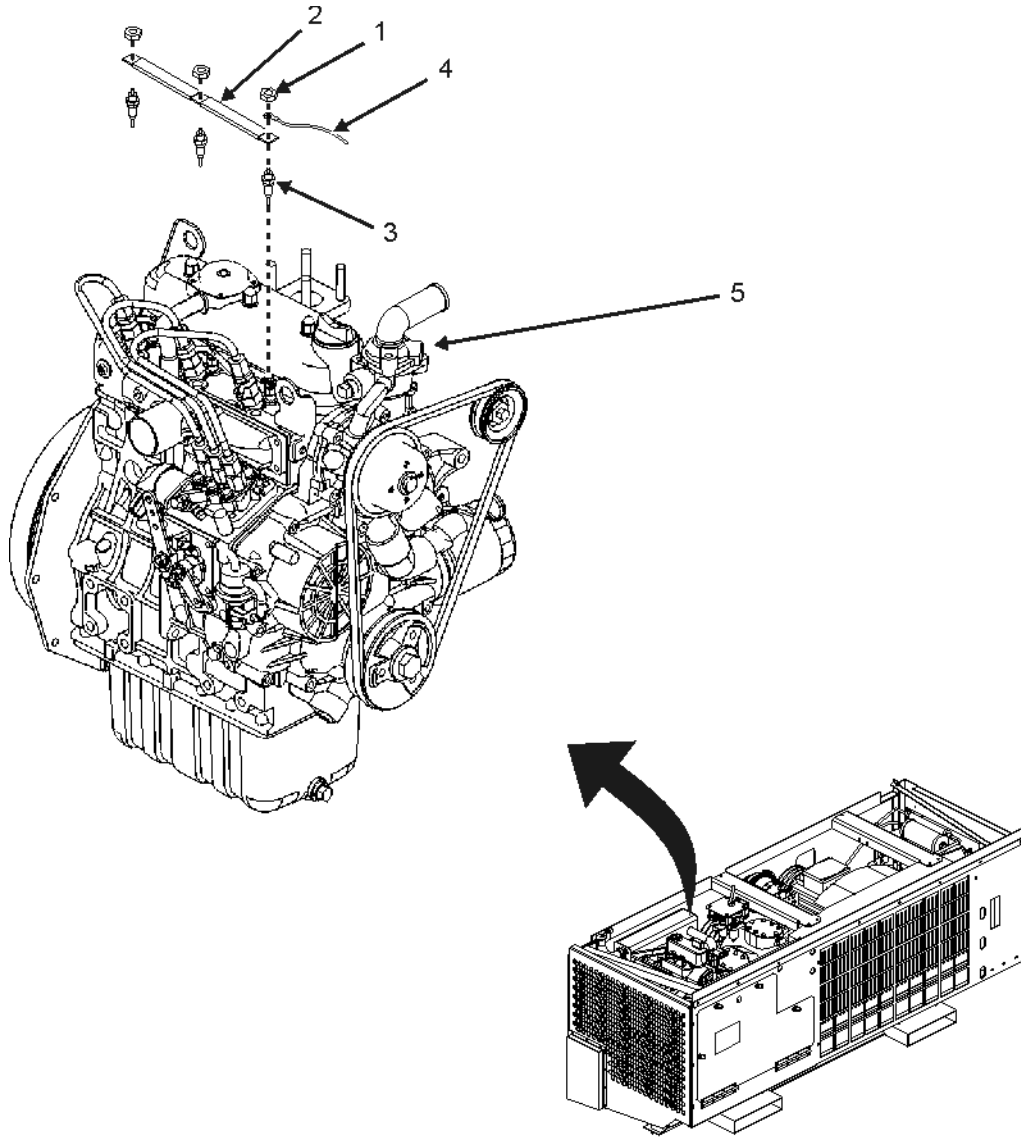


Figure 3. Glow Plug Lead Assembly Test.

TEST – CONTINUED

10. Perform resistance check on each glow plug.
11. If resistance measured is not between 0.7 and 1.2 ohms, glow plug is faulty and must be replaced per this WP.
12. Reinstall glow plug lead assembly (Figure 3, Item 2) onto each glow plug (Figure 3, Item 3), electrical lead (Figure 1, Item 4), and secure using three nuts (Figure 3, Item 1) onto cylinder head (Figure 3, Item 5).
13. Place emergency stop switch (Figure 2, Item 1) on PULL TO START position.
14. Install top-right panel (WP 0031, Install).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

15. Climb off top of MTRCS using roof access provided.
16. Reconnect battery (WP 0070, Reconnect).
17. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
18. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
19. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**REPLACE****WARNING**

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30 minutes before performing maintenance.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

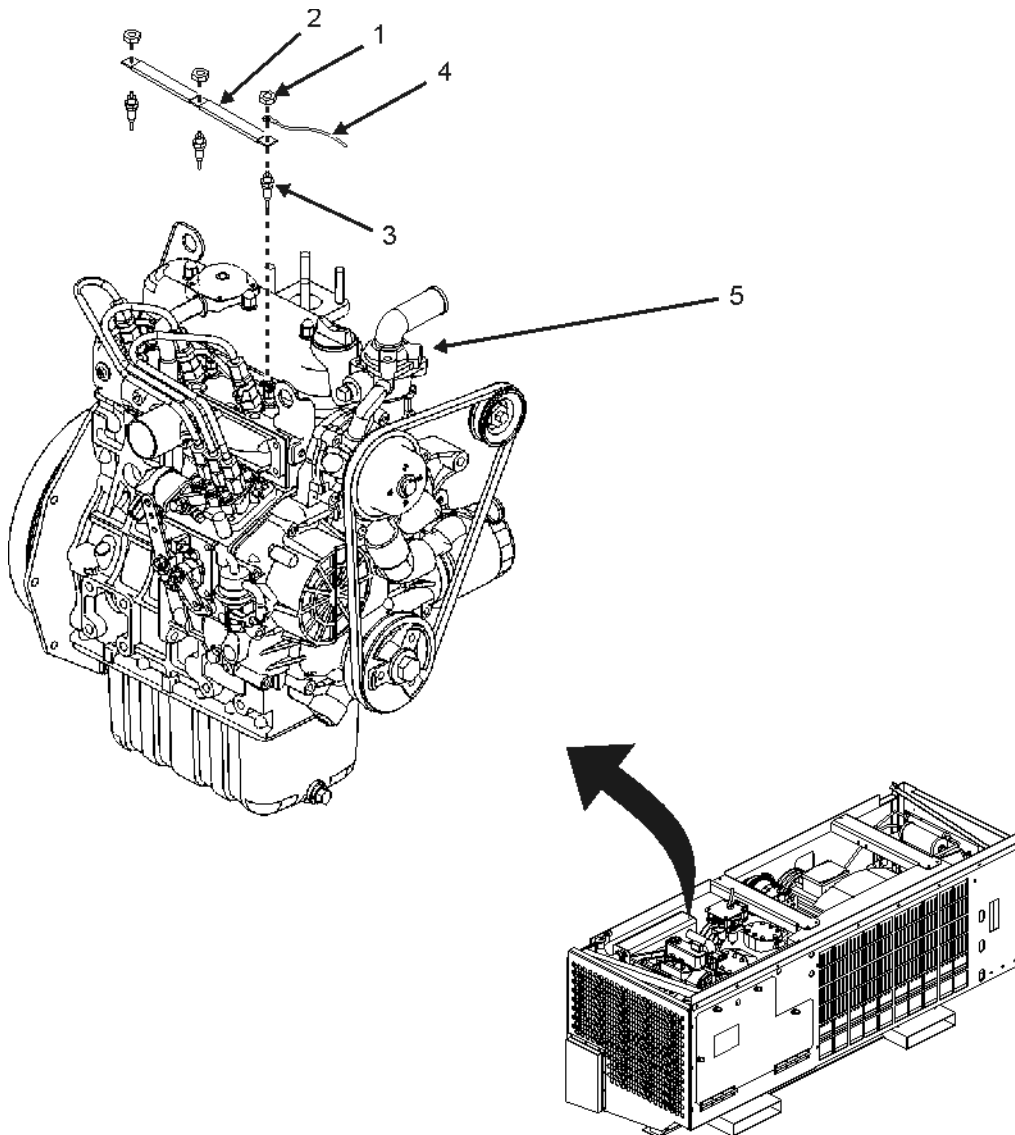
WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

3. Access top of MTRCS using roof access provided.

REPLACE – CONTINUED

4. Remove top-right panel (WP 0031, Remove).
5. Remove three nuts (Figure 4, Item 1) securing glow plug lead assembly (Figure 4, Item 2) to three glow plugs (Figure 4, Item 3).
6. Disconnect electrical lead (Figure 4, Item 4) from forward glow plug.
7. Remove glow plug lead assembly (Figure 4, Item 2).
8. Loosen each glow plug (Figure 4, Item 3) and remove from cylinder head (Figure 4, Item 5).

**Figure 4. Glow Plug Lead Assembly Replacement.**

REPLACE – CONTINUED

9. Place positive multimeter lead on each replacement glow plug (Figure 4, Item 3) and negative multimeter lead on engine block ground.
 - Resistance indicated on meter should be between 0.7 and 1.2 ohms for each glow plug.
10. Carefully install replacement glow plugs (Figure 4, Item 3) into cylinder head (Figure 4, Item 5).

NOTE

There are three glow plugs associated with this engine. An ohm reading check must be performed on each glow plug to assess if a plug is faulty and needs to be replaced.

11. Retest each glow plug after installation by placing positive multimeter lead on each glow plug (Figure 4, Item 3) and negative multimeter lead on engine block ground.
 - Resistance indicated on meter should be between 0.7 and 1.2 ohms for each glow plug.
12. Tighten each glow plug (Figure 4, Item 3) and torque 6 to 11 foot-pounds (WP 0102, Introduction).
13. Install glow plug lead assembly (Figure 4, Item 2).
14. Connect electrical lead (Figure 4, Item 4) to glow plug lead assembly (Figure 4, Item 2).
15. Install three nuts (Figure 4, Item 1) to secure glow plug lead assembly (Figure 4, Item 2) to three glow plugs (Figure 4, Item 3).
16. Install top-right panel (WP 0031, Install).
17. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

18. Climb off top of MTRCS using roof access provided.
19. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
20. Place POWER ON/DOWN switch (Figure 1, Item 1) on control panel to ON position.
21. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
22. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
CONDENSER FAN
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Brush, Cleaning (WP 0110, Item 7)
 Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0052
 WP 0053
 WP 0070
 WP 0102
 TM 10-8145-222-23P

Materials/Parts

Detergent, General Purpose
 (WP 0110, Item 18)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cable disconnected (WP 0005)
 Top panels removed (WP 0031)

Personnel Required

Utilities Equipment Repairer

REPLACE**WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

2. Access top of MTRCS using roof access provided.
3. Make sure emergency stop switch (Figure 1, Item 1) is in PUSH TO STOP position.

REPLACE – CONTINUED

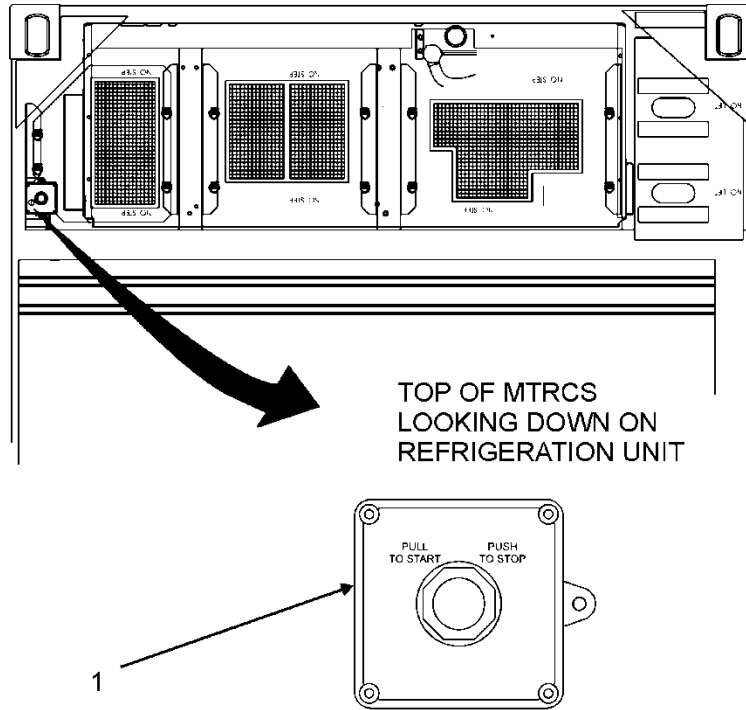


Figure 1. Emergency Stop Switch.

REPLACE – CONTINUED

4. Remove two bolts (Figure 2, Item 1) securing fan shroud (Figure 2, Item 2) to condenser (Figure 2, Item 3).
5. Remove fan shroud (Figure 2, Item 2).

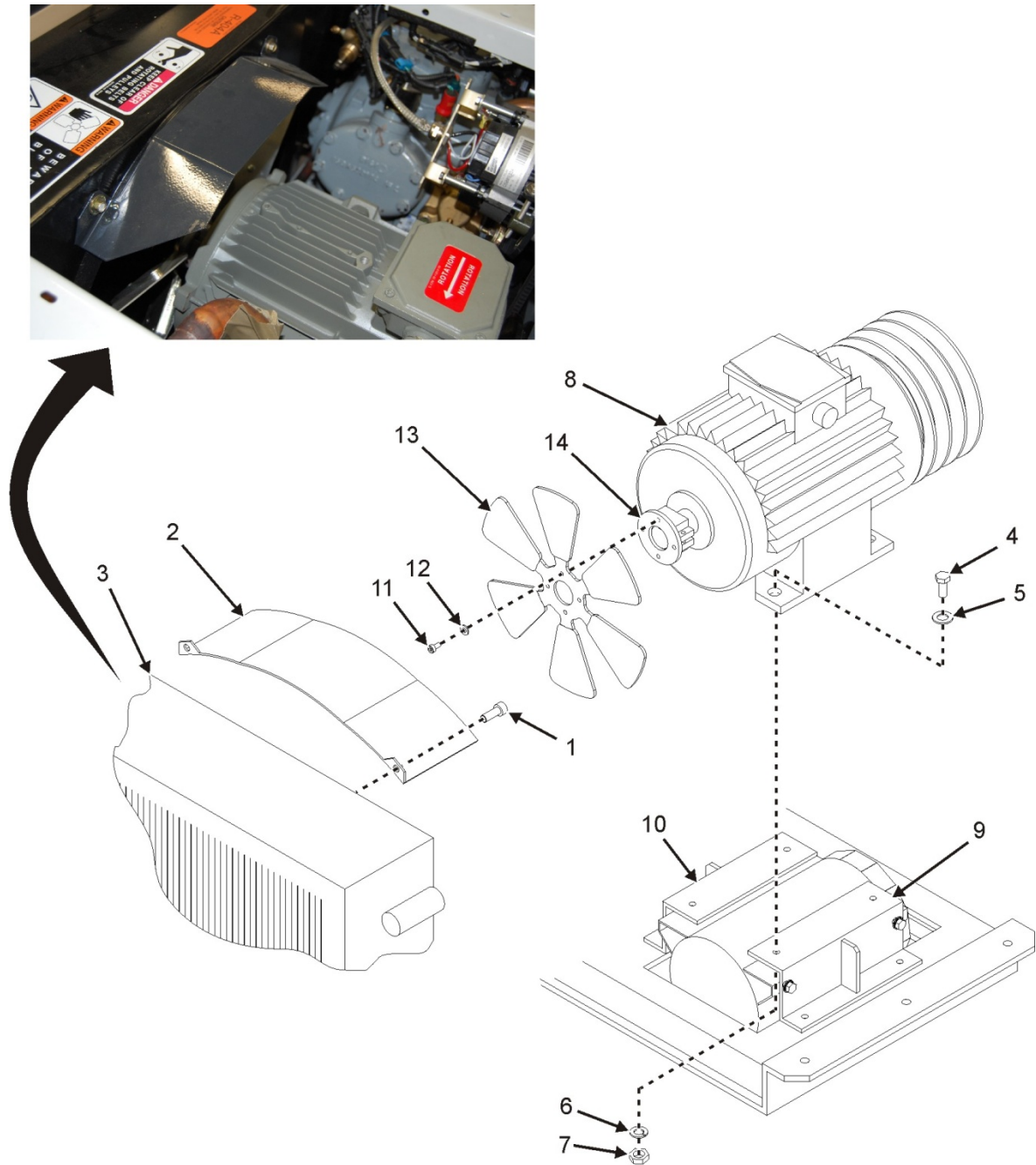


Figure 2. Condenser Fan Removal.

REPLACE – CONTINUED**NOTE**

The alternator will be partially removed to gain access for the condenser fan replacement. When partially removing alternator, only the attaching hardware needs to be removed. The wiring can be left attached.

6. Loosen alternator mounting bolts (Figure 3, Item 1 and Item 2) and self-locking nut (Figure 3, Item 3) enough that the alternator (Figure 3, Item 4) is free to pivot. Do not remove at this time.
7. Screw alternator adjusting bolt (Figure 3, Item 5) counterclockwise until tension is off V-Belt (Figure 3, Item 6).
8. Push alternator (Figure 3, Item 4) downward to loosen alternator V-belt (Figure 3, Item 6).
9. Remove alternator V-belt (Figure 3, Item 6) from alternator pulley (Figure 3, Item 7).

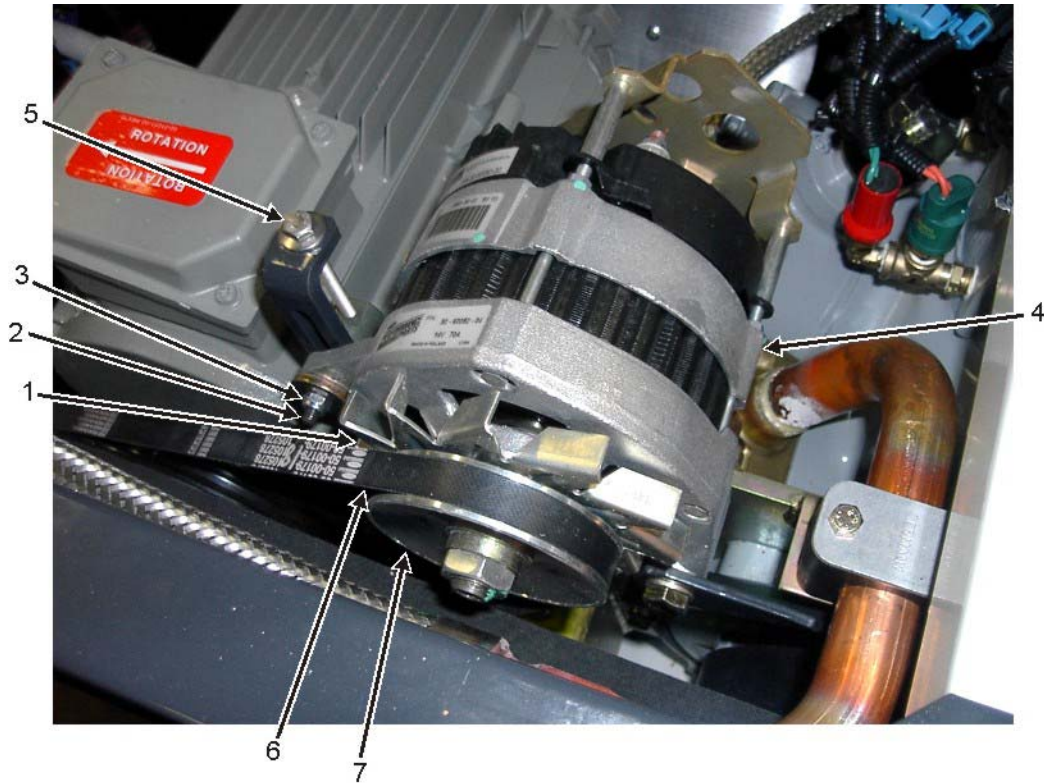


Figure 3. Alternator Mounting Removal.

REPLACE – CONTINUED

NOTE

The fan fits tightly between the radiator condenser and standby motor. In order to remove the fan from the standby motor shaft, it will be necessary to slide the standby motor slightly aft to gain the needed access for fan removal.

It is important to note the distance that the standby motor sits in relation to the rear wall of the refrigeration unit before loosening the mounting bolts. This distance will have to be matched during re-installation in order to make sure the belt alignment is proper.

When sliding standby motor, three belts will be loosened – two standby motor to compressor V-belts and the standby motor to single phase alternator V-belt. These belts will have to be tightened after reinstalling the standby motor.

10. Measure and record distance from upper standby motor end cap (Figure 4, Item 1) to refrigeration unit back wall (Figure 4, Item 2). Note that the standby motor is slightly cocked when installed.

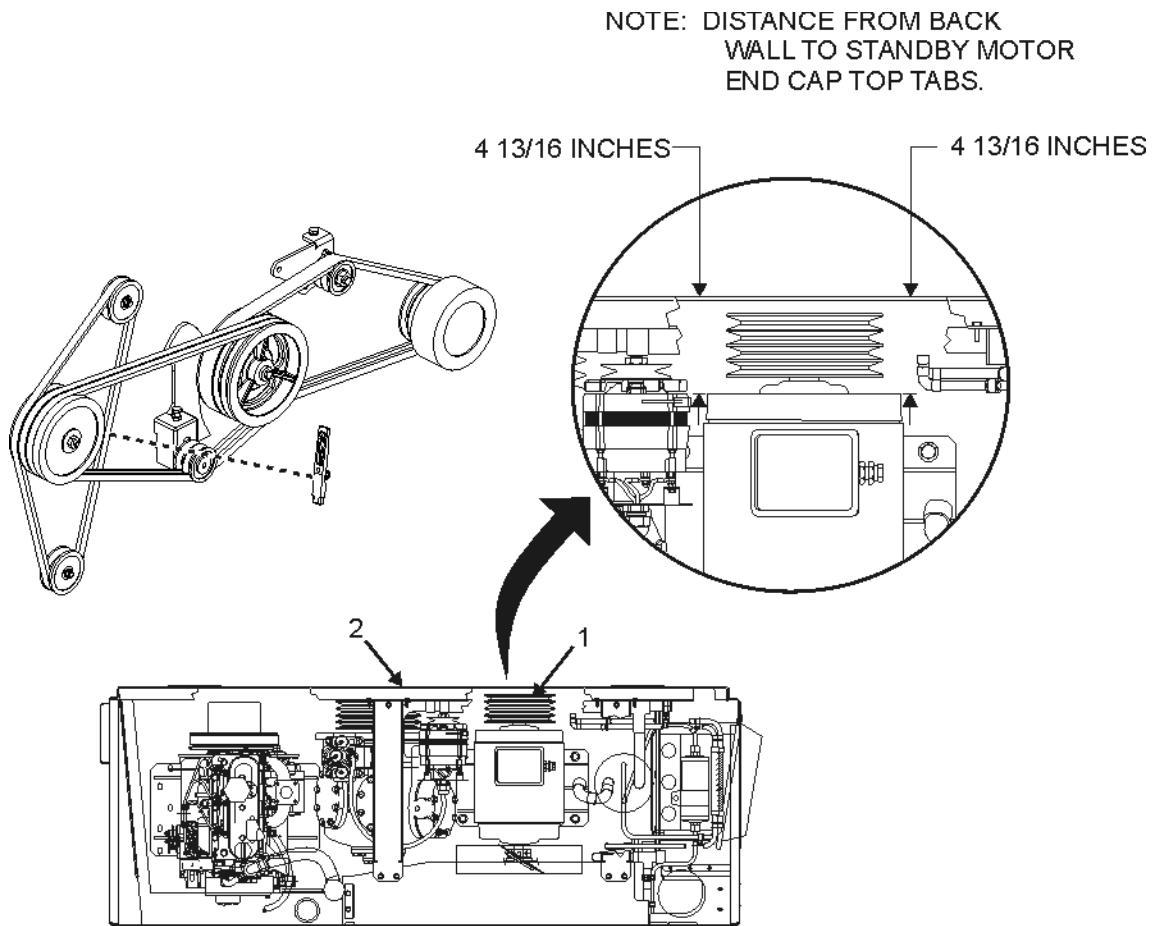
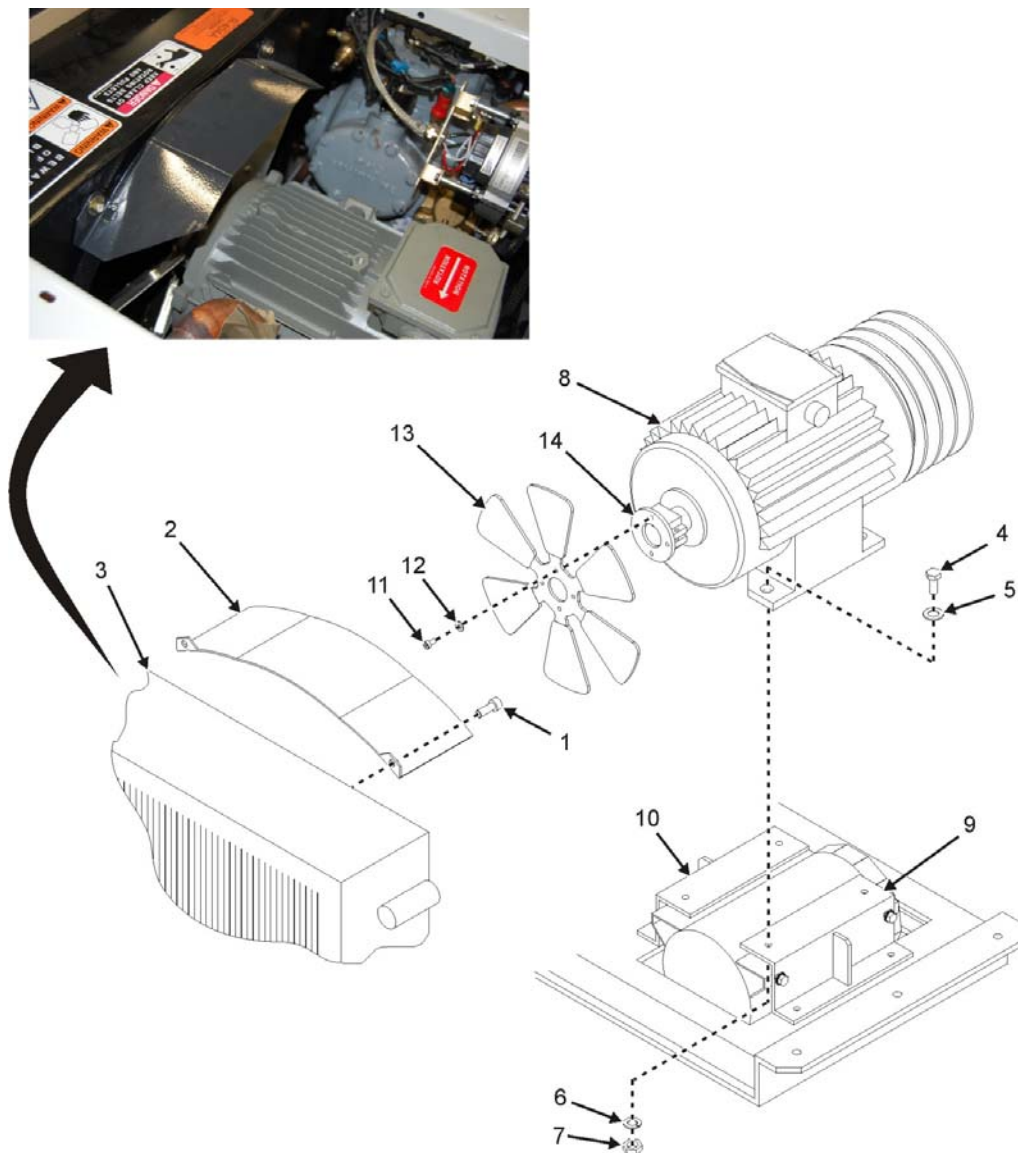


Figure 4. Standby Motor Alignment Clearances.

REPLACE – CONTINUED

11. Remove four bolts (Figure 5, Item 4), washers (Figure 5, Item 5), and nuts (Figure 5, Item 6) securing standby motor (Figure 5, Item 7) to left (Figure 5, Item 8) and right (Figure 5, Item 9) motor brackets.
12. Slide standby motor (Figure 5, Item 7) aft enough to gain required room for fan removal.
13. Remove four bolts (Figure 5, Item 10) and four washers (Figure 5, Item 11) securing condenser fan (Figure 5, Item 12) to fan bushing (Figure 5, Item 13).
14. Carefully separate fan (Figure 5, Item 12) from fan bushing (Figure 5, Item 13).
15. Remove condenser fan (Figure 5, Item 12).
16. Clean and check inside of condenser coil before installing a new fan.

**Figure 5. Condenser Fan Installation.**

REPLACE – CONTINUED**CAUTION**

There must be a gap on the fan shaft to provide clearance between rotating fan blades and standby motor housing. Obtain a clearance of 3/8-inch between base of standby motor and fan bushing to provide adequate clearance.

17. Reposition two standby motor to compressor V-belts and standby motor to single phase alternator V-belt in place.

NOTE

Steel hub of condenser fan faces condenser.

18. Install replacement condenser fan (Figure 5, Item 12) onto fan bushing (Figure 5, Item 13), making sure there is a minimum of 3/8-inch clearance between base of standby motor and fan bushing, and secure using four bolts (Figure 5, Item 10) and washers (Figure 5, Item 11).
19. Tighten bolts (Figure 5, Item 10) in a cross-tightening manner (WP 0102, Introduction).
20. Slide standby motor forward into position and secure to left (Figure 5, Item 8) and right (Figure 5, Item 9) motor brackets using four bolts (Figure 5, Item 4), washers (Figure 5, Item 5), and nuts (Figure 5, Item 6).
21. Confirm there is approximately a 1-1/4 inch gap between fan blades and condenser coil (Figure 4, Item 2).
22. Make sure to match measurements taken when fan was removed for distance between standby motor housing and rear inside wall of refrigeration unit (Figure 4).

NOTE

It will be necessary to rotate the alternator to install the V-belt adjust bolt. It is not necessary to install the V-belt adjust bolt in any particular location in the slotted opening in the adjusting arm as long as the adjusting bolt is through the adjusting arm and secured in the shaft tensioner.

23. Install alternator V-belt (Figure 6, Item 6) on alternator pulley (Figure 6, Item 7).
24. Ensure alternator V-belt (Figure 6, Item 6) is on other pulleys.

CAUTION

Excessive force when placing tension on the alternator V-belt may cause damage to the alternator bearing. Use hand force only to apply tension. Do not use pry bar or any other mechanical tool to apply tension to the alternator V-belt during installation or adjustment procedures.

25. Pull alternator (Figure 6, Item 4) slightly outward to tighten V-belt (Figure 6, Item 6), then turn adjusting bolt (Figure 6, Item 5) clockwise to keep tension on V-belt (Figure 6, Item 6).
26. Adjust V-belt tension (WP 0053).
27. Adjust alternator V-belt tension (WP 0052, Adjust).

REPLACE – CONTINUED

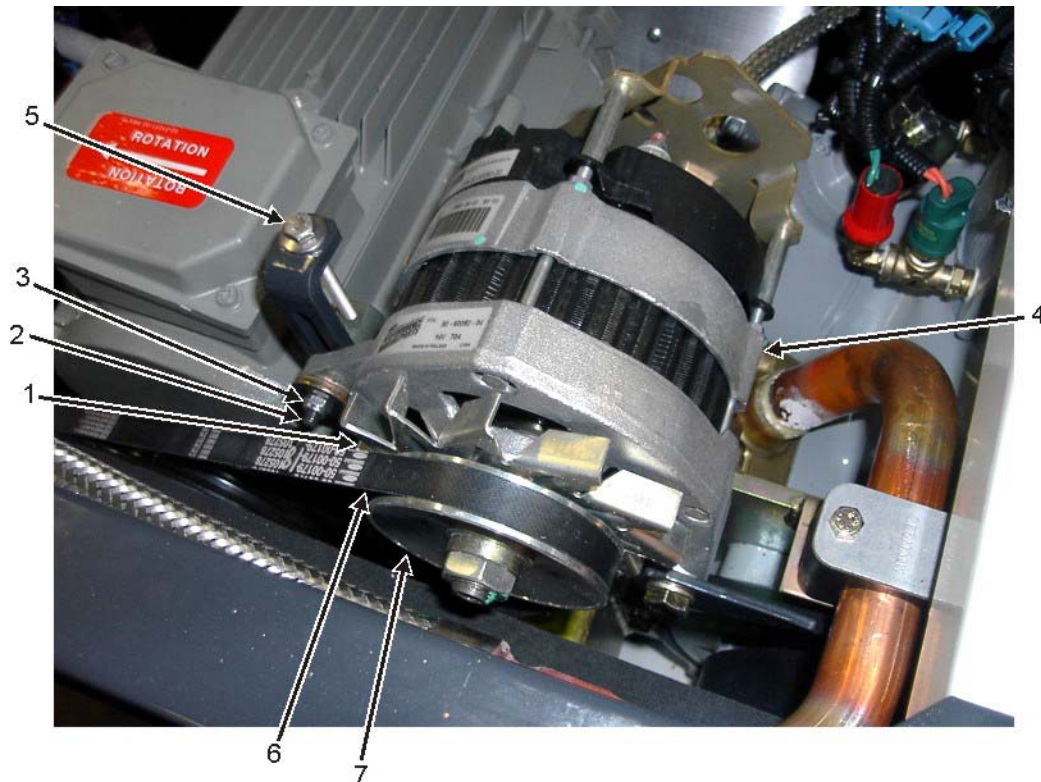


Figure 6. Alternator Mounting Installation.

28. Install fan shroud (Figure 2, Item 2) onto condenser and secure using two bolts (Figure 2, Item 1).
29. Install top-middle panel (WP 0031, Install).
30. Make sure emergency stop switch (Figure 1, Item 1) is in PULL TO START position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

31. Climb off top of MTRCS using roof access provided.
32. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
33. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
34. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
STANDBY MOTOR TO SINGLE-PHASE ALTERNATOR V-BELT
REPLACE, ADJUST

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 Tester, Belt Tension (WP 0108, Item 5)

References

WP 0005
 WP 0031
 WP 0053
 WP 0054
 WP 0070
 WP 0102
 TM 10-8145-222-23P

Personnel Required

Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Top-middle panel removed (WP 0031)
 Top-left panel removed (WP 0031)

REPLACE**WARNING**

Metal jewelry will conduct electricity. Remove all jewelry when working on equipment. Failure to comply can cause injury or death to personnel by electrocution.

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 3) on control panel to DOWN position.
3. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
4. Remove compressor to standby motor V-belt (WP 0053, Remove).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

5. Access top of MTRCS using roof access provided.

REPLACE – CONTINUED

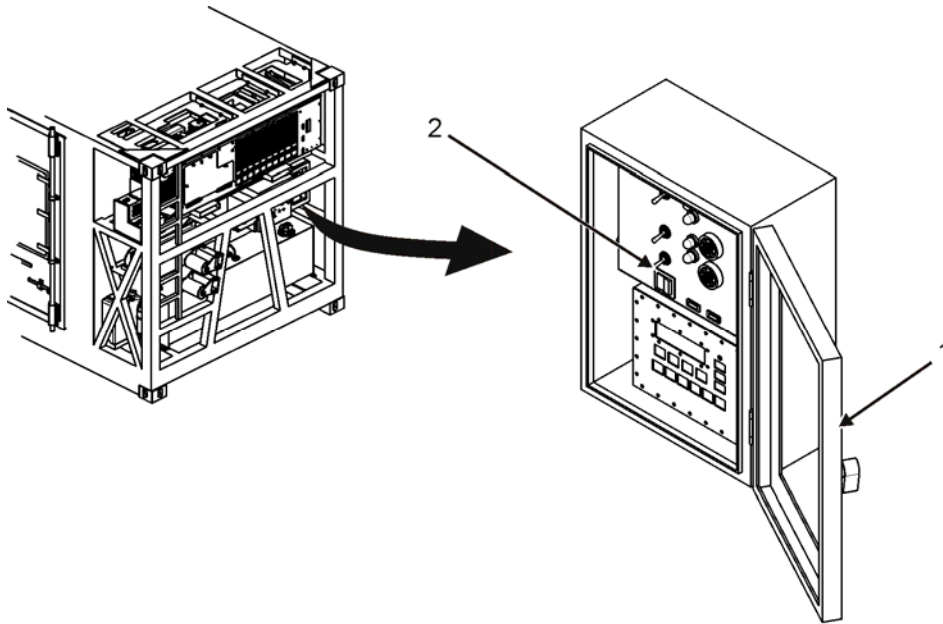


Figure 1. POWER ON/DOWN Switch.

6. Make sure emergency stop switch (Figure 2, Item 1) is in PUSH TO STOP position.

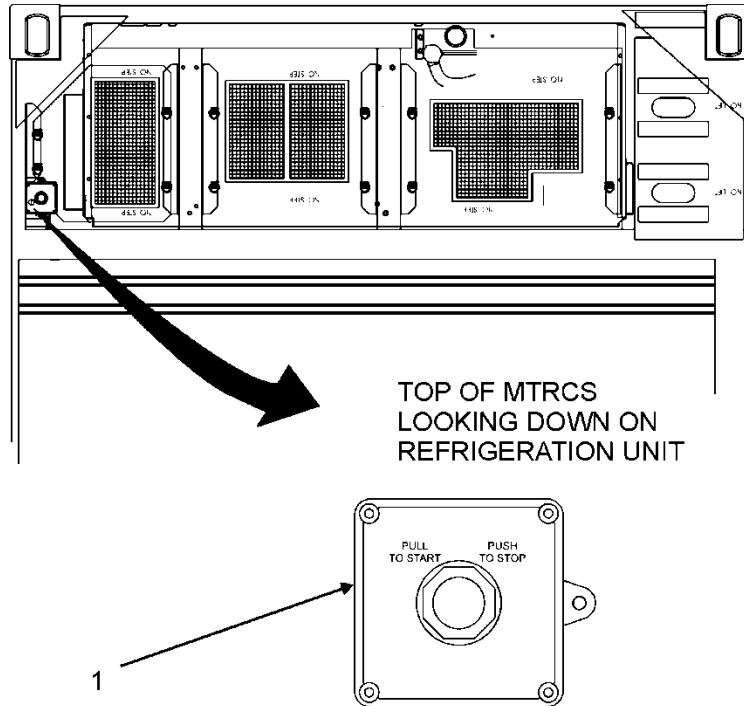
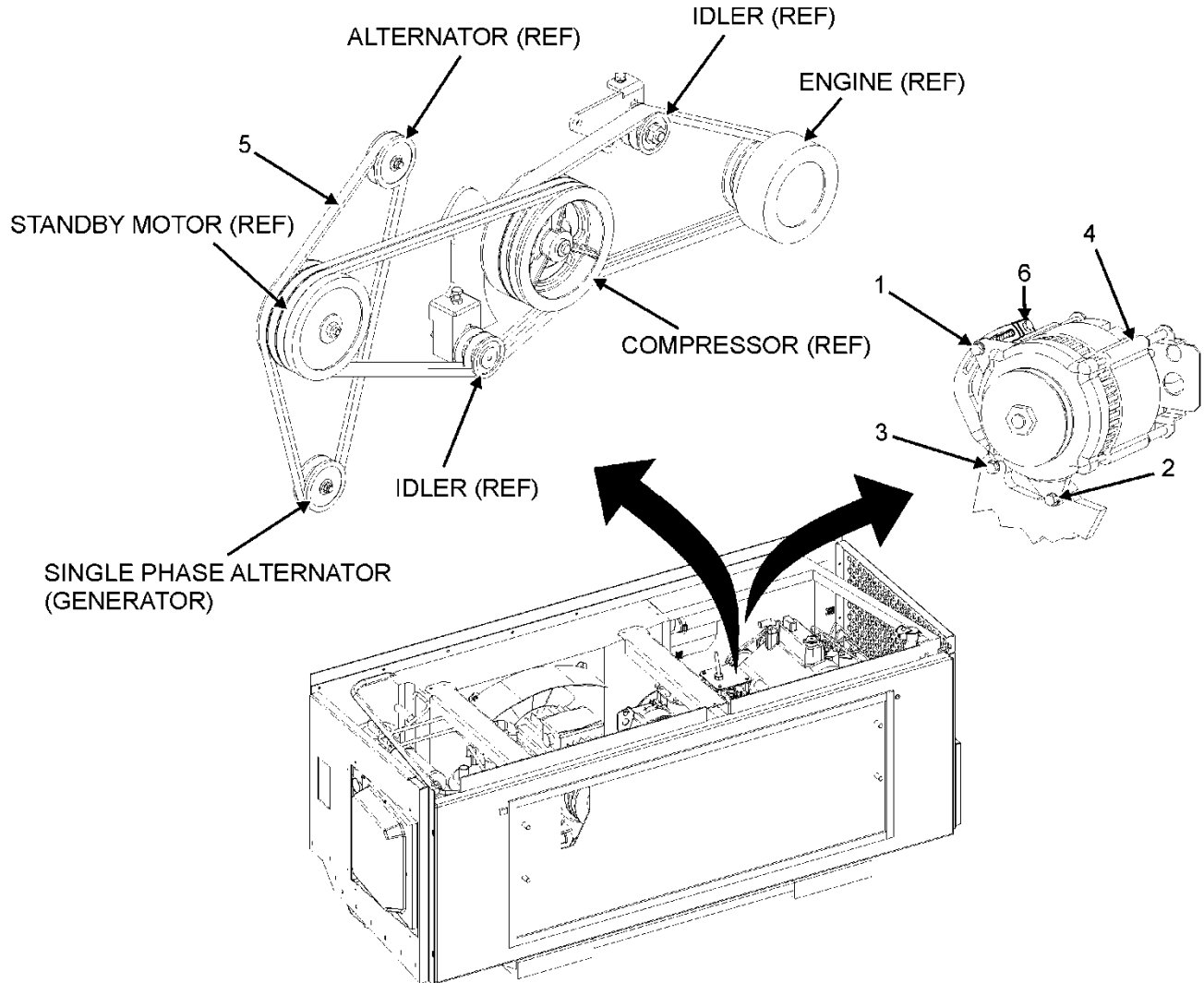


Figure 2. Emergency Stop Switch.

REPLACE – CONTINUED

7. Loosen alternator self-locking nut (Figure 3, Item 1); lower mount bolt (Figure 3, Item 2) and V-belt tension adjustment bolt (Figure 3, Item 3) enough that alternator (Figure 3, Item 4) is free to pivot.
8. Remove standby motor to single-phase alternator V-belt (Figure 3, Item 5).

**Figure 3. Alternator V-Belt.**

9. Place new standby motor to single-phase alternator V-belt (Figure 3, Item 5) around alternator, standby motor, and single-phase alternator pulleys.

CAUTION

Excessive force when placing tension on the alternator V-belt may cause damage to the alternator bearing. Use hand force only to apply tension. Do not use pry bar or any other mechanical tool to apply tension to the alternator V-belt during installation or adjustment procedures.

10. Use hand pressure to pivot alternator slightly outward to tighten V-belt (Figure 3, Item 3) in order to put 30-50 pounds tension on new alternator V-belt (Figure 3, Item 5).

REPLACE – CONTINUED

11. Adjust screw (Figure 3, Item 6) on adjusting arm clockwise to tighten V-belt (Figure 3, Item 5) tension.
12. Keep tension on alternator (Figure 3, Item 4), tighten alternator self-locking nut (Figure 3, Item 1), lower mount bolt (Figure 3, Item 2) and V-belt tension adjustment bolt (Figure 3, Item 3) (WP 0102, Introduction).

NOTE

When checking V-belt tension using the V-belt tension gauge, place the tension gauge as close to midpoint as possible between pulleys.

Proper tension for a V-belt is considered to be the lowest allowable tension in which the belt will not slip during peak load conditions.

13. Check alternator V-belt (Figure 3, Item 5) tension using belt tension gauge. V-belt tension should be 30-50 pounds.
14. Adjust tension of alternator V-belt (Figure 3, Item 5) as needed to achieve tension of 30-50 pounds.

NOTE

New V-belt tension drops rapidly during the first few hours of operation. Check and re-verify proper V-belt tension every four hours during the first 24-hours of operation after replacing the belt.

15. Install top-middle panel (WP 0031, Install).
16. Install top-left panel (WP 0031, Install).
17. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

18. Climb off top of MTRCS using roof access provided.
19. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
20. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
21. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
22. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

ADJUST**V-Belt Tension Check****WARNING**

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Obtain V-belt tension gauge (Figure 4, Item 1) from technical manual holder.

NOTE

The V-belt tension gauge can be held in three different positions (Figure 5), depending on ease of use and location of belt being checked. Holding the gauge in one of these three positions will make sure that only the black pad will be pushed on during the tension check.

6. Place V-belt tension gauge (Figure 4, Item 1) against V-belt (Figure 4, Item 2) at a location (Figure 4, Item 3) midway between belt pulleys (Figure 4, Item 4) with flange on bottom of tension gauge against edge of V-belt.

ADJUST – CONTINUED

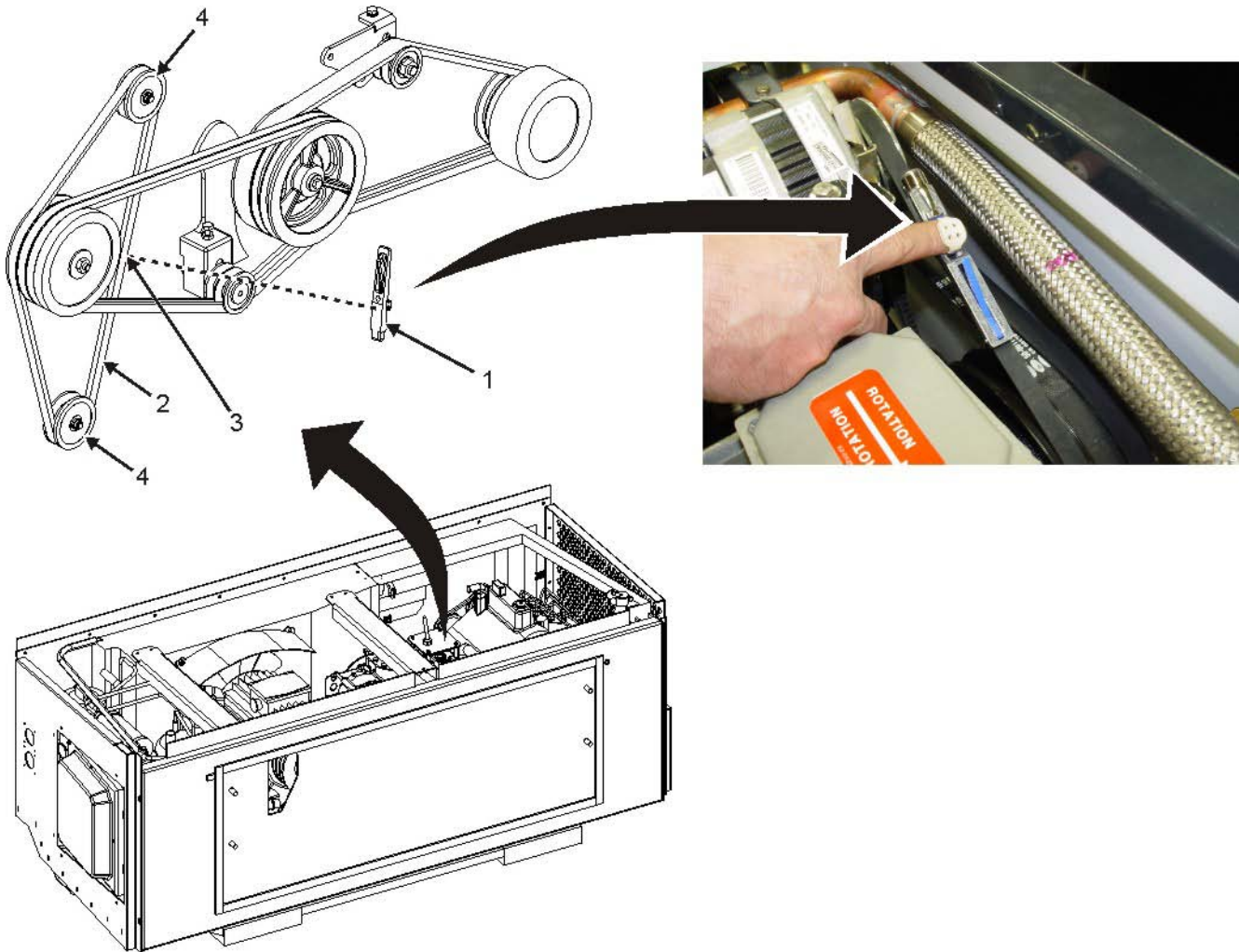


Figure 4. V-Belt Tension Check.

NOTE

While pushing on the tension gauge as it is pressed against the V-belt, you will hear or feel a click when the tension of the V-belt is reached. You will need to stop pressing against the gauge immediately when you hear or feel this click and carefully remove the gauge from the belt without disturbing the position of the black indicator arm.

7. On tension gauge (Figure 5, Item 1), press slowly on black pad (Figure 5, Item 2) and stop when click is heard or felt.

ADJUST – CONTINUED

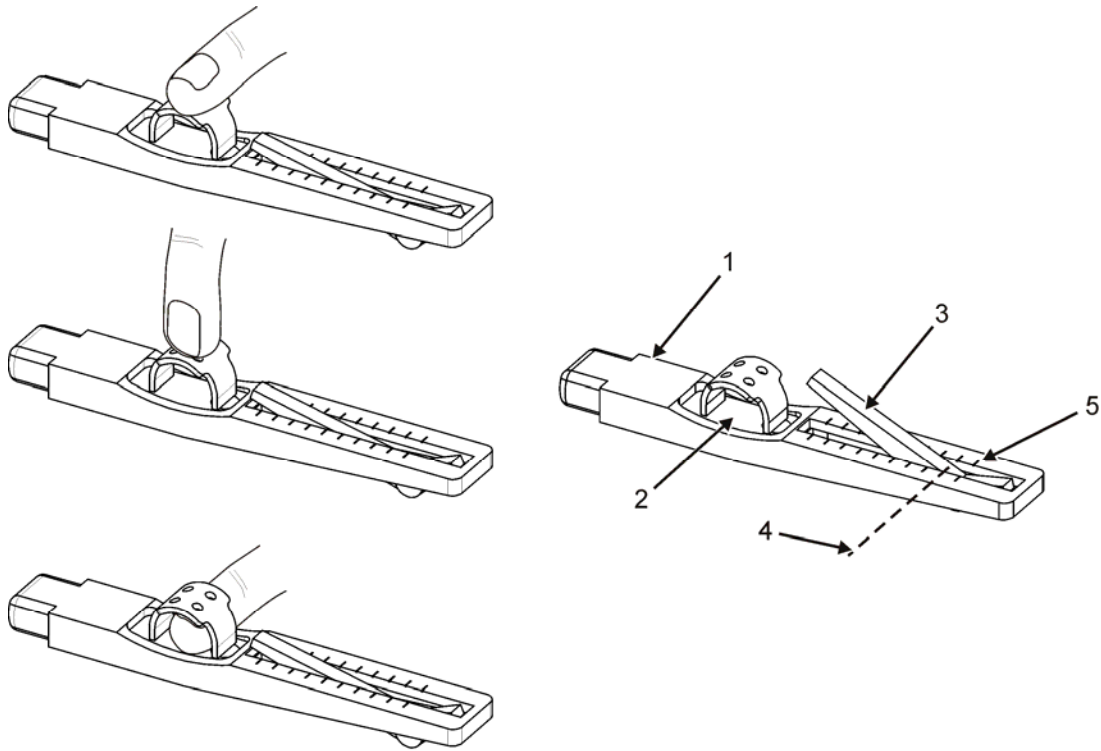


Figure 5. V-Belt Tension Gauge.

8. Carefully remove tension gauge (Figure 4, Item 1) from V-belt (Figure 4, Item 2) so that black indicator arm (Figure 5, Item 3) is not moved.
9. Turn tension gauge (Figure 5, Item 1) sideways and mark position (Figure 5, Item 4) where black indicator arm (Figure 5, Item 3) intersects scale (Figure 5, Item 5).

NOTE

The V-belt tension is determined by reading the scale at the exact location where the black indicator arm intersects the scale on top of the gauge.

10. Turn tension gauge (Figure 5, Item 1) so that scale (Figure 5, Item 5) can be read and determine V-belt tension.
11. Adjust V-belt tension as needed to obtain required tension per this WP.
12. Recheck V-belt tension per steps 6-10 of this task.
13. Install top-middle panel (WP 0031, Install).
14. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.

ADJUST – CONTINUED**WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

15. Exit top of MTRCS using roof access provided.
16. Reconnect negative (-) battery terminal (WP 0070, Disconnect).
17. Place POWER ON/DOWN switch (Figure 1, Item 2) to ON position.
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

V-Belt Adjustment**WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 6, Item 2) to DOWN position.

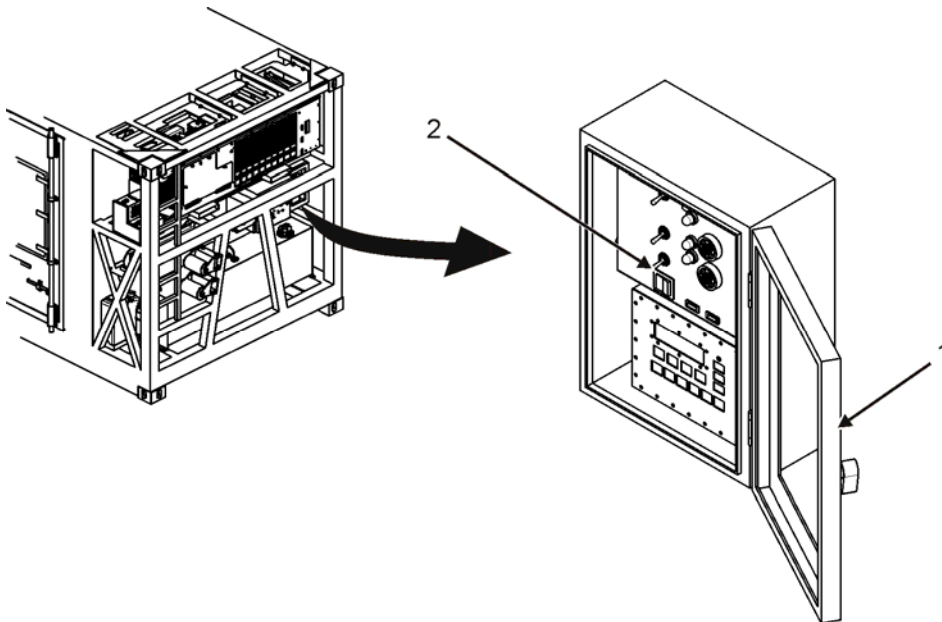


Figure 6. POWER ON/DOWN Switch.

ADJUST – CONTINUED**WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 7, Item 1) in PUSH TO STOP position.

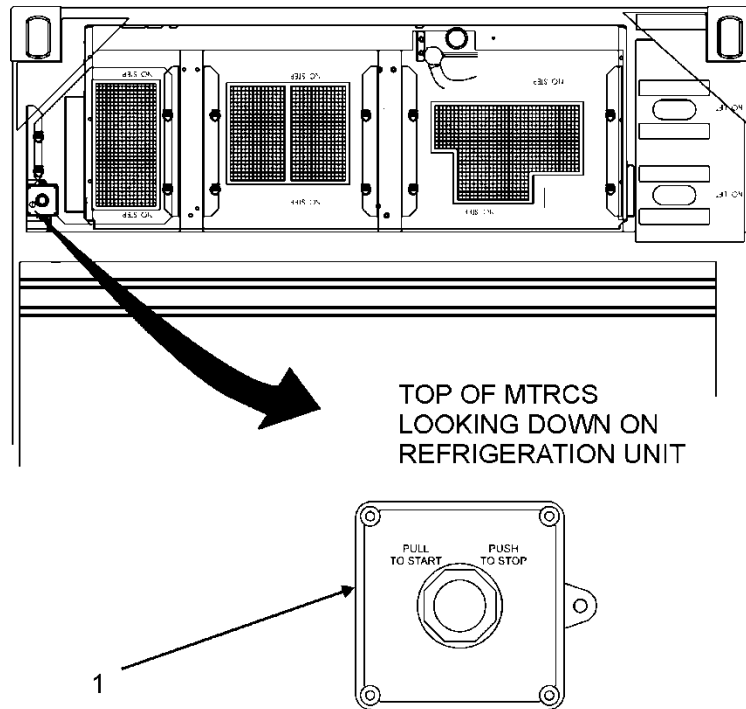


Figure 7. Emergency Stop Switch.

5. Loosen alternator self-locking nut (Figure 8, Item 1), lower mount bolt (Figure 8, Item 2), and V-belt tension adjustment bolt (Figure 8, Item 3) enough that alternator (Figure 8, Item 4) is free to pivot.
6. Use hand pressure to pivot alternator up in order to put 30-50 pounds tension on new alternator V-belt (Figure 8, Item 5).
7. Adjust screw (Figure 8, Item 6) on adjusting arm clockwise to tighten V-belt (Figure 8, Item 5) tension.
8. Tighten alternator self-locking nut (Figure 8, Item 1), lower mount bolt (Figure 8, Item 2), and V-belt tension adjustment bolt (Figure 8, Item 3) (WP 0102, Introduction).
9. Install top-middle panel (WP 0031, Install).
10. Install top-left panel (WP 0031, Install).
11. Place emergency stop switch (Figure 7, Item 1) in PULL TO START position.

ADJUST – CONTINUED

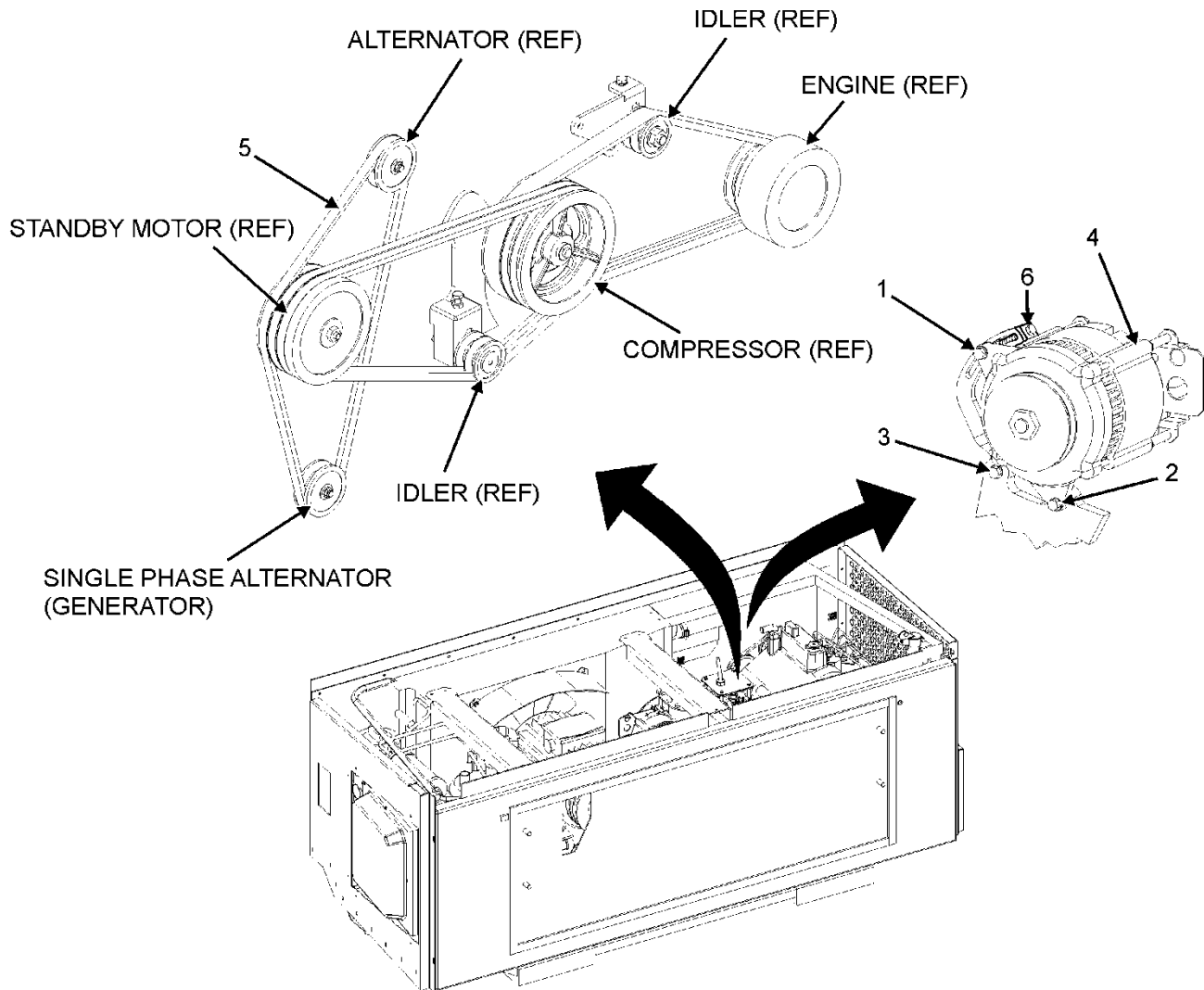


Figure 8. Alternator V-Belt.

12. Exit top of MTRCS.
13. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
14. Place POWER ON/DOWN switch (Figure 6, Item 2) to ON position.
15. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
16. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
STANDBY MOTOR TO COMPRESSOR V-BELT
REPLACE, ADJUST

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 Tester, Belt Tension (WP 0108, Item 5)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0070
 WP 0102
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Top-left panel removed (WP 0031)
 Top-middle panel removed (WP 0031)

REPLACE**WARNING**

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Disconnect negative (-) battery terminal (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

4. Access top of MTRCS using roof access.

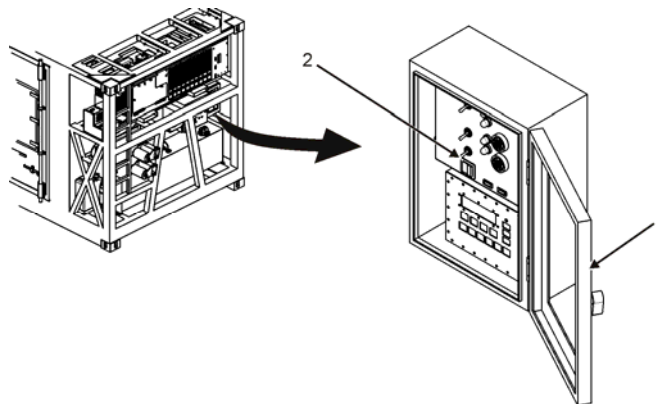


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

- Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.

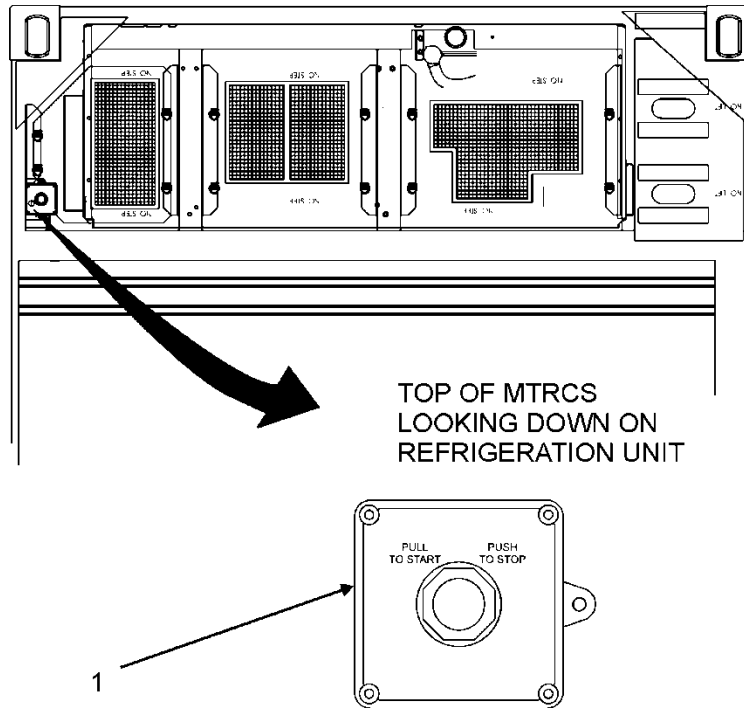


Figure 2. Emergency Stop Switch.

- Loosen V-belt idler tensioner bolt (Figure 3, Item 1).

NOTE

The standby motor to compressor V-belts are a two belt set. Always replace both belts.

- Remove V-belts (Figure 3, Item 2).
- Place new V-belts (Figure 3, Item 2) over compressor, idler, and standby motor pulley.

CAUTION

Excessive force when placing tension on the standby motor to compressor V-belt may cause damage to the standby motor. Use hand force only to apply tension. Do not use pry bar or any other mechanical tool to apply tension to the standby motor to compressor V-belt during installation or adjustment procedures.

- Use hand pressure to put 30-50 pounds tension on new V-belts (Figure 3, Item 2).
- Tighten V-belt idler tensioner bolt (Figure 3, Item 1).

REPLACE – CONTINUED

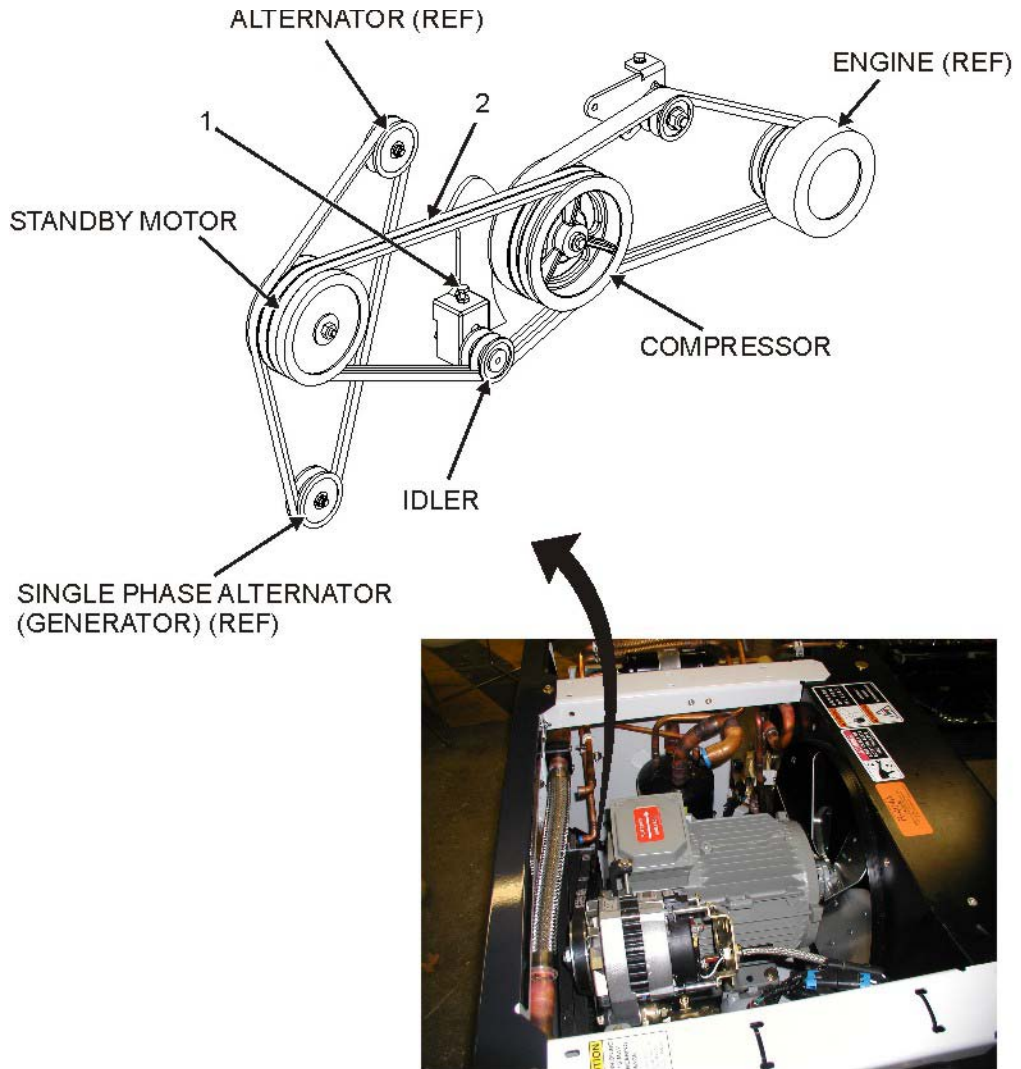


Figure 3. Standby Motor to Compressor V-Belt.

REPLACE – CONTINUED**NOTE**

When checking V-belt tension using the V-belt tension gauge, place the tension gauge as close to midpoint as possible between sheaves.

Proper tension for a V-belt is considered to be the lowest allowable tension that the belt will not slip at during peak load conditions.

11. Check V-belt (Figure 4, Item 2) tension using belt tension gauge. V-belt tension should be 30-50 pounds.
12. Adjust tension of V-belt (Figure 4, Item 2) as needed to achieve tension of 30-50 pounds.

NOTE

New V-belt tension drops rapidly during the first few hours of operation. Check and re-verify proper V-belt tension every four hours during the first 24-hours of operation after replacing the belt.

13. Install top-middle panel (WP 0031, Install).
14. Install top-left panel (WP 0031, Install).
15. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.
16. Exit top of MTRCS.
17. Connect negative (-) battery terminal (WP 0070, Reconnect).
18. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
19. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

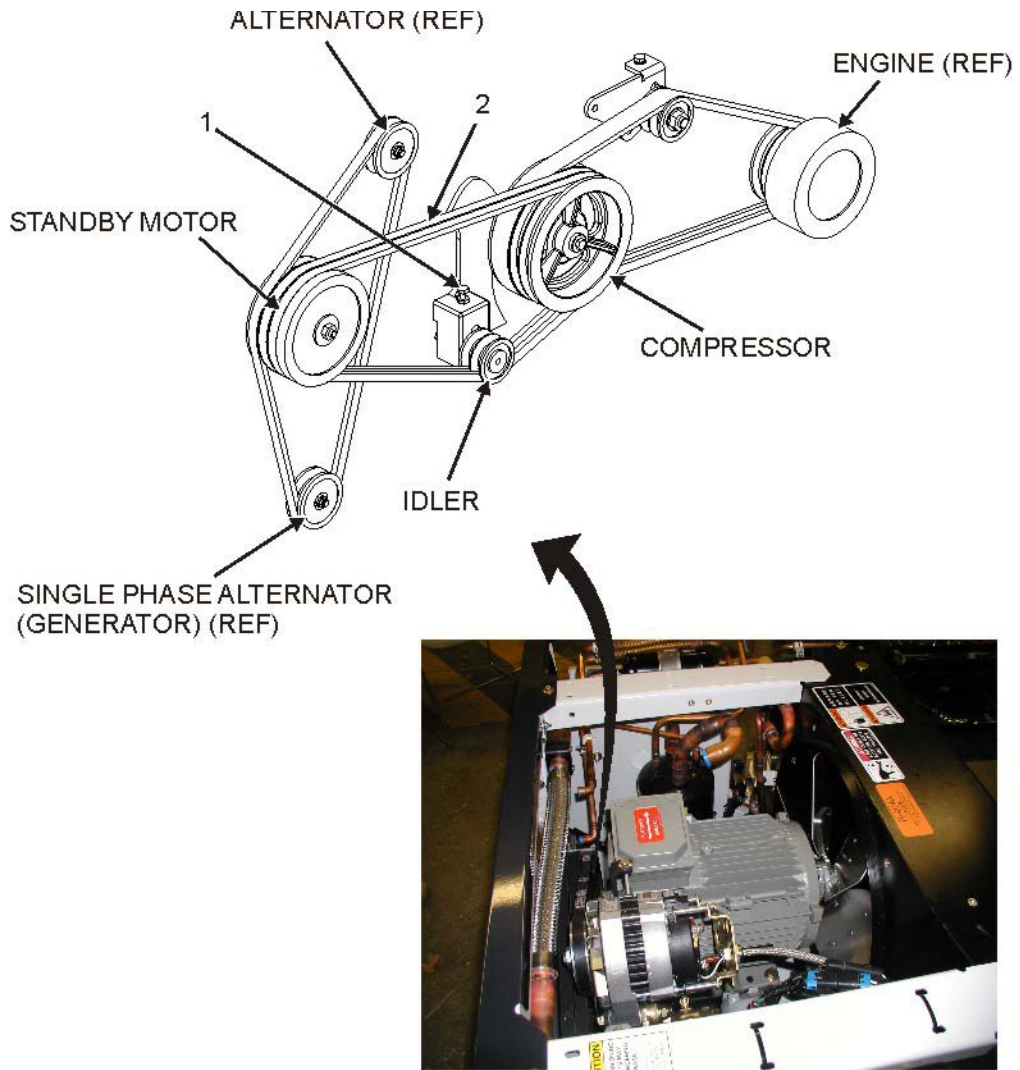


Figure 4. Standby Motor to Compressor V-Belt Tension.

END OF TASK

ADJUST**V-Belt Tension Check****WARNING**

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Obtain V-belt tension gauge (Figure 5, Item 1) from technical manual holder.

NOTE

The V-belt tension gauge can be held in three different positions (Figure 5), depending on ease of use and location of belt being checked. Holding the gauge in one of these three positions will make sure that only the black pad will be pushed on during the tension check.

6. Place V-belt tension gauge (Figure 5, Item 1) against V-belt (Figure 5, Item 2) at a location (Figure 5, Item 3) midway between belt pulleys (Figure 5, Item 4) with flange on bottom of tension gauge against edge of V-belt.

ADJUST – CONTINUED

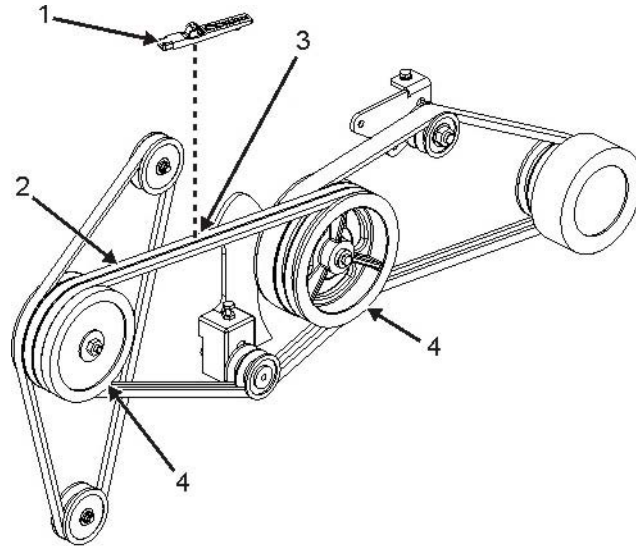


Figure 5. V-Belt Tension Check.

ADJUST – CONTINUED

NOTE

While pushing on the tension gauge as it is pressed against the V-belt, you will hear or feel a click when the tension of the V-belt is reached. You will need to stop pressing against the gauge immediately when you hear or feel this click and carefully remove the gauge from the belt without disturbing the position of the black indicator arm.

7. On tension gauge (Figure 6, Item 1), press slowly on black pad (Figure 6, Item 2) and stop when click is heard or felt.

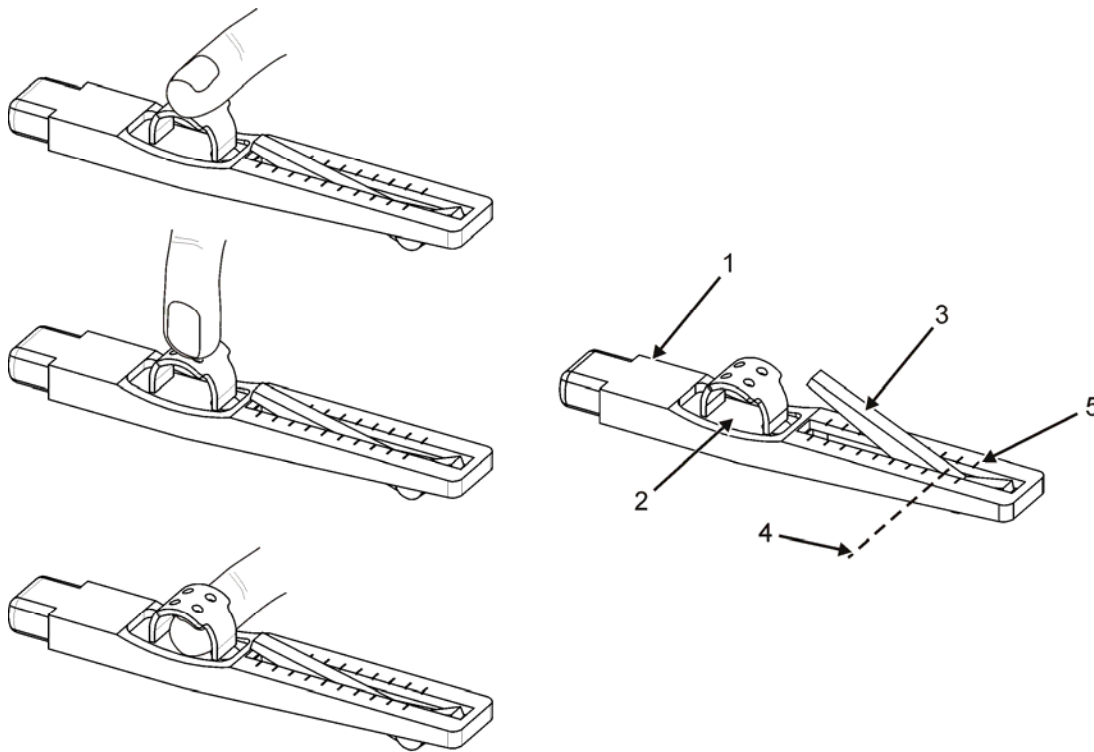


Figure 6. V-Belt Tension Gauge.

8. Carefully remove tension gauge (Figure 5, Item 1) from V-belt (Figure 5, Item 2) so that black indicator arm (Figure 6, Item 3) is not moved.
9. Turn tension gauge (Figure 6, Item 1) sideways and mark position (Figure 6, Item 4) where black indicator arm (Figure 6, Item 3) intersects scale (Figure 6, Item 5).

ADJUST – CONTINUED**NOTE**

The V-belt tension is determined by reading the scale at the exact location where the black indicator arm intersects the scale on top of the gauge.

10. Turn tension gauge (Figure 6, Item 1) so that scale (Figure 6, Item 5) can be read, and determine V-belt tension.
11. Adjust V-belt tension as needed to obtain required tension per this WP.
12. Recheck V-belt tension per steps 6-10 of this task.
13. Install top-middle panel (WP 0031, Install).
14. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

15. Exit top of MTRCS using roof access provided.
16. Reconnect negative (-) battery terminal (WP 0070, Disconnect).
17. Place POWER ON/DOWN switch (Figure 1, Item 2) to ON position.
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

ADJUST – CONTINUED**V-Belt Adjustment****WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Loosen V-belt idler bolt (Figure 7, Item 1).

CAUTION

Excessive force when placing tension on the standby motor to compressor V-belt may cause damage to the standby motor. Use hand force only to apply tension. Do not use pry bar or any other mechanical tool to apply tension to the standby motor to compressor V-belt during installation or adjustment procedures.

NOTE

When checking V-belt tension using the V-belt tension gauge, place the tension gauge as close to midpoint as possible between sheaves.

Proper tension for a V-belt is considered to be the lowest allowable tension that the belt will not slip at during peak load conditions.

6. Use hand pressure to put 30-50 pounds tension on new V-belts (Figure 7, Item 2).

CAUTION

Do not over tighten idler bolt. Over tightening the idler bolt may cause damage to engine and compressor bearings.

7. Tighten V-belt idler bolt (Figure 7, Item 1) (WP 0102, Introduction).
8. Install top-middle panel (WP 0031, Install).
9. Install top-left panel (WP 0031, Install).
10. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.

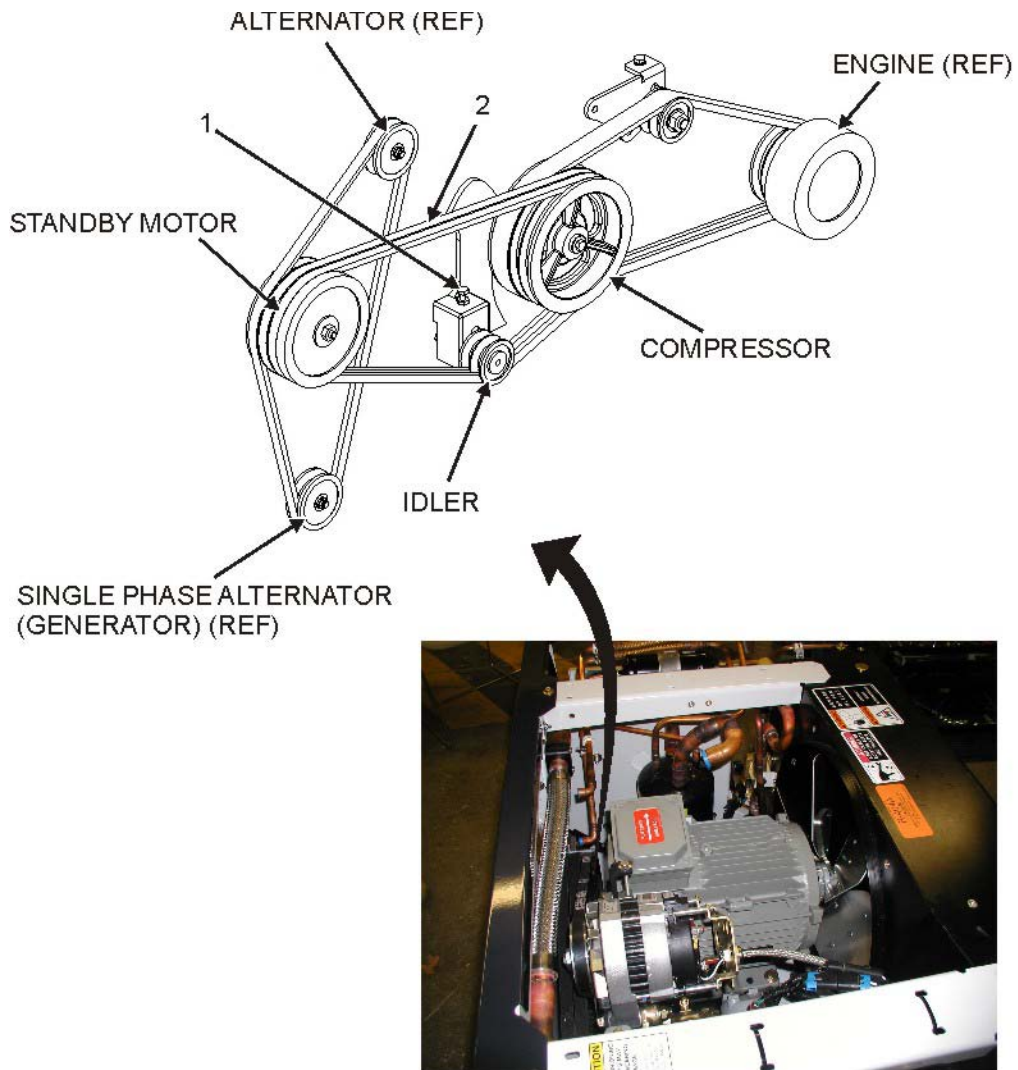
ADJUST – CONTINUED

Figure 7. Standby Motor to Compressor V-Belt Tension.

11. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
12. Place POWER ON/DOWN switch (Figure 1, Item 2) to ON position.
13. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
ENGINE TO COMPRESSOR V-BELT
REPLACE, ADJUST

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 Tester, Belt Tension (WP 0108, Item 5)

References

WP 0005
 WP 0031
 WP 0053
 WP 0056
 WP 0070
 WP 0088
 TM 10-8145-222-23P

Materials/Parts

Lock Washer, $\frac{3}{8}$ -in ID (WP 0111, Item 13)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Top-middle panel removed (WP 0031)
 Top-right panel removed (WP 0031)

Personnel Required

Utilities Equipment Repairer

REPLACE**WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Disconnect negative (-) battery terminal (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

4. Access top of MTRCS using roof access.

REPLACE – CONTINUED

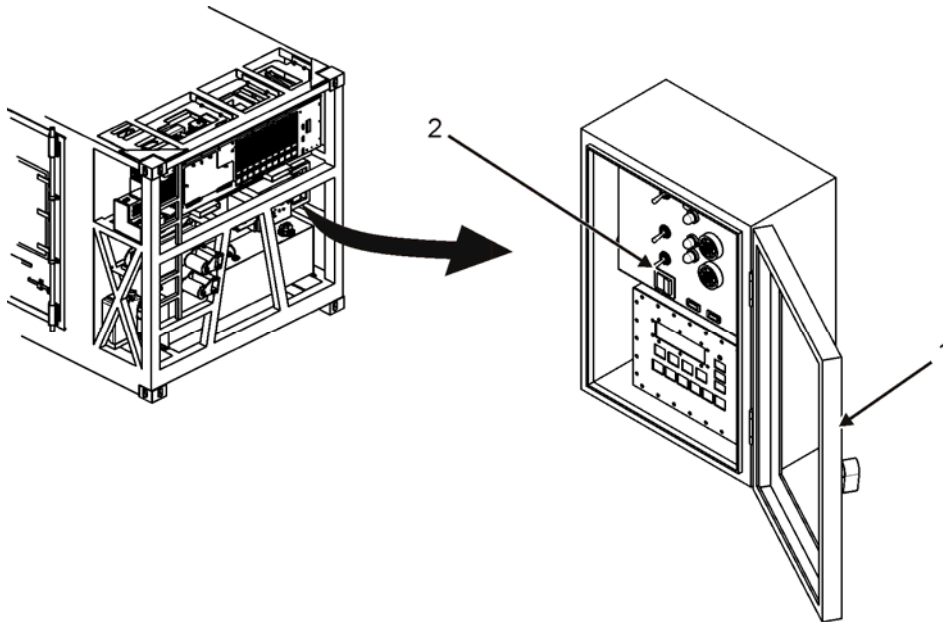


Figure 1. POWER ON/DOWN Switch.

5. Make sure emergency stop switch (Figure 2, Item 1) is in PUSH TO STOP position.
6. Remove muffler (WP 0056, Remove).
7. Remove standby motor to compressor V-belts (WP 0053, Remove).

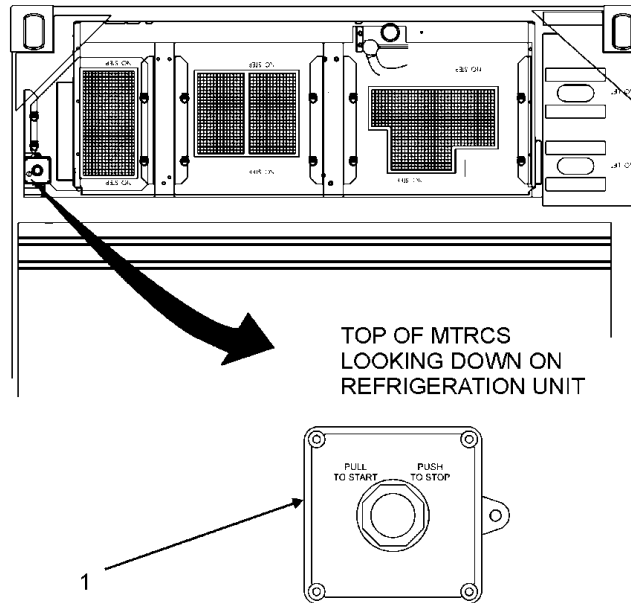


Figure 2. Emergency Stop Switch.

REPLACE – CONTINUED

8. Loosen idler tensioner bolt (Figure 3, Item 1) to remove tension from engine to compressor V-belt (Figure 3, Item 2).
9. Remove idler tensioner bolt (Figure 3, Item 1), lock washer (Figure 3, Item 3) and washer (Figure 3, Item 4) from idler pulley shaft (Figure 3, Item 5). Discard lock washer.
10. Remove nut (Figure 3, Item 6) and lock washer (Figure 3, Item 7) securing idler pulley shaft (Figure 3, Item 5) and idler pulley (Figure 3, Item 8) to bracket (Figure 3, Item 9). Discard lock washer.
11. Remove idler pulley (Figure 3, Item 8) and idler pulley shaft (Figure 3, Item 5) from bracket (Figure 3, Item 9).
12. Remove engine mounted centrifugal clutch (WP 0088, Remove).

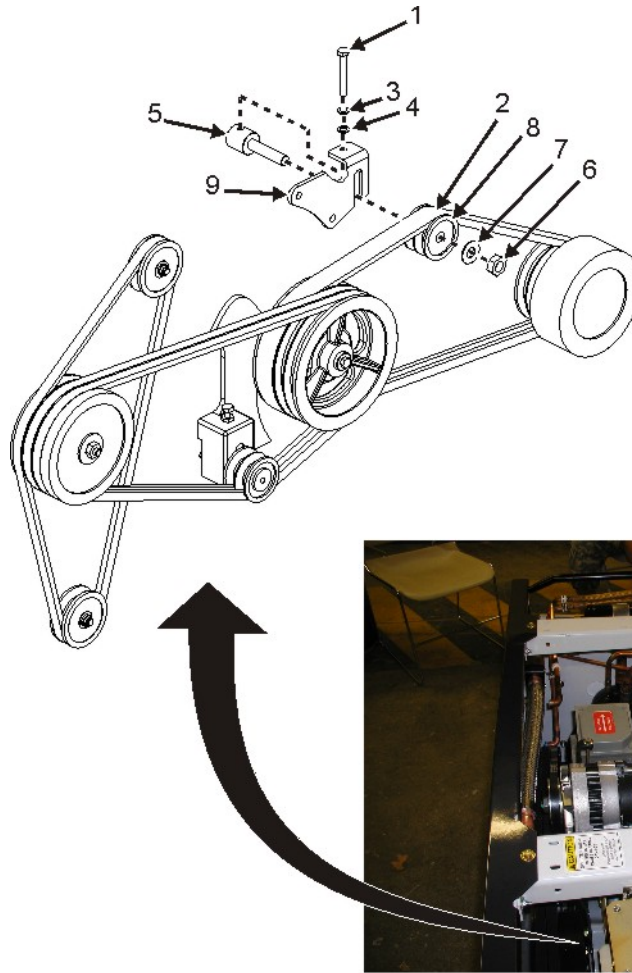


Figure 3. Engine to Compressor V-Belt Idler.

NOTE

The engine to compressor V-belts are a two-belt set. Always replace both belts.

REPLACE – CONTINUED

13. Remove engine to compressor V-belt (Figure 3, Item 2).
14. Install engine to compressor V-belt (Figure 3, Item 2) over clutch and compressor.
15. Install engine mounted centrifugal clutch (WP 0088, Install).
16. Install idler pulley (Figure 3, Item 8) and idler pulley shaft (Figure 3, Item 5) onto bracket (Figure 3, Item 9) and secure using nut (Figure 3, Item 6) and new lock washer (Figure 3, Item 7).
17. Install idler tensioner bolt (Figure 3, Item 1), new lock washer (Figure 3, Item 3) and washer (Figure 3, Item 4) to idler pulley shaft (Figure 3, Item 5).
18. Tighten idler tensioner bolt (Figure 3, Item 1) to attain tension of 30-50 foot-pounds on engine to compressor V-belt (Figure 3, Item 2).
19. Check V-belt tension using V-belt tension gauge. V-belt tension should be 30-50 pounds.
20. Replace standby motor to compressor V-belts (WP 0053, Install).
21. Install muffler (WP 0005, Install).
22. Install top-middle panel (WP 0031, Install).
23. Install top-right panel (WP 0031, Install).
24. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.
25. Exit top of MTRCS.
26. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
27. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
28. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

ADJUST**V-Belt Tension Check****WARNING**

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Obtain V-belt tension gauge (Figure 4, Item 1) from technical manual holder.

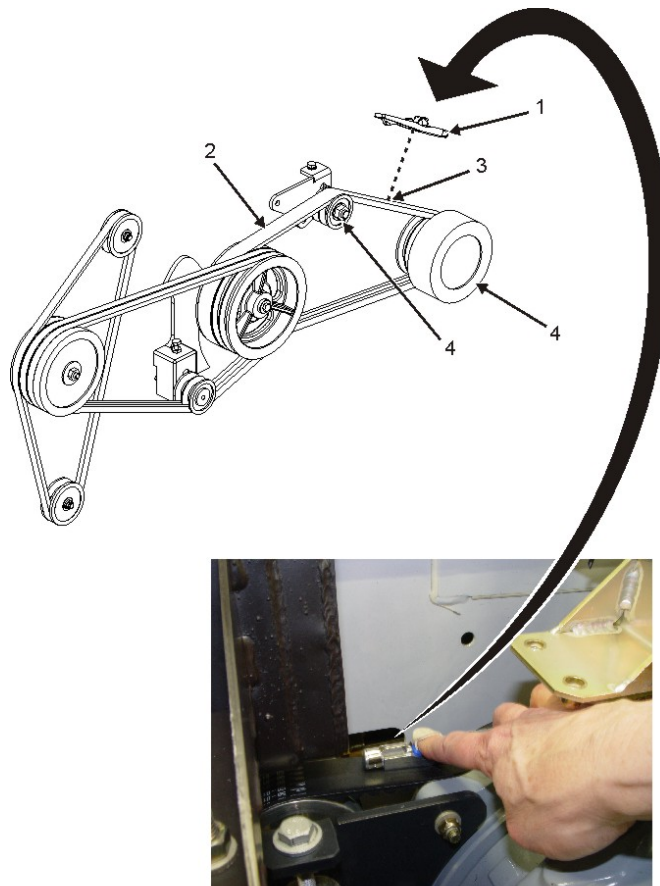


Figure 4. V-Belt Tension Check.

ADJUST – CONTINUED

NOTE

The V-belt tension gauge can be held in three different positions (Figure 5), depending on ease of use and location of belt being checked. Holding the gauge in one of these three positions will make sure that only the black pad will be pushed on during the tension check.

- Place V-belt tension gauge (Figure 4, Item 1) against V-belt (Figure 4, Item 2) at a location (Figure 4, Item 3) midway between belt pulleys (Figure 4, Item 4) with flange on bottom of tension gauge against edge of V-belt.

NOTE

While pushing on the tension gauge as it is pressed against the V-belt, you will hear or feel a click when the tension of the V-belt is reached. You will need to stop pressing against the gauge immediately when you hear or feel this click and carefully remove the gauge from the belt without disturbing the position of the black indicator arm.

- On tension gauge (Figure 5, Item 1), press slowly on black pad (Figure 5, Item 2) and stop when click is heard or felt.

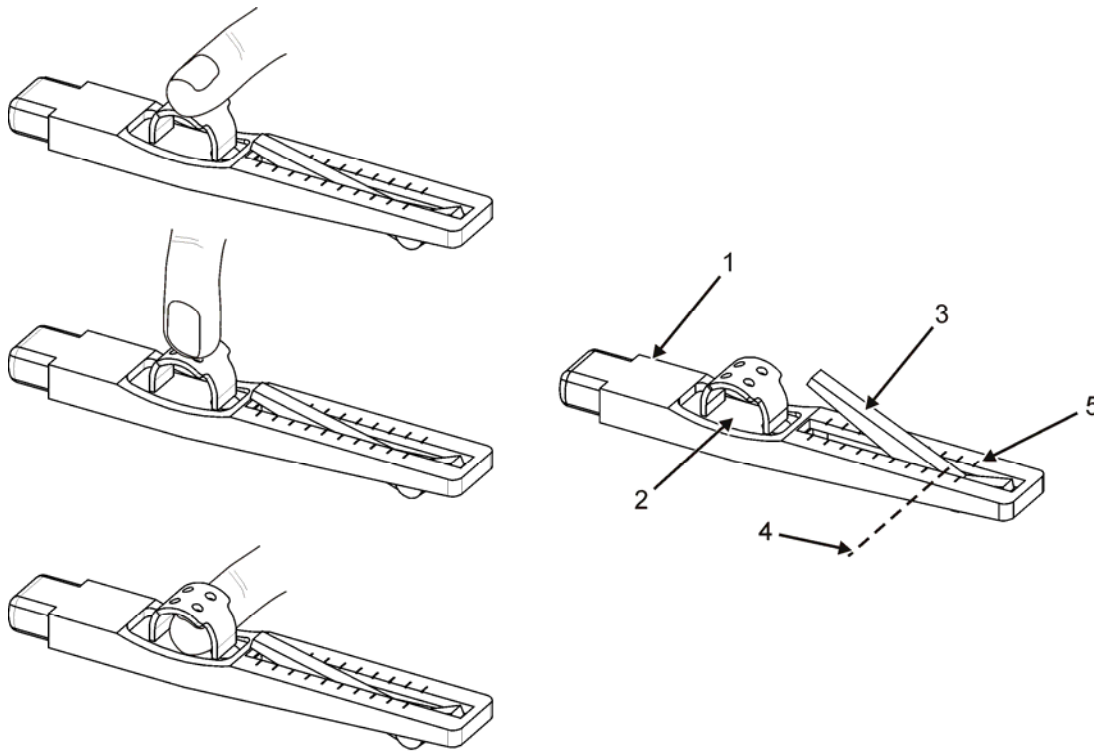


Figure 5. V-Belt Tension Gauge.

ADJUST – CONTINUED

8. Carefully remove tension gauge (Figure 4, Item 1) from V-belt (Figure 4, Item 2) so that black indicator arm (Figure 5, Item 3) is not moved.
9. Turn tension gauge (Figure 5, Item 1) sideways and mark position (Figure 5, Item 4) where black indicator arm (Figure 5, Item 3) intersects scale (Figure 5, Item 5).

NOTE

The V-belt tension is determined by reading the scale at the exact location where the black indicator arm intersects the scale on top of the gauge.

10. Turn tension gauge (Figure 5, Item 1) so that scale (Figure 5, Item 5) can be read, and determine V-belt tension.
11. Adjust V-belt tension as needed to obtain required tension per this WP.
12. Recheck V-belt tension per steps 6-10 of this task.
13. Install top-middle panel (WP 0031, Install).
14. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

15. Exit top of MTRCS using roof access provided.
16. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
17. Place POWER ON/DOWN switch (Figure 1, Item 2) to ON position.
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

ADJUST – CONTINUED**V-Belt Adjustment****WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 6, Item 2) to DOWN position.

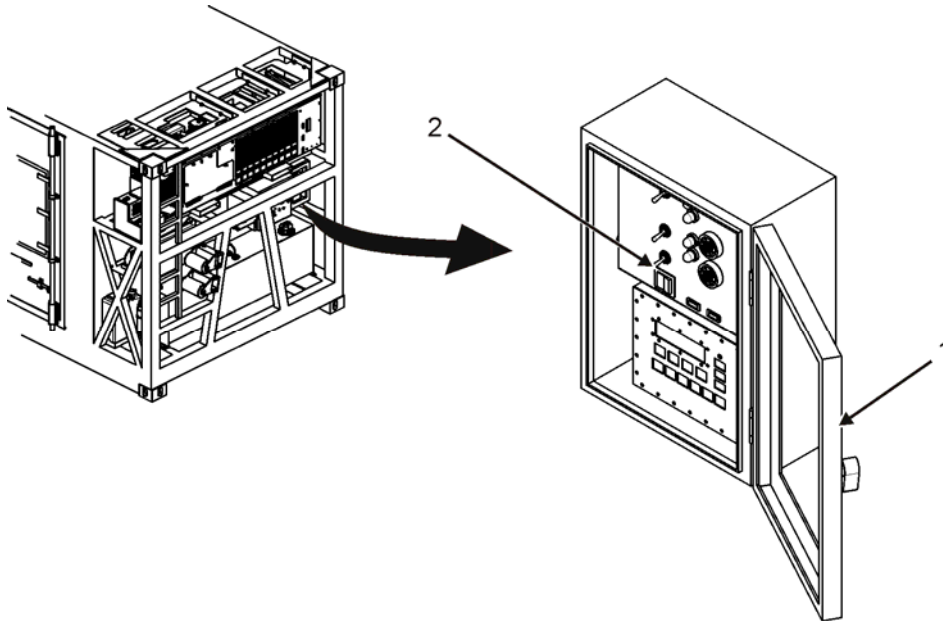


Figure 6. POWER ON/DOWN Switch.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 7, Item 1) in PUSH TO STOP position.
5. Remove top-right panel (WP 0031, Remove).
6. Remove top-middle panel (WP 0031, Remove).

ADJUST – CONTINUED

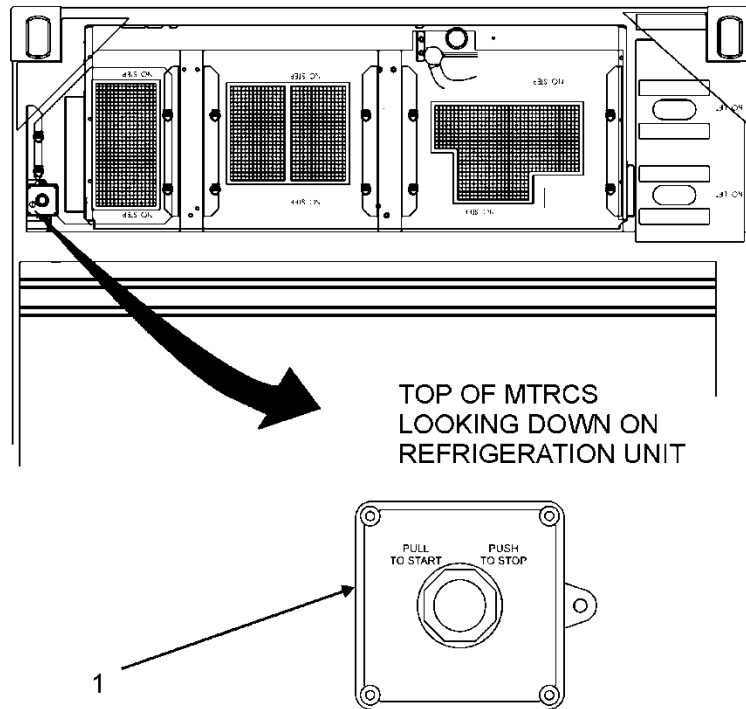


Figure 7. Emergency Stop Switch.

7. Loosen or tighten idler tension bolt (Figure 3, Item 1) as needed to attain a tension of 30-50 pounds.
8. Install top-right panel (WP 0031, Install).
9. Install top-middle panel (WP 0031, Install).
10. Place emergency stop switch (Figure 7, Item 1) in PULL TO START position.
11. Exit top of MTRCS.
12. Reconnect negative (-) battery terminal (WP 0070, Reconnect).
13. Place POWER ON/DOWN switch (Figure 6, Item 2) to ON position.
14. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
15. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
WATER PUMP V-BELT
REPLACE

INITIAL SETUP:

Tools and Special Tools

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)
Tester, Belt Tension (WP 0108, Item 5)

Equipment Condition

Refrigeration unit shut down and cooled for 30-minutes (WP 0005)
External power cables disconnected (WP 0005)
Battery disconnected (WP 0070)

References

WP 0005
WP 0031
WP 0070
WP 0102
TM 10-8145-222-23P

Personnel Required

Quartermaster and Chemical Equipment Repairer

REPLACE
Remove

WARNING

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

3. Access top of MTRCS using roof access provided.

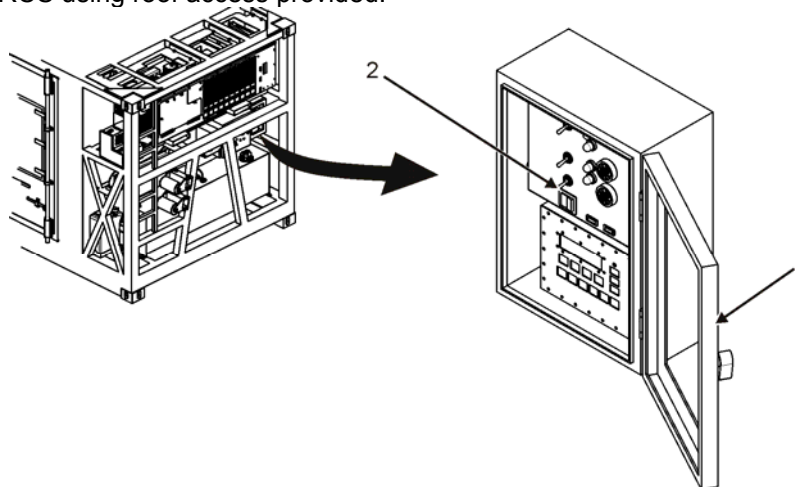


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Exit top of MTRCS.

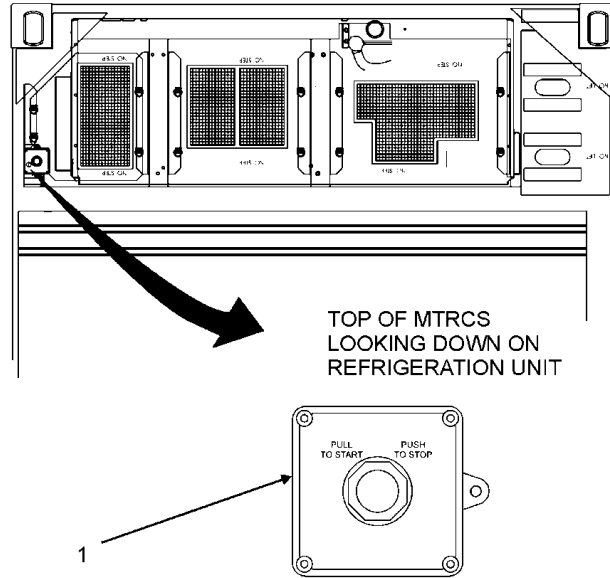


Figure 2. Emergency Stop Switch.

6. Open front panel assembly access cover (Figure 3, Item 1).
7. Rotate four quarter-turn fasteners (Figure 3, Item 2) securing front panel cover assembly (Figure 3, Item 1) 1/4-turn counterclockwise until loose.
8. Lower front panel cover assembly (Figure 3, Item 1).

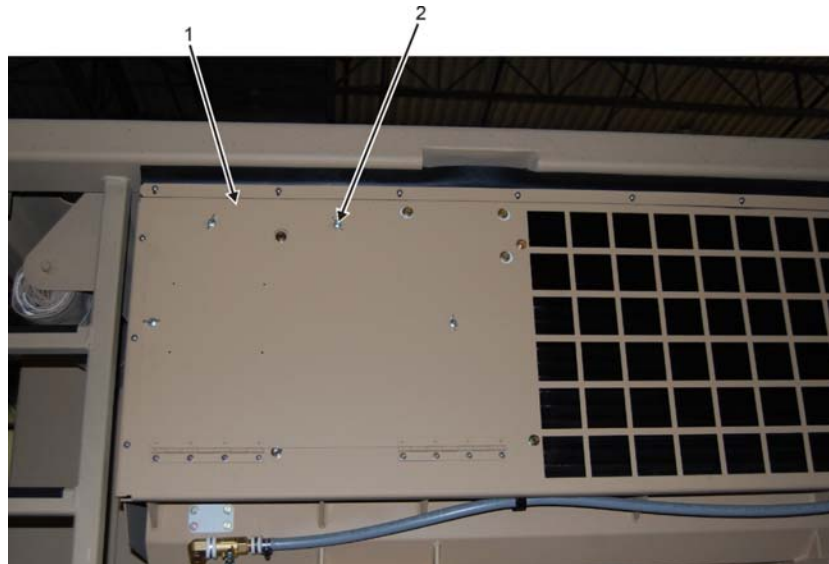


Figure 3. Front Panel Cover.

REPLACE – CONTINUED**NOTE**

Loosening the nut securing the idler pulley will make the idler spring compression easier to accomplish.

9. Loosen nut (Figure 4, Item 1) on idler pulley (Figure 4, Item 2). Do not remove nut at this time.

NOTE

A tensioner adjusting bolt is installed in the V-belt tensioner in order to remove the tension on the belt, allowing belt removal. As the bolt is tightened, tension on the idler spring will become less and will subsequently lessen the tension on the V-belt.

10. Tighten tensioner adjusting bolt (Figure 4, Item 3) in V-belt tensioner (Figure 4, Item 4) until idler spring is fully compressed.
11. Remove nut (Figure 4, Item 1) and lock washer (Figure 4, Item 5). Discard lock washer.
12. Remove idler pulley (Figure 4, Item 2) and V-belt (Figure 4, Item 6) together.
13. Remove V-belt (Figure 4, Item 6) from remaining pulleys (Figure 4, Item 7 and Item 8).

Install

1. Tighten tensioner adjusting bolt (Figure 4, Item 3) in V-belt tensioner (Figure 4, Item 4) until idler spring is fully compressed and remove pulley, if not already accomplished.
2. Install new V-belt (Figure 4, Item 6) and wrap it around two pulleys (Figure 4, Item 7 and Item 8) so that it hangs freely over each.
3. Install idler pulley (Figure 4, Item 2) onto shaft (Figure 4, Item 9) so that V-belt (Figure 4, Item 6) wraps around pulley (Figure 4, Item 2) and secure using new lock washer (Figure 4, Item 5) and nut (Figure 4, Item 1). Do not tighten nut at this time.

NOTE

As the tensioner adjusting bolt is loosened, tension on the idler spring will increase, allowing tension on V-belt to increase.

4. Loosen tensioner adjusting bolt (Figure 4, Item 3) from V-belt tensioner (Figure 4, Item 4) and tighten locking nuts to prevent movement of tensioner adjusting bolt.
5. Tighten idler pulley (Figure 4, Item 2) and nut (Figure 4, Item 1) in accordance with torque specifications (WP 0102).
6. Check that V-belt tension is between 30-40 pounds by performing V-belt Tension Check per this WP.
 - If V-belt tension is between 30-40 pounds, proceed to step 7.
 - If V-belt tension is not between 30-40 pounds, replace V-belt per this WP.

REPLACE – CONTINUED

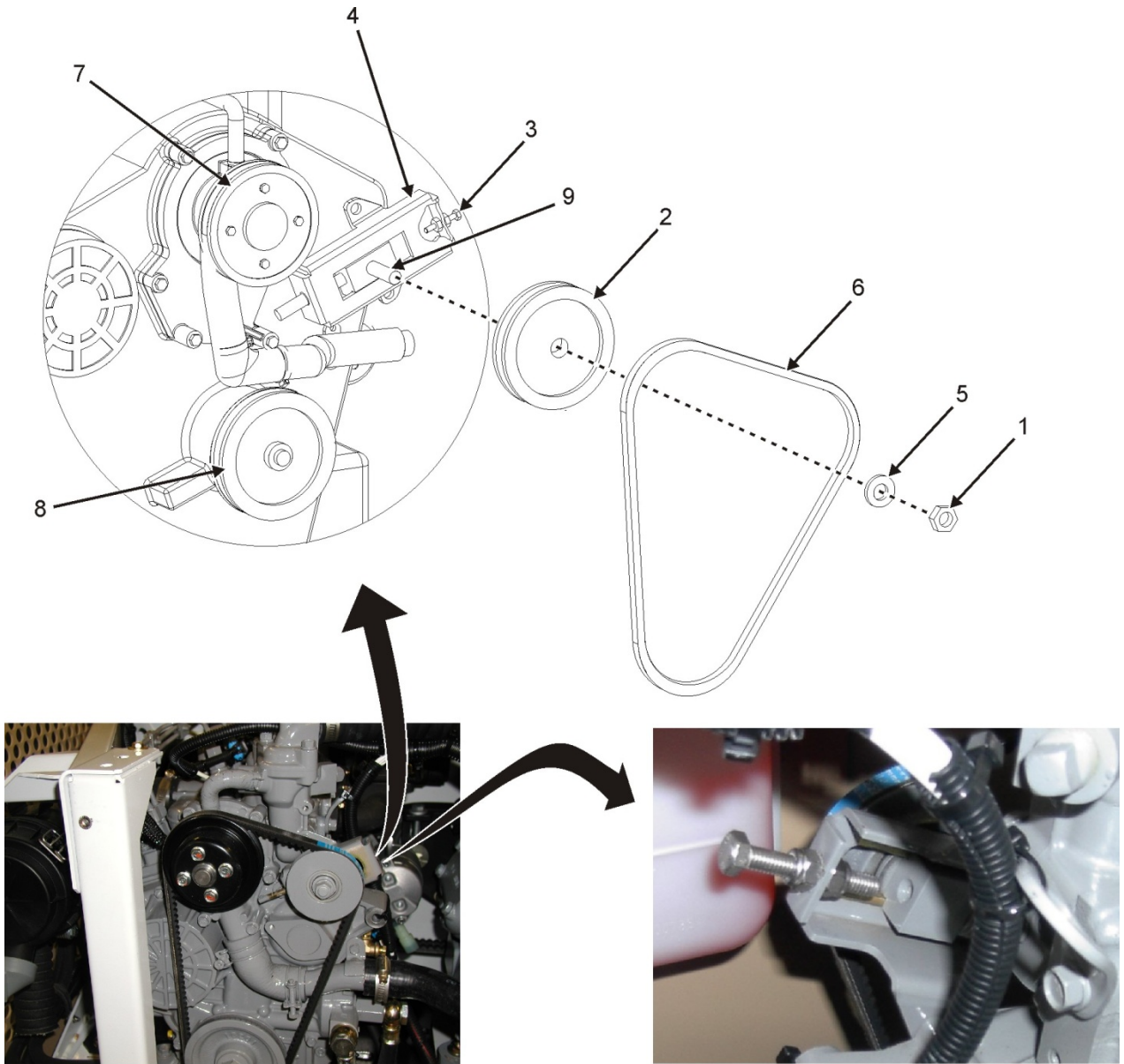


Figure 4. Water Pump V-Belt.

REPLACE – CONTINUED

7. Close front panel assembly access cover (WP 0031, Install).
8. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.
9. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
10. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
11. Operate refrigeration unit to verify unit operates properly after replacement of V-belt (WP 0005, Operating Procedures).
12. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED**V-Belt Tension Check****WARNING**

Beware of V-belts and belt driven components. The refrigeration unit may start automatically. Before performing maintenance on any belt driven system, make sure that the power to the unit is off.

1. Disconnect negative (-) battery terminal (WP 0070, Disconnect).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) to DOWN position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Obtain V-belt tension gauge (Figure 5, Item 1) from technical manual holder.

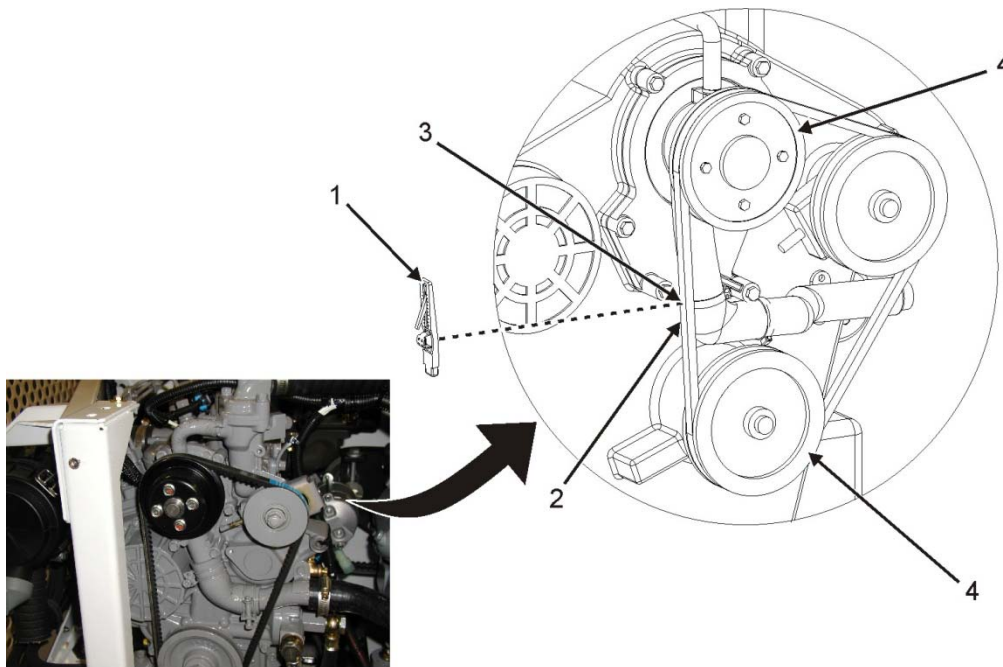


Figure 5. V-Belt Tension Check.

REPLACE – CONTINUED**NOTE**

The V-belt tension gauge can be held in three different positions (Figure 5), depending on ease of use and location of belt being checked. Holding the gauge in one of these three positions will make sure that only the black pad will be pushed on during the tension check.

6. Place V-belt tension gauge (Figure 5, Item 1) against V-belt (Figure 5, Item 2) at a location (Figure 5, Item 3) midway between belt pulleys (Figure 5, Item 4) with flange on bottom of tension gauge against edge of V-belt.

NOTE

While pushing on the tension gauge as it is pressed against the V-belt, you will hear or feel a click when the tension of the V-belt is reached. You will need to stop pressing against the gauge immediately when you hear or feel this click and carefully remove the gauge from the belt without disturbing the position of the black indicator arm.

7. On tension gauge (Figure 6, Item 1), press slowly on black pad (Figure 6, Item 2) and stop when click is heard or felt.

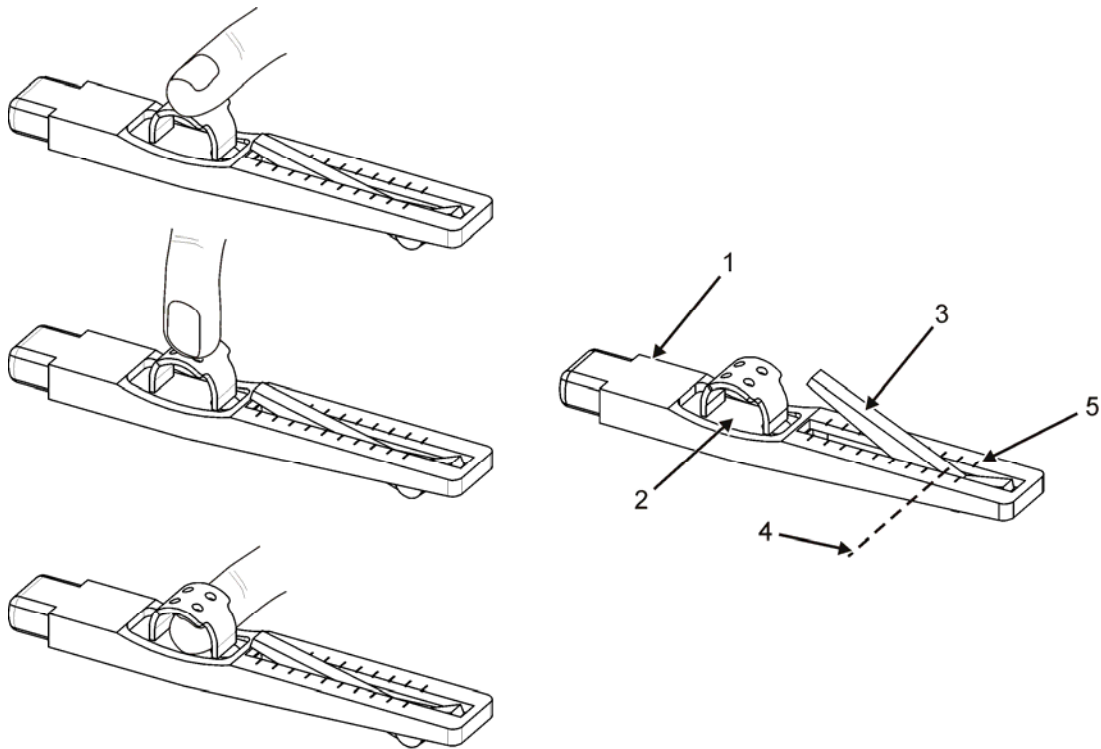


Figure 6. V-Belt Tension Gauge.

REPLACE – CONTINUED

8. Carefully remove tension gauge (Figure 5, Item 1) from V-belt (Figure 5, Item 2) so that black indicator arm (Figure 6, Item 3) is not moved.
9. Turn tension gauge (Figure 6, Item 1) sideways and mark position (Figure 6, Item 4) where black indicator arm (Figure 6, Item 3) intersects scale (Figure 6, Item 5).

NOTE

The V-belt tension is determined by reading the scale at the exact location where the black indicator arm intersects the scale on top of the gauge.

10. Turn tension gauge (Figure 6, Item 1) so that scale (Figure 6, Item 5) can be read, and determine V-belt tension.
11. Adjust V-belt tension as needed to obtain required tension per this WP.
12. Recheck V-belt tension per steps 6-10 of this task.
13. Install top-middle panel (WP 0031, Install).
14. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

15. Exit top of MTRCS using roof access provided.
16. Reconnect negative (-) battery terminal (WP 0070, Disconnect).
17. Place POWER ON/DOWN switch (Figure 1, Item 2) to ON position.
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
MUFFLER
REPAIR, REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Materials/Parts

Penetrating Oil (WP 0110, Item 36)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005

WP 0031

WP 0070

WP 0102

TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down and cool (WP 0005)

External power cables disconnected (WP 0005)

REPAIR

Muffler repair is limited to the replacement of missing or damaged rain cap.

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

WARNING

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access.

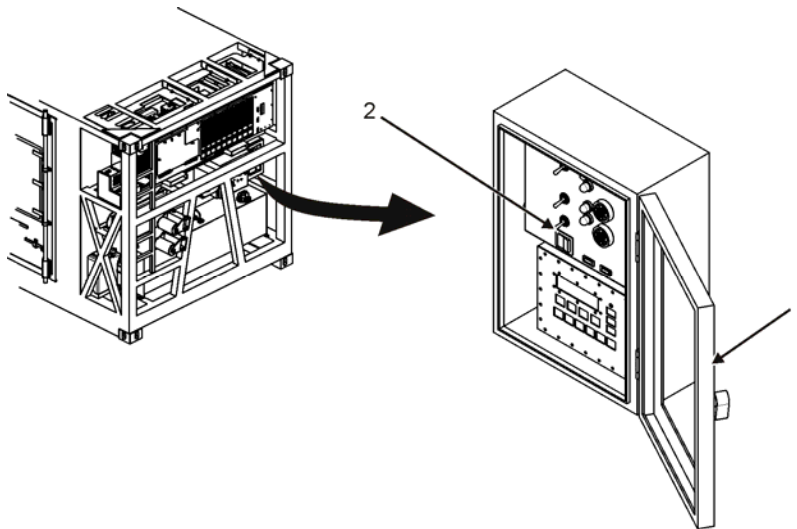


Figure 1. POWER ON/DOWN Switch.

REPAIR – CONTINUED

4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Remove top-right panel (WP 0031, Remove).

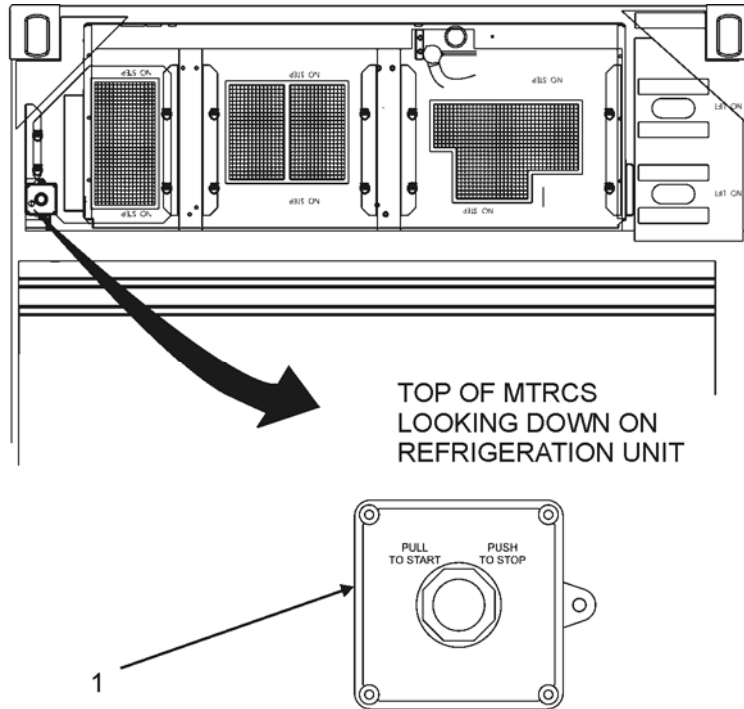


Figure 2. Emergency Stop Switch.

6. Locate muffler rain cap (Figure 3, Item 1).

NOTE

Note the orientation of the rain cap before removing it so that it can be installed with the same orientation.

7. Remove one bolt (Figure 3, Item 2), washer (Figure 3, Item 3), and nut (Figure 3, Item 4) securing rain cap mounting flange (Figure 3, Item 5) to muffler pipe (Figure 3, Item 6).
8. Remove rain cap (Figure 3, Item 1) from muffler pipe (Figure 3, Item 2).
9. Install replacement rain cap (Figure 3, Item 1) over end of muffler pipe (Figure 3, Item 6) and secure using bolt (Figure 3, Item 2), washer (Figure 3, Item 3), and nut (Figure 3, Item 4) to secure rain cap mounting flange (Figure 3, Item 5) to muffler pipe (Figure 3, Item 6).
10. Tighten bolt (Figure 3, Item 2) (WP 0102).

REPAIR – CONTINUED

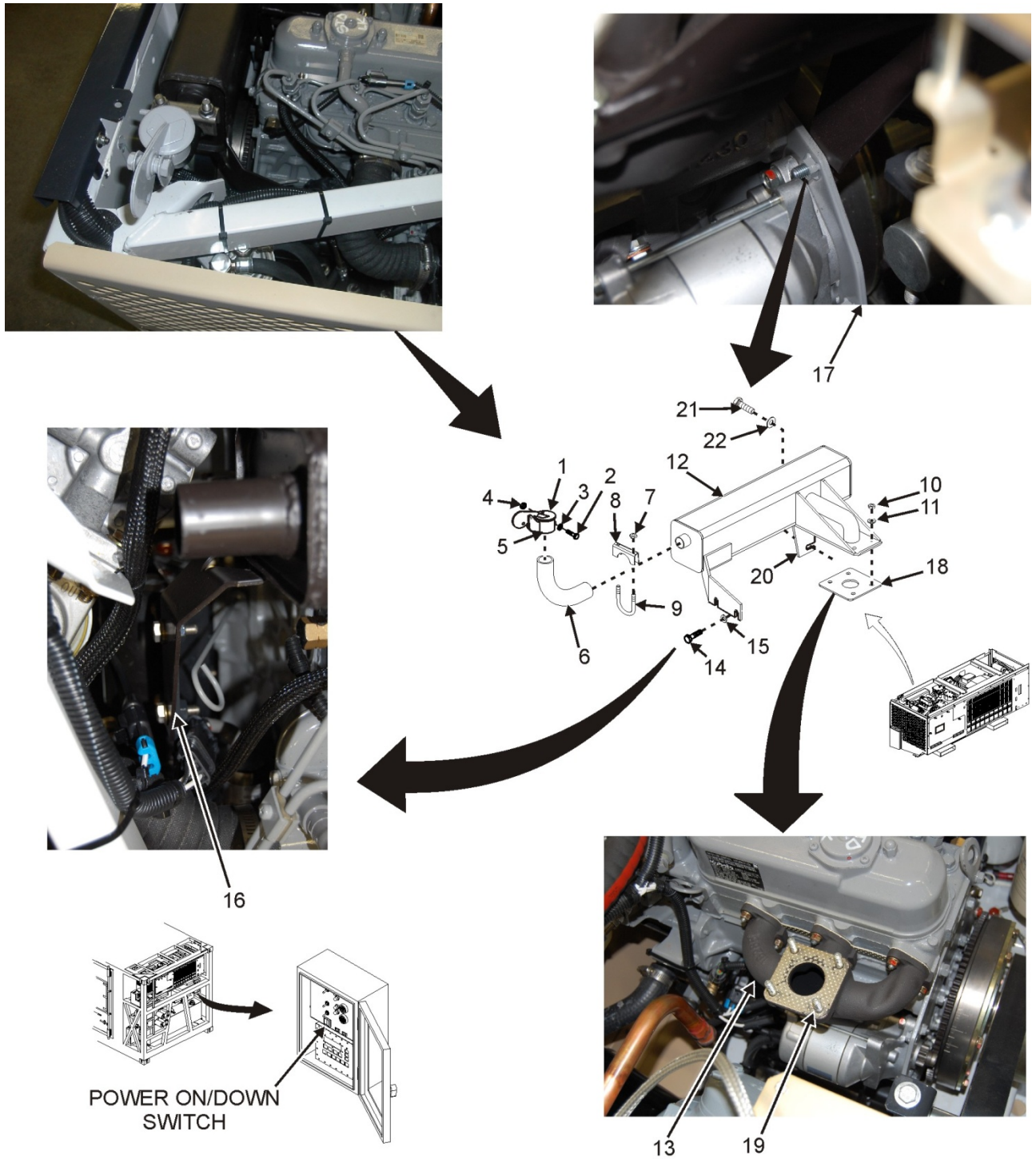


Figure 3. Exhaust Manifold.

REPAIR – CONTINUED

11. Check that rain cap (Figure 3, Item 1) pivots freely.
12. Install top-right panel (WP 0031, Install).
13. Check that rain cap pivots freely with top-right panel installed.
14. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

15. Climb off top of MTRCS using roof access.
16. Place POWER ON/DOWN switch (Figure 1, Item 2) to POWER ON position.
17. Close control panel access door (Figure 1, Item 1).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**REPLACE**

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

4. Access top of MTRCS using roof access.
5. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
6. Remove top-right panel (WP 0031, Remove).

REPLACE – CONTINUED**WARNING**

The exhaust system will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

NOTE

Note orientation of rain cap before removal so that it can be installed with the same orientation.

7. Remove muffler rain cap (Figure 4, Item 1) per this WP. Retain serviceable rain cap for reinstallation.
8. Remove two nuts (Figure 4, Item 7) securing muffler clamp (Figure 4, Item 8) and U-bolt (Figure 4, Item 9) to muffler pipe (Figure 4, Item 6). Retain hardware.

NOTE

Exhaust manifold mount nuts frequently rust in place. The use of penetrating oil will help loosen nuts up from manifold.

Due to exposure to environmental elements, the muffler pipe frequently rusts to the muffler making it difficult to remove without damage.

When replacing muffler, always replace muffler pipe and U-bolt at the same time.

9. Remove four nuts (Figure 4, Item 10) and four washers (Figure 4, Item 11) securing muffler (Figure 4, Item 12) to exhaust manifold (Figure 4, Item 13).
10. Loosen two bolts (Figure 4, Item 14) and washers (Figure 4, Item 15) securing opposite end of muffler (Figure 4, Item 12) to mount bracket (Figure 4, Item 16) in two places.
11. Remove one bolt (Figure 4, Item 21) and washer (Figure 4, Item 22) securing bottom angle (Figure 4, Item 20) to flywheel housing (Figure 4, Item 17) in one place.
12. Remove muffler (Figure 4, Item 12) and exhaust manifold gasket (Figure 4, Item 18) from exhaust manifold (Figure 4, Item 13).
13. Install new exhaust manifold gasket (Figure 4, Item 18) with steel side facing up towards muffler (Figure 4, Item 12) onto exhaust manifold studs (Figure 4, Item 19).
14. Install new muffler (Figure 4, Item 12) onto exhaust manifold (Figure 4, Item 13) and secure with four nuts (Figure 4, Item 10) and washers (Figure 4, Item 11).
15. Secure bottom angle of muffler (Figure 4, Item 20) to flywheel housing (Figure 4, Item 17) using one bolt (Figure 4, Item 21) and washer (Figure 4, Item 22).
16. Tighten bolts (Figure 4, Item 14 and Item 21) (WP 0102).

REPLACE – CONTINUED

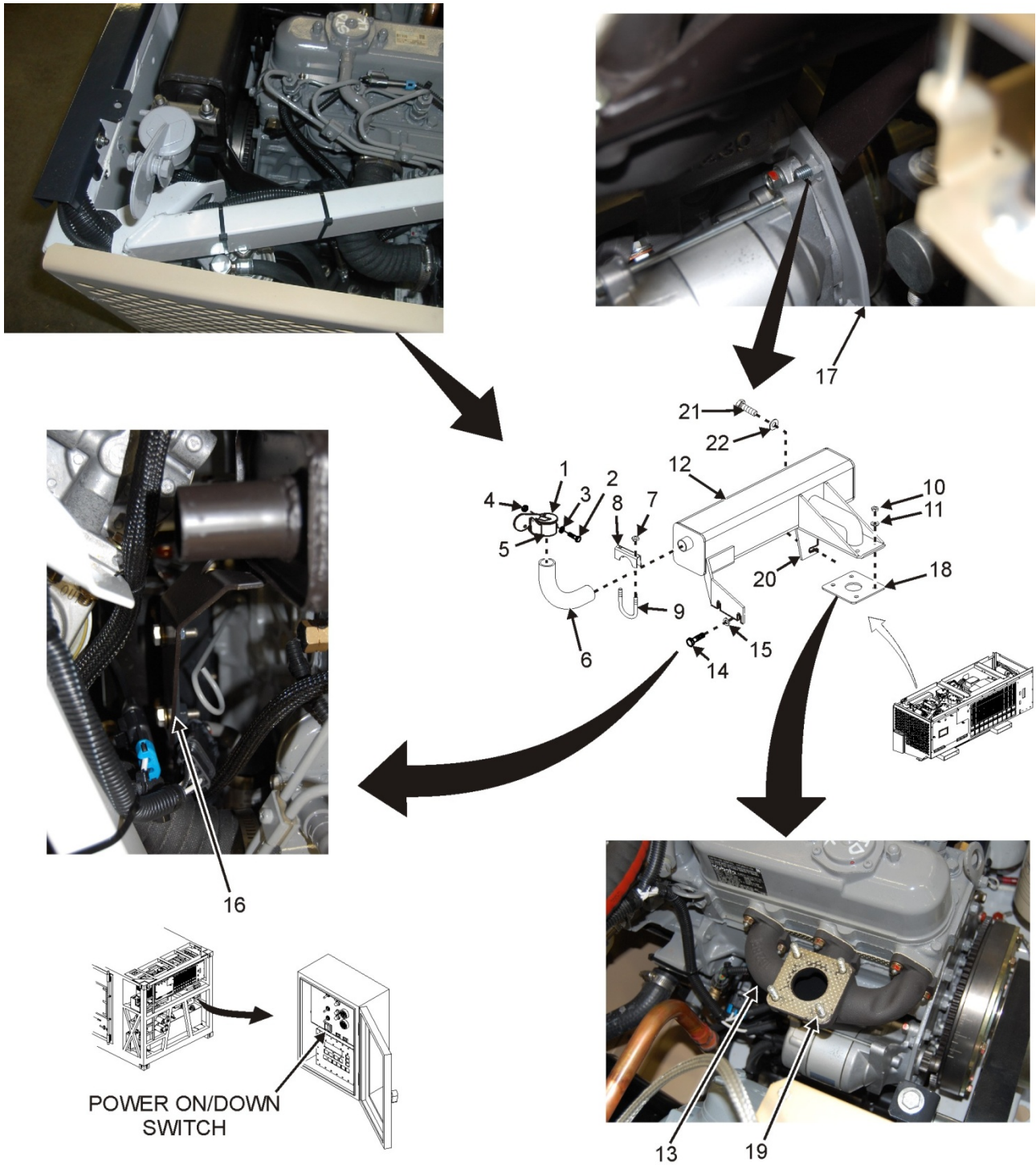


Figure 4. Exhaust Manifold.

REPLACE – CONTINUED**NOTE**

Make sure that the orientation of the rain cap is installed with the same orientation as when it was removed.

17. Tighten nuts (Figure 4, Item 10).
18. Secure opposite end of muffler (Figure 4, Item 12) to engine in two places (Figure 4, Item 16) by tightening two bolts (Figure 4, Item 14) and washers (Figure 4, Item 15).
19. Install replacement muffler pipe (Figure 4, Item 6) onto replacement muffler (Figure 4, Item 12) and secure using replacement U-bolt (Figure 1, Item 9), clamp (Figure 4, Item 8), and two nuts (Figure 4, Item 7).
20. Tighten nuts (Figure 4, Item 7).
21. Reinstall muffler rain cap (Figure 4, Item 1).
22. Install top-right panel (WP 0031, Install).
23. Check that rain cap pivots freely with top-right panel installed.
24. Place emergency stop switch (Figure 2, Item 1) in PULL TO START position

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

25. Climb off top of MTRCS using roof access.
26. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
27. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
28. Close control panel access cover (Figure 1, Item 1)
29. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
OIL PRESSURE SWITCH
REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Materials/Parts

Threadlocking Compound (WP 0110, Item 41)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005

WP 0031

WP 0102

TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down and cool (WP 0005)

External power cables disconnected (WP 0005)

REPLACE

1. Open control panel access cover (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.

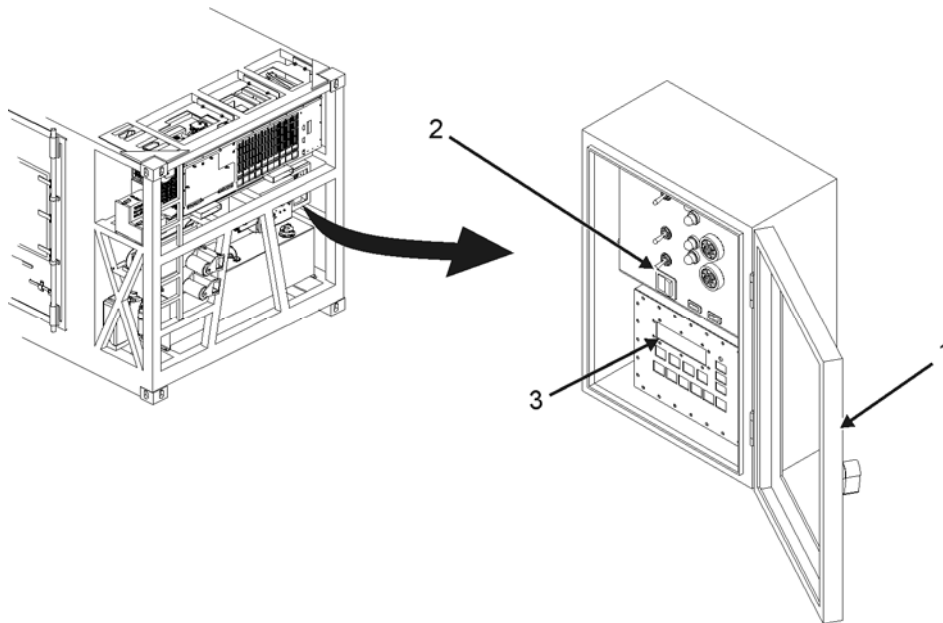


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

3. Access top of MTRCS using roof access provided.
4. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
5. Remove top-right panel (WP 0031, Remove).

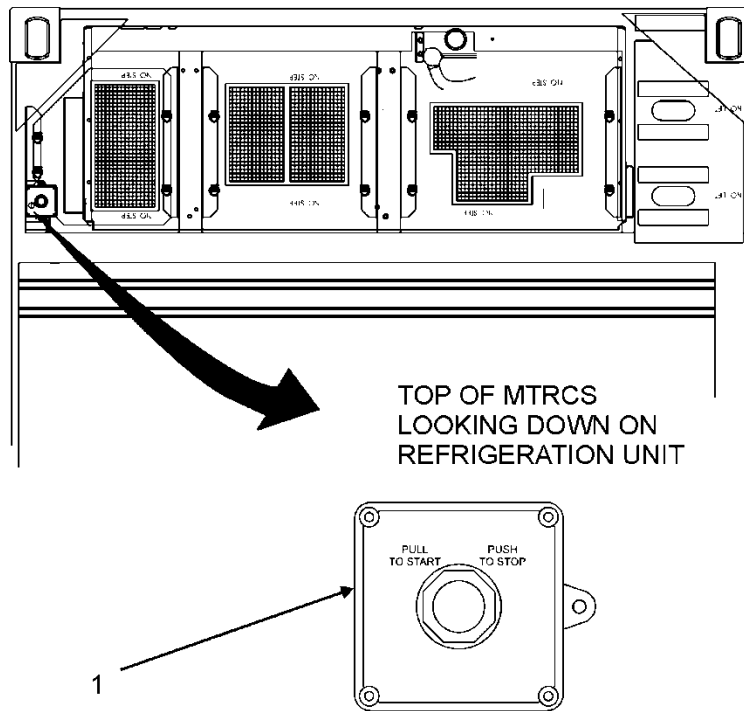


Figure 2. Emergency Stop Switch.

REPLACE – CONTINUED

6. Tag and disconnect electrical connector (Figure 3, Item 1) from oil pressure switch (Figure 3, Item 2).
7. Loosen and remove oil pressure switch (Figure 3, Item 2).

NOTE

The oil pressure switch is mounted to the engine block and located slightly behind the radiator hose.

8. Apply thread sealant to threads of new oil pressure switch (Figure 3, Item 2).
9. Install new oil pressure switch (Figure 3, Item 2) and tighten 11-14 foot-pounds (WP 0102).
10. Connect electrical connector (Figure 3, Item 1) to oil pressure switch (Figure 3, Item 2) as tagged.

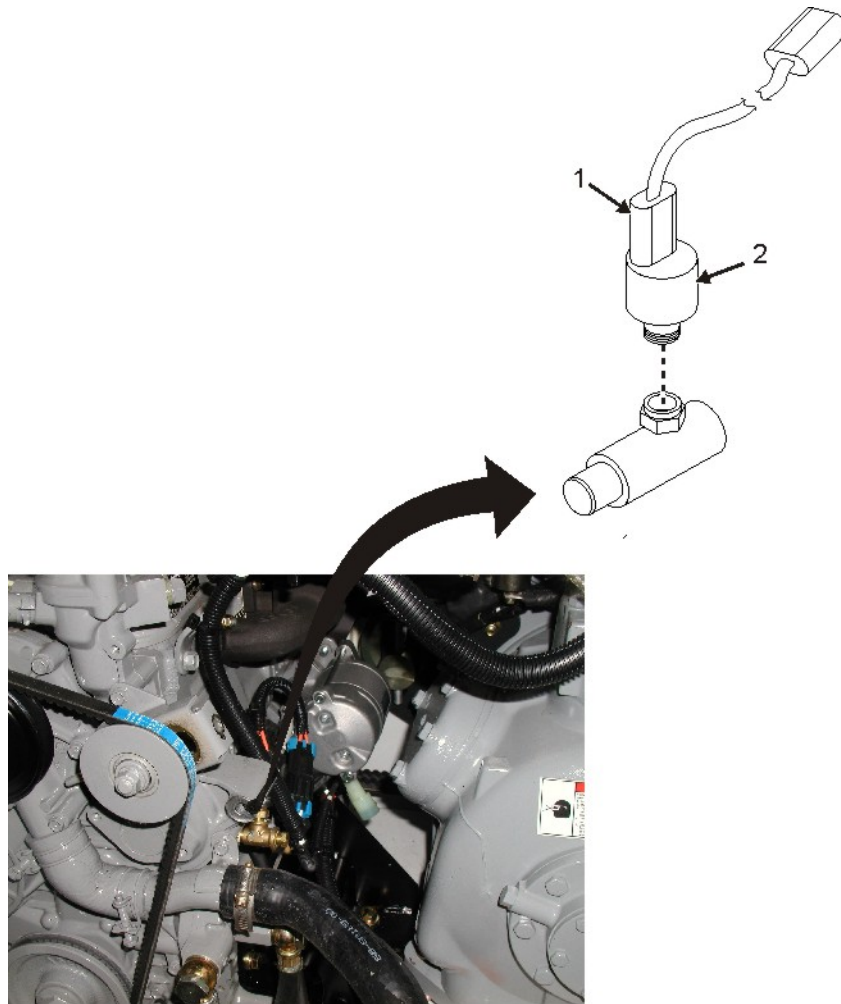


Figure 3. Oil Pressure Switch.

REPLACE – CONTINUED

11. Place emergency stop switch (Figure 4, Item 1) in PULL TO START position.
12. Install top-right panel (WP 0031, Install).
13. Exit top of MTRCS using roof access provided.
14. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.

CAUTION

If alarm code is displayed or audible alarm sounds, shut the diesel engine down immediately by placing the POWER ON/DOWN switch to the DOWN position. Failure to observe this caution can damage the diesel engine.

15. Operate diesel engine and check that alarm code ENGINE OIL (or alarm code AL0 if coded display is used) is not displayed on microprocessor controller display (Figure 1, Item 3) (WP 0005, Operating Procedures).
16. Monitor diesel engine operation for five minutes. If no alarms sound or display on microprocessor display (Figure 1, Item 3), operate engine normally.
17. Close control panel access cover (Figure 1, Item 1).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

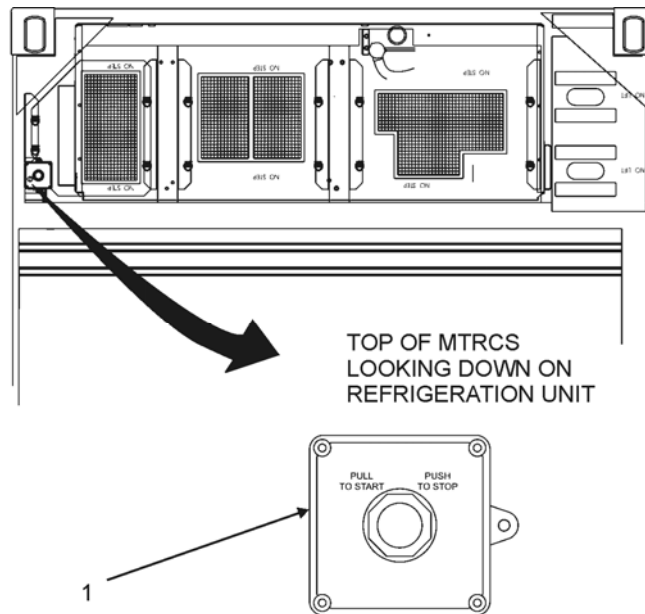


Figure 4. Emergency Stop Switch.

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
**RUN SOLENOID
REPLACE, TEST**

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Materials/Parts

Silicone, RTV (WP 0110, Item 43)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
WP 0031
WP 0056
WP 0070
WP 0102
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Battery disconnected (WP 0070)

REPLACE**Remove Run Solenoid**

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Remove front panel assembly (WP 0031, Remove).
4. Remove right-side panel (WP 0031, Remove).

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

5. Access top of MTRCS using roof access provided.

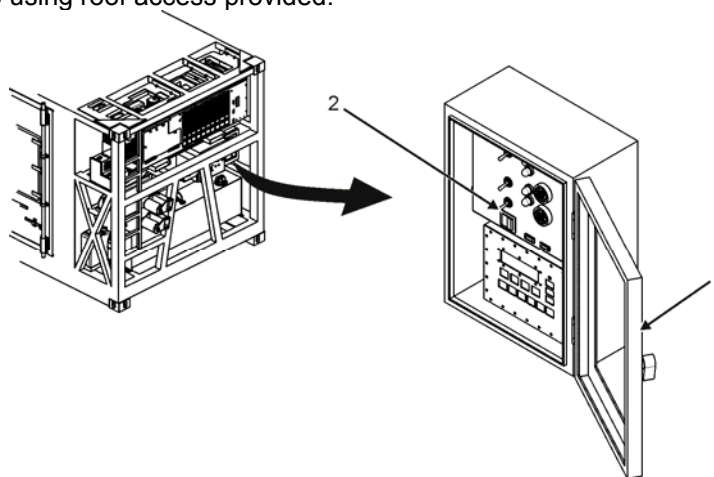


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

6. Place emergency stop switch (Figure 2, Item 1) in PUSH TO STOP position.
7. Remove top-right panel (WP 0031, Remove).
8. Remove muffler (WP 0056, Replace).

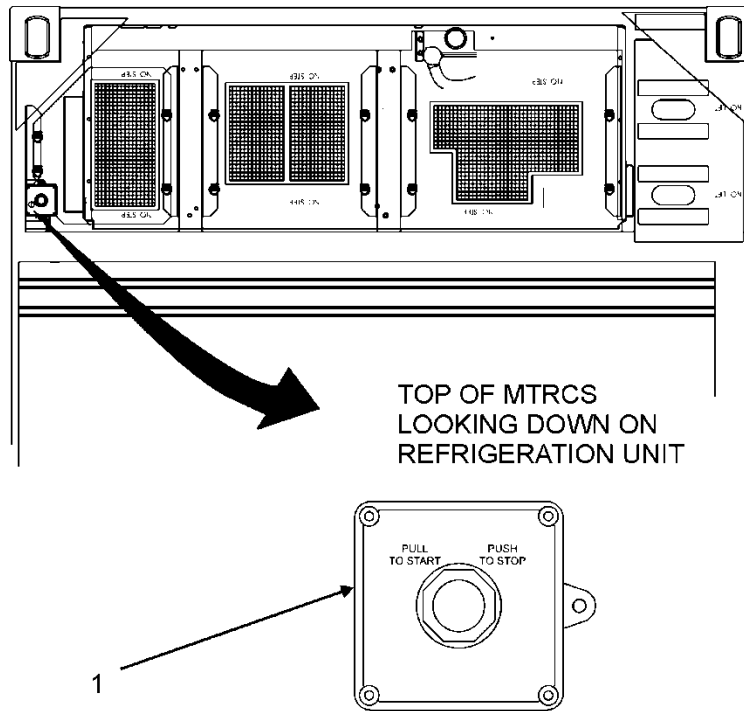


Figure 2. Emergency Stop Switch.

NOTE

To gain access to the two hex screws securing the run solenoid to the engine, it will be necessary to disconnect one end of the air inlet hose and position it out of the way.

9. Loosen hose clamp (Figure 3, Item 1) securing one end of air inlet hose (Figure 3, Item 2) to engine air inlet (Figure 3, Item 3).
10. Disconnect air inlet hose (Figure 3, Item 2) from engine air inlet (Figure 3, Item 3).
11. Tag and disconnect run solenoid electrical connector (Figure 3, Item 4) from engine harness (Figure 3, Item 5).
12. Remove two hex screws (Figure 3, Item 6) and lock washers (Figure 3, Item 7) securing run solenoid (Figure 3, Item 8) to engine housing. Discard lock washers.
13. Remove run solenoid (Figure 3, Item 8) and gasket (Figure 3, Item 9). Discard gasket.

REPLACE – CONTINUED

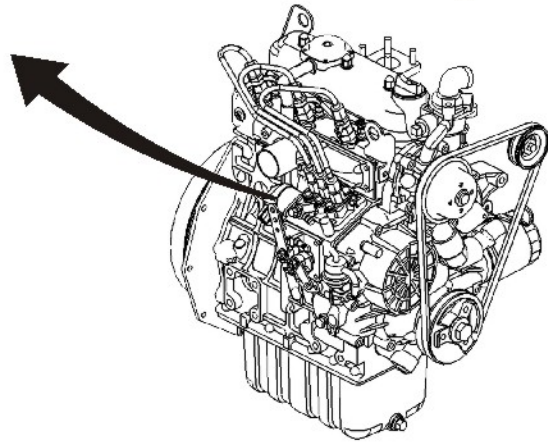
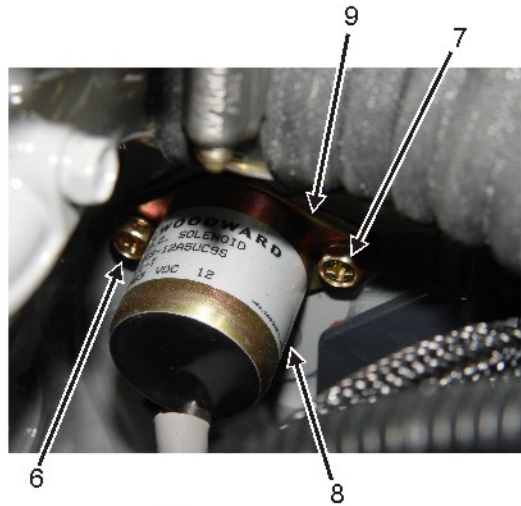
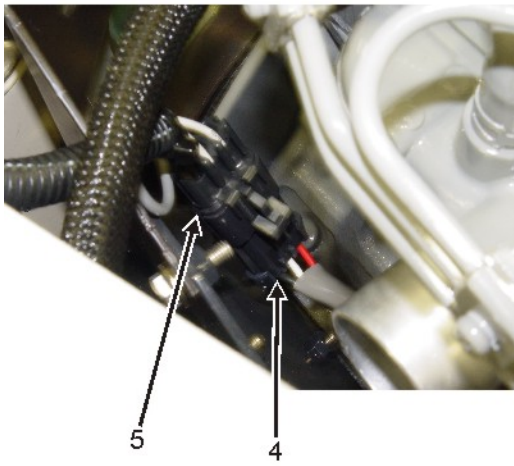
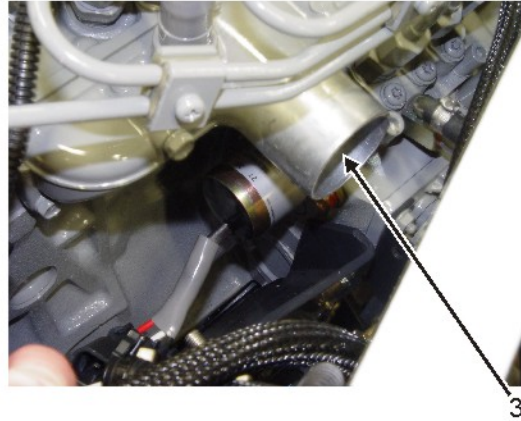
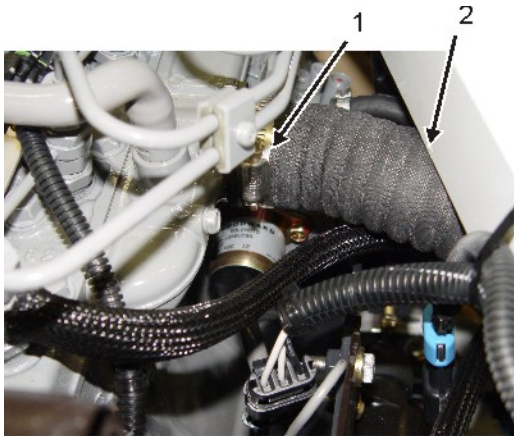


Figure 3. Run Solenoid Removal.

REPLACE – CONTINUED**Install Run Solenoid****WARNING**

RTV may cause eye and skin irritation. Over frequent or extended periods of use, RTV may cause irritation to the respiratory system. Wear eye protection and gloves when using RTV.

1. Apply thin bead of RTV to both sides of new solenoid gasket (Figure 4, Item 9).
2. Install new run solenoid (Figure 4, Item 8) and new gasket (Figure 4, Item 9) to engine housing and secure using two hex screws (Figure 4, Item 6) and new lock washers (Figure 4, Item 7).
3. Torque hex screws (Figure 4, Item 6) to 7 foot-pounds (WP 0102).
4. Connect run solenoid electrical connector (Figure 4, Item 4) to engine harness (Figure 4, Item 5) as tagged.
5. Reconnect air inlet hose (Figure 4, Item 2) to engine air inlet and secure using clamp (Figure 4, Item 1).
6. Tighten clamp (Figure 4, Item 1).
7. Install top-right panel (WP 0031, Install).
8. Place emergency stop switch (Figure 1, Item 2) in PULL TO START position.

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

9. Climb off MTRCS using roof access provided.
10. Install right-side panel (WP 0031, Install).
11. Install front panel assembly (WP 0031, Install).
12. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.
13. Start refrigeration unit and allow unit to run for five minutes to verify proper operation (WP 0005, Operating Procedures).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

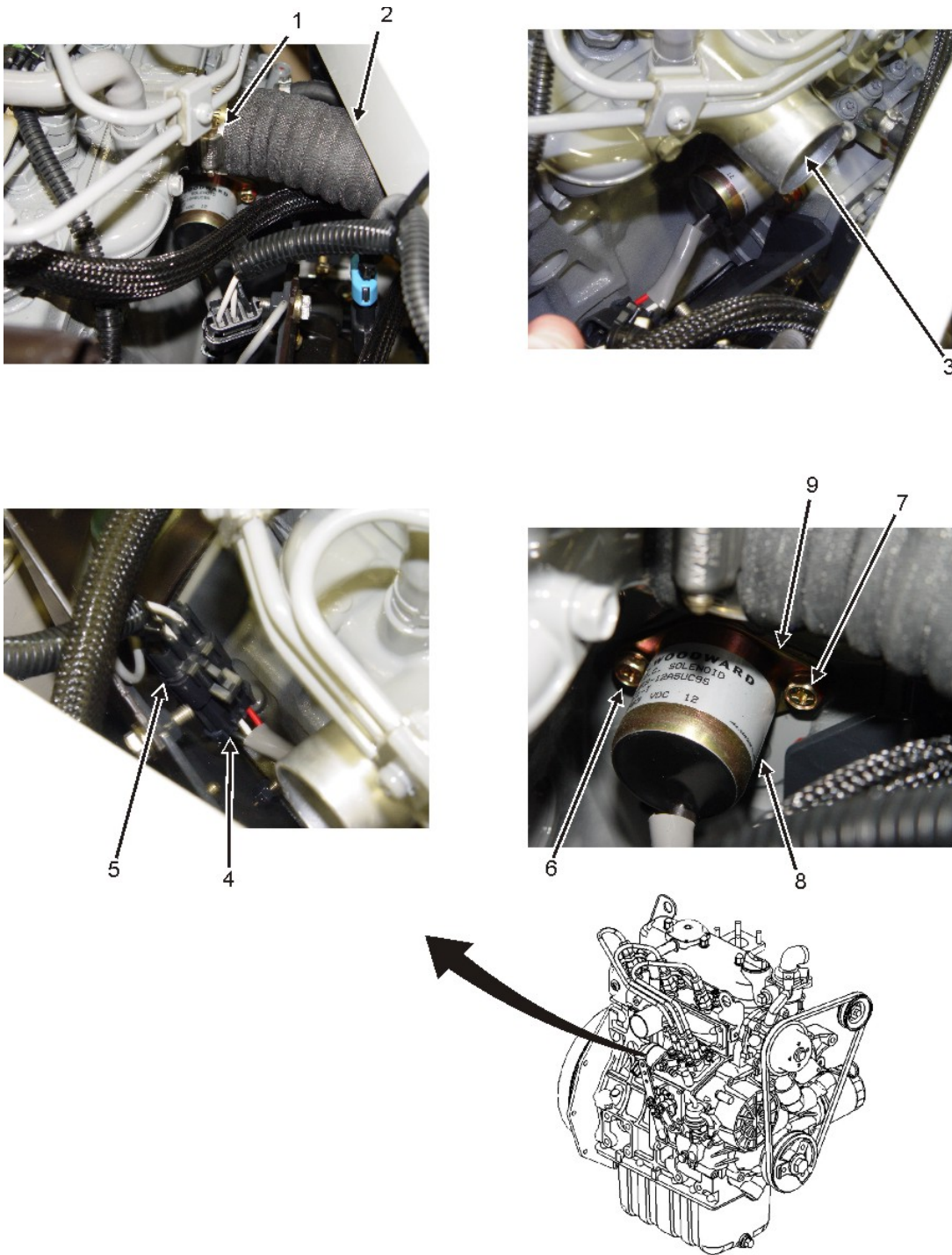
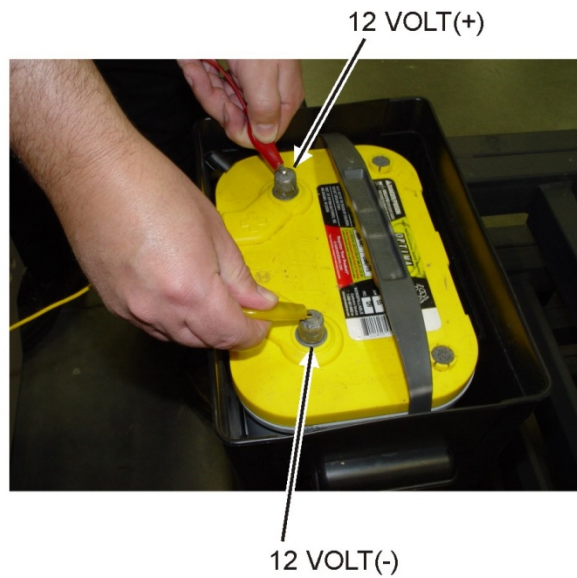
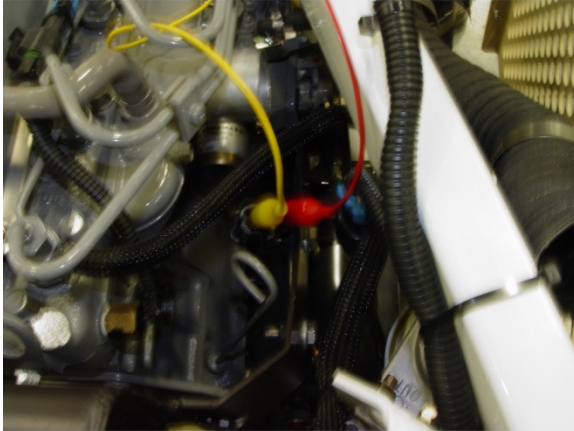
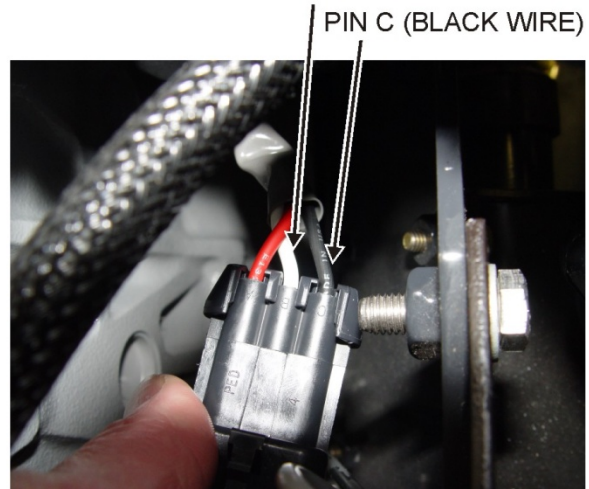
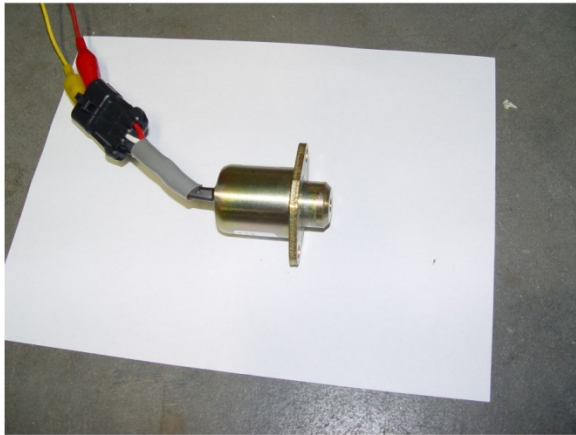


Figure 4. Run Solenoid Installation.

END OF TASK

TEST

1. Remove solenoid per this WP.
2. Disconnect run solenoid connector (Figure 4, Item 4) from engine harness (Figure 4, Item 5).
3. Connect jumper wire to connector pin B (white wire) and 12 volt positive (+) battery terminal (Figure 5).

**Figure 5. Run Solenoid Test.**

4. Connect jumper wire to connector pin C (black wire) and 12 volt negative (-) battery terminal.
 - If solenoid extends, reconnect solenoid per this WP.
 - If solenoid does not extend, replace solenoid per this WP.
5. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK
END OF WORK PACKAGE

SERVICE MAINTENANCE
SPEED SOLENOID
REPLACE, TEST

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Table 2, Item 8)
Electrical Connector Kit (WP 0107, Table 2, Item 3)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
WP 0031
WP 0056
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Battery disconnected (WP 0070)

REPLACE**Remove**

1. Open control panel door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel (Figure 1, Item 1) to DOWN position.
3. Remove front panel assembly (WP 0031, Remove).
4. Remove right-side panel (WP 0031, Remove).

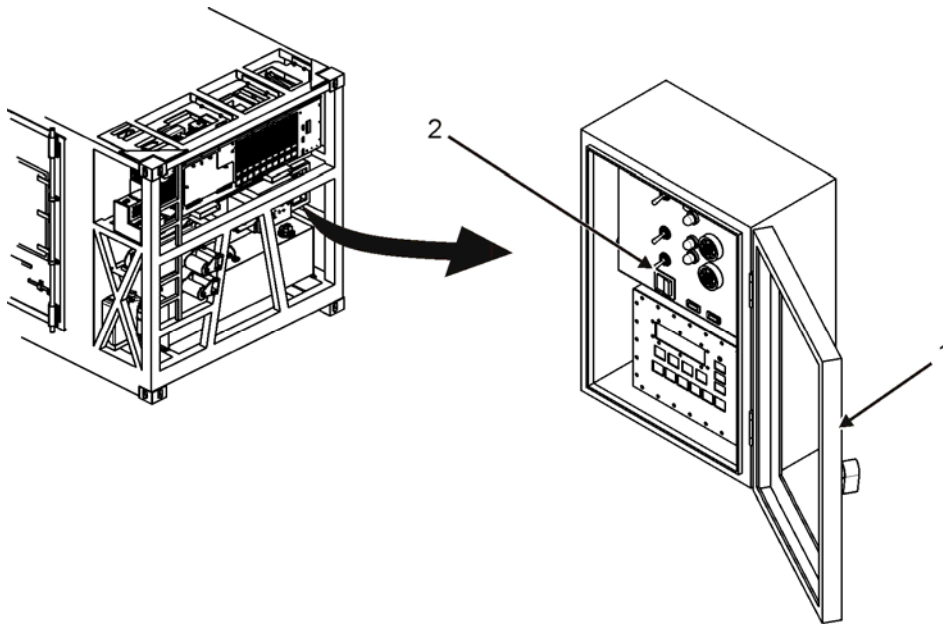


Figure 1. POWER ON/DOWN Switch.

REPLACE – CONTINUED

WARNING

Falling from the top of the MTRCS can result in serious injury or death to personnel. Whenever performing maintenance on top of the MTRCS, always maintain three points of contact to aid in stability. Never attempt to walk backwards while on top of the container.

5. Gain access to top of MTRCS using roof access.
6. Make sure emergency stop switch (Figure 2, Item 1) is in PUSH TO STOP position.

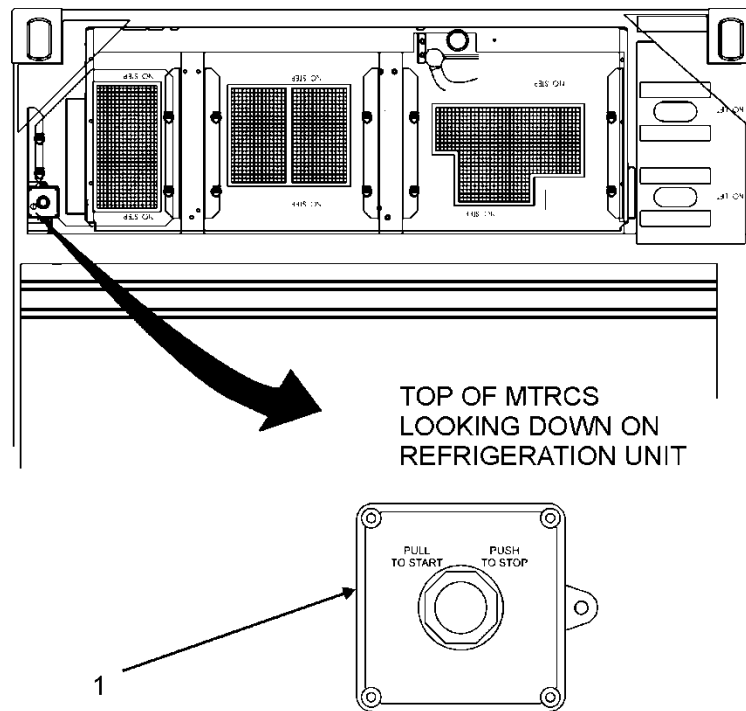


Figure 2. Emergency Stop Switch.

7. Remove top-right panel (WP 0031, Remove).
8. Remove spring (Figure 3, Item 1) from engine speed lever (Figure 3, Item 6) and bracket (Figure 3, Item 12).
9. Disconnect electrical connector (Figure 3, Item 3) from speed solenoid (Figure 3, Item 4).
10. Pry clip (Figure 3, Item 5) from rod (Figure 3, Item 2) and remove rod (Figure 3, Item 2) from solenoid (Figure 3, Item 4).
11. Remove rod (Figure 3, Item 2) from engine speed lever (Figure 3, Item 6).

REPLACE – CONTINUED**NOTE**

Before loosening and removing the mount bolts securing the speed solenoid to the solenoid bracket, scribe a mark where the solenoid is installed so that the replacement solenoid can be installed in same location.

12. Scribe a mark on solenoid bracket (Figure 3, Item 9) where solenoid (Figure 3, Item 4) is installed to be used during reinstallation.
13. Remove four bolts (Figure 3, Item 7) securing solenoid (Figure 3, Item 4) to solenoid bracket (Figure 3, Item 9).
14. Remove speed solenoid (Figure 3, Item 4).

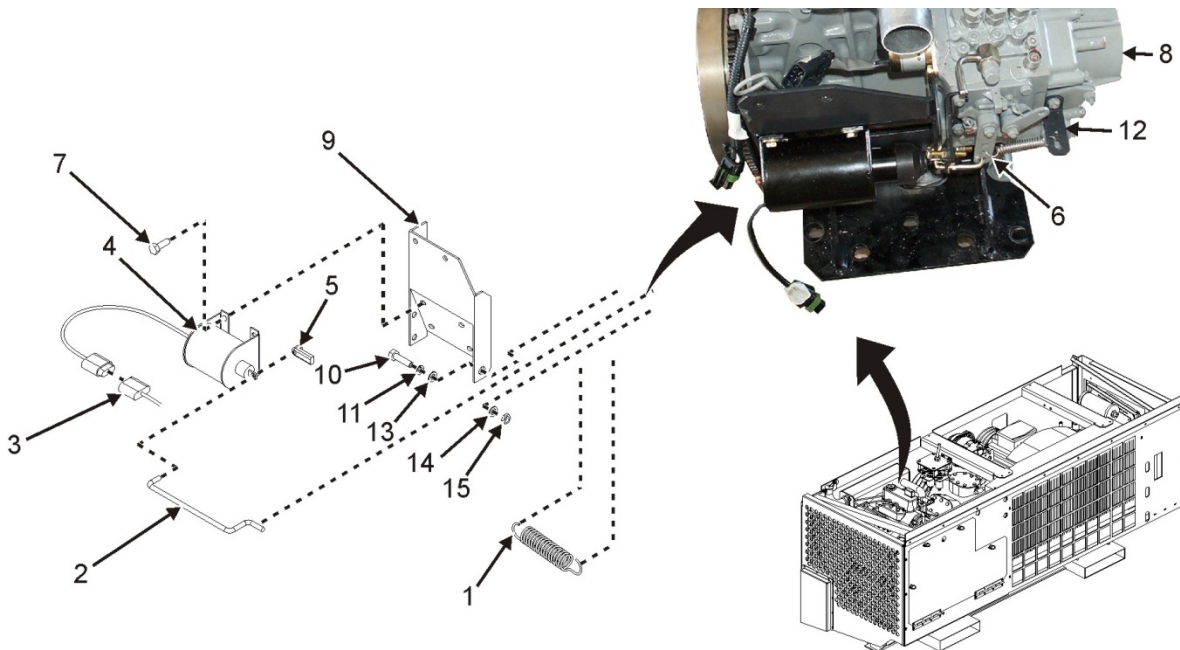


Figure 3. Speed Control Solenoid Removal.

Install

1. Position new speed solenoid (Figure 3, Item 4) on solenoid bracket (Figure 3, Item 9) where previously installed solenoid was marked, and secure using four bolts (Figure 3, Item 7).
2. Attach rod (Figure 3, Item 2) to engine speed lever (Figure 3, Item 6) and to new speed solenoid (Figure 3, Item 4) with clip (Figure 3, Item 5).
3. Connect spring (Figure 3, Item 1) to engine speed lever (Figure 3, Item 6) and bracket (Figure 3, Item 12).
4. Install right-side panel (WP 0031, Install).
5. Install front panel assembly (WP 0031, Install).
6. Install top-right panel (WP 0031, Install).
7. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to ON position.

REPLACE – CONTINUED

8. Operate MTRCS to verify proper operation (WP 0005, Operating Procedures).
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Remove Speed Solenoid Bracket

1. Remove muffler (WP 0056, Remove).
2. Remove speed solenoid per this WP.
3. Remove two bolts (Figure 3, Item 10) and lock washers (Figure 3, Item 11) securing aft side of solenoid mount bracket (Figure 3, Item 9) to engine (Figure 3, Item 8).
4. Remove one bolt (Figure 3, Item 10), and lock washer (Figure 3, Item 11), spacer (Figure 3, Item 13), lock washer (Figure 3, Item 14), and nut (Figure 3, Item 15) securing forward side of solenoid mount bracket (Figure 3, Item 9) to engine (Figure 3, Item 8).
5. Remove solenoid mount bracket (Figure 3, Item 9).
6. Install solenoid mount bracket (Figure 3, Item 9) and secure forward side to engine (Figure 3, Item 8) using one bolt (Figure 3, Item 10), and lock washer (Figure 3, Item 11), spacer (Figure 3, Item 13), lock washer (Figure 3, Item 14), and nut (Figure 3, Item 15).
7. Secure aft side of solenoid mount bracket (Figure 3, Item 9) to engine (Figure 3, Item 8) using two bolts (Figure 3, Item 10) and lock washers (Figure 3, Item 11).
8. Install speed solenoid per this WP.
9. Install muffler (WP 0056, Install).

END OF TASK**TEST**

1. Reconnect battery (WP 0070).

WARNING

Approved hearing protection must be worn when operating the MTRCS diesel engine. Failure to observe this precaution may result in severe and permanent hearing loss.

2. Start refrigeration unit using diesel engine mode (WP 0005, Operating Procedures). The diesel engine should operate in low speed and transition to high speed.
3. Shut down refrigeration unit (WP 0005, Operating Procedures).
4. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
EVAPORATOR BLOWER MOTOR
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)

Materials/Parts

Tie Wrap (WP 0110, Item 55)
 Lock Washer, ³/₈-in ID (WP 0111, Item 13)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0007
 WP 0070
 WP 0102
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

REPLACE**NOTE**

There are two compartments within the MTRCS accommodate cooling and freezing of perishable items. Each compartment is operated independently of the other and has a separate evaporator unit.

Each evaporator contains two evaporator blower motors. Removal and reinstallation of the blower motors is the same for each evaporator. The replacement procedure for each evaporator addresses removal of one blower motor only.

Remove

1. Open control panel assembly door (Figure 1, Item 1).
2. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to OFF position.
3. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to OFF position.
4. Place POWER ON/DOWN switch (Figure 1, Item 4) to DOWN position.
5. Close control panel assembly door (Figure 1, Item 1) and latch (Figure 1, Item 5).
6. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

MTRCS doors are very heavy and solid objects. Make sure rear doors are secured to container frame when in the open position. A gust of wind can cause unsecured doors to slam shut with great force possibly causing severe injury or death to personnel.

7. Open MTRCS rear and side access doors and secure open (WP 0007, Preparation).

REPLACE – CONTINUED

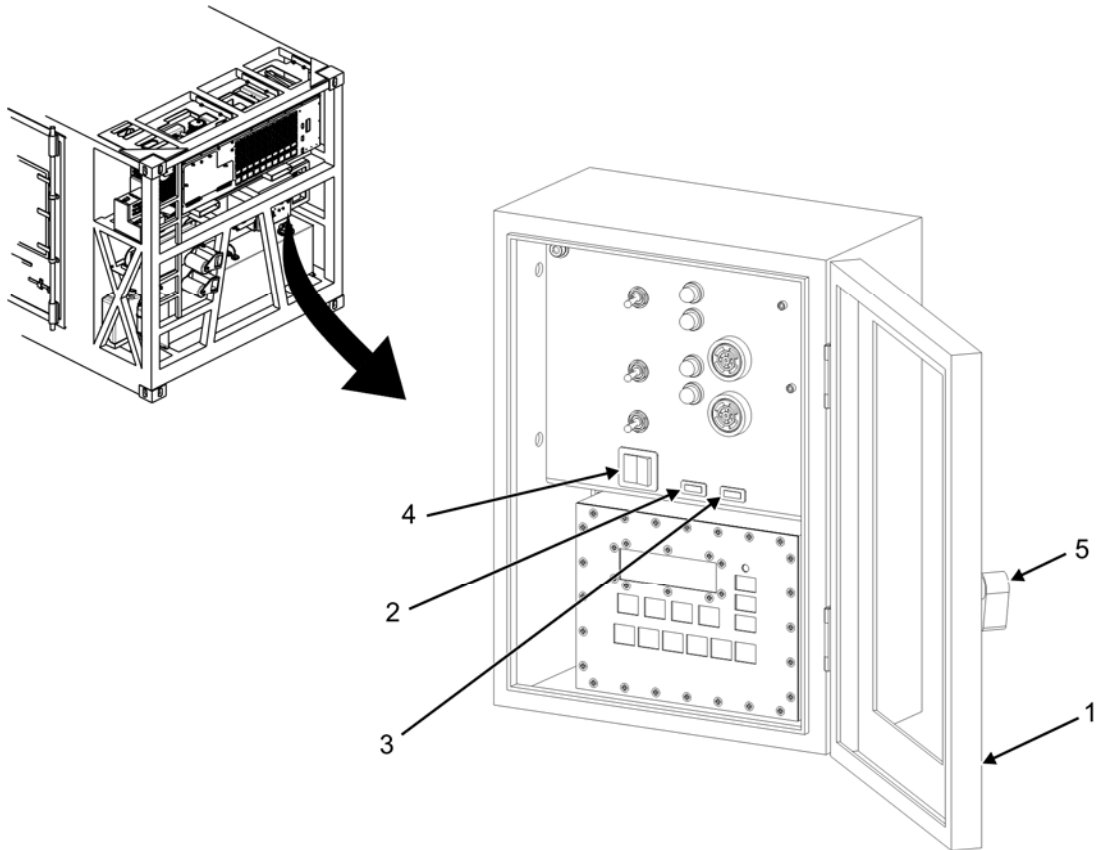


Figure 1. Control Panel Assembly.

REPLACE – CONTINUED**NOTE**

There are two emergency escape hatches located in the container, one for each MTRCS compartment. When the partition panels are installed in the MTRCS container to separate the two compartments, compartment 1 access from compartment 2 and compartment 2 access from compartment 1 will not be possible.

8. Disconnect evaporator electrical connector (Figure 2, Item 1) from evaporator (Figure 2, Item 2).

WARNING

Make sure the evaporator cover is stabilized with your hand prior to removal of the bolts. Failure to do so can cause injury or death.

9. Remove two bolts (Figure 2, Item 3), lock washers (Figure 2, Item 6), and washers (Figure 2, Item 4) securing evaporator cover (Figure 2, Item 5) closed. Discard lock washers. Allow evaporator cover (Figure 2, Item 5) to swing down while securing with one hand.

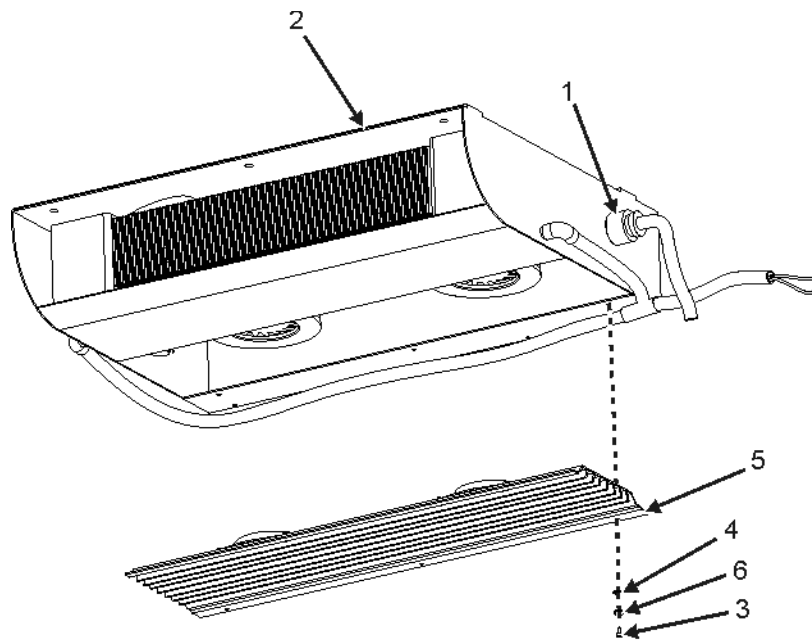


Figure 2. Evaporator Cover Removal.

REPLACE – CONTINUED

10. Remove four screws (Figure 3, Item 1), lock washers (Figure 3, Item 2), washers (Figure 3, Item 3), and nuts (Figure 3, Item 4) securing blower motor mount bracket (Figure 3, Item 5) to evaporator (Figure 3, Item 6). Discard lock washers.

CAUTION

The blower motor has wires attached to the rear of the assembly. These wires will have to be disconnected prior to removal of the blower motor. Use care when pulling the evaporator motor blower assembly mounting bracket away from the evaporator so as not to damage the wiring.

11. Carefully pull mount bracket (Figure 3, Item 5), with blower motor (Figure 3, Item 7) attached, away from evaporator (Figure 3, Item 6) enough to access rear.
12. Tag and disconnect wiring (Figure 3, Item 8) from blower motor (Figure 3, Item 7).
13. Remove four screws (Figure 3, Item 9), washers (Figure 3, Item 10), and lock washers (Figure 3, Item 11) securing blower motor (Figure 3, Item 7) to blower motor mount bracket (Figure 3, Item 5). Discard lock washers.
14. Remove blower motor (Figure 3, Item 7).

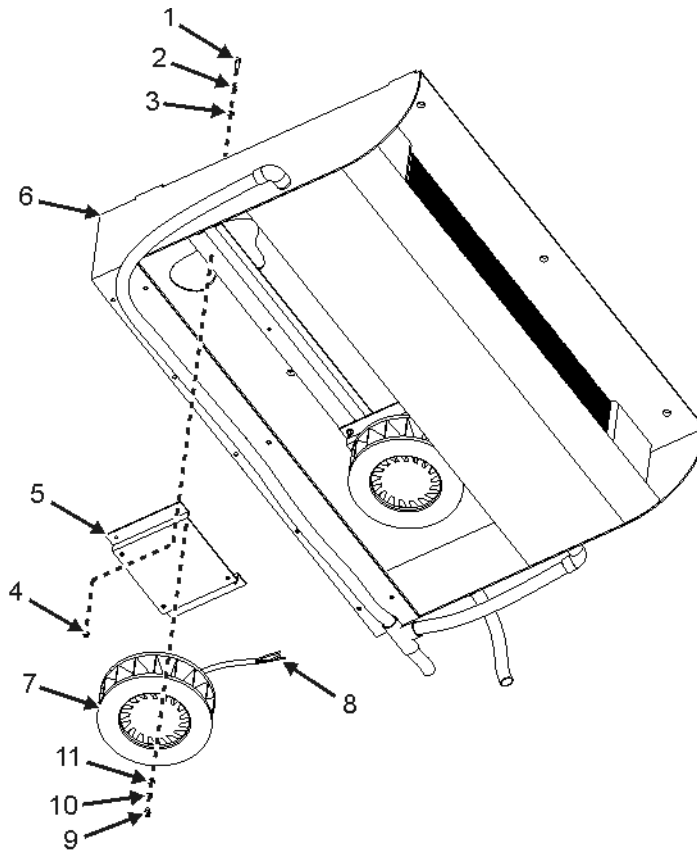
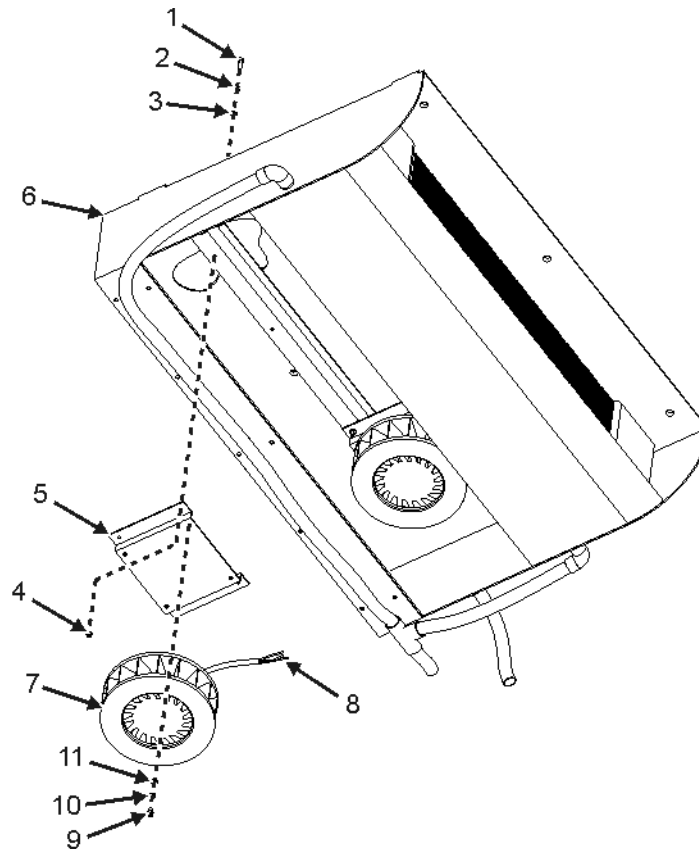


Figure 3. Evaporator Blower Motor Removal.

REPLACE – CONTINUED**Install**

1. Install new blower motor (Figure 4, Item 7) onto mount bracket (Figure 4, Item 5) and secure with four screws (Figure 4, Item 9), washers (Figure 4, Item 10), and new lock washers (Figure 4, Item 11).
2. Reconnect wiring (Figure 4, Item 8) to blower motor (Figure 4, Item 7) as tagged.
3. Attach blower motor mount bracket (Figure 4, Item 5), with blower motor (Figure 4, Item 7) attached, to evaporator (Figure 4, Item 6) and secure with four screws (Figure 4, Item 1), washers (Figure 4, Item 2), new lock washers (Figure 4, Item 3), and nuts (Figure 4, Item 4). Tighten hardware (WP 0102).

**Figure 4. Evaporator Blower Motor Installation.**

REPLACE – CONTINUED

4. Close and secure evaporator cover (Figure 5, Item 5) using two bolts (Figure 5, Item 3), new lock washers (Figure 5, Item 6), and washers (Figure 5, Item 4).
5. Reconnect evaporator electrical connector (Figure 5, Item 1).

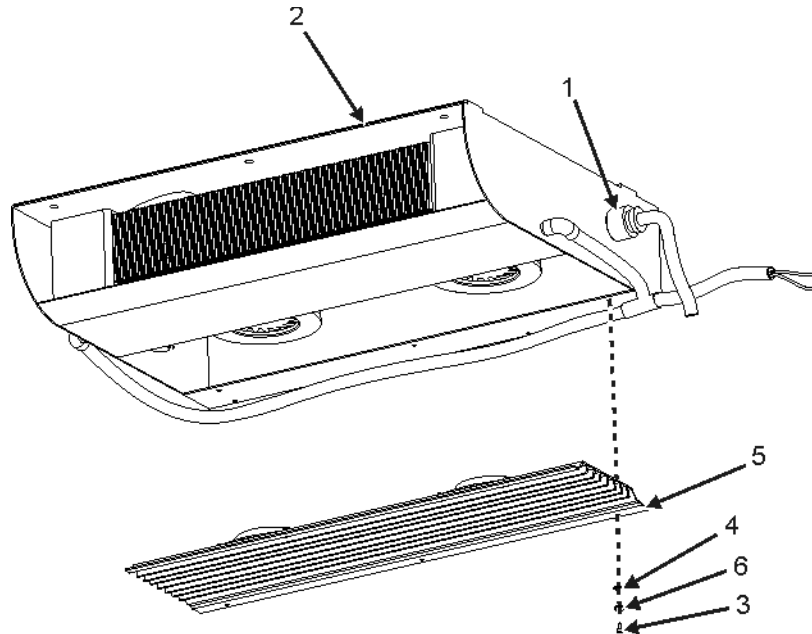


Figure 5. Evaporator Cover Installation.

6. Connect battery (-) negative terminal (WP 0070, Disconnect).
7. Open MTRCS control box door (Figure 6, Item 1).
8. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 6, Item 2) to ON position.
9. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 6, Item 3) to ON position.
10. Place POWER ON/DOWN switch (Figure 6, Item 4) on control panel to POWER ON position.
11. Close MTRCS control box door (Figure 6, Item 1) and latch (Figure 6, Item 5).
12. Start refrigeration unit and operate under normal conditions to check for leaks and proper operation of evaporator (WP 0005, Operating Procedures).

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

13. Close and secure both rear and side access doors (WP 0007, Loading).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

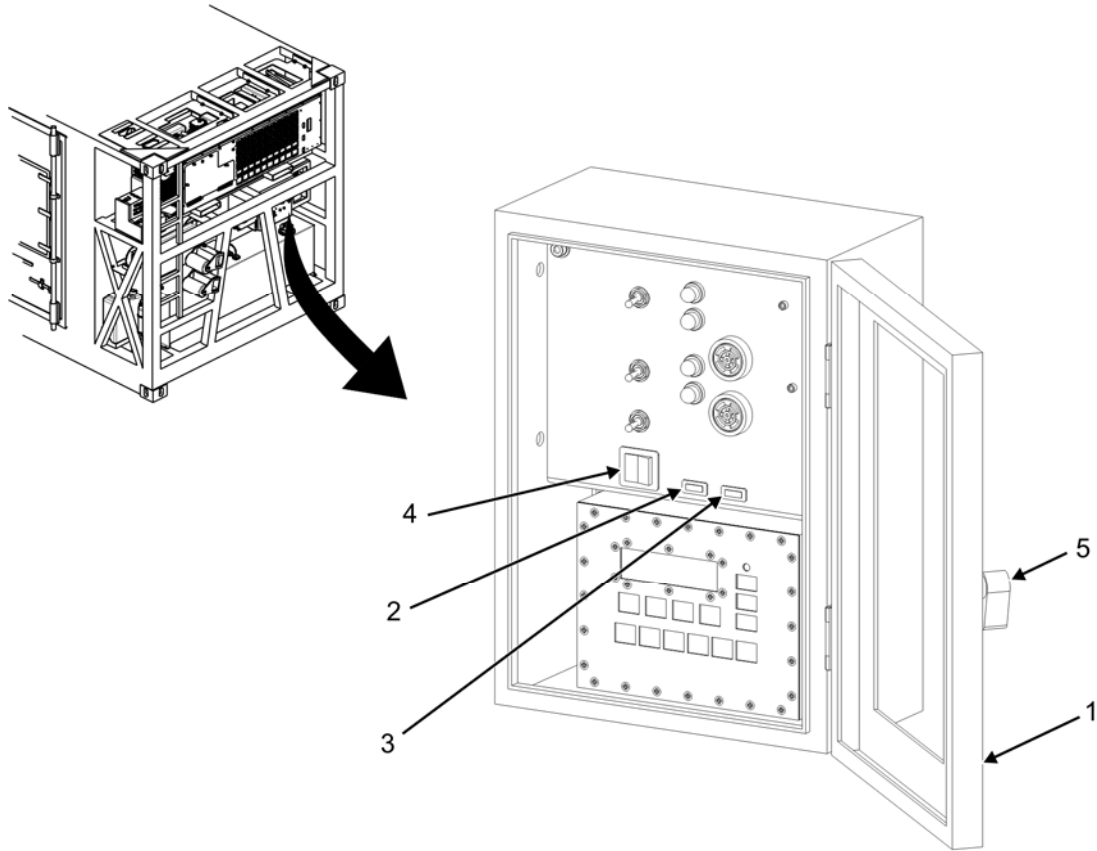


Figure 6. Control Panel Assembly.

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
EVAPORATOR BLOWER MOTOR CAPACITOR
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)
Refrigeration Equipment
Tool Kit (supplement) (WP 0107, Table 2, Item 7)

References

WP 0005
WP 0007
WP 0070
TM 10-8145-222-23P

Personnel Required

Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

REPLACE**NOTE**

There are two compartments within the MTRCS to allow for cooling and freezing of perishable items. Each compartment is operated independently of the other and has a separate evaporator unit.

Each evaporator contains two evaporator blower motor capacitors. Removal and reinstallation of the capacitors is the same for each evaporator. The replacement procedure for each evaporator addresses removal of one blower motor capacitor only.

1. Open control panel assembly door (Figure 1, Item 1).
2. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to OFF position.
3. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to OFF position.
4. Place POWER ON/DOWN switch (Figure 1, Item 4) to DOWN position.
5. Close control panel assembly door (Figure 1, Item 1) and latch (Figure 1, Item 5).
6. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

MTRCS doors are very heavy and solid objects. Make sure rear doors are secured to container frame when in the open position. A gust of wind can cause unsecured doors to slam shut with great force possibly causing severe injury or death to personnel.

7. Open MTRCS rear and side access doors and secure open (WP 0007, Preparation).

REPLACE – CONTINUED

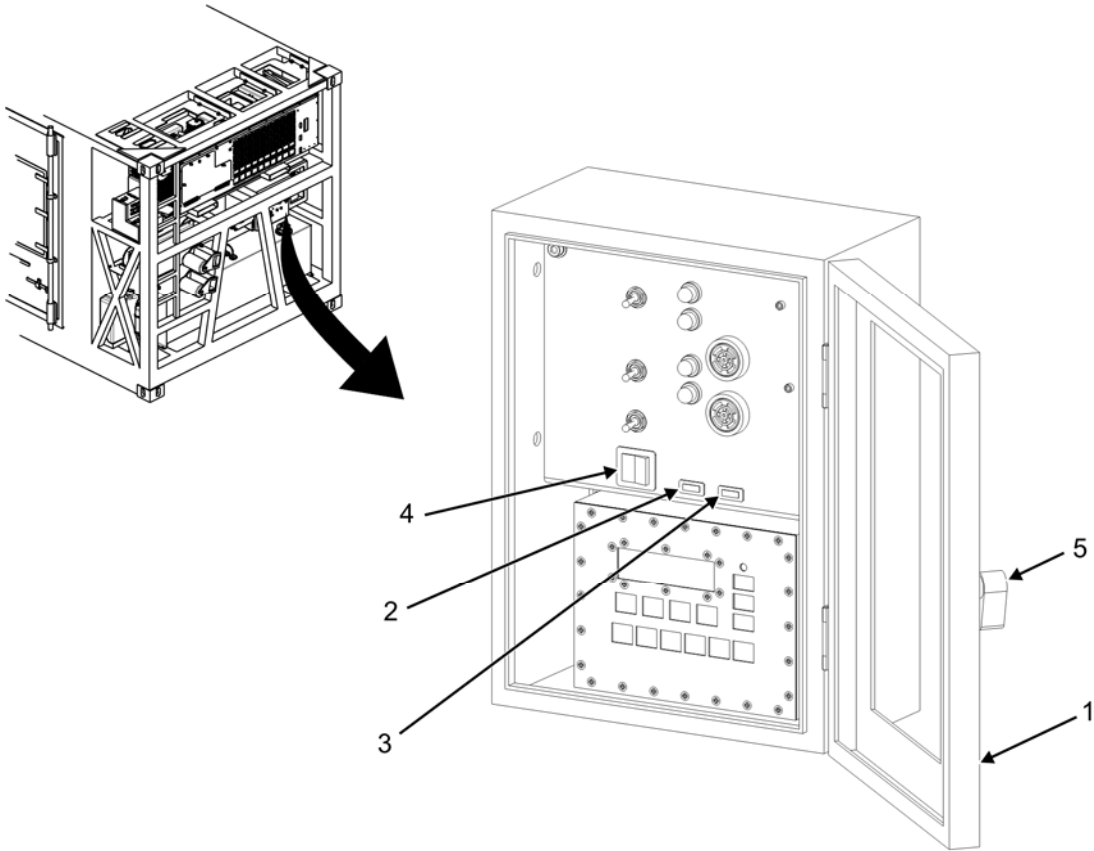


Figure 1. Control Panel Assembly.

REPLACE – CONTINUED**NOTE**

There are two emergency escape hatches located in the container, one for each MTRCS compartment. When the partition panels are installed in the MTRCS container to separate the two compartments, compartment 1 access from compartment 2 and compartment 2 access from compartment 1 will not be possible.

8. Tag and disconnect evaporator electrical connector (Figure 2, Item 1) from evaporator (Figure 2, Item 2).

WARNING

Make sure the evaporator cover is stabilized with your hand prior to removal of the bolts. Failure to do so can cause injury or death.

9. Remove two bolts (Figure 2, Item 3), lock washers (Figure 2, Item 8), and washers (Figure 2, Item 4) securing evaporator cover (Figure 2, Item 5) closed. Discard lock washers. Allow evaporator cover (Figure 2, Item 5) to swing down while securing with one hand.

WARNING

Do not touch capacitor terminals for the first five minutes after the power has been disconnected. Capacitors can store electrical power for extended periods of time after being disconnected from power supply. Failure to comply can cause serious personal injury or death.

10. Cut wire ties securing capacitor wiring (Figure 2, Item 6) using care not to cut wires.
11. Tag and disconnect capacitor wiring (Figure 2, Item 6) and unscrew capacitor (Figure 2, Item 7).
12. Install new capacitor (Figure 2, Item 7) and reconnect wiring (Figure 2, Item 6) as tagged.
13. Secure capacitor wiring (Figure 2, Item 6) with wire ties.
14. Close evaporator cover (Figure 2, Item 5) and secure with two bolts (Figure 2, Item 3), new lock washers (Figure 2, Item 8), and washers (Figure 2, Item 4).
15. Reconnect evaporator electrical connector (Figure 2, Item 1) to evaporator (Figure 2, Item 2).
16. Connect battery (-) negative terminal (WP 0070, Reconnect).
17. Open MTRCS control box door (Figure 1, Item 1).
18. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to ON position.
19. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to ON position.
20. Place POWER ON/DOWN switch (Figure 1, Item 4) on control panel to ON position.
21. Close MTRCS control box door (Figure 1, Item 1) and latch (Figure 1, Item 5).

REPLACE – CONTINUED

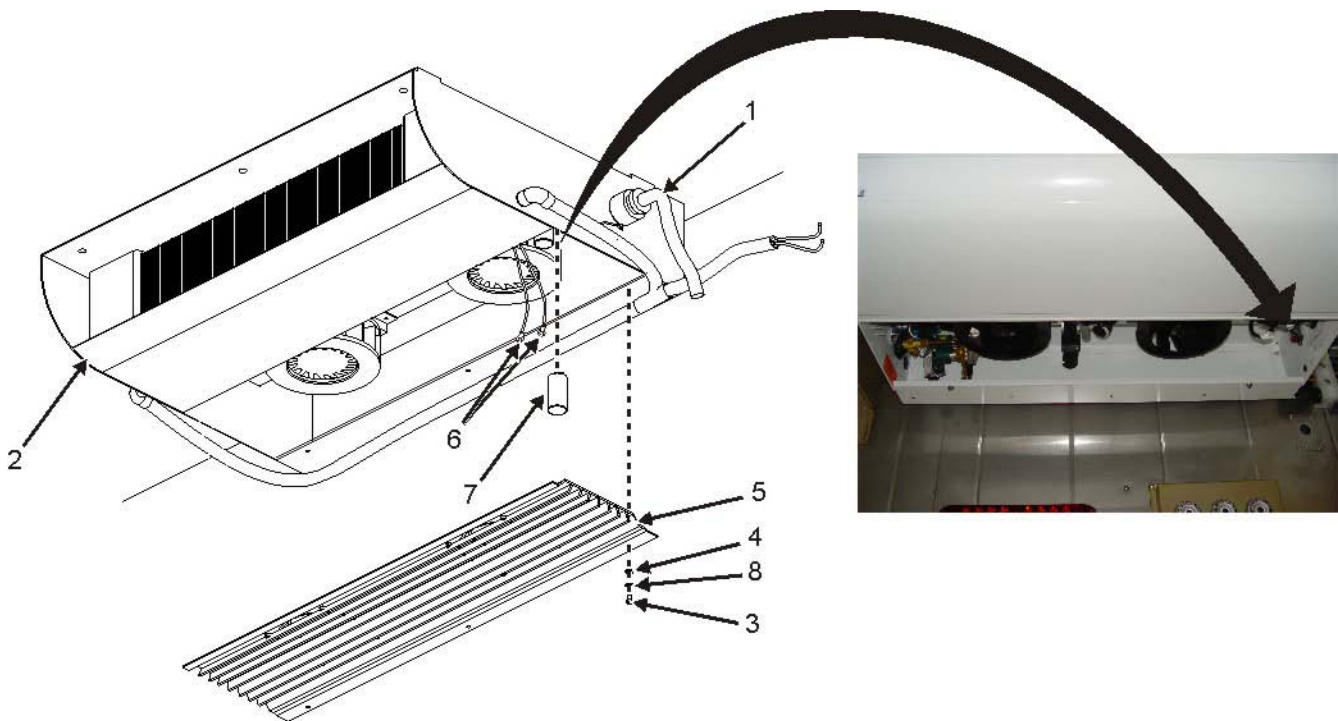


Figure 2. Evaporator Capacitor.

22. Start refrigeration unit and operate under normal conditions to check for leaks and proper operation (WP 0005, Operating Procedures).

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

23. Close and secure both rear and side access doors (WP 0007, Loading).
24. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
EVAPORATOR THERMOSTATIC EXPANSION VALVE
INSPECT

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0032
WP 0070
WP 0094

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

INSPECT**WARNING**

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

NOTE

The Thermostatic Expansion Valve (TXV) automatically regulates the flow of refrigerant into the evaporator coil to adjust for changes in cooling load requirements. The expansion valve is located inside the evaporator housing on the refrigerant pipe leading into the evaporator coil.

An expansion valve is used with each evaporator and the following procedures apply to both expansion valves.

1. Open MTRCS control panel assembly door (Figure 1, Item 1).
2. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to OFF position.
3. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to OFF position.
4. Place POWER ON/DOWN switch (Figure 1, Item 4) on control panel to DOWN position.
5. Close MTRCS control panel assembly door (Figure 1, Item 1) and latch (Figure 1, Item 5).
6. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

INSPECT – CONTINUED

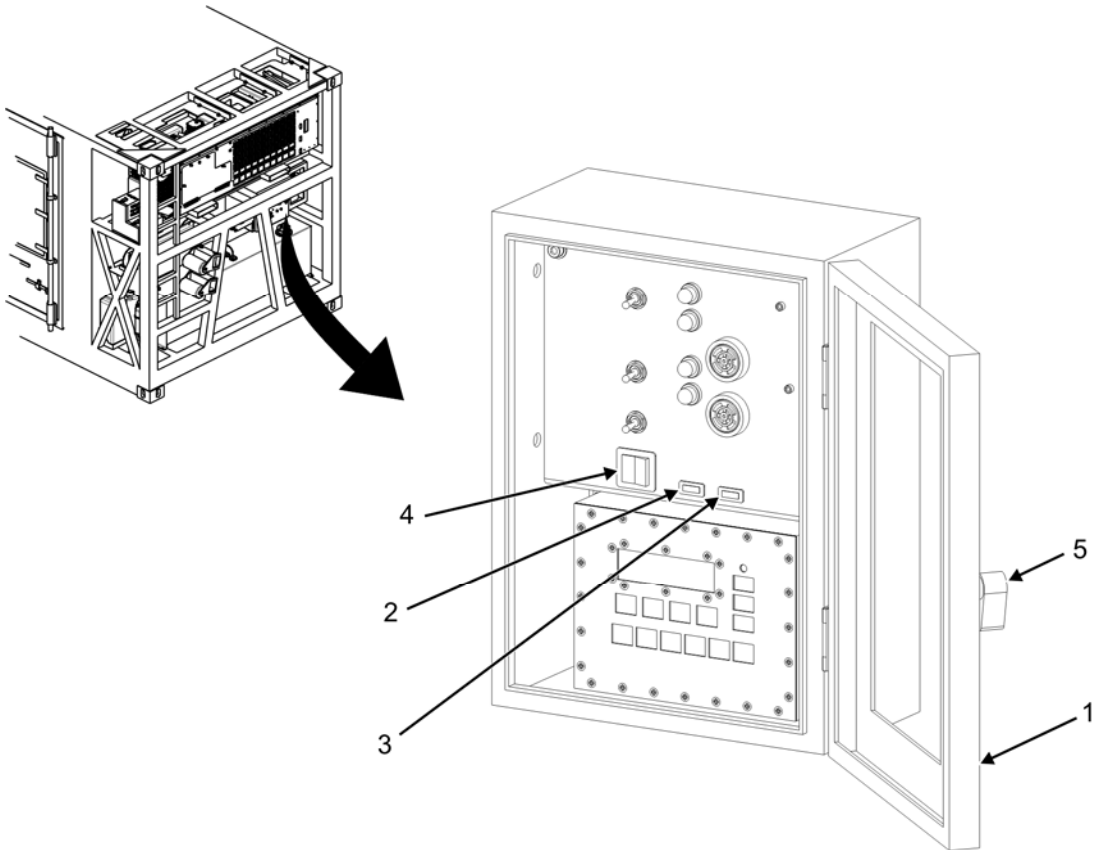


Figure 1. Control Box.

INSPECT – CONTINUED

7. Remove evaporator cover panel (Figure 2, Item 1) by removing two bolts (Figure 2, Item 2), two lock washers (Figure 2, Item 10), and two washers (Figure 2, Item 3). Discard lock washers.

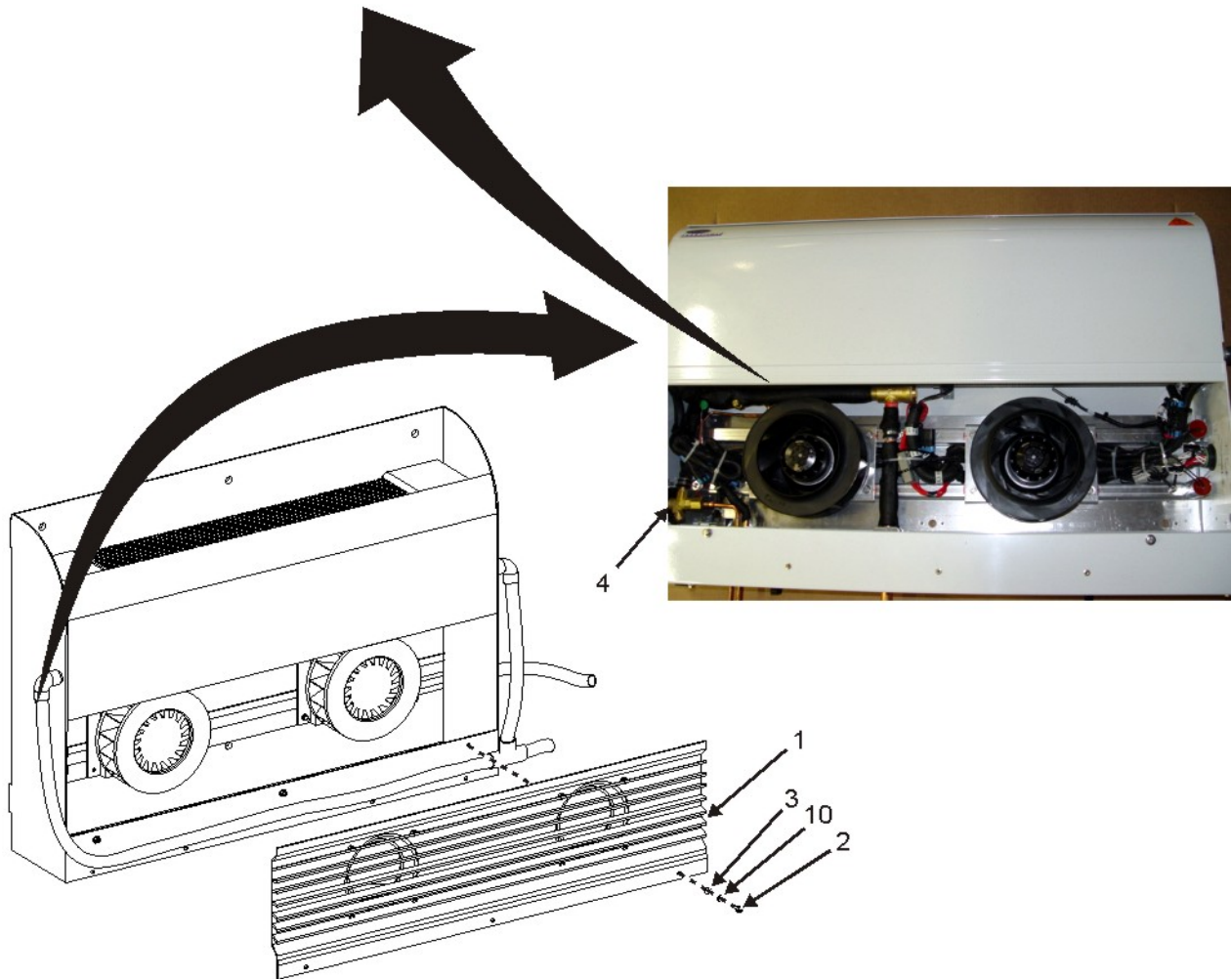
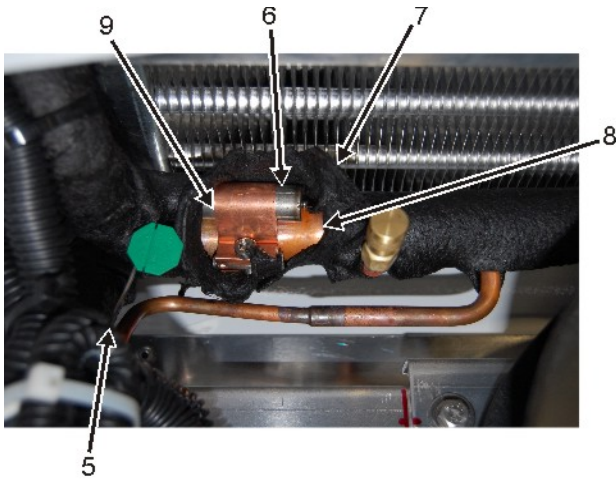


Figure 2. Evaporator Thermostatic Expansion Valve.

INSPECT – CONTINUED**NOTE**

Expansion valve refrigerant leakage would show up as an oily residue at connection points or under the expansion valve.

8. Inspect thermostatic expansion valve (Figure 2, Item 4) for any evidence of refrigerant leak.
 - If a refrigerant leak is suspected, perform a refrigerant leak check and repair as necessary (WP 0032, Service).
9. Inspect capillary line (Figure 2, Item 5) connected at top of expansion valve (Figure 2, Item 4) located under insulation (Figure 2, Item 7) for any kinks or cracks.

NOTE

The TXV bulb is connected to the TXV by a small capillary line and is located several inches away from the TXV, secure to the evaporator outlet line with tie wraps and covered by insulation.

10. Carefully pull back insulation (Figure 2, Item 7) as necessary, and without using tools, to access TXV bulb (Figure 2, Item 6) attached to evaporator outlet refrigerant line (Figure 2, Item 8) and check for any kinks or cracks. If capillary line (Figure 2, Item 5) is damaged, expansion valve (Figure 2, Item 4) will need to be replaced (WP 0094, Replace).
11. Check that TXV bulb (Figure 2, Item 6) is securely attached to refrigerant line (Figure 2, Item 8) and making even contact with line.
12. Tighten TXV bulb clamp (Figure 2, Item 9) as necessary and secure previously removed insulation (Figure 2, Item 7) removed to access TXV bulb (Figure 2, Item 6).
13. Install evaporator cover panel (Figure 2, Item 1) and secure using two bolts (Figure 2, Item 2), new lock washers (Figure 2, Item 10), and washers (Figure 2, Item 3).
14. Connect battery negative (-) terminal (WP 0070, Reconnect).
15. Open MTRCS control panel assembly door (Figure 1, Item 1).
16. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to ON position.
17. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) on control panel to ON position.
18. Close MTRCS control panel assembly door (Figure 1, Item 1) and latch (Figure 1, Item 5).
19. Operate MTRCS refrigeration unit to verify proper operation (WP 0005, Operating Procedures).
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
**HEATER
REPLACE**

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 Electrical Connector Kit (WP 0107, Table 2, Item 3)

References

WP 0005
 WP 0007
 WP 0070

Personnel Required

Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Battery disconnected (WP 0070)

REPLACE**NOTE**

There are two evaporators located inside the MTRCS insulated container. Each of the evaporators has three tubular electrical heaters. This procedure is applicable to the replacement of either evaporator heater.

1. Open MTRCS control box door (Figure 1, Item 1).
2. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to OFF position.
3. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to OFF position.
4. Place POWER ON/DOWN switch (Figure 1, Item 4) on control panel to DOWN position.
5. Close MTRCS control box door (Figure 1, Item 1) and latch (Figure 1, Item 5).

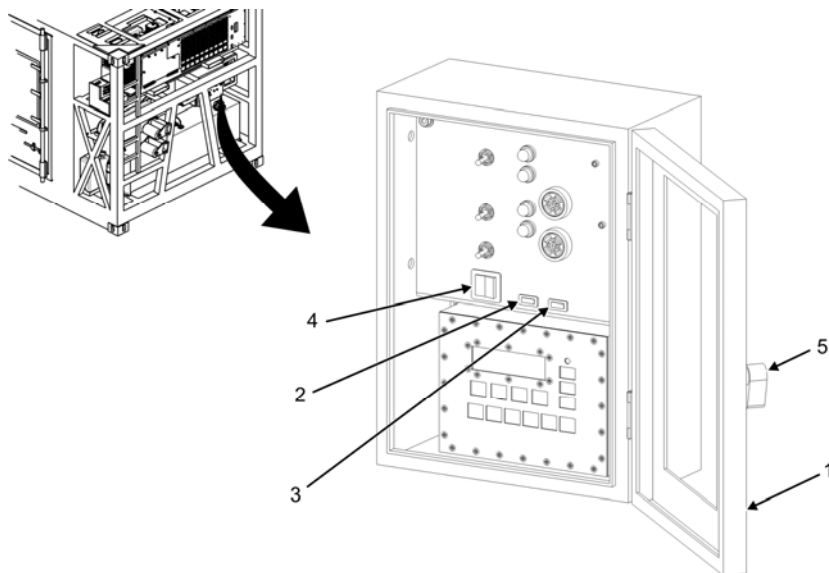


Figure 1. Control Box.

REPLACE – CONTINUED

6. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

7. Open MTRCS side and rear access doors and secure to side of container with attached door chain (WP 0007, Preparation).
8. Open evaporator cover panel (Figure 2, Item 1) by removing two bolts (Figure 2, Item 2), lock washers (Figure 2, Item 18), and washers (Figure 2, Item 3) and allow cover to swing down. Discard lock washers.
9. Cut and remove tie wraps (Figure 2, Item 4) securing return air sensor (Figure 2, Item 5) and temperature chart recorder sensor (Figure 2, Item 6) to evaporator cover (Figure 2, Item 1).
10. Carefully pull sensors (Figure 2, Item 5 and Item 6) through hole in evaporator cover (Figure 2, Item 1).
11. Disconnect two drain hoses (Figure 2, Item 19) from evaporator (Figure 2, Item 7).
12. Remove two elbows (Figure 2, Item 20) from evaporator (Figure 2, Item 7).
13. Remove evaporator cover (Figure 2, Item 1) from evaporator front cover (Figure 2, Item 8) by lifting up and out of evaporator front cover hinged area.

WARNING

The front evaporator cover is bulky and awkward to work with. Make sure to support the evaporator cover when removing attaching hardware.

14. Remove eight bolts (Figure 2, Item 9) securing front evaporator cover (Figure 2, Item 8) to evaporator (Figure 2, Item 7).
15. Remove front evaporator cover (Figure 2, Item 8).
16. Pull drain tube heaters out of evaporator drip pan (Figure 2, Item 12).

WARNING

The evaporator drip pan is bulky and awkward to work with. Make sure to support the evaporator drip pan when removing attaching hardware.

17. Remove three bolts (Figure 2, Item 10) and three washers (Figure 2, Item 11) securing evaporator drip pan (Figure 2, Item 12) to evaporator (Figure 2, Item 7).
18. Remove drip pan (Figure 2, Item 12).

REPLACE - CONTINUED

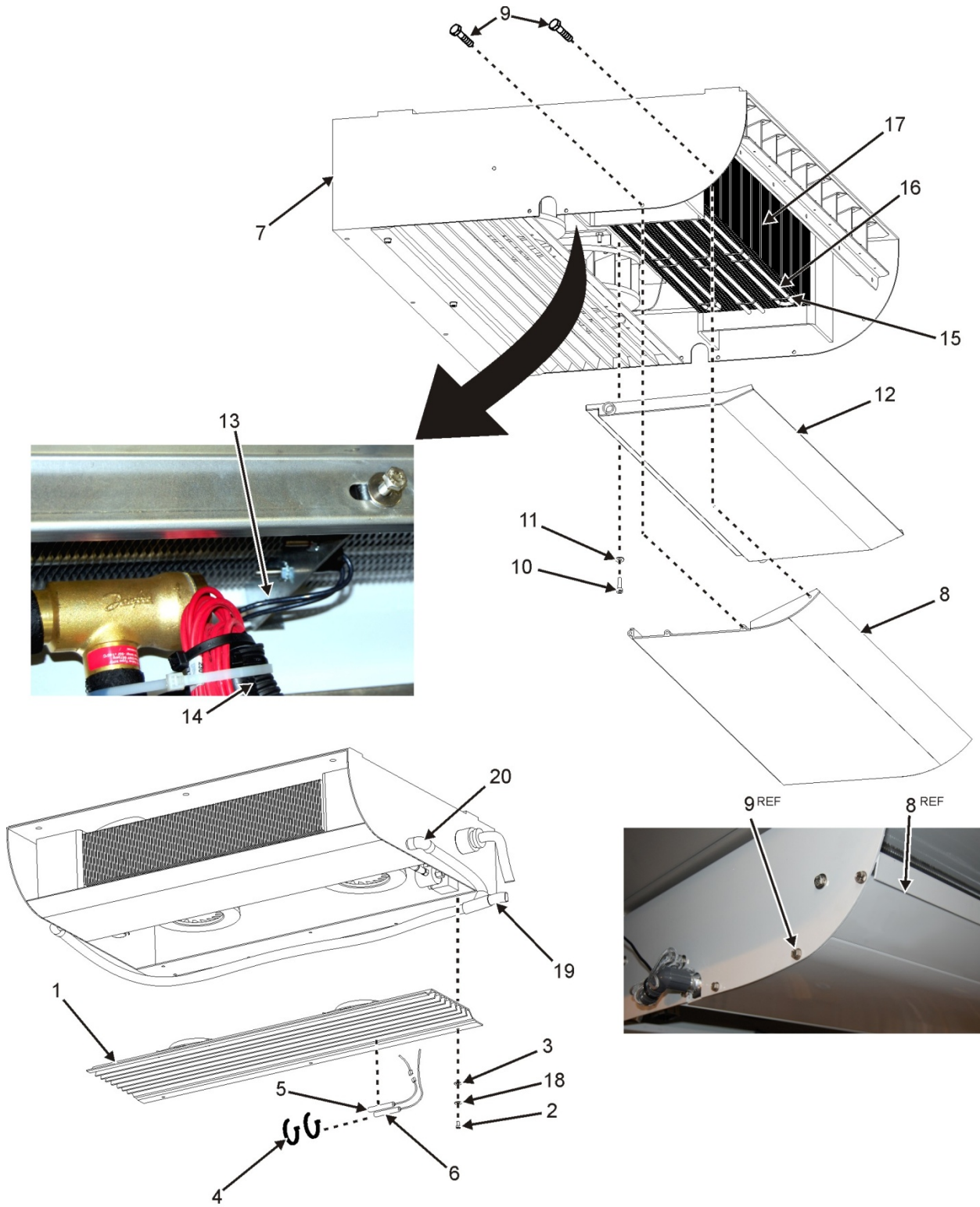


Figure 2. Heater Access.

REPLACE – CONTINUED**NOTE**

There are three electrical heaters on each evaporator. The electrical splice points for two of the heaters are on one end of the evaporator and one of the electrical splice points is on the opposite end of the heater. Splices will be wrapped under heavy black insulation tape.

19. Tag and disconnect applicable heater electrical wiring (Figure 2, Item 13) to heater (Figure 2, Item 16) by cutting at splice location (Figure 2, Item 14).

CAUTION

The metal fins of the evaporator coil are damaged easily. Use care when removing the heaters from the evaporator coils.

20. Remove four heater clips (Figure 3, Item 1) securing heater (Figure 3, Item 2) to evaporator coil (Figure 3, Item 3).
21. Remove heater (Figure 3, Item 2) and wiring remaining on heater while noting routing of wiring for reinstallation.
22. Prepare wiring on new heater and existing wiring in evaporator for splicing.
23. Install replacement heater (Figure 3, Item 2) to evaporator coil (Figure 3, Item 3) and secure using four heater clips (Figure 3, Item 1).

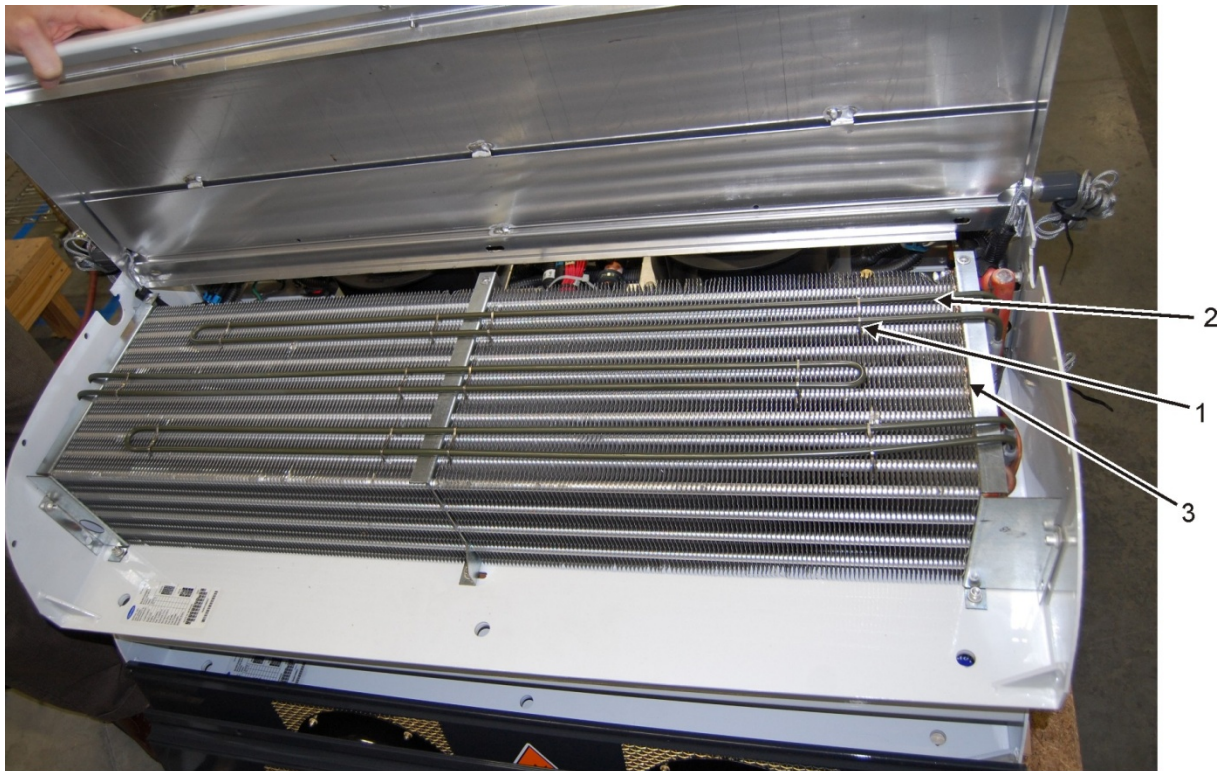


Figure 3. Heater.

REPLACE – CONTINUED

24. Reconnect electrical wiring (Figure 4, Item 13) to heater (Figure 4, Item 16) as tagged by splicing wires together.
25. Secure any loose wiring and connectors as needed inside evaporator compartment using tie wraps (Figure 4, Item 4).
26. Remove tags from electrical wiring.
27. Feed drain tube heaters through evaporator drip pan (Figure 4, Item 12).
28. Install drip pan (Figure 4, Item 12) to evaporator (Figure 4, Item 7) and secure using three bolts (Figure 4, Item 10) and three washers (Figure 4, Item 11).
29. Install front evaporator cover (Figure 4, Item 8) to evaporator (Figure 4, Item 7) and secure using eight bolts (Figure 4, Item 9).
30. Install evaporator cover panel (Figure 4, Item 1) onto front evaporator cover (Figure 4, Item 8) hinged area.
31. Feed drain tube heaters through two elbows (Figure 4, Item 20) and install elbows to evaporator (Figure 4, Item 7).
32. Feed drain tube heaters into drain tube (Figure 4, Item 19) and secure drain tubes to evaporator (Figure 4, Item 7).
33. Route temperature chart recorder sensor (Figure 4, Item 6) and return air sensor (Figure 4, Item 5) wiring through evaporator cover (Figure 4, Item 1).
34. Mount return air sensor (Figure 4, Item 5) and temperature chart recorder sensor (Figure 4, Item 6) to cover and secure with two tie wraps (Figure 4, Item 4).
35. Close evaporator cover panel (Figure 4, Item 1) by installing two bolts (Figure 4, Item 2), two washers (Figure 4, Item 3) and two new lock washers (Figure 4, Item 18).

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

36. Close MTRCS rear and side access doors after making sure no personnel are remaining inside (WP 0007, Loading).
37. Reconnect battery negative (-) terminal (WP 0070, Reconnect).

REPLACE – CONTINUED

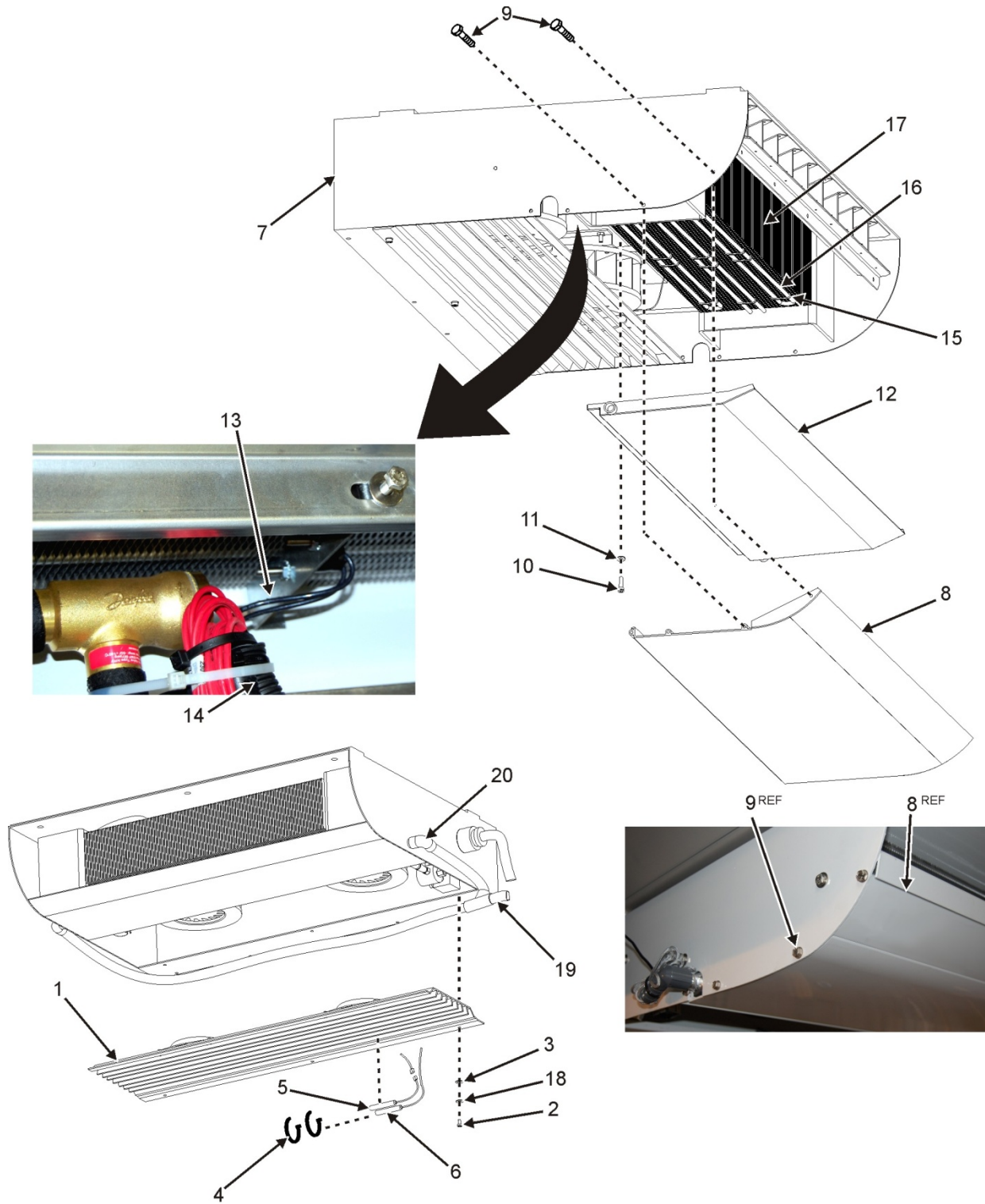
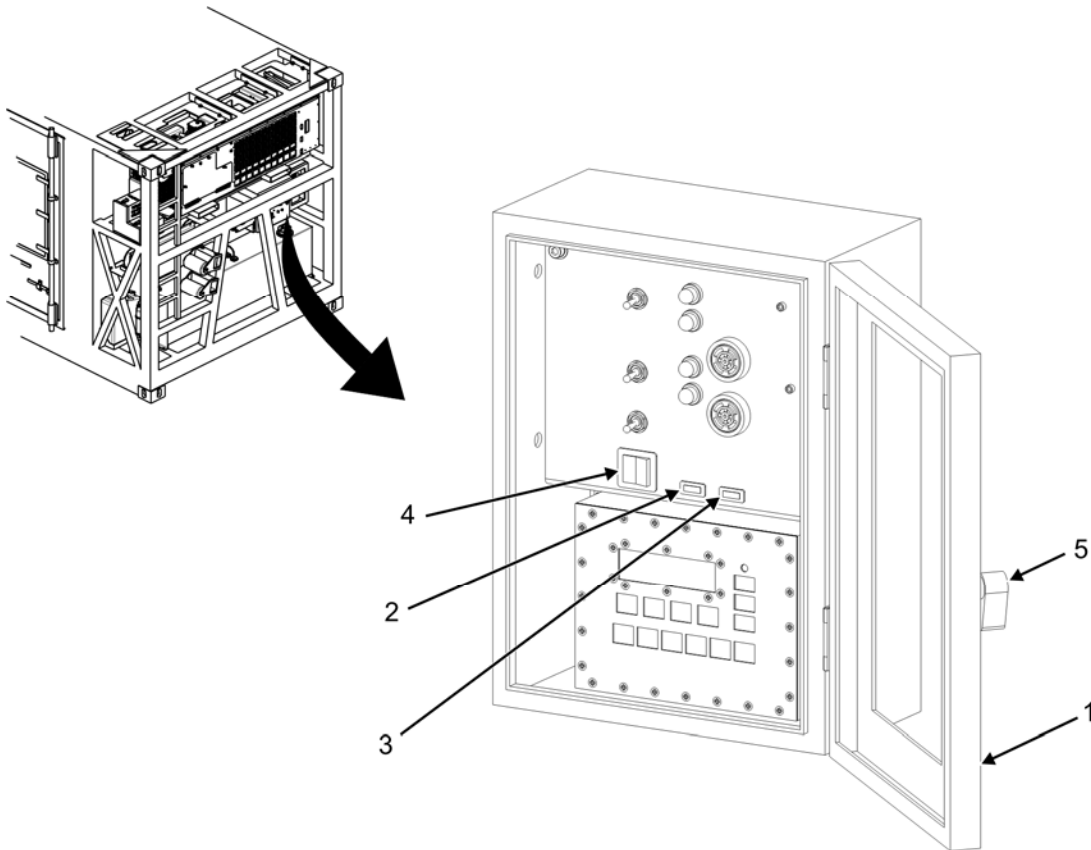


Figure 4. Heater Access.

REPLACE – CONTINUED

38. Open MTRCS control box door (Figure 5, Item 1).
39. Place POWER ON/DOWN switch (Figure 5, Item 4) on control panel to ON position.
40. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 5, Item 2) to ON position.
41. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 5, Item 3) to ON position.
42. Close MTRCS control box door (Figure 5, Item 1) and latch (Figure 5, Item 5).
43. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

**Figure 5. Control Box.****END OF TASK****END OF WORK PACKAGE**

SERVICE MAINTENANCE
LIQUID SOLENOID VALVE COIL
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Refrigeration Equipment
Tool Kit (supplement) (WP 0107, Table 2, Item 7)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)
Stool, Step (WP 0109)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0070

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)
Battery disconnected (WP 0070)

REPLACE

Replace the evaporator liquid solenoid valve coil as follows:

NOTE

There are two liquid solenoid valves; one in each compartments evaporator. This procedure is applicable to the replacement of either liquid solenoid valve coil.

The liquid solenoid valve coil can be replaced without having to pump the refrigeration unit down.

1. Open applicable evaporator cover panel (Figure 1, Item 1) by removing two bolts (Figure 1, Item 2) and two washers (Figure 1, Item 3).

NOTE

The use of a step aid may be required during the performance of this task.

2. Tag and disconnect electrical connector (Figure 1, Item 4) from liquid solenoid valve coil (Figure 1, Item 5).

NOTE

During the removal of the retainer clip that secures the coil to the solenoid valve, the use of a screwdriver may be required as a prying device to free the clip from the enclosure tube.

3. Lift coil retainer clip (Figure 1, Item 6) securing coil (Figure 1, Item 5) to liquid solenoid valve (Figure 1, Item 8). Retain retainer for installation of new coil.
4. Remove coil (Figure 1, Item 5) from liquid solenoid valve enclosing tube assembly (Figure 1, Item 7).

CAUTION

It is important that the replacement coil be of the same type, voltage rating, and frequency of the coil that was removed. Coil type, voltage rating, and frequency information are indicated on the coil housing. Make sure to verify this information before installing the replacement coil or damage to the system may occur.

5. Verify coil type, voltage, and frequency of replacement coil nameplate is same as removed coil.

REPLACE – CONTINUED

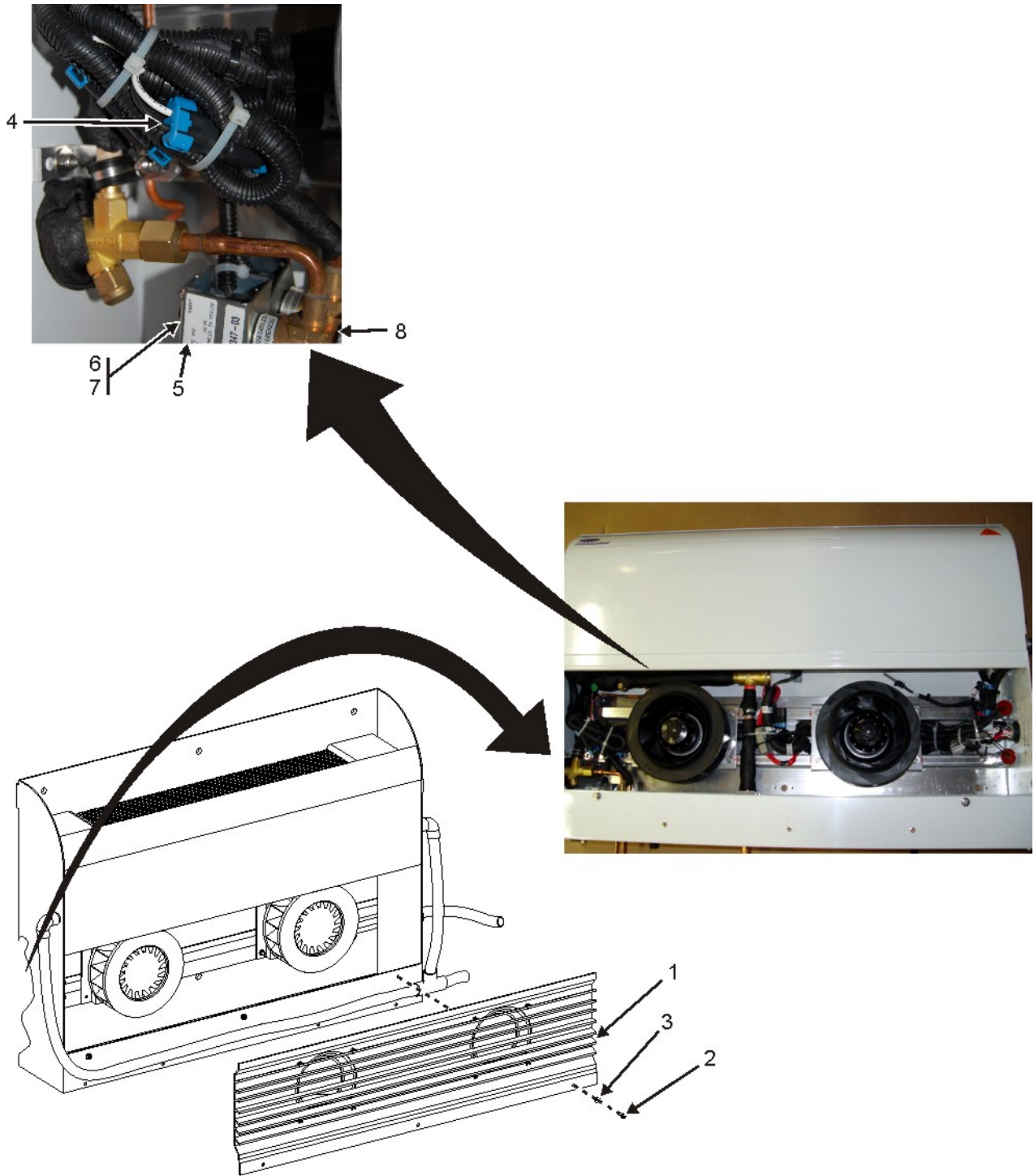


Figure 1. Liquid Solenoid Valve Coil Replacement.

REPLACE – CONTINUED

6. Install coil retainer (Figure 1, Item 6) over replacement coil (Figure 1, Item 5) to secure to liquid solenoid valve (Figure 1, Item 8). Install replacement coil (Figure 1, Item 5) over enclosing tube assembly (Figure 1, Item 7).
7. Reconnect electrical connector (Figure 1, Item 4) to liquid solenoid valve coil (Figure 1, Item 5) as tagged during disconnection.
8. Remove wire tags from wire leads (Figure 1, Item 4).
9. Close evaporator cover panel (Figure 1, Item 1) and secure using two bolts (Figure 1, Item 2) and two washers (Figure 1, Item 3).
10. Reconnect battery (WP 0070, Reconnect).
11. Start refrigeration unit and verify proper operation (WP 0005, Operating Procedures).
12. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
HOT GAS VALVE COIL
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)
Stool, Step (WP 0109)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0064
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)
Battery disconnected (WP 0070)
Liquid line solenoid coil removed (WP 0064)

REPLACE**NOTE**

There are two hot gas valves; one in each compartments evaporator. This procedure is applicable to the replacement of either hot gas valve coil.

The hot gas valve coil can be replaced without having to pump the refrigeration unit down.

1. Remove evaporator cover panel (Figure 1, Item 1) by removing two bolts (Figure 1, Item 2) and two washers (Figure 1, Item 3).

NOTE

The use of a step aid may be required during the performance of this task.

2. Tag and disconnect electrical connector (Figure 1, Item 4) from hot gas valve coil (Figure 1, Item 5).
3. Remove coil retainer (Figure 1, Item 6) securing coil (Figure 1, Item 5) to hot gas valve (Figure 1, Item 8).
4. Remove coil (Figure 1, Item 5) from hot gas valve enclosing tube assembly (Figure 1, Item 7).

CAUTION

It is important that the replacement coil be of the same type, voltage rating, and frequency of the coil that was removed. Coil type, voltage rating, and frequency information are indicated on the coil housing. Make sure to verify this information before installing the replacement coil or damage to the system may occur.

5. Verify coil type, voltage, and frequency of replacement coil nameplate is same as removed coil.
6. Install replacement coil (Figure 1, Item 5) over enclosing tube assembly (Figure 1, Item 7).
7. Install coil retainer (Figure 1, Item 6) over replacement coil (Figure 1, Item 5) to secure to hot gas valve (Figure 1, Item 8).

REPLACE – CONTINUED

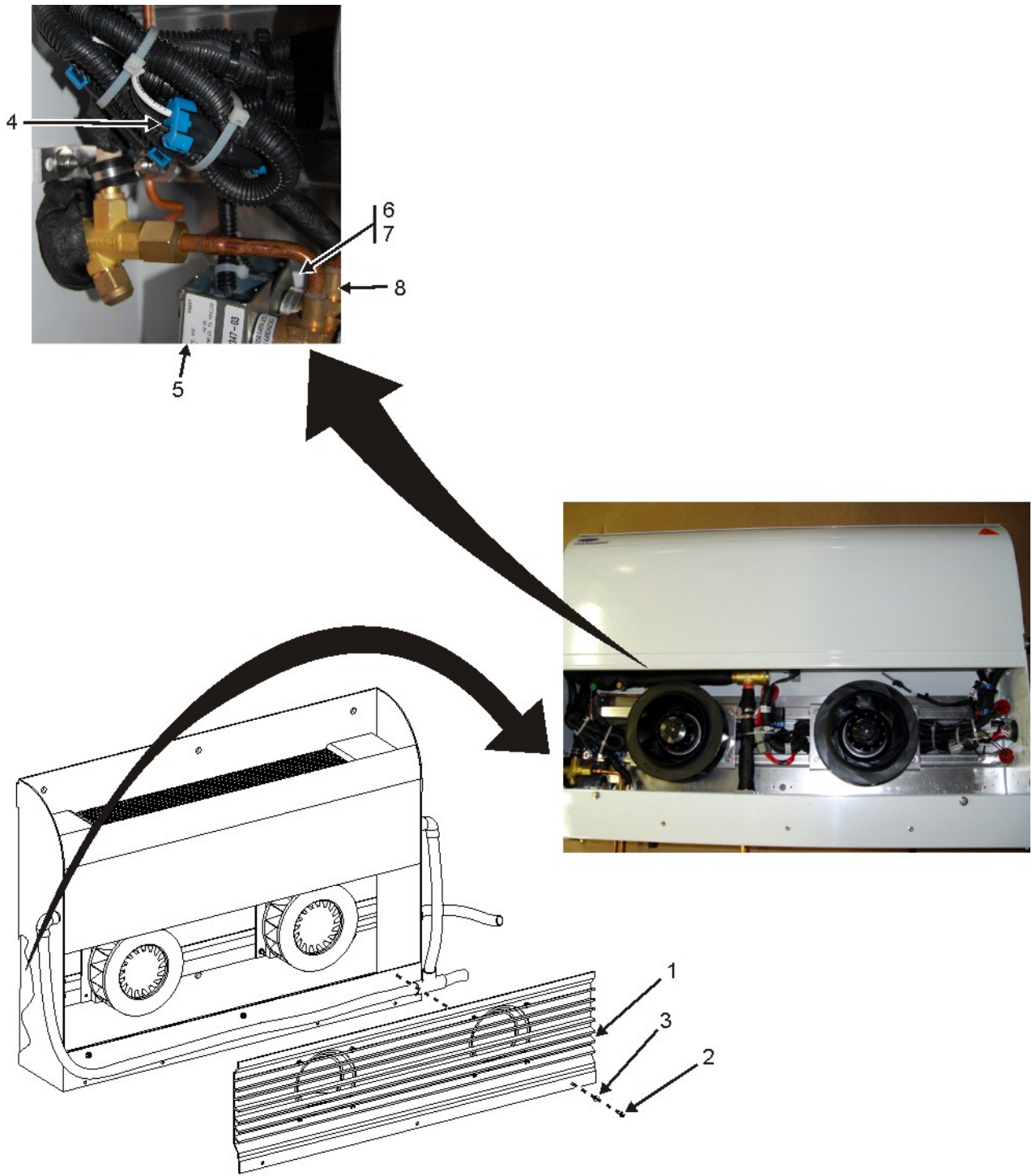


Figure 1. Hot Gas Valve Coil Replacement.

REPLACE – CONTINUED

8. Reconnect electrical connector (Figure 1, Item 4) to hot gas valve coil (Figure 1, Item 5) as tagged during disconnection.
9. Install liquid line solenoid coil (WP 0064, Replace).
10. Remove wire tags from wire leads (Figure 1, Item 4).
11. Close evaporator cover panel (Figure 1, Item 1) and secure using two bolts (Figure 1, Item 2) and two washers (Figure 1, Item 3).
12. Reconnect battery (WP 0070, Reconnect).
13. Start refrigeration unit and verify proper operation (WP 0005, Operating Procedures).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
EVAPORATOR SENSORS
INSPECT, REPLACE

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Tie Wrap (WP 0110, Item 55)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0070
WP 0102
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

INSPECT**Evaporator Sensors****WARNING**

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

NOTE

Each evaporator has two sensors (evaporator return air sensor and temperature chart recorder sensor) mounted to the evaporator grill. The sensors are mounted in tandem with each other to the forward blower on each evaporator. The temperature chart recorder sensor is hard wired to the recorder. The return air sensor has an electrical connector. The following procedure is applicable to inspection of either sensor on either evaporator.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Remove two bolts (Figure 1, Item 1) and washers (Figure 1, Item 2) securing evaporator cover (Figure 1, Item 3) and carefully swing cover open.
3. Inspect return air sensor (Figure 1, Item 4) and temperature chart recorder sensor (Figure 1, Item 5) for cracks, broken mount, or any other visible damage. Replace any damaged sensor or mount.
4. Inspect return air sensor (Figure 1, Item 4) and temperature chart recorder sensor (Figure 1, Item 5) wiring for cut or frayed insulation, and secure connection.
 - a. Make any necessary repair to wiring with electrical tape and tighten loose hardware (WP 0102).
 - b. If sensor is damaged or wiring is damaged beyond repair, replace applicable sensor per this WP.

INSPECT – CONTINUED

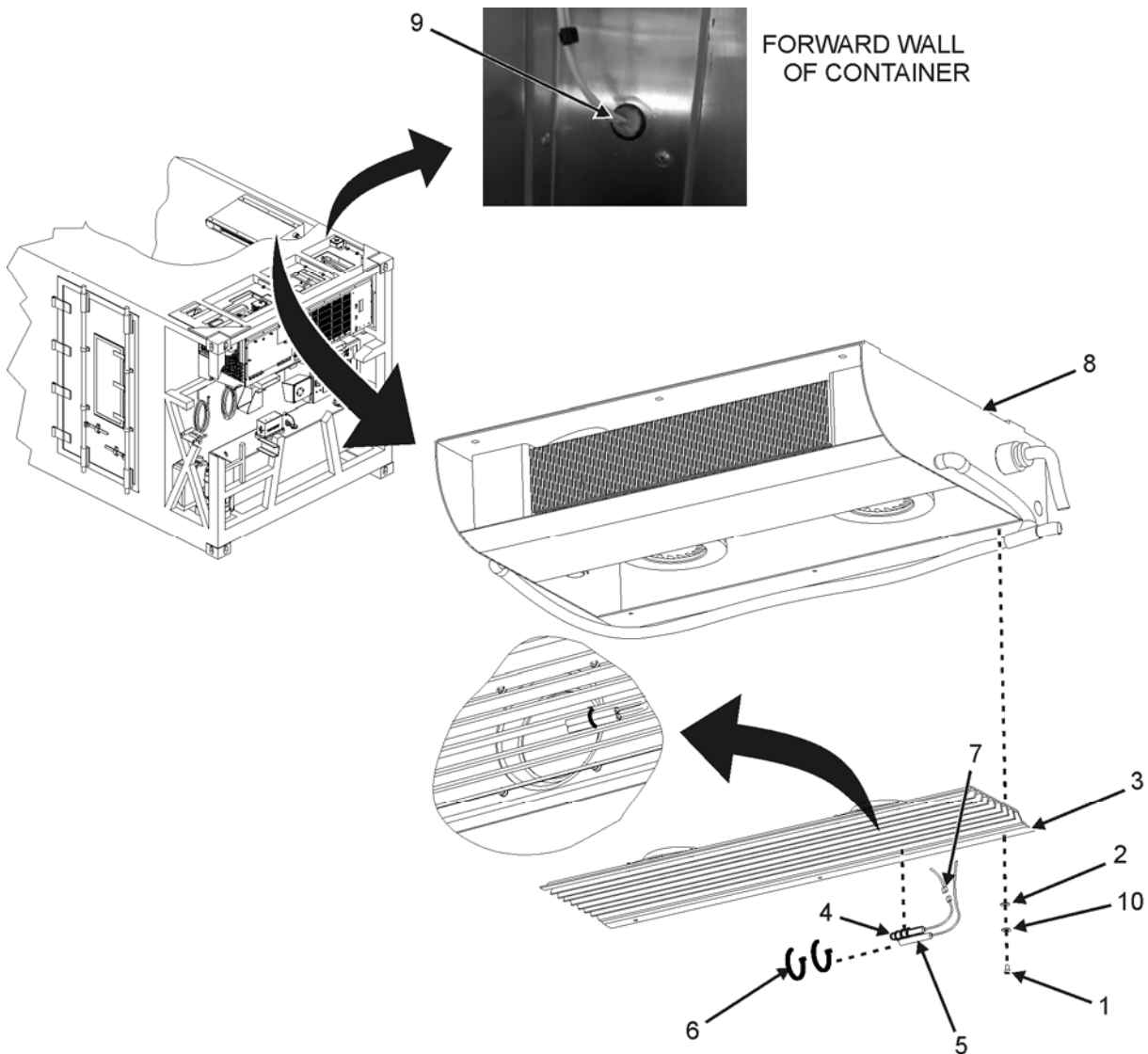


Figure 1. Evaporator Sensors.

5. Close evaporator cover (Figure 1, Item 3) and secure using two bolts (Figure 1, Item 1) and washers (Figure 1, Item 2).
6. Connect battery negative (-) terminal (WP 0070, Reconnect).
7. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

REPLACE**WARNING**

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

NOTE

Each evaporator has two sensors (evaporator return air sensor and chart recorder sensor) mounted to the evaporator grill. The return air sensor is the forward most positioned sensor when looking up at the evaporator. The chart recorder sensor is the aft most positioned sensor. The following procedure is applicable to replacement of either sensor on either evaporator.

Return Air Sensor

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Remove two bolts (Figure 2, Item 1) and washers (Figure 2, Item 2) securing evaporator cover (Figure 2, Item 3) and carefully swing cover open.
3. Cut and remove tie wraps (Figure 2, Item 6) securing return air sensor (Figure 2, Item 4) and temperature chart recorder sensor (Figure 2, Item 5) to evaporator cover (Figure 2, Item 3).
4. Carefully pull sensor through hole in cover (Figure 2, Item 3).
5. Disconnect electrical connector (Figure 2, Item 7) from return air sensor (Figure 2, Item 4).
6. Remove return air sensor (Figure 2, Item 4).
7. Install return air sensor (Figure 2, Item 4) and reconnect electrical connector (Figure 2, Item 7).
8. Carefully slide return air sensor (Figure 2, Item 4) and temperature chart recorder sensor (Figure 2, Item 5) through hole and secure to evaporator cover (Figure 2, Item 3) using two tie wraps.
9. Close evaporator cover (Figure 2, Item 3) and secure using two bolts (Figure 2, Item 1) and washers (Figure 2, Item 2).
10. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
11. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

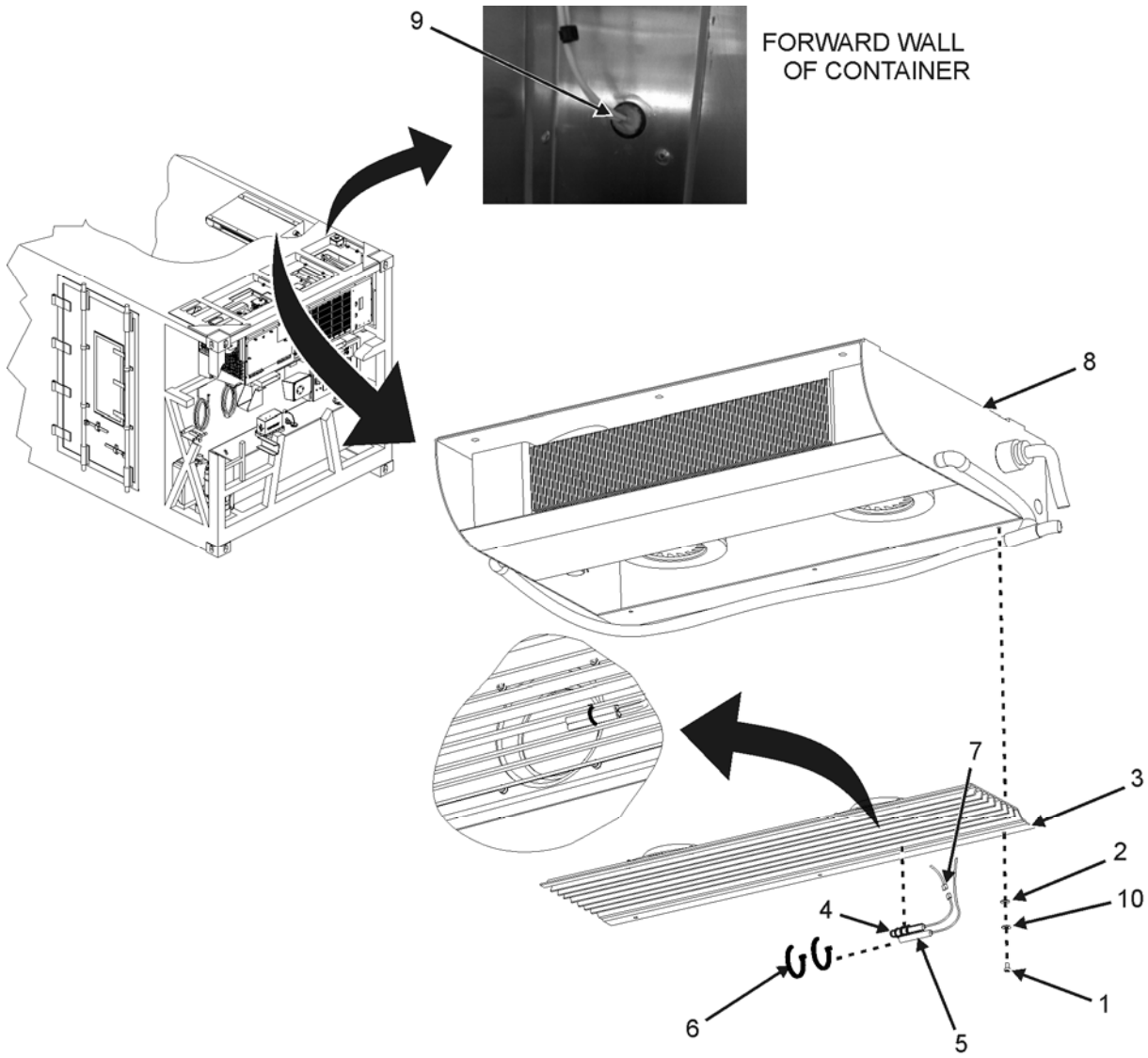
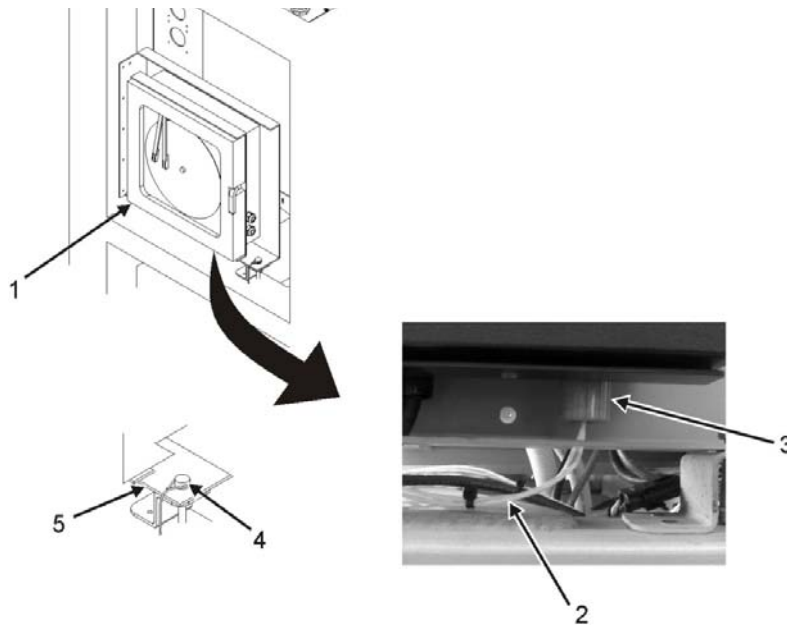


Figure 2. Return Air and Temperature Chart Recorder Sensors.

REPLACE – CONTINUED**Temperature Chart Recorder Sensor**

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Remove two bolts (Figure 2, Item 1) and washers (Figure 2, Item 2) securing evaporator cover (Figure 2, Item 3) and carefully swing cover open.
3. Cut and remove tie wraps (Figure 2, Item 6) securing return air sensor (Figure 2, Item 4) and temperature chart recorder sensor (Figure 2, Item 5) to evaporator cover (Figure 2, Item 3).
4. Carefully pull sensors through hole in evaporator cover (Figure 2, Item 3).
5. Cut tie wraps as needed and carefully pull temperature chart recorder sensor (Figure 2, Item 5) out of evaporator (Figure 2, Item 8).
6. Cut and remove tie wraps, as needed, from temperature chart recorder sensor (Figure 2, Item 5) cable between evaporator cutout and location where cable passes through container forward wall (Figure 2, Item 9).
7. Carefully remove sealant as needed from container pass through forward wall (Figure 2, Item 9) on inside and outside of container so that cable will be able to be pulled through.
8. On outside of container just aft of temperature chart recorder (Figure 3, Item 1), locate temperature chart recorder sensor (Figure 2, Item 5) cable and continue cutting tie wraps as needed until cable (Figure 3, Item 2) enters temperature chart recorder feed through (Figure 3, Item 3).
9. Remove snap pin (Figure 3, Item 4) from holder securing hinged mount bracket (Figure 3, Item 5) to frame.
10. Swing hinged mount bracket (Figure 3, Item 5) open with chart recorder (Figure 3, Item 1) attached.

**Figure 3. Cable Routing.**

REPLACE – CONTINUED

11. Remove two screws (Figure 4, Item 1) securing chart recorder hinged front panel (Figure 4, Item 2) closed.

12. Swing chart recorder hinged front panel (Figure 4, Item 2) open.

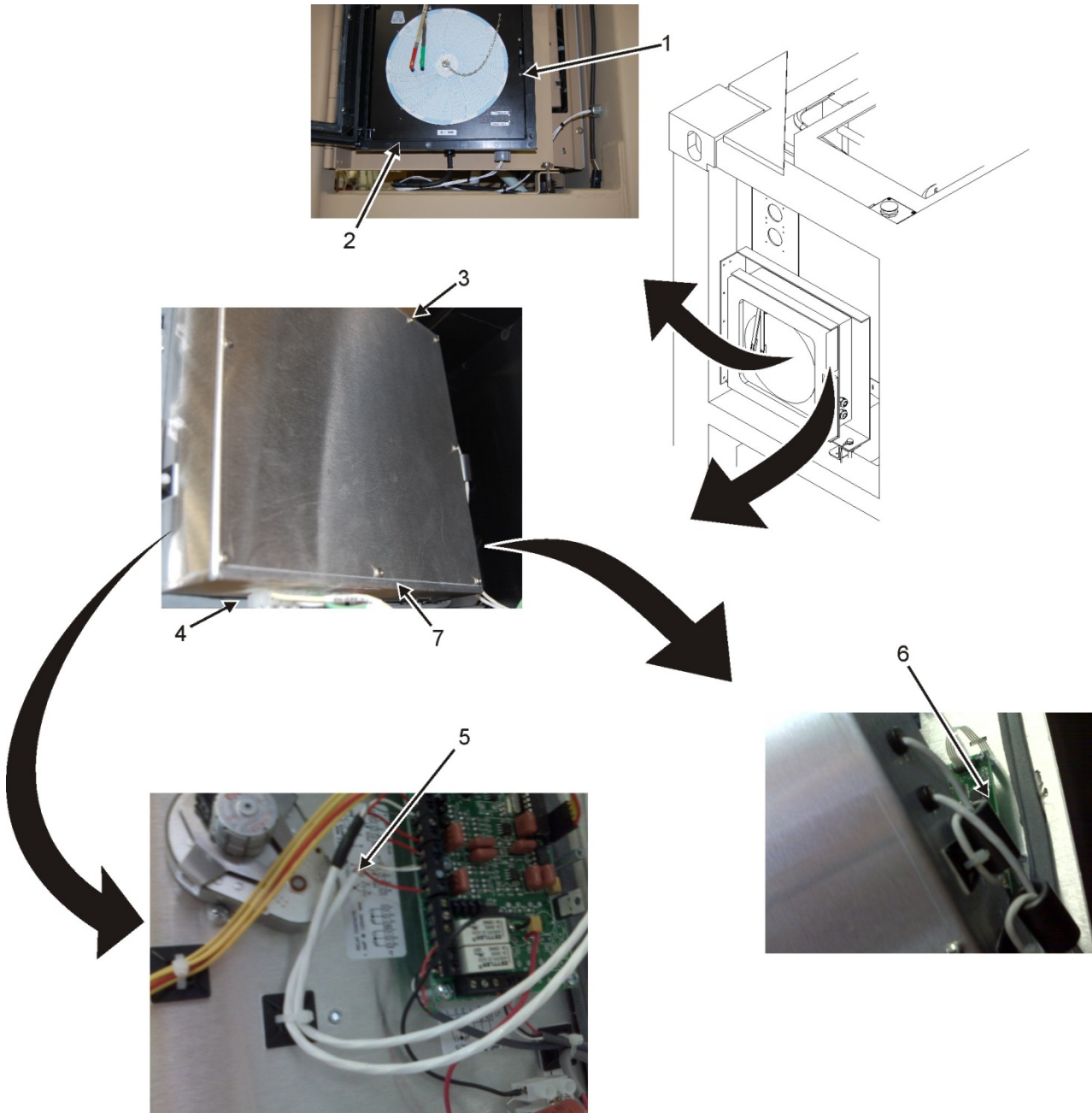


Figure 4. Wiring Disconnect.

REPLACE – CONTINUED

13. Remove ten screws (Figure 4, Item 3) securing rear cover (Figure 4, Item 7) to hinged front panel (Figure 4, Item 4) to gain access to wiring connections.

NOTE

The sensor wiring for the chart recorder is hard wired to the circuit board inside the chart recorder rear cover. There are two red wires connected to the circuit card. The polarity of these two red wires does not matter as long as they are reconnected in the same two connect points as disconnected from.

14. Tag and disconnect three wires (Figure 4, Item 5) of applicable sensor.
15. Cut tie wraps as needed and pull sensor cable out of hinged front panel side through wire anchor in hinged front panel.
16. Cut tie wraps as needed securing cable and ferrite noise suppressor (Figure 4, Item 6) to hinged front panel (Figure 4, Item 2).
17. Carefully pull cable through ferrite noise suppressor (Figure 5). Retain ferrite noise suppressor.

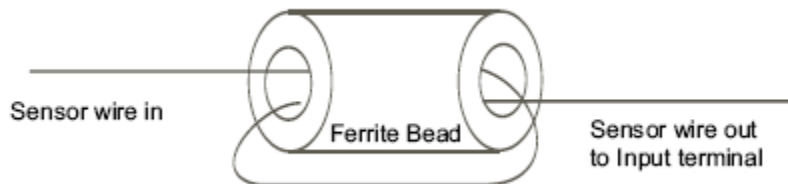


Figure 5. Ferrite Noise Suppressor.

18. Loosen feed through (Figure 6, Item 3) at bottom of temperature chart recorder (Figure 6, Item 1) and feed cable through until outside of temperature chart recorder.
19. Pull cable into container until free and remove sensor and cable (Figure 6, Item 2).

REPLACE – CONTINUED

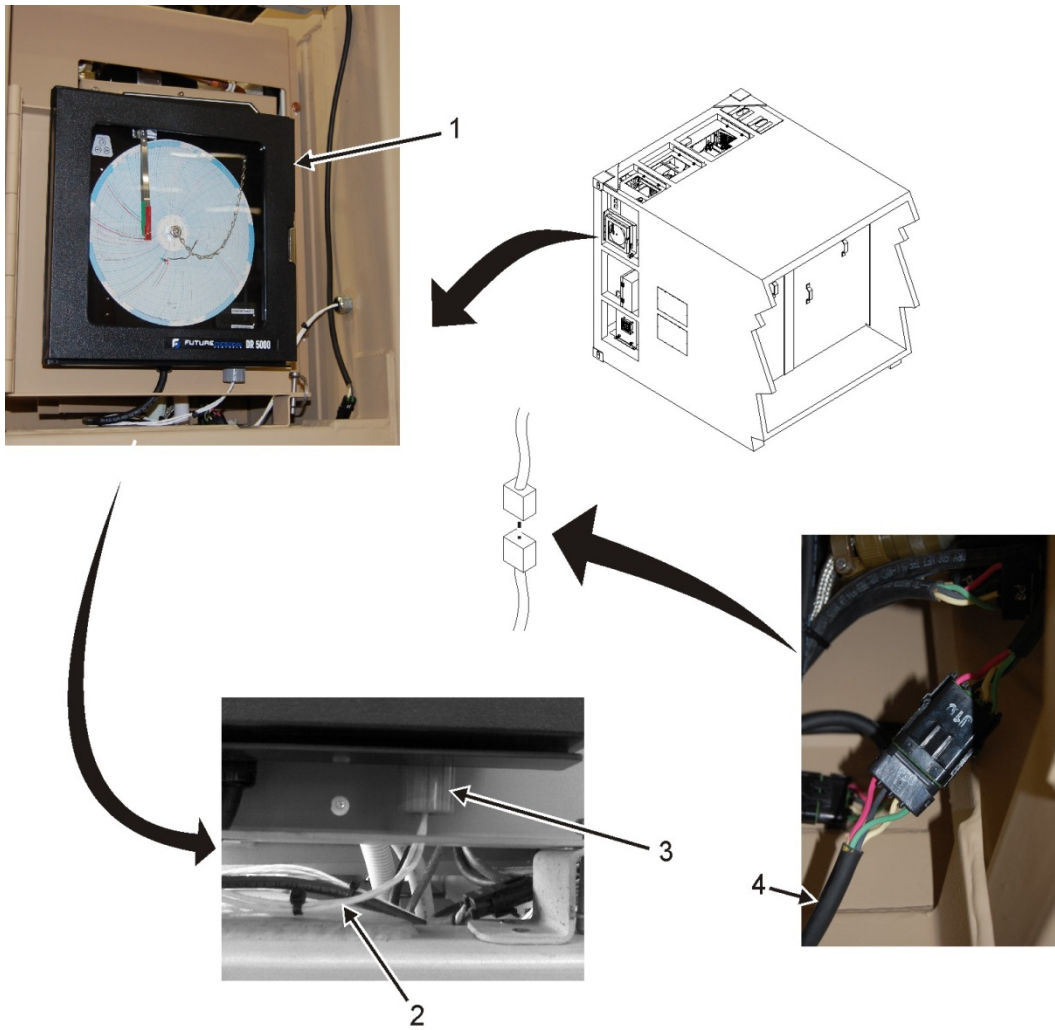


Figure 6. Cable Routing.

REPLACE – CONTINUED

20. Feed new sensor (Figure 7, Item 5) and cable through container feed through by pushing sensor end through container pass through from outside container wall to inside container wall (Figure 6, Item 5).

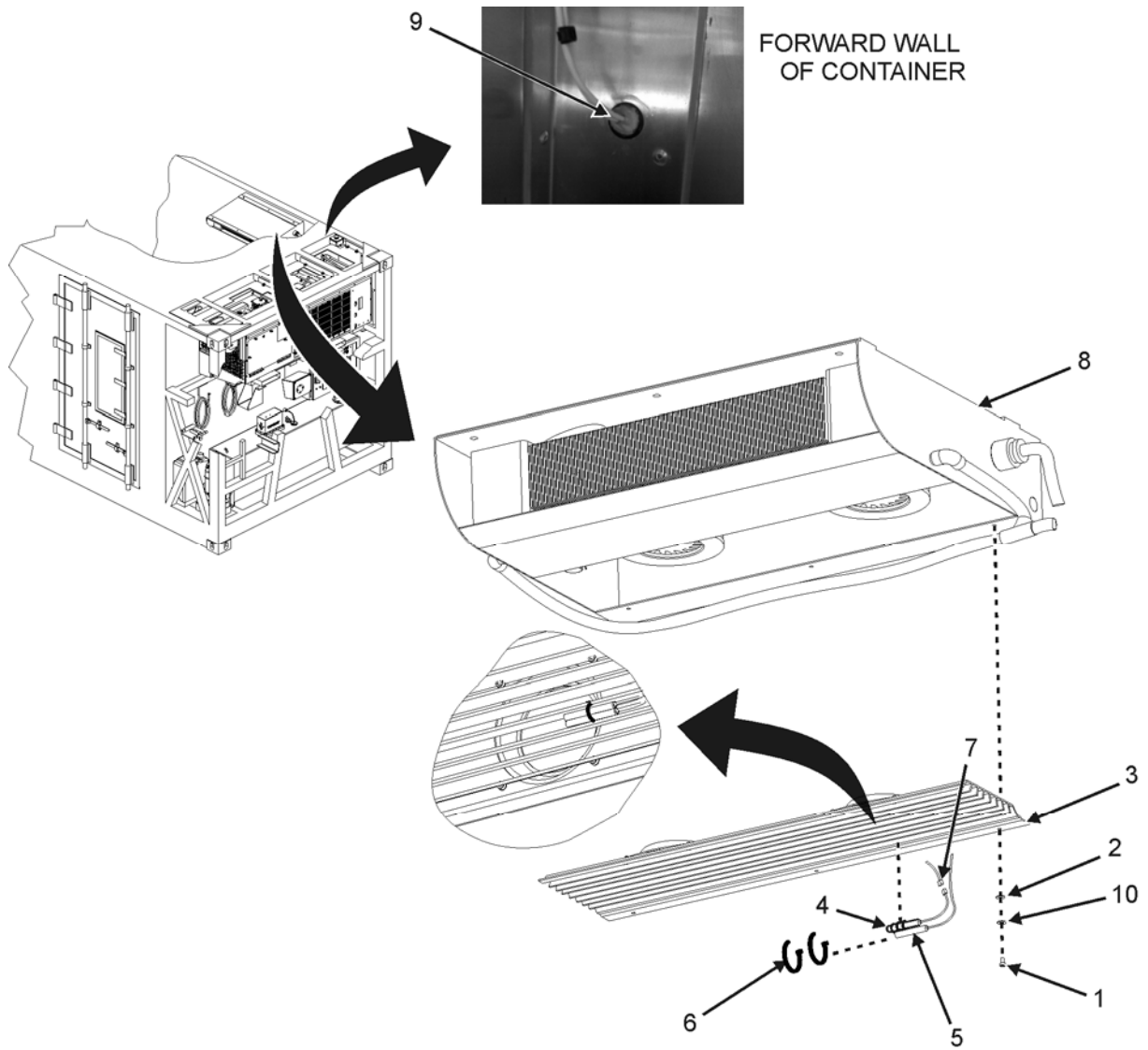


Figure 7. Evaporator Sensors.

REPLACE – CONTINUED

21. On inside of container, carefully pull sensor (Figure 7, Item 5) and cable through until enough is through to mount sensor on evaporator cover (Figure 7, Item 3).
22. Route sensor cable (Figure 7, Item 5) into evaporator (Figure 7, Item 8) through evaporator cutout on forward side of evaporator.
23. Carefully pull return air sensor (Figure 7, Item 4) and temperature chart recorder sensor (Figure 7, Item 5) through hole in cover (Figure 7, Item 3).
24. Mount return air sensor (Figure 7, Item 4) and temperature chart recorder sensor (Figure 7, Item 5) to cover and secure with two tie wraps (Figure 7, Item 6).
25. Install tie wraps (Figure 7, Item 6) as needed from mount location forward to where sensor cables pass through container wall while removing slack in cables as needed.
26. On outside of container, feed cable (Figure 6, Item 2) into bottom of temperature chart recorder (Figure 6, Item 1) through waterproof protector (Figure 6, Item 3).
27. Feed cable through ferrite noise suppressor (Figure 4, Item 6) as shown in illustration (Figure 5).
28. Feed cable through feed through in hinged front panel side (Figure 4, Item 4).
29. Reconnect applicable sensor wiring (Figure 4, Item 5) as tagged.
30. Install tie wraps as needed to secure wiring (Figure 4, Item 5) inside hinged front panel (Figure 4, Item 4).
31. Install strain reliefs to sensor wires.
32. Remove two alignment screws (Figure 8, Item 1) mounted to side of rear cover (Figure 8, Item 2) and install into opposite corners of chart recorder (Figure 8, Item 3).
33. Install rear cover (Figure 8, Item 2) to chart recorder (Figure 8, Item 3) and secure using 8 screws (Figure 8, Item 4). Remove two alignment screws (Figure 8, Item 1) and store on side of rear cover (Figure 8, Item 2) and install remaining 2 screws (Figure 8, Item 4).
34. Close hinged front panel (Figure 4, Item 2) and secure using two screws (Figure 4, Item 1).
35. Close chart recorder (Figure 6, Item 1) hinged front panel and secure using snap pin (Figure 6, Item 5).
36. Install tie wraps as needed to secure wiring (Figure 6, Item 2) between temperature chart recorder (Figure 6, Item 1) and container pass through.
37. Close evaporator cover (Figure 7, Item 3) and secure using two bolts (Figure 7, Item 1) and washers (Figure 7, Item 2).
38. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
39. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

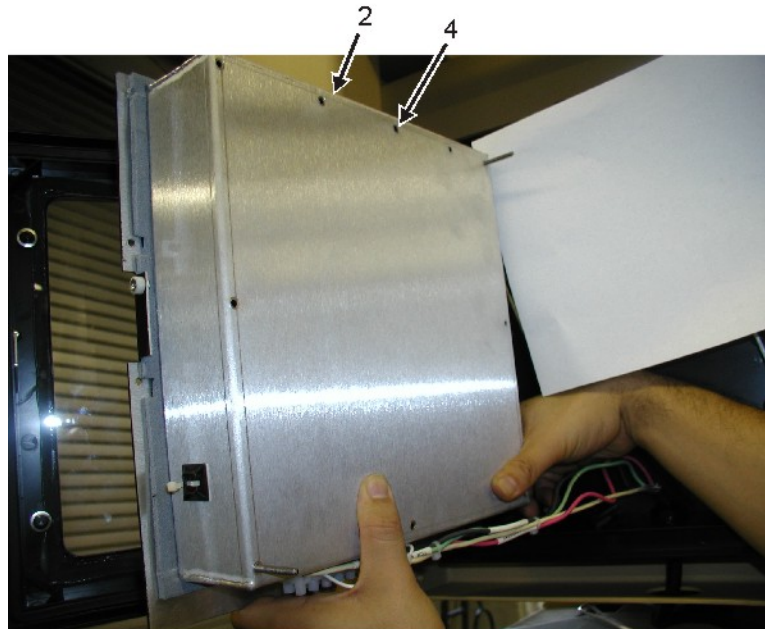
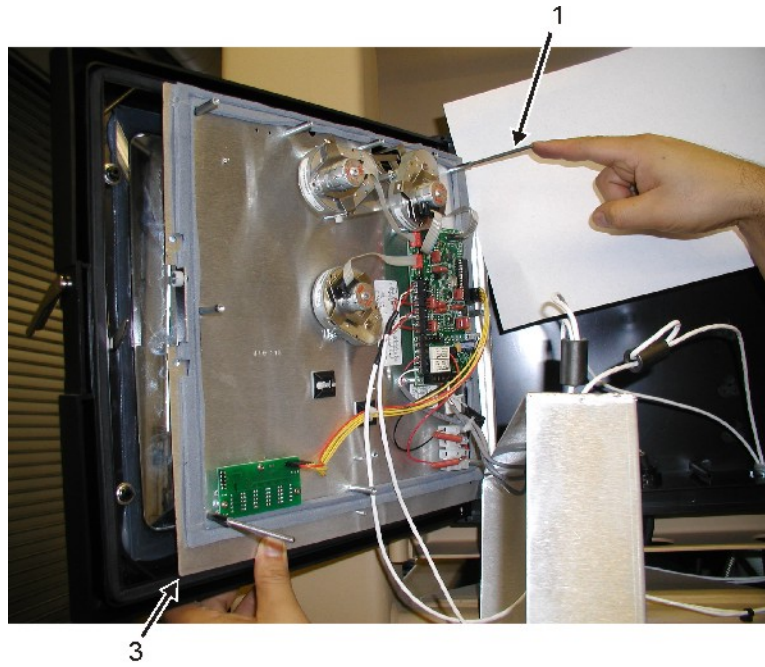


Figure 8. Chart Recorder Rear Cover.

REPLACE – CONTINUED**Defrost Thermistor Sensor (DTS)**

1. Remove two screws to allow the evaporator return air grill to swing down and remove, if necessary, to gain proper access to DTS.
2. Locate the defrost temperature sensor (Figure 9, Item 1) mounted on the evaporator coil mounting bracket toward the front of the evaporator.

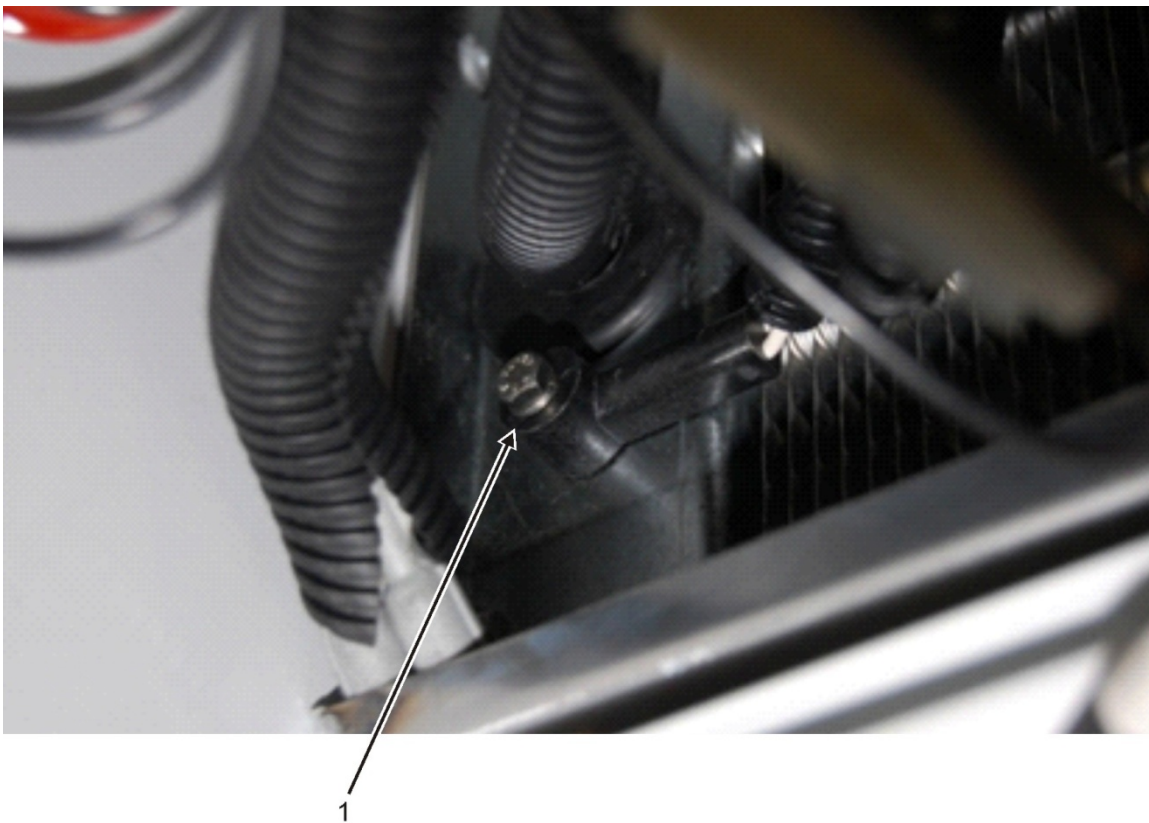


Figure 9. DTS Location.

REPLACE – CONTINUED

3. Cut wire ties at the large wire bundle and remove electrical tape at the main multi-wire bundle entering the side wall of the evaporator.
4. Remove bolt (Figure 10, Item 1) and washer (Figure 10, Item 2) mounting the sensor (Figure 10, Item 3) to the evaporator coil frame.

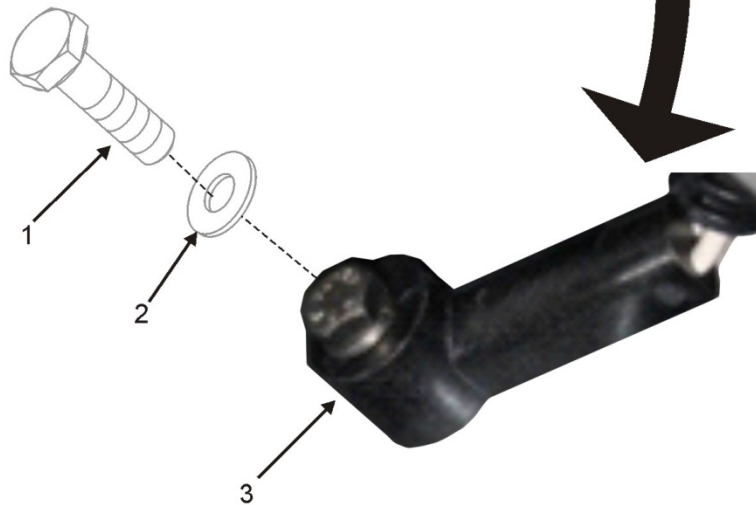


Figure 10. DTS Mounting Bolt.

REPLACE – CONTINUED

5. Cut the two wires (Figure 11, Item 1) at approximately 6 inches from the sensor.

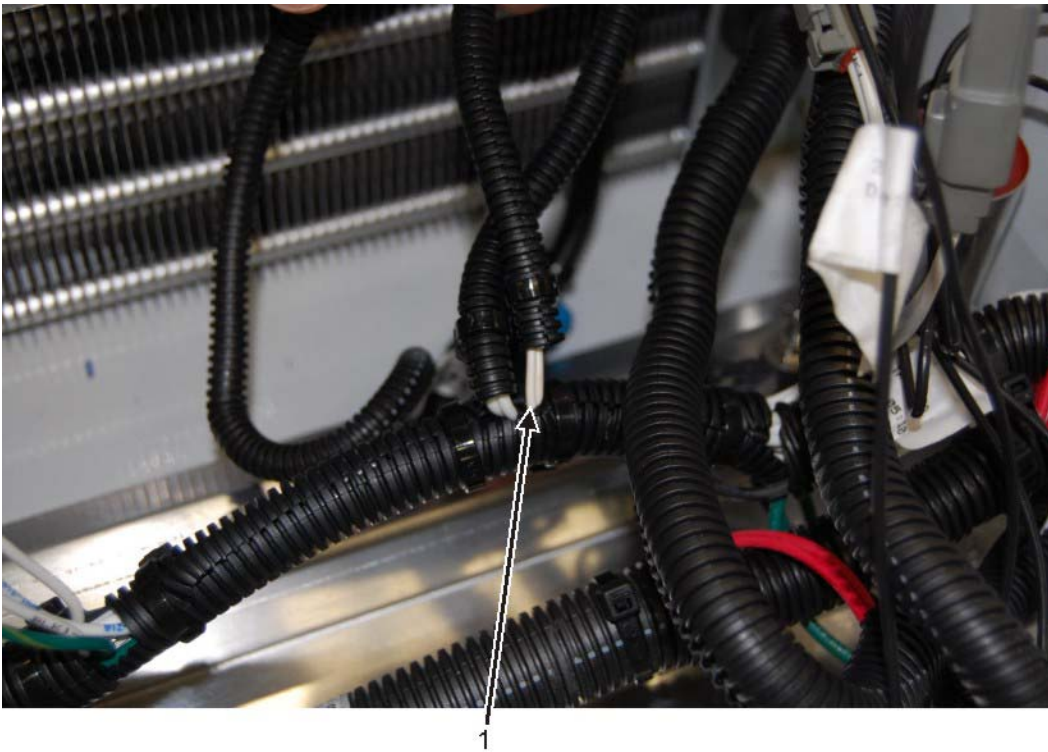


Figure 11. DTS Wire Splice.

6. Strip the cut wires to allow for proper installation of a butt splice.
7. Strip wires on new DTS back to allow for proper installation of a butt splice.
8. Butt splice the new DTS to the two cut white wires.
 - Note that either of the white wires on the new DTS can connect to either of the white wires on the existing white wires. There is no specific orientation.
9. Place the black protective loom back over the two new butt splices.
10. Fasten the new DTS sensor (Figure 10, Item 3) to the coil frame using the existing bolt (Figure 10, Item 1) and washer (Figure 10, Item 2).
11. Rebundle the wires and apply wire ties as required to properly secure components.
12. Hinge the grill cover back up and fasten two existing screws

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE**DRAIN HOSES
REPLACE**

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)
Face Shield (WP 0110, Item 20)
Gloves, Rubber (WP 0110, Item 21)
Pail, Utility (Plastic) (WP 0107, Item 35)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

REPLACE**Drain Hoses****WARNING**

The drain hose heaters operate from high voltage sources. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

NOTE

There are several individual drain hoses used between both evaporators to route condensate from evaporator drip pans to the container walls for outside drainage. This task can be used to replace any drain hose. Some hoses may be secured to the container using clamps and attaching hardware that will need to be removed as required to remove the drain hose.

2. Disconnect both sides of damaged drain hose (Figure 1, Item 1).
3. Remove screws (Figure 1, Item 2), lock washers (Figure 1, Item 3), washers (Figure 1, Item 4), and clamps (Figure 1, Item 5) securing drain hose (Figure 1, Item 1) as required. Discard lock washers.
4. Pull drain hose heater (Figure 1, Item 6) out of drain line.
5. Cut a single piece of clear hose to replace damaged piece.
6. Insert drain hose heater (Figure 1, Item 6) through new hose.

REPLACE – CONTINUED

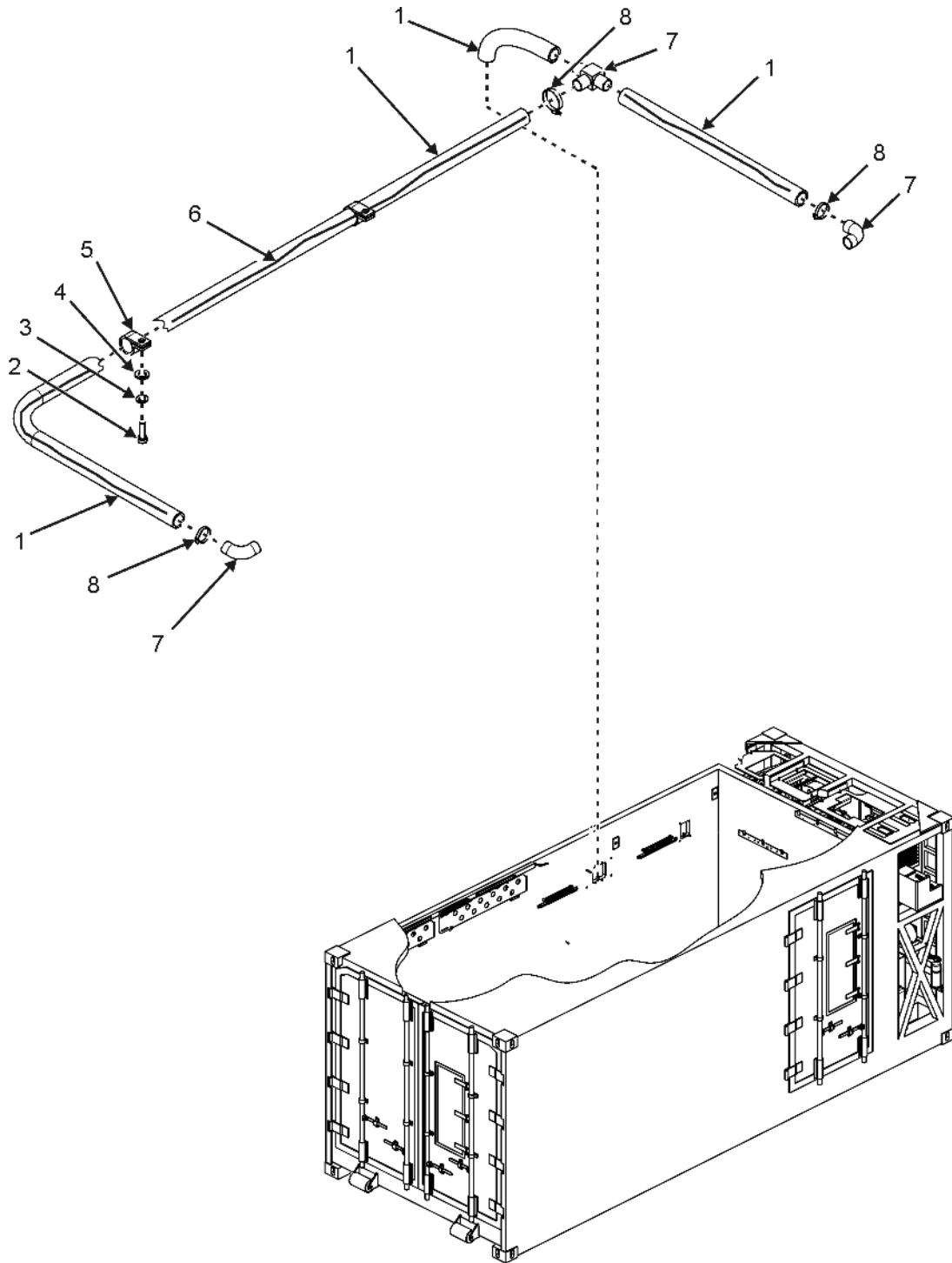


Figure 1. Drain Hoses.

REPLACE – CONTINUED

7. Connect both sides of new drain hose (Figure 1, Item 1) to connector fittings (Figure 1, Item 7) and secure with clamp (Figure 1, Item 8).
8. If removed, reinstall clamps (Figure 1, Item 5) and secure using screws (Figure 1, Item 2), new lock washers (Figure 1, Item 3), and washers (Figure 1, Item 4).
9. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Breather Elements**NOTE**

Due to the size of the nut securing the breather element, it may be helpful to use a spanner wrench when loosening or tightening the nut.

1. Loosen nut and remove (Figure 2, Item 9) from breather (Figure 2, Item 10).
2. Remove six screws (Figure 2, Item 11), lock washers (Figure 2, Item 12), and washers (Figure 2, Item 13) securing breather cover (Figure 2, Item 14) to wall. Discard lock washers.
3. Remove cover (Figure 2, Item 14) and seals (Figure 2, Item 16) from wall.
4. Remove nut (Figure 2, Item 15) and washer (Figure 2, Item 17) from back side of breather (Figure 2, Item 10).
5. Remove breather (Figure 2, Item 10).
6. Install new breather (Figure 2, Item 10) into cover (Figure 2, Item 14) and hand tighten nut (Figure 2, Item 15) and washer (Figure 2, Item 17).
7. Install breather cover (Figure 2, Item 14) to wall and secure using eight screws (Figure 2, Item 11), new lock washers (Figure 2, Item 12), and washers (Figure 2, Item 13).
8. Install nut (Figure 2, Item 9) and seals (Figure 2, Item 16) on breather (Figure 2, Item 10) and tighten.
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures)

REPLACE – CONTINUED

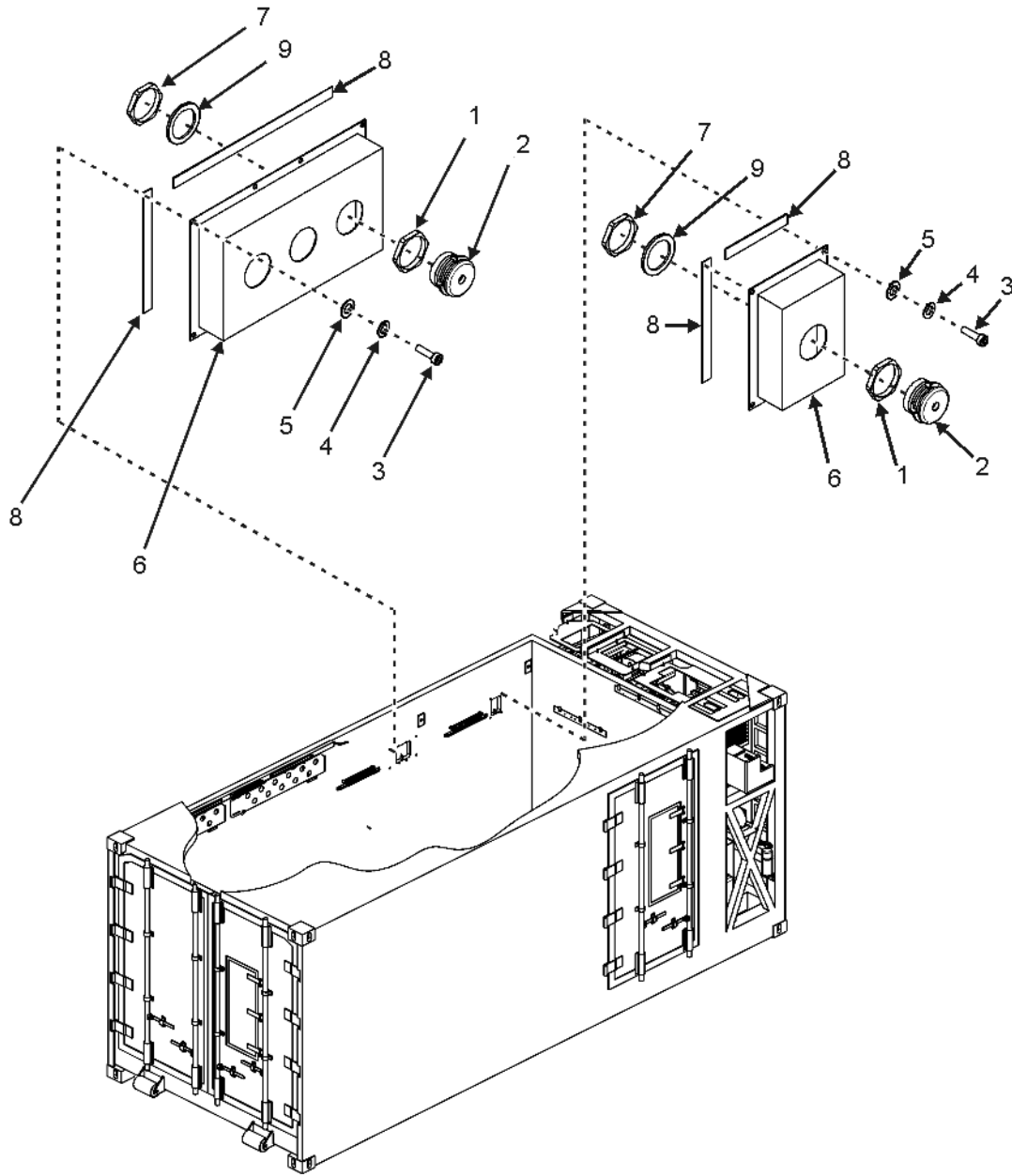


Figure 2. Breather.

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
**LIGHTING
REPLACE**

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)
 Electrical Connector Maintenance Kit
 (WP 0107, Table 2, Item 3)

References

WP 0005
 WP 0070

Personnel Required

Quartermaster and Chemical Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
 Battery disconnected (WP 0070)
 Insulated container doors open and secure (WP 0005)

REPLACE**Remove Wall Mounted Light Strip Lamp Assemblies**

1. Open control panel access door (Figure 1, Item 1).
2. Place POWER ON/DOWN switch (Figure 1, Item 2) on control panel to DOWN position.
3. Remove protective covering from applicable red light strip lamp assembly (Figure 1, Item 3) wiring (Figure 3, Item 12) as needed to gain access to splice points. Retain for reinstallation.
4. Tag and cut wiring (Figure 3, Item 12) for red light strip lamp assembly (Figure 1, Item 3) at two splice points (Figure 1, Item 4).
5. Remove two screws (Figure 1, Item 5) and threaded standoffs (Figure 1, Item 6) securing red light strip lamp assembly (Figure 1, Item 3) to container wall.
6. Remove red light strip lamp assembly (Figure 1, Item 3).
7. Disconnect white light strip lamp assembly (Figure 1, Item 7) electrical connector (Figure 1, Item 8) from electrical connector (Figure 1, Item 9).
8. Remove two screws (Figure 1, Item 10) and lock washers (Figure 1, Item 11) securing white light strip lamp assembly (Figure 1, Item 7) to container wall. Discard lock washers.
9. Remove white light strip lamp assembly (Figure 1, Item 7).

REPLACE – CONTINUED

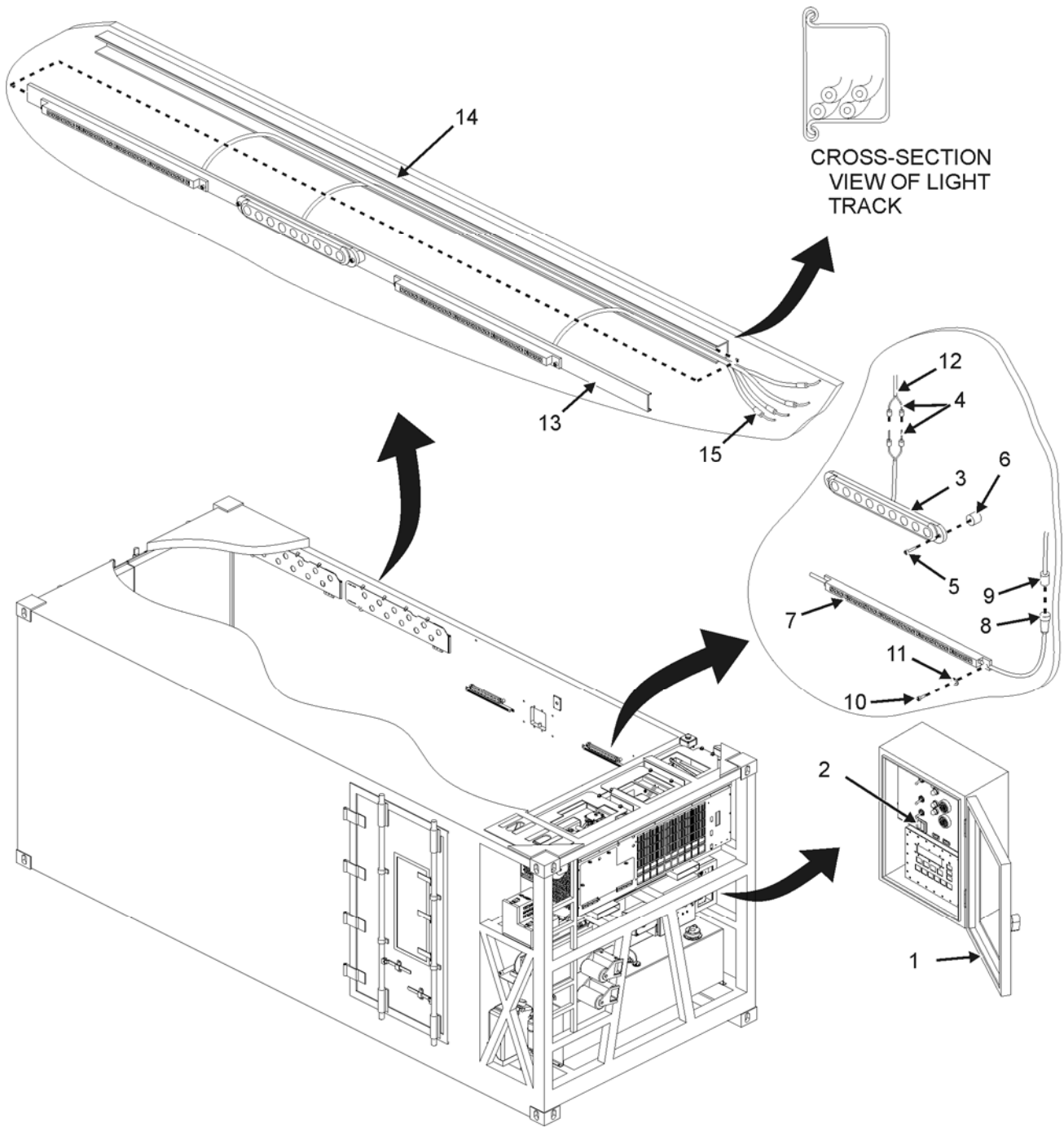


Figure 1. Light Strip Replace.

REPLACE – CONTINUED**Install Wall Mounted Light Strip Lamp Assemblies**

1. Install new white light lamp assembly (Figure 1, Item 7) onto container wall and secure using two screws (Figure 1, Item 10) and new lock washers (Figure 1, Item 11).
2. Connect power source electrical connector (Figure 1, Item 9) to white light strip lamp assembly (Figure 1, Item 7) electrical connector (Figure 1, Item 8).
3. Install new red light lamp assembly (Figure 1, Item 3) onto container wall and secure using two screws (Figure 1, Item 5) and threaded standoffs (Figure 1, Item 6).
4. Prepare existing wiring and wiring on new red light strip lamp assembly (Figure 1, Item 3) for splicing.
5. Reconnect wiring (Figure 3, Item 12) by installing two splices onto wiring on new red light strip lamp assembly (Figure 1, Item 3) and container wiring at splice points (Figure 1, Item 4) as tagged, and remove tags.
6. Reinstall protective covering over applicable red light strip lamp assembly (Figure 1, Item 3).
7. Reconnect battery (WP 0070, Reconnect).
8. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Remove Multi-light Assembly**NOTE**

Once the cover of the multi-light assembly is removed, the cover and wiring for lights will hang freely. The entire cover, with lights and associated wiring attached, will be removed and replaced as a part of this procedure.

The cover can be easily removed by pinching the base in and pulling the cover off in a repeated motion for the entire length of the cover.

1. Pry multi-light assembly cover (Figure 1, Item 13) off by starting at one end and working cover off towards opposite end, and allow assembly to hang freely.
2. Tag and cut wiring for multi-light assembly (Figure 1, Item 14) at four splice points (Figure 1, Item 15) at evaporator end of assembly and remove multi-light assembly (Figure 1, Item 14).

Install Multi-Light Assembly

1. Prepare existing wiring and wiring on new multi-light assembly (Figure 1, Item 14) for splicing.
2. Reconnect wiring by installing four splices onto wiring on new multi-light assembly (Figure 1, Item 14) and container wiring at splice points (Figure 1, Item 15) as tagged, and remove tags.

NOTE

When installing the cover over the track base, it is important to make sure that all wiring is tucked inside of track so it is not pinched.

3. Install multi-light assembly cover (Figure 1, Item 13) by starting at one end and working cover on towards opposite end.

REPLACE – CONTINUED**Remove Multi-Light Assembly White LED Light Strip LT3.****NOTE**

Once the cover of the multi-light assembly is removed, the cover and wiring for lights will hang freely.

The cover can be easily removed by pinching the base in and pulling the cover off in a repeated motion for the entire length of the cover.

1. Remove two end caps (Figure 2, Item 1 and Item 2) from both ends of multi-light assembly channel (Figure 2, Item 3).
2. Slide end cap (Figure 2, Item 1) and grommet (Figure 2, Item 4) up along wire harness (Figure 2, Item 5).
3. Pry multi-light assembly cover (Figure 2, Item 6) off by starting at one end and working cover off towards opposite end, and allow assembly to hang freely.

NOTE

When cutting splices, always cut wires as close to the splice as possible in order to leave as much wire left as possible for re-splicing.

4. Remove tie wraps as needed to gain access to light strip splice points.
5. On forward end of white LED light strip LT3 (Figure 2, Item 7), tag and then cut one red wire from one brown wire directly behind splice (Figure 2, Item 8). Discard splice.
6. Tag and then cut one black wire from one blue wire directly behind splice (Figure 2, Item 8). Discard splice.
7. On aft end of white LED light strip LT3 (Figure 2, Item 7), tag and then cut one blue wire from one white wire directly behind splice (Figure 2, Item 9). Discard splice.
8. Tag and then cut one brown wire from one white wire directly behind splice (Figure 2, Item 9). Discard splice.
9. Remove two screws (Figure 2, Item 11), lock washers (Figure 2, Item 12), and washers (Figure 2, Item 13) securing white LED light strip LT3 (Figure 2, Item 7) to multi-light assembly cover (Figure 2, Item 6).
10. Pull wires through cutout in multi-light assembly cover (Figure 2, Item 6) and remove white LED light strip LT3 (Figure 2, Item 7) from multi-light assembly cover (Figure 2, Item 6).

REPLACE – CONTINUED

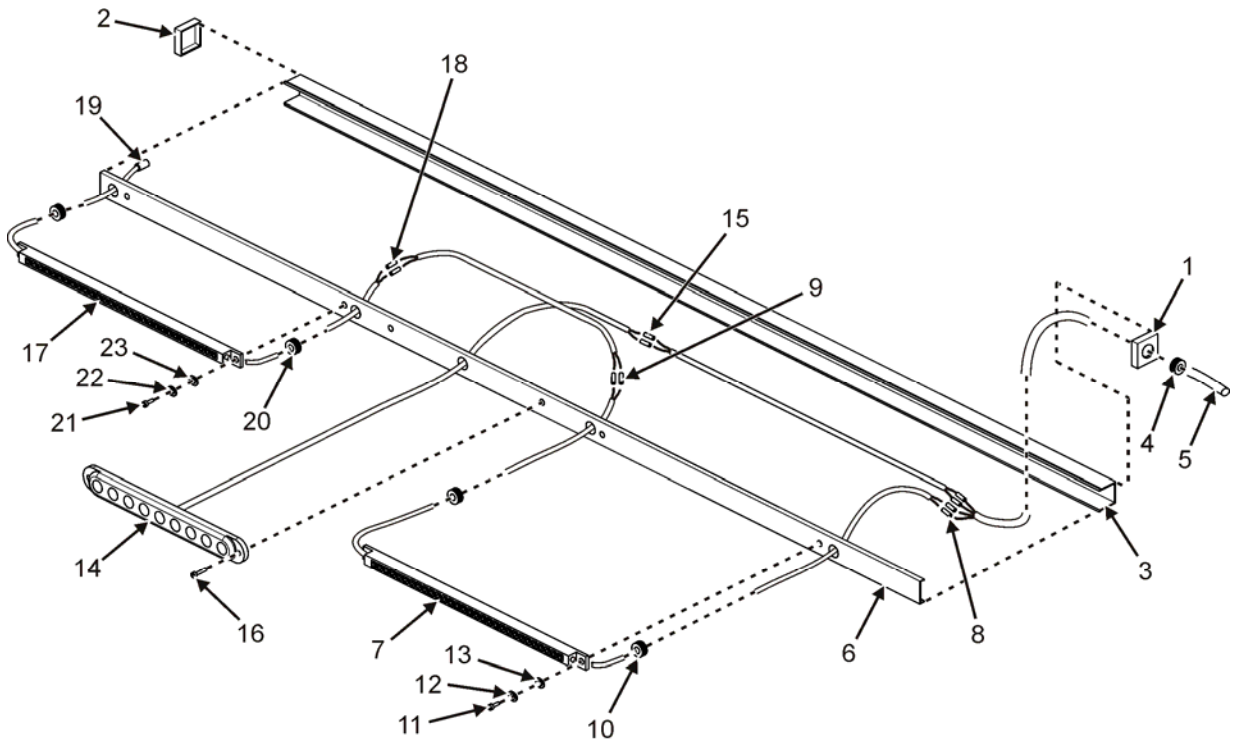


Figure 2. Removal of White LT3 Light Strip.

REPLACE – CONTINUED**Install Multi-Light Assembly White LED Light Strip LT3.****NOTE**

Replacement white LED light strips will come with connectors attached on each end. It will be necessary to cut the connectors off of the replacement light strip. Once the connectors are cut off, the white insulation protecting the two individual wires on each end will need to be stripped back approximately 2-inches in order to prepare the individual wires for splicing.

1. On replacement white LED light strip LT3 (Figure 3, Item 7), cut electrical connectors off of each end of light strip leaving approximately 6-inches of wire on each end of light strip.
2. Trim white insulation back approximately 3-inches to expose two individual light strip wires on each end where cut.
3. Prepare existing container wiring and wiring on replacement LED light strip LT3 (Figure 3, Item 7) for splicing.
4. Route wires through cutout in multi-light assembly cover (Figure 3, Item 6) and secure white LED light strip LT3 (Figure 3, Item 7) to multi-light assembly cover (Figure 3, Item 6) using two screws (Figure 3, Item 11), lock washers (Figure 3, Item 12), and washers (Figure 3, Item 13).
5. On aft end of white LED light strip LT3 (Figure 3, Item 7), connect one brown wire to one white wire as tagged using splice (Figure 3, Item 9). Remove tags.
6. Connect one blue wire to one white wire as tagged using splice (Figure 3, Item 9). Remove tags.
7. On forward end of white LED light strip LT3 (Figure 3, Item 7), connect one blue wire to one black wire as tagged using splice (Figure 3, Item 8).
8. Connect one brown wire to one red wire as tagged using splice (Figure 3, Item 8).
9. Install tie wraps as needed to secure light strip wiring.

NOTE

When installing the cover over the track base, it is important to make sure that all wiring is tucked inside of track so it is not pinched.

10. Install multi-light assembly cover (Figure 3, Item 6) by starting at one end and working cover on towards opposite end.

REPLACE – CONTINUED

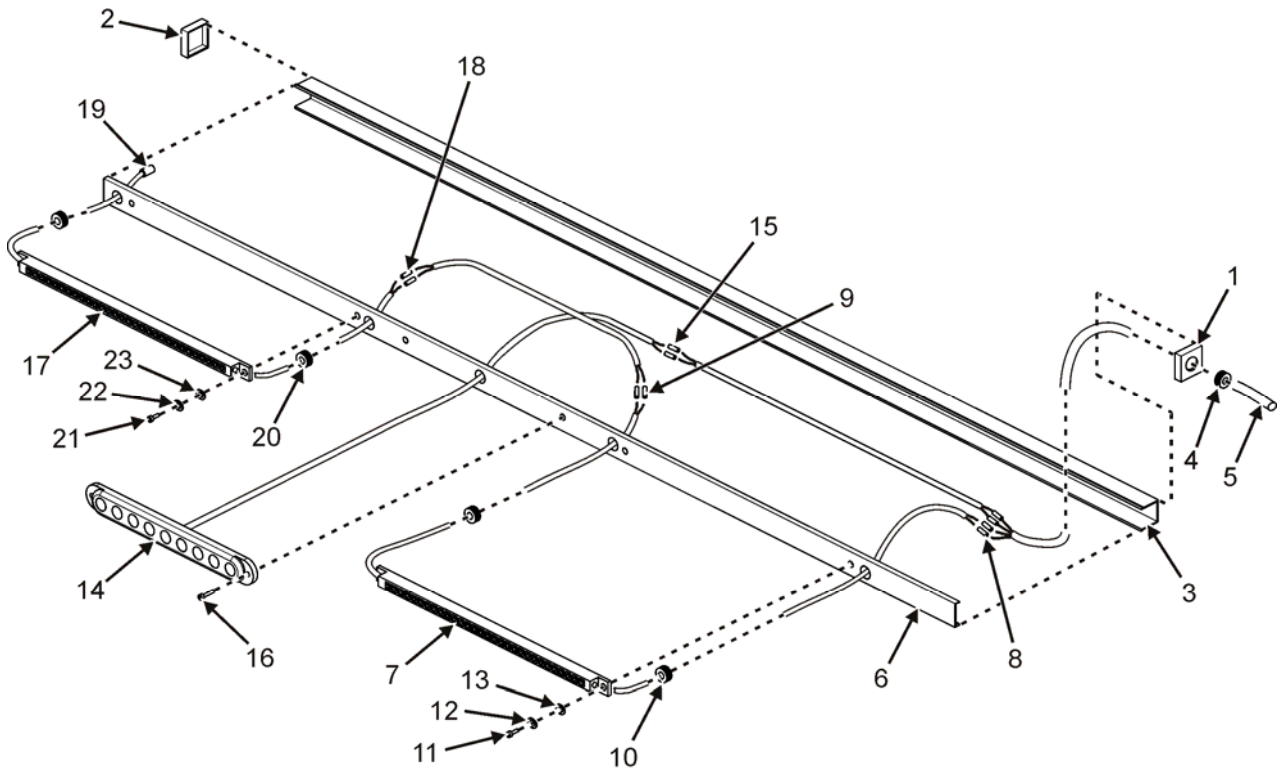


Figure 3. Installation of White LT3 Light Strip.

11. Install two end caps (Figure 3, Item 1 and Item 2) over both ends of multi-light assembly channel (Figure 3, Item 3).
12. Press grommet (Figure 3, Item 4) in place in end cap (Figure 3, Item 1) and over wires (Figure 3, Item 5).

Remove Multi-Light Assembly Red LED Light Strip BLT3.

NOTE

Once the cover of the multi-light assembly is removed, the cover and wiring for lights will hang freely.

The cover can be easily removed by pinching the base in and pulling the cover off in a repeated motion for the entire length of the cover.

1. Remove two end caps (Figure 4, Item 1 and Item 2) from both ends of multi-light assembly channel (Figure 4, Item 3).
2. Slide end cap (Figure 4, Item 1) and grommet (Figure 4, Item 4) up along wire harness (Figure 4, Item 5).

REPLACE – CONTINUED

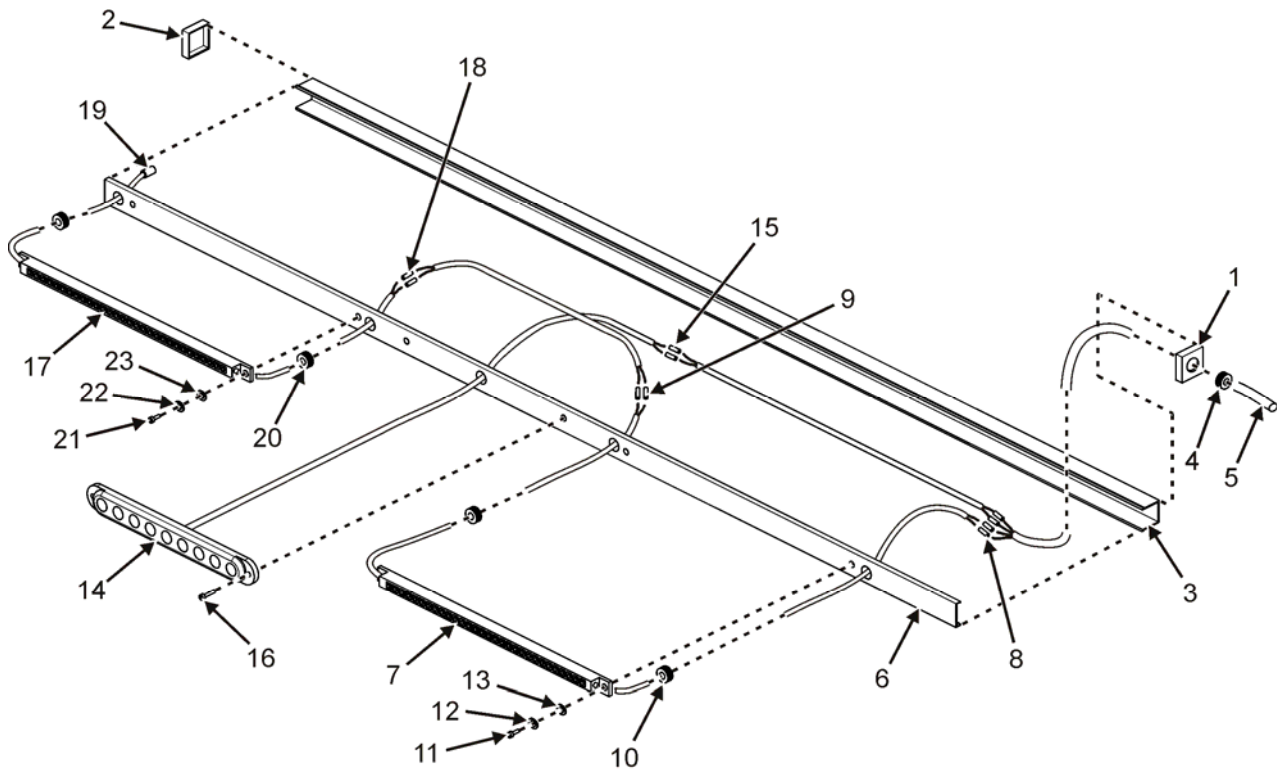


Figure 4. Removal of Red BLT3 Light Strip.

3. Pry multi-light assembly cover (Figure 4, Item 6) off by starting at one end and working cover off towards opposite end, and allow assembly to hang freely.

NOTE

When cutting splices, always cut wires as close to the splice as possible in order to leave as much wire left as possible for re-splicing.

4. Remove tie wraps as needed to gain access to light strip splice points.
5. On red LED light strip BLT3 (Figure 4, Item 14), tag and then cut one white wire from one green wire directly behind splice (Figure 4, Item 15). Discard splice.
6. Tag and then cut one white wire from one white wire directly behind splice (Figure 4, Item 15). Discard splice.
7. Remove two screws (Figure 4, Item 11) securing red LED light strip BLT3 (Figure 4, Item 14) to multi-light assembly cover (Figure 4, Item 6).
8. Pull wires through cutout in multi-light assembly cover (Figure 4, Item 6) and remove red LED light strip BLT3 (Figure 4, Item 14) from multi-light assembly cover (Figure 4, Item 6).

REPLACE – CONTINUED**Install Multi-Light Assembly Red LED Light Strip BLT3.**

1. On replacement red LED light strip BLT3 (Figure 5, Item 14), cut wires leaving approximately 6-inches of wire on end of light strip.
2. Prepare existing container wiring and wiring on replacement LED light strip BLT3 (Figure 5, Item 14) for splicing.
3. Route wires through cutout in multi-light assembly cover (Figure 5, Item 6) and secure red LED light strip BLT3 (Figure 5, Item 14) to multi-light assembly cover (Figure 5, Item 6) using two screws (Figure 5, Item 16).
4. On replacement red LED light strip BLT3 (Figure 5, Item 14), connect one white wire to one white wire as tagged using splice (Figure 5, Item 15). Remove tags.
5. Connect one green wire to one white wire as tagged using splice (Figure 5, Item 15). Remove tags.
6. Install tie wraps as needed to secure light strip wiring.

NOTE

When installing the cover over the track base, it is important to make sure that all wiring is tucked inside of track so it is not pinched.

7. Install multi-light assembly cover (Figure 5, Item 6) by starting at one end and working cover on towards opposite end.
8. Install two end caps (Figure 5, Item 1 and Item 2) over both ends of multi-light assembly channel (Figure 5, Item 3).
9. Press grommet (Figure 5, Item 4) in place in end cap (Figure 5, Item 1) and over wires (Figure 5, Item 5).

REPLACE – CONTINUED

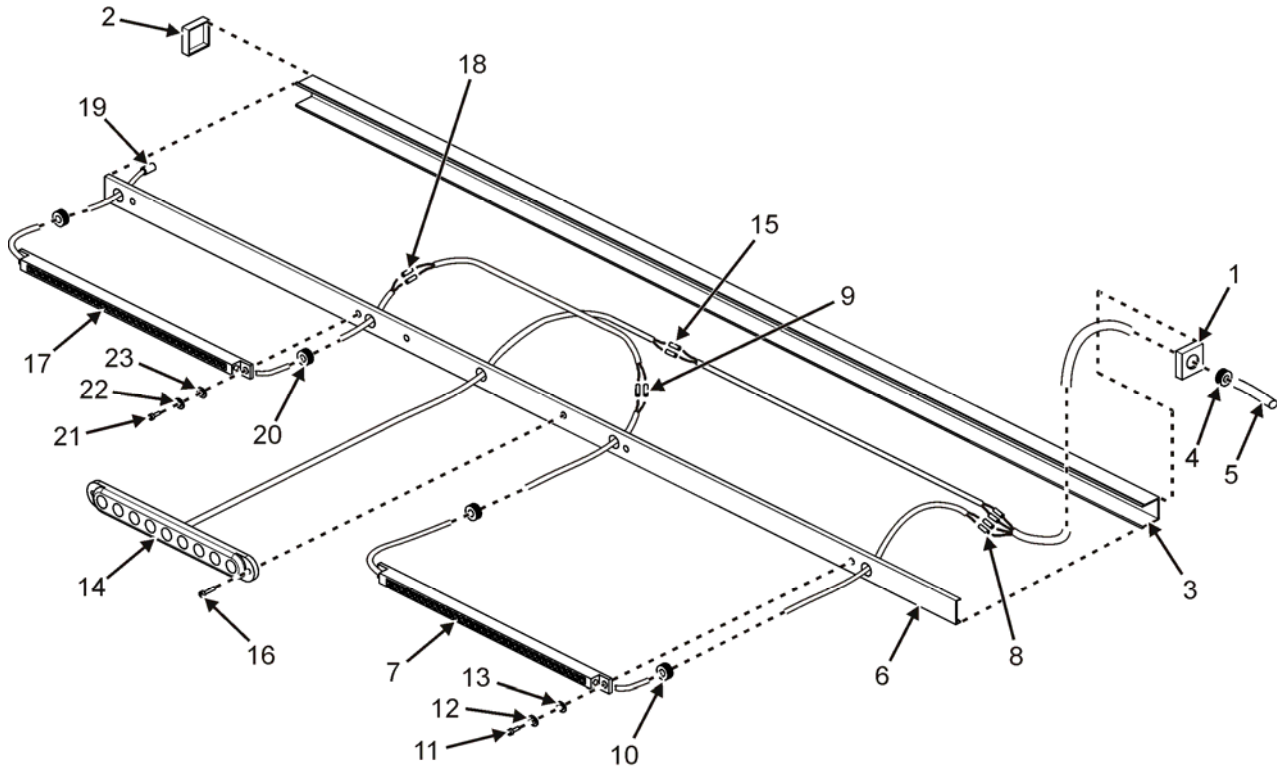


Figure 5. Installation of Red BLT3 Light Strip.

Remove Multi-Light Assembly White LED Light Strip LT4.

NOTE

Once the cover of the multi-light assembly is removed, the cover and wiring for lights will hang freely.

The cover can be easily removed by pinching the base in and pulling the cover off in a repeated motion for the entire length of the cover.

1. Remove two end caps (Figure 6, Item 1 and Item 2) from both ends of multi-light assembly channel (Figure 6, Item 3).
2. Slide end cap (Figure 6, Item 1) and grommet (Figure 6, Item 4) up along wire harness (Figure 6, Item 5).
3. Pry multi-light assembly cover (Figure 6, Item 6) off by starting at one end and working cover off towards opposite end; allow assembly to hang freely.

REPLACE – CONTINUED

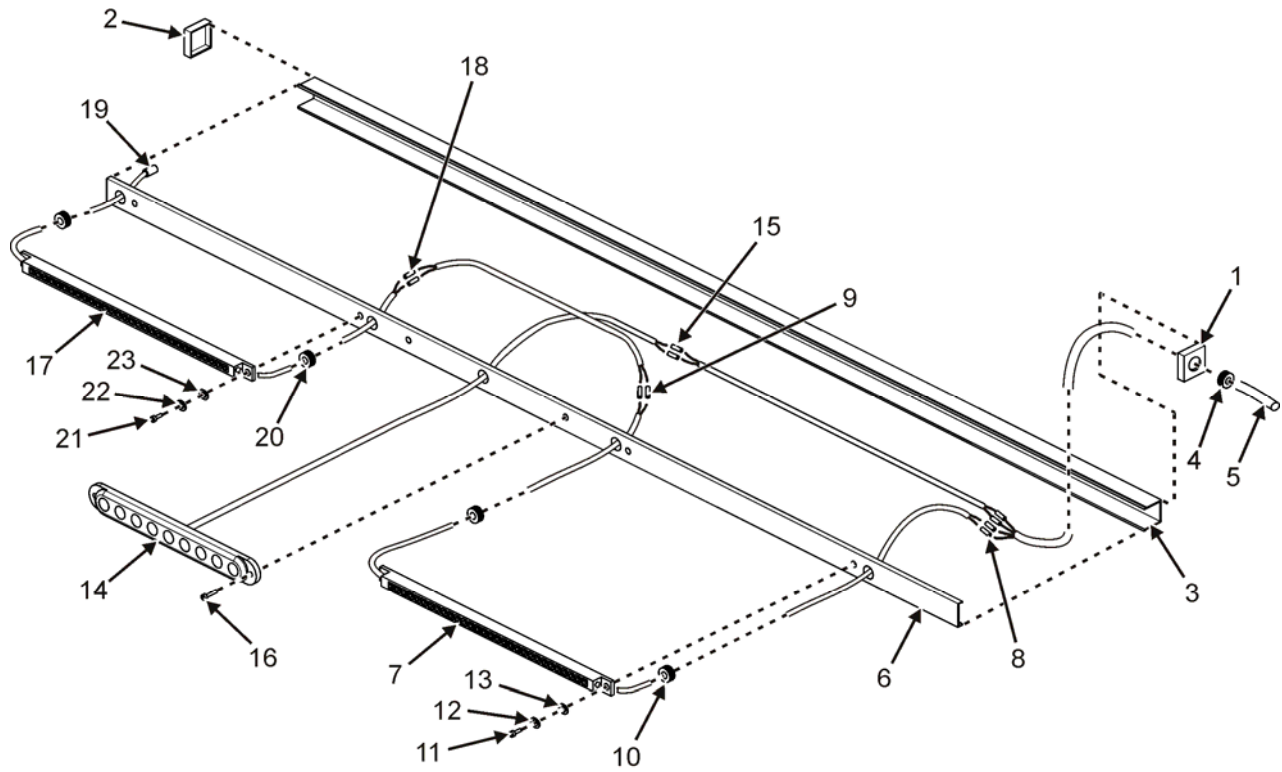


Figure 6. Removal of White LT4 Light Strip.

NOTE

When cutting splices, always cut wires as close to the splice as possible in order to leave as much wire left as possible for re-splicing.

4. Remove tie wraps as needed to gain access to light strip splice points.
5. On forward end of white LED light strip LT4 (Figure 6, Item 17), tag and then cut one blue wire from one white wire directly behind splice (Figure 6, Item 18). Discard splice.
6. Tag and then cut one brown wire from one white wire directly behind splice (Figure 6, Item 18). Discard splice.
7. On aft end of white LED light strip LT4 (Figure 6, Item 17), cut insulation sleeve and splice (Figure 6, Item 19) from wire. Discard splice.
8. Pull two grommets (Figure 6, Item 20) out of multi-light assembly cover (Figure 6, Item 6) and slide up light strip harness.
9. Remove two screws (Figure 6, Item 21), lock washers (Figure 6, Item 22), and washers (Figure 6, Item 23) securing white LED light strip LT4 (Figure 6, Item 17) to multi-light assembly cover (Figure 6, Item 6).
10. Pull wires through cutout in multi-light assembly cover (Figure 6, Item 6) and remove white LED light strip LT4 (Figure 6, Item 17) from multi-light assembly cover (Figure 6, Item 6).

REPLACE – CONTINUED**Install Multi-Light Assembly White LED Light Strip LT4.****NOTE**

Replacement white LED light strips will come with connectors attached on each end. It will be necessary to cut the connectors off of the replacement light strip. Once the connectors are cut off, the white insulation protecting the two individual wires on each end will need to be stripped back approximately 2-inches in order to prepare the individual wires for splicing.

1. On replacement white LED light strip LT4 (Figure 7, Item 17), cut electrical connectors off of each end of light strip leaving approximately 6-inches of wire on each end of light strip.
2. On forward side of white LED light strip LT4 (Figure 7, Item 17), trim white insulation back approximately 3-inches to expose two individual light strip wires where cut.
3. Prepare existing container wiring and wiring on forward end of replacement white LED light strip LT4 (Figure 7, Item 17) for splicing.
4. Route wires through cutout in multi-light assembly cover (Figure 7, Item 6) and secure white LED light strip LT4 (Figure 7, Item 17) to multi-light assembly cover (Figure 7, Item 6) using two screws (Figure 7, Item 21), lock washers (Figure 7, Item 22), and washers (Figure 7, Item 23).

NOTE

The aft end of the white LED light strip LT4 will be dead-ended. This can be done using approximately 1 1/2-inches of heat shrink insulation sleeve over the end of the harness with approximately half on the harness and half extending past the harness ending.

5. On aft end of white LED light strip LT4 (Figure 7, Item 7), install approximately 1 1/2-inches of insulation sleeve (Figure 7, Item 19) over cut harness and heat shrink in place using heat gun.
6. On forward end of white LED light strip LT4 (Figure 7, Item 17), connect one blue wire to one white wire as tagged using splice (Figure 7, Item 18).
7. Connect one brown wire to one white wire as tagged using splice (Figure 7, Item 18).
8. Install tie wraps as needed to secure light strip wiring.

NOTE

When installing the cover over the track base, it is important to make sure that all wiring is tucked inside of track so it is not pinched.

9. Install multi-light assembly cover (Figure 7, Item 6) by starting at one end and working cover on towards opposite end.
10. Install two end caps (Figure 7, Item 1 and Item 2) over both ends of multi-light assembly channel (Figure 7, Item 6).
11. Press grommet (Figure 7, Item 4) in place in end cap (Figure 7, Item 1) and over wires (Figure 7, Item 5).

REPLACE – CONTINUED

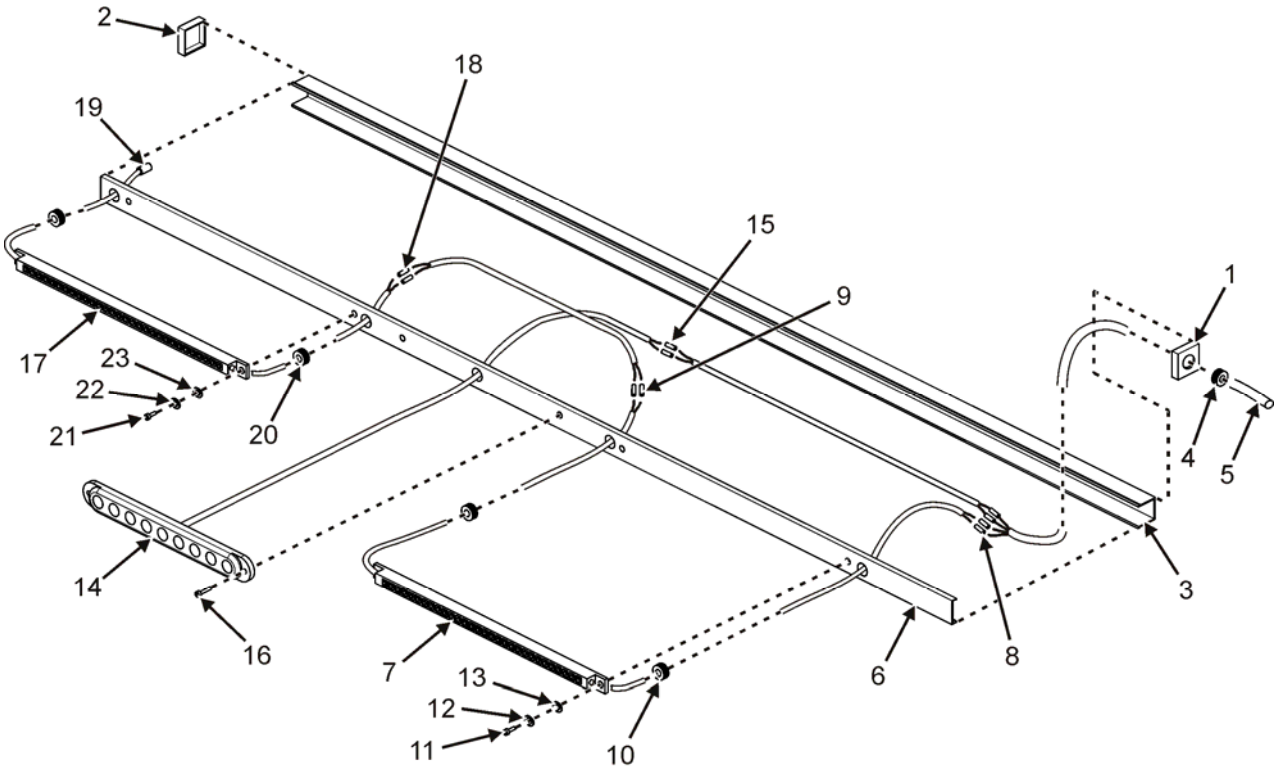


Figure 7. Installation of White LT4 Light Strip.

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
POWER CABLE ASSEMBLIES
TEST, REPLACE

INITIAL SETUP:**Tools and Special Tools**

Electrical Connector Kit (WP 0107, Table 2, Item 3)
General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Materials/Parts

Lock Washer, $\frac{3}{8}$ -in ID (WP 0111, Item 13)
Tie Wrap (WP 0110, Item 55)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
WP 0070
WP 0102
WP 0103
TM 10-8145-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Battery disconnected (WP 0070)
External power cables disconnected (WP 0005)

TEST

The power box has two (2) fifty-foot attaching power supply cables and two six-foot pigtailed with connectors that can be connected to four different electrical input voltages. When using an external power source, the rotary cam action switches must be set to correspond to incoming electric voltage.

WARNING

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

NOTE

Refer to the MTRCS electrical schematic (WP 0103) for additional information regarding the wiring of the unit.

TEST – CONTINUED

Test Cable Assembly P1A

1. Make sure external electrical power unit is turned OFF.
2. Open power box door (Figure 1, Item 1).

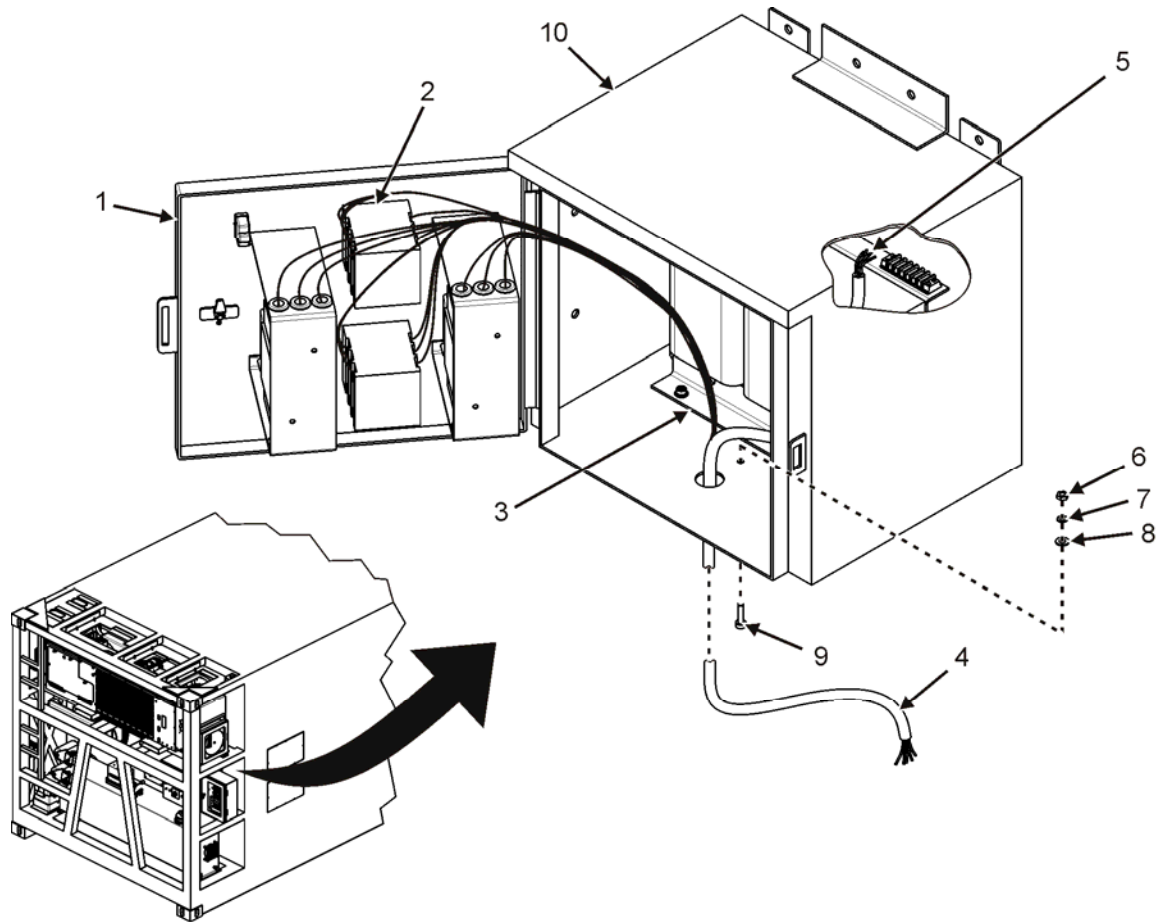


Figure 1. Power Cable Assembly Test.

TEST – CONTINUED

- Use a multimeter set to AC voltage scale to verify no voltage is present on switch S1 (Figure 1, Item 2) terminals S1-1, S1-5, and S1-9 (Figure 2).

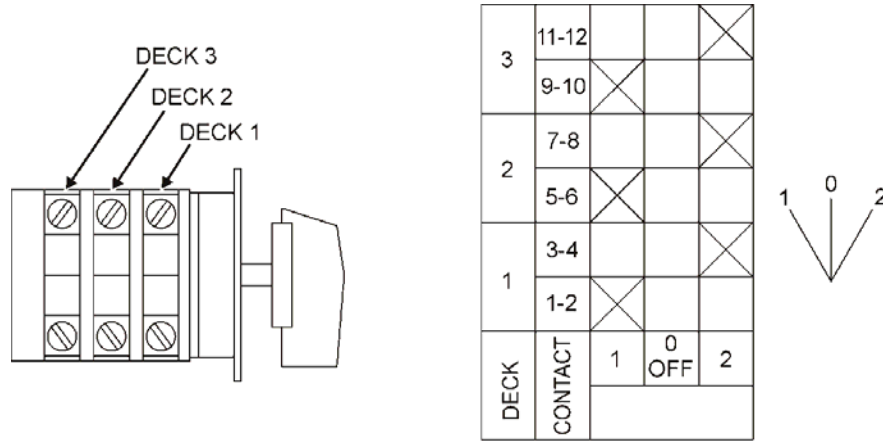


Figure 2. Switch S1 and S2 Contact Arrangement and Circuit Diagram.

- Use a multimeter set to AC voltage scale to verify no voltage is present on transformer TR1 (Figure 1, Item 3) terminal TR1-X0 (Figure 3).

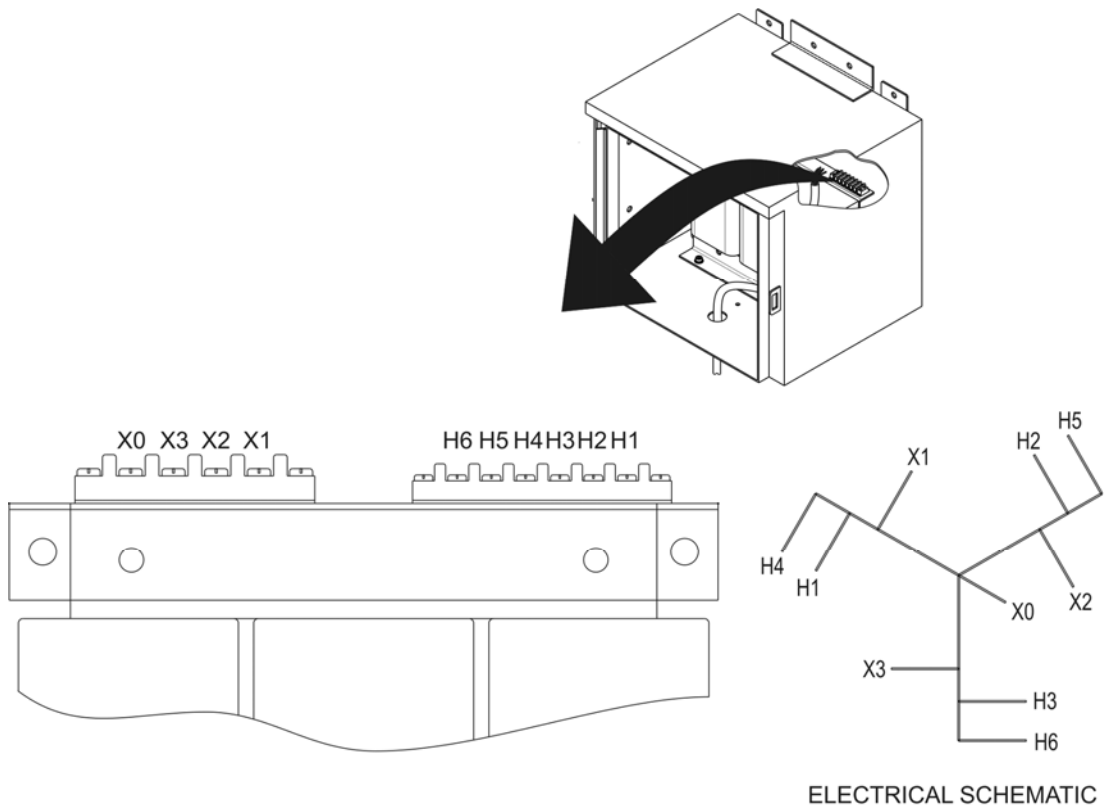


Figure 3. Transformer TR1 Layout and Circuit Diagram.

TEST – CONTINUED

5. Tag and disconnect wiring (Figure 1, Item 4) to switch S1 (Figure 1, Item 2) terminals S1-1, S1-5, and S1-9 (Figure 2).
6. Tag and disconnect wiring (Figure 1, Item 5) to transformer TR1 (Figure 1, Item 3) terminal TR1-X0 (Figure 3).
7. Tag ground wires leading to power box ground (GND) lug (Figure 1, Item 6).
8. Remove one power box ground lug (Figure 1, Item 6), lock washer (Figure 1, Item 7), washer (Figure 1, Item 8), and screw (Figure 1, Item 9) securing three ground wires to power box (Figure 1, Item 10). Discard lock washer.
9. Disconnect ground wires and position disconnected ground wires away from transformer (Figure 1, Item 3). Temporarily secure if needed.
10. Use a multimeter set to ohms scale to make Cable Assembly P1A (Figure 4) continuity checks as shown in Table 1.

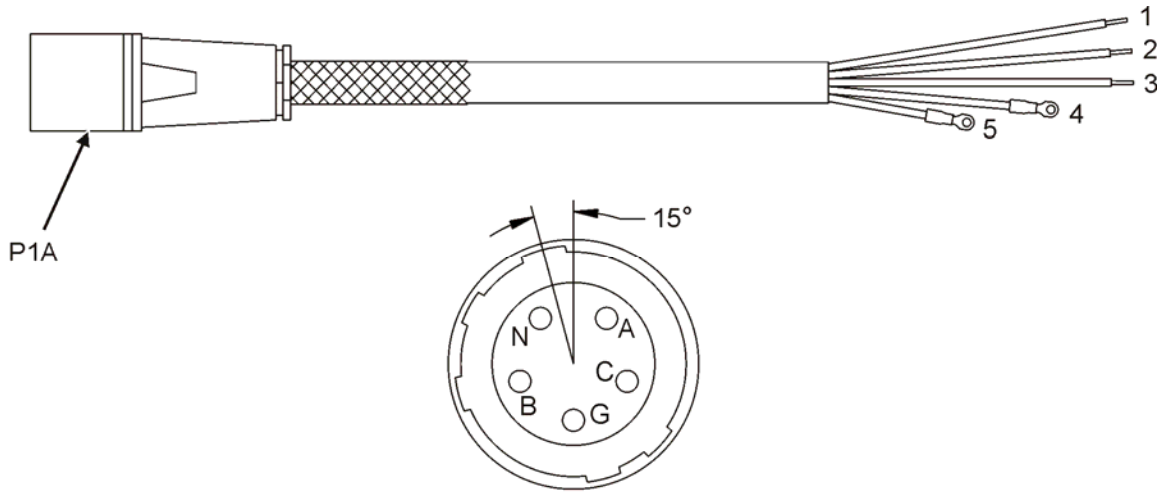


Figure 4. Cable Assembly P1A and Contact Arrangement.

Table 1. Cable Assembly P1A.

Figure 4 Wire Ref No.	Termination		Wire Color	Result
	From	To		
1	P1A-A	S1-1	Red	<0.5Ω
2	P1A-B	S1-5	Black	<0.5Ω
3	P1A-C	S1-9	Orange	<0.5Ω
4	P1A-N	TR1-X0	White	<0.5Ω
5	P1A-G	GND	Green	<0.5Ω

11. If Result column in Table 1 indicates greater than 0.5 ohm, perform cable assembly replace per this WP.

TEST – CONTINUED

12. Reconnect three tagged ground wires to power box (Figure 1, Item 10) using one screw (Figure 1, Item 9), washer (Figure 1, Item 8), new lock washer (Figure 1, Item 7), and power box ground lug (Figure 1, Item 6). Tighten hardware (WP 0102).
13. Reconnect wiring (Figure 1, Item 5) to transformer TR1 (Figure 1, Item 3) terminal TR1-X0 (Figure 3).
14. Reconnect wiring (Figure 1, Item 4) to switch S1 (Figure 1, Item 2) terminals S1-1, S1-5, and S1-9 (Figure 3).
15. Remove tags from wiring.
16. Close power box door (Figure 1, Item 1).
17. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Test Cable Assembly P2A**WARNING**

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

1. Make sure external electrical power unit is turned OFF.
2. Open power box door (Figure 1, Item 1).
3. Use a multimeter set to AC voltage scale to verify no voltage is present on switch S1 (Figure 1, Item 2) terminals S1-3, S1-7, and S1-11 (Figure 2).
4. Use a multimeter set to AC voltage scale to verify no voltage is present on transformer TR1 (Figure 1, Item 3) terminal TR1-X0 (Figure 3).
5. Tag and disconnect wiring (Figure 1, Item 4) to switch S1 (Figure 1, Item 2) terminals S1-3, S1-7, and S1-11 (Figure 2).
6. Tag and disconnect wiring (Figure 1, Item 5) to transformer TR1 (Figure 1, Item 4) terminal TR1-X0 (Figure 4).
7. Tag ground wires leading to power box lug GND (Figure 1, Item 6).
8. Remove one power box ground lug (Figure 1, Item 6), lock washer (Figure 1, Item 7), washer (Figure 1, Item 8), and screw (Figure 1, Item 9) securing three ground wires to power box (Figure 1, Item 10). Discard lock washer.
9. Disconnect ground wires and position disconnected ground wires away from transformer (Figure 1, Item 3). Temporarily secure if needed.
10. Use a multimeter set to ohms scale to make Cable Assembly P2A (Figure 5) continuity checks as shown in Table 2.

TEST – CONTINUED

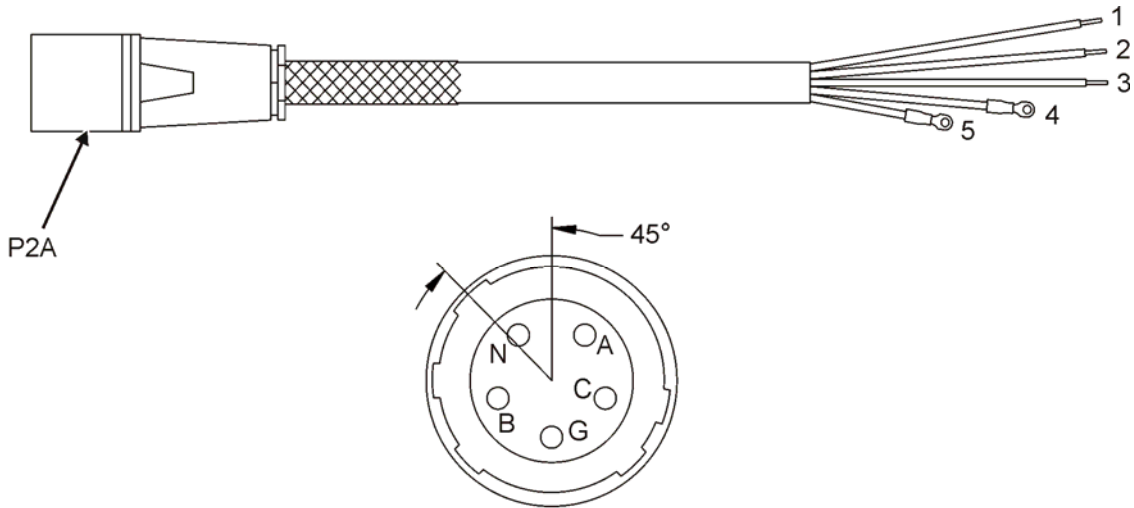


Figure 5. Cable Assembly P2A and Contact Arrangement.

Table 2. Cable Assembly P2A.

Figure 5 Wire Ref No.	Termination		Wire Color	Result
	From	To		
1	P2A-A	S1-3	Red	<0.5Ω
2	P2A-B	S1-7	Black	<0.5Ω
3	P2A-C	S1-11	Orange	<0.5Ω
4	P2A-N	TR1-X0	White	<0.5Ω
5	P2A-G	GND	Green	<0.5Ω

11. If Results column in Table 2 indicates greater than 0.5 ohm, perform cable assembly repair per this WP.
12. Reconnect ground wires to power box (Figure 1, Item 10) using one screw (Figure 1, Item 9), washer (Figure 1, Item 8), new lock washer (Figure 1, Item 7), and power box ground lug (Figure 1, Item 6). Tighten hardware (WP 0102).
13. Reconnect wiring (Figure 1, Item 5) to transformer TR1 (Figure 1, Item 3) terminal TR1-X0 (Figure 3).
14. Reconnect wiring (Figure 1, Item 4) to switch S1 (Figure 1, Item 2) terminals S1-3, S1-7, and S1-11 (Figure 3).
15. Remove tags from wiring.
16. Close power box door (Figure 1, Item 1).
17. Reconnect battery (WP 0070, Reconnect).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

TEST – CONTINUED**Test Cable Assembly P1B****WARNING**

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

1. Make sure external electrical power unit is turned OFF.
2. Disconnect P1B (Figure 6) from P1A (Figure 4), if connected.
3. Use a multimeter set to AC voltage scale to verify no voltage is present on external electrical power supply output terminals.
4. Tag and disconnect wiring to external electrical power supply.
5. Use a multimeter set to ohms scale to make Cable Assembly P1B (Figure 6) continuity checks as shown in Table 3.

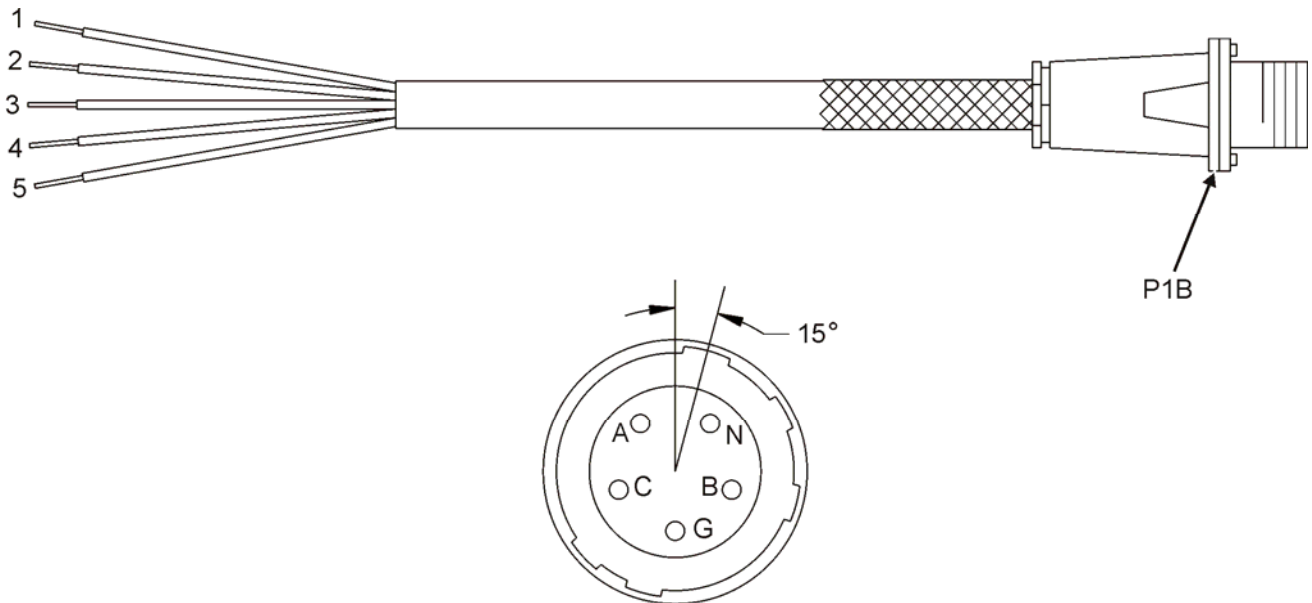


Figure 6. Cable Assembly P1B and Contact Arrangement.

TEST – CONTINUED

Table 3. Cable Assembly P1B.

Wire Ref No.	Termination		Wire Color	Result
	From	To		
1	P1B-A	Ext Pwr A Phase	Red	<0.5Ω
2	P1B-B	Ext Pwr B Phase	Black	<0.5Ω
3	P1B-C	Ext Pwr C Phase	Orange	<0.5Ω
4	P1B-N	Ext Pwr Neutral	White	<0.5Ω
5	P1B-G	Ext Pwr Ground	Green	<0.5Ω

6. If Results column in Table 3 indicates greater than 0.5 ohm, perform cable assembly replace per this WP.
7. Reconnect wiring to external electrical power supply.
8. Remove tags from wiring.
9. Reconnect battery (WP 0070, Reconnect).
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Test Cable Assembly P2B

WARNING

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

1. Make sure external electrical power unit is turned OFF.
2. Disconnect P2B (Figure 7) from P2A (Figure 6), if connected.
3. Use a multimeter set to AC voltage scale to verify no voltage is present on external electrical power supply output terminals.
4. Tag and disconnect wiring to external electrical power supply.
5. Use a multimeter set to ohms scale to make continuity checks as shown in Table 4.
6. If Results column in Table 4 indicates greater than 0.5 ohm, perform cable assembly replace per this WP.

TEST – CONTINUED

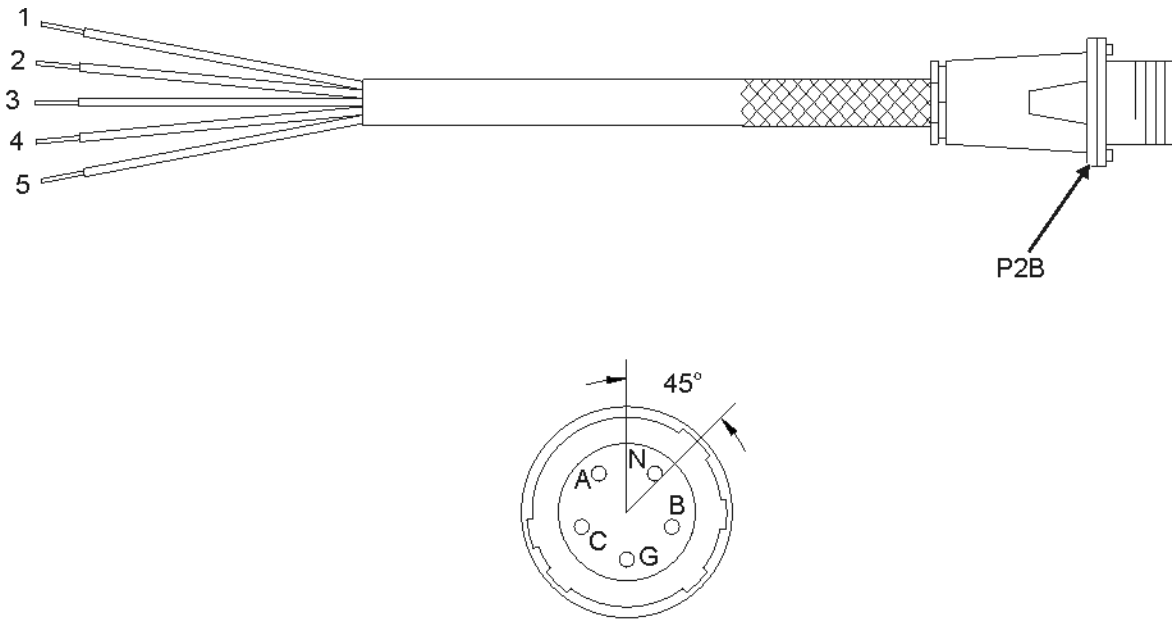


Figure 7. Cable Assembly P2B and Contact Arrangement.

Table 4. Cable Assembly P2B.

Wire Ref No.	Termination		Wire Color	Result
	From	To		
1	P2B-A	Ext Pwr A Phase	Red	<0.5Ω
2	P2B-B	Ext Pwr B Phase	Black	<0.5Ω
3	P2B-C	Ext Pwr C Phase	Orange	<0.5Ω
4	P2B-N	Ext Pwr Neutral	White	<0.5Ω
5	P2B-G	Ext Pwr Ground	Green	<0.5Ω

7. Reconnect wiring to external electrical power supply.
8. Remove tags from wiring.
9. Reconnect battery (WP 0070, Reconnect).
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

REPLACE**WARNING**

High voltage is present when the system is in operation. Use extreme care not to contact wires during operation as serious injury or death to personnel could result.

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the MTRCS and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

NOTE

Refer to the MTRCS electrical schematic (WP 0103) for additional information regarding the wiring of the unit.

Replace Cable Assembly P1A**Remove**

1. Make sure external electrical power unit is turned OFF.
2. Remove cable assembly P1A (Figure 8, Item 1) and P2A (Figure 8, Item 2) from storage hooks (Figure 8, Item 3 and Item 4) and unroll sufficiently to allow room to work at power box (Figure 8, Item 5).

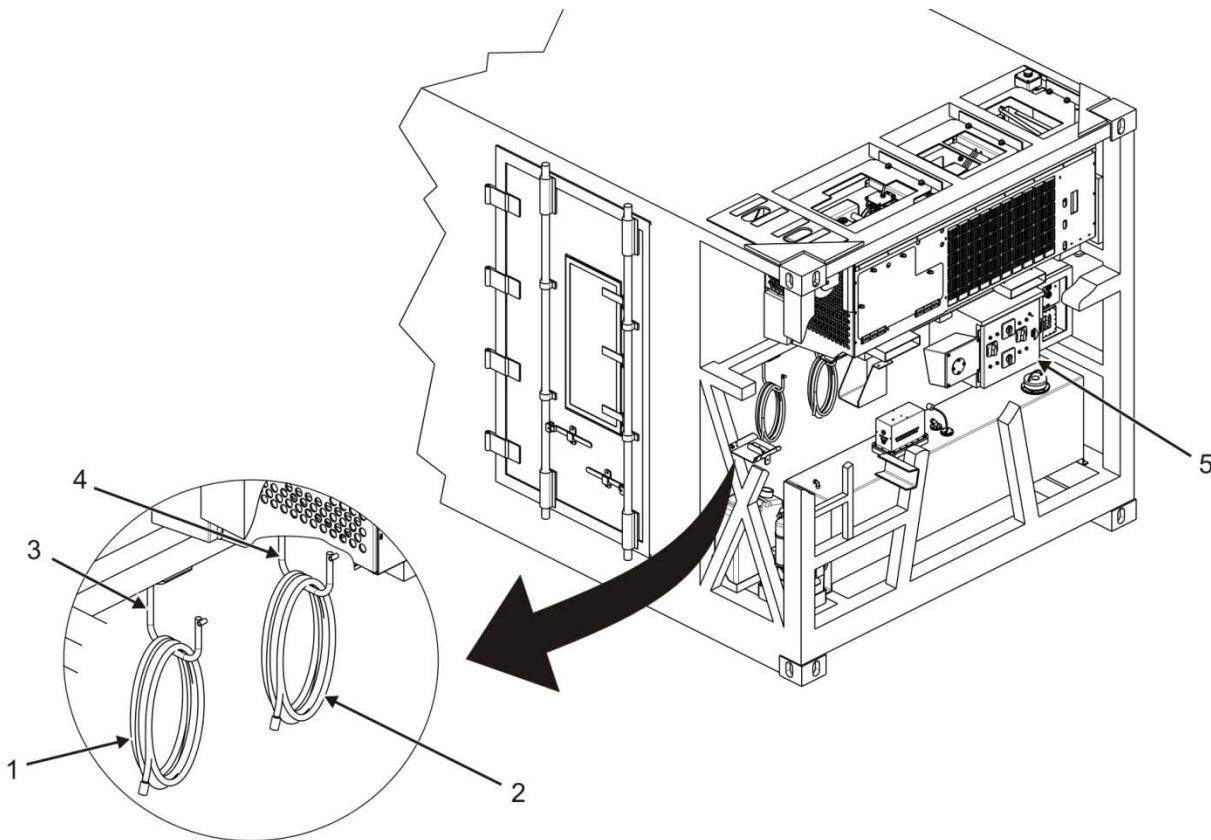


Figure 8. Power Cable Assembly Storage.

REPLACE – CONTINUED

3. Open power box door (Figure 9, Item 1) and secure open.
4. Use a multimeter set to AC voltage scale to verify no AC voltage is present on switch S1 (Figure 9, Item 2) terminals S1-1, S1-3, S1-5, S1-7, S1-9, and S1-11 (Figure 2).
5. Tag red wire terminating at switch S1 (Figure 9, Item 2) terminal S1-1 (Figure 2).
6. Tag black wire terminating at switch S1 (Figure 9, Item 2) terminal S1-5 (Figure 2).
7. Tag orange wire terminating at switch S1 (Figure 9, Item 2) terminal S1-9 (Figure 2).
8. Tag white wire terminating at transformer TR1 (Figure 9, Item 3) terminal TR1-X0 (Figure 3).

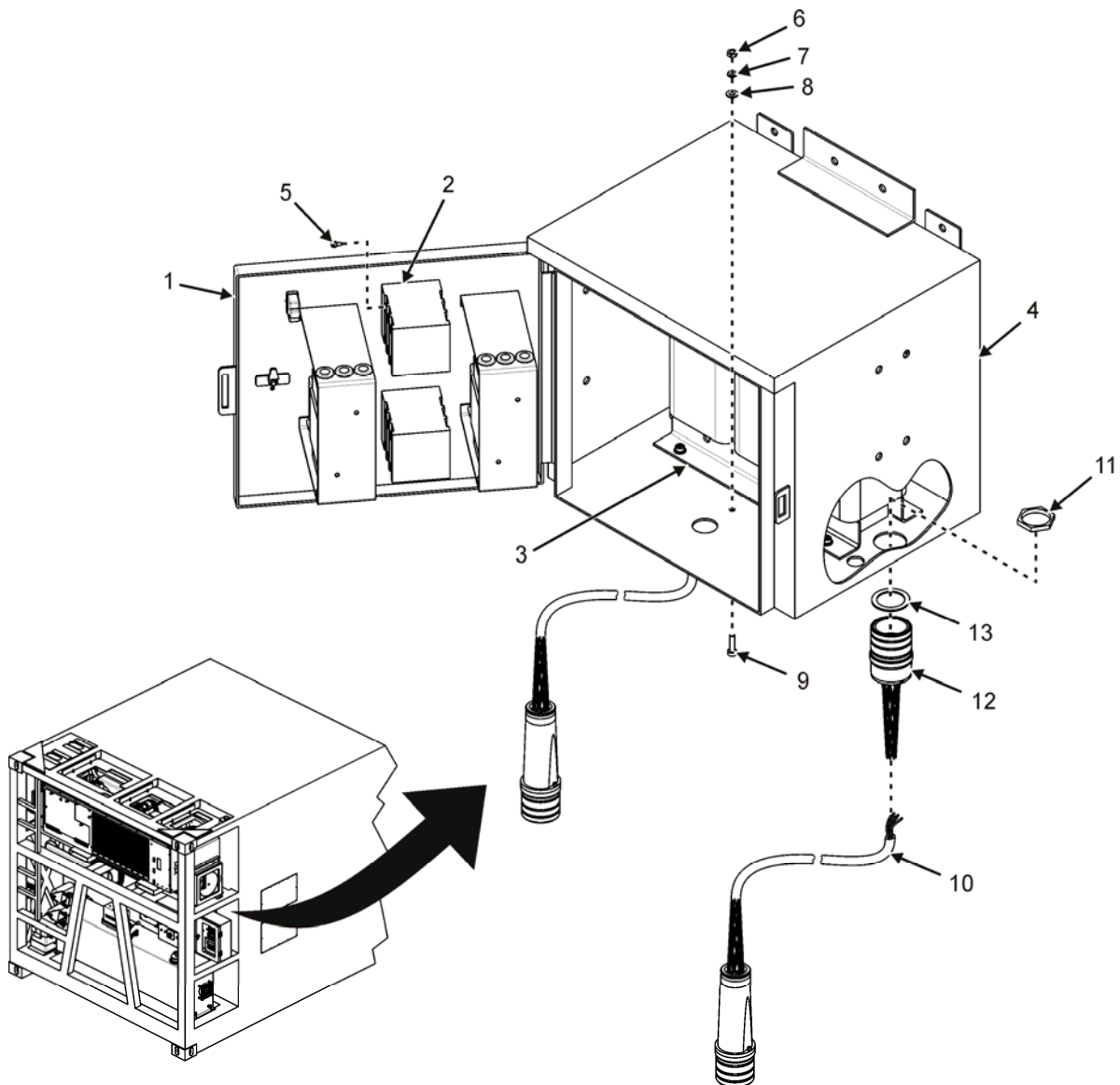


Figure 9. Power Cable Assembly P1A Replacement.

REPLACE – CONTINUED**NOTE**

There are three ground wires attached to the power box GND; one for cable assembly P1A ground, one for cable assembly P2A ground, and one for standby motor ground. Only one of the wires is applicable to cable assembly P1A and will have to be removed to accomplish removal of cable assembly P1A. The other two ground wires will remain inside the power box and be re-connected when cable assembly P1A is re-installed.

9. Tag one white ground wire and two green ground wires terminating at power box ground lug (Figure 9, Item 6) on power box (Figure 9, Item 4).
10. Loosen three terminal screws (Figure 9, Item 5) and disconnect three wires from switch S1 (Figure 9, Item 2) terminals S1-1, S1-5, and S1-9 (Figure 2).

NOTE

There are two white neutral wires attached to terminal TR1-X0. One of the ground wires is for cable P1A and one of the ground wires is for cable P2A.

11. Loosen terminal screw and disconnect two white neutral wires from transformer TR1 (Figure 9, Item 3) terminal TR1-X0 (Figure 3).
12. Remove power box ground lug (Figure 9, Item 6), lock washer (Figure 9, Item 7), washer (Figure 9, Item 8), and screw (Figure 9, Item 9) securing three ground wires to power box (Figure 9, Item 4). Discard lock washer.
13. Disconnect three ground wires from power box (Figure 9, Item 4).

NOTE

When removing the wiring for cable assembly P1A from the power box, make note of how wires are routed and where tie-down straps are removed from in order to aid in the re-installation of the cable assembly.

14. Carefully cut and remove any tie-down straps securing cable assembly P1A (Figure 9, Item 10) wires together with other wires.
15. Loosen locking nut (Figure 9, Item 11) securing cord mesh (Figure 9, Item 12) and cable assembly P1A (Figure 9, Item 10) to power box (Figure 9, Item 4).
16. Remove locking nut (Figure 9, Item 11) securing cable assembly (Figure 9, Item 10) to power box (Figure 9, Item 4).
17. Carefully guide P1A wiring out of power box (Figure 9, Item 4) to fully remove cable assembly P1A (Figure 9, Item 10).

NOTE

The cord mesh surrounding the cable can be easily maneuvered and slid up or down the cable by compressing the mesh.

18. Slide cord mesh (Figure 9, Item 12) back along length of cable by compressing cord mesh.

REPLACE – CONTINUED

19. Remove locking nut (Figure 9, Item 11) and cord mesh (Figure 9, Item 12) for re-installation on replacement cable assembly P1A (Figure 9, Item 10) by compressing cord mesh allowing it to slide easily along cable.
20. Remove grommet (Figure 9, Item 13).

Install

1. Slide cord mesh (Figure 9, Item 12) over wires and onto replacement cable assembly P1A (Figure 9, Item 10) by compressing cord mesh allowing it to slide easily along cable.
2. Slide locking nut (Figure 9, Item 11) over wires and onto replacement cable assembly P1A (Figure 9, Item 10).
3. Slide rubber grommet (Figure 9, Item 13) over cable to seat on cord mesh collar (Figure 9, Item 12).

NOTE

There will be approximately three feet of un-terminated wiring for S1 connections (three places); two feet of wire for transformer TR1 terminal X0 connection and one foot of wire for GND connection that will be routed inside of the power box. These individual wires will be outside of the insulated cable jacket and will not be exposed to environmental conditions outside of the power box.

4. Carefully guide replacement cable assembly P1A (Figure 9, Item 10) wires into power box (Figure 9, Item 4).
5. Route three wires (red, black, and orange) to switch S1 (Figure 9, Item 2).
6. Connect red wire at switch S1 (Figure 9, Item 2) terminal S1-1 (Figure 2) and tighten terminal screw (Figure 9, Item 5). Tighten screw 20 to 25 inch-pounds of torque (WP 0102).
7. Connect black wire at switch S1 (Figure 9, Item 2) terminal S1-5 (Figure 2) and tighten terminal screw (Figure 9, Item 5). Tighten screw 20 to 25 inch-pounds of torque (WP 0102).
8. Connect orange wire at switch S1 (Figure 9, Item 2) terminal S1-9 (Figure 2) and tighten terminal screw (Figure 9, Item 5). Tighten screw 20 to 25 inch-pounds of torque (WP 0102).
9. Route white neutral wire to transformer TR1 (Figure 9, Item 3).
10. Connect white neutral wire at transformer TR1 (Figure 9, Item 3) terminal TR1-X0 (Figure 3) and tighten terminal screw (WP 0102).
11. Route green ground wire to power box ground lug (Figure 9, Item 6).
12. Connect one white ground wire and two green ground wires to power box (Figure 9, Item 4) by installing one screw (Figure 9, Item 9), flat washer (Figure 9, Item 8), new lock washer (Figure 9, Item 7), and power box ground lug (Figure 9, Item 6). Tighten hardware (WP 0102).
13. Remove all wire tags.
14. Slide cord mesh (Figure 9, Item 12) over cable assembly (Figure 9, Item 10) and into power box (Figure 9, Item 4).
15. Install locking nut (Figure 9, Item 11) and tighten to secure cable assembly P1A (Figure 9, Item 10) to power box (Figure 9, Item 4).

REPLACE – CONTINUED

16. Install tie-down straps at locations where removed to secure installation.
17. Close and secure power box door (Figure 9, Item 1).
18. Reconnect battery (WP 0070, Reconnect).
19. Perform Test Cable Assembly P1A in accordance with this WP.
20. Place cable assembly P1A (Figure 8, Item 1) and P2A (Figure 8, Item 2) on storage hooks (Figure 8, Item 3 and Item 4).
21. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Cable Assembly P2A**Remove**

1. Make sure external electrical power unit is turned OFF.
2. Remove cable assembly P1A (Figure 8, Item 1) and P2A (Figure 8, Item 2) from storage hooks (Figure 8, Item 3 and Item 4) and unroll sufficiently to allow room to work at power box (Figure 8, Item 5).
3. Open power box door (Figure 10, Item 1) and secure open.
4. Use a multimeter set to voltage scale to verify no AC voltage is present on switch S1 (Figure 10, Item 2) terminals S1-1, S1-3, S1-5, S1-7, S1-9, and S1-11 (Figure 2).
5. Tag red wire terminating at switch S1 (Figure 10, Item 2) terminal S1-3 (Figure 2).
6. Tag black wire terminating at switch S1 (Figure 10, Item 2) terminal S1-7 (Figure 2).
7. Tag orange wire terminating at switch S1 (Figure 10, Item 2) terminal S1-11 (Figure 2).
8. Tag white wire terminating at transformer TR1 (Figure 10, Item 3) terminal TR1-X0 (Figure 3).

NOTE

There are three ground wires attached to the power box GND; one for cable assembly P1A ground, one for cable assembly P2A ground, and one for standby motor ground. Only one of the wires is applicable to cable assembly P2A and will have to be removed to accomplish removal of cable assembly P2A. The other two ground wires will remain inside the power box and be re-connected when cable assembly P2A is re-installed.

9. Tag one white ground wire and two green ground wires terminating at power box ground lug (Figure 10, Item 6) on power box (Figure 10, Item 4).
10. Loosen three terminal screws (Figure 10, Item 5) and disconnect three wires from switch S1 (Figure 10, Item 2) terminals S1-3, S1-7, and S1-11 (Figure 2).

REPLACE – CONTINUED

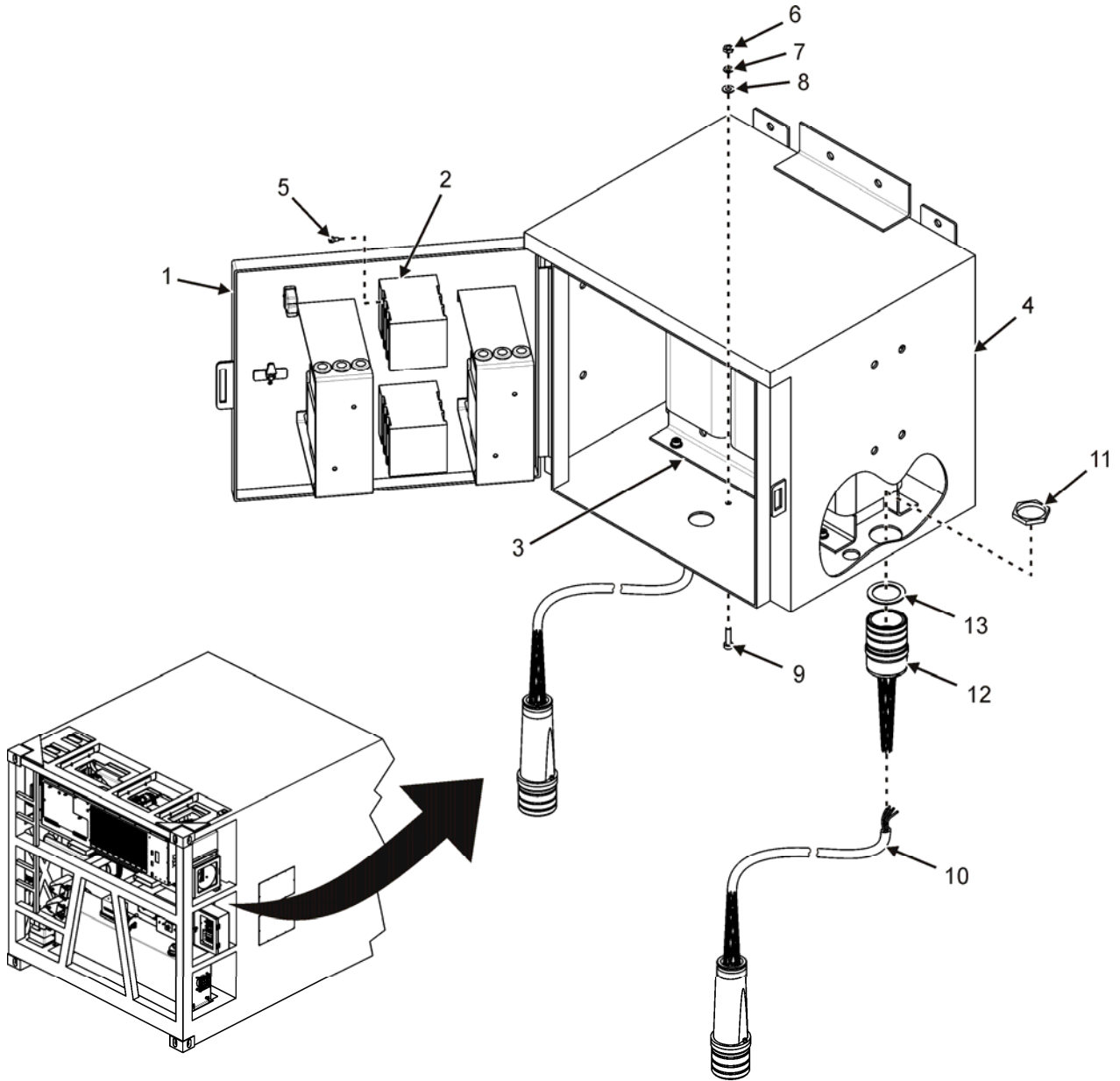


Figure 10. Power Cable Assembly P2A Removal.

REPLACE – CONTINUED**NOTE**

There are two white neutral wires attached to terminal TR1-X0. One of the ground wires is for cable P1A and one of the ground wires is for cable P2A.

11. Loosen terminal screw and disconnect two white neutral wires from transformer TR1 (Figure 10, Item 3) terminal TR1-X0 (Figure 3).
12. Remove one power box ground lug (Figure 10, Item 6), lock washer (Figure 10, Item 7), washer (Figure 10, Item 8), and screw (Figure 10, Item 9) securing three ground wires to power box (Figure 10, Item 4). Discard lock washer.
13. Disconnect three ground wires from power box (Figure 10, Item 4).

NOTE

When removing the wiring for cable assembly P2A from the power box, make note of how wires are routed and where tie-down straps are removed from in order to aid in the re-installation of the cable assembly.

14. Carefully cut and remove any tie-down straps securing cable assembly P2A (Figure 10, Item 10) wires together with other wires.
15. Loosen locking nut (Figure 10, Item 11) securing cord mesh (Figure 10, Item 12) and cable assembly P2A (Figure 10, Item 10) to power box (Figure 10, Item 4).
16. Slide cord mesh (Figure 10, Item 12) back along length of cable.
17. Remove locking nut (Figure 10, Item 11) securing cable assembly (Figure 10, Item 10) to power box (Figure 10, Item 4).
18. Carefully guide P2A wiring out of power box (Figure 10, Item 9) to fully remove cable assembly P2A (Figure 10, Item 10).

NOTE

The cord mesh surrounding the cable can be easily maneuvered and slid up or down the cable by compressing the mesh.

19. Slide cord mesh (Figure 10, Item 12) back along length of cable by compressing cord mesh.
20. Remove locking nut (Figure 10, Item 11) and cord mesh (Figure 10, Item 12) for re-installation on replacement cable assembly P2A (Figure 10, Item 10) by compressing cord mesh allowing it to slide easily along cable.
21. Remove grommet (Figure 10, Item 13).

REPLACE – CONTINUED**Install**

1. Slide locking nut (Figure 11, Item 11) over wires and onto replacement cable assembly P2A (Figure 11, Item 10) by compressing cord mesh allowing it to slide easily along cable.
2. Slide cord mesh (Figure 11, item 12) over wires and onto replacement cable assembly P2A (Figure 11, Item 10).
3. Slide rubber grommet (Figure 11, Item 13) over cable to seat on cord mesh collar (Figure 11, Item 12).

NOTE

There will be approximately three feet of un-terminated wiring for S1 connections (three places); two feet of wire for transformer TR1 terminal X0 connection and one foot of wire for GND connection that will be routed inside of the power box. These individual wires will be outside of the insulated cable jacket and will not be exposed to environmental conditions outside of the power box.

4. Carefully guide replacement cable assembly P2A (Figure 11, Item 10) wires into power box (Figure 11, Item 4).
5. Route three wires (red, black, and orange) to switch S1 (Figure 11, Item 2).
6. Connect red wire at switch S1 (Figure 11, Item 2) terminal S1-3 (Figure 2) and tighten terminal screw (Figure 11, Item 5). Tighten screw 20 to 25 inch-pounds of torque (WP 0102).
7. Connect black wire at switch S1 (Figure 11, Item 2) terminal S1-7 (Figure 2) and tighten terminal screw (Figure 11, Item 5). Tighten screw 20 to 25 inch-pounds of torque (WP 0102).
8. Connect orange wire at switch S1 (Figure 11, Item 2) terminal S1-11 (Figure 2) and tighten terminal screw (Figure 11, Item 5). Tighten screw 20 to 25 inch-pounds of torque (WP 0102).
9. Route white neutral wire to transformer TR1 (Figure 11, Item 3).
10. Connect white neutral wire at transformer TR1 (Figure 11, Item 3) terminal TR1-X0 (Figure 3) and tighten terminal screw (WP 0102).
11. Route green ground wire to power box ground lug (Figure 11, Item 6).
12. Connect one white ground wire and two green ground wires to power box (Figure 11, Item 4) by installing one screw (Figure 11, Item 9), one flat washer (Figure 11, Item 8), one new lock washer (Figure 11, Item 7), and one power box ground lug (Figure 11, Item 6). Tighten hardware (WP 0102).
13. Remove all wire tags.

REPLACE – CONTINUED

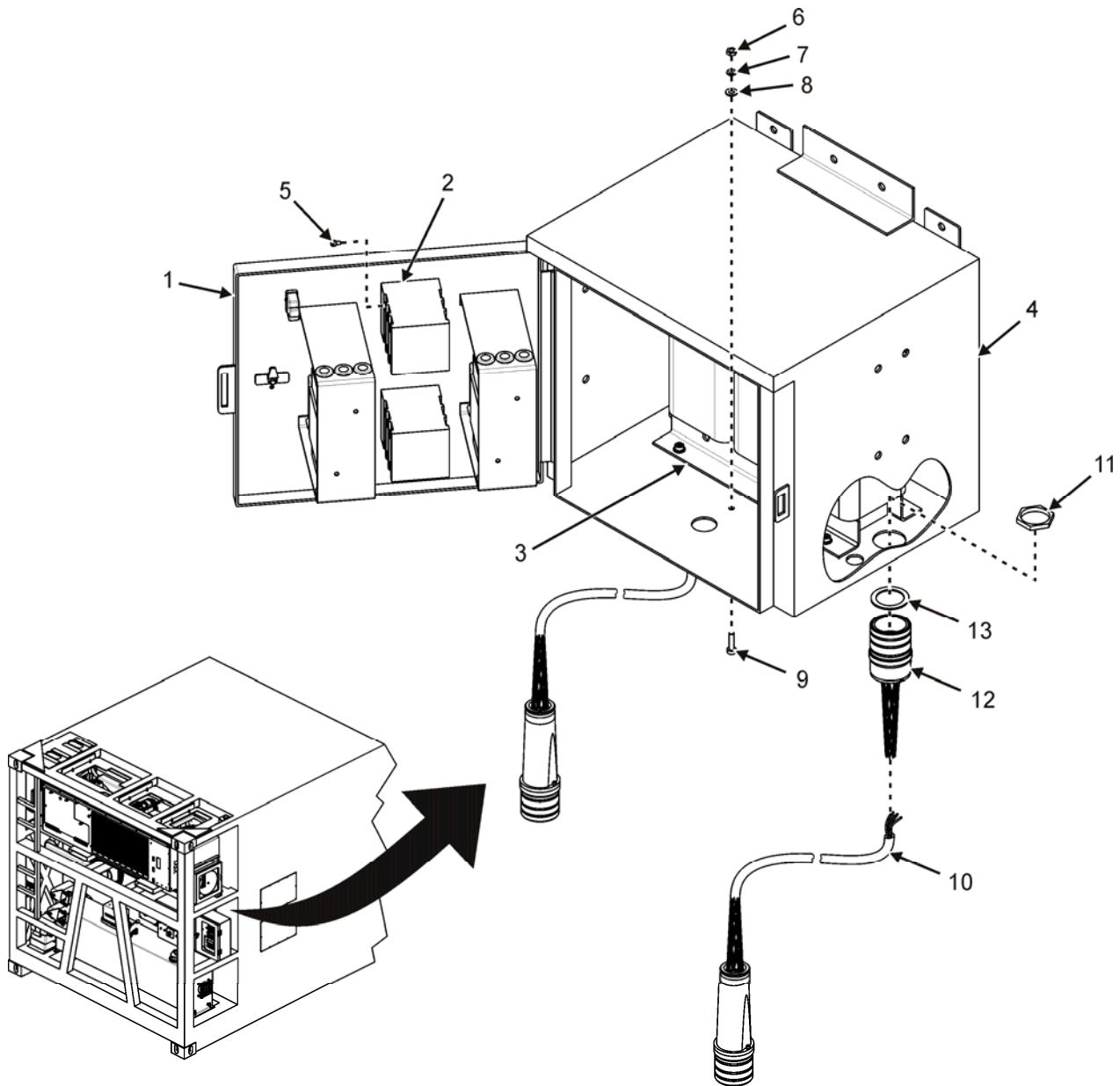


Figure 11. Power Cable Assembly P2A Installation.

REPLACE – CONTINUED**NOTE**

The cord mesh surrounding the cable can be easily maneuvered and slid up or down the cable by compressing the mesh.

14. Slide cord mesh (Figure 11, Item 12) over cable assembly (Figure 11, Item 10) and into power box (Figure 11, Item 4).
15. Install lock nut (Figure 11, Item 11) and tighten to secure cable assembly P2A (Figure 11, Item 10) to power box (Figure 11, Item 4).
16. Install tie-down straps at locations where removed to secure installation.
17. Close and secure power box door (Figure 11, Item 1).
18. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
19. Perform Test Cable Assembly P2A in accordance with this WP.
20. Place cable assembly P1A (Figure 8, Item 1) and P2A (Figure 8, Item 2) on storage hooks (Figure 8, Item 3 and Item 4).
21. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

SERVICE MAINTENANCE
BATTERY
SERVICE, REPLACE

INITIAL SETUP:**Tools and Special Tools**

General Mechanic Tool Kit (WP 0107, Table 2, Item 5)

Personnel Required

Quartermaster and Chemical Equipment Repairer

Materials/Parts

Apron, Utility (WP 0110, Item 4)
Brush (WP 0110, Item 7)
Gloves, Rubber (WP 0110, Item 21)
Pail, Utility Plastic (WP 0110, Item 35)
Shield, Face (WP 0110, Item 20)
Sodium Bicarbonate, Technical (WP 0110, Item 48)
Spill Kit (WP 0110, Item 49)
Towel, Machinery Wiping (WP 0110, Item 52)

References

WP 0005
WP 0031
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

SERVICE**Disconnect****WARNING**

The battery contains sulfuric acid that can cause blindness and severe burns. Use extreme care when performing maintenance on or around the battery. Use protective clothing and face shield while performing maintenance on the battery. If battery acid gets on your skin, rinse it off with water immediately. If battery acid gets in your eyes, flush your eyes with water and seek immediate medical attention.

Gasses that may be emitted from the battery are explosive. Never perform maintenance on a battery when near sparks, open flame, or while smoking.

NOTE

The battery used in the MTRCS is considered to be maintenance free and does not require filling or topping off with electrolyte. Cleaning the terminal connections of corrosion and cleaning the battery case and battery of debris or electrolyte acid seepage is the only service that can be performed.

1. Loosen and remove two lock nuts (Figure 1, Item 7) and two flat washers (Figure 1, Item 8) securing two L-bolts (Figure 1, Item 9) to battery box clamp (Figure 1, Item 10).
2. Remove two L-bolts (Figure 1, Item 9) from battery box clamp (Figure 1, Item 10) and battery pan (Figure 1, Item 3).
3. Remove battery box clamp (Figure 1, Item 10).
4. Remove battery box cover (Figure 1, Item 6) from battery box (Figure 1, Item 2).

SERVICE – CONTINUED

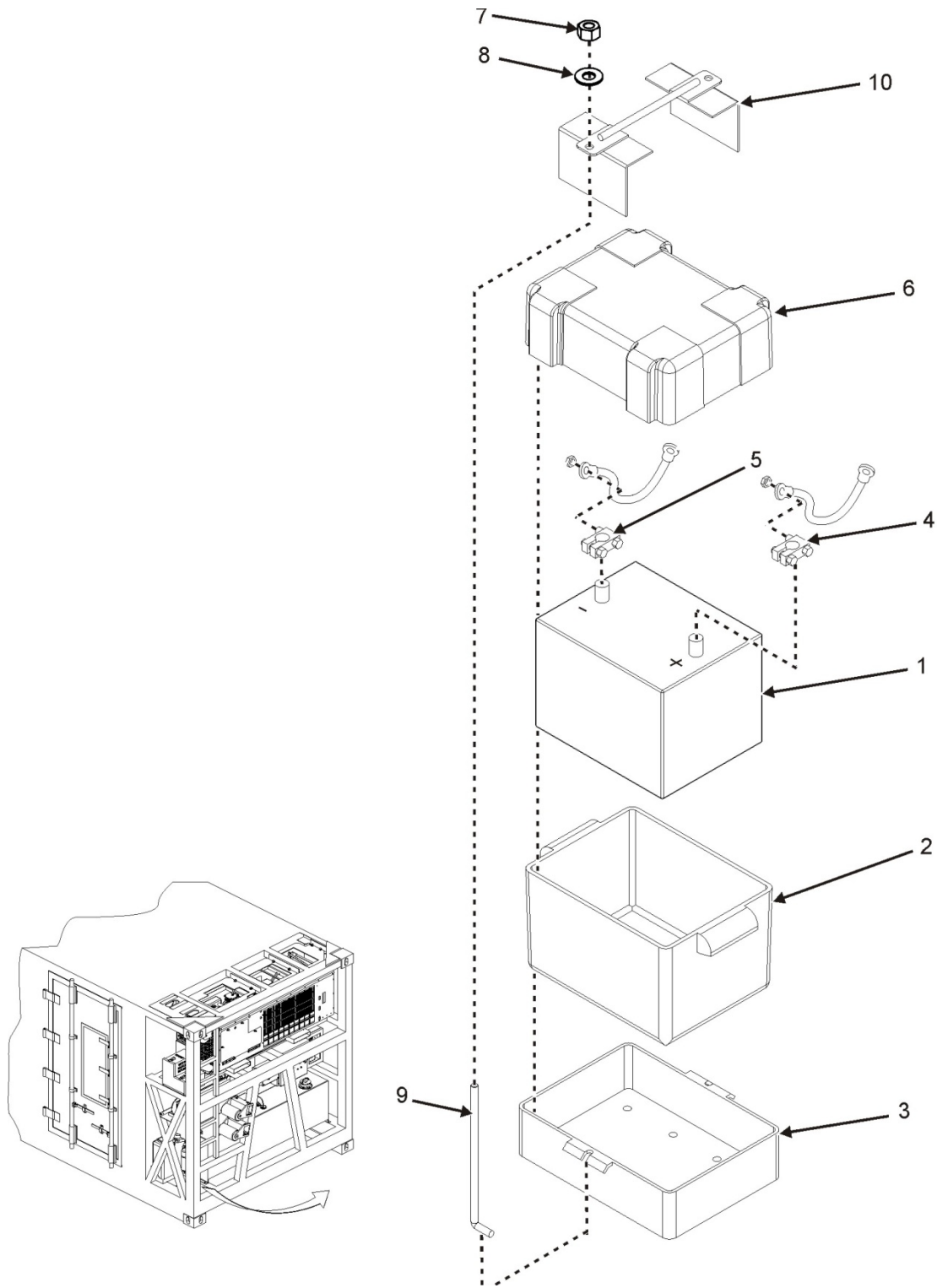


Figure 1. Service of Battery.

SERVICE – CONTINUED**WARNING**

Storage batteries contain a high current potential and can explode if short circuited. Never allow any metal to cross between the battery terminals or between the positive terminal and any part of the MTRCS frame. Personal injury could result.

5. Disconnect negative (-) battery lead (Figure 1, Item 5) from battery (Figure 1, Item 1).
6. Disconnect positive (+) battery lead (Figure 1, Item 4) from battery (Figure 1, Item 1).

Reconnect

1. Connect positive (+) battery lead (Figure 1, Item 4) to positive (+) battery terminal. Tighten lead.
2. Connect negative (-) battery lead (Figure 1, Item 5) to negative (-) battery terminal. Tighten lead.
3. Install battery box cover (Figure 1, Item 6) on battery box (Figure 1, Item 2).
4. Install battery box clamp (Figure 1, Item 10) over cover (Figure 1, Item 6).
5. Install two L-bolts (Figure 1, Item 9) through lip on battery pan (Figure 1, Item 3) and through battery box clamp (Figure 1, Item 10).
6. Secure two L-bolts (Figure 1, Item 9) to battery box clamp (Figure 1, Item 10) using two lock nuts (Figure 1, Item 7) and flat washers (Figure 1, Item 8).
7. Tighten lock nuts (Figure 1, Item 7) hand tight.
8. Place MTRCS in desired mode of operation (WP 0005, Operating Procedures).

Voltage Check**WARNING**

The battery contains sulfuric acid that can cause blindness and severe burns. Use extreme care when performing maintenance on or around the battery. Use protective clothing and face shield while performing maintenance on the battery. If battery acid gets on your skin, rinse it off with water immediately. If battery acid gets in your eyes, flush your eyes with water and seek immediate medical attention.

Gasses that may be emitted from the battery are explosive. Never perform maintenance on a battery when near sparks, open flame, or while smoking.

1. Loosen and remove two lock nuts (Figure 2, Item 7) and two flat washers (Figure 2, Item 8) securing two L-bolts (Figure 2, Item 9) to battery box clamp (Figure 2, Item 10).
2. Remove two L-bolts (Figure 2, Item 9) from battery box clamp (Figure 2, Item 10) and battery pan (Figure 2, Item 3).
3. Remove battery box clamp (Figure 2, Item 10).
4. Remove battery box cover (Figure 2, Item 6) from batter box (Figure 2, Item 2).

SERVICE – CONTINUED

5. Turn multimeter to volts DC scale.
6. Connect positive (+) lead of multimeter to positive (+) battery terminal (Figure 2, Item 4).
7. Connect negative (-) lead of multimeter to negative (-) battery terminal (Figure 2, Item 5).
8. Verify battery (Figure 2, Item 1) voltage is between 11.0 and 13.4 volts DC. If voltage is not within 11.0 and 13.4 volts DC, replace battery in accordance with Remove and Install in this WP.
9. Remove multimeter leads from positive (+) battery terminal (Figure 2, Item 4), and negative (-) battery terminal (Figure 2, Item 5).
10. Install battery box cover (Figure 2, Item 6).
11. Install battery box clamp (Figure 2, Item 10) over battery box cover (Figure 2, Item 6).
12. Install two L-bolts (Figure 2, Item 9) through lip on battery pan (Figure 2, Item 3) and through battery box clamp (Figure 2, Item 10).
13. Secure two L-bolts (Figure 2, Item 9) to battery box clamp (Figure 2, Item 10) using two lock nuts (Figure 2, Item 7) and flat washers (Figure 2, Item 8).
14. Tighten lock nuts (Figure 2, Item 7).
15. Place MTRCS back into desired mode of operation.

SERVICE – CONTINUED

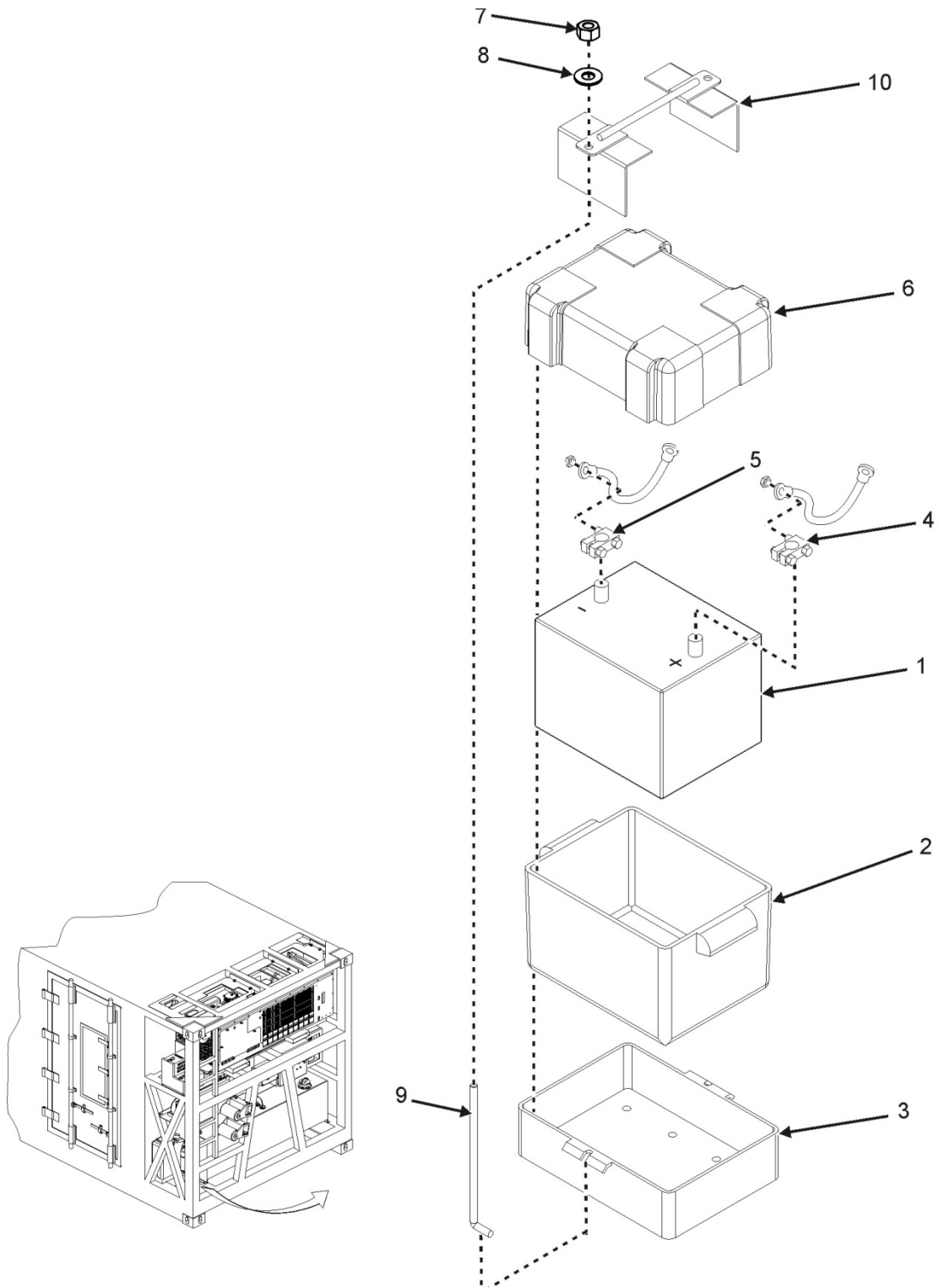


Figure 2. Voltage Check of Battery.

SERVICE – CONTINUED**Clean****WARNING**

The battery contains sulfuric acid that can cause blindness and severe burns. Use extreme care when performing maintenance on or around the battery. Use protective clothing and face shield while performing maintenance on the battery. If battery acid gets on your skin, rinse it off with water immediately. If battery acid gets in your eyes, flush your eyes with water and seek immediate medical attention.

Gasses that may be emitted from the battery are explosive. Never perform maintenance on a battery when near sparks, open flame, or while smoking.

1. Remove battery in accordance with Remove task per this WP.

WARNING

Battery cleaning solution may cause irritation to eyes and skin, and may irritate respiratory system if inhaled frequently or over prolonged period of time. Wear eye protection and rubber gloves when handling battery cleaning solution.

2. Prepare a battery cleaning solution of 1 ounce sodium bicarbonate to 8 – 16 ounces of water.

CAUTION

Use care when cleaning the battery top. Sealed, maintenance-free batteries still have vents to relieve excessive gas pressure, and may allow the cleaning solution to enter the battery, greatly reducing battery capacity and service life.

3. Clean outside of battery (Figure 3, Item 1) using a battery cleaning solution and brush. Wipe dry with towel.
4. Clean battery box (Figure 3, Item 2) and battery pan (Figure 3, Item 3) using battery cleaning solution and brush. Wipe dry with towel.
5. Clean battery positive (+) (Figure 3, Item 5) and negative (-) (Figure 3, Item 4) terminals with battery cleaning solution and brush.
6. Inspect battery box (Figure 3, Item 2) and battery box cover (Figure 3, Item 6) for cracks. Replace if needed.
7. Inspect battery pan (Figure 3, Item 3) for cracks and corrosion.
8. Install battery (Figure 3, Item 1) in accordance with Install task per this WP.
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

SERVICE – CONTINUED

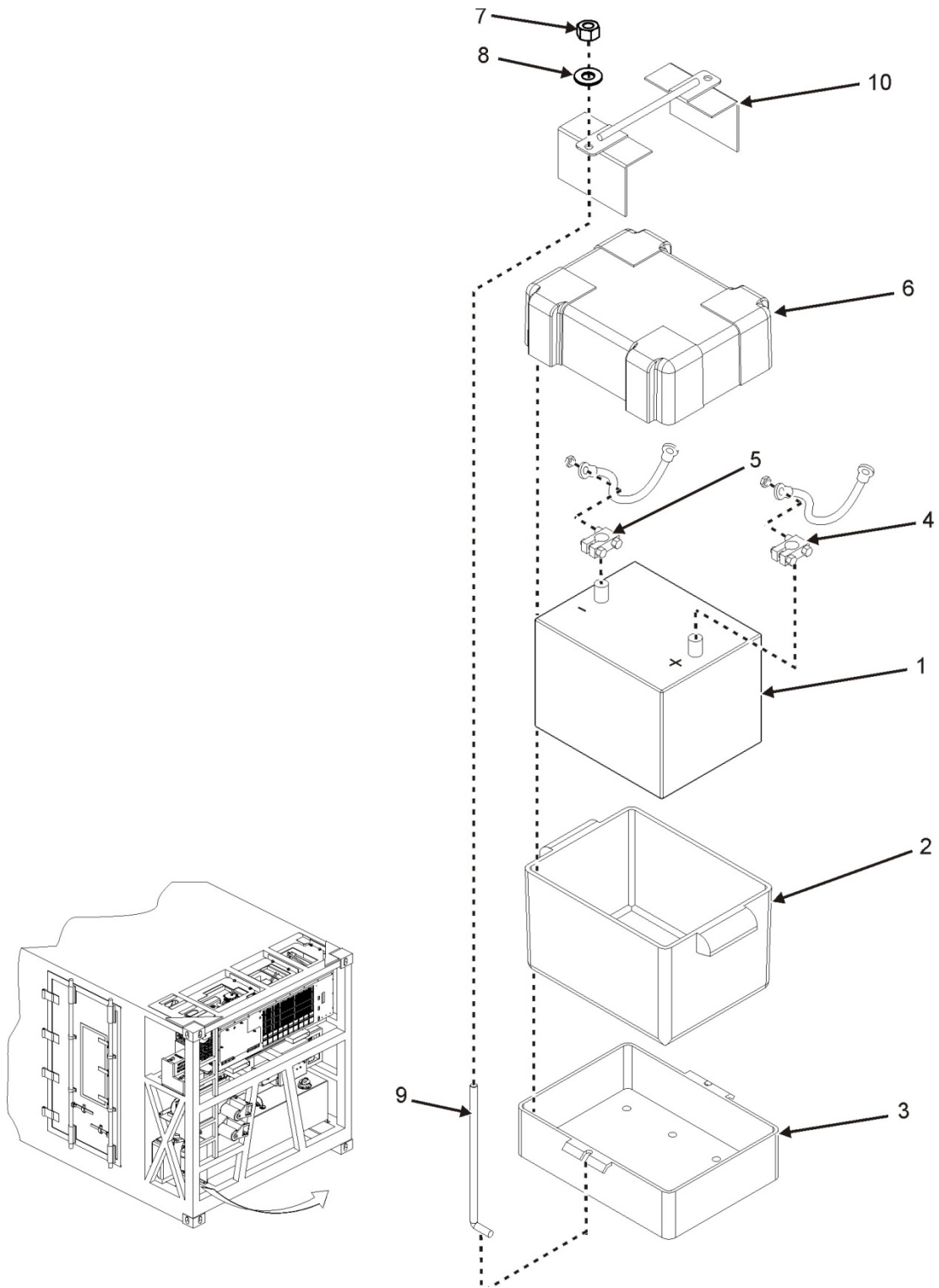


Figure 3. Cleaning of Battery.

END OF TASK

REPLACE**Remove****WARNING**

The battery contains sulfuric acid that can cause blindness and severe burns. Use extreme care when performing maintenance on or around the battery. Use protective clothing and face shield while performing maintenance on the battery. If battery acid gets on your skin, rinse it off with water immediately. If battery acid gets in your eyes, flush your eyes with water and seek immediate medical attention.

Gasses that may be emitted from the battery are explosive. Never perform maintenance on a battery when near sparks, open flame, or while smoking.

1. Loosen and remove two lock nuts (Figure 4, Item 7) and two flat washers (Figure 4, Item 8) securing two L-bolts (Figure 4, Item 9) to battery box clamp (Figure 4, Item 10).
2. Remove two L-bolts (Figure 4, Item 9) from battery box clamp (Figure 4, Item 10) and battery pan (Figure 4, Item 3).
3. Remove battery box clamp (Figure 4, Item 10).
4. Remove battery box cover (Figure 4, Item 6).

WARNING

The battery contains sulfuric acid that can cause blindness and severe burns. Use extreme care when performing maintenance on or around the battery. Use protective clothing and face shield while performing maintenance on the battery. If battery acid gets on your skin, rinse it off with water immediately. If battery acid gets in your eyes, flush your eyes with water and seek immediate medical attention.

Gasses that may be emitted from the battery are explosive. Never perform maintenance on a battery when near sparks, open flame, or while smoking.

Storage batteries contain a high current potential and can explode if short circuited. Never allow any metal to cross between the battery terminals or between the positive terminal and any part of the MTRCS frame. Personal injury could result.

5. Disconnect negative (-) lead (Figure 4, Item 5) from battery (Figure 4, Item 1).
6. Disconnect positive (+) battery lead (Figure 4, Item 4) from battery (Figure 4, Item 1).
7. Remove battery (Figure 4, Item 1) from battery box (Figure 4, Item 2).
8. Dispose of battery (Figure 4, Item 1) in accordance with SOP.

REPLACE – CONTINUED

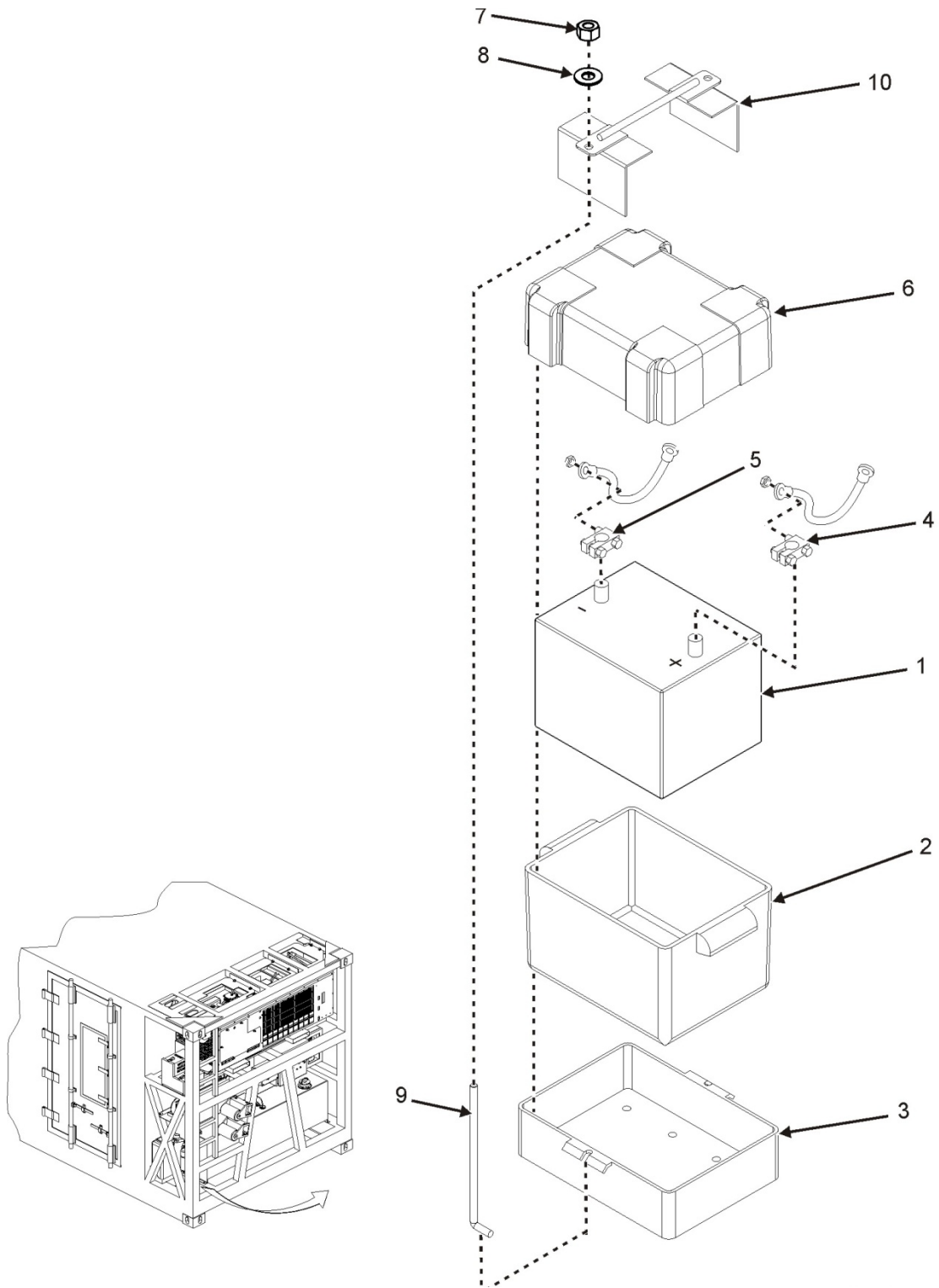


Figure 4. Removal/Installation of Battery.

REPLACE – CONTINUED**Install**

1. Install replacement battery (Figure 4, Item 1) in battery box (Figure 4, Item 2).

WARNING

Storage batteries contain a high current potential and can explode if short circuited. Never allow any metal to cross between the battery terminals or between the positive terminal and any part of the MTRCS frame. Personal injury could result.

2. Connect positive (+) battery lead (Figure 4, Item 4) to positive (+) battery terminal. Tighten lead.
3. Connect negative (-) battery lead (Figure 4, Item 5) to negative (-) battery terminal. Tighten lead.
4. Install battery box cover (Figure 4, Item 6) on battery box (Figure 4, Item 2).
5. Install battery box clamp (Figure 4, Item 10) over cover (Figure 4, Item 6).
6. Install two L-bolts (Figure 4, Item 9) through lip on battery pan (Figure 4, Item 3) and through battery box clamp (Figure 4, Item 10).
7. Secure two L-bolts (Figure 4, Item 9) to battery box clamp (Figure 4, Item 10) using two lock nuts (Figure 4, Item 7) and flat washers (Figure 4, Item 8).
8. Tighten lock nuts (Figure 4, Item 7) hand tight.
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

**SERVICE MAINTENANCE
TEMPERATURE CHART RECORDER
TEST, REPLACE**

INITIAL SETUP:

Tools and Special Tools

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Setup Charts CCW (WP 0110, Item 14)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0027
WP 0066
WP 0070
TM 10-8145-222-23P

Equipment Condition

MTRCS set up and operating (WP 0005)

TEST

The Temperature Chart Recorder can be completely tested using a simple check of the green LED indicator (Figure 1, Item 1) on the unit. Depending on the condition of the light, certain requirements exist for the unit. A steady green LED, with cartridge pens operating within the chart range, indicates that the temperature chart recorder is functioning normally.

Using a combination of green LED indication and pen position, the temperature chart recorder operating conditions can be tested. The following LED indications shown in Table 1 indicate the temperature chart recorder operating condition.

Table 1. Temperature Chart Recorder LED Test States.

LED	Pens	Meaning	Remedy
Steady ON	Within chart range	Normal operation	None required
Steady ON	Above 100% outer ring	Unit operating in chart change mode	Press and release CHART CHANGE key (3) to return unit to normal operating mode.
Flashing rapidly	At 0% or 100% outer or inner range	Sensors are in a break condition, or pen inputs are out of range above +90 or below -10	Check or replace sensor; validate sensor setup (WP 0066).
Steady OFF	Not Applicable	No power to unit	Check for power at power terminals at control panel.

END OF TASK

REPLACE**WARNING**

Electrical voltage and current cannot be seen and, when contacted, can result in death, render you unconscious, or severely burn you. Use extreme care when working around or with energized equipment. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning.

Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

High voltage is present inside the temperature chart recorder. Do not perform any maintenance on electrical equipment unless all power is removed.

Be careful not to contact high-voltage connections of 115 VAC input connections when installing or operating this equipment.

1. Open temperature chart recorder door (Figure 1, Item 2) by lifting handle up and pulling door open.

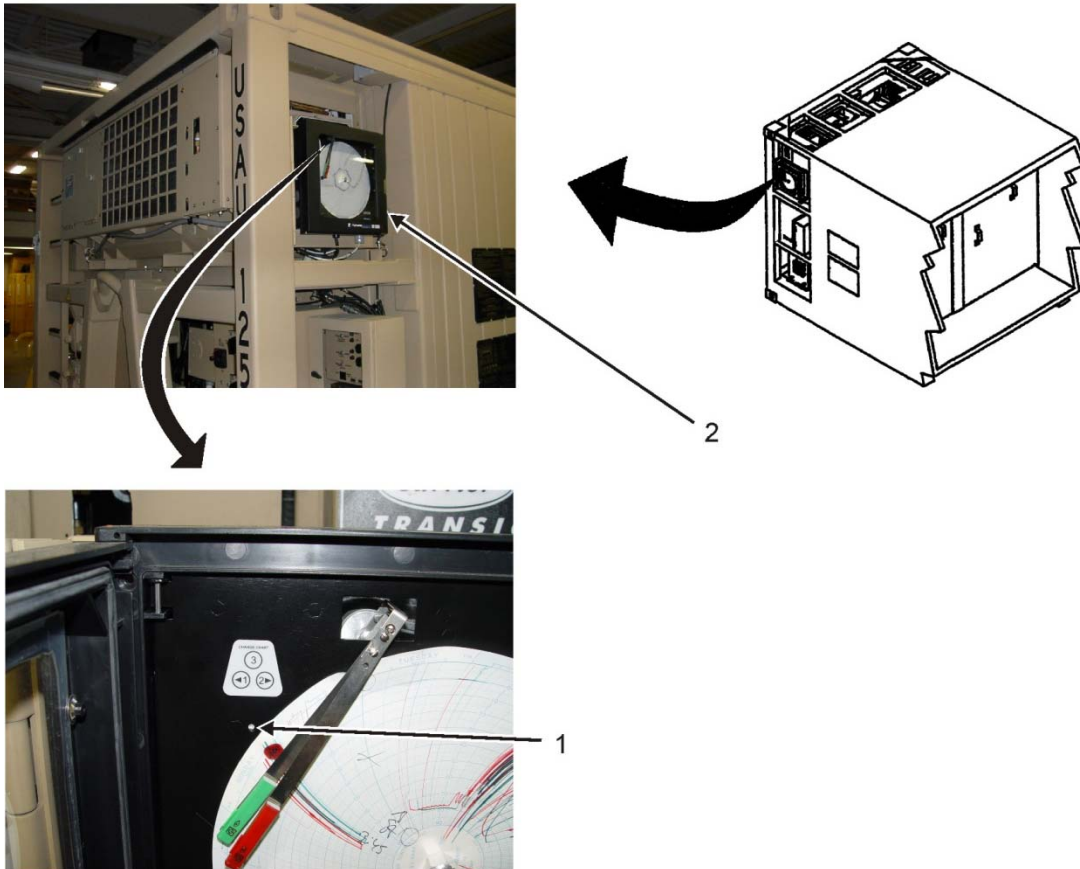


Figure 1. Temperature Chart Recorder.

REPLACE – CONTINUED**NOTE**

Pens and LED display may delay response to key input.

2. Press and release CHANGE CHART key (3) on temperature chart recorder keypad (Figure 2).
 - Green and red pens begin moving towards left outside area of chart.

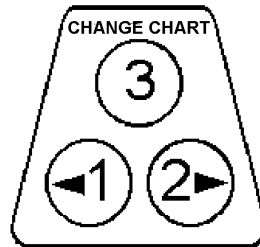


Figure 2. Temperature Chart Recorder Keypad.

3. When both pens have stopped above outer ring, unscrew chart hub knob from center of chart.
4. Remove old chart paper from center hub.
5. Shut down refrigeration unit if running (WP 0005, Operating Procedures).
6. Disconnect battery (WP 0070, Disconnect).
7. Disconnect external electrical power if connected (WP 0005, Operating Procedures).

NOTE

A new temperature chart recorder will come with both temperature chart recorder sensor cables and a power cable already attached. The temperature chart recorder sensor cables will be completely removed from the MTRCS for each evaporator and remain attached to old temperature chart recorder when removed.

8. Remove two bolts (Figure 3, Item 1) and washers (Figure 3, Item 2) securing evaporator cover (Figure 3, Item 3) and carefully swing cover open.
9. Cut and remove tie wraps (Figure 3, Item 6) securing return air sensor (Figure 3, Item 4) and temperature chart recorder sensor (Figure 3, Item 5) to evaporator cover (Figure 3, Item 3).
10. Carefully pull sensors through hole in evaporator cover (Figure 3, Item 3).
11. Cut tie wraps as needed and carefully pull temperature chart recorder sensor (Figure 3, Item 5) out of evaporator (Figure 3, Item 8).
12. Cut and remove tie wraps, as needed, from temperature chart recorder sensor (Figure 3, Item 5) cable between evaporator cutout and location where cable passes through container forward wall (Figure 3, Item 9).

REPLACE – CONTINUED

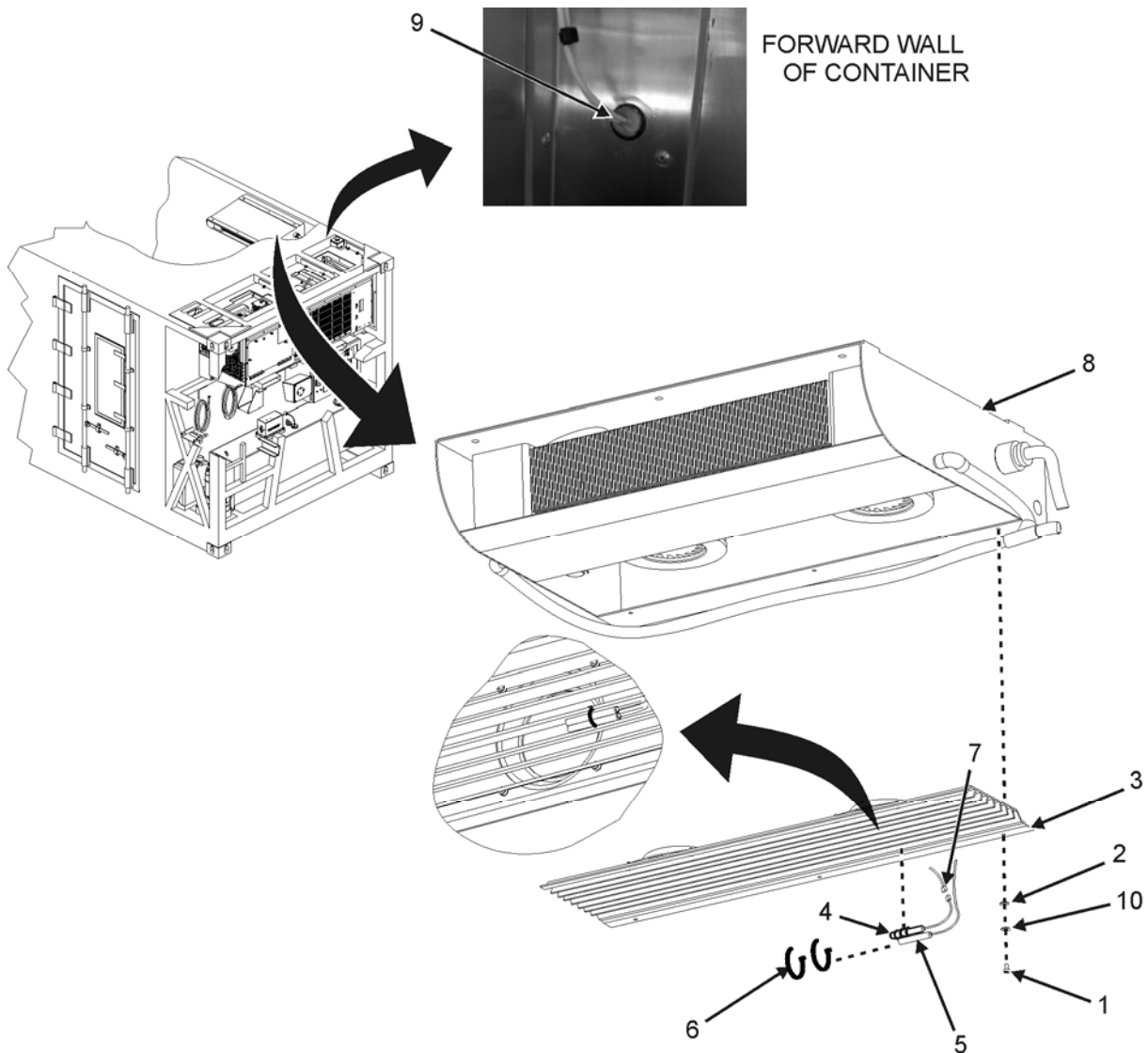


Figure 3. Evaporator Sensors.

13. Carefully remove sealant as needed from container pass through forward wall (Figure 3, Item 9) on inside and outside of container so that cable will be able to be pulled through.
14. Remove snap pin (Figure 4, Item 1) from holder securing hinged mount bracket (Figure 4, Item 2) to frame.
15. Swing hinged mount bracket (Figure 4, Item 2) open with chart recorder (Figure 4, Item 3) attached.
16. While maintaining firm grasp of chart recorder, remove two bolts (Figure 4, Item 4) and lock washers (Figure 4, Item 5) securing chart recorder (Figure 4, Item 3) to mount bracket (Figure 4, Item 6). Discard lock washers.

REPLACE – CONTINUED

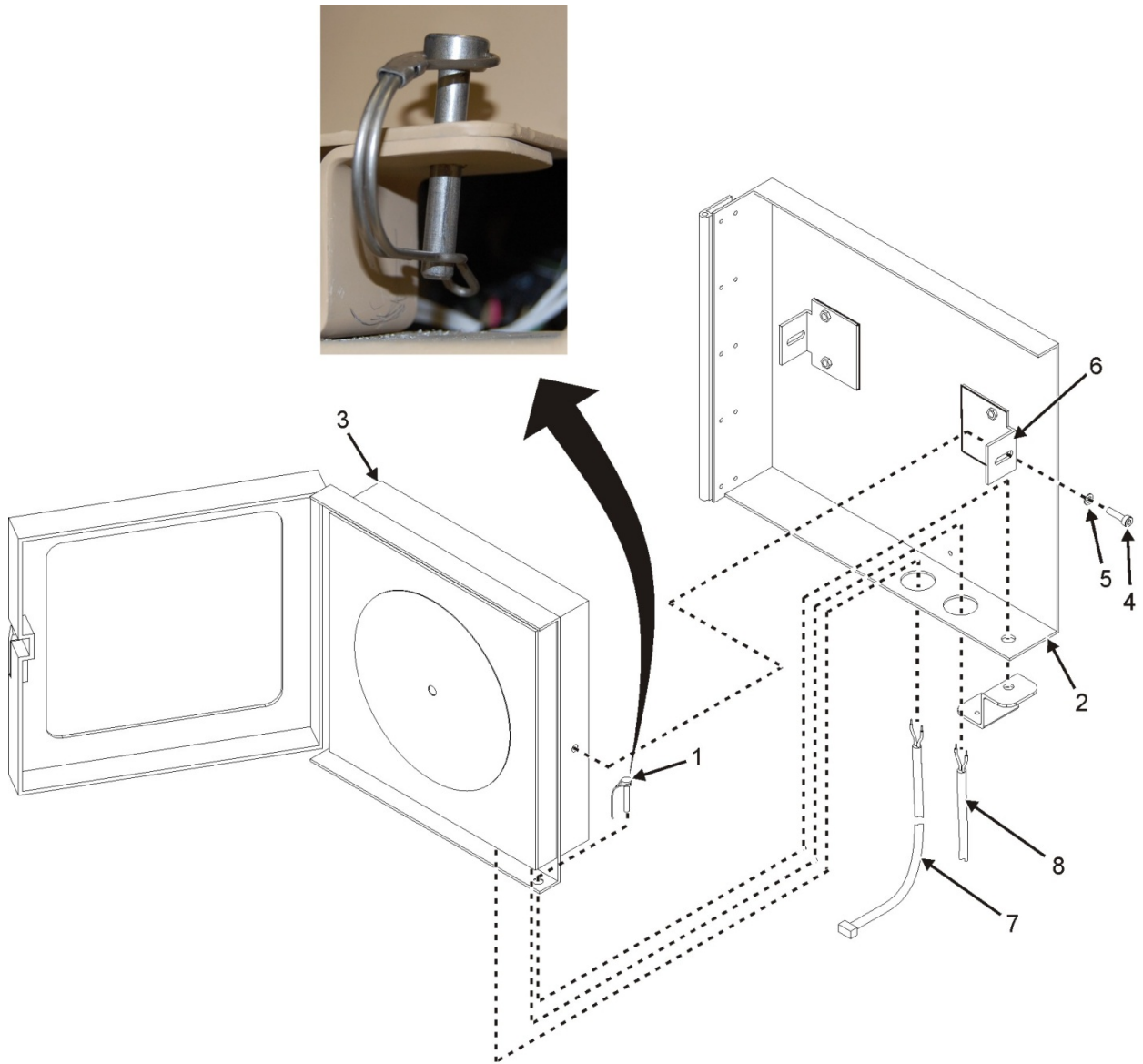


Figure 4. Temperature Chart Recorder Replacement.

REPLACE – CONTINUED**NOTE**

The temperature chart recorder power cable and sensor cables will need to be pulled through the cutouts in the hinged mount bracket when removing the temperature chart recorder.

17. Remove chart recorder (Figure 4, Item 3) and attached cable (Figure 4, Item 7 and Item 8) from hinged mount bracket (Figure 4, Item 2).

NOTE

A new temperature chart recorder will come with both temperature chart recorder sensor cables and a power cable already attached. The temperature chart recorder sensor cables will be completely removed from the MTRCS for each evaporator and remain attached to old temperature chart recorder when removed. Steps 22 through 28 are to be performed for each evaporator temperature chart recorder sensor.

18. Feed power cable (Figure 4, Item 7 and Item 8) through cutouts in mount bracket (Figure 4, Item 6) and install new chart recorder (Figure 4, Item 3); then secure using two bolts, (Figure 4, Item 4) and new lock washers (Figure 4, Item 5).
19. Feed new sensor (Figure 5, Item 5) and cable through container feed through by pushing sensor end through container pass through from outside container wall to inside container wall (Figure 6, Item 5).
20. On inside of container, carefully pull sensor (Figure 5, Item 5) and cable through until enough is through to mount sensor on evaporator cover (Figure 5, Item 3).
21. Carefully pull return air sensor (Figure 5, Item 4) and temperature chart recorder sensor (Figure 5, Item 5) through hole in cover (Figure 5, Item 3).
22. Mount return air sensor (Figure 5, Item 4) and temperature chart recorder sensor (Figure 5, Item 5) to cover and secure with two tie wraps (Figure 5, Item 6).
23. Install tie wraps (Figure 5, Item 6) as needed from mount location forward to where sensor cables pass through container wall while removing slack in cables as needed.
24. On outside of container, secure temperature chart recorder sensor cables using tie wraps up to point where cables enter temperature chart recorder feed through (Figure 5, Item 9).

REPLACE – CONTINUED

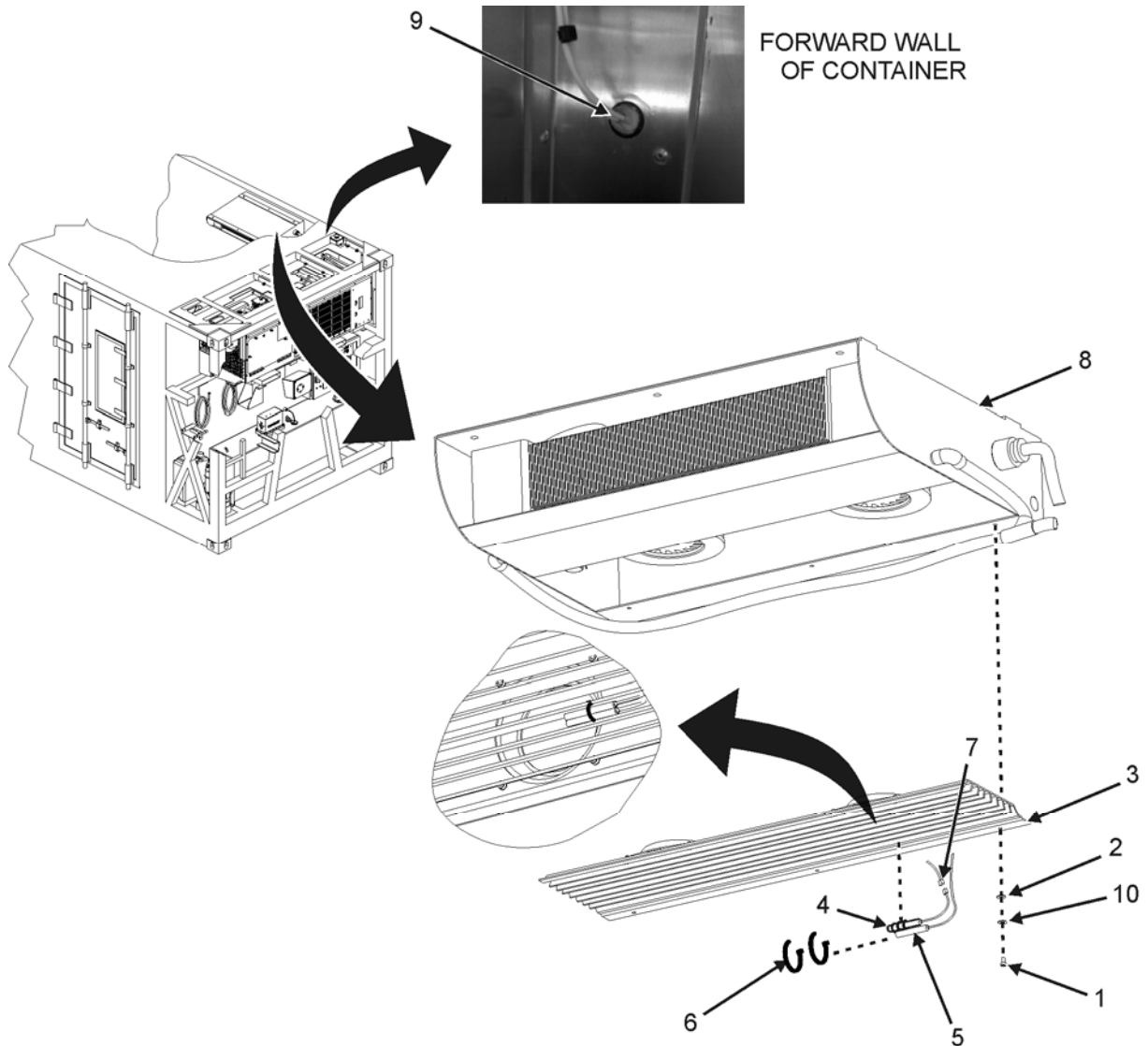


Figure 5. Evaporator Sensors.

25. Swing hinged mount bracket (Figure 4, Item 2) closed and secure to frame by installing snap pin (Figure 4, Item 1).
26. Reconnect battery (WP 0070, Reconnect).
27. On control panel (Figure 3, Item 1), place POWER ON/DOWN switch to ON position.
28. Open temperature chart recorder door (Figure 1, Item 2) by lifting handle up and pulling door open.
29. Press and release CHANGE CHART key (Figure 2, Item 3) on temperature chart recorder keypad.

REPLACE – CONTINUED

30. Green and red pens begin moving towards left outside area of chart.
31. When both pens have stopped above outer ring, unscrew chart hub knob from center of chart.
32. Install new chart paper over center hub.
33. Position chart paper so that correct time line coincides with time line groove on chart plate.
34. Perform Temperature Chart Recorder Service per WP 0027 to set alarm and calibrate pens.

Change Cartridge Pen Arm

Change either cartridge pen arm as follows:

NOTE

Each time the chart paper or fiber tip pen cartridge is changed, make sure that each pen stops at the current temperature of the chart paper. Otherwise, this pen offset can cause the unit to record an incorrect temperature on the chart.

If replacing green cartridge pen arm, it will be necessary to remove the red cartridge pen first in order to gain access to green pen arm screws. Both pen arms are removed the same way.

1. Open chart recorder door (Figure 6, Item 1).
2. Loosen two screws (Figure 6, Item 2) securing metal pen arm (Figure 6, Item 3) and carefully remove pen arm.

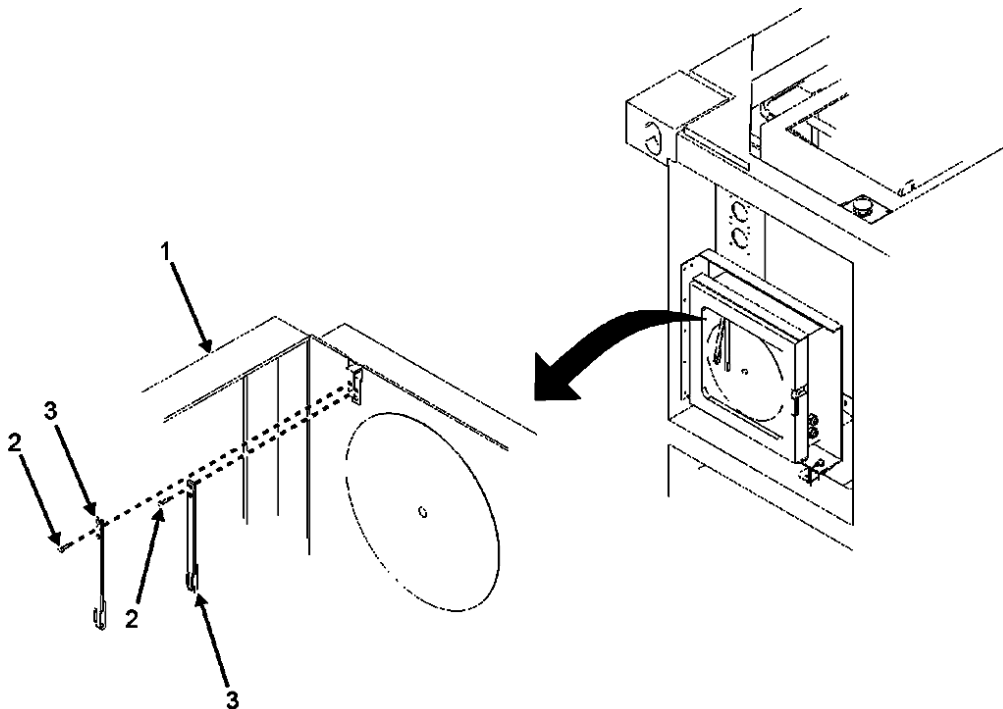


Figure 6. Cartridge Pen Arm Removal.

REPLACE – CONTINUED

3. Turn pen arm over, marker tip up (Figure 7).
4. Release “U” clip tab and lift off of metal pen arm releasing cartridge pen (Figure 7).
5. Dispose of old cartridge pen.
6. Position new cartridge pen onto metal pen arm (Figure 7).
7. Wrap “U” clip tab around pen arm and snap into place (Figure 7).
8. Remove protective pen cap (Figure 7).
9. Install metal pen arm (Figure 6, Item 3) and secure with two screws (Figure 6, Item 2).

NOTE

Each time the chart paper or fiber tip pen cartridge is changed, make sure that each pen stops at the inner and outer most temperature graduation of the chart paper. Otherwise, this pen offset can cause the unit to record an incorrect temperature on the chart.

10. If pen does not touch the paper, adjust pens (WP 0027, Adjust).

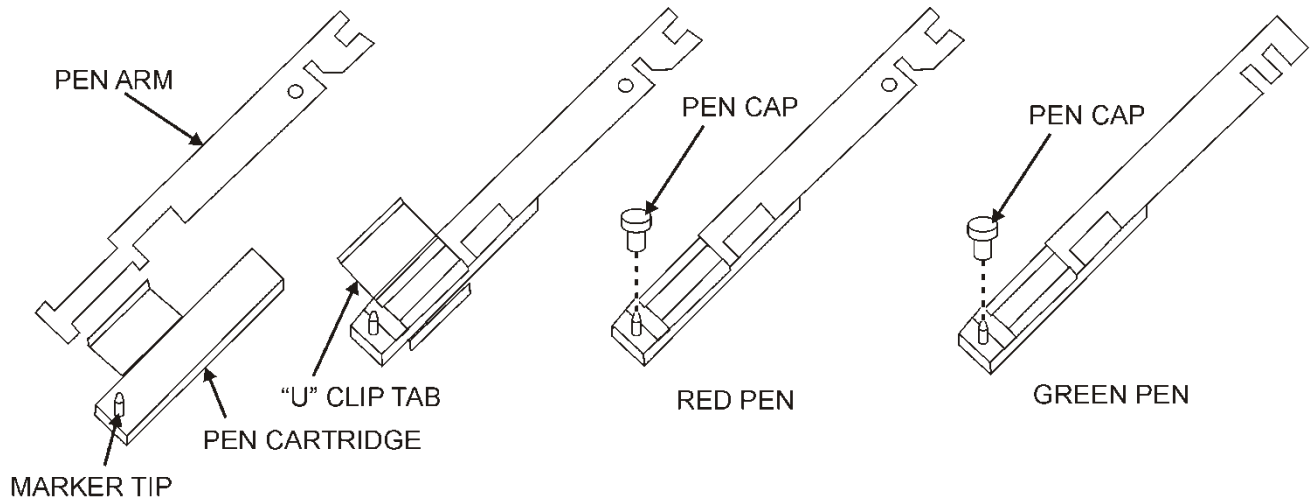


Figure 7. Changing Cartridge Pen Arm.

END OF TASK

END OF WORK PACKAGE

SERVICE MAINTENANCE
DOCUMENT HOLDER
REPLACE, REPAIR

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Table 2, Item 8)
Shield, Face (WP 0110, Item 20)

Materials/Parts

Adhesive (WP 0110, Item 1)
Alcohol, Isopropyl (WP 0110, Item 2)
Gloves, Rubber (WP 0110, Item 21)
Blind Rivet, (0.187 shank diameter x 0.25 grip length)
(WP 0111, Item 9)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0102
TM 10-8145-222-23P

REPLACE

1. Remove contents of document holder and set aside.
2. Remove three bolts (Figure 1, Item 1), lock washers (Figure 1, Item 2), and washers (Figure 1, Item 3) securing document holder (Figure 1, Item 4) to MTRCS frame. Discard lock washers.
3. Remove document holder (Figure 1, Item 4).
4. Install new document holder (Figure 1, Item 4) to MTRCS frame and secure using three bolts (Figure 1, Item 1), new lock washers (Figure 1, Item 2), and washers (Figure 1, Item 3).
5. Tighten bolts (Figure 1, Item 1) (WP 0102).
6. Replace contents of document holder.

REPLACE – CONTINUED

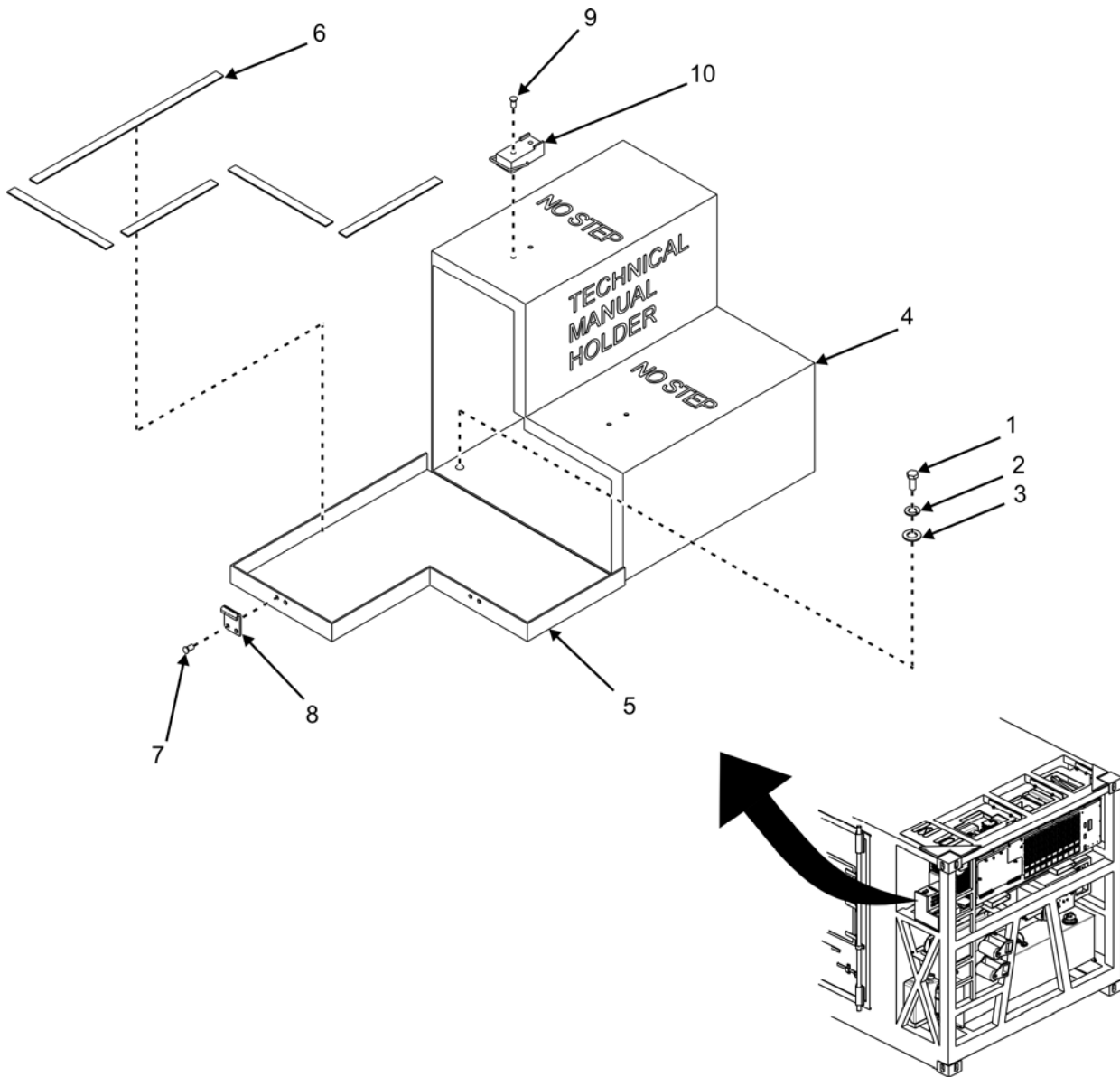


Figure 1. Document Holder.

END OF TASK

REPAIR**Replace Lid Gaskets**

1. Open document holder lid (Figure 1, Item 5).
2. Remove damaged gasket (Figure 1, Item 6) from lid using scraper.
3. Using bulk rubber strip, make five new gasket strips to approximate lengths and widths required on each non-hinged side of lid interior.

WARNING

Wear protective gloves and eye protection when using Isopropyl alcohol. If contact with eyes is made, flush with clean water and seek immediate medical first aid for eyes. Rinse and dry hands immediately after exposure. Failure to observe this warning may result in drying and/or serious damage to the skin.

4. Clean gasket surface area of lid with isopropyl alcohol.

WARNING

Always wear eye, face, and hand protection when working with adhesives. Avoid contact with skin and clothes and do not breathe vapors. If contact is made with eyes or skin, seek immediate medical aid.

5. Apply small quantity of adhesive to entire length of gasket (Figure 1, Item 6) and install on lid (Figure 1, Item 5).
6. Press gasket (Figure 1, Item 6) firmly in place and clean any excess adhesive that may seep from under gasket.
7. Allow adhesive to cure.
8. Close document holder lid (Figure 1, Item 5).

Replace Draw-Pull Catch

1. Open document holder lid (Figure 1, Item 5).

WARNING

Wear eye protection when drilling old rivets out. Rivet chips can be hot and fly in various directions.

2. Drill two rivets (Figure 1, Item 7) out of document holder lid (Figure 1, Item 5) and remove draw (Figure 1, Item 8) of draw-pull catch.
3. Drill two rivets (Figure 1, Item 9) out of top of document holder (Figure 1, Item 4) and remove pull (Figure 1, Item 10) of draw-pull catch.

REPAIR – CONTINUED

4. Remove any burrs left from drilling.
5. Install replacement pull (Figure 1, Item 10) of draw-pull catch in top of document holder (Figure 1, Item 4) using two rivets (Figure 1, Item 9).
6. Install replacement draw (Figure 1, Item 8) of draw-pull catch in document holder lid (Figure 1, Item 5) using two rivets (Figure 1, Item 7).
7. Close document holder lid (Figure 1, Item 5).

END OF TASK**END OF WORK PACKAGE**

CHAPTER 6
FIELD MAINTENANCE INSTRUCTIONS
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
REPAIR

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Table 2, Item 8)
 Shield, Face (WP 0110, Item 20)
 Gloves, Leather (WP 0110, Item 22)
 Shears, Metal Cutting (WP 0110, Item 42)

Materials/Parts

Lock Washer, ¼-in ID (WP 0111, Item 12)
 Blind Rivet (0.125 shank diameter x 0.125 grip length)
 (WP 0111, Item 1)
 Brush, Paint (WP 0110, Item 8)
 Brush, Wire (WP 0110, Item 9)
 Expanding Spray Foam (WP 0110, Item 27)
 Primer Kit, Epoxy, White (WP 0110, Item 19)
 Silicone, Clear Caulking (WP 0110, Item 12)
 Thinner (WP 0110, Item 51)

Materials/Parts (continued)

Towel, Machinery Wiping (WP 0110, Item 52)
 Topcoat, Polyurethane (WP 0110, Item 37)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
 WP 0007
 WP 0023
 TM 43-0139
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)

REPAIR**MTRCS Skin Patch Repair****WARNING**

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

NOTE

The following procedure is applicable to panel patch repair of both interior and exterior skin damage.

Skin repairs to the MTRCS container will require recertification of the container.

1. Open left and right rear doors by first pushing cam handles away from each other (WP 0007, Unloading).
2. Open right door completely and secure to side of container with attached door chain (WP 0007, Unloading).
3. Open left door completely and secure to side of container with attached door chain (WP 0007, Unloading).

REPAIR – CONTINUED

4. Open side door and secure to side of container with attached door chain (WP 0007, Unloading).

CAUTION

Before performing the patch procedure to either an interior or exterior MTRCS wall skin, the damaged area needs to be evaluated. If damage is to an internal structural wall post, the damaged area cannot be patched. Further evaluation of damage to take place at a higher level of maintenance.

The panel patch is an 8-inch by 10-inch pre-drilled metal sheet. A 1-inch minimum overlap is required to securely attach the patch to the MTRCS skin.

5. Evaluate damaged area of skin (Figure 1, Item 1) to see if patch repair is possible using guidelines as follows:
 - If damaged area is limited to exterior or interior wall sheeting, wall can be patched using 8-inch by 10-inch panel patch.
 - If damage is to internal structural wall post, wall cannot be patched. Notify supervisor.
 - If damaged area is greater than 6-inch by 8-inch in size, wall cannot be patched. Notify supervisor.

WARNING

If the container skin has been damaged, there will be sharp metal edges capable of causing severe and deep cuts to your skin. Always wear protective gloves when working with damaged metal surfaces.

6. Using metal cutting shears, remove as much damaged metal as possible without enlarging damaged area of skin (Figure 1, Item 1). Make sure surface is flat after trimming.
7. Carefully press remaining damaged metal down to allow attachment of patch panel (Figure 1, Item 2).

WARNING

Rubber gloves, face and eye protection should be worn when handling any chemicals. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury.

8. Spray expanding foam insulation into affected area of damage until filled.

NOTE

The spray foam used for this repair is expanding type foam. The foam will expand to completely fill the damage void.

9. Allow foam insulation to cure until hardened.

REPAIR – CONTINUED

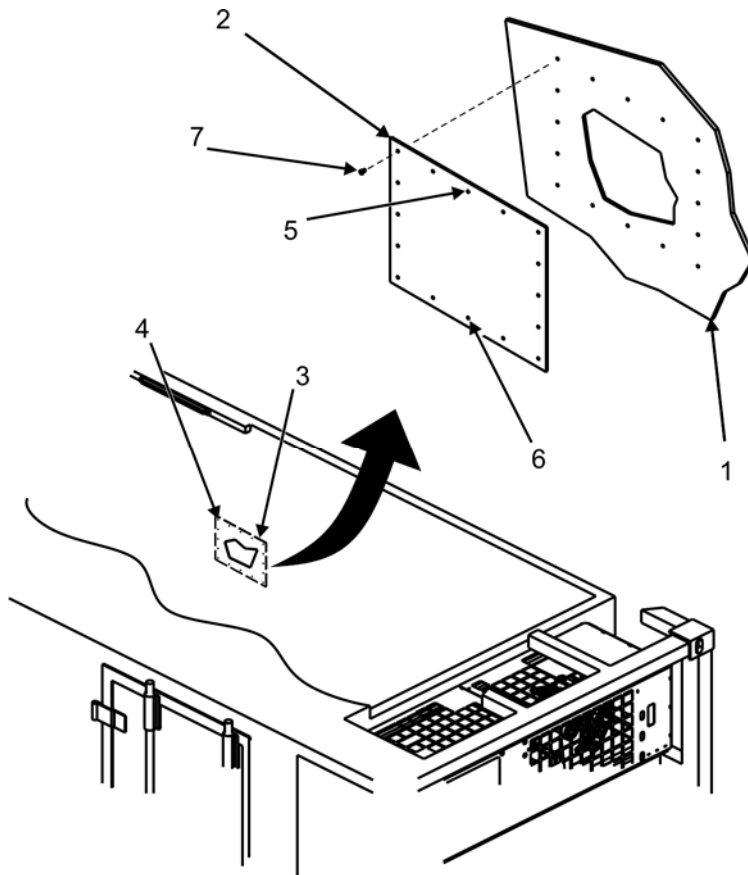


Figure 1. MTRCS Skin Patch Repair.

WARNING

The foam insulation will have to be trimmed flush to allow the patch panel to be installed. Use of a hacksaw blade to trim the hardened foam is required. The hacksaw blade is sharp and can cause severe cuts to your skin. Use protective gloves.

10. Use hacksaw blade to carefully cut hardened excess foam insulation so it is flush with surface of skin.
11. Place 8-inch by 10-inch patch panel (Figure 1, Item 2) over damaged area of skin (Figure 1, Item 1).
12. Using pencil or other marking device, mark perimeter (Figure 1, Item 3) of patch panel (Figure 1, Item 2) on damaged area.

REPAIR – CONTINUED**NOTE**

Be sure to mark rivet-hole locations so that rivet will not be installed into grooved area in wall.

13. Using pencil or other marking device, mark rivet-hole locations (Figure 1, Item 4) on damaged skin (Figure 1, Item 1).
14. Remove patch panel (Figure 1, Item 2) and check that a 1-inch minimum overlap exists over damaged area of skin (Figure 1, Item 1).
15. Place patch panel (Figure 1, Item 2) back in place where it is to be installed.
16. Drill one 1/8-inch hole (Figure 1, Item 5) through top hole of patch panel (Figure 1, Item 2) into skin.
17. Drill one 1/8-inch hole (Figure 1, Item 6) through bottom hole of patch panel (Figure 1, Item 2) into skin.
18. Remove patch panel (Figure 1, Item 2).

NOTE

When applying silicone caulk to perimeter of patch be sure to fill grooved areas of the wall.

19. Apply clear silicone caulk to perimeter of patch panel (Figure 1, Item 2) backside along hole centerlines.
20. Apply clear silicone caulk to barrel of two pop rivets (Figure 1, Item 7).
21. Place patch panel (Figure 1, Item 2) with caulked backside against damaged area of skin (Figure 1, Item 1).
22. Partially install patch panel (Figure 1, Item 2) to skin by installing two caulked pop rivets (Figure 1, Item 7) into top and bottom holes of patch panel (Figure 1, Item 2) and previously drilled holes in skin.
23. Using patch panel (Figure 1, Item 2) as a template, match drill 14 remaining 1/8-inch patch panel holes into damaged area of skin (Figure 1, Item 1).
24. Apply clear silicone caulk to barrel of 14 remaining pop rivets (Figure 1, Item 7).
25. Secure patch panel (Figure 1, Item 2) to skin by installing 14 remaining caulked pop rivets (Figure 1, Item 7) into remaining holes of patch panel and previously drilled holes.
26. Apply clear silicone caulk to outside perimeter of patch panel (Figure 1, Item 2) after all rivets (Figure 1, Item 7) are installed.
27. Wipe away excess caulk.

REPAIR – CONTINUED**WARNING**

MTRCS doors are very heavy and solid objects. Use care when closing doors. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

28. Close and secure side container door and left and right rear container doors (WP 0007, Unloading).
29. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace PLS Roller Lanyards**NOTE**

This procedure can be used to replace either the lanyard or the chain. The PLS roller may be in either the stored position (front of container) or in the deployed position (rear of container).

1. Remove damaged PLS roller from deployed or stored position (WP 0023, Remove).
2. Remove locking clip (Figure 2, Item 1) securing pin (Figure 2, Item 2).

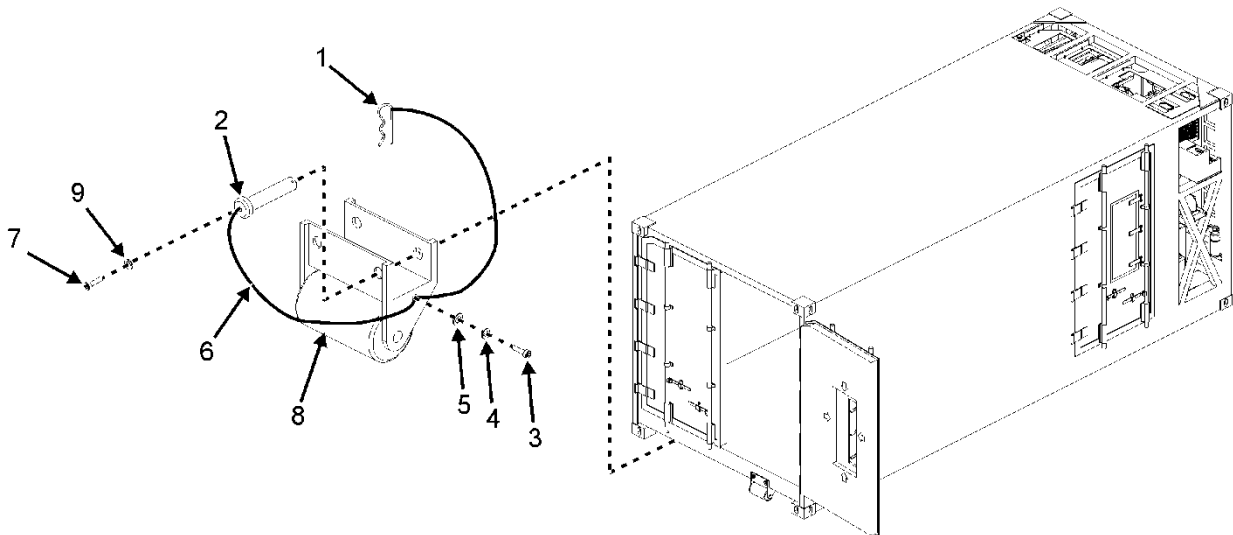


Figure 2. PLS Roller Lanyards.

3. Remove one screw (Figure 2, Item 3), lock washer (Figure 2, Item 4), and washer (Figure 2, Item 5) securing lanyard chain (Figure 2, Item 6) to PLS roller (Figure 2, Item 8). Discard lock washer.
4. Remove one screw (Figure 2, Item 7) and washer (Figure 2, Item 9) securing lanyard chain (Figure 2, Item 6) to pin (Figure 2, Item 2).
5. Remove lanyard chain (Figure 2, Item 6).

REPAIR – CONTINUED

6. Install lanyard chain (Figure 2, Item 6) and secure to pin (Figure 2, Item 2) using one screw (Figure 2, Item 7) and washer (Figure 2, Item 9).
7. Install lanyard chain (Figure 2, Item 6) and secure to PLS roller (Figure 2, Item 8) using one screw (Figure 2, Item 3), new lock washer (Figure 2, Item 4), and washer (Figure 2, Item 5).
8. Install pin (Figure 2, Item 2) into PLS roller (Figure 2, Item 8) and secure using locking clip (Figure 2, Item 1).
9. Install PLS roller in either stored or deployed position it was removed from (WP 0023, Install).

Replace Swing Out Panels Lanyard, Clips

1. Unload insulated container to extent necessary to gain access to damaged swing out panel (WP 0007, Unloading).
2. Remove four bolts (Figure 3, Item 5) and lock washers (Figure 3, Item 9) securing applicable mount bracket (Figure 3, Item 6) and swing out panel (Figure 3, Item 3) to container. Discard lock washers.
3. Remove swing out panel (Figure 3, Item 3) and place on a flat work surface.

WARNING

Wear eye protection when drilling old rivets out. Rivet chips can be hot and fly in various directions.

4. Drill out and remove rivet (Figure 3, Item 1, or Item 7) securing lanyard (Figure 3, Item 2) or clip (Figure 3, Item 8) to swing out panel (Figure 3, Item 3).
5. Remove lanyard (Figure 3, Item 2) or clip (Figure 3, Item 8).
6. Install new lanyard (Figure 3, Item 2) or clip (Figure 3, Item 8) to swing out panel (Figure 3, Item 3) and secure using rivet (Figure 3, Item 1, or Item 7).

NOTE

The pin is a key-chain style connector. No tools are needed to install the pin to the lanyard.

7. Install new pin (Figure 3, Item 4) onto lanyard (Figure 3, Item 2).
8. Install swing out panel (Figure 3, Item 3) and mounting bracket (Figure 3, Item 6) to container and secure using four bolts (Figure 3, Item 5) and new lock washers (Figure 3, Item 9).
9. Reload any removed cargo into container (WP 0007, Loading).

REPAIR – CONTINUED

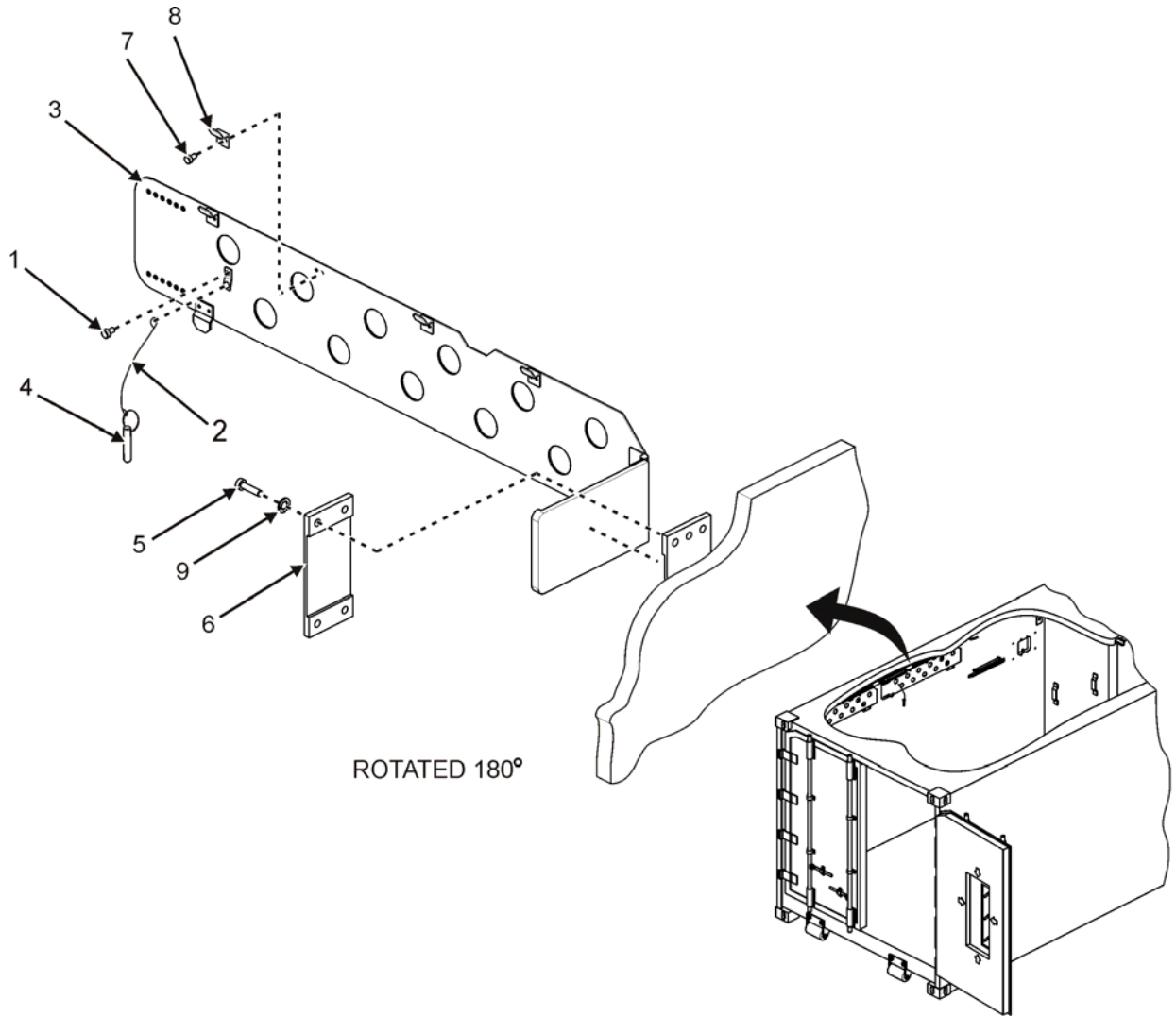


Figure 3. Swing Out Panel Lanyard and Clips.

REPAIR – CONTINUED**Touch up Paint**

The following procedures provide you with a guide to applying touch up paint to the MTRCS. Refer to TM 43-0139 for additional guidance regarding the painting of U.S. Army materiel.

Topcoat Application Without Primer.**WARNING**

MIL-C-85285C Type 1 topcoat is combustible. Keep away from excessive heat, sparks, electrical equipment, and open flames.

MIL-C-85285C Type 1 topcoat may be irritating to eyes and skin if contact is made. Wear protective clothing, gloves, and face shield. Wash areas of skin thoroughly with soap and water. Flush eyes with lukewarm low pressure water for 15 minutes and seek medical attention.

Vapors from MIL-C-85285C Type 1 topcoat may be irritating to eyes, nose, and throat. Avoid prolonged exposure and use only in a well ventilated area.

CAUTION

Epoxy topcoat can only be applied over previously epoxy-polyurethane cured surfaces. MIL-PRF-85285 is an epoxy topcoat. Failure to observe this precaution may cause damage to equipment.

If damaged area requires sanding down to metal, primer must be applied to surface before painting. Do not perform this procedure. Instead, perform Topcoat Application With Primer procedure.

NOTE

Area of application must be clean, structurally sound, and free of dirt, wax, loose paint, grease, or other foreign contaminants.

1. If area to be painted has old paint that is peeling, remove old paint with wire brush.
2. Clean area to be painted or resurfaced using detergent mixture.
3. If area to be painted is heavily soiled, wash area with cleaner for 3 to 5 minutes and allow to air dry.

NOTE

Scuff sanding the area to be painted or resurfaced before application of primer provides a good surface for bonding.

4. Scuff sand area to be painted using 80-100 grit sand paper.
5. Wipe sanded area clean using alcohol and wipe dry with clean towel.

NOTE

MIL-C-85285C Type 1 topcoat is a two-part component that must be mixed prior to use.

6. Mix topcoat at a ratio of four parts pigmented component to one part catalyst by volume.

REPAIR – CONTINUED

7. Let material stand for 15 minutes before applying to allow for chemical induction.
8. Brush topcoat on to affected area needing touch up.

Topcoat Application With Primer.**WARNING**

DOD-P-15328 wash primer is combustible. Keep away from excessive heat, sparks, electrical equipment, and open flames.

DOD-P-15328 wash primer may be irritating to eyes and skin if contact is made. Wear protective clothing, gloves, and face shield. Wash areas of skin thoroughly with soap and water. Flush eyes with lukewarm low pressure water for 15 minutes and seek medical attention.

Vapors from DOD-P-15328 wash primer may be irritating to eyes, nose, and throat. Avoid prolonged exposure and use only in a well ventilated area.

CAUTION

Epoxy topcoat can only be applied over previously epoxy-polyurethane cured surfaces. MIL-PRF-85285 is an epoxy topcoat. Failure to observe this precaution may cause damage to equipment.

NOTE

Area of application must be clean, structurally sound, and free of dirt, wax, loose paint, grease, or other foreign contaminants.

1. If area to be painted has old paint that is peeling, remove old paint with wire brush.
2. Clean area to be painted or resurfaced using detergent mixture.
3. If area to be painted is heavily soiled, wash area with cleaner for 3 to 5 minutes and allow to air dry.
4. Sand damaged area down to bare metal.

NOTE

DOD-P-15328 wash primer is a two-part component that must be mixed prior to use.

DOD-P-15328 wash primer is tack free within 10 minutes of application and is dry hard after 1 hour.

5. Mix wash primer at a ratio of one part base to one part catalyst by volume.
6. Apply wash primer to affected area using a light brush coat to a thickness of 0.3 to 0.5 mils.
7. Allow area to dry for a minimum of 30 minutes.

REPAIR – CONTINUED**WARNING**

MIL-P-53022B Type 1 epoxy primer is combustible. Keep away from excessive heat, sparks, electrical equipment, and open flames.

MIL-P-53022B Type 1 epoxy primer may be irritating to eyes and skin if contact is made. Wear protective clothing, gloves, and face shield. Wash areas of skin thoroughly with soap and water. Flush eyes with lukewarm low pressure water for 15-minutes and seek medical attention.

Vapors from MIL-P-53022B Type 1 epoxy primer may be irritating to eyes, nose, and throat. Avoid prolonged exposure and use only in a well ventilated area.

NOTE

MIL-P-53022B Type 1 epoxy primer is a two-part component that must be mixed prior to use.

MIL-P-53022B Type 1 epoxy primer is tack free within 5 minutes and is dry hard within 90-minutes.

8. Mix epoxy primer at a ratio of four parts epoxy primer to one part catalyst by volume.
9. Apply epoxy primer to affected area using a light brush coat.
10. Allow area to dry for a minimum of 30 minutes before applying next coat.

WARNING

MIL-C-85285C Type 1 topcoat is combustible. Keep away from excessive heat, sparks, electrical equipment, and open flames.

MIL-C-85285C Type 1 topcoat may be irritating to eyes and skin if contact is made. Wear protective clothing, gloves, and face shield. Wash areas of skin thoroughly with soap and water. Flush eyes with lukewarm low pressure water for 15 minutes and seek medical attention.

Vapors from MIL-C-85285C Type 1 topcoat may be irritating to eyes, nose, and throat. Avoid prolonged exposure and use only in a well ventilated area.

NOTE

MIL-C-85285C Type 1 topcoat is a two-part component that must be mixed prior to use.

11. Mix topcoat at a ratio of four parts pigmented component to one part catalyst by volume. REPAIR – CONTINUED
12. Let material stand for 15 minutes before applying to allow for chemical induction.
13. Brush topcoat on to affected area needing touch up.

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
FUEL TANK
REPLACE, REPAIR

INITIAL SETUP:**Tools and Special Tools**

Electrical Connector Kit (WP 0107, Table 2, Item 3)
Gloves, Rubber (WP 0110, Item 21)
SATS (WP 0107, Table 2, Item 8)
Shield, Face (WP 0110, Item 20)
Spill Kit (WP 0110, Item 49)

Materials/Parts

Silicone, RTV (WP 0110, Item 45)
Threadlocker, Sealing Compound (WP 0110, Item 41)
Tie Wraps (WP 0110, Item 55)
Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Quartermaster and Chemical Equipment Repairer
(6)

References

WP 0005
WP 0030
WP 0049
WP 0070
WP 0102
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)
Battery disconnected (WP 0070)

REPLACE**Remove Fuel Tank****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

The fuel tank will retain a small amount of fuel even after it has been drained. Fuel lines will have some fuel in them that will drain out when disconnected. Use cleaning rags or spill kit to clean up any spills when performing the following tasks.

1. Drain fuel from fuel tank into suitable container (WP 0030, Service).
2. Remove fuel pump from fuel tank (WP 0049, Remove).
3. Remove fuel tank cap (Figure 1, Item 18) and attached filler tube by pulling tube up and rotating out of filler neck flange (Figure 1, Item 26). Retain for reinstallation.
4. Disconnect 3/8-inch fuel line (Figure 1, Item 1) from fuel tank outlet elbow (Figure 1, Item 2).

REPLACE – CONTINUED

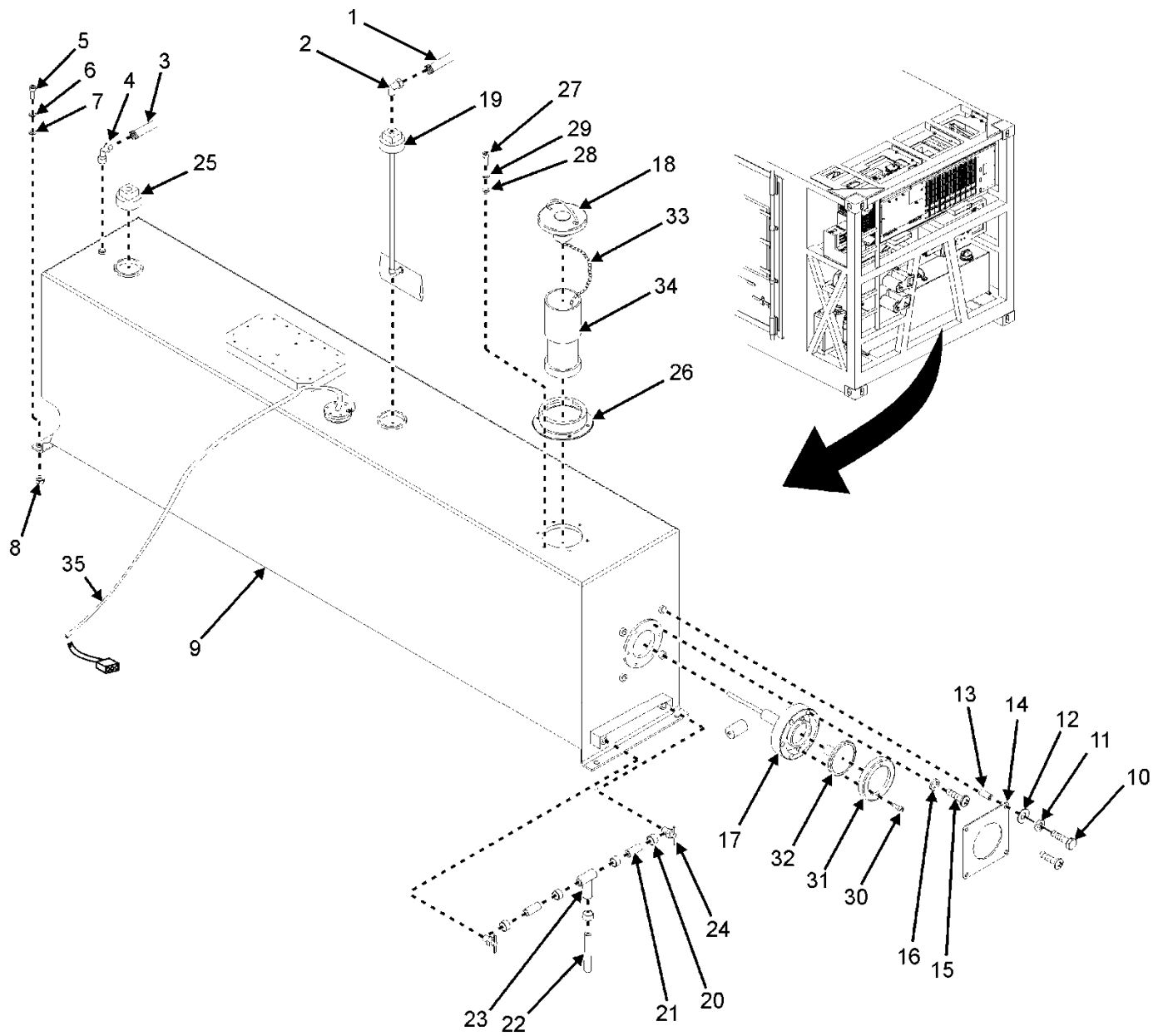


Figure 1. Fuel Tank.

REPLACE – CONTINUED**NOTE**

Note the orientation of the elbow when removed so that it can be reinstalled on the new tank in the same orientation.

5. Remove outlet elbow (Figure 1, Item 2) from tank. Retain for reinstallation.
6. Disconnect fuel sending unit electrical connector P4/J4 on wire harness (Figure 1, Item 35).
7. Disconnect 1/4-inch fuel line (Figure 1, Item 3) from fuel tank inlet elbow (Figure 1, Item 4).

NOTE

Due to the tight clearances of the fuel tank, it may be necessary to remove the fuel tank filler neck to gain the needed clearance to slide the tank out of the MTRCS frame. If you need to remove the filler neck, perform steps 8 through 10.

8. Remove six screws (Figure 1, Item 27), lock washers (Figure 1, Item 29), and washers (Figure 1, Item 28) securing filler neck flange (Figure 1, Item 26) to tank (Figure 1, Item 9). Discard lock washers.

CAUTION

Foreign debris inside a fuel tank can cause severe damage to engine and accessory component. When removing sealant from filler neck flange, use care not to allow pieces of sealant to drop inside of tank.

9. Cut sealant away from filler neck flange (Figure 1, Item 26).
10. Break seal on filler neck flange (Figure 1, Item 26) and remove filler neck flange (Figure 1, Item 26).
11. Remove four screws (Figure 1, Item 5), lock washers (Figure 1, Item 6), washers (Figure 1, Item 7), and nuts (Figure 1, Item 8) securing fuel tank (Figure 1, Item 9) to frame. Discard lock washers.

WARNING

The fuel tank empty weight is approximately 225 pounds and is awkward to install into the MTRCS frame. Use 5-6 persons to install tank to prevent personal injury.

12. Remove fuel tank (Figure 1, Item 9) by sliding tank out left side of frame.

REPLACE – CONTINUED**Install Fuel Tank****WARNING**

The fuel tank empty weight is approximately 225 pounds and is awkward to remove from the MTRCS frame. Use 5-6 persons to remove tank to prevent personal injury.

NOTE

Due to the tight clearances of the fuel tank, it may be necessary to remove the fuel tank filler neck to gain the needed clearance to slide the tank into the MTRCS frame. If you need to remove the filler neck, perform steps 1 through 3.

1. Remove six screws (Figure 1, Item 27), lock washers (Figure 1, Item 29), and washers (Figure 1, Item 28) securing filler neck flange (Figure 1, Item 26) to new tank (Figure 1, Item 9).
2. Cut sealant away from filler neck flange (Figure 1, Item 26).
3. Carefully remove filler neck flange (Figure 1, Item 26) as needed to break seal and remove filler neck flange (Figure 1, Item 26).

NOTE

When installing the fuel tank, make sure that the liquid level gauge is facing the outside of the MTRCS frame.

4. Install fuel tank with fuel gauge orientated to the outside of the frame (Figure 1, Item 9) into position on frame.
5. Install four screws (Figure 1, Item 5), new lock washers (Figure 1, Item 6), washers (Figure 1, Item 7), and nuts (Figure 1, Item 8) to attach fuel tank (Figure 1, Item 9) to frame.
6. Tighten fuel tank mounting hardware (WP 0102).

CAUTION

Make sure that filler neck flange mounting area is free of sealant and other debris before installing filler neck flange into tank. Failure to do so can result in a poor sealing surface and possible leaks.

7. Apply a light bead of RTV around the outside of the filler neck flange (Figure 1, Item 26).
8. Install filler neck flange (Figure 1, Item 26) and secure to tank using six screws (Figure 1, Item 27), new lock washers (Figure 1, Item 29), and washers (Figure 1, Item 28).
9. Connect 1/4-inch fuel line (Figure 1, Item 3) to tank inlet elbow (Figure 1, Item 4).
10. Install inlet elbow (Figure 1, Item 2) onto tank.
11. Connect 3/8-inch fuel line (Figure 1, Item 1) to tank inlet elbow (Figure 1, Item 2).
12. Connect fuel sending unit electrical connector P4/J4 on wire harness (Figure 1, Item 35).

REPLACE – CONTINUED

13. Install fuel pump, but only place cover on top of fuel pump without attaching (WP 0049, Install).
14. Install filler tube into filler neck flange (Figure 1, Item 26).
15. Fill fuel tank with fuel (WP 0030, Service).
16. Install fuel tank cap (Figure 1, Item 18).
17. Check fuel tank, elbows, and fittings for leaks.
18. Secure fuel pump cover if no leaks are present (WP 0049, Install).
19. Reconnect battery (WP 0070, Reconnect).
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**REPAIR****Replace Liquid Level Gauge Assembly****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

The fuel tank will retain a small amount of fuel even after it has been drained. Fuel lines will have some fuel in them that will drain out when disconnected. Use cleaning rags to clean up any spills when performing the following tasks.

1. Drain fuel from fuel tank into suitable container (WP 0030, Service).
2. Remove four screws (Figure 2, Item 10), lock washers (Figure 2, Item 11), washers (Figure 2, Item 12), and spacers (Figure 2, Item 13), securing guard (Figure 2, Item 14) to fuel tank (Figure 2, Item 9). Discard lock washers.
3. Remove guard (Figure 2, Item 14).
4. Remove two screws (Figure 2, Item 30) securing outer gauge cover (Figure 2, Item 31) to gauge facing (Figure 2, Item 32).

REPAIR – CONTINUED**NOTE**

The liquid level gauge consists of the gauge, a center shaft, gears, float arm, and float. Use care when removing the entire assembly from the fuel tank, as it can be bulky and difficult to maneuver.

5. Carefully remove liquid level gauge dial face (Figure 2, Item 32) from housing with float assembly (Figure 2, Item 17) from fuel tank (Figure 2, Item 9).
6. Remove six remaining hex head screws (Figure 2, Item 15) and washers (Figure 2, Item 16) securing housing with float assembly (Figure 2, Item 17) to fuel tank (Figure 2, Item 9).
7. Remove housing unit with gasket or trim sealant as required from housing mount area.

NOTE

The housing is secured to the tank with sealant. It is not threaded into the tank. It will be necessary to pry and pull the housing out of the tank.

8. Carefully remove housing with float assembly (Figure 2, Item 17) from fuel tank (Figure 2, Item 9).
9. Clean excess sealant material from housing mount area by scraping excess away and using machinery wiping towel.

WARNING

RTV may cause eye and skin irritation. Over frequent or extended periods of use, RTV may cause irritation to the respiratory system. Use in a well-ventilated area. Wear eye protection and gloves when using RTV.

10. Apply sealant around mounting surface on fuel tank (Figure 2, Item 9) where housing contacts tank.

NOTE

The housing with float assembly has a keyway located at the six o'clock position that corresponds to a notch on the gauge dial face. The gauge dial face can be installed only one way into the housing with float assembly.

11. Carefully install replacement housing with float assembly (Figure 2, Item 17) onto fuel tank (Figure 2, Item 9) with keyway at the six o'clock position.
12. Apply threadlocking compound to threads of six hex head screws (Figure 2, Item 15).
13. Install six hex head screws (Figure 2, Item 15) and washers (Figure 2, Item 16) to secure housing with float assembly (Figure 2, Item 17) to fuel tank (Figure 2, Item 9).
14. Tighten six screws (Figure 2, Item 15) (WP 0102) in a crossing pattern.

REPAIR – CONTINUED**NOTE**

The housing with float assembly has a keyway located at the six o'clock position that corresponds to a notch on the gauge dial face. The gauge dial face can be installed only one way into the housing with float assembly.

15. Install gauge dial face (Figure 2, Item 32) into housing with float assembly (Figure 2, Item 17) noting keyway.
16. Install outer gauge cover (Figure 2, Item 31) and secure with two screws (Figure 2, Item 30).
17. Install guard (Figure 2, Item 14) over liquid level gauge (Figure 2, Item 17) and secure using four screws (Figure 2, Item 10), washers (Figure 2, Item 12), new lock washers (Figure 2, Item 11), and spacers (Figure 2, Item 13).
18. Tighten four guard screws (Figure 2, Item 10) (WP 0102).
19. Allow sealant to cure for 15 minutes before filling tank with fuel.
20. Fill fuel tank with fuel (WP 0030, Service).
21. Check for leaks around liquid level gauge (Figure 2, Item 17).
22. Connect battery (WP 0070, Reconnect).
23. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Fuel Level Sending Unit**WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

The fuel tank will retain a small amount of fuel even after it has been drained. Fuel lines will have some fuel in them that will drain out when disconnected. Use cleaning rags to clean up any spills when performing the following tasks.

1. Drain fuel from fuel tank into suitable container (WP 0030, Service).
2. Disconnect fuel sending unit electrical connector P4/J4 (Figure 3, Item 1) on wire harness (Figure 3, Item 2).
3. Remove six bolts (Figure 3, Item 3), lock washers (Figure 3, Item 4), and washers (Figure 3, Item 5), and green ground wire (Figure 3, Item 6) securing sending unit mount (Figure 3, Item 7) to fuel tank (Figure 3, Item 8). Discard lock washers.

REPAIR – CONTINUED

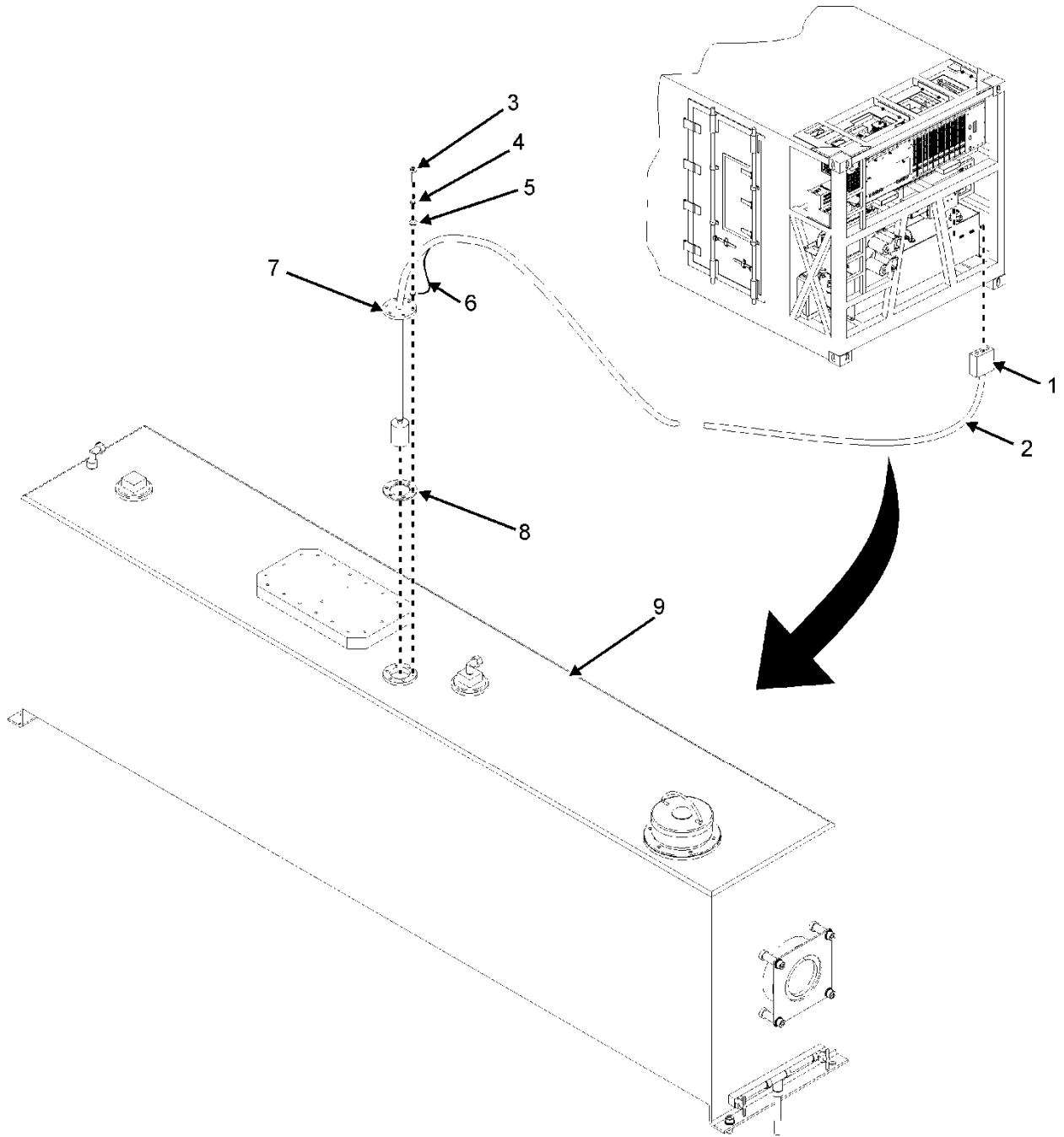


Figure 3. Fuel Sending Unit.

REPAIR – CONTINUED

4. Carefully pry and pull fuel level sending unit mount (Figure 3, Item 7) and gasket (Figure 3, Item 8), with sending unit attached, out of fuel tank (Figure 3, Item 9).
5. Clean gasket and RTV silicone from tank (Figure 3, Item 9) at fuel sending unit mount area.
6. Install gasket (Figure 3, Item 8) over liquid level switch and pipe until flush with fuel sending unit mount flange.
7. Carefully lower sending unit into fuel tank until flush with tank (Figure 3, Item 9).
8. Install green ground wire (Figure 3, Item 6) to sending unit mount at location where removed using one bolt (Figure 3, Item 3), new lock washer (Figure 3, Item 4) and washer (Figure 3, Item 5). Do not tighten bolt at this time.
9. Install remaining five bolts (Figure 3, Item 3), new lock washers (Figure 3, Item 4), and washers (Figure 3, Item 5) to secure sending unit.
10. Tighten six sending unit mount bolts (Figure 3, Item 3) in cross tightening pattern (WP 0102).
11. Connect fuel sending unit electrical connector P4/J4 (Figure 3, Item 1) on wire harness (Figure 3, Item 2).

WARNING

Rubber gloves, face, and eye protection should be worn when handling chemicals. Failure to wear proper protective clothing and equipment may result in skin irritation and/or serious eye injury.

12. Apply sealing compound to fuel level sending unit area of wire feed through.
13. Allow sealing compound to cure approximately two hours until hard.
14. Fill fuel tank with fuel (WP 0030, Service).
15. Connect battery (WP 0070, Reconnect).
16. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED**Replace Fuel Tank Cap****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

Use cleaning rags or spill kit to clean up any spills when performing the following tasks.

1. Disconnect battery (WP 0070, Disconnect).

NOTE

The fuel tank cap is attached to the fuel tank with a short chain.

2. Remove fuel tank cap (Figure 4, Item 1) from fuel tank (Figure 4, Item 2) by turning counterclockwise and lifting.
3. Allow fuel tank cap (Figure 4, Item 1) to rest on top of fuel tank (Figure 4, Item 2), then unhook and remove fuel tank cap (Figure 4, Item 1) from chain (Figure 4, Item 3).
4. Install replacement fuel tank cap (Figure 4, Item 1) and hook into place on chain (Figure 4, Item 3).
5. Install replacement cap (Figure 4, Item 1) onto fuel tank (Figure 4, Item 2) and turn in clockwise direction to lock in place.
6. Connect battery (WP 0070, Reconnect).
7. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

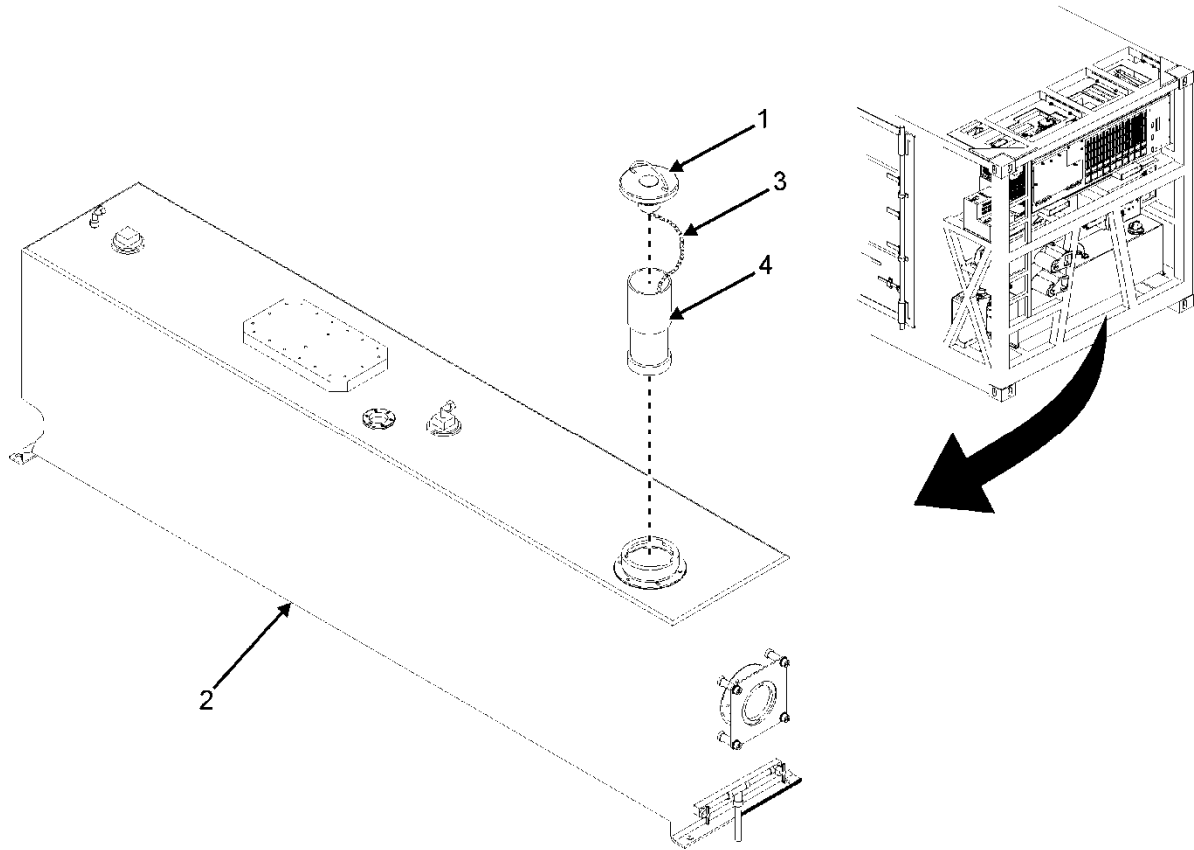


Figure 4. Fuel Cap/Filler Neck/Strainer.

REPAIR – CONTINUED**Replace Filler Neck Flange/Strainer****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

Fuel lines will have some fuel in them that will drain out when disconnected. Use cleaning rags or spill kit to clean up any spills when performing the following tasks.

1. Disconnect battery if not already disconnected (WP 0070, Disconnect).
2. Remove fuel tank cap (Figure 4, Item 1) from fuel tank (Figure 4, Item 2) by turning counterclockwise and lifting.
3. Unhook fuel tank cap (Figure 4, Item 1) and chain (Figure 4, Item 3) from fuel tank filler flange (Figure 4, Item 4). Retain for reinstallation.
4. Pull filler neck flange (Figure 4, Item 4) out of fuel tank (Figure 4, Item 2) and rotate to lock in place.
5. Pull filler neck flange (Figure 4, Item 4) up again and rotate to remove flange from fuel tank (Figure 4, Item 2).
6. Install replacement filler neck flange (Figure 4, Item 4) into fuel tank (Figure 4, Item 2) and rotate twice to allow flange to lower into tank.
7. Hook fuel tank cap (Figure 4, Item 1) and chain (Figure 4, Item 3) to replacement filler neck flange (Figure 4, Item 4).
8. Install fuel tank cap (Figure 4, Item 1) onto filler neck flange (Figure 4, Item 4) and secure in place by rotating clockwise.
9. Reconnect battery (WP 0070, Reconnect).
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedure).

REPAIR – CONTINUED**Replace Elbow****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

Fuel lines will have some fuel in them that will drain out when disconnected. Use cleaning rags or spill kit to clean up any spills when performing the following tasks.

NOTE

There are two elbows of different sizes located on top of the fuel tank. The following elbow replacement procedure is applicable to both the 1/4-inch return elbow and 3/8-inch fuel feed elbow located on the top of the fuel tank.

1. Disconnect battery if not already disconnected (WP 0070, Disconnect).
2. Loosen 1/4-inch return line fitting (Figure 5, Item 1) or 3/8-inch fuel feed line (Figure 5, Item 2) fitting at applicable elbow (Figure 5, Item 3 or Item 4).
3. Remove fuel line (Figure 5, Item 1 or Item 2) from elbow (Figure 5, Item 3 or Item 4).
4. Clean any fuel leakage from line with machinery wiping towels. Dispose of contaminated towels in accordance with unit SOP.
5. Remove applicable elbow (Figure 5, Item 3 or Item 4) from fuel tank (Figure 5, Item 5) by turning in counterclockwise direction.

REPAIR – CONTINUED

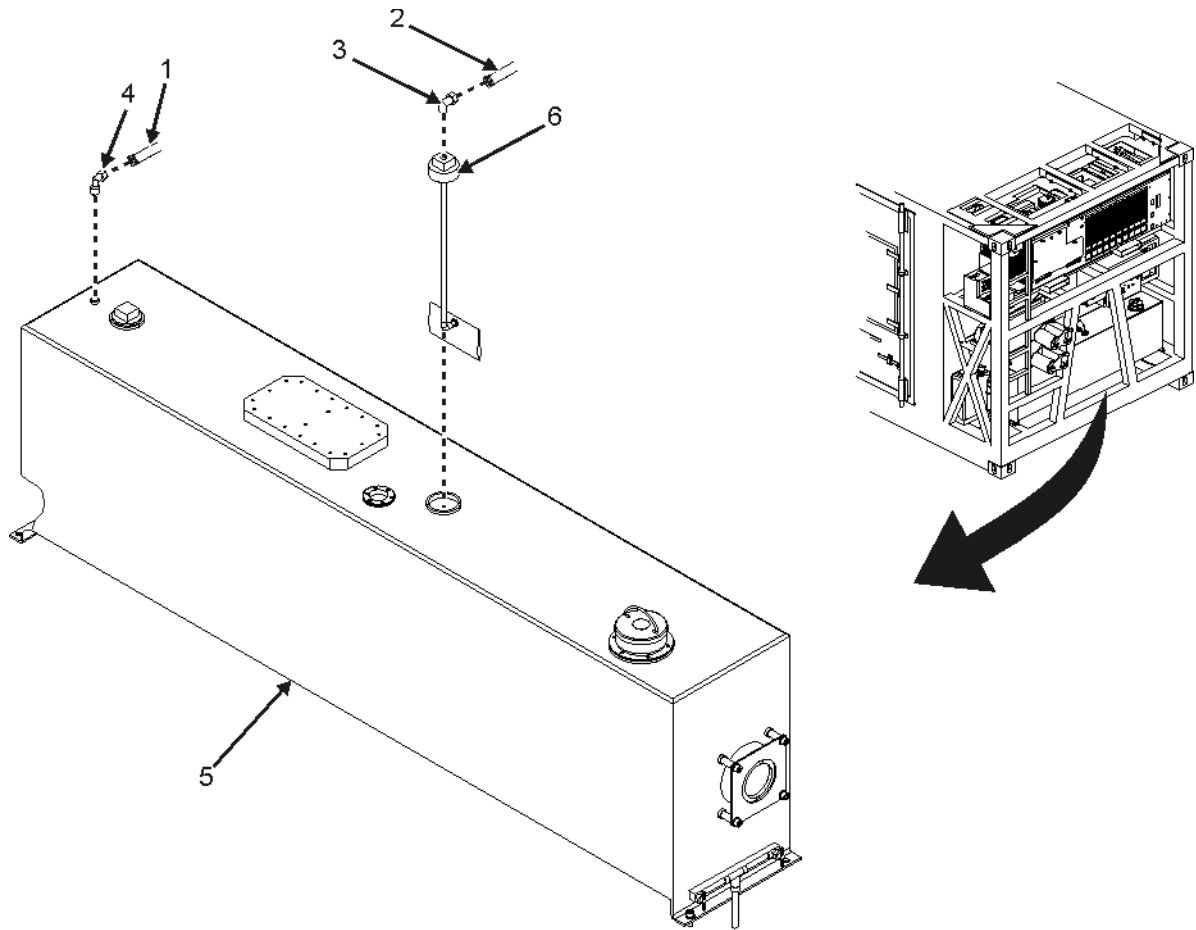


Figure 5. Fuel Tank Components.

REPAIR – CONTINUED**WARNING**

Wear eye protection and gloves. Sealant may cause eye and skin irritation, and may irritate respiratory system upon frequent or prolonged use. Avoid contact with eyes and skin, and prolonged exposure to fumes. If contact is made with eyes, flush eyes immediately with water for 15 minutes and seek medical attention. If contact is made with skin, wash affected area with soap and water. If skin irritation persists, seek medical attention. If swallowed, rinse mouth. Do not induce vomiting. Keep individual calm and seek immediate medical attention. Failure to comply with this warning may cause serious personal injury or death.

NOTE

When removing the elbow from the fuel tank, make note of the positioning of the elbow so that replacement elbow can be installed in the same position.

6. Apply sealant to threads of replacement elbow (Figure 5, Item 3 or Item 4).
7. Install applicable elbow (Figure 5, Item 3 or Item 4) into fuel tank (Figure 5, Item 5) by turning in clockwise direction.
8. Tighten elbow (Figure 5, Item 3 or Item 4) so that it aligns with position removed from.
9. Install applicable fuel line (Figure 5, Item 1 or Item 2) to elbow (Figure 5, Item 3 or Item 4).
10. Tighten fuel line (Figure 5, Item 1 or Item 2).
11. Connect battery (WP 0070, Reconnect).
12. Start refrigeration unit using diesel engine mode (WP 0005, Operating Procedures).
13. Check replaced elbow (Figure 5, Item 3 or Item 4) for leakage and repair if necessary per this WP.
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED**Replace Fuel Outlet Assembly****WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

Fuel lines will have some fuel in them that will drain out when disconnected. Use cleaning rags to clean up any spills when performing the following tasks.

NOTE

If fuel contamination has occurred, or is suspected, always remove and replace the fuel outlet assembly after cleaning and purging tank.

1. Disconnect battery if not already disconnected (WP 0070, Disconnect).
2. Loosen 3/8-inch fuel feed line (Figure 6, Item 3) fitting from elbow (Figure 6, Item 4).
3. Remove fuel line (Figure 6, Item 2) from elbow (Figure 6, Item 3).
4. Clean any fuel leakage from line with machinery wiping towels.

NOTE

When removing the elbow from the fuel tank, make note of the positioning of the elbow so that replacement elbow can be installed in the same position.

5. Remove elbow (Figure 6, Item 3) from fuel outlet assembly (Figure 6, Item 6) by turning in counterclockwise direction.
6. Unscrew fuel outlet assembly (Figure 6, Item 6) in a counterclockwise direction from fuel tank (Figure 6, Item 5).

NOTE

The fuel outlet assembly extends to the bottom of the fuel tank and has a fuel strainer attached to the end of the extension. Use care when removing the fuel outlet assembly from the fuel tank.

7. Carefully remove fuel outlet assembly (Figure 6, Item 6) from fuel tank (Figure 6, Item 5).

REPAIR – CONTINUED

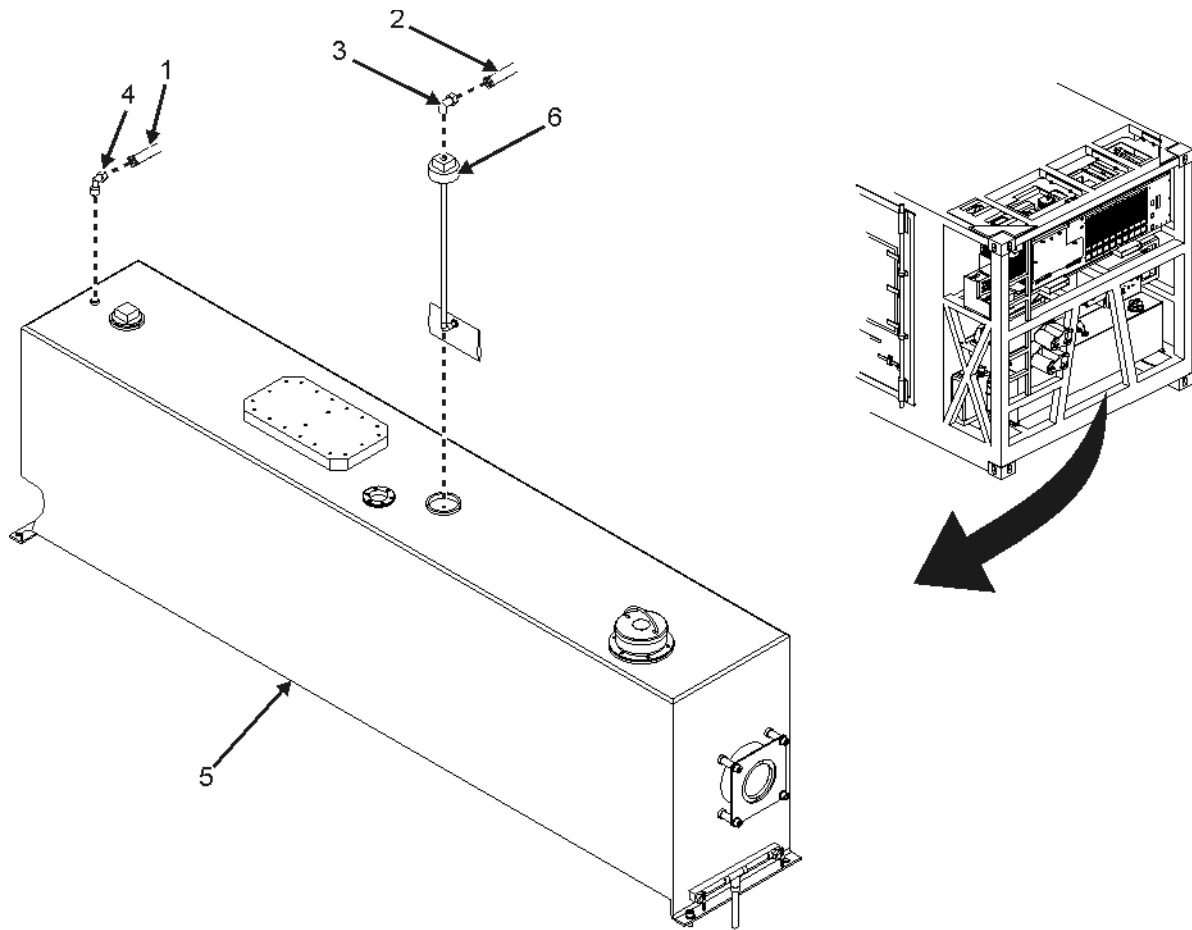


Figure 6. Fuel Tank Components.

WARNING

Wear eye protection and gloves. Sealant may cause eye and skin irritation, and may irritate respiratory system upon frequent or prolonged use. Avoid contact with eyes and skin, and prolonged exposure to fumes. If contact is made with eyes, flush eyes immediately with water for 15 minutes and seek medical attention. If contact is made with skin, wash affected area with soap and water. If skin irritation persists, seek medical attention. If swallowed, rinse mouth. Do not induce vomiting. Keep individual calm and seek immediate medical attention. Failure to comply with this warning may cause serious personal injury or death.

8. Apply sealant to threads of replacement fuel outlet assembly (Figure 6, Item 6).
9. Install fuel outlet assembly (Figure 6, Item 6) into fuel tank (Figure 6, Item 5) and tighten by turning in a clockwise direction.

REPAIR – CONTINUED

10. Apply sealant to threads of elbow (Figure 6, Item 3).
11. Install elbow (Figure 6, Item 3) into fuel outlet assembly (Figure 6, Item 6) by turning in clockwise direction.
12. Tighten elbow (Figure 6, Item 3) so that it aligns with position removed from.
13. Install fuel line (Figure 6, Item 2) to elbow (Figure 6, Item 3).
14. Tighten fuel line (Figure 6, Item 2).
15. Connect battery (WP 0070, Reconnect).
16. Start refrigeration unit using diesel engine mode (WP 0005, Operating Procedures).
17. Check elbow (Figure 4, Item 3) for leakage and repair if necessary per this WP.
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Fuel Tank Drain Hoses**WARNING**

The JP-8 and diesel fuels used with the MTRCS are combustible and highly explosive. Do not smoke or use open flame when performing maintenance. Flames and explosion can occur resulting in severe injury or death.

The JP-8 and diesel fuels used with the MTRCS are toxic. Always wear eye, face, and hand protection when working with or around fuel. If fuel contact is made with eyes, flush your eyes and seek immediate medical attention. If fuel contact is made with skin or clothing, remove contaminated clothing immediately, clean your skin with a mild soap or cleanser, and rinse with clean water.

CAUTION

Fuel lines may have some fuel in them that will drain out when disconnected. Use cleaning rags to clean up any spills when performing the following tasks.

1. Disconnect battery if not already disconnected (WP 0070, Disconnect).
2. Remove five hose clamps (Figure 5, Item 1) securing drain hoses (Figure 5, Item 2 and Item 3) to tee (Figure 5, Item 4) and two drain cocks (Figure 5, Item 5).
3. Remove drain hoses (Figure 5, Item 2 and Item 3) and tee (Figure 5, Item 4).
4. Install drain hoses (Figure 5, Item 2 and Item 3) to tee (Figure 5, Item 4) in three locations and secure using three hose clamps (Figure 5, Item 1).
5. Install drain hoses (Figure 7, Item 2 and Item 3) and tee (Figure 7, Item 4) to two drain cocks (Figure 7, Item 5) and secure using two hose clamps (Figure 7, Item 1).
6. Tighten all hose clamps (Figure 7, Item 1).

REPAIR – CONTINUED

7. Connect battery (WP 0070, Reconnect).
8. Open and close fuel drain cocks (Figure 7, Item 5) to check for leaks. Repair leaks if necessary (WP 0030, Service).
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

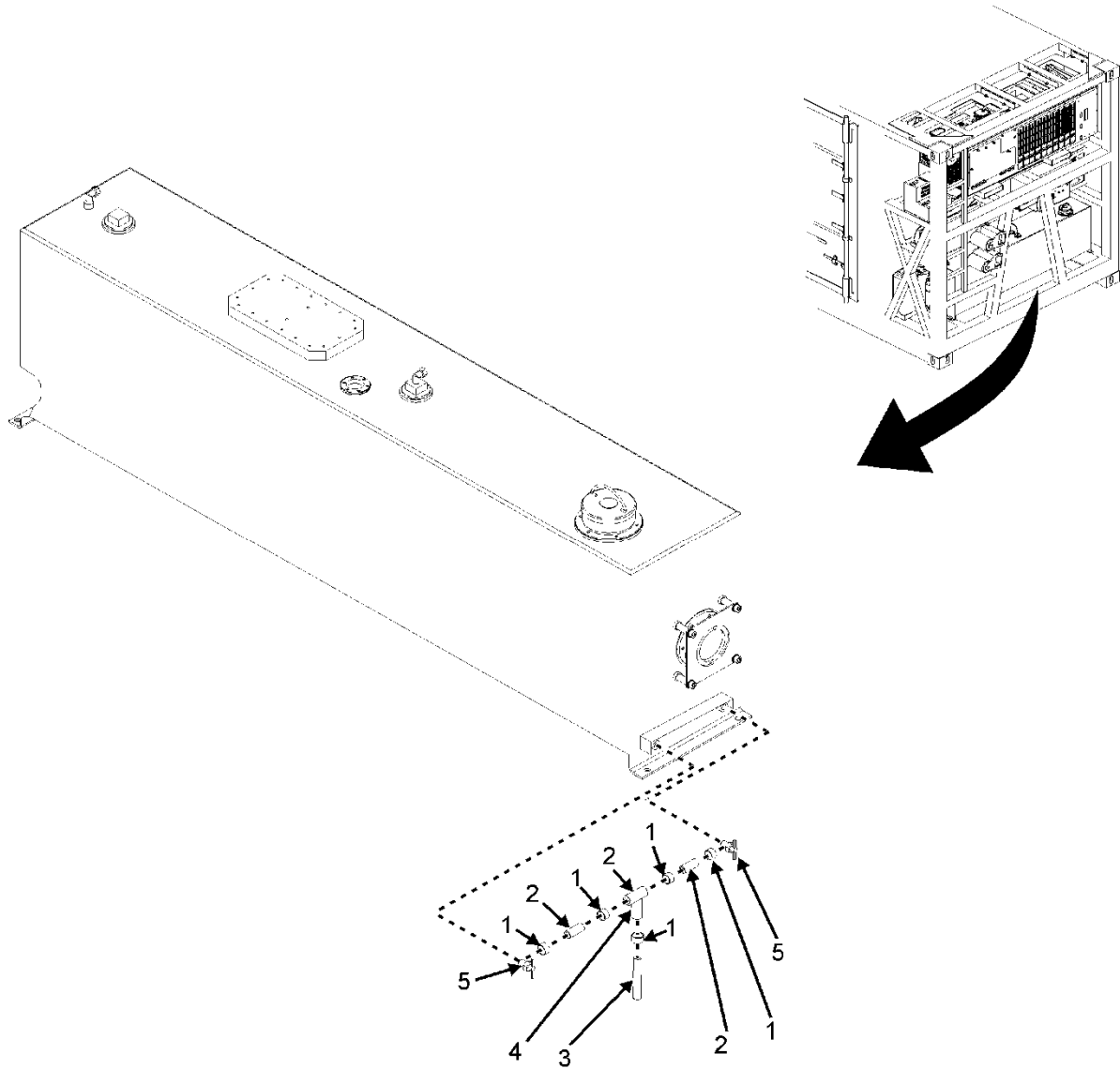


Figure 7. Fuel Tank Drain Hoses.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
REFRIGERATION UNIT
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Forklift (WP 0109)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 Spill Kit (WP 0110, Item 23)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 WP 0102
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 All RU panels removed (WP 0031)

REPLACE**Remove**

1. Recover refrigerant from system (WP 0032, Service).

WARNING

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

2. Disconnect battery (WP 0070, Disconnect).
3. Replace battery cover temporarily.
4. Tag and disconnect microprocessor positive (+) (Figure 1, Item 1), fuel pump positive (+) (Figure 1, Item 2), battery positive (+) (Figure 1, Item 3), and battery negative (-) (Figure 1, Item 4) cables from studs.

REPLACE – CONTINUED

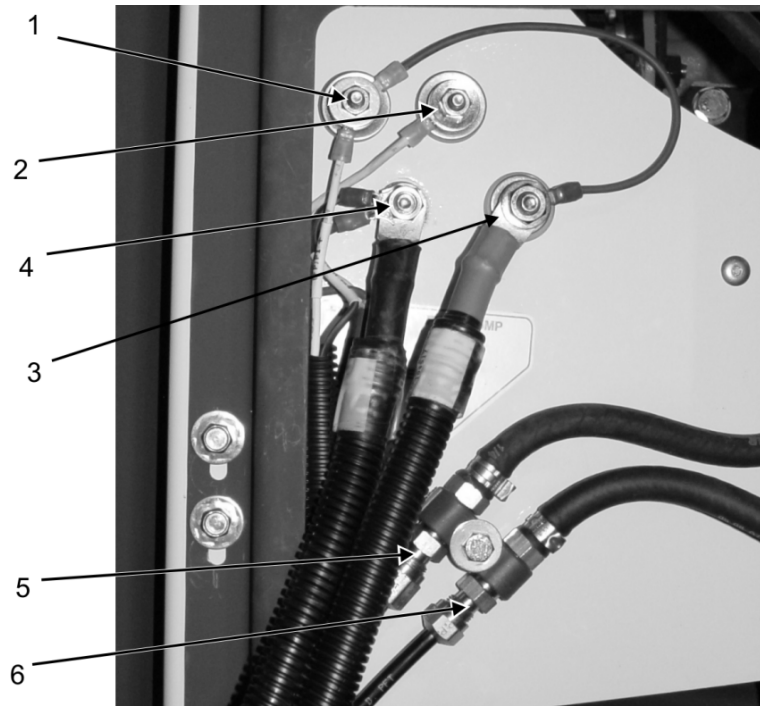


Figure 1. Electrical and Fuel Line Disconnects.

WARNING

Rubber gloves, face protector, and safety glasses should be worn. Fuel can cause skin/eye irritant. Failure to wear safety equipment can cause serious injury to personnel.

NOTE

Disconnecting the input and output fuel lines to the engine will result in residual fuel draining from the fuel lines. Have a fuel catch pan or spill kit available and positioned to catch residual fuel as lines are disconnected.

5. Disconnect one 3/8-inch fuel inlet line (Figure 1, Item 5) and one 1/4-inch fuel outlet line (Figure 1, Item 6) from refrigeration unit quick disconnect and catch residual fuel using spill kit.

REPLACE – CONTINUED

6. Slightly above control panel assembly, tag and disconnect 50/60 Hz switch connector (P11/J11) (Figure 2, Item 1).
7. Slightly above control panel assembly, tag and disconnect insulated container light connector (P3/J3) (Figure 2, Item 2).
8. Tag and disconnect K1 power connector (P9/J9) (Figure 2, Item 3) next to chart recorder.

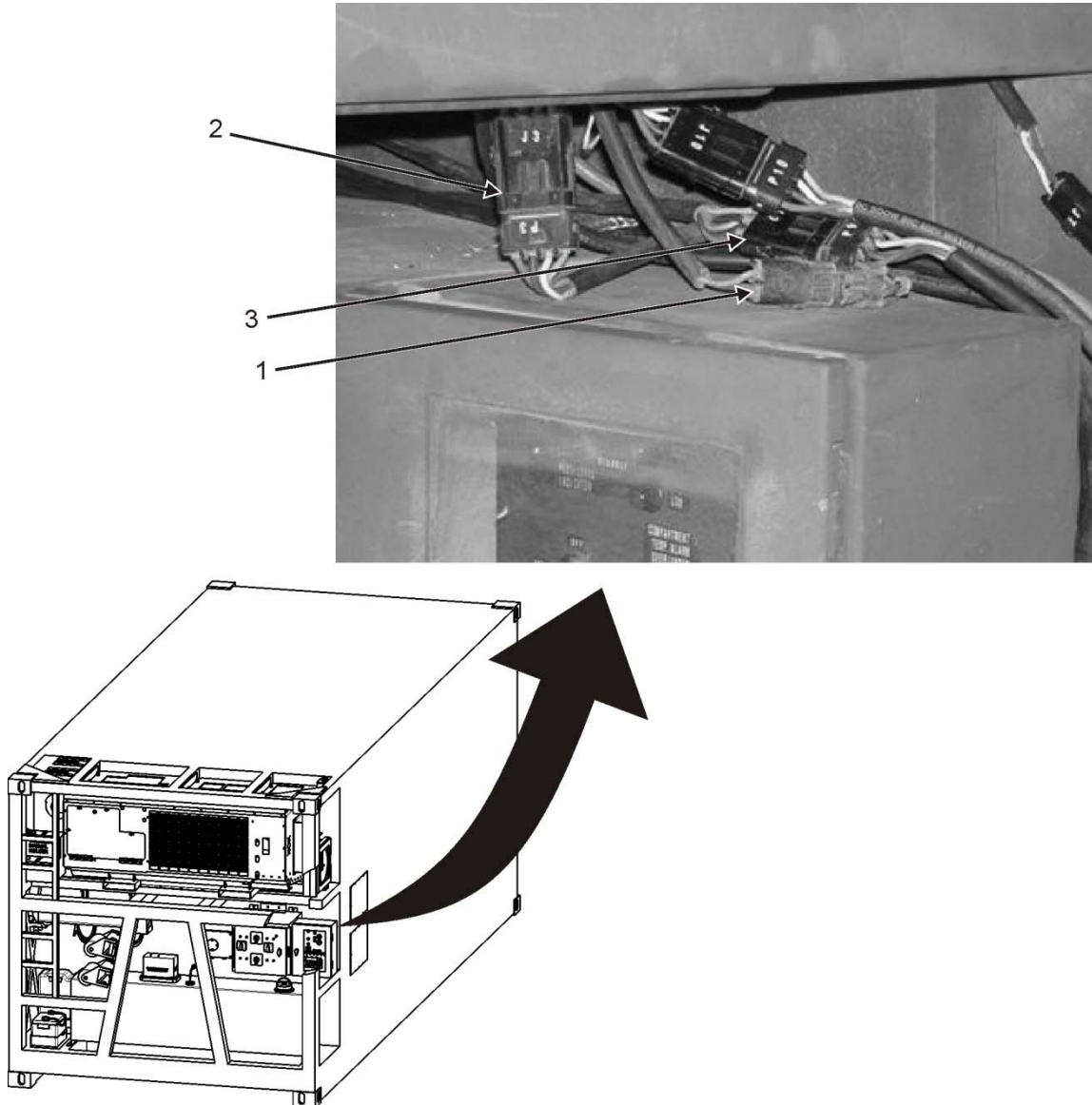


Figure 2. 50/60 Hz, P3/J3, and P9/J9 Electrical Connectors.

REPLACE – CONTINUED

NOTE

The disconnect point of the braided line connector (P12/J12) can be identified by the thin blue line around the portion of the connector that twists.

9. Tag and disconnect braided line connector (P12/J12) (Figure 3, Item 1) at control box.
10. Tag and disconnect power on/off connector (P6/J6) (Figure 3, Item 2) next to chart recorder.

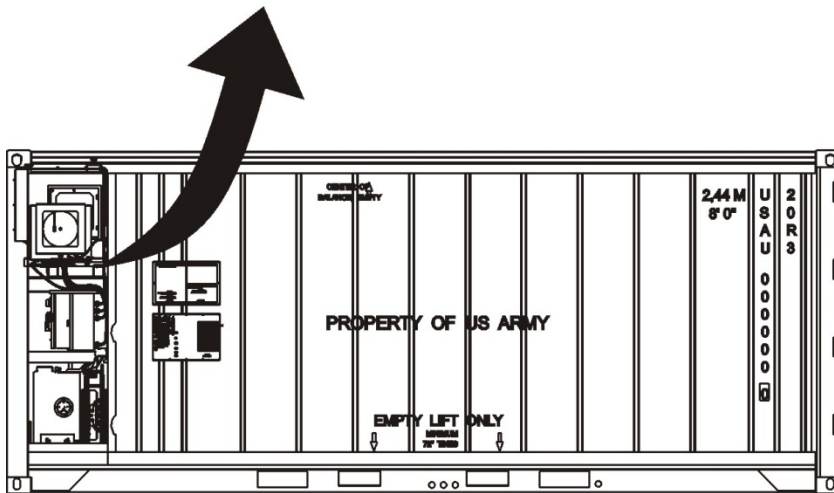
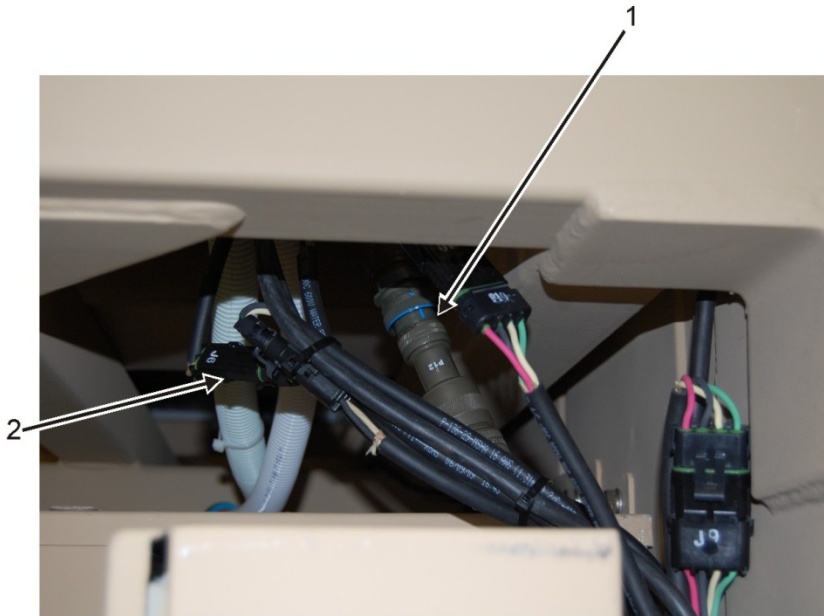


Figure 3. Braided Line (P12/J12) and P6/J6 Connectors.

REPLACE – CONTINUED

11. Tag and disconnect capacitor box connector (P14/J14) (Figure 4, Item 2).
12. Tag and disconnect power connector (P13/J13) (Figure 4, Item 1).

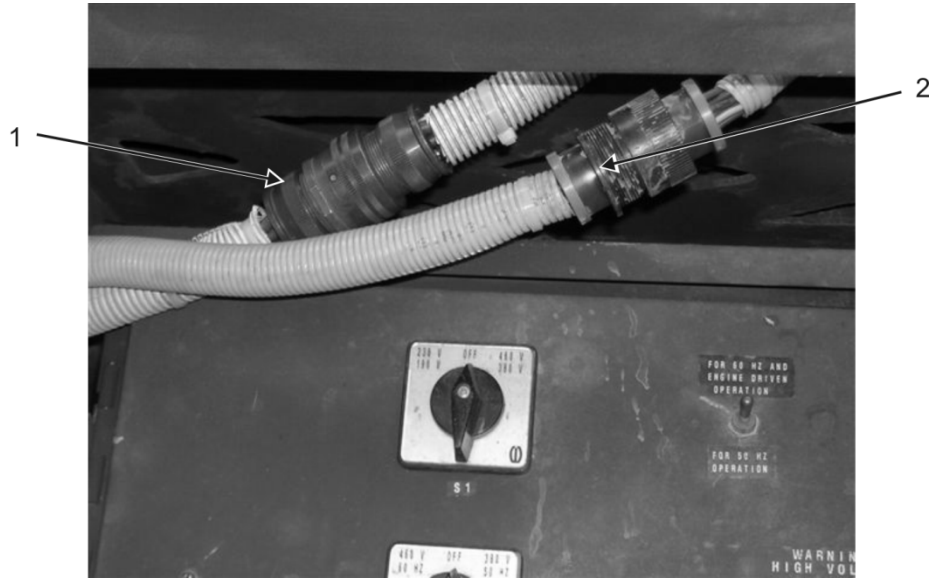


Figure 4. Capacitor Box (P14/J14) and Power (P13/J13) Connectors.

REPLACE – CONTINUED

13. Tag and disconnect evaporator control connector (P8/J8) (Figure 5, Item 1) outside MPC Box.

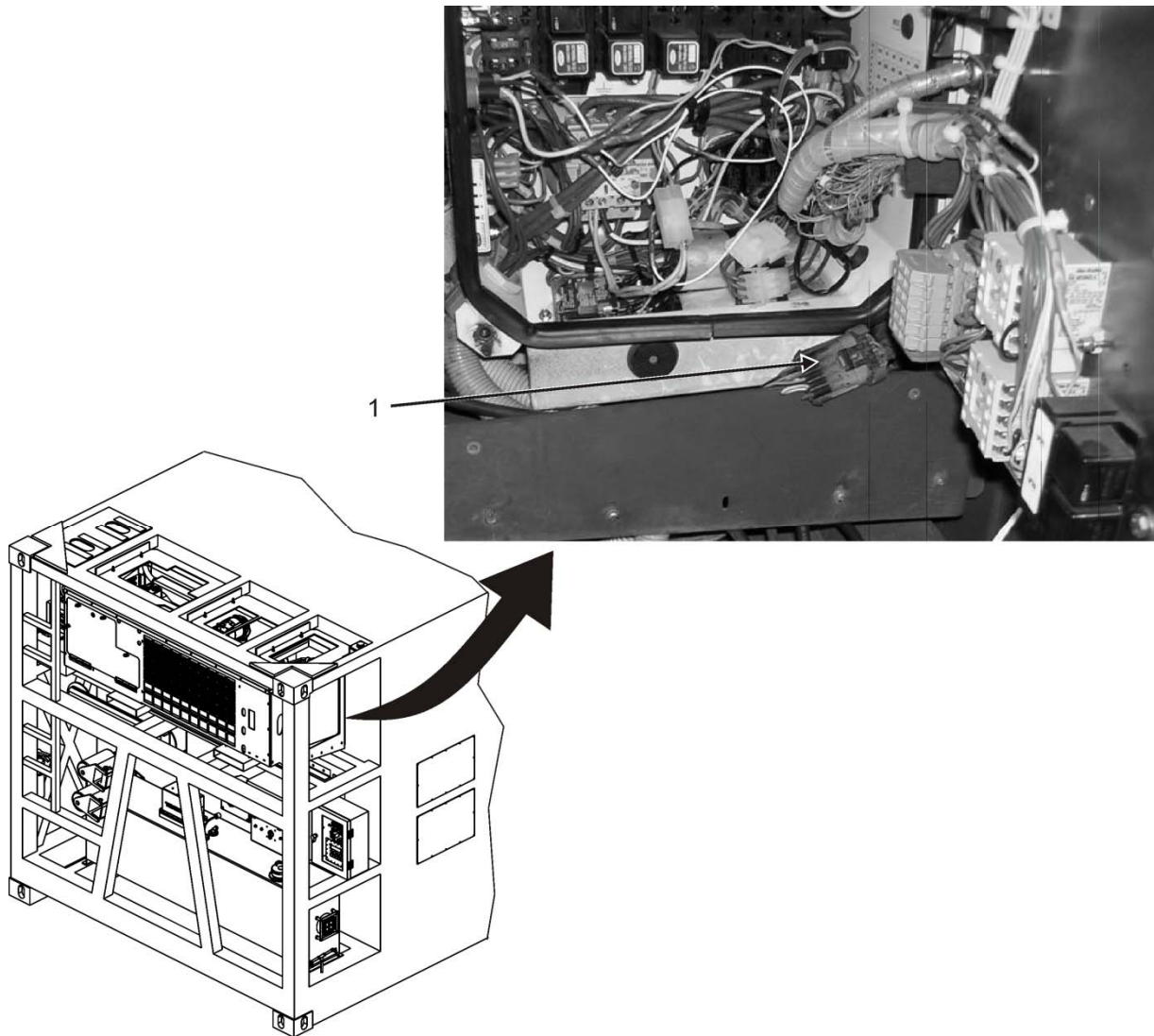


Figure 5. Evaporator Control Connector.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

14. Access top of MTRCS using roof access provided.

REPLACE – CONTINUED**NOTE**

The ground wires for connectors 1CP and 2CP are attached to single shared ground with a screw and a nut.

15. Tag and disconnect evaporator connector 1CP (Figure 6, Item 1) and green ground wire (Figure 6, Item 2) from receptacle adjacent to refrigeration unit filter drier.
16. Tag and disconnect evaporator connector 2CP (Figure 6, Item 3) and green ground wire (Figure 6, Item 2) from receptacle adjacent to refrigeration unit filter drier.

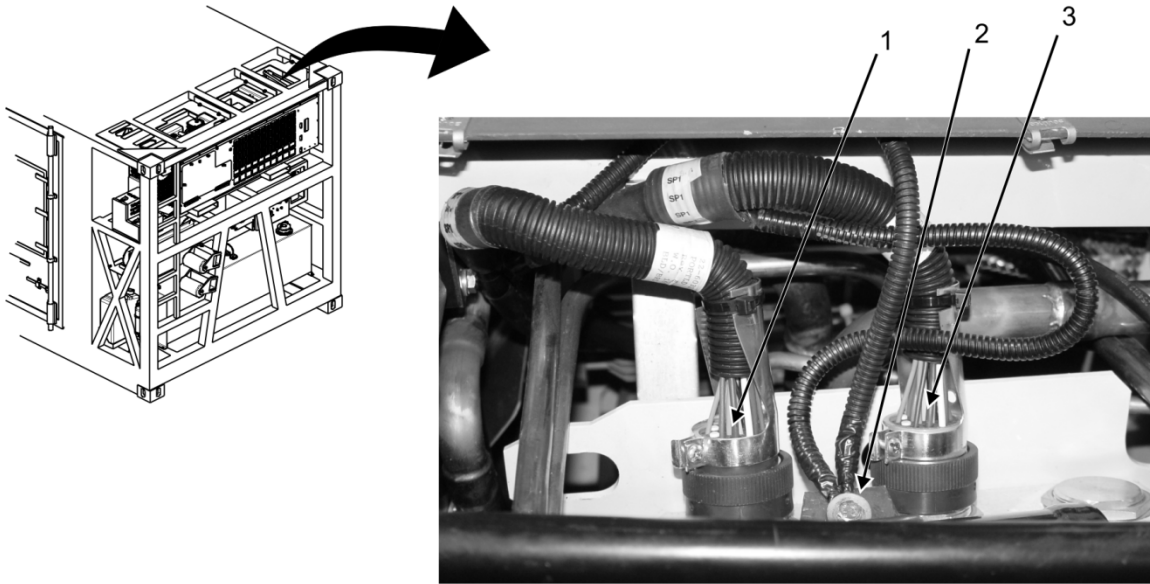


Figure 6. 1CP and 2CP Electrical Connectors.

NOTE

The two evaporator cables and associated connectors 1CP and 2CP will be fed up through a hole in the wall behind the back of the refrigerator unit during removal, with refrigeration lines.

17. Cut wire ties as needed to free evaporator electrical cables from refrigerant piping.
18. Feed both evaporator electrical cables out so that they hang on top of MTRCS roof toward right side.

WARNING

Soldering procedures emit gasses that can be harmful if inhaled for long durations. Before performing any soldering procedures, make sure that adequate ventilation is available. Use face shield and protective gloves when performing soldering procedures.

19. Remove all insulation covering 1 1/8-inch refrigerant pipe.

REPLACE – CONTINUED

20. Remove four screws (Figure 7, Item 1), lock washers (Figure 7, Item 23), washers (Figure 7, Item 3), and nuts (Figure 7, Item 4) securing six butterfly clamps (Figure 7, Item 5) to refrigerant piping (Figure 7, Item 6) near filter drier (Figure 7, Item 7). Retain clamps for reinstallation. Discard lock washers.

CAUTION

Soldering and desoldering procedures take place in a very tight surrounding. Make sure a heat shield is used during solder and desolder procedures to protect wiring, belts, and associated components nearby.

21. Desolder small upper refrigerant pipe (Figure 7, Item 8) at desolder location (Figure 7, Item 9).
22. Desolder 1 1/8-inch pipe (Figure 7, Item 10) from accumulator (Figure 7, Item 11) at elbow (Figure 7, Item 12).
23. Desolder elbow (Figure 7, Item 12) from 1 1/8-inch pipe (Figure 7, Item 13). Discard elbow if installing a new refrigeration unit. Retain elbow for reinstallation if removing refrigeration unit to facilitate other maintenance.
24. Desolder small lower refrigerant pipe (Figure 7, Item 14) at desolder location (Figure 7, Item 15).

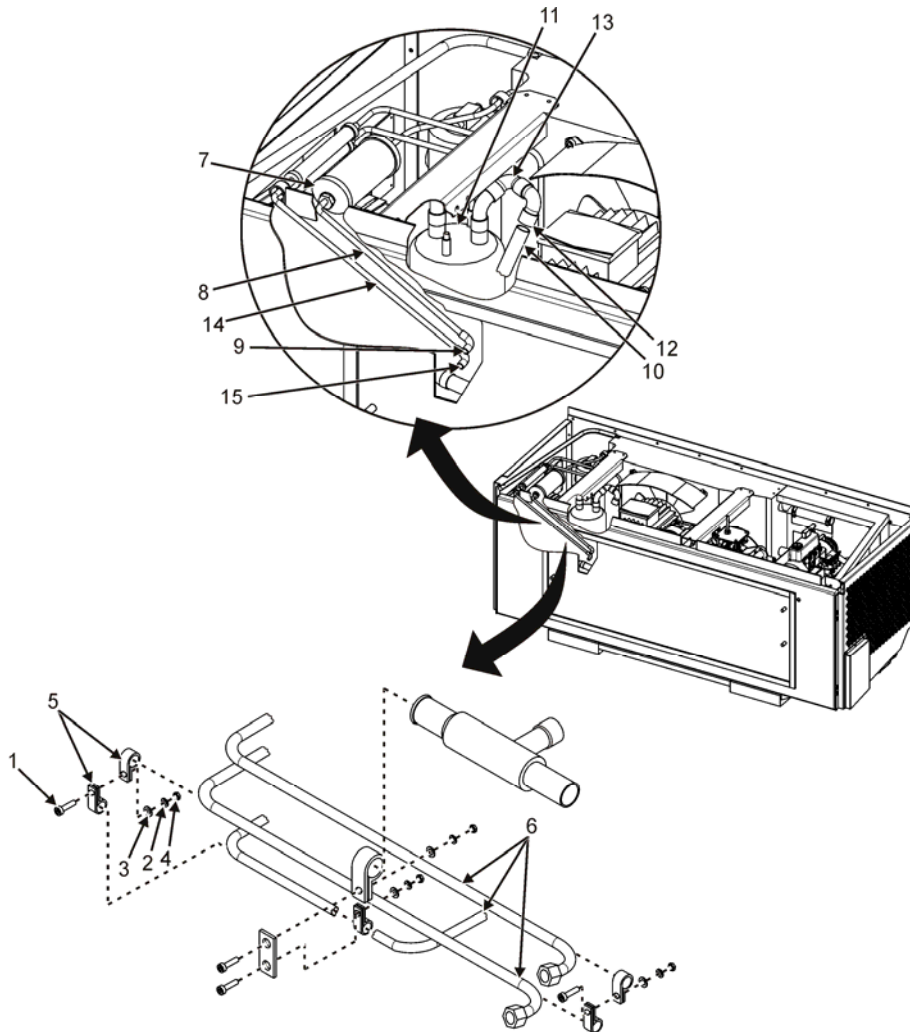


Figure 7. Refrigeration Lines.

REPLACE – CONTINUED

25. Loosen diesel engine muffler pipe U-bolt (Figure 8, Item 1) and rotate muffler pipe (Figure 8, Item 2) downward to avoid hitting it during refrigeration unit removal.

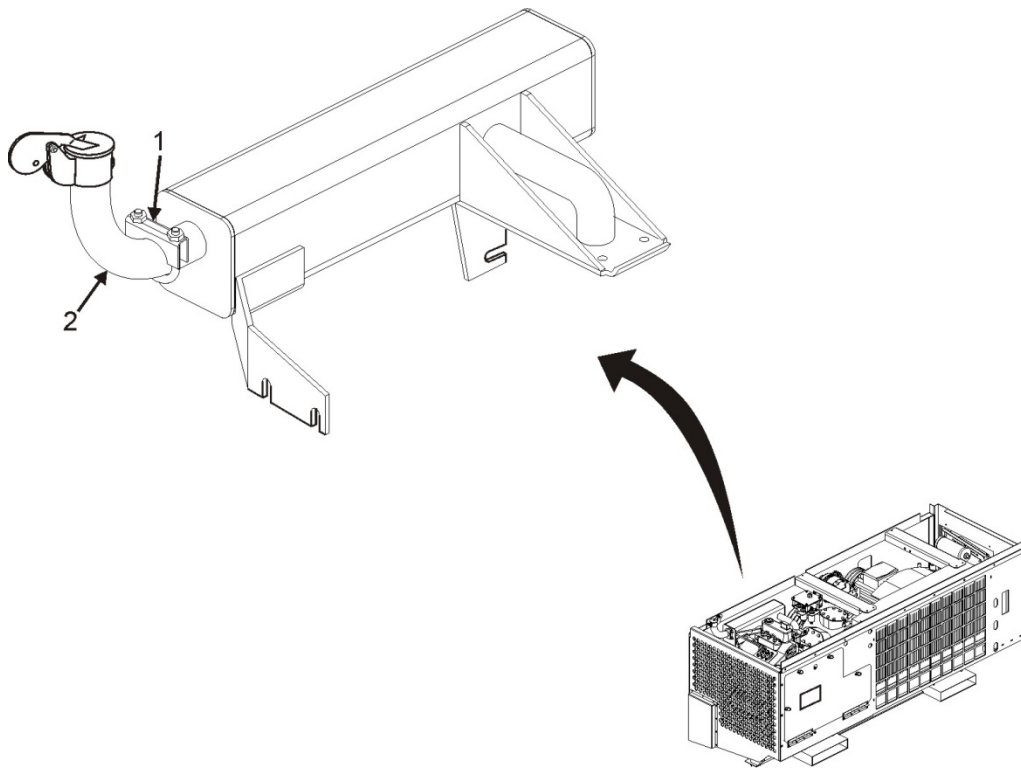


Figure 8. Muffler Pipe U-Bolt.

REPLACE – CONTINUED

26. Remove radiator cap (Figure 9, Item 1) to provide additional clearance for radiator during removal of refrigeration unit.



Figure 9. Radiator Cap.

27. Carefully crawl to roof access point and climb off MTRCS.

NOTE

After all electrical connections are disconnected, there will be seven individual electrical cables that will be fed through the MTRCS frame. Each cable will need to be pulled through the frame cutout individually. Begin with the smallest and finish with the largest cable.

28. Carefully tuck seven disconnected electrical cables (Figure 10, Item 1) inside MTRCS frame for refrigeration unit removal.

REPLACE – CONTINUED

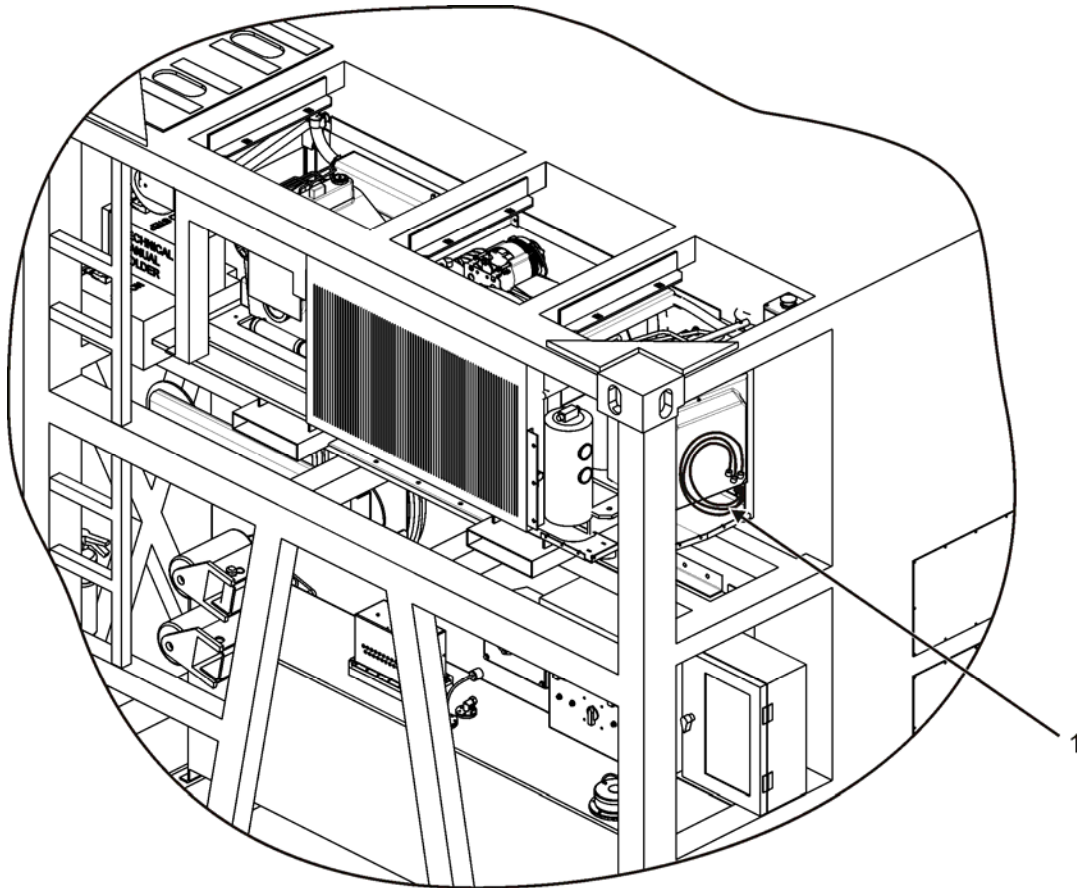


Figure 10. Electrical Cable Feeds.

REPLACE – CONTINUED

NOTE

There are four bolts securing the refrigeration unit to the container forward outside wall at each corner, and three bolt and nut combinations securing the refrigeration unit to the angle bracket at the forward lower end of the refrigeration unit. When removing the bolts, remove the three support angle bolts first, followed by the bottom two bolts on refrigeration unit, and the top two refrigeration unit mount bolts last.

29. Unbolt support angle at front end near bale bar by removing three bolts (Figure 11, Item 1), lock washers (Figure 11, Item 2), washers (Figure 11, Item 3), and nuts (Figure 11, Item 4). Discard lock washers.

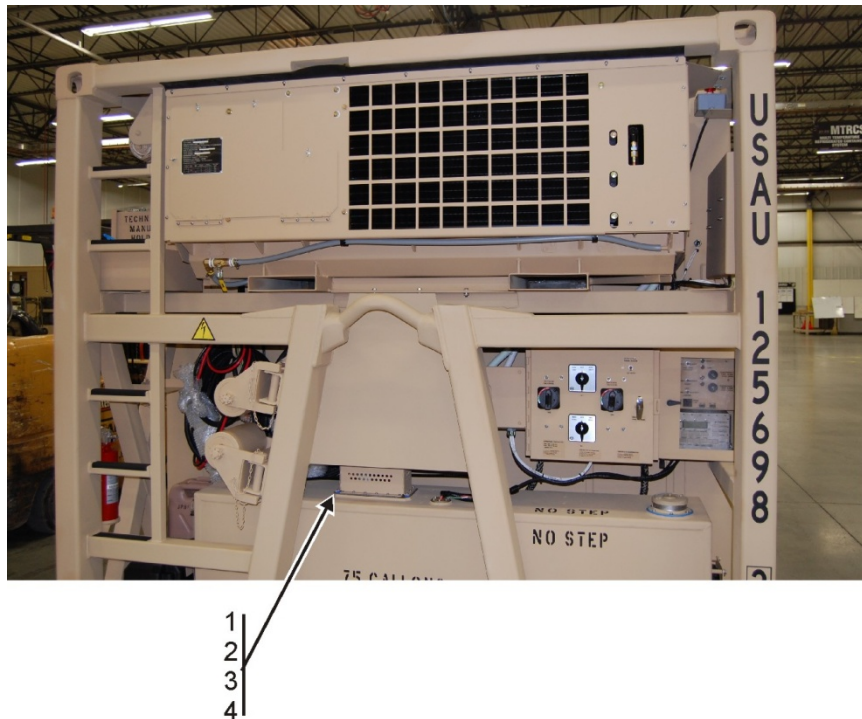


Figure 11. Support Angle Bolt Layout.

REPLACE – CONTINUED

NOTE

The bottom two refrigeration unit mount bolts sit at the back of the unit as facing it on the left and right sides. It will be necessary to create a long extension to access these two bolts.

30. Remove two bolts (Figure 12, Item 1), lock washers (Figure 12, Item 2), and washers (Figure 12, Item 3) to unbolt bottom of refrigeration unit (Figure 12, Item 4) from front wall of container in two places. Discard lock washers.

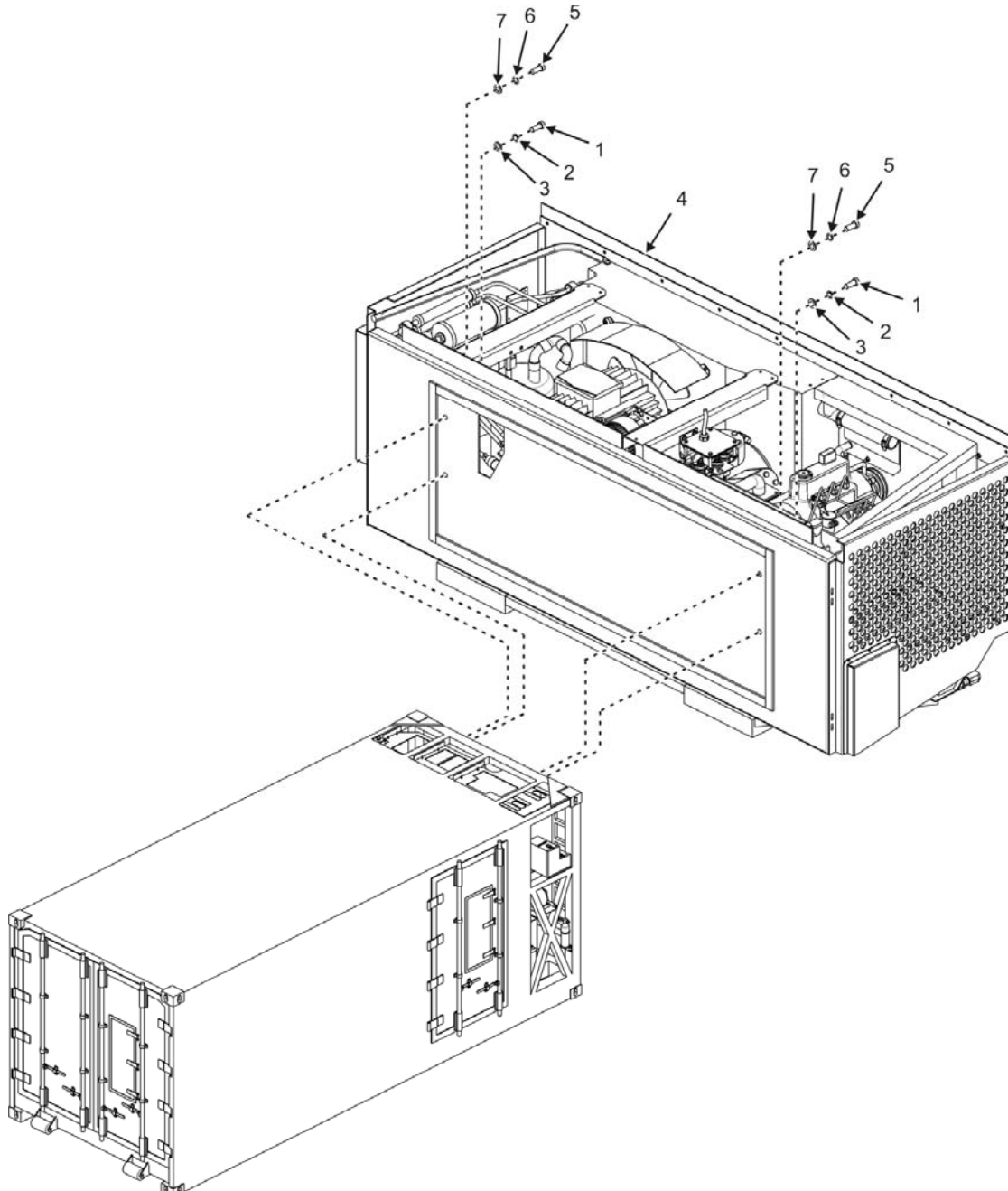


Figure 12. Refrigeration Unit Mounting Bolts.

REPLACE – CONTINUED**WARNING**

The refrigeration unit weighs approximately 1,200 pounds and must be removed from the MTRCS frame mounting location using a forklift.

The forklift operator must be aware of ground personnel positions at all times. A forklift ground guide must be positioned near the front of the container during removal of the refrigeration unit.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

31. Position one person on top of the container to make sure electrical cables and piping pass through hole on back of refrigeration unit chassis when removing.
32. Position forklift tines inside refrigeration unit forklift slots (Figure 13) and carefully provide enough lift to support refrigeration unit.



Figure 13. Forklift Slots.

REPLACE – CONTINUED**WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

33. Access top of MTRCS using roof access provided.

NOTE

Electrical cables 1CP, 2CP, and J3 should be placed up on top of the MTRCS out of the way to facilitate removal of refrigeration unit.

34. Remove two bolts (Figure 12, Item 5), lock washers (Figure 12, Item 6), and washers (Figure 12, Item 7) to unbolt top of refrigeration unit (Figure 12, Item 4) from front wall of container in two places. Discard lock washers.
35. Carefully crawl to roof access point and climb off MTRCS.

CAUTION

Use extreme care when backing the refrigeration unit away from the MTRCS chassis. Be alert at all times to positioning of the unit, cables, and top of radiator at the fill port, as it is a tight fit into the MTRCS chassis. Double check to make sure radiator cap has been removed. Use one or more spotters when removing the refrigeration unit.

36. Slowly pull refrigeration unit away from container front wall approximately eight-inches and stop.
37. Confirm that no electrical or refrigerant lines will be damaged as refrigeration unit removal progresses.
38. Carefully feed seven electrical cables (Figure 10, Item 1) through the MTRCS frame as unit is removed.
39. Remove refrigeration unit completely and slowly lower it to ground while paying close attention to electrical cables.
40. Protect all connection ends as required to prevent damage.

REPLACE – CONTINUED**Install**

1. Remove any previously installed protective caps from connection ends.
2. Remove radiator cap (Figure 14, Item 1) if installed.



Figure 14. Radiator Cap.

WARNING

Installation of the refrigeration unit from the MTRCS is accomplished using a forklift. Only authorized licensed forklift operators are allowed to drive a forklift. The forklift operator must be aware of ground personnel at all times. Personnel can be crushed causing serious injury or death.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

3. Position forklift tines inside refrigeration unit forklift slots (Figure 15) and carefully lift refrigeration unit into position for installation onto MTRCS chassis.

REPLACE – CONTINUED



Figure 15. Forklift Slots.

4. Position one person on top of container to make sure cables and piping pass through hole on back of refrigeration unit when installing.
5. Position forklift, with refrigeration unit lifted, in front of MTRCS frame.
6. Make sure that seven electrical cables (Figure 16, Item 1) are tucked inside refrigeration unit so that they can be fed through chassis during installation.

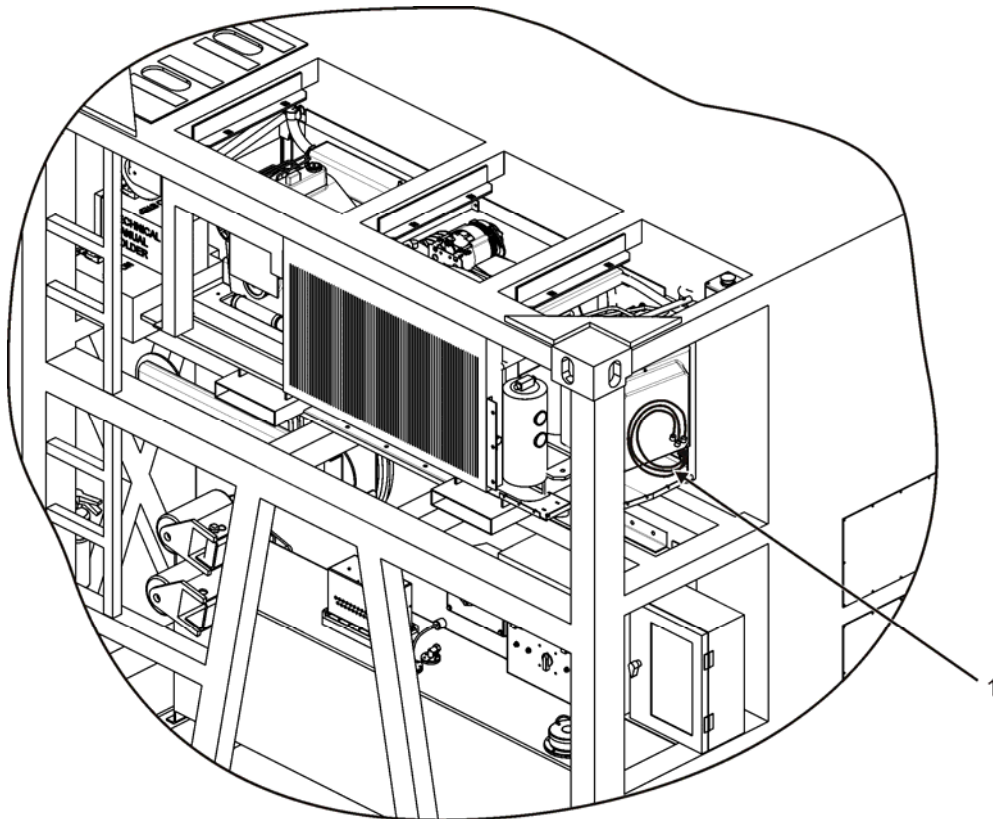


Figure 16. Electrical Cable Feeds.

REPLACE – CONTINUED**CAUTION**

Use extreme care when installing the refrigeration unit into the MTRCS chassis. Be alert at all times to positioning of the unit, cables, and top of radiator at the fill port, as it is a tight fit into the MTRCS chassis. Check to make sure radiator cap is removed before installation. Check that oil drain line has adequate clearance. Use one or more spotters when installing the refrigeration unit.

7. While guiding cables in, slowly move forklift forward towards MTRCS to position refrigeration unit in place on chassis until cables are in place and refrigeration unit mounting holes are aligned with container mount holes.
8. Leave forklift in place in case alignment of refrigeration unit requires movement.

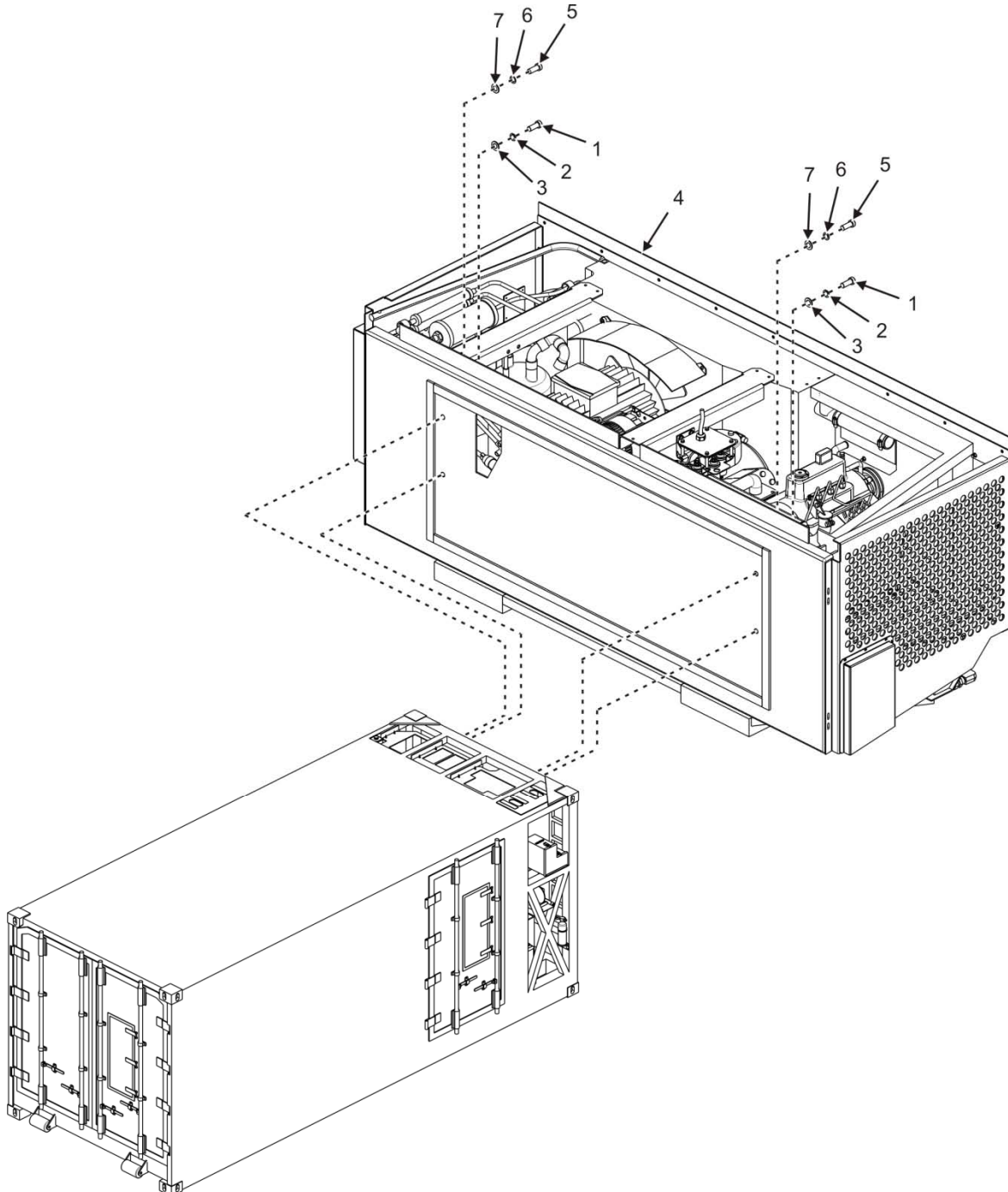
WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

9. Access top of MTRCS using roof access provided.

REPLACE – CONTINUED

10. Install two bolts (Figure 17, Item 5), new lock washers (Figure 12, Item 6), and washers (Figure 12, Item 7) through mount holes at top of refrigeration unit (Figure 12, Item 4) and into front wall of container in two places. Do not tighten hardware completely at this time.

**Figure 17. Refrigeration Unit Mounting Bolts.**

REPLACE – CONTINUED

11. Carefully crawl to roof access point and climb off MTRCS.
12. Install three bolts (Figure 18, Item 1), new lock washers (Figure 18, Item 2), washers (Figure 18, Item 3), and nuts (Figure 18, Item 4) to secure refrigeration unit to support angle at front end near bale bar. Do not tighten hardware completely at this time.

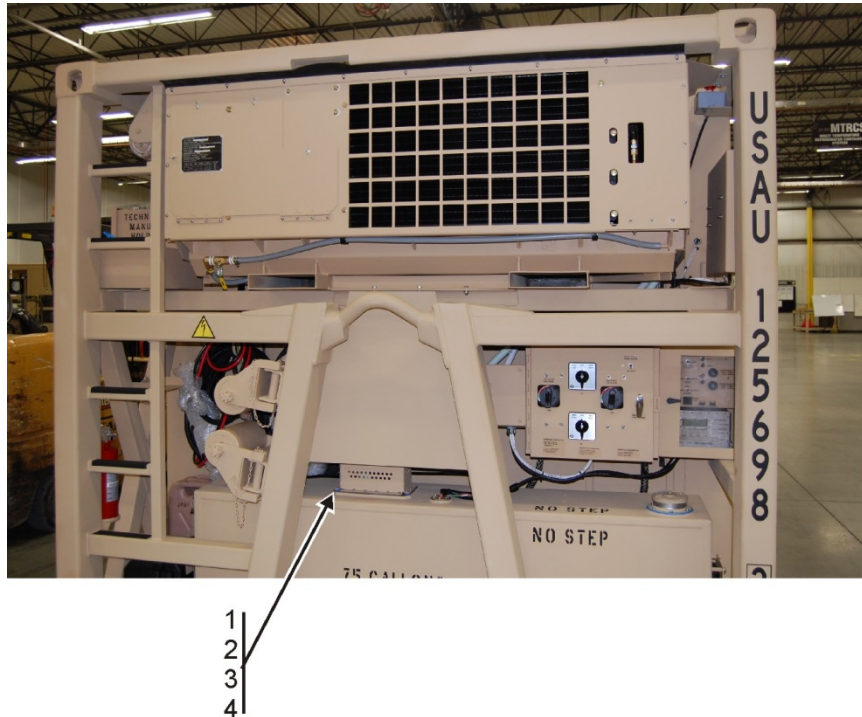


Figure 18. Support Angle Bolt Layout.

13. Install two bolts (Figure 17, Item 1), new lock washers (Figure 17, Item 2), and washers (Figure 17, Item 3) through mount holes at bottom of refrigeration unit (Figure 17, Item 4) and into front wall of container in two places. Do not tighten hardware completely at this time.
14. Torque four bolts (Figure 17, Item 5 and Item 1) securing refrigeration unit to container front wall to 80 foot-pounds (WP 0102).
15. Tighten three bolts (Figure 18, Item 1) securing refrigeration unit to support angle to 36 foot-pounds (WP 0102).
16. Carefully back forklift away from MTRCS and lower tines to ground.
17. Install radiator cap (Figure 14, Item 1).
18. Access top of MTRCS using roof access provided.
19. Rotate diesel engine exhaust pipe to correct orientation and tighten U-bolt (Figure 19, Item 1).

REPLACE – CONTINUED

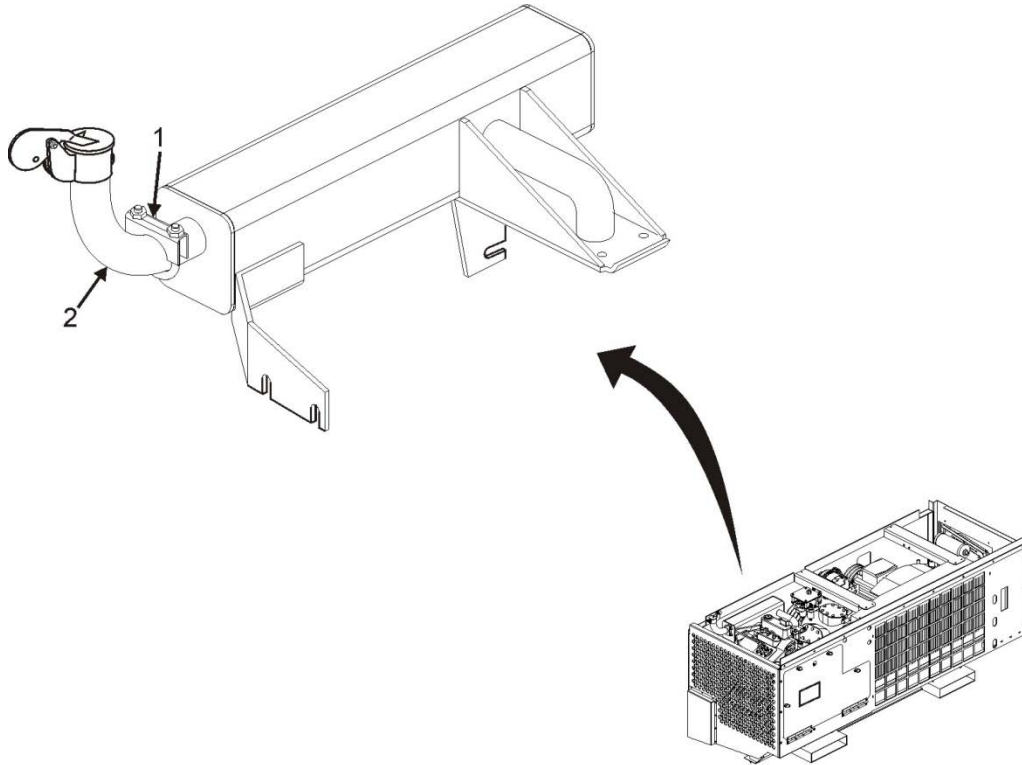


Figure 19. Muffler Pipe U-bolt.

REPLACE – CONTINUED

20. Solder three refrigerant lines (Figure 20, Item 8, Item 10, and Item 14) at top of refrigeration unit.

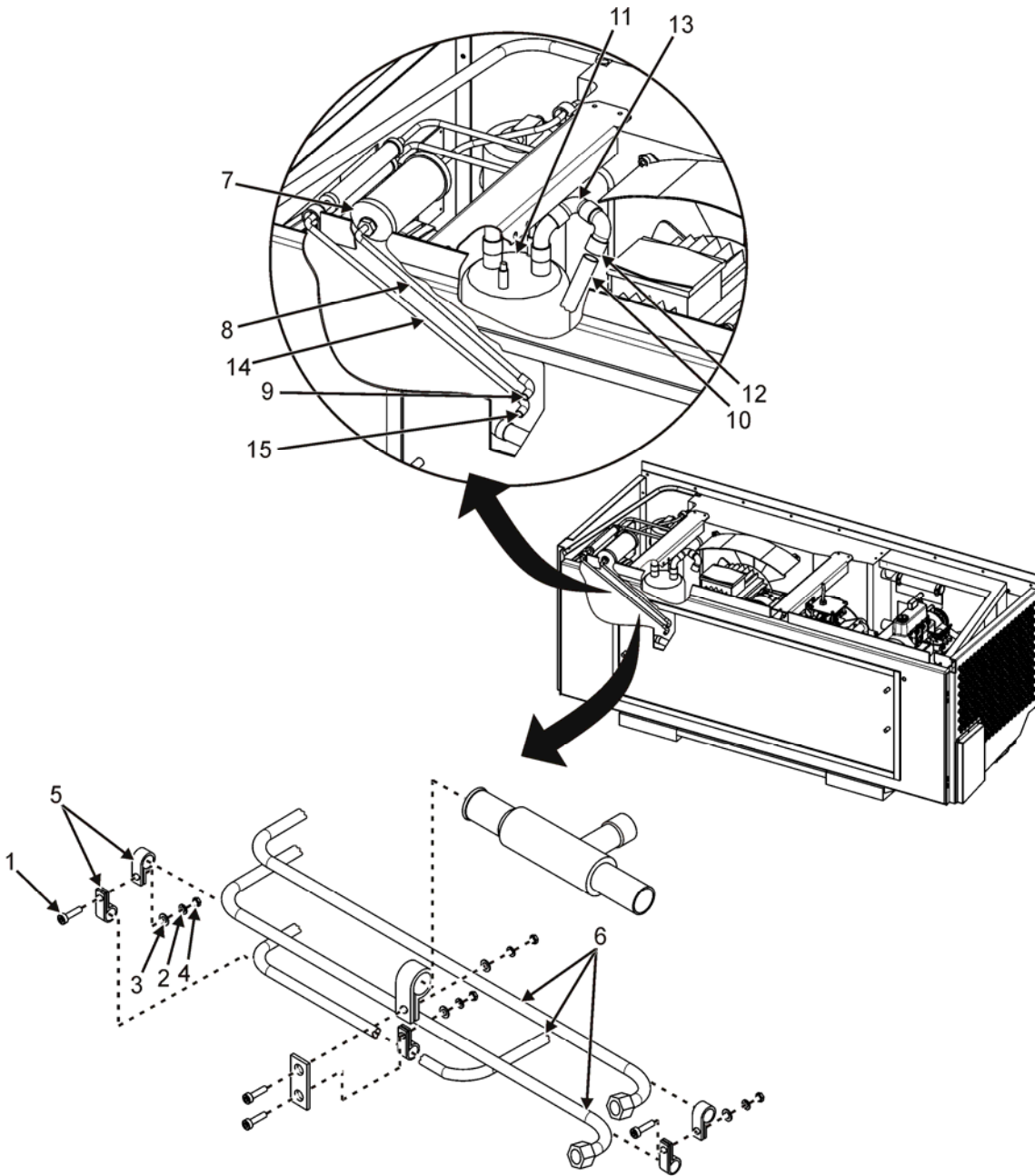


Figure 20. Refrigeration Lines.

REPLACE – CONTINUED**CAUTION**

When reconnecting evaporator connectors 1CP and 2CP, make sure to route them in such a way as to avoid interference with V-belts during operation.

NOTE

The ground wires for connectors 1CP and 2CP are attached to a single shared ground with a screw and a nut.

21. Reconnect evaporator electrical connector 2CP (Figure 21, Item 3) and green ground wire (Figure 21, Item 2) as tagged. Remove tag.
22. Reconnect evaporator electrical connector 1CP (Figure 21, Item 1) and green ground wire (Figure 21, Item 2) as tagged. Remove tag.

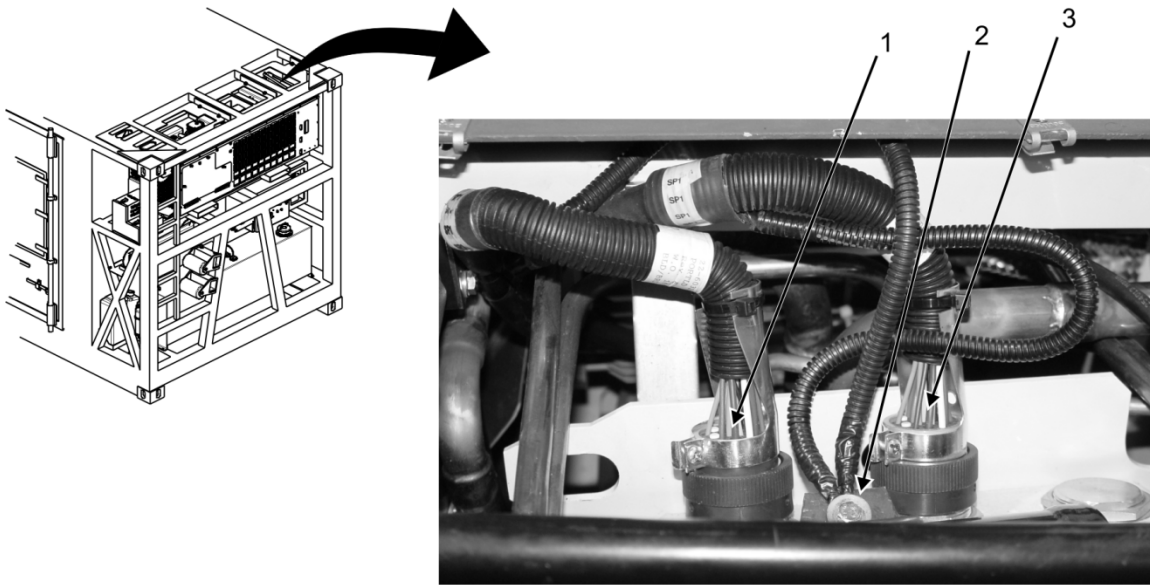


Figure 21. 1CP and 2CP Electrical Connectors.

23. Tie wrap electrical lines as needed to secure to piping and away from V-belt movement.
24. Carefully crawl to roof access point and climb off MTRCS.

REPLACE – CONTINUED

25. Reconnect evaporator control connector (P8/J8) (Figure 22, Item 1) outside MPC box. Remove tag.

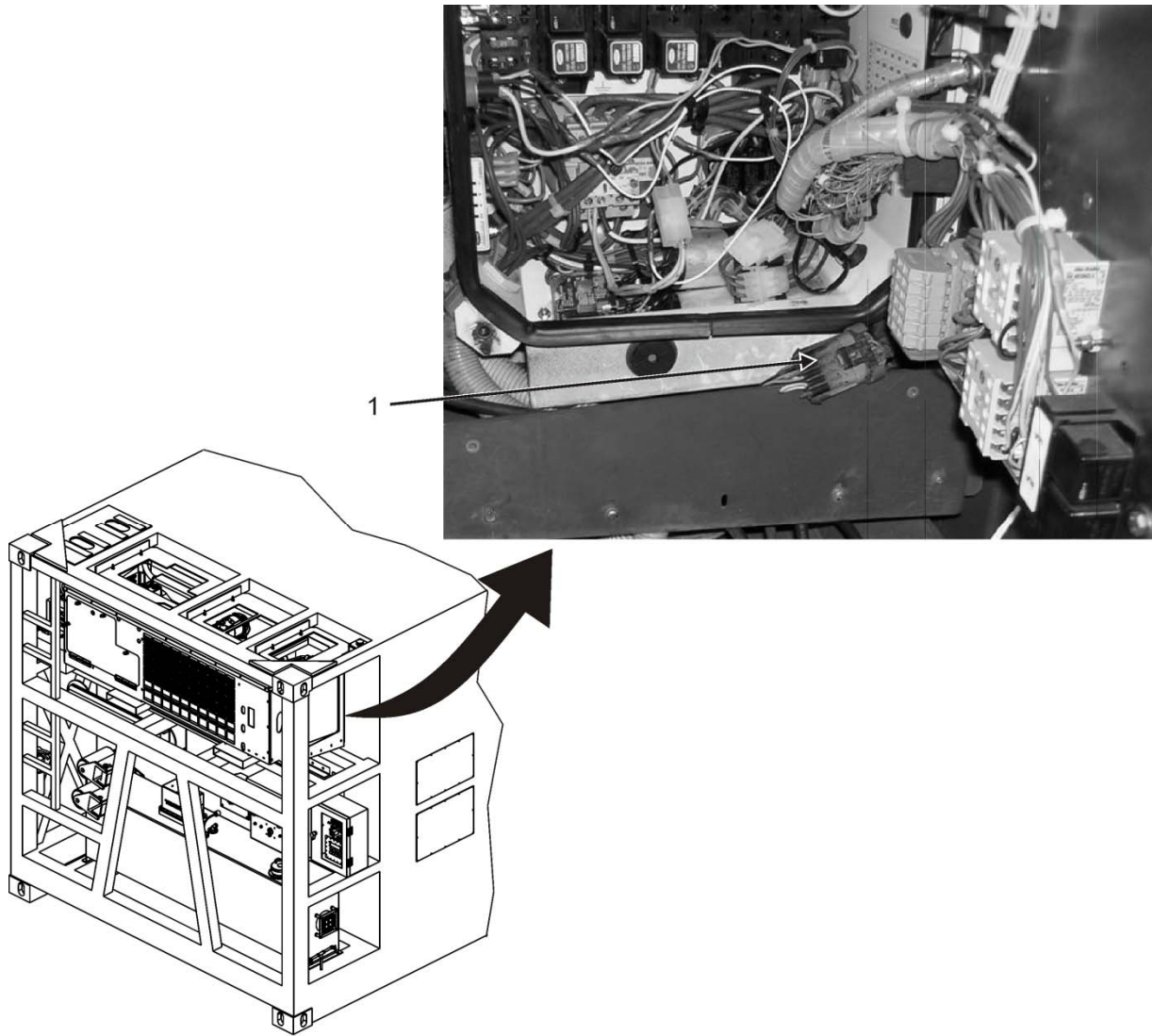


Figure 22. Evaporator Control Connector.

REPLACE – CONTINUED

26. Reconnect power connector (P13/J13) (Figure 23, Item 1). Remove tag.

27. Connect capacitor box connector (P14/J14) (Figure 23, Item 2). Remove tag.

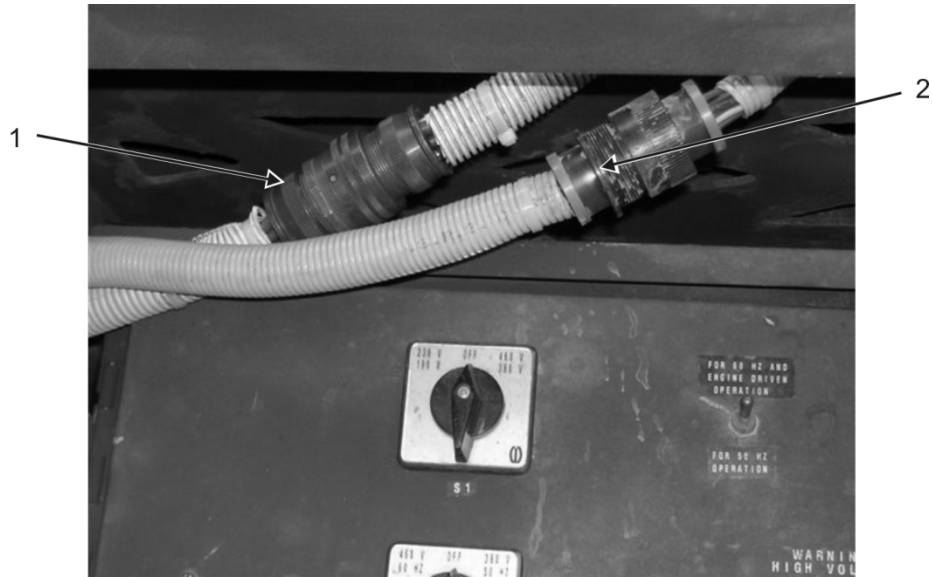


Figure 23. Capacitor Box (P14/J14) and Power (P13/J13) Connectors.

REPLACE – CONTINUED

- 28. Connect power on/off connector (P6/J6) (Figure 24, Item 2). Remove tag.
- 29. Connect braided line connector (P12/J12) (Figure 24, Item 1). Remove tag.

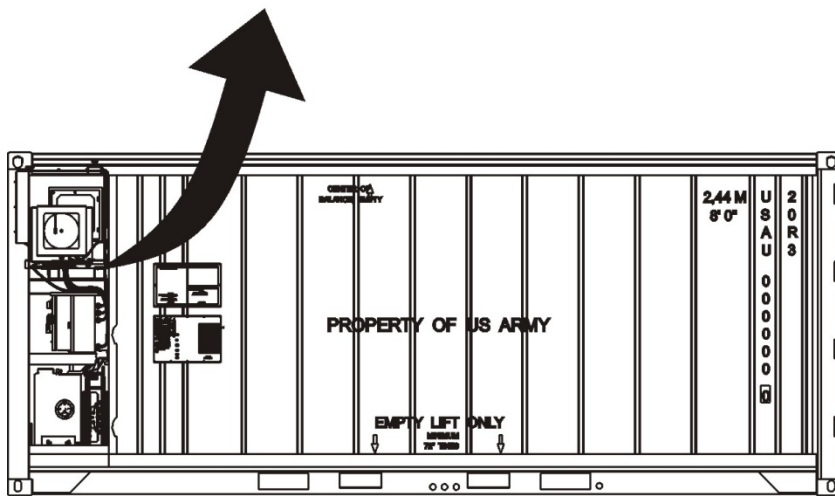
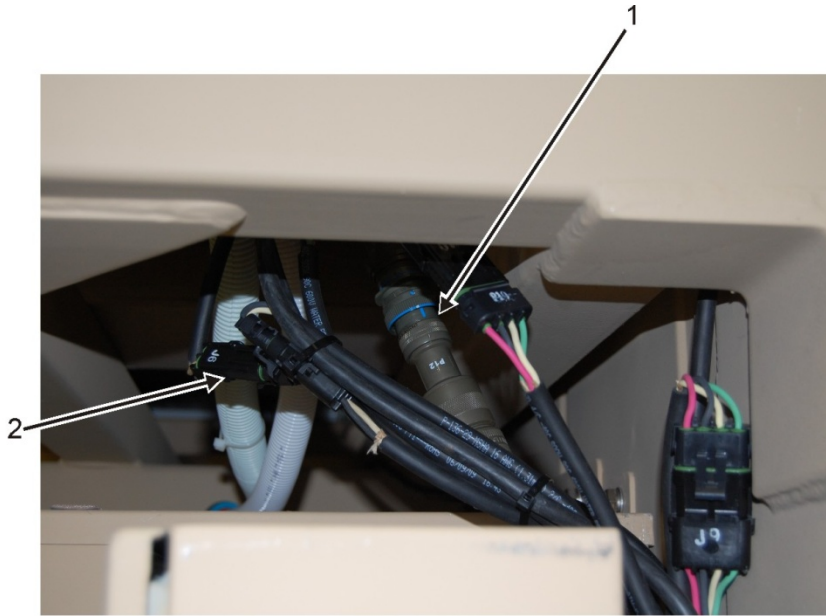


Figure 24. Braided Line P12/J12 and P6/J6 Connectors.

REPLACE – CONTINUED

30. Connect K1 power connector (P9/J9) (Figure 25, Item 3) next to chart recorder. Remove tag.
31. Reconnect insulated container light connector (P3/J3) (Figure 25, Item 2). Remove tag.
32. Reconnect 50/60 Hz switch connector (P11/J11) (Figure 25, Item 1). Remove tag.

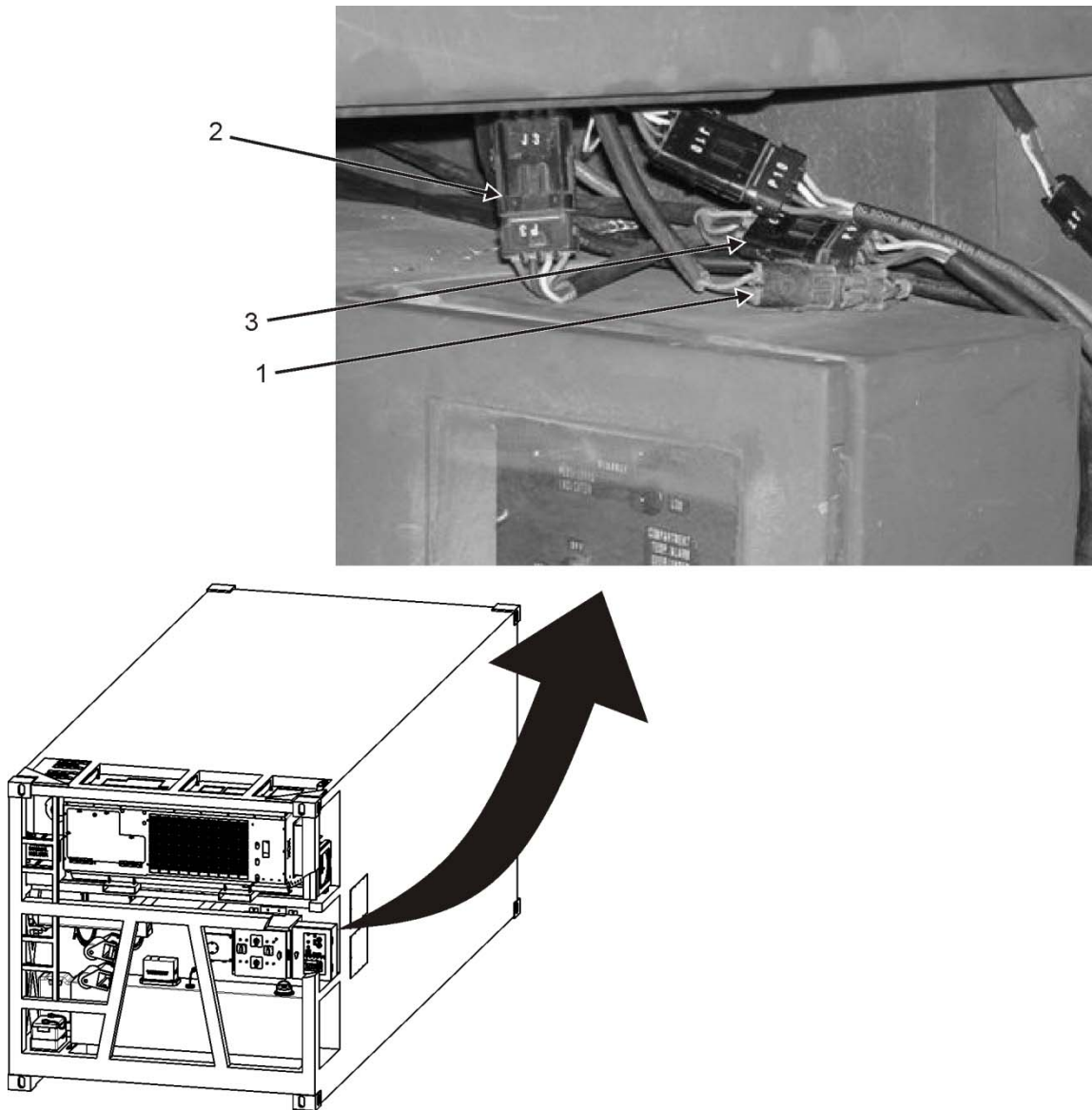


Figure 25. 50/60 Hz, P3/J3, and P9/J9 Electrical Connectors.

33. Reconnect one 3/8-inch fuel inlet line (Figure 26, Item 5) and one 1/4-inch fuel outlet line (Figure 26, Item 6) to refrigeration unit quick disconnects.

REPLACE – CONTINUED

34. Reconnect microprocessor positive (+) (Figure 26, Item 1), fuel pump positive (+) (Figure 26, Item 2), battery positive (+) (Figure 26, Item 3), and battery negative (-) (Figure 26, Item 4) cables to studs as tagged. Remove tag.

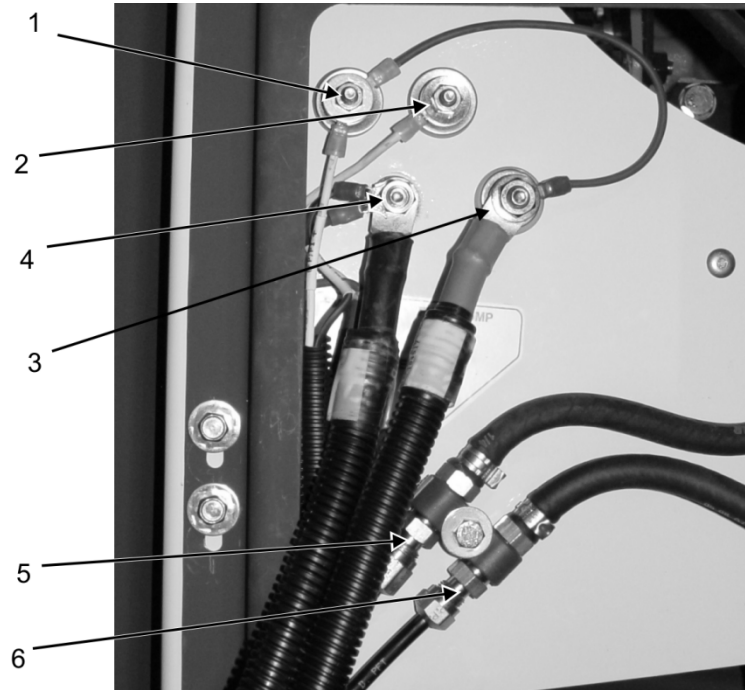


Figure 26. Electrical and Fuel Line Connections.

35. Reconnect battery (WP 0070, Reconnect).
36. Charge system with refrigerant (WP 0032, Service).
37. Perform refrigerant leak check (WP 0032, Service).
38. Operate refrigeration unit and check for normal operation (WP 0005, Operating Procedures).
39. Install right-side panel (WP 0031, Install).
40. Install left-side panel (WP 0031, Install).
41. Install front panel assembly (WP 0031, Install).
42. Install top-left panel (WP 0031, Install).
43. Install top-middle panel (WP 0031, Install)
44. Install top-right panel (WP 0031, Install).
45. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
COMPRESSOR
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Hoist, Chain (WP 0107, Table 2, Item 2)
 Pail, Utility (Metal) (WP 0110, Item 34)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005	WP 0054
WP 0031	WP 0055
WP 0032	WP 0075
WP 0034	WP 0086
WP 0048	WP 0088
WP 0052	WP 0102
WP 0053	TM 10-8145-222-23P

Materials/Parts

Towel, Machinery Wiping (WP 0110, Item 55)

Equipment Condition

Refrigeration unit removed (WP 0075)
 External electrical power disconnected (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)

REPLACE**Remove**

1. Remove front panel assembly (WP 0031, Remove).
2. Remove two screws (Figure 1, Item 1), lock washers (Figure 1, Item 2), and washers (Figure 1, Item 3) from bracket (Figure 1, Item 4). Discard lock washers.
3. Cut two tie wraps (Figure 1, Item 5) on top bracket (Figure 1, Item 6) securing wiring harness (Figure 1, Item 7).
4. Remove three screws (Figure 1, Item 8) and washers (Figure 1, Item 9) from bracket (Figure 1, Item 6).
5. Remove two screws (Figure 1, Item 10), washers (Figure 1, Item 11), self-locking nuts (Figure 1, Item 12), and lift bracket (Figure 1, Item 6) from refrigeration unit. Retain bracket for installation.

REPLACE – CONTINUED

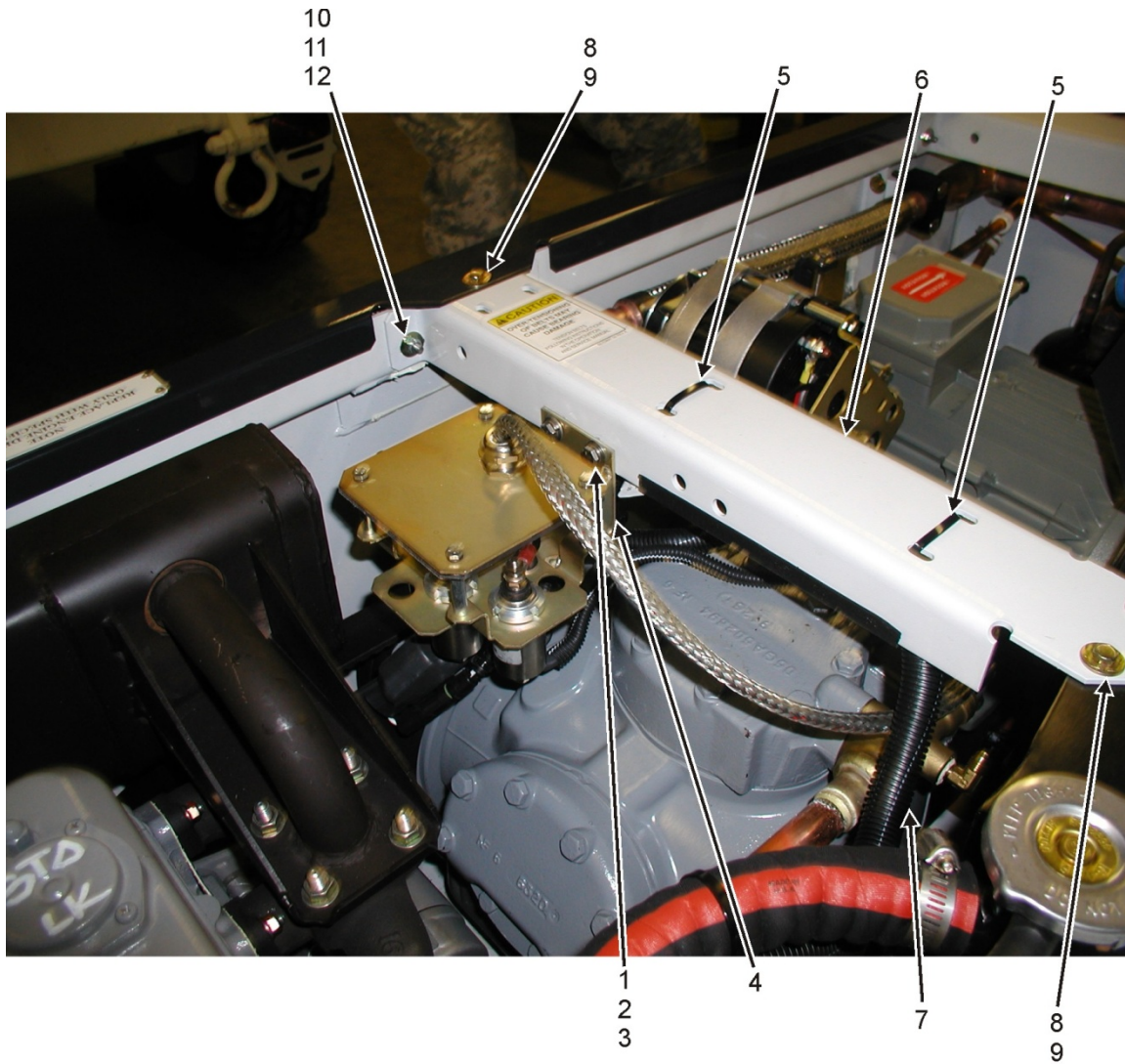


Figure 1. Refrigeration Support Bracket Removal.

REPLACE – CONTINUED

6. Partially remove alternator (WP 0048, Remove).
7. Tag and disconnect suction compressor discharge temperature sensor electrical connector (Figure 2, Item 1).
8. Tag and disconnect suction pressure transducer electrical connector (Figure 2, Item 2).
9. Tag and disconnect two high pressure cutout switch electrical connectors (Figure 2, Item 3).
10. Tag and disconnect unloader coil electrical connector (Figure 2, Item 4).
11. Frontseat (close) suction service valve (Figure 2, Item 5) by turning clockwise.
12. Frontseat (close) discharge service valve (Figure 2, Item 6) by turning clockwise.
13. Remove two bolts (Figure 2, Item 7) and washers (Figure 2, item 8) securing discharge service valve (Figure 2, Item 6) to compressor (Figure 2, Item 9).
14. Remove discharge service valve (Figure 2, Item 6) and gasket (Figure 2, Item 10) from compressor (Figure 2, Item 9) with piping attached. Discard gasket.

CAUTION

The discharge tube can kink or be easily bent if not careful. Use care when removing or repositioning discharge service valve from compressor so that tube is not bent or otherwise damaged during removal.

15. Carefully secure discharge service valve (Figure 2, Item 6) out of way.
16. Remove two bolts (Figure 2, Item 14), washers (Figure 2, Item 15), and nuts (Figure 2, Item 16) securing saddle clamp (Figure 2, Item 17) to suction line (Figure 2, Item 18). Discard lock washers.
17. Remove saddle clamp (Figure 2, Item 17). Retain for reinstallation.
18. Remove four bolts (Figure 2, Item 12) and four washers (Figure 2, Item 13) securing suction service valve (Figure 2, Item 5) to compressor (Figure 2, Item 9).
19. Remove suction service valve (Figure 2, Item 5) and gasket (Figure 2, Item 11) from compressor (Figure 2, Item 9) with piping attached. Discard gasket.

CAUTION

The suction tube can kink or be easily bent if not careful. Use care when removing or repositioning suction service valve from compressor so that tube is not bent or otherwise damaged during removal.

20. Carefully secure suction service valve (Figure 2, Item 5) out of the way.
21. Remove standby motor to compressor V-belt (WP 0053, Remove).

REPLACE – CONTINUED

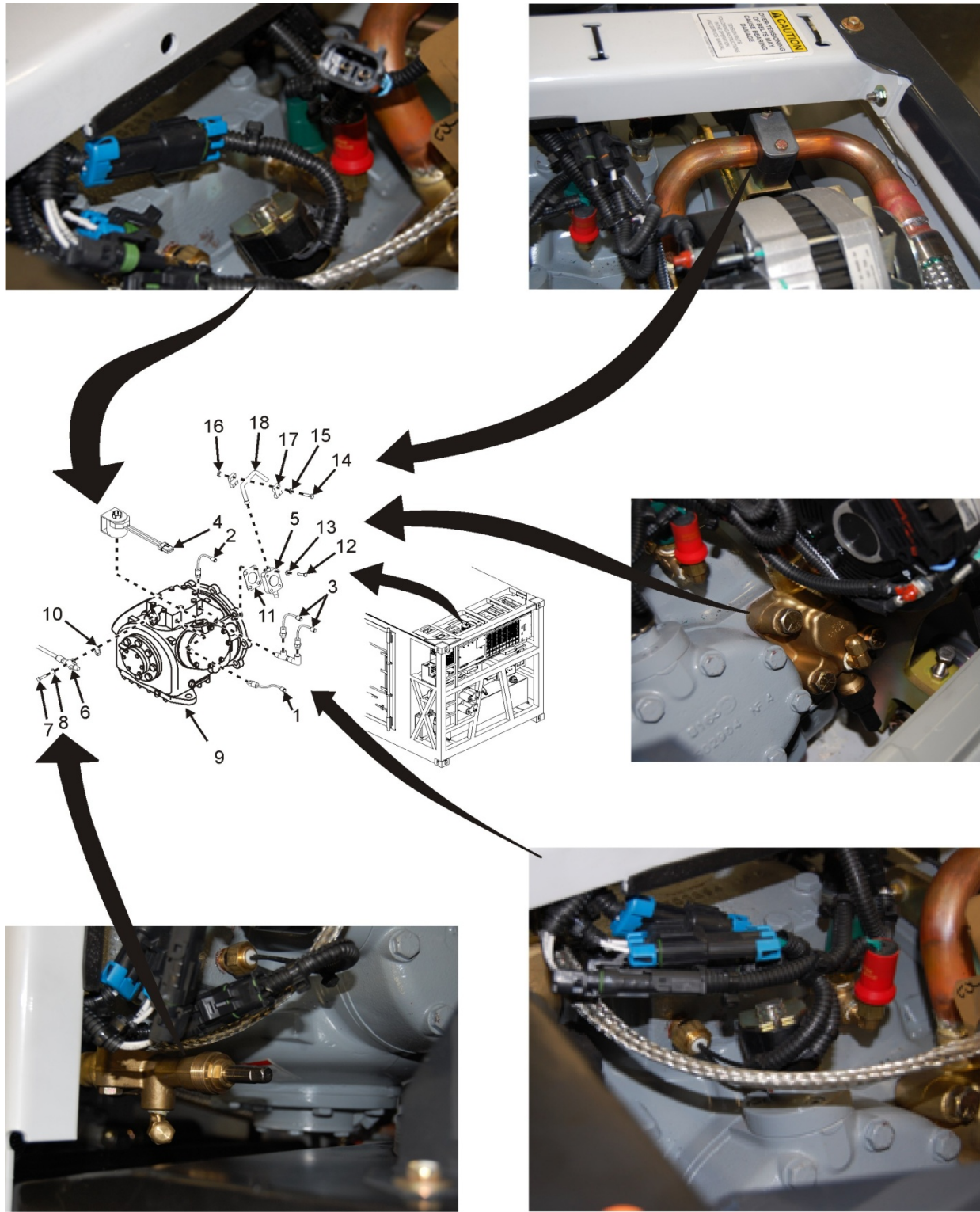


Figure 2. Compressor Removal.

REPLACE – CONTINUED

NOTE

The compressor is secured to the power tray by four bolts. The two forward mounting bolts have nuts. There are also two spacers between the compressor and power tray on the forward end.

22. Remove two bolts (Figure 3, Item 1), washers (Figure 3, Item 2), and lock washers (Figure 3, Item 3) securing aft end of compressor to power tray (Figure 3, Item 4). Discard lock washers.
23. Remove two bolts (Figure 3, Item 5), washers (Figure 3, Item 6), lock washers (Figure 3, Item 7), and nuts (Figure 3, Item 8) securing front end of compressor to power tray (Figure 3, Item 4). Retain hardware.
24. Remove two spacers (Figure 3, Item 9) located under front of compressor between compressor (Figure 3, Item 10) and power tray (Figure 3, Item 4). Retain for reinstallation.

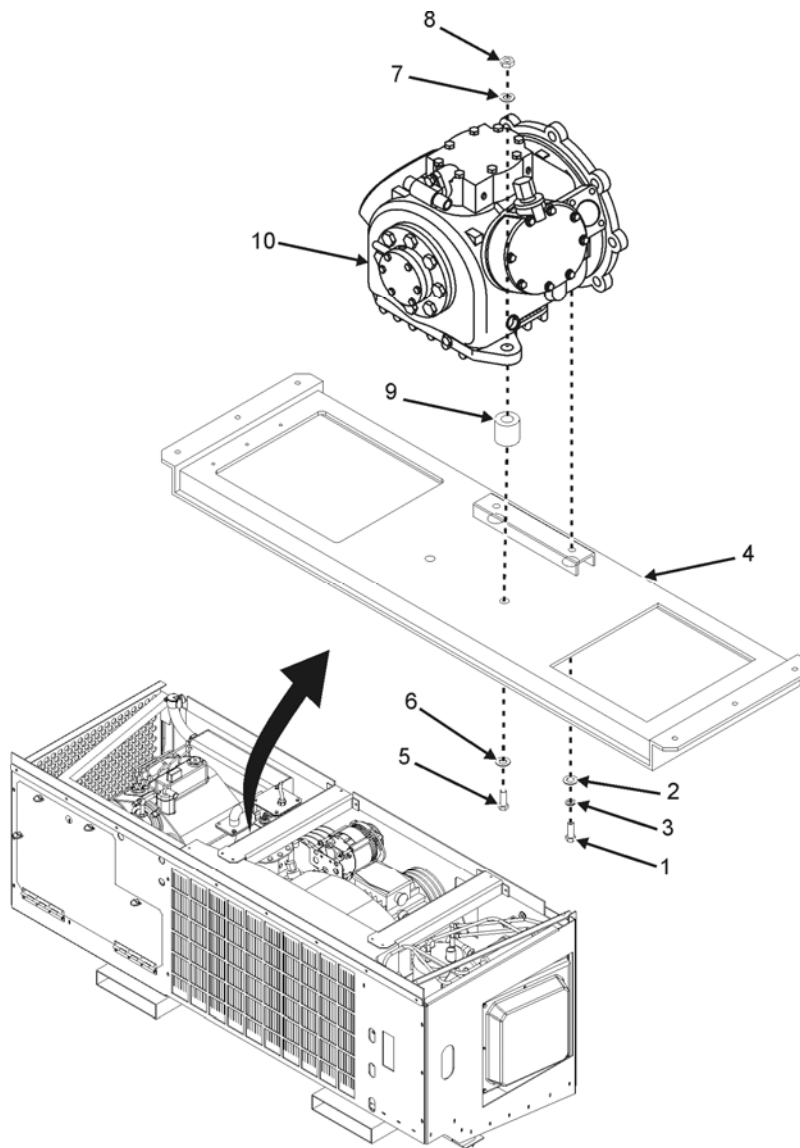


Figure 3. Compressor Mounting Aft End.

REPLACE – CONTINUED

25. Remove two bolts (Figure 4, Item 1) from compressor (Figure 4, Item 2).

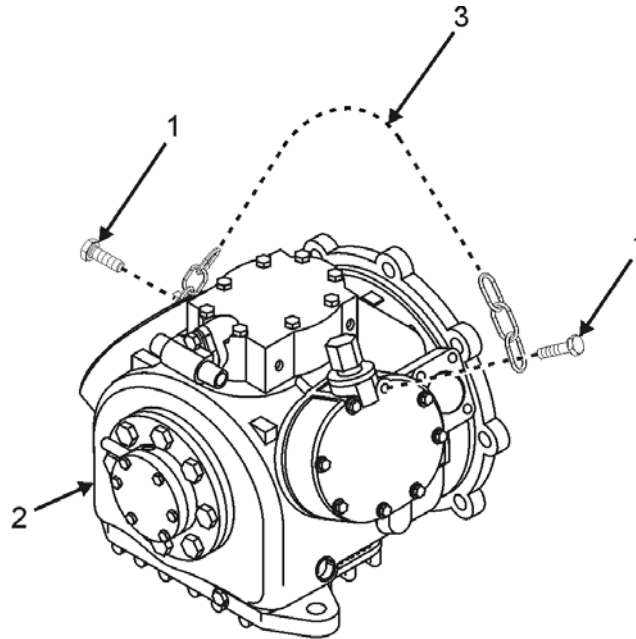


Figure 4. Compressor Hoist Install.

26. Insert bolts (Figure 4, Item 1) through chain (Figure 4, Item 3) and back into compressor (Figure 4, Item 2), then tighten (WP 0102).

WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury. The compressor weighs 150 to 175 pounds. Never attempt to move more than 42 pounds alone.

Never perform a lifting operation alone and always use guide ropes when using a hoist and moving hanging assemblies.

A lack of attention or improper positioning during a lifting operation can cause serious injury or death. Pay very close attention at all times to items being moved during a lift operation. Never stand under an item being lifted or in a position where you could be trapped or pinned.

27. Attach hoist to chain (Figure 4, Item 3).
28. Lift compressor (Figure 4, Item 2) from refrigeration unit chassis and lower onto sturdy surface.
29. Remove two bolts (Figure 4, Item 1) and chain (Figure 4, Item 3) from compressor (Figure 4, Item 2).
30. Reinstall two bolts (Figure 4, Item 1) into removed compressor (Figure 4, Item 2).

REPLACE – CONTINUED

31. Drain compressor oil into suitable container (WP 0034, Removing Oil From Compressor).

NOTE

Replacement compressor may or may not be shipped with oil. Always check the oil level in the replacement compressor before installing it into the refrigeration unit.

32. Remove two bolts (Figure 4, Item 1) from new compressor (Figure 4, Item 2).
33. Insert bolts (Figure 4, Item 1) through chain (Figure 4, Item 3) and back into compressor (Figure 4, Item 2), then tighten (WP 0102).

Install**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. The compressor weighs 150 to 175 pounds. Never attempt to move more than 42 pounds alone.

Never perform a lifting operation alone and always use guide ropes when using a hoist and moving hanging assemblies.

A lack of attention or improper positioning during a lifting operation can cause serious injury or death. Pay very close attention at all times to items being moved during a lift operation. Never stand under an item being lifted or in a position where you could be trapped or pinned.

1. Attach hoist to new compressor (Figure 4, Item 2).
2. Use hoist to lift compressor (Figure 4, Item 2) and place on power tray in engine location.
3. Remove two bolts (Figure 4, Item 1) and chain (Figure 4, Item 3) from new compressor (Figure 4, Item 2).
4. Re-install two bolts (Figure 4, Item 1) into new compressor (Figure 4, Item 2).
5. Slide compressor (Figure 3, Item 10) into place.
6. Install spacers (Figure 3, Item 9) on front compressor mounts between compressor and power tray.
7. Position compressor to engine V-belt over compressor pulley.
8. Install standby motor to compressor V-belts (WP 0053, Install).
9. Secure rear compressor to power tray using two bolts (Figure 3, Item 1), washers (Figure 3, Item 2), and new lock washers (Figure 3, Item 3).

REPLACE – CONTINUED**NOTE**

The two forward mount bolts will pass through the spacers located between the compressor and the power tray.

10. Secure front end of compressor to power tray using two bolts (Figure 3, Item 5), washers (Figure 3, Item 6), new lock washers (Figure 3, Item 7), and nuts (Figure 3, Item 8).
11. Torque four compressor mount bolts (Figure 3, Item 1 and Item 5) to 40 foot-pounds (WP 0102).
12. Temporarily install engine but do not tighten (WP 0086, Install).

CAUTION

The suction and discharge tubes can kink or be easily bent if not careful. Use care when installing suction and discharge service valves so that tubes are not bent or otherwise damaged during installation.

NOTE

Always clean surface area of compressor prior to installing a new gasket.

13. Clean gasket area of suction and discharge service valve mount locations on compressor.
14. Reinstall discharge service valve (Figure 5, Item 6) and new gasket (Figure 5, Item 10) and secure using two bolts (Figure 5, Item 7) and washers (Figure 5, Item 8). Torque bolts 20 to 30 foot-pounds (WP 0102).
15. Reinstall suction service valve (Figure 5, Item 5) and new gasket (Figure 5, Item 11) to compressor and secure using four bolts (Figure 5, Item 12) and washers (Figure 5, Item 13). Torque bolts to 55 to 80 foot-pounds (WP 0102).
16. Install saddle clamp (Figure 5, Item 17) to suction line (Figure 5, Item 18) and secure using two bolts (Figure 5, Item 14), washers (Figure 5, Item 15), and nuts (Figure 5, Item 16).
17. Tighten standby motor to compressor V-belts (WP 0052, Install).
18. Reinstall partially removed alternator (WP 0048, Install).
19. Check alternator V-belt tension (WP 0052, Adjust).
20. Reconnect two high pressure cutout switch electrical connectors (Figure 5, Item 3) as tagged.
21. Reconnect unloader coil electrical connector (Figure 5, Item 4) as tagged.
22. Reconnect pressure transducer electrical connector (Figure 5, Item 2) as tagged.

REPLACE – CONTINUED

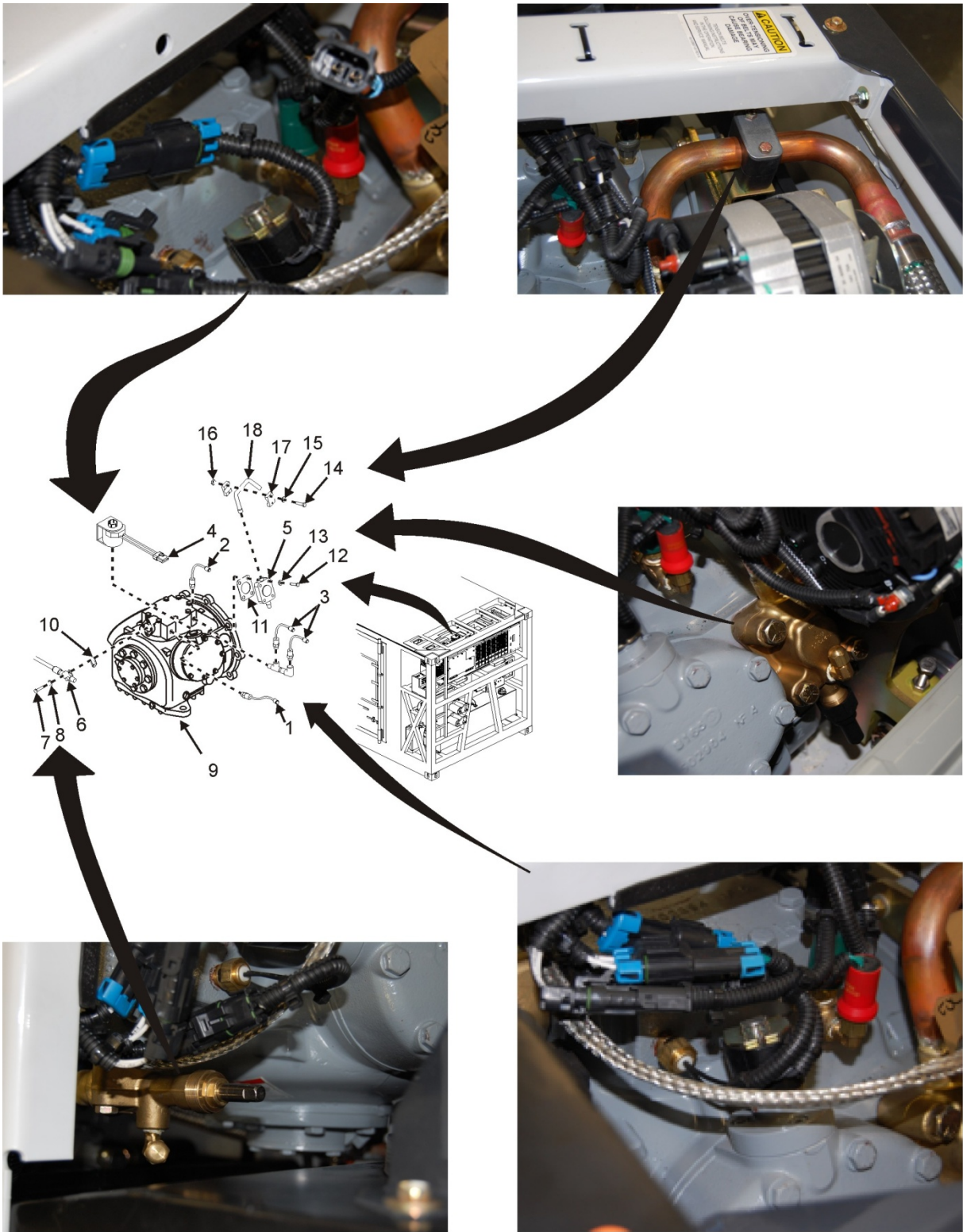


Figure 5. Compressor Installation.

REPLACE – CONTINUED

23. Reconnect compressor discharge temperature sensor electrical connector (Figure 5, Item 1) as tagged.
24. Connect and secure engine mount bolts (WP 0086, Install).
25. Install engine to compressor V-belt (WP 0054, Install) and clutch (WP 0088, Install).
26. Complete engine installation (WP 0086).

NOTE

Alignment of the three major refrigeration unit components (diesel engine, compressor, and standby motor) is important so that the belts interconnecting these components wear evenly. Misalignment of these three components could cause belt failure and subsequent system shutdown.

27. Check all V-belt tensions (WP 0052, WP 0053, WP 0054, and WP 0055, Adjust).
28. Add oil to replacement compressor if required (WP 0034, Service).
29. Position bracket (Figure 6, Item 6) on refrigeration unit and secure with two screws (Figure 6, Item 10), washers (Figure 6, Item 11), and self-locking nuts (Figure 6, Item 12).
30. Install three screws (Figure 6, Item 8) and washers (Figure 6, Item 9) securing bracket (Figure 6, Item 6) to refrigeration unit.
31. Install two screws (Figure 6, Item 1), new lock washers (Figure 6, Item 2), and washers (Figure 6, Item 3) securing bracket (Figure 6, Item 4) to bracket (Figure 6, Item 6).
32. Secure wiring harness (Figure 6, Item 7) with two tie wraps (Figure 6, Item 5) on bracket (Figure 6, Item 6).

REPLACE – CONTINUED

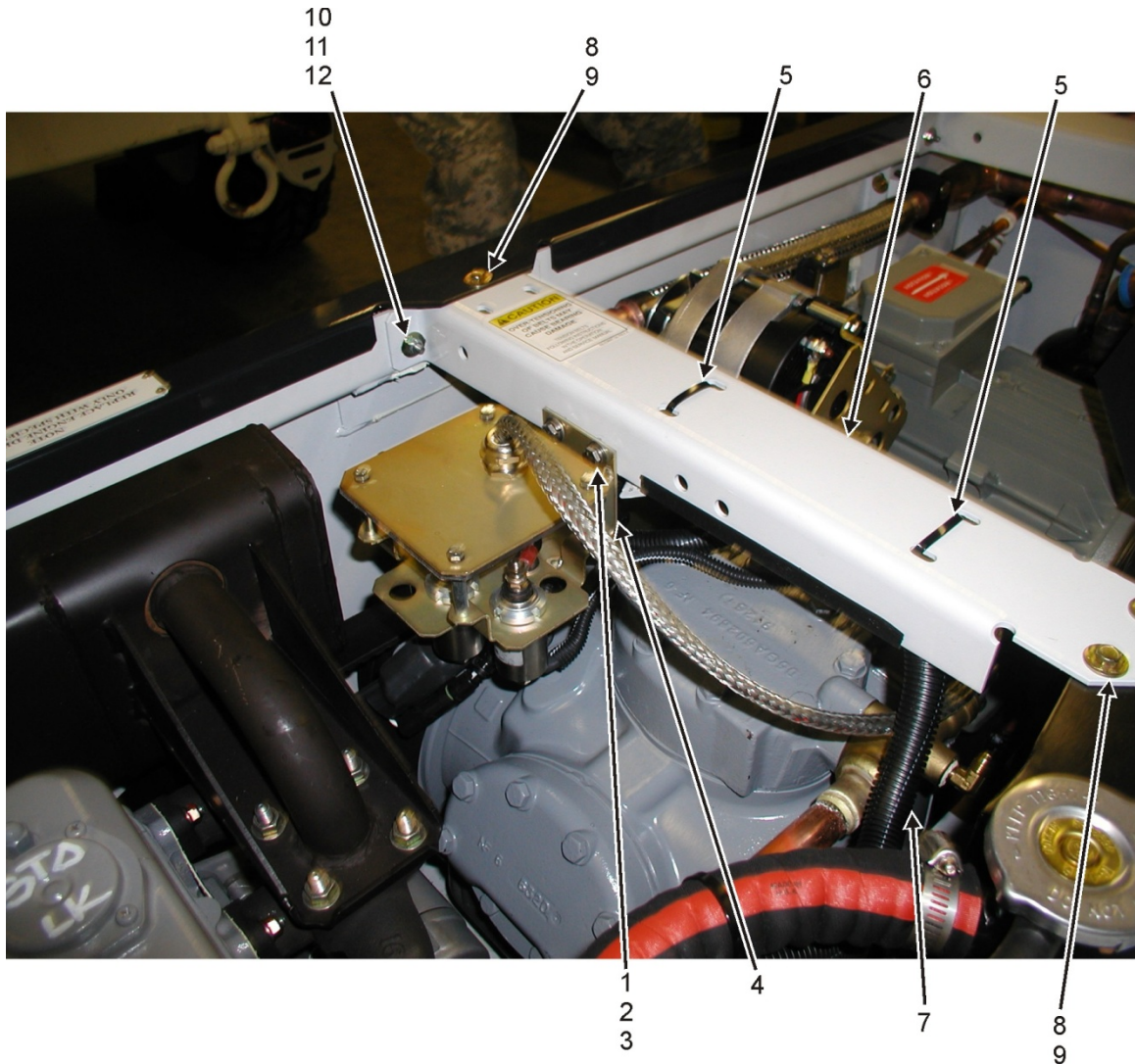


Figure 6. Refrigeration Support Bracket Installation.

REPLACE – CONTINUED

33. Perform evacuation and dehydration to 500 (\pm 25) microns (29.90 Hg vacuum) (WP 0032, Service).
34. Monitor manifold gauge for five minutes.
 - If pressure rises, perform refrigerant leak check (WP 0032, Service).
 - If pressure does not rise, proceed to next step.
35. Install manifold gauges (WP 0032, Service).
36. Start refrigeration unit in cool mode and run for 10 minutes (WP 0005, Operating Procedures).
 - Check refrigerant charge by blocking off airflow to condenser coil until discharge pressure can be maintained at 210 psig. Charge system with refrigerant as required (WP 0032, Service).
37. Shut down refrigeration unit (WP 0005, Operating Procedures).

CAUTION

A new compressor needs to be checked for oil level after usage. As compressor operates for the first time, oil will migrate to various internal compressor passages. As a result, oil level may need to be adjusted.

38. Check compressor oil level and service as required (WP 0034, Service).
39. Operate refrigeration unit to verify refrigeration cycles are operational after compressor replacement (WP 0005, Operating Procedures). Check compressor oil level and service as required (WP 0034, Service).
40. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
COMPRESSOR PRESSURE REGULATING VALVE
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 WP 0075
 TM 10-8145-222-23P

Materials/Parts

Towel, Machinery Wiping (WP 0110, Item 55)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)

REPLACE

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access.
4. Remove top-left panel (WP 0031, Remove).
5. Remove top-middle panel (WP 0031, Remove).
6. Remove one screw (Figure 1, Item 1), lock washer (Figure 1, Item 2), washer (Figure 1, Item 3), and nut (Figure 1, Item 4) securing Compressor Pressure Regulating (CPR) valve clamp (Figure 1, Item 5) to clamp mounting plate. Discard lock washer.
7. Remove clamp (Figure 1, Item 5).
8. Remove two bolts (Figure 1, Item 9), washers (Figure 1, Item 10) and nuts (Figure 1, Item 11) securing CPR valve saddle clamp (Figure 1, Item 12) to frame.
9. Remove both halves of saddle clamp (Figure 1, Item 12).

REPLACE – CONTINUED

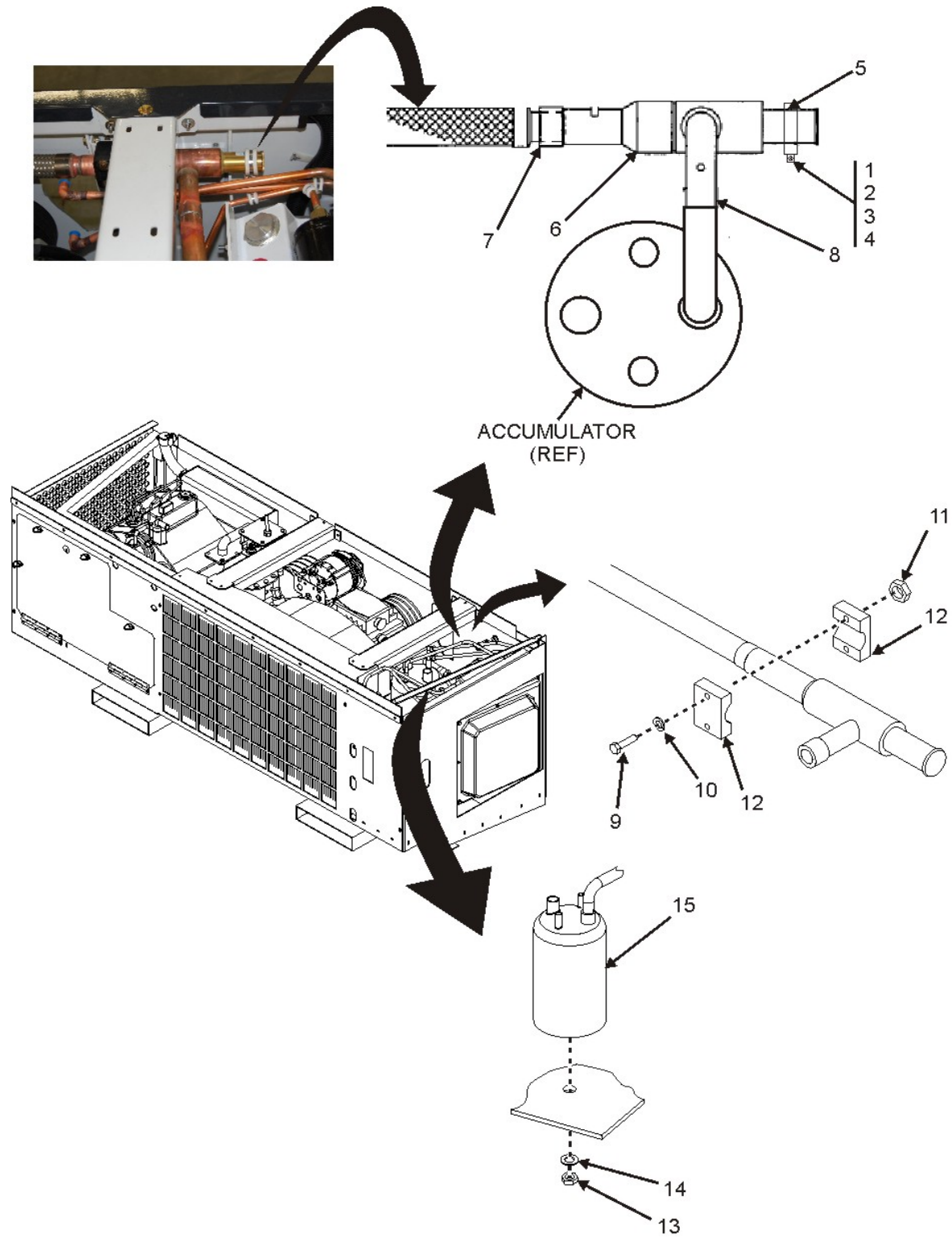


Figure 1. CPR Valve.

REPLACE – CONTINUED**NOTE**

The accumulator will need to be loosened from its mounting position in order to gain the needed movement in the tubing to be de-soldered so that the joint can be separated. The entire accumulator will not have to be removed, just the mounting hardware securing it to the refrigeration unit chassis.

10. Remove mounting nut (Figure 1, Item 13) and washer (Figure 1, Item 14) from bottom of accumulator (Figure 1, Item 15) to facilitate separation of tubes during desoldering operation.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered, or surrounding components. Wrapping the component to be soldered in wet rags will act as a heat sink and minimize exposure to heat. Excessive heat will damage the valve assembly.

NOTE

Before desoldering the CPR valve, make sure to note the orientation of the valve on the piping as installed so that the replacement valve can be installed in the same position and orientation.

11. Desolder one end of CPR valve (Figure 1, Item 6) flared fitting joint from suction vibrasorber (Figure 1, Item 7).
12. Desolder one end of CPR valve (Figure 1, Item 6) from 1 1/8-inch suction tube (Figure 1, Item 8) at flared fitting (Figure 1, Item 6).
13. Remove CPR valve (Figure 1, Item 6).
14. Solder one end of new CPR valve (Figure 1, Item 6) to 1 1/8-inch suction tube (Figure 1, Item 8) leading into accumulator.
15. Solder other end of CPR valve (Figure 1, Item 6) into suction vibrasorber (Figure 1, Item 7).

WARNING

Piping will remain very hot following soldering procedures. Make sure to wait long enough for pipes to cool before performing maintenance or attaching clamps.

16. Install mounting nut (Figure 1, Item 13) and washer (Figure 1, Item 14) to secure accumulator (Figure 1, Item 15) to chassis.
17. Install both halves of saddle clamp (Figure 1, Item 12) and secure CPR valve to frame using two bolts (Figure 1, Item 9), washers (Figure 1, Item 10), and nuts (Figure 1, Item 11).
18. Install clamp (Figure 1, Item 5) over CPR valve (Figure 1, Item 6) and secure to mounting plate using one screw (Figure 1, Item 1), new lock washer (Figure 1, Item 2), washer (Figure 1, Item 3), and nut (Figure 1, Item 4).

REPLACE – CONTINUED

19. Reinstall refrigeration unit onto MTRCS (WP 0075, Install).
20. Perform refrigeration system dehydration (WP 0032, Service).
21. Release refrigerant into system (WP 0032, Service).
22. Install top-middle panel (WP 0031, Install).
23. Install top-left panel (WP 0031, Install).
24. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
25. Start refrigeration unit and operate in cool mode (WP 0005, Operating Procedures).
26. Check refrigerant level and charge system with refrigerant as required (WP 0032, Service).
27. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
MAIN HEAT SOLENOID VALVE
REPAIR, REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 WP 0091
 TM 10-8145-222-23P

Materials/Parts

Emery Cloth (WP 0110, Item 16)
 Gasket Kit and Seal (WP 0111, Item 3)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Front panel assembly removed (WP 0031)
 Top-left panel removed (WP 0031)

Personnel Required

Utilities Equipment Repairer

REPAIR**Main Heat Solenoid Valve****WARNING**

The refrigeration unit can start automatically causing drive components and fans to operate unannounced. Unit operation must be prevented to avoid personal injury.

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery (WP 0070, Disconnect).
3. Tag and disconnect electrical connector from valve coil (Figure 1, Item 1).
4. Spread clip (Figure 1, Item 2) securing coil (Figure 1, Item 3) to valve outer body (Figure 1, Item 4) and remove coil.

REPAIR – CONTINUED

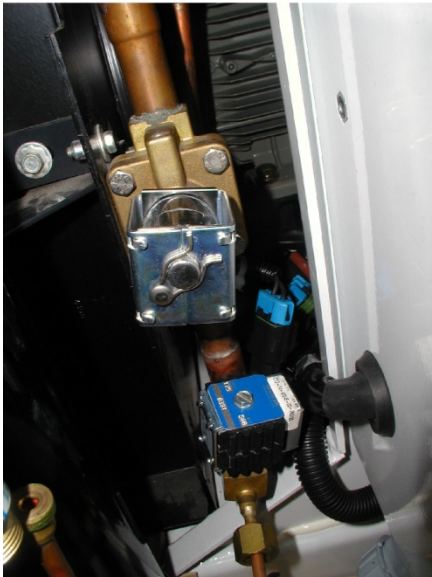
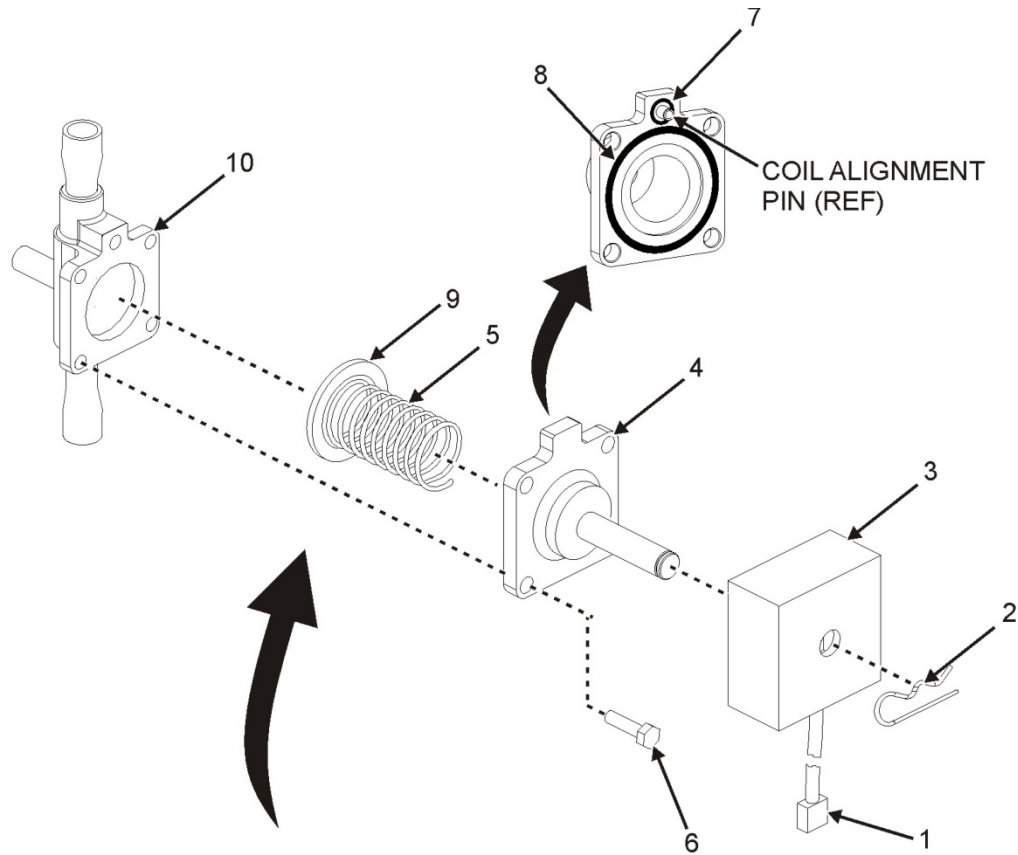


Figure 1. Main Heat Valve Coil.

REPAIR – CONTINUED**CAUTION**

A very small coil alignment pin is located at top of the valve outer body. The pin prevents the coil from rotating on enclosure tube. Do not lose pin when removing valve outer body.

NOTE

Two O-rings are located between the valve outer body and main body. Removing four bolts will allow outer valve body to be removed and expose the O-rings for replacement.

5. Remove four bolts (Figure 1, Item 6) to pull valve outer body (Figure 1, Item 4) off exposing two O-rings (Figure 1, Item 7 and Item 8).
6. Remove two O-rings (Figure 1, Item 7 and Item 8) and discard.
7. Remove seat disc (Figure 1, Item 9) and spring (Figure 1, Item 5) from inside valve body (Figure 1, Item 10) and discard.
8. Check valve body (Figure 1, Item 10), seat disc (Figure 1, Item 9), and O-rings (Figure 1, Item 7 and Item 8) for any damage, foreign objects, or obstructions. If found, remove material.

CAUTION

When installing seat disc into seat body, make sure to install the seat disc with the spring facing out. Incorrect installation of the seat disc could result in valve failure.

9. Install two new O-rings (Figure 1, Item 7 and Item 8) on valve body (Figure 1, Item 10).
10. Insert new seat disc (Figure 1, Item 9) and spring (Figure 1, Item 5) into valve body (Figure 1, Item 10).
11. Install valve outer body (Figure 1, Item 4) and secure using four bolts (Figure 1, Item 6).
12. Install coil (Figure 1, Item 3) and secure using clip (Figure 1, Item 2).
13. Reconnect electrical connector to valve coil (Figure 1, Item 1) as tagged.
14. Perform evacuation and dehydration (WP 0032, Service).
15. Charge system with refrigerant (WP 0032, Service).
16. Perform refrigerant leak check (WP 0032, Service).
17. Connect battery terminals (WP 0070, Reconnect).
18. Start refrigeration unit and check for proper operation (WP 0005, Operating Procedures).
19. Install top-left panel (WP 0031, Install).

REPAIR – CONTINUED

20. Install front panel assembly (WP 0031, Install).
21. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**REPLACE****Main Heat Valve and 7/8-Inch Check Valve Assembly**

1. Recover refrigerant (WP 0032, Service).
2. Remove top-left panel (WP 0031, Remove).
3. Remove front panel assembly (WP 0031, Remove)
4. Remove condenser (WP 0083, Remove) and place on sturdy work surface.
5. Remove coil if not already accomplished.
6. Remove two bolts (Figure 2, Item 1) and washers (Figure 2, Item 2) securing main heat valve mount bracket (Figure 2, Item 3) to condenser (Figure 2, Item 4).
7. Remove two screws (Figure 2, Item 5) and washers (Figure 2, Item 6) securing saddle clamp plate (Figure 2, Item 7) and saddle clamp front (Figure 2, Item 8) to refrigerant pipe (Figure 2, Item 9).

NOTE

When the piping is pulled on to gain added clearance, the saddle clamp back may drop.

8. Remove saddle clamp plate (Figure 2, Item 7), saddle clamp front (Figure 2, Item 8), and saddle clamp back (Figure 2, Item 10). Retain for reinstallation.
9. Remove two screws (Figure 2, Item 11), nuts (Figure 2, Item 12), lock washers (Figure 2, Item 13), and washers (Figure 2, Item 14) securing two clamps (Figure 2, Item 15) and plate (Figure 2, Item 16) to check valve refrigerant pipe (Figure 2, Item 17) and filter-drier inlet pipe (Figure 2, Item 18). Discard lock washers.

REPLACE – CONTINUED

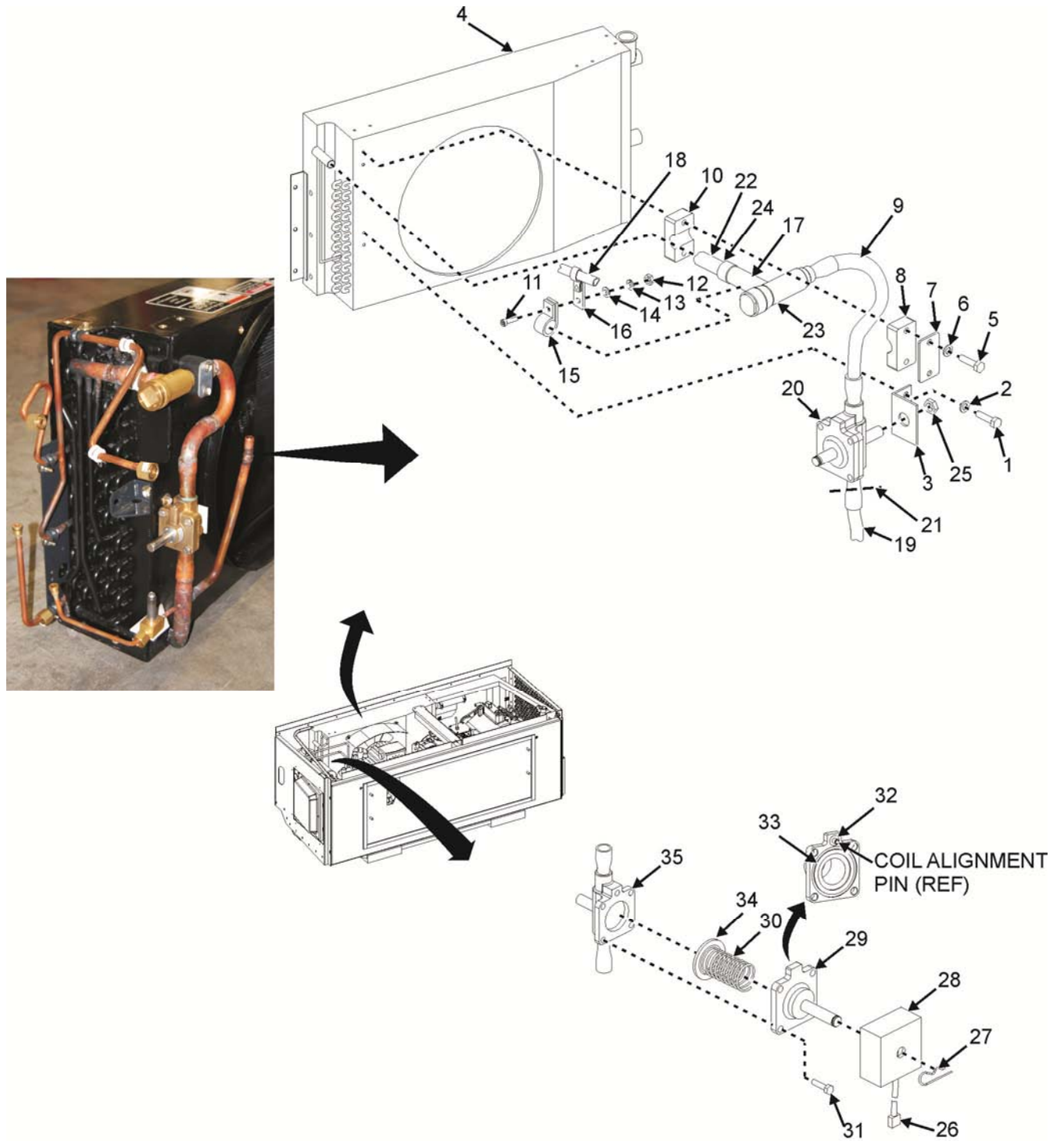


Figure 2. Main Heat Valve Removal.

REPLACE – CONTINUED**NOTE**

Because of tight clearance, it may be necessary to cut half of pipe, then flip cutter over to cut remaining half.

When cutting the main heat valve pipe to remove the heat valve, make the cut just above the flared end of the pipe coming out of the main heat valve. The new main heat valve will have copper piping extending out from the valve, and will need to be trimmed to fit.

10. Pull slightly on 7/8-inch check valve (Figure 2, Item 23) for needed clearance to fit pipe cutter between condenser (Figure 2, Item 4) and refrigerant pipe (Figure 2, Item 19) and cut pipe from bottom side of main heat valve (Figure 2, Item 20) at cut location (Figure 2, Item 21).

WARNING

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, flush with clean water and seek medical attention. Failure to observe this warning may result in serious injury to personnel.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered, or surrounding components. Wrapping the component to be soldered in wet rags will act as a heat sink and minimize exposure to heat.

NOTE

Make sure to note the position of the main heat valve before removing it so that replacement valve can be installed in the same location.

11. Desolder refrigerant pipe (Figure 2, Item 22) from 7/8-inch check valve (Figure 2, Item 23) at desolder location (Figure 2, Item 24). Ensure check valve is heat shrink/wrapped.
12. Remove main heat valve (Figure 2, Item 20) and 7/8-inch check valve (Figure 2, Item 23) assembly.
13. Desolder remaining portion of main heat valve (Figure 2, Item 20) pipe extrusion from pipe (Figure 2, Item 19).
14. Desolder tube (Figure 3, Item 9) from main heat valve (Figure 3, Item 20).
15. Remove one nut (Figure 2, Item 25) securing main heat valve (Figure 2, Item 20) to bracket (Figure 2, Item 3). Retain bracket for reinstallation.

REPLACE – CONTINUED

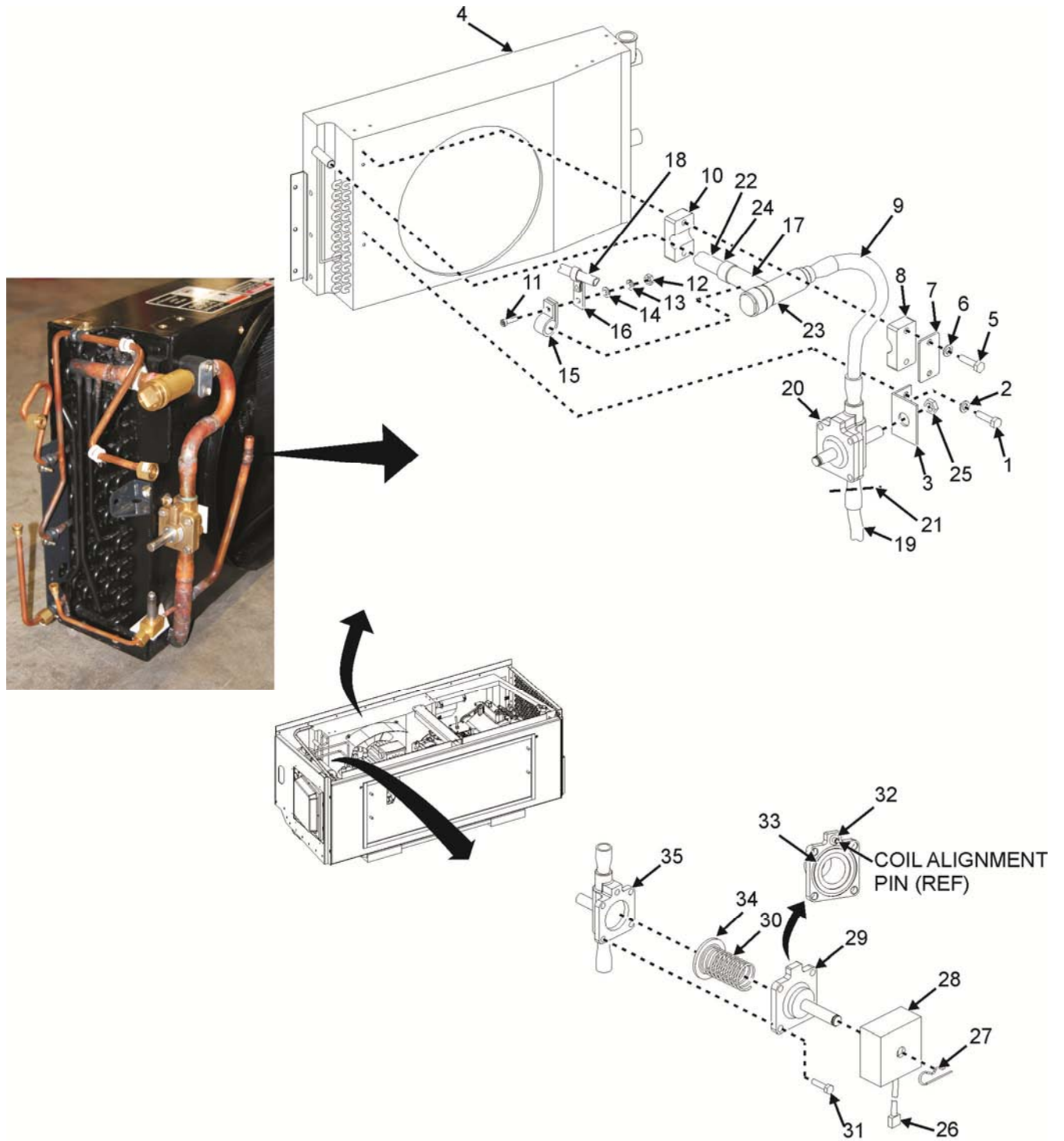


Figure 3. Heat Valve and Coil Installation.

REPLACE – CONTINUED

16. On replacement main heat valve (Figure 2, Item 20), spread clip (Figure 3, Item 26) securing coil (Figure 1, Item 28) to valve outer body (Figure 1, Item 4) and remove coil.
17. Remove four bolts (Figure 3, Item 31) to pull valve outer body (Figure 3, Item 29) off exposing two O-rings (Figure 3, Item 32 and Item 33).
18. Remove two O-rings (Figure 3, Item 32 and Item 33). Retain for reinstallation.
19. Remove seat disc (Figure 3, Item 34) and spring (Figure 3, Item 30) from inside valve body (Figure 3, Item 35). Retain for reinstallation.

NOTE

Before soldering replacement assembly into place on the condenser, make sure that you fit check the assembly to see that all piping lines up and fits accurately. Make any corrections to piping as needed before soldering assembly into place.

20. Assemble new main heat valve (Figure 3, item 20) and check valve (Figure 3, Item 23) in place onto pipe (Figure 3, Item 9).
21. Solder new main heat valve (Figure 3, Item 20) and pipe (Figure 3, Item 9) to compressor check valve (Figure 3, Item 23) and to refrigerant pipe (Figure 3, Item 19) and pipe (Figure 3, Item 22).

WARNING

Allow piping to cool sufficiently before reinstalling coil and clamps.

22. Install two O-rings (Figure 3, Item 32 and Item 33) on outer valve body (Figure 3, Item 20).
23. Insert seat disc (Figure 3, Item 34) and spring (Figure 3, Item 30) into valve outer body (Figure 3, Item 35).
24. Install valve outer body (Figure 3, Item 29) and secure using four bolts (Figure 3, Item 31).
25. Install coil (Figure 3, Item 28) and secure using clip (Figure 3, Item 26).
26. Install two clamps (Figure 3, Item 15) and plate (Figure 3, Item 16) and secure using two screws (Figure 3, Item 11), nuts (Figure 3, Item 12), new lock washers (Figure 3, Item 13), and washers (Figure 3, Item 14) to check valve refrigerant pipe (Figure 3, Item 17) and filter drier inlet pipe (Figure 3, Item 18).
27. Install saddle clamp back (Figure 3, Item 10), saddle clamp front (Figure 3, Item 8), and saddle clamp plate (Figure 3, Item 7) over refrigerant pipe (Figure 3, Item 9) and secure using two screws (Figure 3, Item 5) and washers (Figure 3, Item 6).
28. Secure main heat valve (Figure 3, Item 20) to bracket (Figure 3, Item 3) using one nut (Figure 3, Item 25).
29. Secure main heat valve mount bracket (Figure 3, Item 3) to condenser (Figure 3, Item 4) using two bolts (Figure 3, Item 1) and washers (Figure 3, Item 2).
30. Install coil (Figure 3, Item 3) and secure using clip (Figure 3, Item 27).

REPLACE – CONTINUED

31. Install condenser (WP 0083, Install).
32. Reconnect electrical connector to valve coil (Figure 3, Item 1) if not already accomplished.
33. Perform evacuation and dehydration (WP 0032, Service).
34. Perform refrigerant leak check (WP 0032, Service).
35. Charge system with refrigerant (WP 0032, Service).
36. Start refrigeration unit and check for proper operation (WP 0005, Operating Procedures).
37. Install top-left panel (WP 0031, Install).
38. Install front panel assembly (WP 0031, Install).
39. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
RECEIVER PRESSURE SOLENOID VALVE
REPAIR, REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 TM 10-8145-222-23P

Personnel Required

Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)

REPAIR**WARNING**

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area of skin with soap and water.

NOTE

Repair of the receiver pressure solenoid valve is limited to replacement of the solenoid coil. Perform the following steps to replace the solenoid coil.

1. Disconnect battery (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

2. Remove top-left panel (WP 0031, Remove).
3. Remove top-middle panel (WP 0031, Remove).
4. Tag and disconnect electrical connector (Figure 1, Item 1) from receiver pressure solenoid coil (Figure 1, Item 2).

REPAIR – CONTINUED

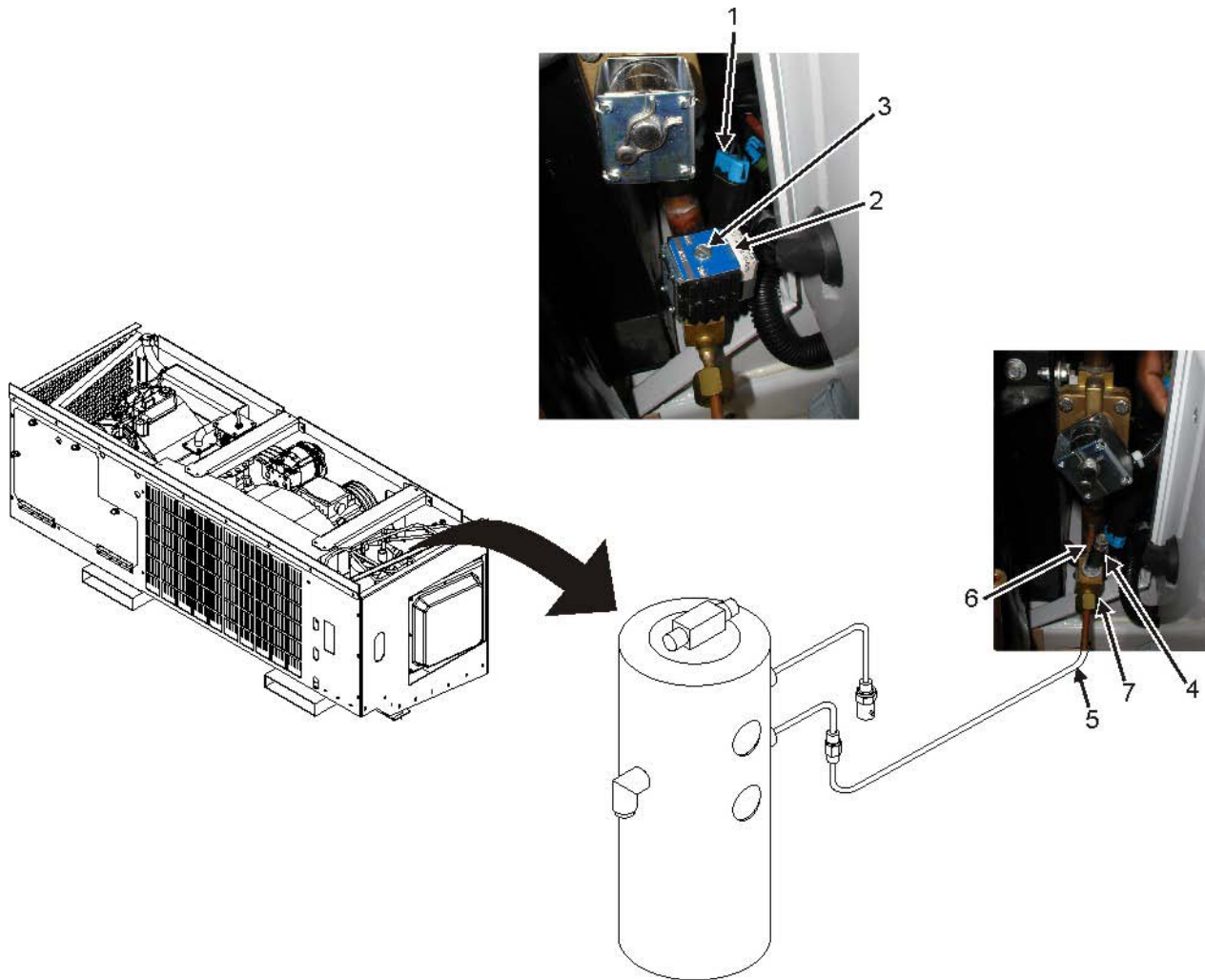


Figure 1. Receiver Pressure Solenoid Coil.

5. Remove bolt (Figure 1, Item 3) securing top of solenoid coil (Figure 1, Item 2) to enclosure tube (Figure 1, Item 4).
6. Remove coil (Figure 1, Item 2) by sliding coil off of enclosure tube (Figure 1, Item 4).
7. Install replacement coil onto enclosure tube (Figure 1, Item 4).
8. Install bolt (Figure 1, Item 3) onto top of enclosure tube (Figure 1, Item 4) to secure coil (Figure 1, Item 2).
9. Reconnect electrical connector (Figure 1, Item 1) to receiver pressure solenoid coil (Figure 1, Item 2).
10. Remove tag from electrical connector.

REPAIR – CONTINUED**WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

11. Install top-middle panel (WP 0031, Install).
12. Install top-left panel (WP 0031, Install).
13. Reconnect battery (WP 0070, Reconnect).
14. Run refrigeration unit in cool mode (WP 0005, Operating Procedures).
15. Check to make sure unit is cooling properly.
16. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**REPLACE****WARNING**

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area of skin with soap and water.

NOTE

Perform the replacement task only if repair is ineffective.

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Access top of MTRCS using roof access.
4. Remove top-left panel (WP 0031, Remove).
5. Remove top-middle panel (WP 0031, Remove).
6. Remove receiver pressure solenoid valve coil (Figure 2, Item 2) in accordance with this WP.

REPLACE – CONTINUED

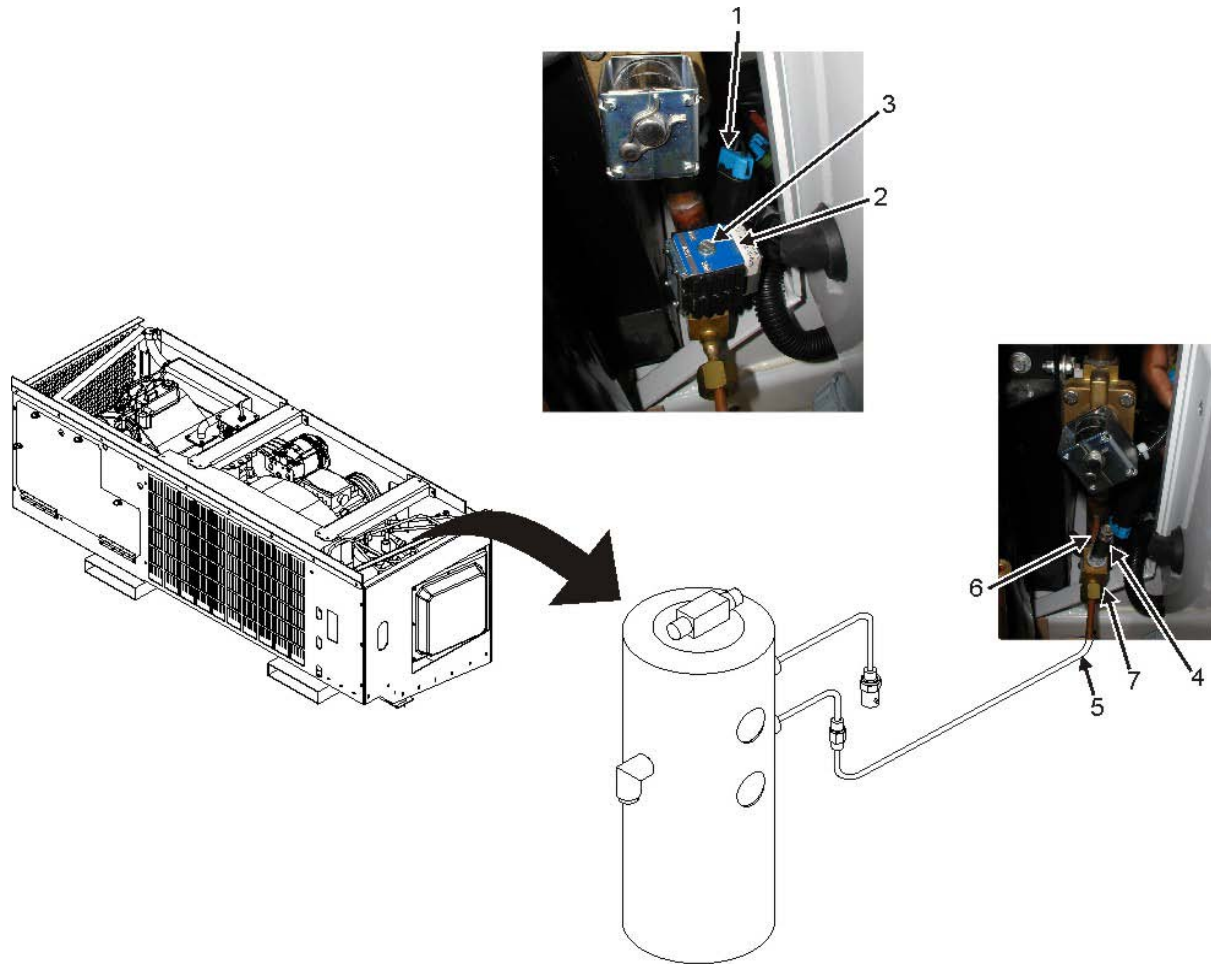


Figure 2. Receiver Pressure Solenoid Valve.

REPLACE – CONTINUED**WARNING**

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, flush with clean water and seek medical attention. Failure to observe this warning may result in serious injury to personnel.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered, or surrounding components. Wrapping the component to be soldered in wet rags will act as a heat sink and minimize exposure to heat.

7. Desolder each end of 1/4-inch receiver pressure solenoid valve (Figure 2, Item 7) from 1/4-inch tube (Figure 2, Item 5 and Item 6).
8. Remove valve (Figure 2, Item 7).
9. Install replacement receiver pressure solenoid valve (Figure 2, Item 7) and solder in two fittings to secure valve to 1/4-inch tube (Figure 2, Item 5 and Item 6).
10. Install receiver pressure solenoid valve coil (Figure 2, Item 2) in accordance with this WP.
11. Perform refrigerant leak check (WP 0032, Service).
12. Perform evacuation and dehydration (WP 0032, Service).
13. Charge system with refrigerant (WP 0032, Servicing).
14. Install top-middle panel (WP 0031, Install).
15. Install top-left panel (WP 0031, Install).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

16. Access top of MTRCS using roof access provided; then crawl around refrigeration unit to access run/stop switch located at right front corner of refrigeration unit through top grill.
17. Reconnect battery (WP 0070, Reconnect).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
DISCHARGE SERVICE VALVE
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0036
 WP 0070
 TM 10-8145-222-23P

Materials/Parts

Filter Dryer (WP 0111, Item 2)
 Threadlocker, Sealing Compound (WP 0110, Item 41)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

Personnel Required

Utilities Equipment Repairer (2)

REPLACE**WARNING**

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area of skin with soap and water.

1. Pump refrigeration unit down (WP 0032, Service).
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Remove top-left panel (WP 0031, Remove).
4. Remove top-middle panel (WP 0031, Remove).

REPLACE – CONTINUED

CAUTION

The discharge tube can kink or be easily bent if not careful. Use care when removing discharge service valve from discharge tube so that tube is not bent or otherwise damaged during removal.

5. Remove two bolts (Figure 1, Item 1) and two washers (Figure 1, Item 2) securing discharge service valve (Figure 1, Item 3) to compressor (Figure 1, Item 4).

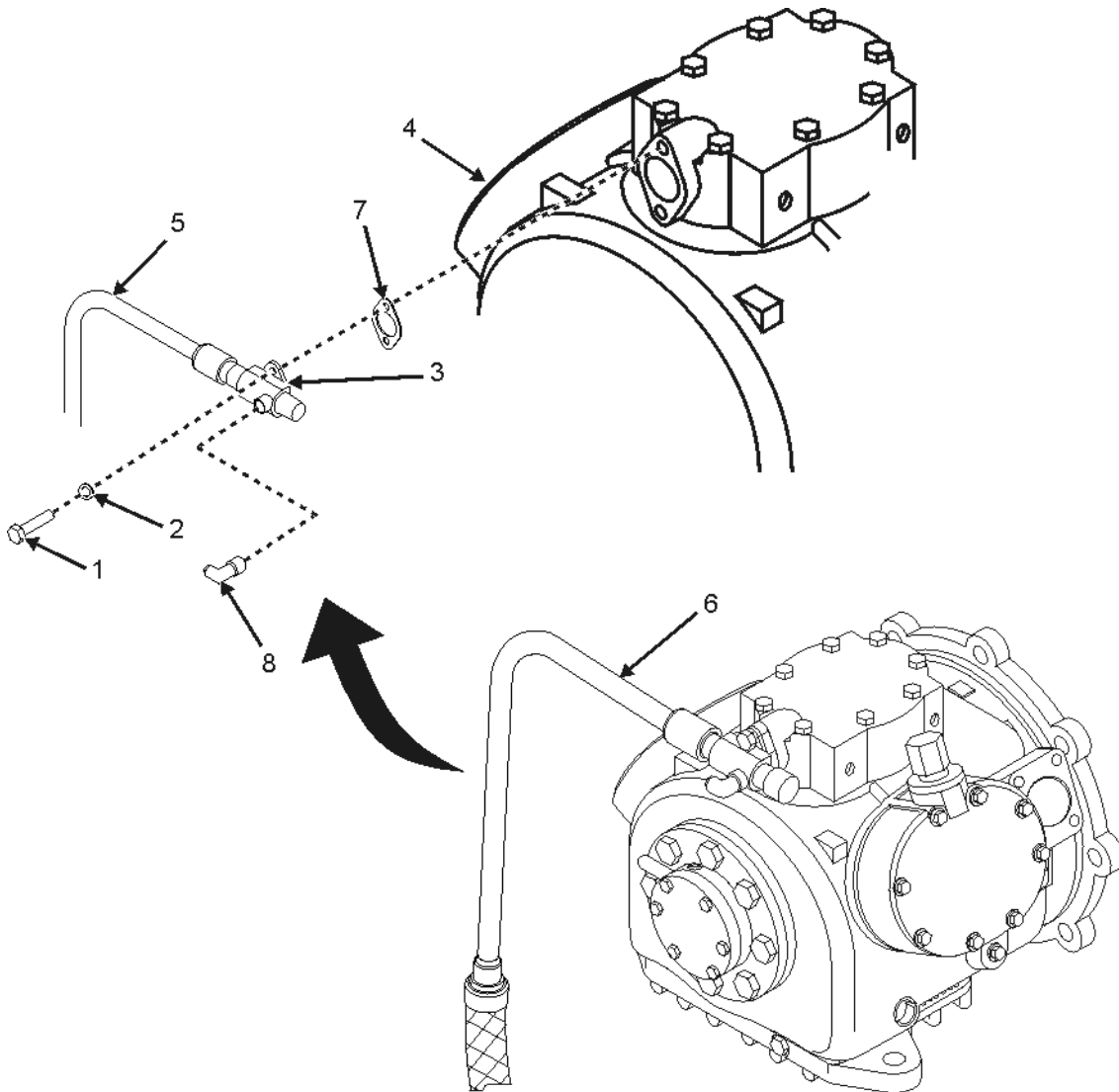


Figure 1. Discharge Service Valve Removal.

REPLACE – CONTINUED**WARNING**

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, flush with clean water and seek medical attention. Failure to observe this warning may result in serious injury to personnel.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered, or surrounding components. Wrapping the component to be soldered in wet rags will act as a heat sink and minimize exposure to heat.

NOTE

Due to the difficulty in getting a torch on the bottom end of the vibrasorber, the discharge service valve will be cut out of the unit at a point between the outlet portion of the valve and the 90-degree bend in the tube. The tube is then desoldered from the valve, and reused on the new installation. When installing a new valve, the pipe will be soldered to the new valve, and that assembly will be soldered into the unit with a coupling.

6. Cut tube (Figure 1, Item 5) leading from discharge service valve (Figure 1, Item 3) at location (Figure 1, Item 6) approximately halfway between discharge tube outlet and 90-degree bend.
7. Remove discharge service valve (Figure 1, Item 3) and gasket from compressor (Figure 1, Item 7). Discard gasket.
8. Measure and record length of tube (Figure 1, Item 6) remaining on discharge service valve (Figure 1, Item 3) after cut for use on new valve assembly.
9. Remove elbow fitting (Figure 1, Item 8) from discharge service valve (Figure 1, Item 3). Retain fitting for reinstallation.
10. Measure appropriate length and cut tube (Figure 2, Item 5) on new discharge service valve (Figure 2, Item 3) assembly at same location (Figure 2, Item 6) as removed valve.

REPLACE – CONTINUED

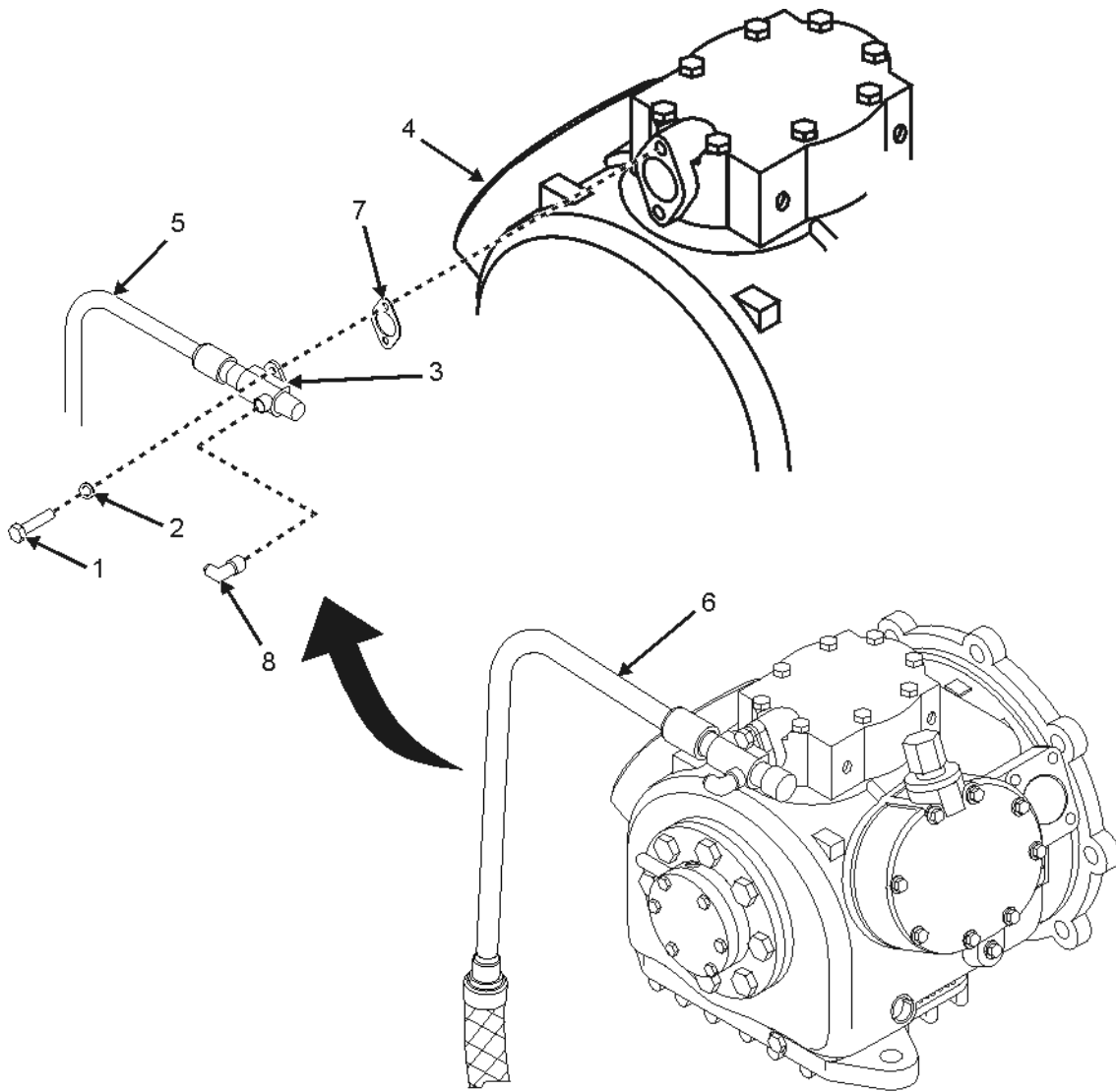


Figure 2. Discharge Service Valve Installation.

REPLACE – CONTINUED**WARNING**

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, flush with clean water and seek medical attention. Failure to observe this warning may result in serious injury to personnel.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered, or surrounding components. Wrapping the component to be soldered in wet rags will act as a heat sink and minimize exposure to heat. Make sure all wiring is clear of solder and desolder areas.

11. Solder one side of coupling to tube (Figure 2, Item 5) at location of cut (Figure 2, Item 6).
12. Clean surface area of compressor (Figure 2, Item 4) where valve was removed with a scraper or razor prior to installing new gasket.
13. Install tube (Figure 2, Item 6), new discharge service valve (Figure 2, Item 3), and new gasket (Figure 2, Item 7) with rib side out to compressor (Figure 2, Item 4) and secure with two bolts (Figure 2, Item 1) and two washers (Figure 2, Item 2). Do not tighten bolts at this time.
14. Solder tube (Figure 2, Item 6) to existing tube (Figure 2, Item 5) using previously installed coupling at location where old valve and tube assembly was cut from unit.

CAUTION

The discharge tube can kink or be easily bent if not careful. Use care when installing discharge service valve so that tube is not bent or otherwise damaged during installation.

15. Torque two bolts (Figure 2, Item 1) and two washers (Figure 2, Item 2) securing discharge service valve (Figure 2, Item 3) to compressor (Figure 2, Item 4) to 20 to 30 foot-pounds.
16. Apply lock tight to elbow fitting (Figure 2, Item 8).
17. Install elbow fitting (Figure 2, Item 8) on new discharge service valve (Figure 2, Item 3).
18. Change filter drier (WP 0036, Replace).
19. Perform evacuation and dehydration (WP 0032, Service).
20. Release refrigerant into system (WP 0032, Service).
21. Install top-middle panel (WP 0031, Install).

REPLACE – CONTINUED

22. Install top-left panel (WP 0031, Install).
23. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
24. Run refrigeration unit (WP 0005, Operating Procedures).
25. Perform refrigerant leak check (WP 0032, Service).
26. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
SUCTION SERVICE VALVE
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Insulation Tape (WP 0110, Item 26)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
 WP 0031
 WP 0032
 WP 0036
 WP 0052
 WP 0070
 WP 0102
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

REPLACE**WARNING**

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area of skin with soap and water.

1. Perform evacuation and dehydration (WP 0032, Service).
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Remove top-left panel (WP 0031, Remove).
4. Remove top-middle panel (WP 0031, Remove).
5. Remove alternator (WP 0048, Remove).

REPLACE – CONTINUED

CAUTION

The suction tube can kink or be easily bent if not careful. Use care when removing suction service valve from suction tube so that tube is not bent or otherwise damaged during removal.

- Remove two bolts (Figure 1, Item 1), washers (Figure 1, Item 2), and nuts (Figure 1, Item 3) securing suction tube saddle clamp and spacer (Figure 1, Item 4) located near CPR valve (Figure 1, Item 5).

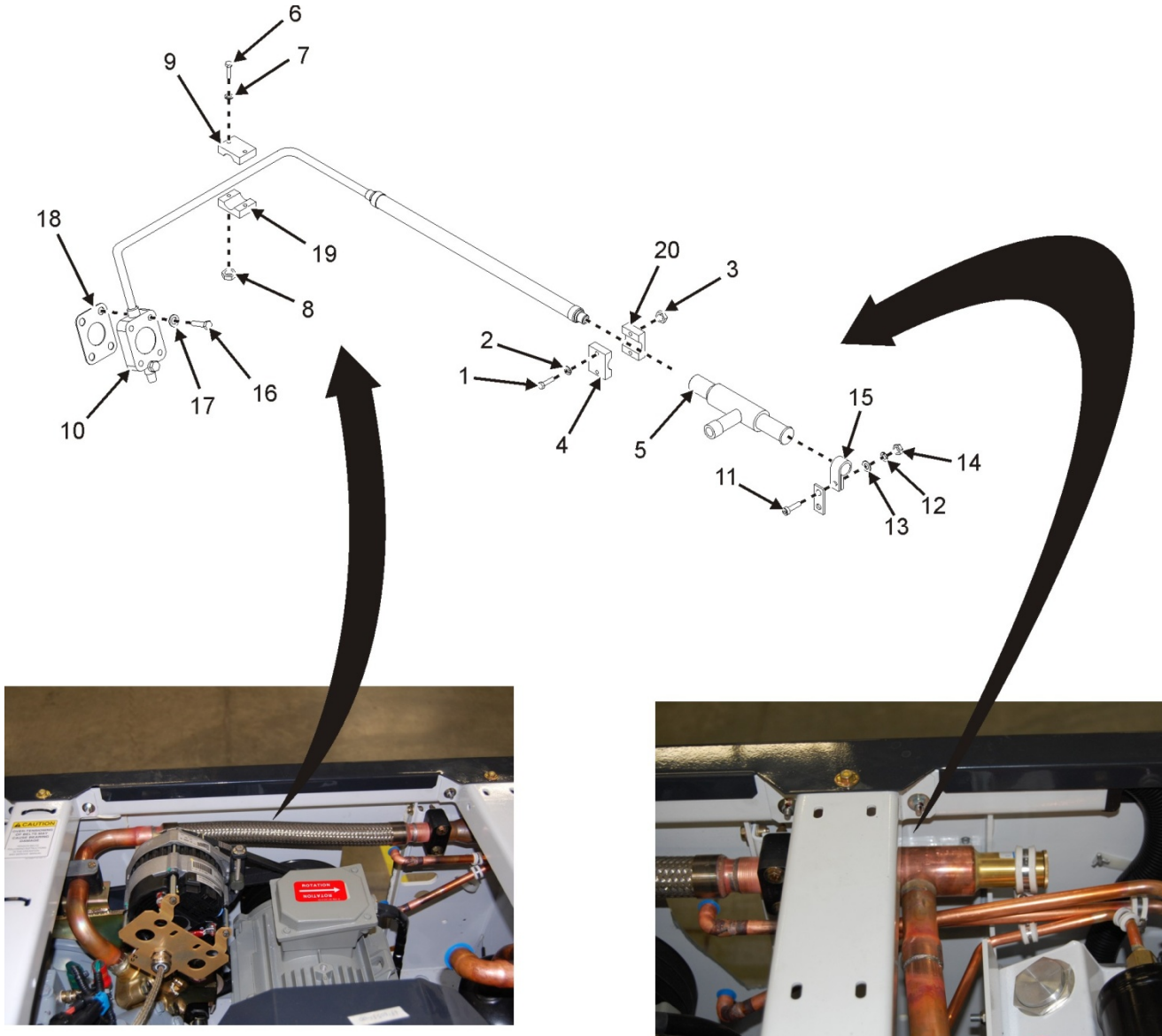


Figure 1. Suction Service Valve Assembly Removal.

REPLACE – CONTINUED**NOTE**

Rear side of saddle clamp will stay in place until both saddle clamps have been removed. Both saddle clamps mount the same way. Figure 1 is used as a visual reference for both saddle clamps.

7. Remove front side of saddle clamp and spacer (Figure 1, Item 4).
8. Remove two bolts (Figure 1, Item 6), washers (Figure 1, Item 7), and nuts (Figure 1, Item 8) securing suction tube saddle clamp and spacer (Figure 1, Item 9) located near suction service valve (Figure 1, Item 10).

NOTE

Be sure to note position of old valve before desoldering so that new valve can be installed with correct orientation.

9. Remove one screw (Figure 1, Item 11), lock washer (Figure 1, Item 12), washer (Figure 1, Item 13), and nut (Figure 1, Item 14) securing CPR valve clamp (Figure 1, Item 15) to clamp mounting plate. Discard lock washer.
10. Remove clamp (Figure 1, Item 15) from CPR valve (Figure 1, Item 5).
11. Remove four bolts (Figure 1, Item 16) and four washers (Figure 1, Item 17) securing suction service valve (Figure 1, Item 10) to compressor.
12. Remove suction service valve (Figure 1, Item 10) and gasket (Figure 1, Item 18) from compressor.
13. Discard gasket (Figure 1, Item 18).
14. Remove rear side of saddle clamps (Figure 1, Item 19 and Item 20).
15. Remove four bolts (Figure 2, Item 2), and four washers (Figure 2, Item 3), and two nuts (Figure 2, Item 4), two washers (Figure 2, Item 5), and two bolts (Figure 2, Item 6) securing support arm (Figure 2, Item 1) to frame above accumulator, and support arm bracket (Figure 2, Item 7) to support arm (Figure 2, Item 1).
16. Remove support arm (Figure 2, Item 1).

REPLACE – CONTINUED

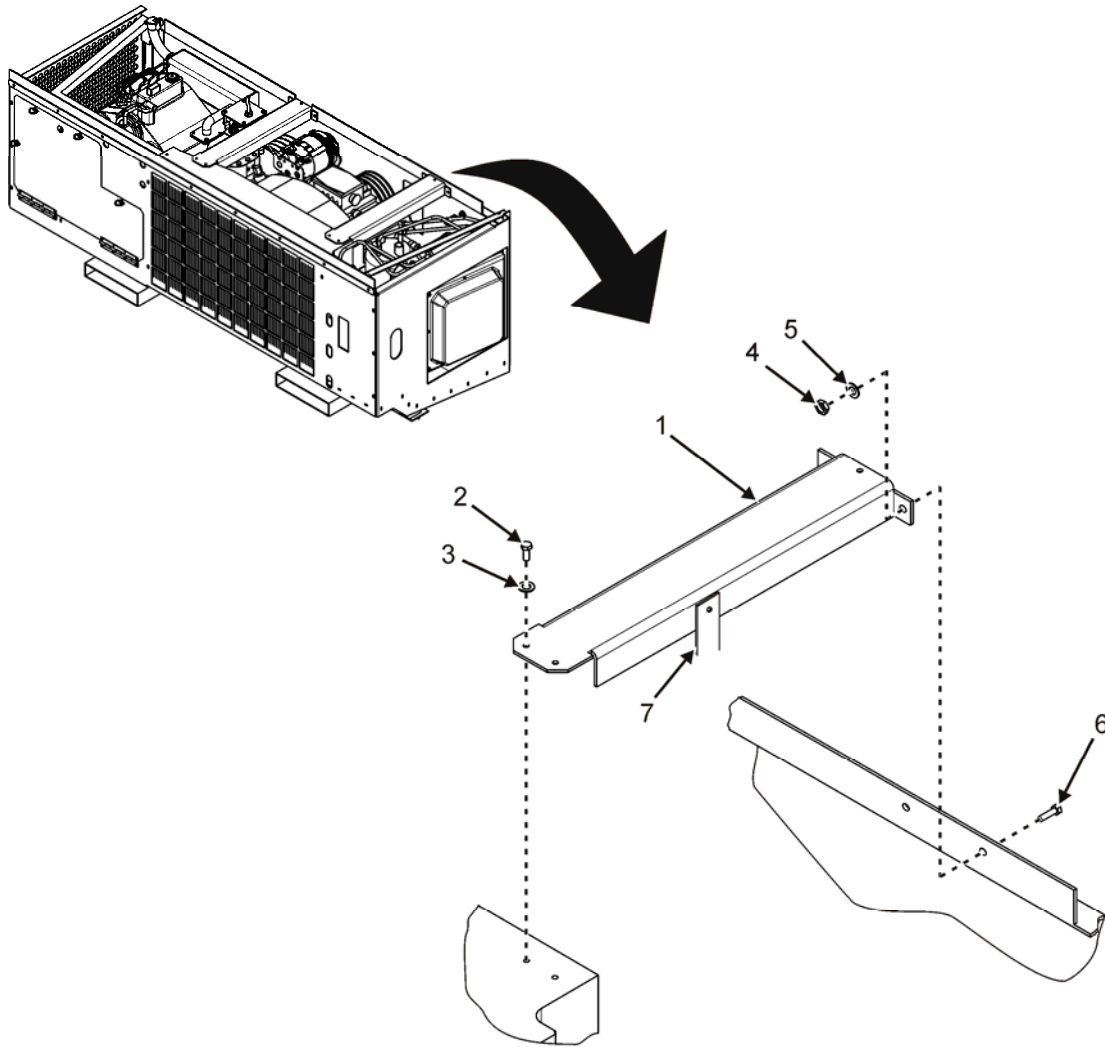


Figure 2. Support Arm.

REPLACE – CONTINUED

NOTE

The accumulator will need to be loosened from its mounting position in order to gain the needed movement in the tubing to be de-soldered so that the joint can be separated. The entire accumulator will not have to be removed, just the mounting hardware securing it to the refrigeration unit chassis.

17. Remove mounting nut (Figure 3, Item 1) and washer (Figure 3, Item 2) from bottom of accumulator to facilitate separation of tubes during desoldering operation.
18. Disconnect copper line (Figure 3, Item 4) running from filter-drier (Figure 3, Item 5) to accumulator (Figure 3, Item 3) at filter-drier only.

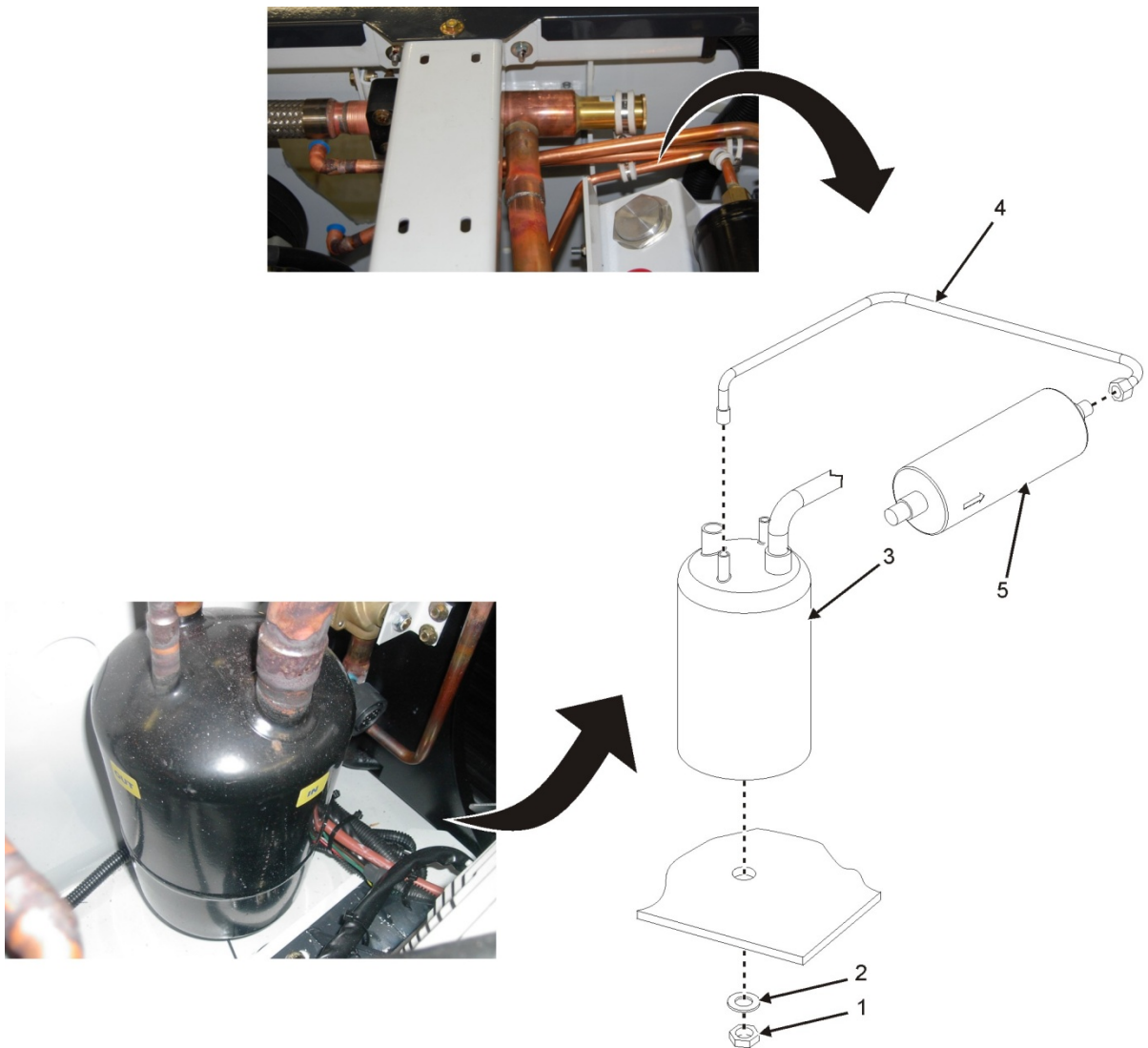


Figure 3. Accumulator Mounting Removal.

REPLACE – CONTINUED**WARNING**

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, flush with clean water and seek medical attention. Failure to observe this warning may result in serious injury to personnel.

CAUTION

Use a piece of sheet metal or equivalent and/or wet rags to shield refrigerator unit and electrical equipment during desoldering procedures. Use heat sink on both sides of pipe being de-soldered. Excessive heat will damage the valve assembly.

NOTE

Be sure to note position of old valve before desoldering so that new valve can be installed correctly.

The suction service valve assembly consists of the suction service valve, suction line vibrasorber, CPR valve, and associated tubing.

19. Desolder suction service valve (Figure 4, Item 1) assembly at joint (Figure 4, Item 2) coming off of CPR valve (Figure 4, Item 3) and before accumulator.

NOTE

The suction service valve assembly consists of the suction service valve, suction line vibrasorber, CPR valve, and associated tubing.

20. Remove suction service valve (Figure 4, Item 1) assembly.
21. Remove fitting (Figure 4, Item 4) from old valve (Figure 4, Item 1). Retain for reinstallation.
22. Cover threads of fitting (Figure 4, Item 4) with tape.

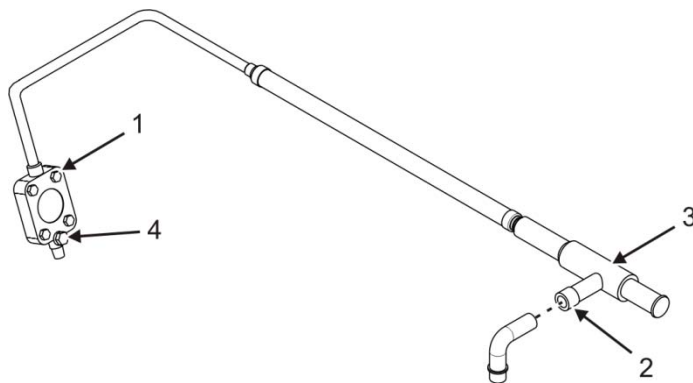


Figure 4. Suction Service Valve Assembly (Standalone).

REPLACE – CONTINUED

23. Install fitting (Figure 4, Item 4) in new valve (Figure 4, Item 1).
24. Align replacement valve assembly (Figure 4, Item 1) into accumulator.

WARNING

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, flush with clean water and seek medical attention. Failure to observe this warning may result in serious injury to personnel.

CAUTION

Before soldering, be sure that suction service valve can be installed into the saddle clamps. This is critical to the life of the valve.

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered, or surrounding components. Wrapping the component to be soldered in wet rags will act as a heat sink and minimize exposure to heat. Excessive heat will damage the valve assembly.

25. Solder suction service valve (Figure 4, Item 1) assembly at joint (Figure 4, Item 2) coming off of CPR valve (Figure 4, Item 3) and fitting (Figure 4, Item 4) on CPR valve before accumulator.

NOTE

When installing insulation, do not cover portion of valve that was soldered during this procedure until leak check has been completed.

26. Install insulation onto suction service valve tubing from accumulator to CPR valve.
27. Place suction service valve assembly into refrigeration unit.
28. Install nut (Figure 3, Item 1) and washer (Figure 3, Item 2) on bottom of accumulator to secure accumulator to refrigeration unit chassis.
29. Clean surface area of compressor prior to installing a new gasket. Be sure all cables are secured out of the way using wire ties.
30. Install rear portion of both saddle clamps (Figure 5, Item 19 and Item 20) behind tube locations.
31. Install new suction service valve (Figure 5, Item 10) and gasket (Figure 5, Item 18) onto compressor and temporarily secure in place using four bolts (Figure 5, Item 16) and four washers (Figure 5, Item 17). Do not tighten bolts at this time.
32. Install saddle clamp cap and spacer (Figure 5, Item 9) over suction tube and secure using two bolts (Figure 5, Item 6), washers (Figure 5, Item 7), and nuts (Figure 5, Item 8).
33. Install saddle clamp cap and spacer (Figure 5, Item 4) over suction tube and secure using two bolts (Figure 5, Item 1), washers (Figure 5, Item 2), and nuts (Figure 5, Item 3).

REPLACE – CONTINUED

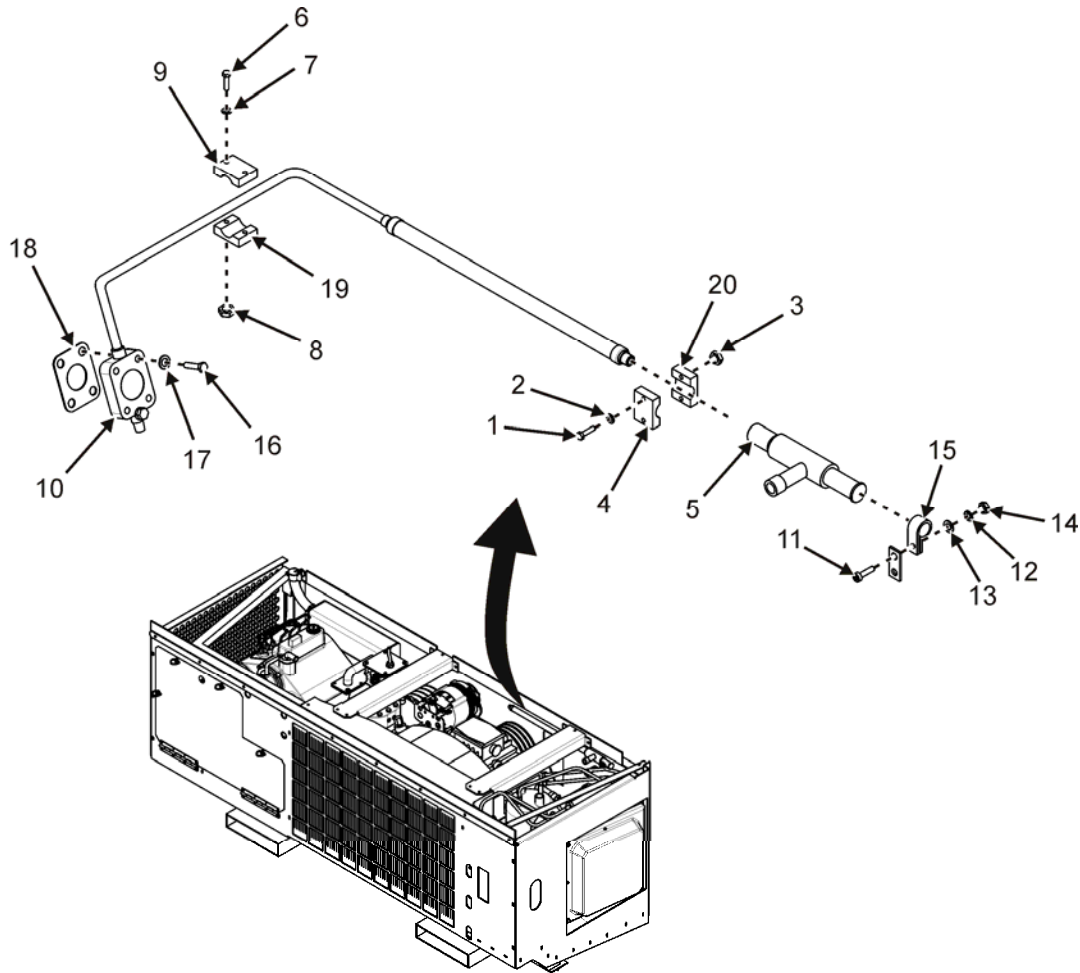


Figure 5. Suction Service Valve Assembly Installation.

34. Tighten four suction service valve mount bolts (Figure 5, Item 16) to 55 to 80 foot-pounds of torque (WP 0102).
35. Install clamp (Figure 5, Item 15) onto CPR valve (Figure 5, Item 5) and secure to clamp mounting plate using one screw (Figure 5, Item 11), new lock washer (Figure 5, Item 12), washer (Figure 5, Item 13), and nut (Figure 5, Item 14).

REPLACE – CONTINUED

36. Install support arm (Figure 3, Item 1) and support arm bracket (Figure 3 Item 7) and secure using four bolts (Figure 3, Item 2) and four washers (Figure 3, Item 3), and two nuts (Figure 3, Item 4), two washers (Figure 3, Item 5), and two bolts (Figure 3, Item 6).
37. Reinstall partially removed alternator (WP 0048) with wiring connected and secure with alternator.
38. Install and adjust alternator V-belt (WP 0048).
39. Change filter-drier (WP 0036, Replace).
40. Perform evacuation and dehydration (WP 0032, Service).
41. Release refrigerant into system (WP 0032, Service).
42. Perform refrigerant leak check (WP 0032, Service).
43. Install any remaining insulation.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

44. Install top-middle panel (WP 0031, Install).
45. Install top-left panel (WP 0031, Install).
46. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
47. Run refrigerator unit (WP 0005, Operating Procedures).
48. Check refrigerant level and charge system with refrigerant as required (WP 0032, Service).
49. Verify unit is operating properly.
50. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
RECEIVER AND CHECK VALVES
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 TM 10-8145-222-23P

Personnel Required

Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External electrical power disconnected (WP 0005)

REPLACE**Receiver****WARNING**

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area with soap and water.

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery (WP 0070, Disconnect).
3. Remove top-left panel (WP 0031, Remove).
4. Remove front panel assembly (WP 0031, Remove).
5. Remove left-side panel (WP 0031, Remove).
6. Disconnect piping (Figure 1, Item 1) from receiver outlet valve (Figure 1, Item 2).

NOTE

Before removing the 3/8-inch and 1/4-inch check valves from the receiver, make note of the flow direction as installed to aid in the reinstallation.

7. Disconnect condenser piping (Figure 1, Item 3) from receiver 3/8-inch check valve (Figure 1, Item 4).
8. Disconnect hot gas line (Figure 1, Item 5) from receiver 1/4-inch check valve (Figure 1, Item 6).
9. Remove one nut (Figure 1, Item 7) and washer (Figure 1, Item 8) securing receiver (Figure 1, Item 9) bottom to bottom panel assembly.
10. Remove receiver (Figure 1, Item 9).

REPLACE – CONTINUED

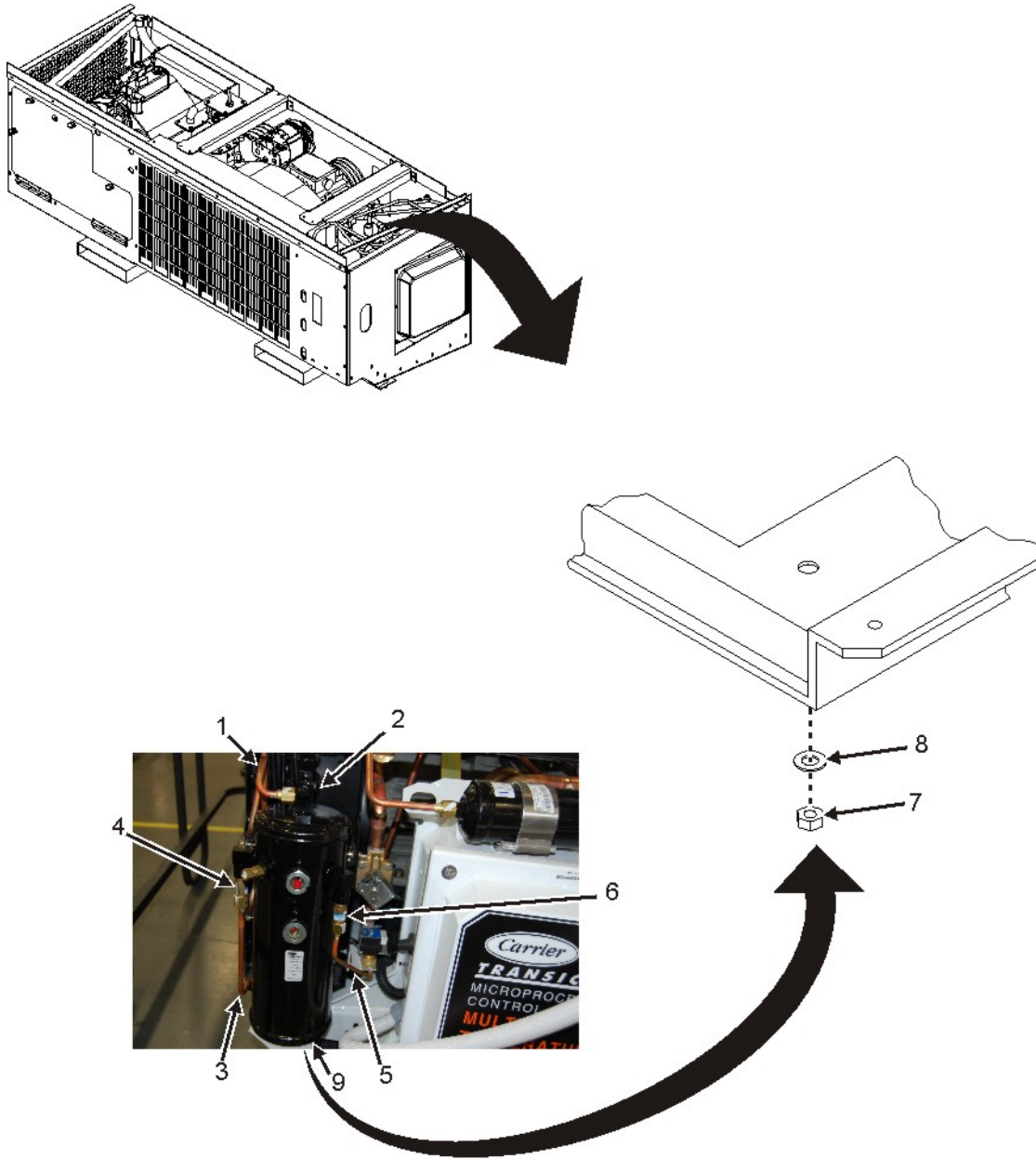


Figure 1. Receiver.

REPLACE – CONTINUED

11. Remove cap screw securing back of receiver.
12. Remove 3/8-inch check valve (Figure 1, Item 4) and 1/4-inch check valve (Figure 1, Item 6) from receiver (Figure 1, Item 9). Discard both check valves.
13. Install new 3/8-inch check valve (Figure 1, Item 4) and new 1/4-inch check valve (Figure 1, Item 6) into receiver.
14. Secure back of receiver with cap screw.

NOTE

Before tightening the receiver mounting hardware, make sure that the refrigeration lines are properly aligned.

15. Install receiver (Figure 1, Item 9) onto bottom panel assembly and secure with one nut (Figure 1, Item 7) and washer (Figure 1, Item 8).
16. Connect hot gas line (Figure 1, Item 5) to receiver 1/4-inch check valve (Figure 1, Item 6).
17. Connect condenser line (Figure 1, Item 3) to receiver 3/8-inch check valve (Figure 1, Item 4).
18. Connect piping (Figure 1, Item 1) to receiver outlet valve (Figure 1, Item 2).
19. Perform refrigerant leak check (WP 0032, Service).
20. Perform evacuation and dehydration (WP 0032, Service).
21. Charge system with refrigerant (WP 0032, Service).
22. Install top-left panel (WP 0031, Install).
23. Install left-side panel (WP 0031, Install).
24. Install front panel assembly (WP 0031, Install).
25. Reconnect battery (WP 0070, Reconnect).
26. Operate refrigeration unit to verify refrigeration cycles are operational after receiver replacement (WP 0005, Operating Procedures).
27. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED**Condenser to Receiver 3/8-Inch Check Valve****WARNING**

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area of skin with soap and water.

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery (WP 0070, Disconnect).
3. Remove front panel assembly to gain access to receiver (WP 0031, Remove).
4. Remove left-side panel (WP 0031, Remove).

CAUTION

Use care when removing the tubing away from the check valve. The tubing can be easily bent or kinked if care is not exercised.

5. Loosen flare nut (Figure 2, Item 1) and remove piping (Figure 2, Item 2) away from 3/8-inch check valve (Figure 2, Item 3).
6. Loosen and remove 3/8-inch check valve (Figure 2, Item 3) from receiver.
7. Install check valve (Figure 2, Item 3) onto receiver and tighten.
8. Carefully align piping (Figure 2, Item 2) with 3/8-inch check valve (Figure 2, Item 3).
9. Slide flare nut (Figure 2, Item 1) over piping (Figure 2, Item 2) and connect to check valve (Figure 2, Item 3).
10. Tighten flare nut (Figure 2, Item 1).
11. Perform refrigerant leak check (WP 0032, Service).
12. Perform evacuation and dehydration (WP 0032, Service).
13. Charge system with refrigerant (WP 0032, Service).
14. Install left-side panel (WP 0031, Install).
15. Install front panel assembly (WP 0031, Install).
16. Reconnect battery (WP 0070, Reconnect).
17. Operate refrigeration unit to verify refrigeration cycles are operational after check valve replacement (WP 0005, Operating Procedures).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

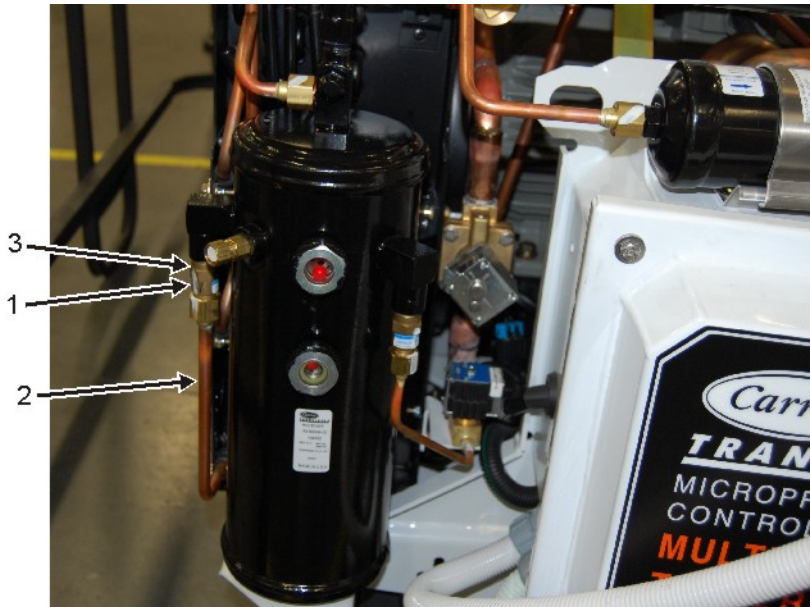


Figure 2. Condenser to Receiver 3/8-Inch Check Valve Replacement.

Hot Gas Line to Receiver 1/4-Inch Check Valve

WARNING

Compressor lubricating oil is caustic and can cause severe injury to skin and eyes. Wear gloves and protective face shield whenever contact with compressor lubricating oil is possible. If contact with eyes is made, flush eyes and seek immediate medical attention. If contact with skin is made, wash affected area of skin with soap and water.

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery (WP 0070, Disconnect).
3. Remove front panel assembly to gain access to receiver (WP 0031, Remove).
4. Remove left-side panel (WP 0031, Remove).

CAUTION

Use care when removing the tubing away from the check valve. The tubing can be easily bent or kinked if care is not exercised.

5. Loosen flare nut (Figure 3, Item 1) and remove piping (Figure 3, Item 2) away from 1/4-inch check valve (Figure 3, Item 3).
6. Loosen and remove 1/4-inch check valve (Figure 3, Item 3) from receiver.
7. Install new 1/4-inch check valve (Figure 3, Item 3) onto receiver and tighten.

REPLACE – CONTINUED

8. Carefully align piping (Figure 3, Item 2) with 1/4-inch check valve (Figure 3, Item 3).
9. Slide flare nut (Figure 3, Item 1) over piping (Figure 3, Item 2) and connect to 1/4-inch check valve (Figure 3, Item 3).
10. Tighten flare nut (Figure 3, Item 1).
11. Perform refrigerant leak check (WP 0032, Service).
12. Perform evacuation and dehydration (WP 0032, Service).
13. Charge system with refrigerant (WP 0032, Service).
14. Install left-side panel (WP 0031, Install).
15. Install front panel assembly (WP 0031, Install).
16. Reconnect battery (WP 0070, Reconnect).
17. Operate refrigeration unit to verify refrigeration cycles are operational after check valve replacement (WP 0005, Operating Procedures).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

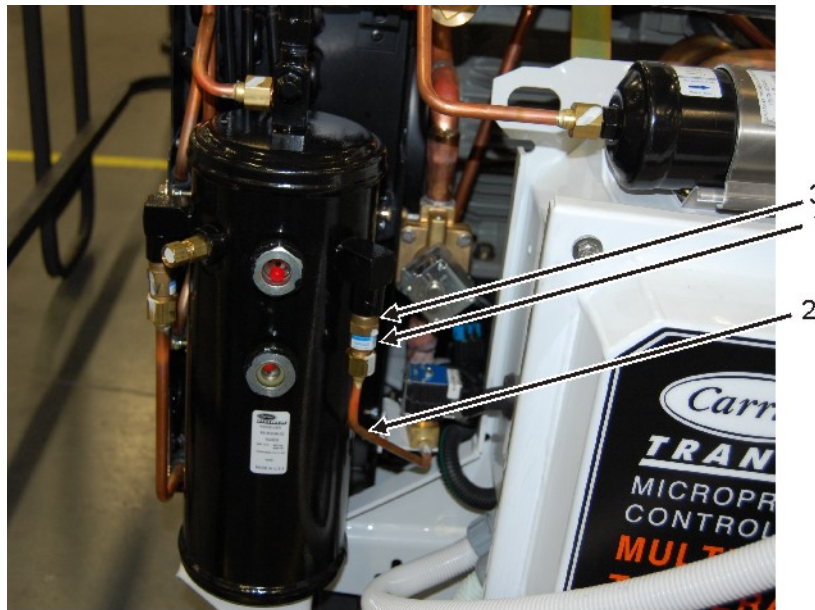


Figure 3. Hot Gas Line to Receiver 1/4-Inch Check Valve Replacement.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CONDENSER
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Antifreeze (WP 0110, Item 3)
 Filter-Drier (WP 0111, Item 2)
 Refrigerant, R404A, 15-pounds (WP 0110, Item 32)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0032
 WP 0036
 WP 0044
 WP 0070
 WP 0075
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down and cool (WP 0005)
 Refrigeration unit removed (WP 0075)
 External electrical power disconnected (WP 0005)
 Battery disconnected (WP 0070)
 All panels removed (WP 0031)

REPLACE**Remove****WARNING**

The exhaust system and engine coolant will become extremely hot after a short period of operating time. Allow engine to cool for 30-minutes before performing maintenance.

1. Let engine cool for 30 minutes before performing maintenance.
1. Recover refrigerant (WP 0032, Service).
2. Drain coolant from system (WP 0044, Service).
3. Loosen one clamp (Figure 1, Item 1) securing lower radiator hose (Figure 1, Item 2) to radiator (Figure 1, Item 3).
4. Disconnect lower radiator hose (Figure 1, Item 2) from radiator (Figure 1, Item 3) and secure out of way.
5. Remove small clear tube (Figure 1, Item 4) by unwrapping it from lower radiator hose (Figure 1, Item 2).

REPLACE – CONTINUED

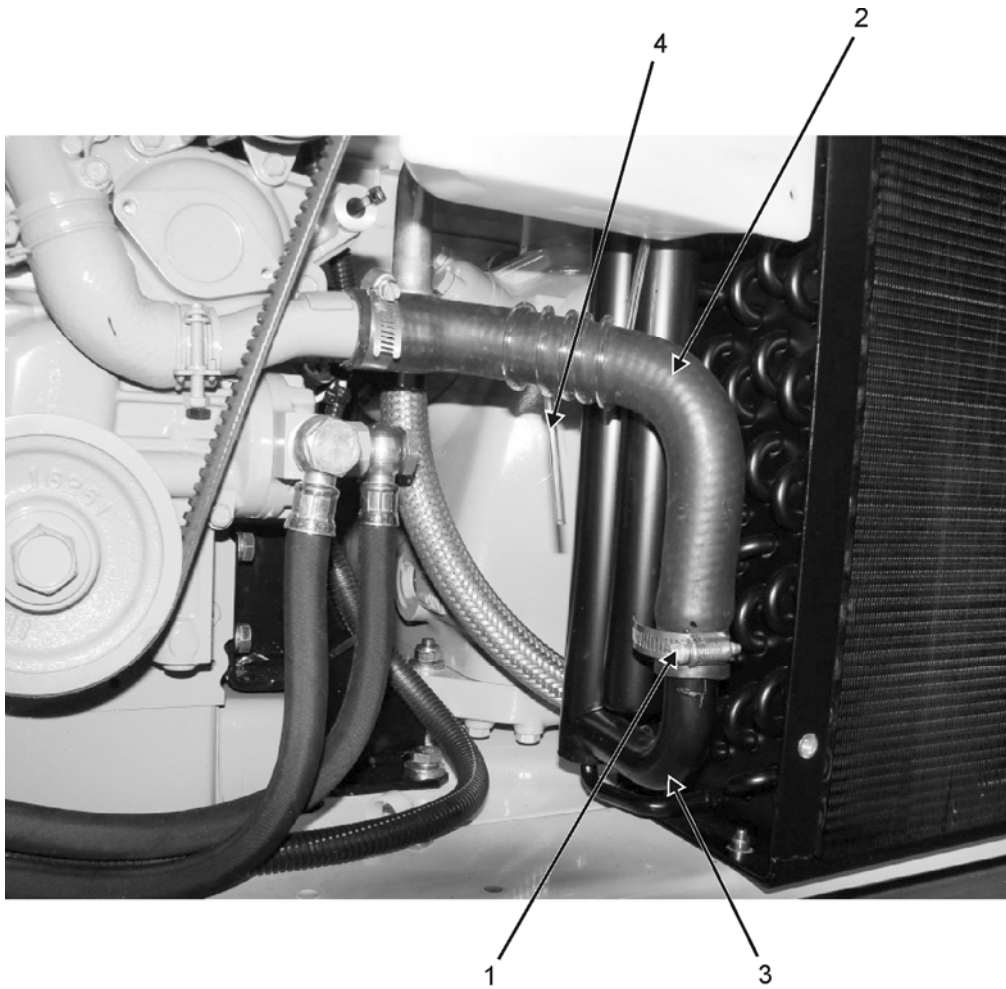


Figure 1. Lower Radiator Hose Disconnect.

REPLACE – CONTINUED

6. Loosen one clamp (Figure 2, Item 1) securing upper radiator hose (Figure 2, Item 2) to radiator (Figure 2, Item 3).
7. Disconnect upper radiator hose (Figure 2, Item 2) from radiator (Figure 2, Item 3) and secure out of way.

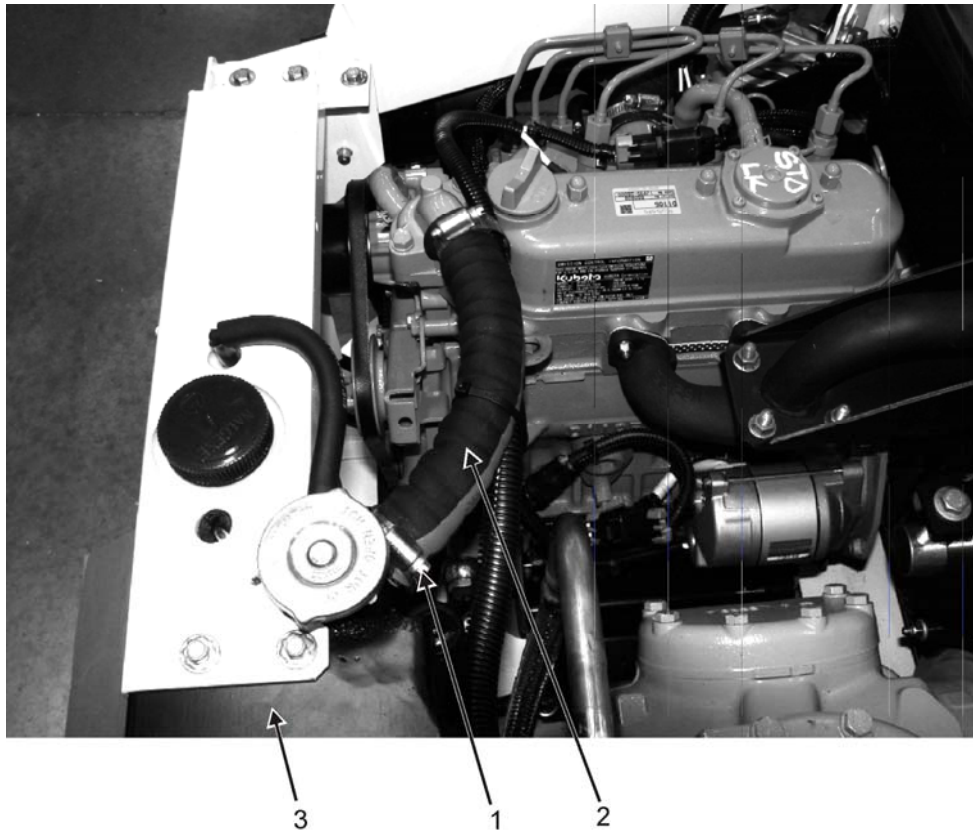
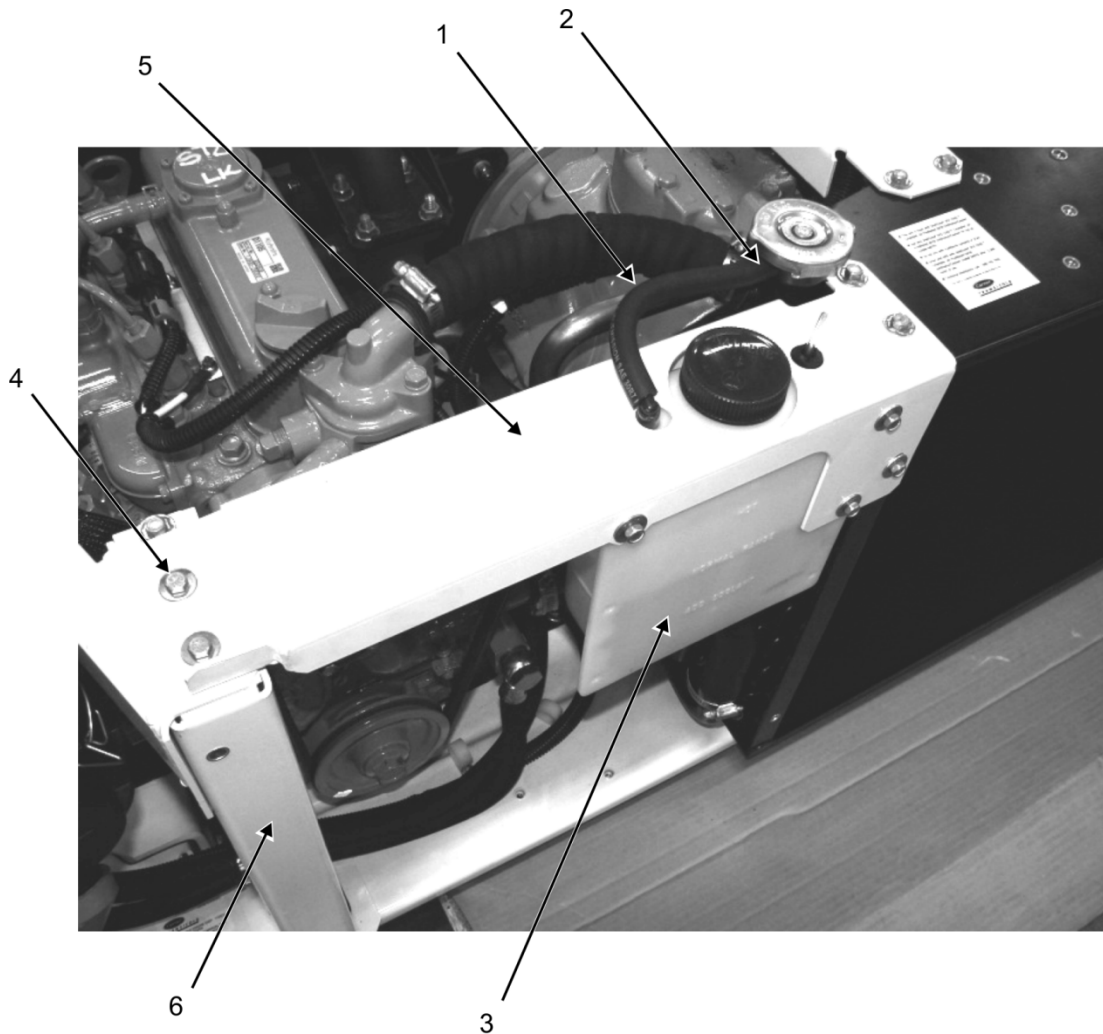


Figure 2. Upper Radiator Hose Disconnect.

REPLACE – CONTINUED

8. Disconnect and remove radiator overflow tube (Figure 3, Item 1) from radiator (Figure 3, Item 2) and overflow tank (Figure 3, Item 3). Retain for reinstallation.
9. Remove four hex head screws (Figure 3, Item 4) securing channel bar (Figure 3, Item 5) and overflow tank (Figure 3, Item 3) to frame (Figure 3, Item 6) and radiator (Figure 3, Item 2).
10. Remove channel bar (Figure 3, Item 5) and overflow tank (Figure 3, Item 3).

**Figure 3. Overflow Tank.**

11. Remove four hex head screws (Figure 4, Item 1) securing two channel bars (Figure 4, Item 2) to condenser (Figure 4, Item 3).
12. Remove two screws (Figure 4, Item 4) and washers (Figure 4, Item 5) securing fan shroud (Figure 4, Item 6) to condenser (Figure 4, Item 3).

REPLACE - CONTINUED

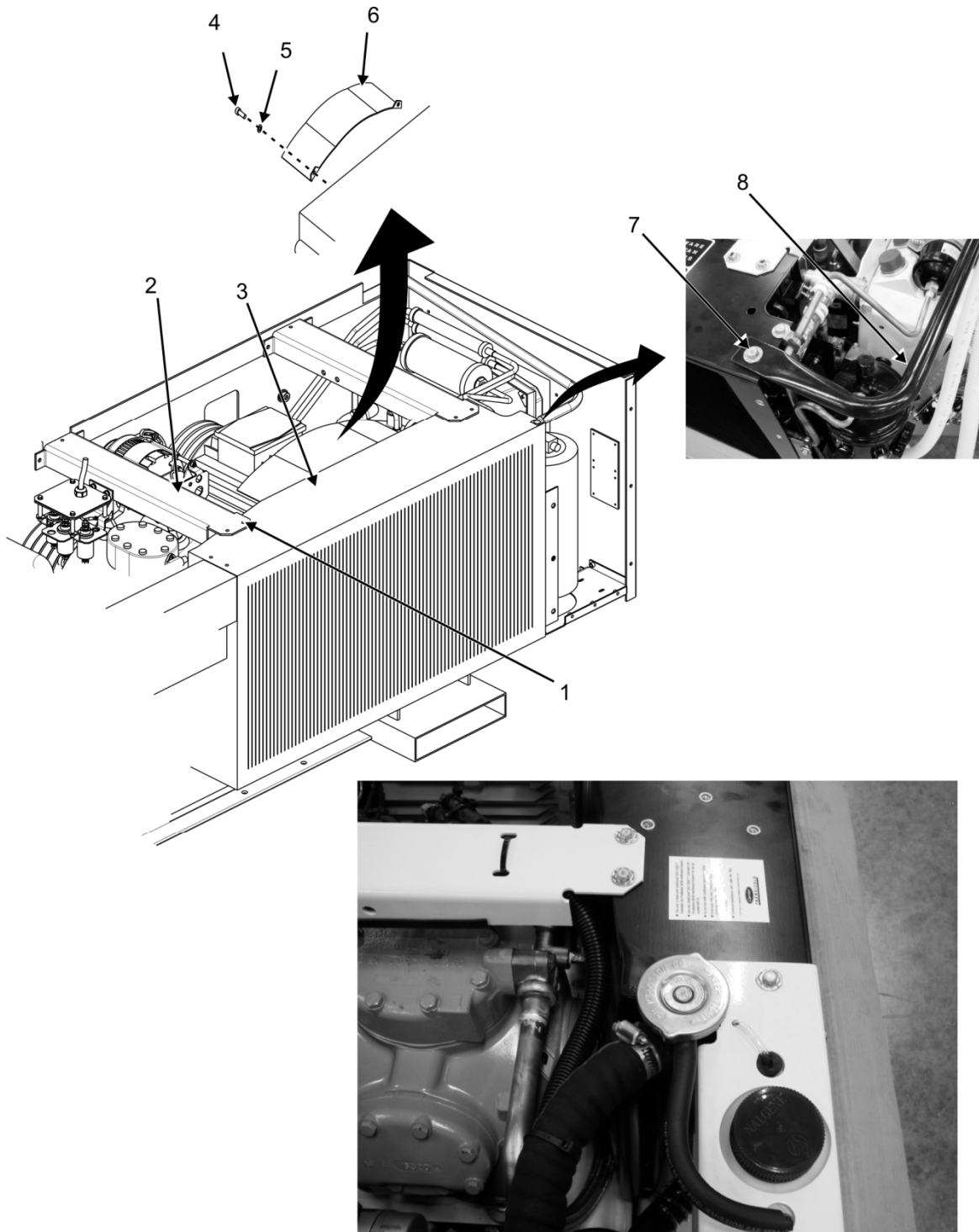


Figure 4. Channel Bars.

REPLACE – CONTINUED

13. Remove fan shroud (Figure 4, Item 6).
14. Remove one hex head bolt (Figure 4, Item 7) securing one end of black support bar (Figure 4, Item 8) to condenser (Figure 4, Item 3).
15. Disconnect refrigerant piping (Figure 5, Item 1) from receiver outlet valve (Figure 5, Item 2).
16. Disconnect condenser piping (Figure 5, Item 3) from receiver 3/8-inch check valve (Figure 5, Item 4).
17. Disconnect hot gas line (Figure 5, Item 5) from receiver 1/4-inch check valve (Figure 5, Item 6).

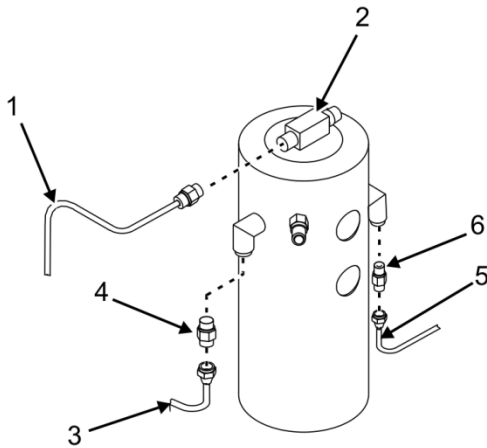


Figure 5. Receiver Lines Disconnect.

REPLACE – CONTINUED

18. Remove one screw (Figure 6, Item 1), nut (Figure 6, Item 2), lock washer (Figure 6, Item 3), and washer (Figure 6, Item 4) securing two clamps (Figure 6, Item 5) to two refrigerant pipes (Figure 6, Item 6 and Item 7) near filter-drier (Figure 6, Item 8) inlet. Remove and retain clamps.
19. Remove one screw (Figure 6, Item 9), nut (Figure 6, Item 10), lock washer (Figure 6, Item 11), and washer (Figure 6, Item 12) securing two clamps (Figure 6, Item 13) to two refrigerant pipes (Figure 6, Item 7 and Item 14) near filter-drier (Figure 6, Item 8) inlet. Remove and retain clamps.
20. Loosen fitting (Figure 6, Item 15) and disconnect refrigeration pipe (Figure 6, Item 6) from filter-dryer (Figure 6, Item 8) inlet.

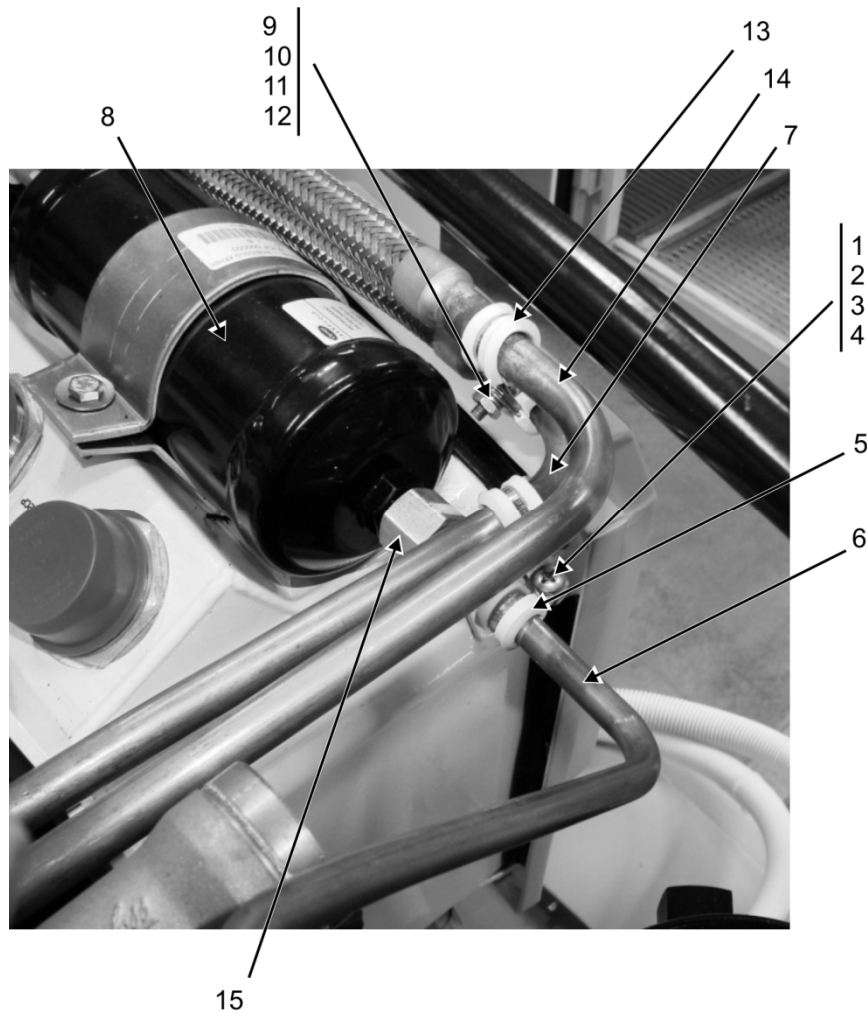
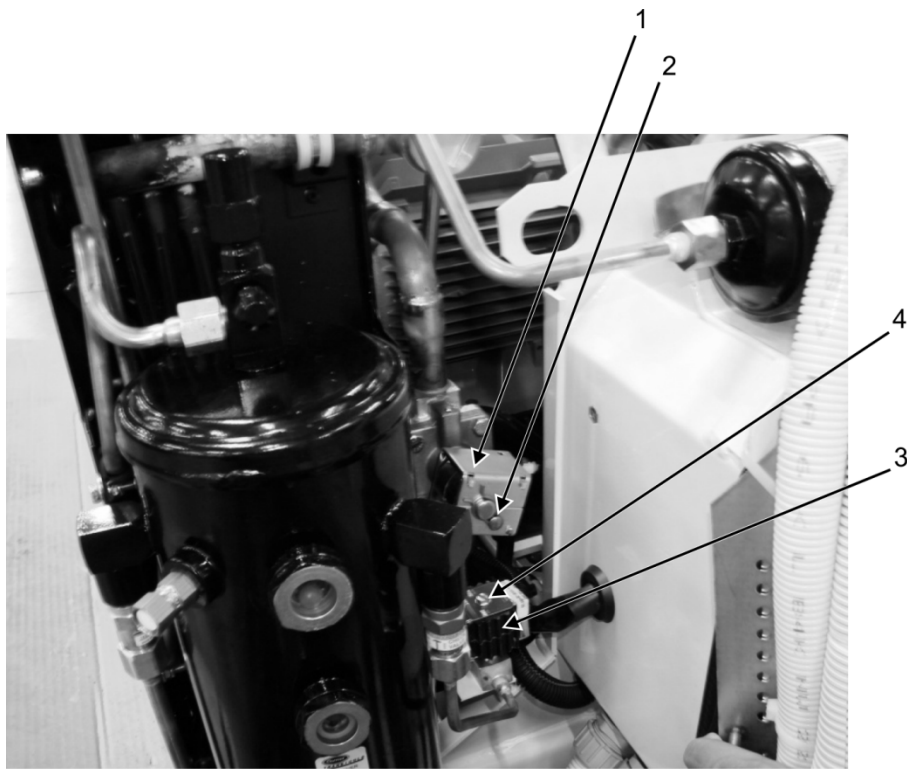


Figure 6. Clamp Removal at Filter-Drier.

REPLACE – CONTINUED

21. Disconnect electrical connector from main heat valve coil (Figure 7, Item 1).
22. Remove clip (Figure 7, Item 2) securing main heat valve coil (Figure 7, Item 1) and remove coil. Retain for reinstallation.
23. Disconnect electrical connector from hot gas valve coil (Figure 7, Item 3).
24. Remove screw (Figure 7, Item 4) securing hot gas valve coil (Figure 7, Item 3) and remove coil. Retain for reinstallation.

**Figure 7. Coil Removal.**

REPLACE – CONTINUED**WARNING**

Soldering procedures emit gasses that can be harmful if inhaled for long durations. Before performing any soldering procedures, make sure that adequate ventilation is available. Use face shield and protective gloves when performing soldering procedures.

CAUTION

Soldering and desoldering procedures take place in a very tight surrounding. Make sure a heat shield is used during solder and desolder procedures to protect wiring and associated components nearby.

25. Desolder vertical refrigerant pipe running between radiator and accumulator at soldered joint (Figure 8, Item 1).

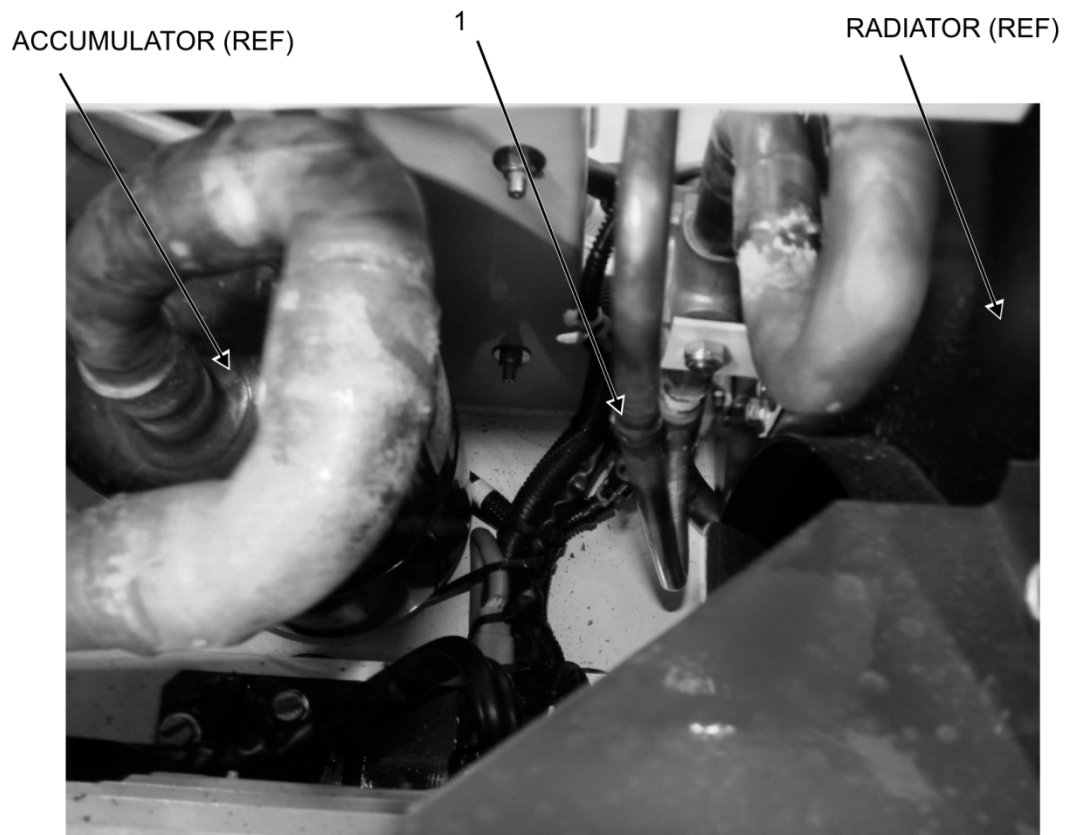


Figure 8. Desolder Refrigerant Pipe.

REPLACE – CONTINUED**NOTE**

The condenser will be removed with the entire discharge service line and valve attached between compressor and condenser.

26. Remove two bolts (Figure 9, Item 1) and washers (Figure 9, Item 2) securing discharge service valve (Figure 9, Item 3) to compressor (Figure 9, Item 4).
27. Remove gasket (Figure 9, Item 5). Discard gasket.

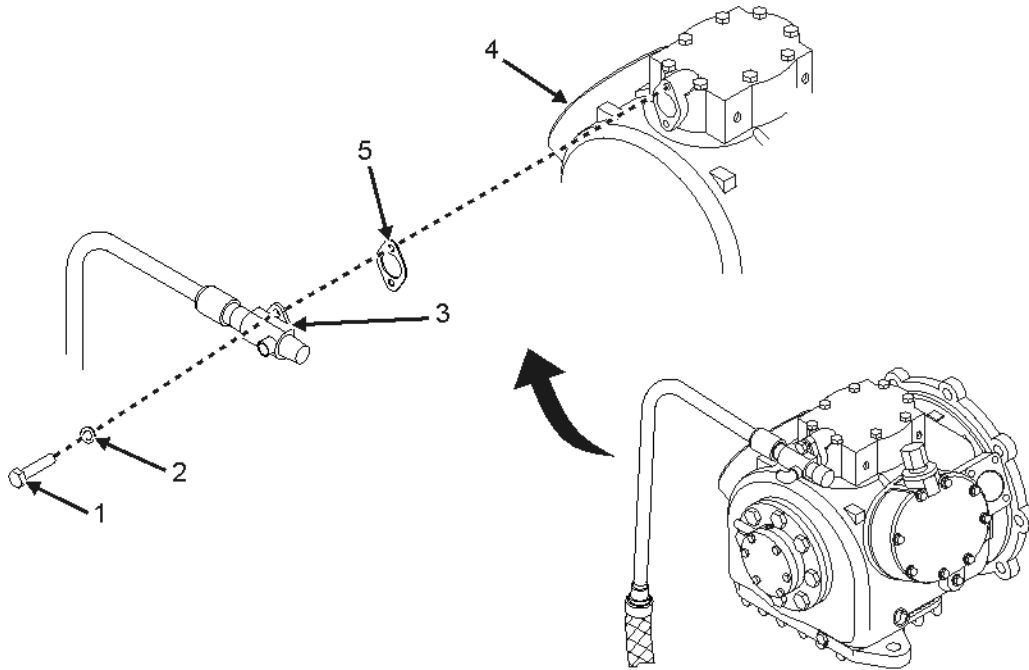


Figure 9. Discharge Service Valve and Line.

REPLACE – CONTINUED**NOTE**

There are four hex head bolts securing the base of the condenser assembly to the refrigeration unit frame. There are two bolts on each end of the condenser assembly and they are accessible from the underside of the frame.

28. Remove four hex head bolts (Figure 10, Item 1) securing base of condenser assembly (Figure 10, Item 2) to frame (Figure 10, Item 3).

WARNING

The condenser assembly weighs approximately 40 pounds and is a bulky item. Use two persons to remove the condenser assembly from the refrigeration unit.

29. Carefully remove radiator from refrigeration unit.

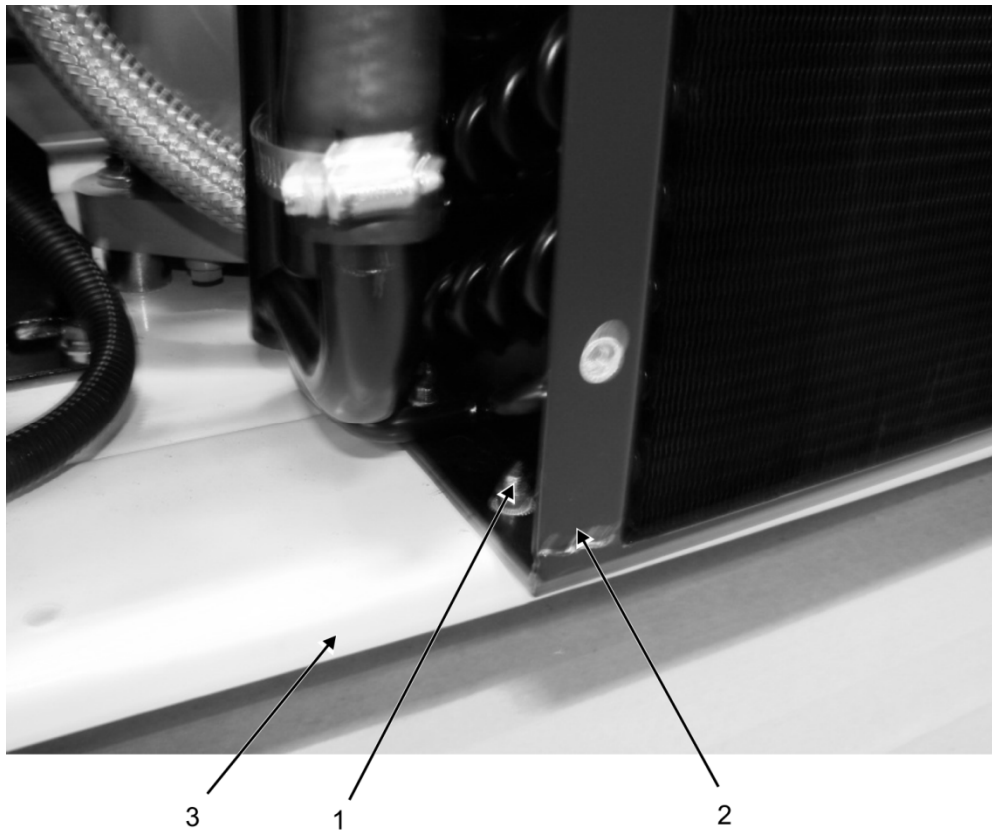


Figure 10. Radiator Mounting Hardware.

REPLACE – CONTINUED**Install****WARNING**

The condenser assembly weighs approximately 40 pounds and is a bulky item. Use two persons to install the condenser assembly into the refrigeration unit.

1. Carefully install replacement condenser assembly into refrigeration unit.

NOTE

There are four hex head bolts that secure the base of the condenser assembly to the refrigeration unit frame. There are two bolts on each end of the condenser assembly and they are installed from the underside of the frame.

2. Secure base of condenser assembly (Figure 10, Item 2) to frame (Figure 10, Item 3) using four hex head bolts (Figure 10, Item 1).
3. Install new gasket (Figure 9, Item 5) and secure discharge service valve (Figure 9, Item 3) to compressor (Figure 9, Item 4) using two bolts (Figure 9, Item 1) and washers (Figure 9, Item 2).

WARNING

Soldering procedures emit gasses that can be harmful if inhaled for long durations. Before performing any soldering procedures, make sure that adequate ventilation is available. Use face shield and protective gloves when performing soldering procedures.

CAUTION

Soldering and desoldering procedures take place in a very tight surrounding. Make sure a heat shield is used during solder and desolder procedures to protect wiring and associated components nearby.

4. Solder vertical refrigerant pipe running between radiator and accumulator at soldered joint (Figure 8, Item 1).
5. Install main heat valve coil (Figure 7, Item 1) and secure using clip (Figure 7, Item 2).
6. Reconnect electrical connector to main heat valve coil (Figure 7, Item 1).
7. Install hot gas valve coil (Figure 7, Item 3) and secure using screw (Figure 7, Item 4).
8. Reconnect electrical connector to hot gas valve coil (Figure 7, Item 3).
9. Connect refrigeration pipe (Figure 6, Item 6) to filter-dryer (Figure 6, Item 8) inlet and secure using fitting (Figure 6, Item 15).
10. Install two clamps (Figure 6, Item 13) to two refrigerant pipes (Figure 6, Item 7 and Item 14) near filter-drier (Figure 6, Item 8) inlet and secure using one screw (Figure 6, Item 9), nut (Figure 6, Item 10), lock washer (Figure 6, Item 11), and washer (Figure 6, Item 12).
11. Install two clamps (Figure 6, Item 5) to two refrigerant pipes (Figure 6, Item 6 and Item 7) near filter-drier (Figure 6, Item 8) inlet and secure using one screw (Figure 6, Item 1), nut (Figure 6, Item 2), lock washer (Figure 6, Item 3), and washer (Figure 6, Item 4).

REPLACE – CONTINUED

12. Connect hot gas line (Figure 5, Item 5) to receiver 1/4-inch check valve (Figure 5, Item 6).
13. Connect condenser piping (Figure 5, Item 3) to receiver 3/8-inch check valve (Figure 5, Item 4).
14. Connect refrigerant piping (Figure 5, Item 1) to receiver outlet valve (Figure 5, Item 2).
15. Connect black bar (Figure 4, Item 8) to condenser (Figure 4, Item 3) using one hex head bolt (Figure 4, Item 7).
16. Install fan shroud (Figure 4, Item 6) and secure to condenser (Figure 4, Item 3) using two screws (Figure 4, Item 4) and washers (Figure 4, Item 5).
17. Remove four hex head screws (Figure 4, Item 1) securing two channel bars (Figure 4, Item 2) to condenser (Figure 4, Item 3).
18. Install channel bar (Figure 3, Item 5) and overflow tank (Figure 3, Item 3) to frame (Figure 3, Item 6) and radiator (Figure 3, Item 2) and secure using four hex head screws (Figure 3, Item 4).
19. Install and reconnect radiator overflow tube (Figure 3, Item 1) to radiator (Figure 3, Item 2) and overflow tank (Figure 3, Item 3).
20. Reconnect upper radiator hose (Figure 2, Item 2) to radiator (Figure 2, Item 3) and secure using one clamp (Figure 2, Item 1).
21. Reconnect lower radiator hose (Figure 1, Item 2) to radiator (Figure 1, Item 3) and secure using one clamp (Figure 1, Item 1).
22. Install small clear tube (Figure 1, Item 4) and secure to lower radiator hose (Figure 1, Item 2) by wrapping it around hose.
23. Confirm condenser fan clearance of 1 1/4-inch (+/- 1/4-inch) from fan blade to new radiator fins.
24. Install RU (WP 0075)
25. Refill radiator with engine coolant (WP 0044, Refill Cooling System).
26. Replace filter-drier (WP 0036, Replace)
27. Perform evacuation and dehydration (WP 0032, Service).
28. Perform refrigerant leak check and repair leaks as required (WP 0032, Service).
29. Charge system with refrigerant (WP 0032, Service).

WARNING

The MTRCS contains high voltage sources and exposed rotating parts. Make sure to use extreme care when working on the MTRCS while the engine is operating. Beware of V-belts and engine driven components. Failure to comply with this warning can result in serious injury or death to personnel.

30. Operate refrigeration unit in diesel engine mode for approximately two minutes and check for coolant leaks. Repair leaks as required. (WP 0005, Operating Procedures).

REPLACE – CONTINUED

31. Install top-middle panel (WP 0031, Install).
32. Install top-left panel (WP 0031, Install).
33. Install left-side panel (WP 0031, Install).
34. Install front panel assembly (WP 0031, Install).
35. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).
36. Monitor white overflow tank and add coolant as required for next 24 operating hours.

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
ACCUMULATOR/HEAT EXCHANGER
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External electrical power disconnected (WP 0005)
 Refrigeration unit removed (WP 0075)

REPLACE

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery (WP 0070, Disconnect).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

3. Gain access to top of MTRCS using roof access.
4. Remove top-left panel (WP 0031, Remove).
5. Remove top-middle panel (WP 0031, Remove).
6. Remove front panel assembly (WP 0031, Remove).
7. Remove five bolts (Figure 1, Item 2) and washers (Figure 1, Item 3), and two nuts (Figure 1, Item 4) and washers (Figure 1, Item 5) securing support arm (Figure 1, Item 1) and support arm bracket (Figure 1, Item 6) to frame and position out of way of accumulator.

REPLACE – CONTINUED

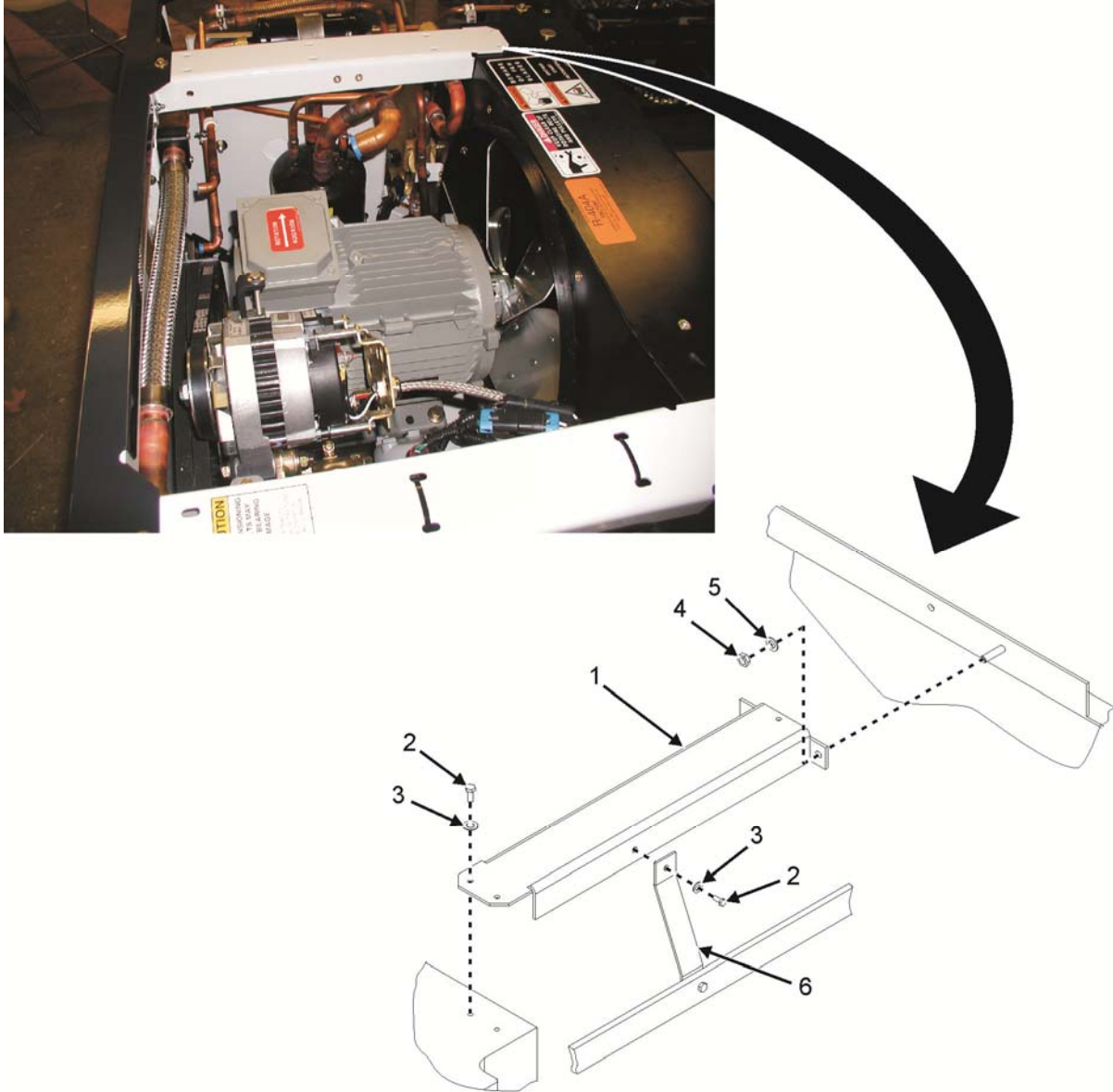


Figure 1. Support Arm.

REPLACE – CONTINUED**NOTE**

Due to the fragile nature of the accumulator neck flanges and the tight workspace needed for desoldering the connections to the accumulator, the accumulator will be removed with piping attached and placed on a work bench for desoldering piping from the accumulator. Piping removed will be reused on the new accumulator and soldered back onto the new accumulator before installing it into the refrigeration unit.

8. Remove two screws (Figure 2, Item 1), lock washers (Figure 2, Item 2), washers (Figure 2, Item 3), and nuts (Figure 2, Item 4) securing 3/8-inch refrigerant pipe clamp (Figure 2, Item 5) and CPR valve clamp (Figure 2, Item 6) to clamp mounting plate (Figure 2, Item 7) near CPR valve (Figure 2, Item 8). Discard lock washers.
9. Remove 3/8-inch refrigerant pipe clamp (Figure 2, Item 5), CPR valve clamp (Figure 2, Item 6), and clamp mounting plate (Figure 2, Item 7). Retain for reinstallation.
10. Remove one screw (Figure 2, Item 9), lock washer (Figure 2, Item 10), washer (Figure 2, Item 11), and nut (Figure 2, Item 12) securing two clamps (Figure 2, Item 13) to two refrigerant pipes (Figure 2, Item 14) at filter drier (Figure 2, Item 15) inlet. Discard lock washer.
11. Remove two clamps (Figure 2, Item 13) at filter drier (Figure 2, Item 15) inlet. Retain for reinstallation.
12. Remove one screw (Figure 2, Item 16), lock washer (Figure 2, Item 17), washer (Figure 2, Item 18), and nut (Figure 2, Item 19) securing two clamps (Figure 2, Item 20) to two evaporator refrigerant pipes near filter drier (Figure 2, Item 15) inlet. Discard lock washer.
13. Remove two clamps (Figure 2, Item 20) near filter drier (Figure 2, Item 15) inlet. Retain for reinstallation.
14. Loosen 3/8-inch refrigerant pipe fitting (Figure 2, Item 21) from filter-drier (Figure 2, Item 15) outlet.
15. Remove 3/8-inch refrigerant pipe (Figure 2, Item 21) from filter-drier (Figure 2, Item 15) outlet.
16. Cut 1/2-inch refrigerant pipe (Figure 2, Item 14) leading to evaporator vibrasorber (Figure 2, Item 22) at cut location (Figure 2, Item 23).

WARNING

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, wash with clean water and seek medical attention.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered or surrounding components. Wrapping the components to be soldered in wet rags will act as a heat sink and minimize exposure to heat.

17. Wrap CPR valve (Figure 2, Item 8) with wet rags to serve as a heat sink and use a heat shield where required in order to protect surrounding components, hoses, and/or wiring.

REPLACE – CONTINUED

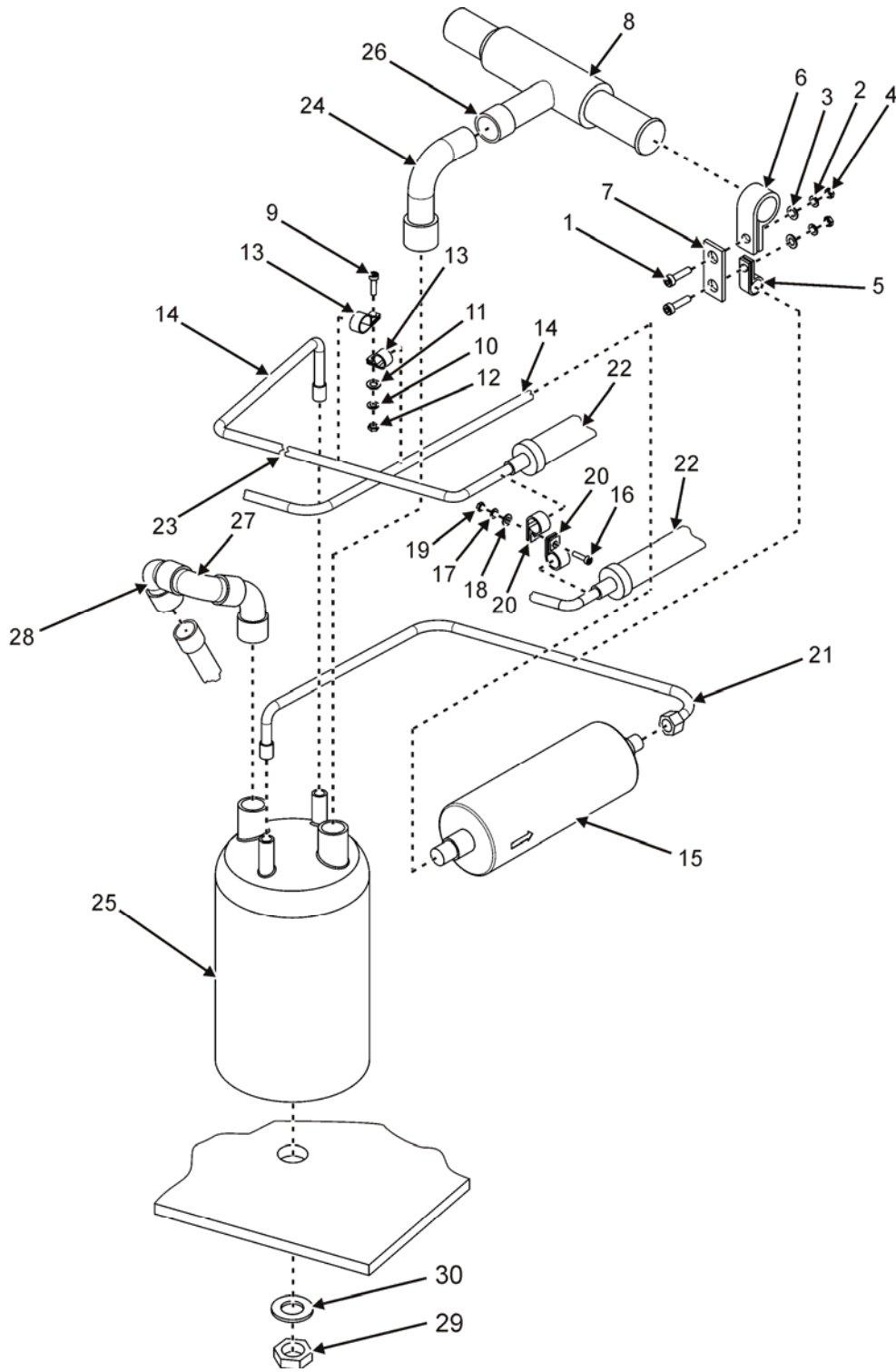


Figure 2. Accumulator/Heat Exchanger Removal.

REPLACE – CONTINUED

18. Desolder 1-1/8-inch refrigerant pipe (Figure 2, Item 24) between accumulator (Figure 2, Item 25) and CPR valve (Figure 2, Item 8) at flared fitting (Figure 2, Item 26) location.
19. Use a heat shield where required in order to protect surrounding components, hoses, and/or wiring, and desolder 1-1/8-inch pipe (Figure 2, Item 27) from accumulator (Figure 2, Item 25) at elbow (Figure 2, Item 28).
20. Remove one nut (Figure 2, Item 29) and one washer (Figure 2, Item 30) securing accumulator (Figure 2, Item 25) to refrigeration unit chassis.
21. Carefully remove accumulator (Figure 2, Item 25) with refrigerant piping attached from refrigeration unit and place on a work bench.

CAUTION

If using a vise or clamps to hold the accumulator in place during desolder or solder operations, use care so as not to damage the accumulator.

NOTE

It is important to note the direction of the piping coming out of the accumulator before desoldering and install the piping into the new accumulator with the same orientation so that the accumulator will fit back into the refrigeration unit, and piping will align with existing refrigeration unit piping.

22. Remove insulation as required from accumulator piping. Retain for reinstallation.

WARNING

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, wash with clean water and seek medical attention.

23. Desolder one 3/8-inch refrigerant pipe (Figure 3, Item 2) from accumulator (Figure 3, Item 3). Retain pipe for reinstallation.
24. Desolder one 1/2-inch refrigerant pipe (Figure 3, Item 1) from accumulator (Figure 3, Item 3). Retain pipe for reinstallation.
25. Desolder two 1 1/8-inch refrigerant pipes (Figure 3, Item 4 and Item 5) from accumulator (Figure 3, Item 3). Retain pipes for reinstallation.
26. Refer to Figure 3 and temporarily install piping into new accumulator without soldering piping to accumulator.
27. Temporarily install new accumulator into refrigeration unit in order to fit-check piping alignment before soldering.
28. Make any needed piping alignment changes with accumulator in place to align with refrigeration unit piping.

REPLACE – CONTINUED

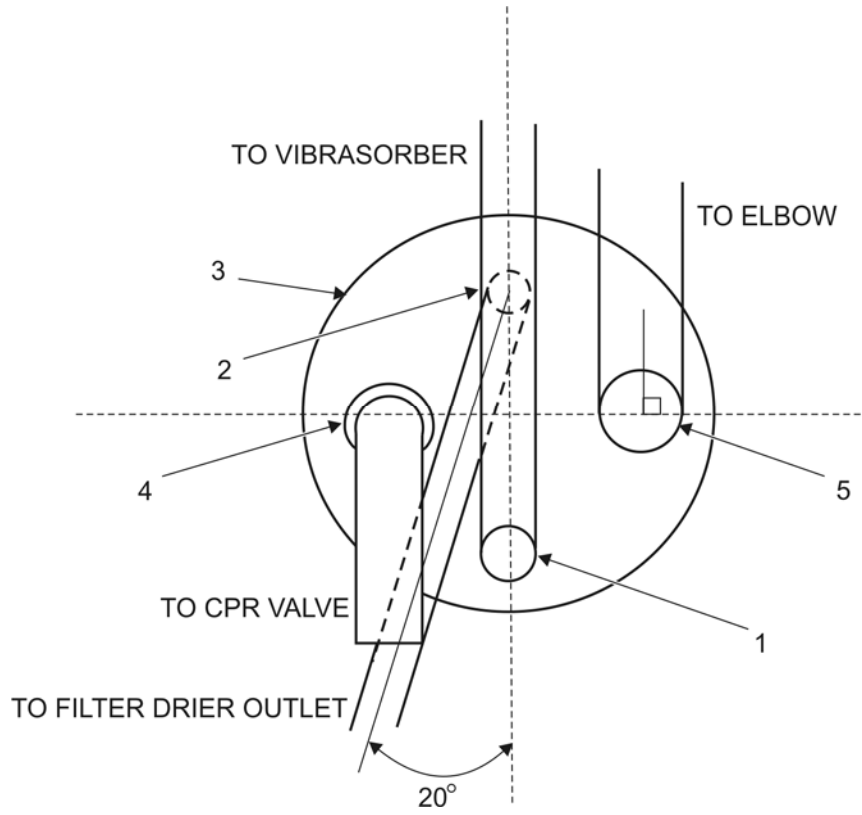


Figure 3. Accumulator Buildup.

REPLACE – CONTINUED

29. Carefully remove accumulator without disturbing pipe alignment and place on workbench.
30. Use a permanent marker to mark accumulator and four pipes before removing pipes from accumulator.
31. Remove four pipes from accumulator.

WARNING

Many of the chemicals used while soldering are toxic. Avoid prolonged exposure to fumes. Wear rubber gloves and eye protection. Failure to wear proper protective clothing may result in skin irritation and/or serious eye injury. Wash hands with soap and water after handling solder. If inhaled, move soldier to fresh air and seek medical attention. If contact with skin or eyes is made, wash with clean water and seek medical attention.

CAUTION

Use care when soldering and desoldering components into the system so as not to overheat the component being soldered or surrounding components. Wrapping the components to be soldered in wet rags will act as a heat sink and minimize exposure to heat.

32. Solder one 1-1/8-inch accumulator to CPR valve refrigerant pipe (Figure 3, Item 4) to accumulator (Figure 1, Item 3).
33. Solder one 1-1/8-inch accumulator to elbow refrigerant pipe (Figure 3, Item 5) to accumulator (Figure 3, Item 3).
34. Solder one 1/2-inch accumulator to vibrasorber refrigerant pipe (Figure 3, Item 1) to accumulator (Figure 3, Item 3).
35. Solder one 1/2-inch coupling into 1/2-inch accumulator to vibrasorber refrigerant pipe (Figure 3, Item 1).
36. Solder one 3/8-inch accumulator to filter drier refrigerant pipe (Figure 3, Item 2) to accumulator (Figure 3, Item 3).
37. Carefully install accumulator (Figure 2, Item 25) with refrigerant piping attached into refrigeration unit and align accumulator piping with refrigeration unit piping.

NOTE

Make sure pipes are properly aligned before soldering.

38. Use a heat shield where required in order to protect surrounding components, hoses, and/or wiring, and solder in 1 1/8-inch pipe (Figure 2, Item 27) at elbow (Figure 2, Item 28).
39. Wrap CPR valve (Figure 4, Item 8) with wet rags to serve as a heat sink and use a heat shield where required in order to protect surrounding components, hoses, and/or wiring.
40. Solder 1 1/8-inch refrigerant pipe (Figure 4, Item 24) in between accumulator (Figure 4, Item 25) and CPR valve (Figure 4, Item 8) at flared fitting (Figure 4, Item 26) location.
41. Solder 1/2-inch refrigerant pipe (Figure 4, Item 14) into evaporator vibrasorber (Figure 4, Item 22) at cut location (Figure 4, Item 23).

REPLACE – CONTINUED

42. Install 3/8-inch refrigerant pipe fitting (Figure 4, Item 21) into filter-drier (Figure 4, Item 15) outlet and tighten.
43. Secure accumulator (Figure 4, Item 25) to refrigeration unit chassis with one nut (Figure 4, Item 29) and one washer (Figure 4, Item 30).

WARNING

Soldering procedures will make piping extremely hot and can cause severe burns.
Allow solder points to cool sufficiently before continuing with clamp installation.

44. Install two clamps (Figure 4, Item 20) to two evaporator refrigerant pipes near filter drier (Figure 4, Item 15) inlet and secure using one screw (Figure 4, Item 16), new lock washer (Figure 4, Item 17), washer (Figure 4, Item 18), and nut (Figure 4, Item 19).
45. Install two clamps (Figure 4, Item 13) to two refrigerant pipes at filter drier (Figure 4, Item 15) inlet and secure using one screw (Figure 4, Item 9), new lock washer (Figure 4, Item 10), washer (Figure 4, Item 11), and nut (Figure 4, Item 12).
46. Install 3/8-inch refrigerant pipe clamp (Figure 4, Item 5) and CPR valve clamp (Figure 4, Item 6) to clamp mounting plate (Figure 4, Item 7) and secure using two screws (Figure 4, Item 1), new lock washers (Figure 4, Item 2), washers (Figure 4, Item 3), and nuts (Figure 4, Item 4).
47. Install support arm (Figure 1, Item 1) and support arm bracket (Figure 1, Item 6) to frame and secure using five bolts (Figure 1, Item 2) and washers (Figure 1, Item 3), and two nuts (Figure 1, Item 4) and two washers (Figure 1, Item 5).
48. Connect battery (WP 0070, Reconnect).
49. Perform refrigerant leak check (WP 0032, Service).
50. Perform evacuation and dehydration (WP 0032, Service).
51. Charge system with refrigerant (WP 0032, Service).
52. Install top-middle panel (WP 0031, Install).
53. Install top-left panel (WP 0031, Install).
54. Install front panel assembly (WP 0031, Install).
55. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of accumulator (WP 0005, Operating Procedures).
56. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED

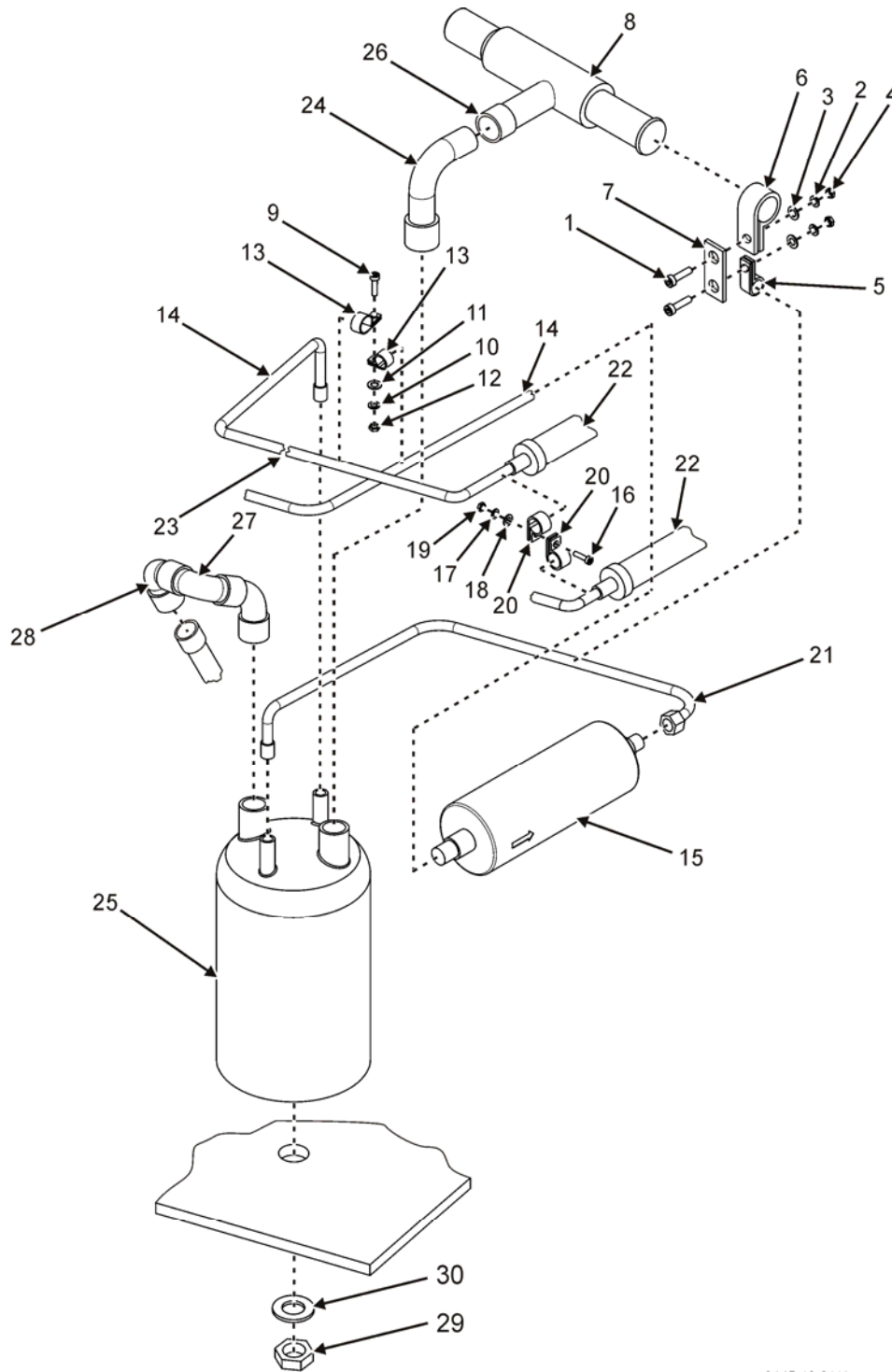


Figure 4. Accumulator/Heat Exchanger Installation.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SIGHT GLASS
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
 WP 0031
 WP 0032
 WP 0070
 TM 10-8145-222-23P

Materials/Parts

Threadlocker, Sealing Compound (WP 0110, Item 41)

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External electric power disconnected (WP 0005)

Personnel Required

Utilities Equipment Repairer

REPLACE

1. Recover refrigerant (WP 0032, Service).
2. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
3. Remove front panel assembly (WP 0031, Remove).
4. Remove left-side panel (WP 0031, Remove).

NOTE

The use of a step aid may be required to access sight glass.

5. Unscrew and remove sight glass (Figure 1, Item 1) and O-ring (Figure 1, Item 2) from receiver (Figure 1, Item 3).
6. Remove O-ring (Figure 1, Item 2) from sight glass (Figure 1, Item 1). Discard O-ring.
7. Install new O-ring (Figure 1, Item 2) onto new sight glass (Figure 1, Item 1).
8. Apply sealing compound to pipe threads of new sight glass (Figure 1, Item 1).
9. Install sight glass (Figure 1, Item 1) into receiver (Figure 1, Item 3) and tighten.
10. Perform leak check on sight glass (WP 0032, Service).
11. Connect battery negative (-) terminal (WP 0070, Reconnect).
12. Perform evacuation and dehydration (WP 0032, Service).
13. Charge system with refrigerant (WP 0032, Service).

REPLACE – CONTINUED



Figure 1. Sight Glass.

14. Install left-side panel (WP 0031, Install).
15. Install front panel assembly (WP 0031, Install).
16. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of sight glass (WP 0005, Operating Procedures).
17. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures)

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
REFRIGERATION UNIT DIESEL ENGINE
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Glasses, Safety (WP 0110, Item 39)
Gloves, Rubber (WP 0110, Item 21)
Hoist, Chain (WP 0107, Table 2, Item 2)
SATS (WP 0107, Table 2, Item 8)
Shield, Face (WP 0110, Item 20)
Spill Kit (WP 0110, Item 49)

Materials/Parts

Oil, Engine (WP 0110, Item 28, 30, or 31)
Tie Wrap (WP 0110, Item 55)
Towel, Machinery Wiping (WP 0110, Item 52)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005	WP 0057
WP 0019	WP 0058
WP 0031	WP 0059
WP 0042	WP 0075
WP 0044	WP 0088
WP 0045	WP 0102
WP 0056	TM 10-8145-222-23P

Equipment Condition

Refrigeration unit removed (WP 0075)
External power cables disconnected (WP 0005)

REPLACE**Remove**

1. Drain coolant from radiator (WP 0044, Service).
2. Drain oil from engine (WP 0042, Service).
3. Remove front panel assembly (WP 0031, Remove).
4. Remove right-side panel (WP 0031, Remove).
5. Disconnect oil drain valve line (Figure 1, Item 1) from underside of engine (Figure 1, Item 2).
6. Remove oil filter (WP 0042, Remove).
7. Remove top-right panel (WP 0031, Remove).
8. Remove top-middle panel (WP 0031, Remove).
9. Remove muffler (WP 0056, Remove).

REPLACE – CONTINUED

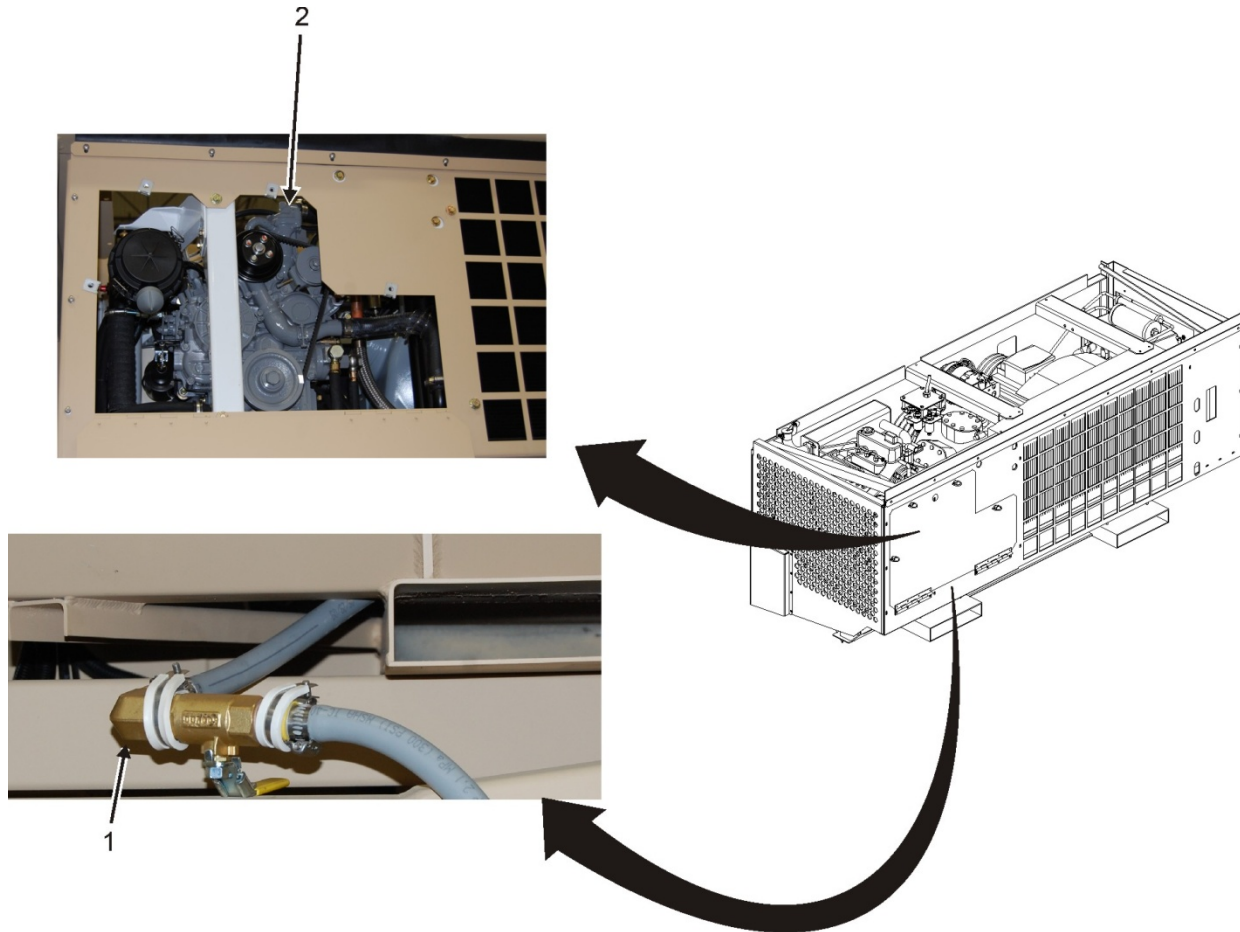


Figure 1. Oil Drain Valve.

REPLACE – CONTINUED

10. Loosen one clamp (Figure 2, Item 1) securing air cleaner inlet pipe (Figure 2, Item 2) to air intake manifold (Figure 2, Item 3).
11. Disconnect air cleaner inlet pipe (Figure 2, Item 2) from air intake manifold (Figure 2, Item 3).

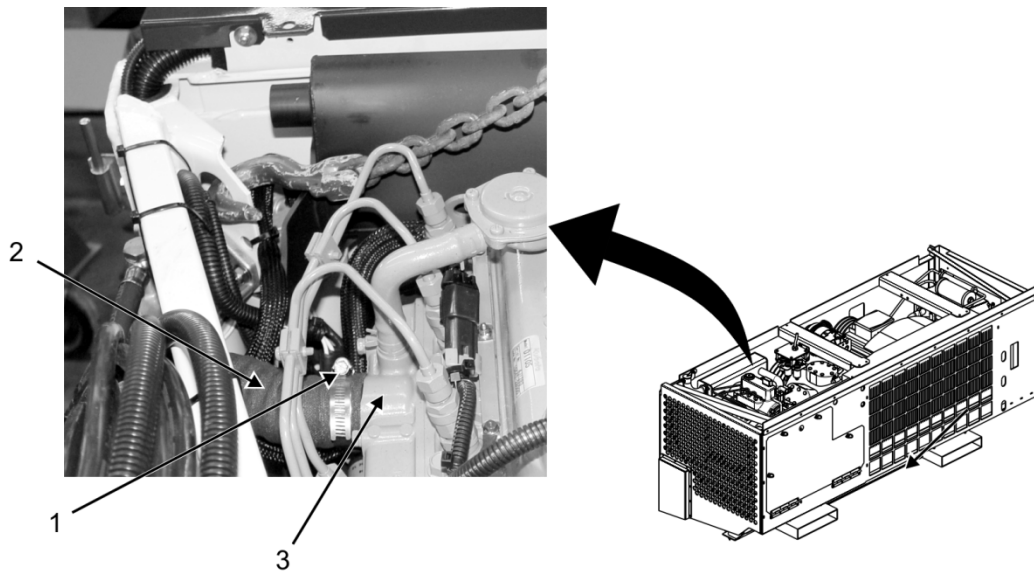


Figure 2. Air Intake Manifold.

REPLACE – CONTINUED

12. Remove two bolts (Figure 3, Item 1), lock washers (Figure 3, Item 2), and washers (Figure 3, Item 3) securing air cleaner body mount bracket (Figure 3, Item 4) to refrigeration unit upper support arm (Figure 3, Item 5). Discard lock washers.
13. Remove air cleaner body mount bracket (Figure 3, Item 4) with air cleaner body attached.

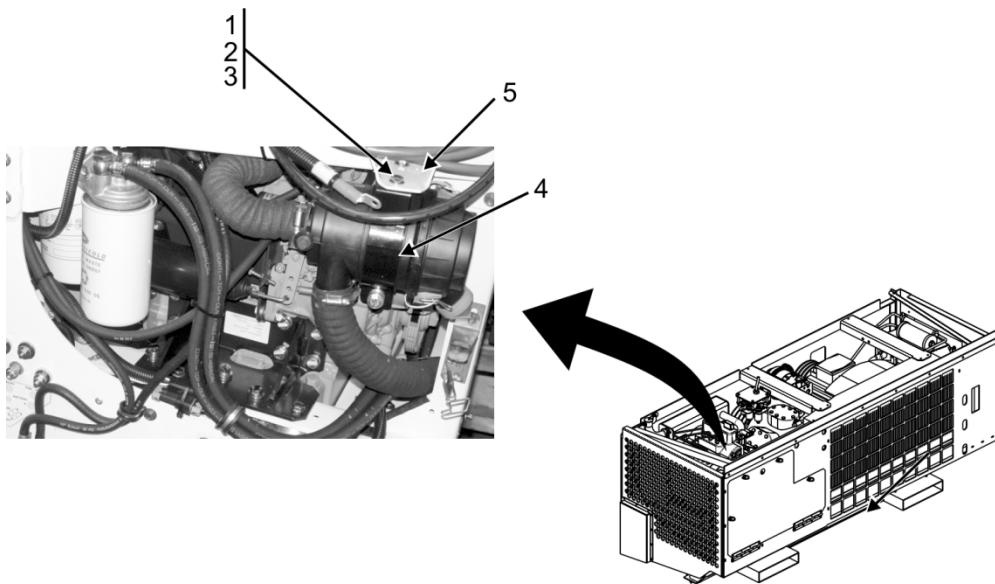


Figure 3. Air Intake Cleaner.

REPLACE – CONTINUED**NOTE**

Watch for residual coolant in the hose. Use a spill kit placed under the hose to catch any spillover.

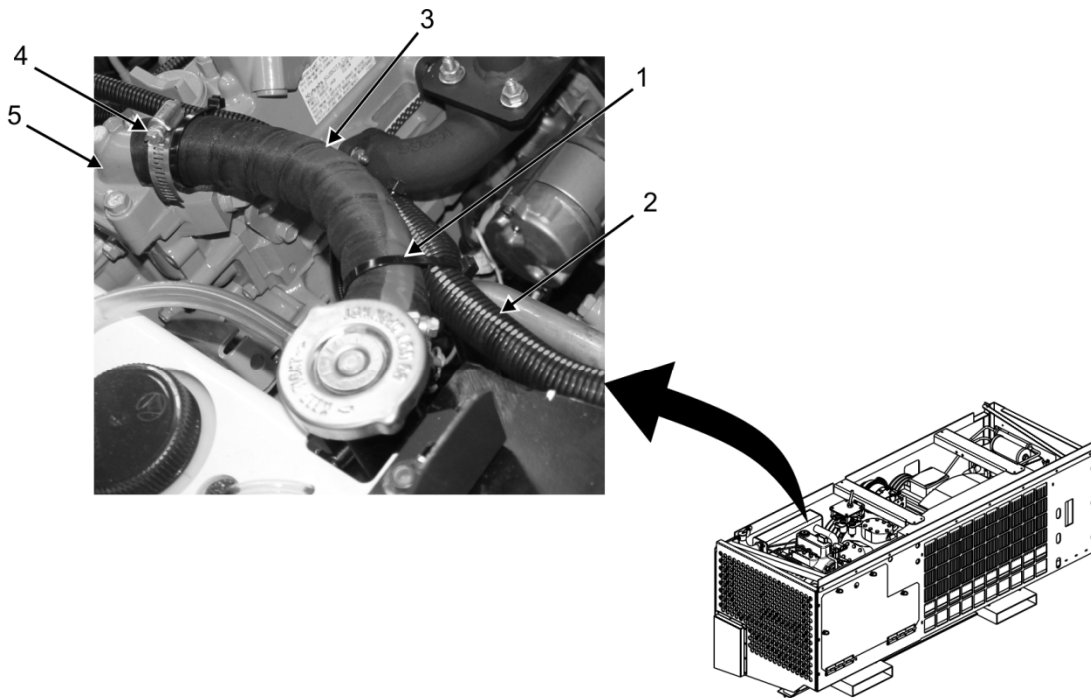
14. Loosen two clamps (Figure 4, Item 1) securing water pump supply hose (Figure 4, Item 2) to water pump and metal pipe (Figure 4, Item 3).
15. Disconnect water pump supply hose (Figure 4, Item 2) at metal pipe (Figure 4, Item 3) and tie wrap to overflow bottle so that hose does not drain.



Figure 4. Water Pump Supply Hose Disconnect.

REPLACE – CONTINUED

16. Cut and remove tie straps (Figure 5, Item 1) securing wire harness (Figure 5, Item 2) to radiator return hose (Figure 5, Item 3). Discard tie straps.
17. Loosen two clamps (Figure 5, Item 4) securing radiator return hose (Figure 5, Item 3) to radiator and to thermostat housing (Figure 5, Item 5).
18. Remove radiator return hose (Figure 5, Item 3).

**Figure 5. Radiator Hose.**

REPLACE – CONTINUED

19. Partially disconnect engine wire harness from connection points on engine in accordance with Table 1 and as illustrated in Figure 6.
20. Position partially disconnected engine wire harness out of way.
21. Remove clutch (WP 0088, Remove).

Table 1. Engine Harness Disconnects.

Engine Component	Quantity	Figure Number	Item Number
Glow Plugs Connection	1	6	1
Oil Pressure Switch	1	6	2
Run Solenoid	1	6	3
Water Temperature Sensor	1	6	4
Speed Solenoid	1	6	5
Starter Wiring	1	6	6

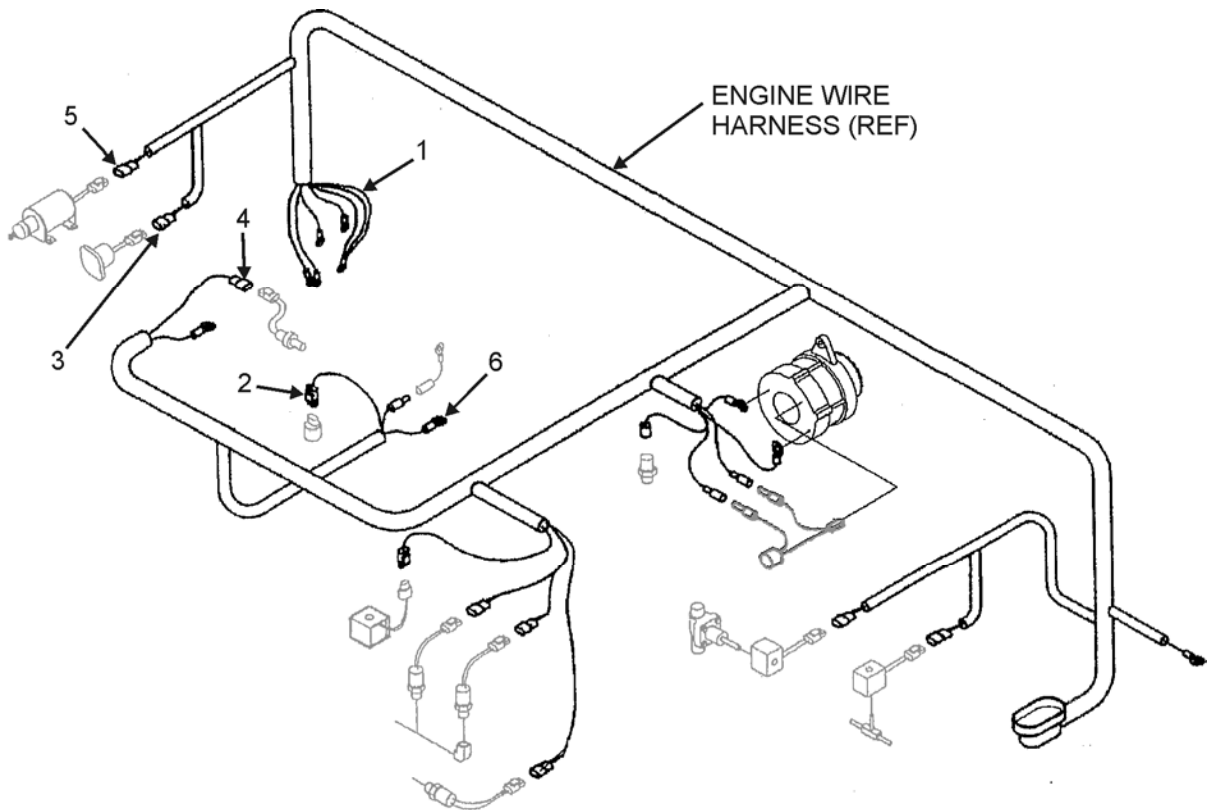


Figure 6. Engine Harness Connections.

REPLACE – CONTINUED

NOTE

Watch for residual fuel in the fuel lines. Use a spill kit placed under each hose to catch any spillover.

22. Disconnect fuel injector line (Figure 7, Item 6) at rear of engine.

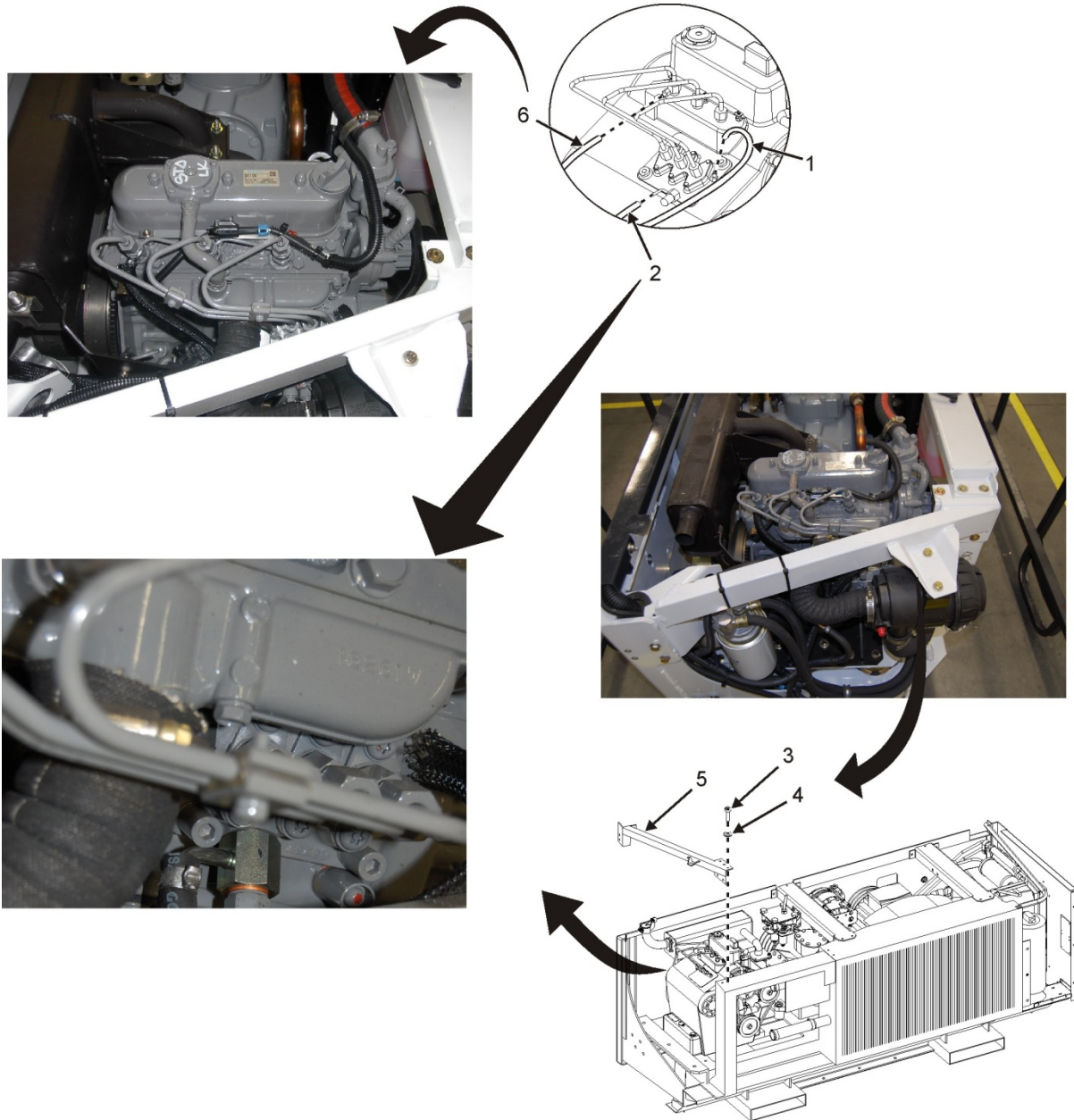


Figure 7. Engine Inlet and Outlet Fuel Lines.

REPLACE – CONTINUED

23. Tag and disconnect inlet (Figure 7, Item 1) and outlet (Figure 7, Item 2) fuel lines from injector and engine return, and allow residual fuel to drain into suitable container.

NOTE

Watch for residual oil in inlet and outlet lines. Use a spill kit placed under each hose to catch any spillover.

24. Remove eight bolts (Figure 7, Item 3) and washers (Figure 7, Item 4) from two ends of cross member and top plate (Figure 7, Item 5).
25. Tag and disconnect oil inlet (Figure 8, Item 1) and outlet (Figure 8, Item 2) lines from engine.
26. Remove cross member and top plate (Figure 7, Item 5).

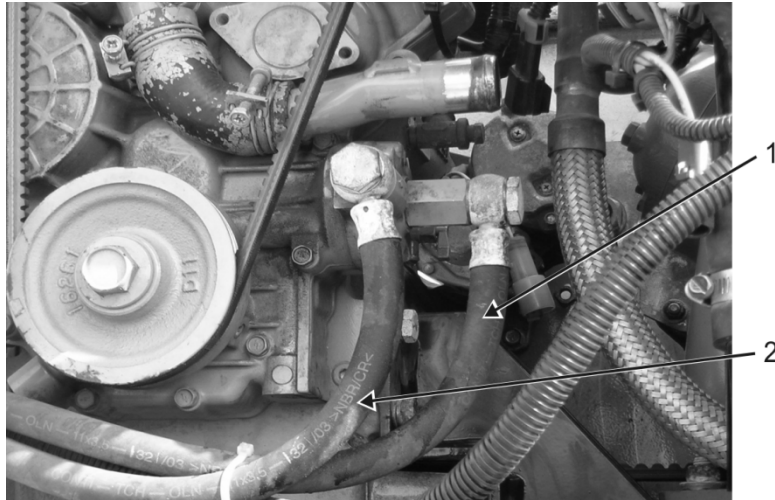


Figure 8. Oil Lines.

REPLACE – CONTINUED

27. Disconnect engine ground strap (Figure 9, Item 1) from flywheel housing by removing one bolt (Figure 9, Item 2) and lock washer (Figure 9, Item 3). Discard lock washer.

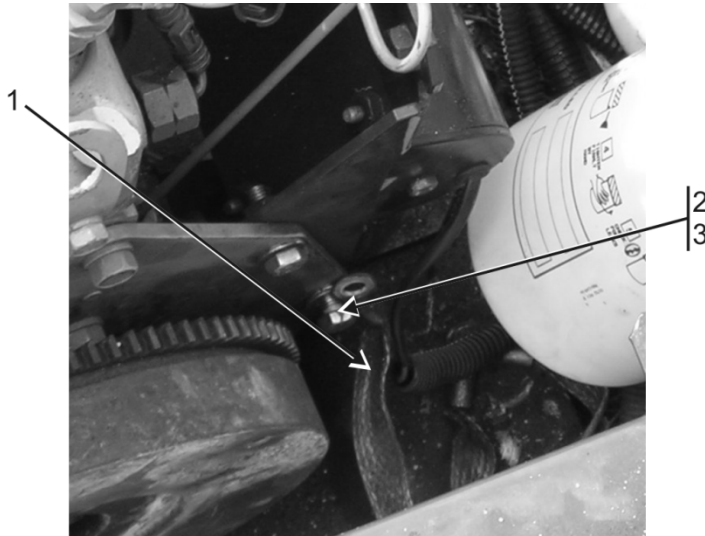


Figure 9. Engine Ground Strap.

NOTE

Ten bolts secure the two engine mount brackets to the refrigeration unit frame. The five on the inboard side use identical hardware. Two of the outboard side bolts use different lengths and additional hardware.

28. Remove eight bolts (Figure 10, Item 1), lock washers (Figure 10, Item 2), and washers (Figure 10, Item 3) securing inboard engine mount bracket (Figure 10, Item 4) and outboard engine mount bracket (Figure 10, Item 5) to refrigeration unit frame (Figure 10, Item 6). Discard lock washers.
29. Remove two longer bolts (Figure 10, Item 7 and Item 16), four washers (Figure 10, Item 9), two shock mounts (Figure 10, Item 11), two spacers (Figure 10, Item 15), two lock washers (Figure 10, Item 8), and two nuts (Figure 10, Item 10) from outboard engine mount bracket (Figure 10, Item 5) and refrigeration unit frame (Figure 10, Item 6). Discard lock washers.

REPLACE – CONTINUED

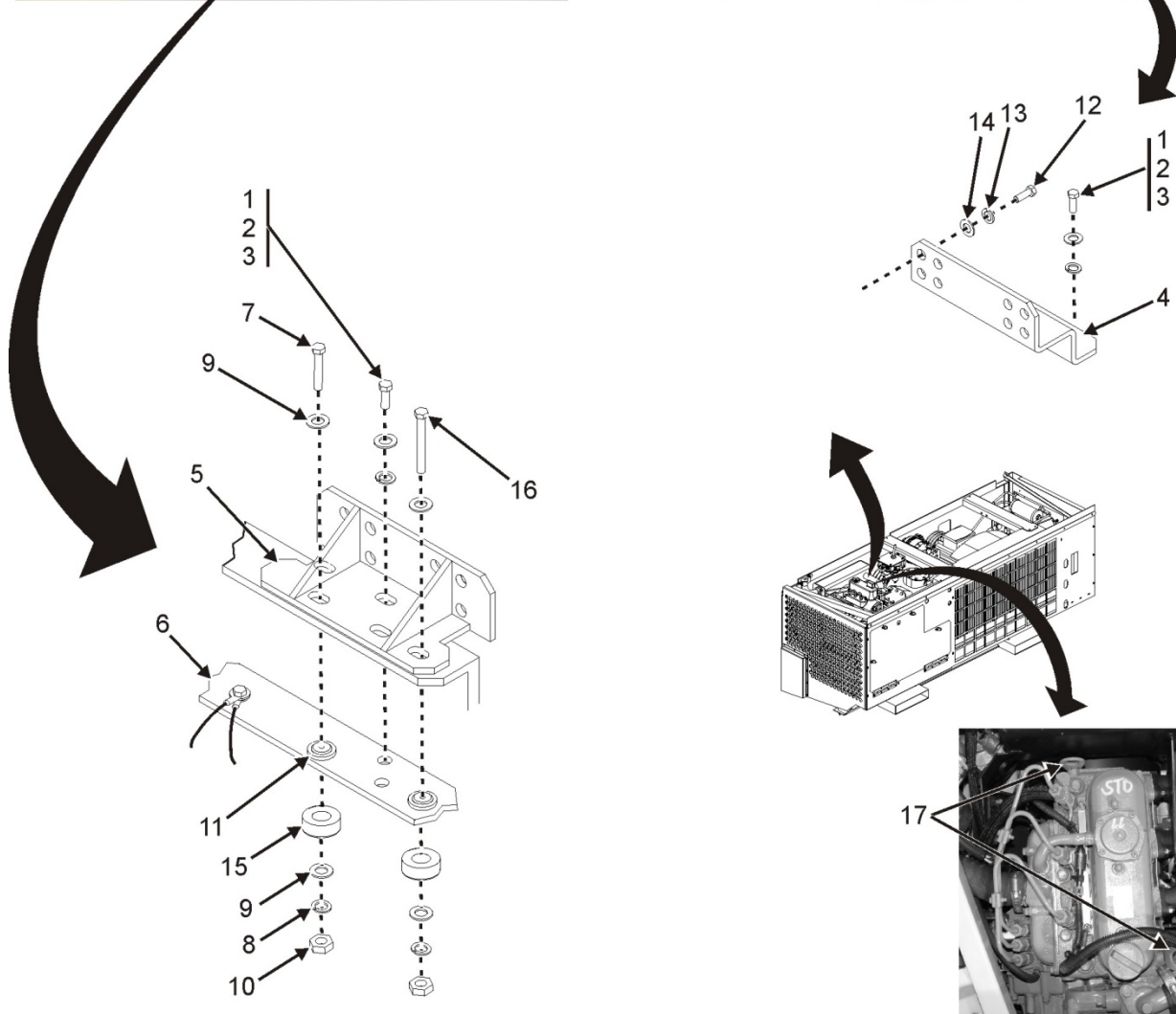
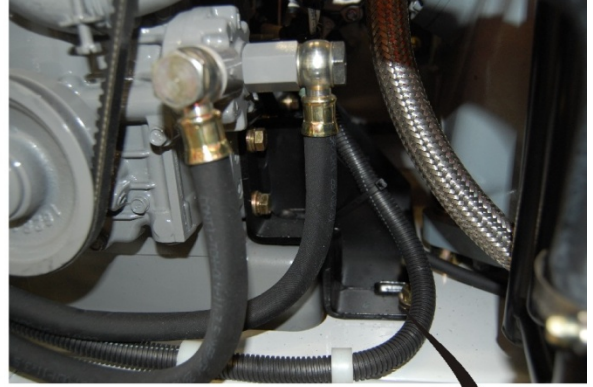
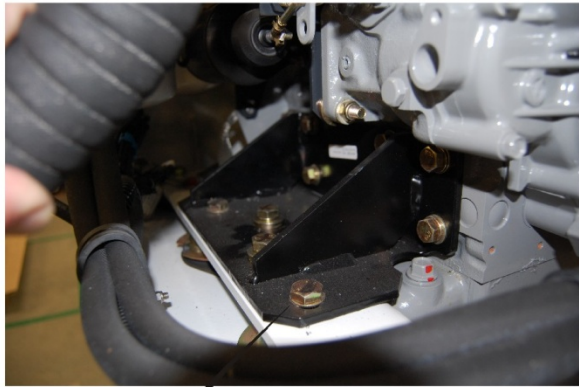


Figure 10. Engine Mount Bolt Layout Removal.

REPLACE – CONTINUED

WARNING

Never perform a lifting operation alone and always use guide ropes when using a hoist and moving hanging assemblies.

A lack of attention or improper positioning during a lifting operation can cause serious injury or death. Pay very close attention at all times to items being moved during a lift operation. Never stand under an item being lifted or in a position where you could be trapped or pinned.

30. Attach hoist to engine at two engine hoist points (Figure 11, Item 1).

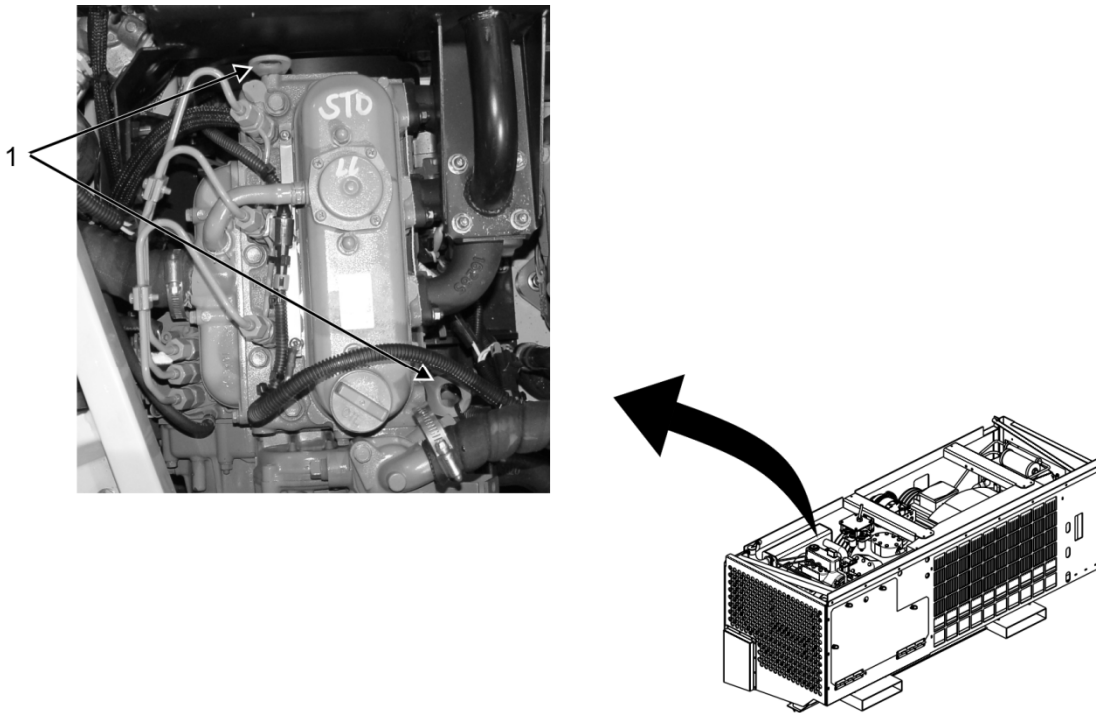


Figure 11. Hoist Attachment Points.

REPLACE – CONTINUED**CAUTION**

The engine fits tightly in the refrigeration unit chassis. Use caution when removing so as to maintain adequate clearance for the oil drain pan, front of engine, and engine oil drain line.

NOTE

When engine is slightly raised enough to gain access to inboard engine mount bracket, the hoist operation will need to stop so that the inboard engine mount bracket bolts can be loosened to give the bracket some play during the remainder of the engine removal.

31. Partially begin removing engine from refrigeration unit chassis.

NOTE

The following step is not required if performing this operation while the refrigeration unit is on the ground.

32. Stop engine hoist and loosen inboard mount bracket (Figure 10, Item 4) to provide adequate clearance for removal by loosening eight bolts (Figure 10, Item 12).
33. Continue hoist operation and completely remove engine from refrigeration unit chassis, then place on flat surface.
34. Remove water temperature sensor (WP 0045, Remove). Retain for reinstallation.
35. Remove oil pressure switch (WP 0057, Remove). Retain for reinstallation.
36. Remove run solenoid (WP 0058, Remove). Retain for reinstallation.
37. Remove speed solenoid (WP 0059, Remove). Retain for reinstallation.

NOTE

The inboard and outboard engine mount brackets are secured to the engine with eight bolts, lock washers, and washers on each side.

38. Remove 16 bolts (Figure 10, Item 12), lock washers (Figure 10, Item 13), and washers (Figure 10, Item 14) securing inboard engine mount bracket (Figure 10, Item 4) and outboard engine mount brackets (Figure 10, Item 5) to engine. Discard lock washers.
39. Disconnect engine from hoist at two engine hoist points (Figure 11, Item 1).
40. Record engine identification number (serial number) of engine removed.

REPLACE – CONTINUED**Install**

Install the refrigeration unit diesel engine as follows:

1. Record engine identification number (serial number) of new engine.
2. Install speed solenoid (WP 0059, Install).
3. Install run solenoid (WP 0058, Install).
4. Install oil pressure switch (WP 0057, Install).
5. Install water temperature sensor (WP 0045, Install).

WARNING

Never perform a lifting operation alone and always use guide ropes when using a hoist and moving hanging assemblies.

A lack of attention or improper positioning during a lifting operation can cause serious injury or death. Pay very close attention at all times to items being moved during a lift operation. Never stand under an item being lifted or in a position where you could be trapped or pinned.

6. Attach hoist to engine at two engine hoist points (Figure 12, Item 17).

NOTE

The inboard and outboard engine mount brackets are secured to the engine with eight bolts, lock washers, and washers on each side.

7. Attach inboard engine mount bracket (Figure 12, Item 4) and outboard engine mount bracket (Figure 12, Item 5) to engine using 16 bolts (Figure 12, Item 12), new lock washers (Figure 12, Item 13), and washers (Figure 12, Item 14). Leave inboard bolts loose at this time.
8. Torque eight outboard mount bracket bolts (Figure 12, Item 12) to 40 foot-pounds (WP 0102).

NOTE

The inboard engine mount bracket is kept loose while lowering the engine into place. During installation of engine into the refrigeration unit chassis, it will be necessary to maneuver the inboard engine mount bracket in order to fit the engine into place.

9. Lift engine using hoist and lower onto refrigeration unit chassis.

REPLACE – CONTINUED

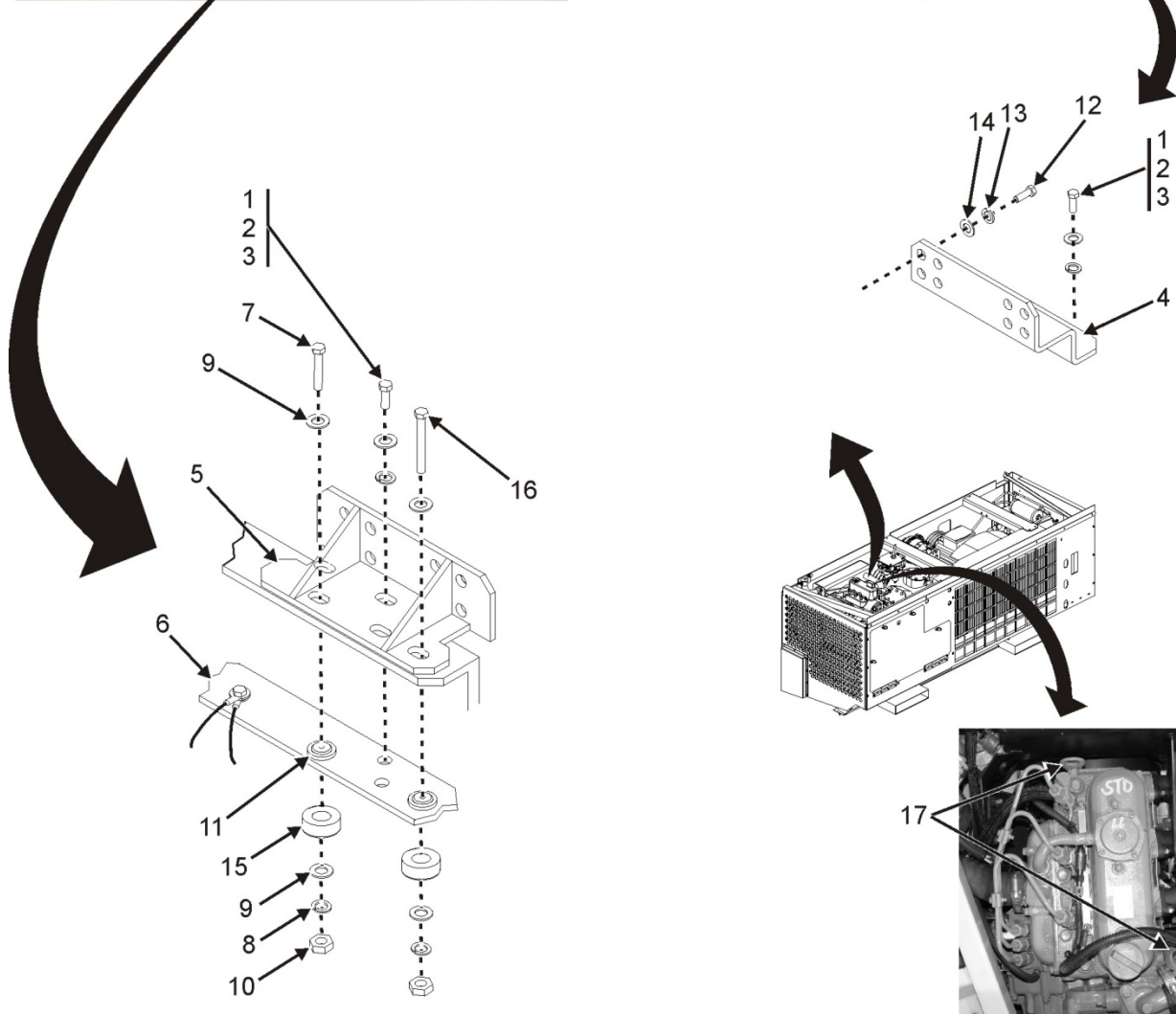
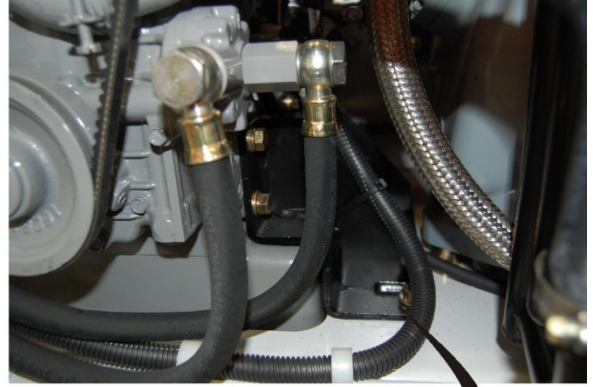
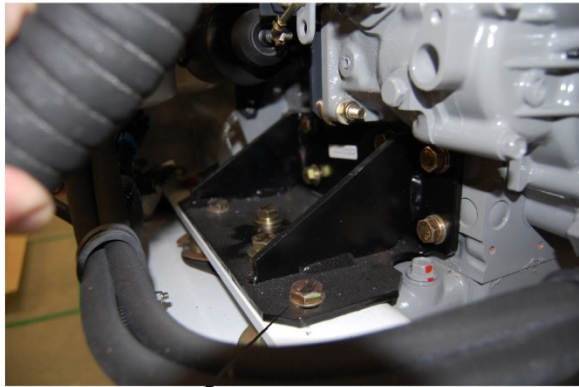


Figure 12. Engine Mount Bolt Layout Installation.

REPLACE – CONTINUED**CAUTION**

The engine mount bracket is slotted, allowing for minor adjustments as needed to align V-belts. Before tightening mount bolts, make sure that the engine and compressor belt pulleys for the engine to compressor V-belt are aligned. Failure to obtain a proper alignment can reduce the life of the belt and/or cause equipment damage.

There needs to be a clearance of 7 1/4-inches (+/- 1/16) between refrigeration unit back wall and engine bell housing on outboard side and 7 7/16-inches (+/- 1/16) between refrigeration unit back wall and engine bell housing on inboard side in order maintain belt alignment. Make sure that you have obtained this clearance before tightening mount bracket bolts to chassis.

10. Secure inboard engine mount bracket (Figure 12, Item 4) to chassis (Figure 12, Item 6) using five bolts (Figure 12, Item 1), new lock washers (Figure 12, Item 2), and washers (Figure 12, Item 3).
11. Torque five bolts (Figure 12, Item 1) to 50 foot-pounds (WP 0102).

NOTE

Ten bolts secure the two engine mount brackets to the refrigeration unit frame. The five on the inboard side use identical hardware. Two of the outboard side bolts use different lengths and additional hardware.

12. Secure outboard engine mount bracket (Figure 12, Item 5) to chassis (Figure 12, Item 6) using three bolts (Figure 12, Item 1), new lock washers (Figure 12, Item 2), and washers (Figure 12, Item 3).
13. Install one long bolt (Figure 12, Item 7), one washer (Figure 12, Item 9), shock mount (Figure 12, Item 11), spacer (Figure 12, Item 15), new lock washer (Figure 12, Item 8), and nut (Figure 12, Item 10) into chassis (Figure 12, Item 6) and outboard engine mount bracket (Figure 12, Item 5).
14. Install final long bolt (Figure 12, Item 16), one washer (Figure 12, Item 9), shock mount (Figure 12, Item 11), spacer (Figure 12, Item 15), new lock washer (Figure 12, Item 8), and nut (Figure 12, Item 10) into chassis (Figure 12, Item 6) and outboard engine mount bracket (Figure 12, Item 5).
15. Torque bolts (Figure 12, Item 1 and Item 7) to 50 foot-pounds (WP 0102).
16. Check for a clearance of 7 1/4-inches (+/- 1/16) between refrigeration unit back wall and engine bell housing on outboard side and 7 7/16-inches (+/- 1/16) between refrigeration unit back wall and engine bell housing on inboard side.
 - If clearance is not accurate, perform Alignment per this WP.
17. Torque eight inboard mount bracket bolts (Figure 12, Item 12) to 40 foot-pounds (WP 0102).

REPLACE – CONTINUED**CAUTION**

Before disconnecting the engine from the engine hoist, make sure that the engine is in the correct position and is stable and secure.

18. Disconnect hoist from engine at two engine hoist points (Figure 12, Item 17).
19. Connect engine ground strap (Figure 13, Item 1) to flywheel housing using one bolt (Figure 13, Item 2) and new lock washer (Figure 13, Item 3).

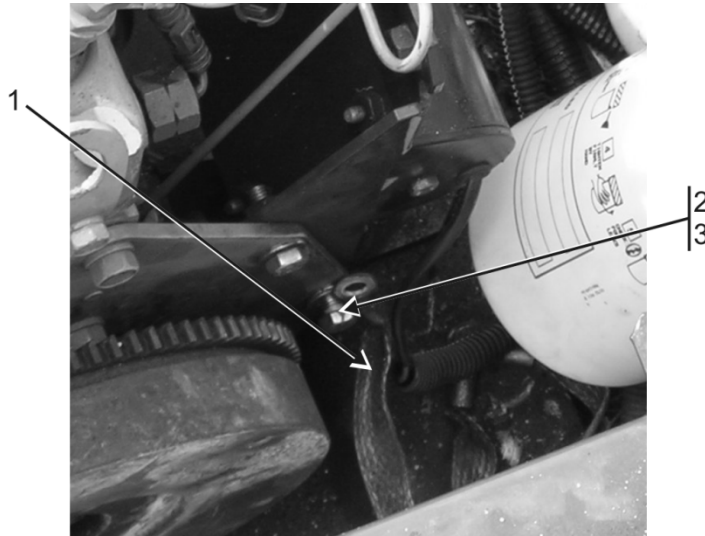


Figure 13. Engine Ground Strap.

REPLACE – CONTINUED

20. Install clutch (WP 0088, Install).

21. Connect oil inlet (Figure 14, Item 1) and outlet (Figure 14, Item 2) lines to engine. Remove tags.

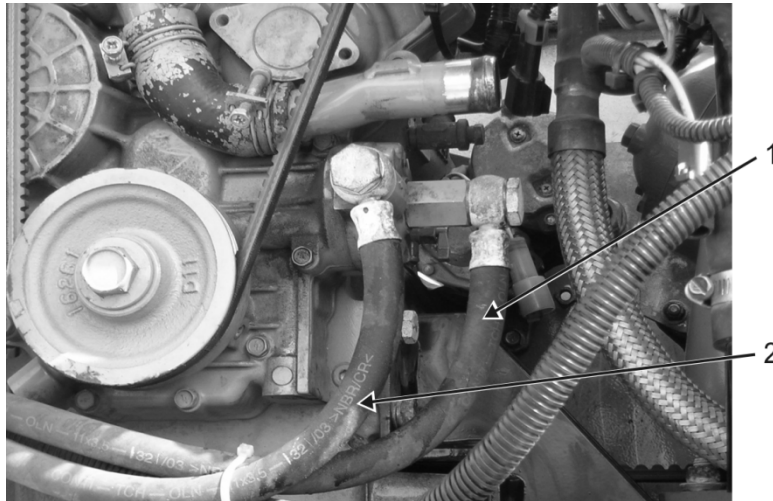


Figure 14. Oil Lines.

REPLACE – CONTINUED

22. Connect inlet (Figure 15, Item 1) and outlet (Figure 15, Item 2) fuel lines to injector and engine return as tagged. Remove tags.
23. Reinstall cross member and top plate (Figure 15, Item 5) using eight bolts (Figure 15, Item 3) and washers (Figure 15, Item 4) at two ends of cross member and top plate.

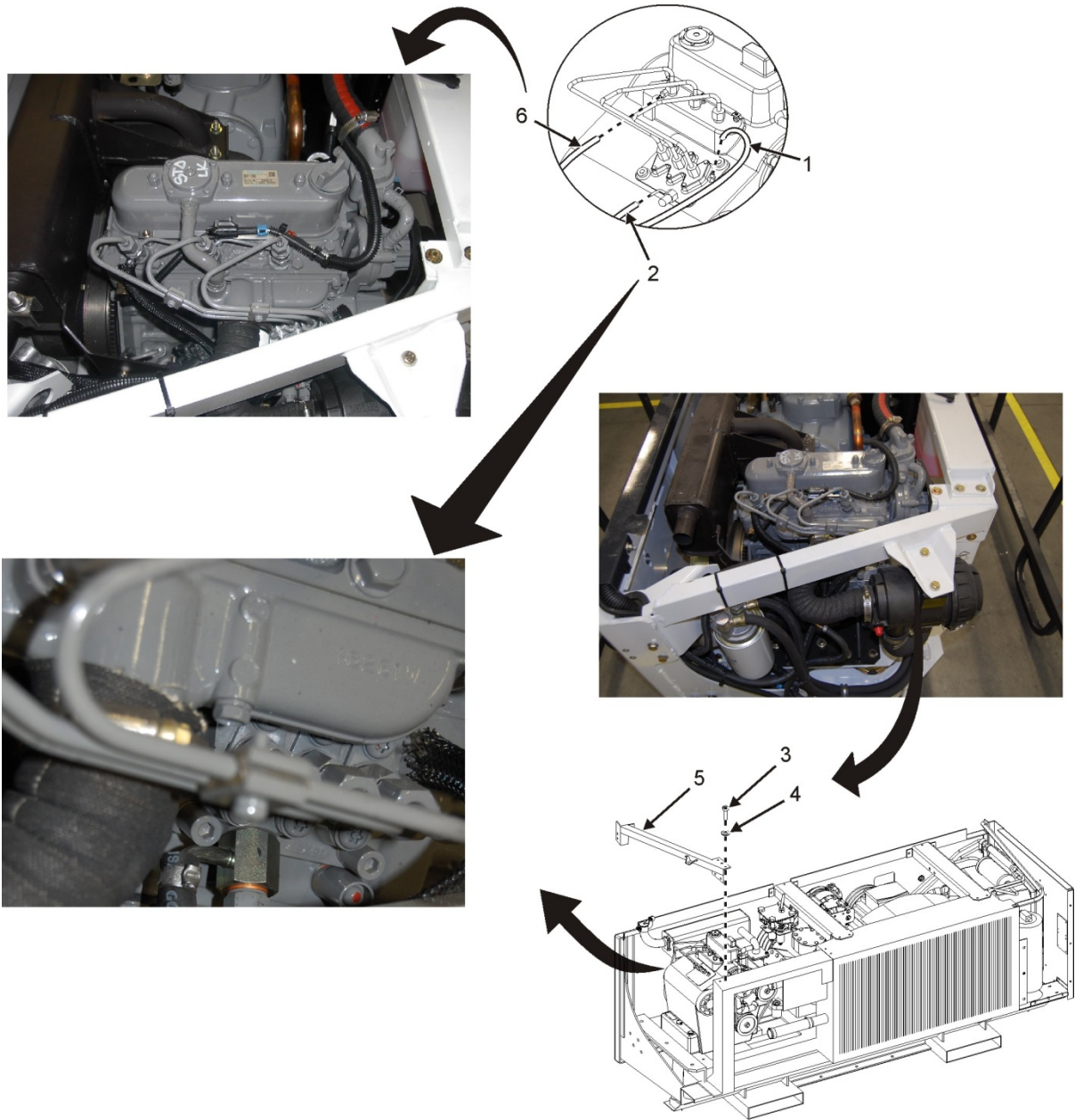


Figure 15. Engine Inlet and Outlet Fuel Lines.

REPLACE – CONTINUED

24. Reconnect engine wire harness in accordance with Table 2 and as illustrated in Figure 16.

Table 2. Engine Harness Connects.

Engine Component	Quantity	Figure Number	Item Number
Glow Plugs Connection	1	6	1
Oil Pressure Switch	1	6	2
Run Solenoid	1	6	3
Water Temperature Sensor	1	6	4
Speed Solenoid	1	6	5
Starter Wiring	1	6	6

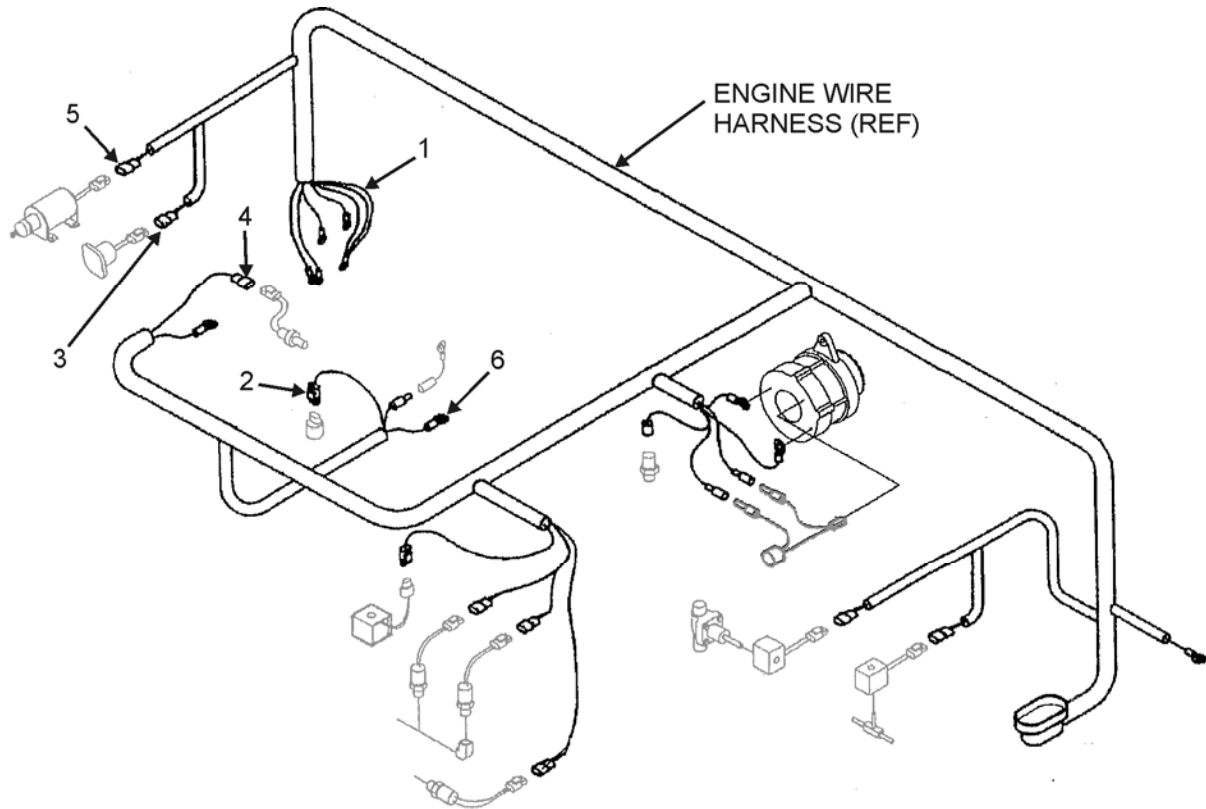


Figure 16. Engine Harness Connections.

REPLACE – CONTINUED

25. Install radiator return hose (Figure 17, Item 3) and secure one end to radiator and other end to thermostat housing (Figure 17, Item 5) using two clamps (Figure 17, Item 4).

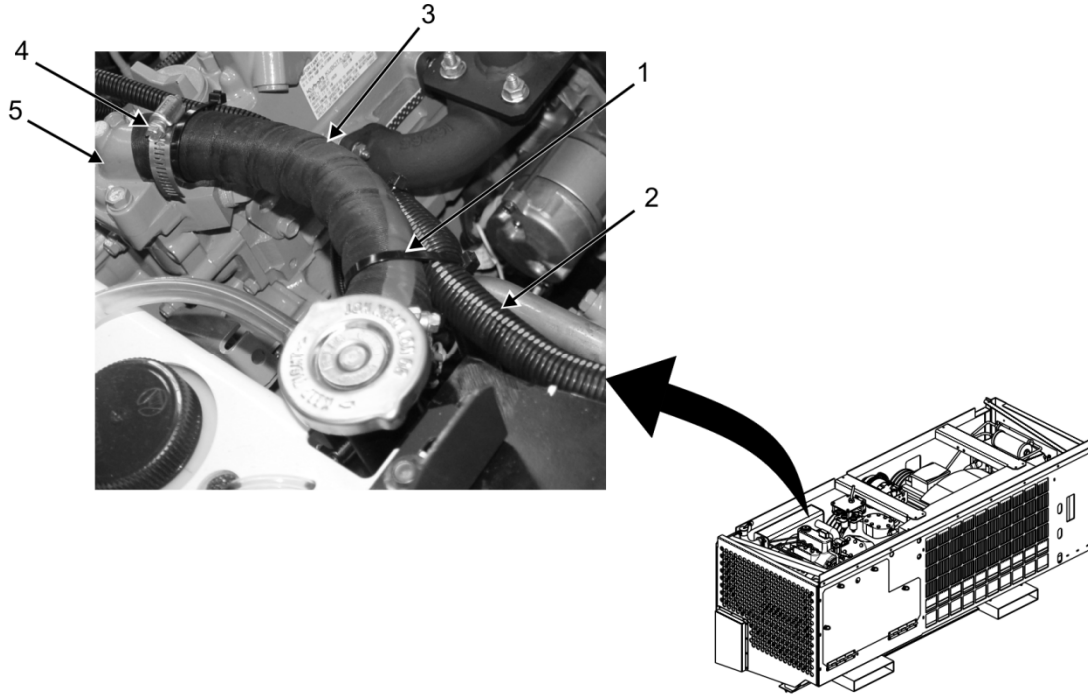


Figure 17. Radiator Hose.

26. Reconnect radiator return hose (Figure 18, Item 2) at metal pipe (Figure 18, Item 3).



Figure 18. Water Pump Supply Hose Connect.

REPLACE – CONTINUED

27. Secure wire harness (Figure 17, Item 2) to radiator return hose (Figure 17, Item 3) using two tie straps (Figure 17, Item 1).
28. Install air cleaner body mount bracket (Figure 19, Item 4), with air cleaner attached, to refrigeration unit chassis upper support arm (Figure 19, Item 5) and secure using two bolts (Figure 19, Item 1), new lock washers (Figure 19, Item 2) and washers (Figure 19, Item 3).

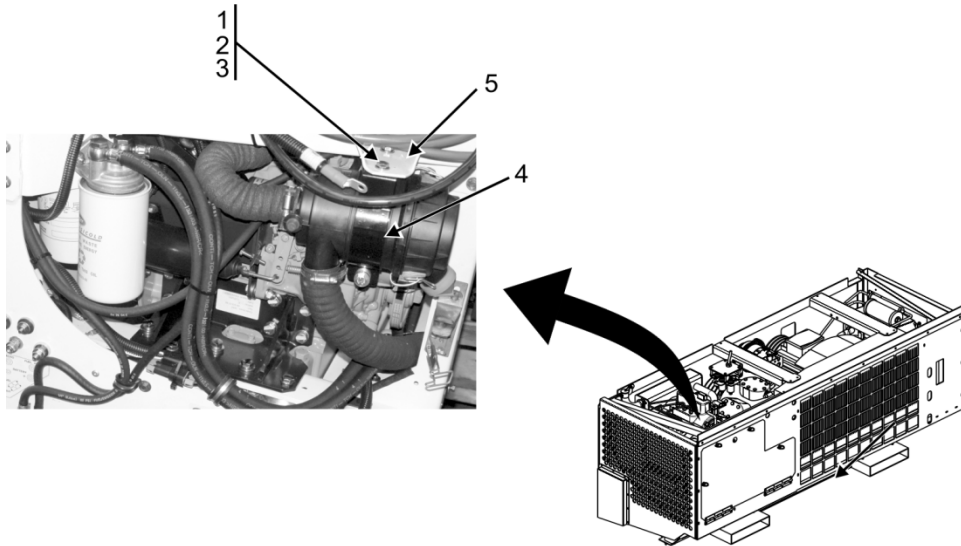


Figure 19. Air Intake Cleaner.

29. Install one end of air cleaner inlet pipe (Figure 20, Item 2) to air intake manifold and secure using one clamp (Figure 20, Item 1).

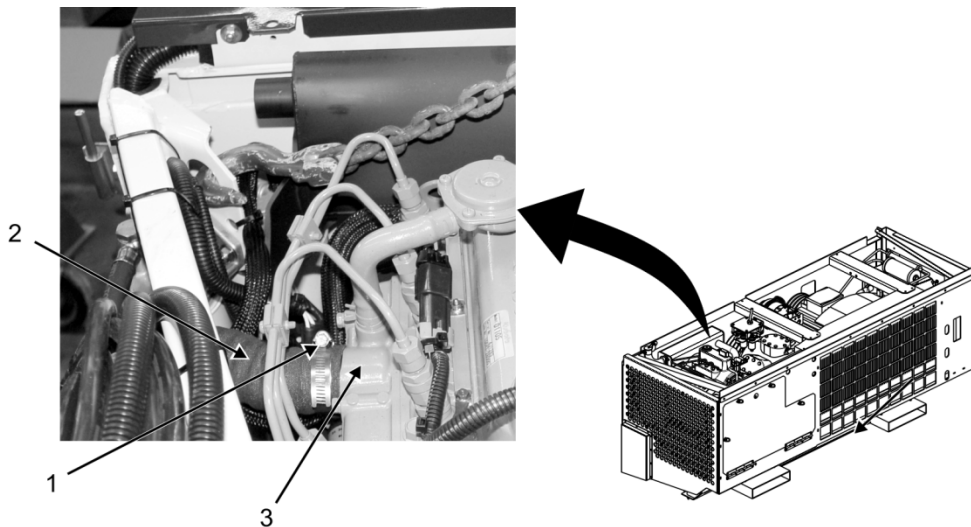


Figure 20. Air Intake Manifold.

REPLACE – CONTINUED

30. Perform Alignment per this WP.
31. Connect oil drain valve (Figure 21, Item 1) to underside of engine (Figure 21, Item 2).
32. Install refrigeration unit (WP 0075, Install).
33. Install muffler (WP 0056, Install).

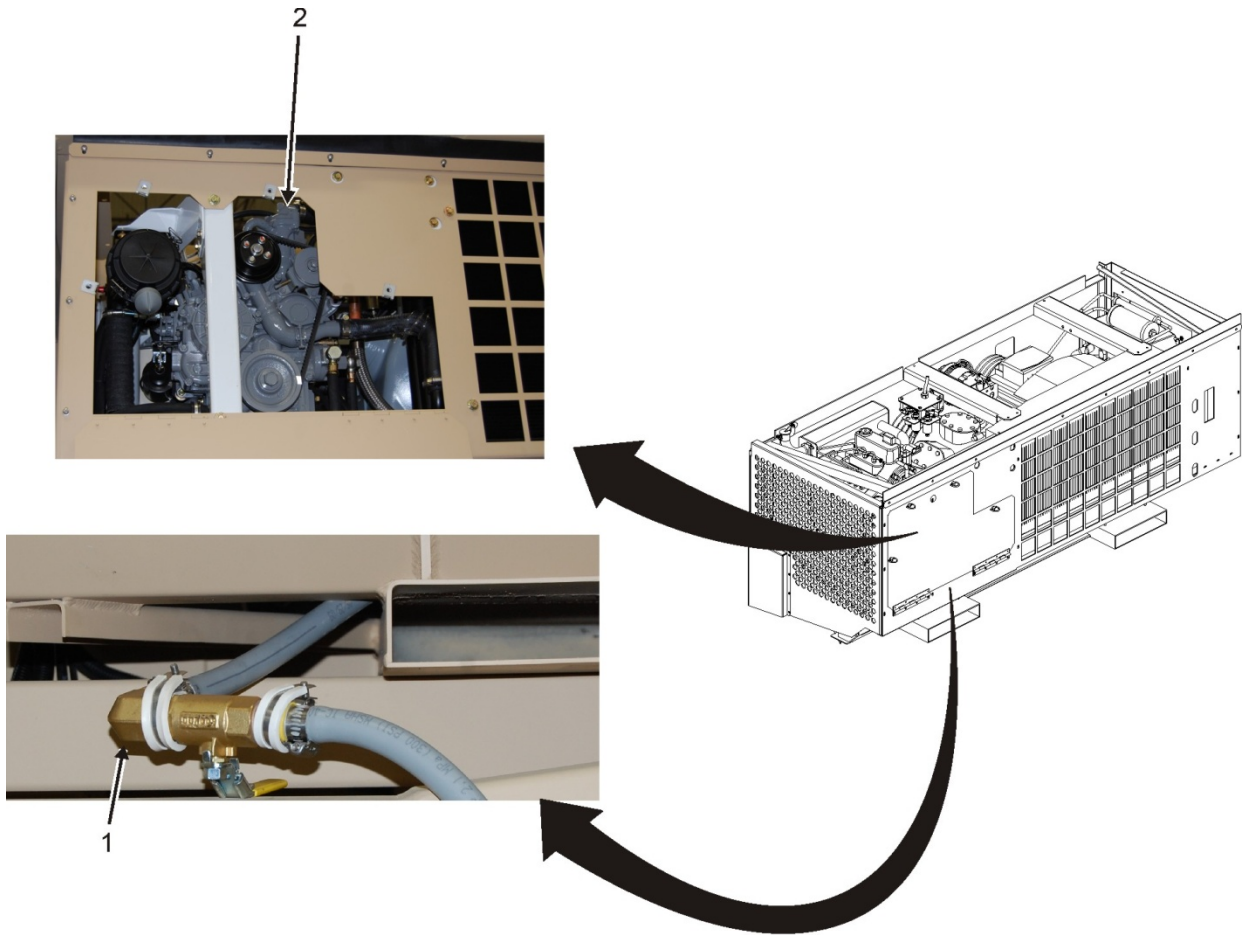


Figure 21. Oil Drain Valve.

34. Check all hose and electrical connections.
35. Service engine oil and oil filter (WP 0042, Service).
36. Service coolant system (WP 0044, Service).

REPLACE – CONTINUED

37. Connect battery negative (-) terminal (WP 0070, Reconnect).
38. Perform BEFORE operation PMCS checks (WP 0019).
39. Operate diesel engine for sufficient time to check all connections for fuel, oil, and coolant leaks (WP 0005, Operating Procedures).
40. Monitor microprocessor control for any alerts or warnings.
41. Shut down refrigeration unit (WP 0005, Operating Procedures).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or even death.
Keep three points of contact on the MTRCS at all times when on the roof.

42. Gain access to top of MTRCS using roof access.
43. Make sure emergency stop switch is in PULL TO START position.
44. Install top-middle panel (WP 0031, Install).
45. Install top-right panel (WP 0031, Install).
46. Exit top of MTRCS.
47. Install right-side panel (WP 0031, Install).
48. Install front panel assembly (WP 0031, Install).
49. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Alignment

Alignment of the three major refrigeration unit components (diesel engine, compressor, and standby motor) is important so that the belts interconnecting these components wear evenly. Misalignment of these three components could cause belt failure and subsequent system shutdown. Diesel engine alignment is accomplished by loosening ten bolts at the base of the engine in order to adjust the position of the engine.

1. Remove right-side panel (WP 0031, Remove).
2. Remove front panel assembly (WP 0031, Remove).

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or even death.
Keep three points of contact on the MTRCS at all times when on the roof.

3. Gain access to top of MTRCS using roof access.
4. Make sure emergency stop switch is in PUSH TO STOP position.

REPLACE – CONTINUED

5. Remove top-middle panel (WP 0031, Remove).
6. Remove top-right panel (WP 0031, Remove).
7. Remove muffler (WP 0056, Remove).
8. Loosen five bolts (Figure 22, Item 1) securing outboard engine mount bracket (Figure 22, Item 2) to chassis (Figure 22, Item 3). Do not remove bolts.

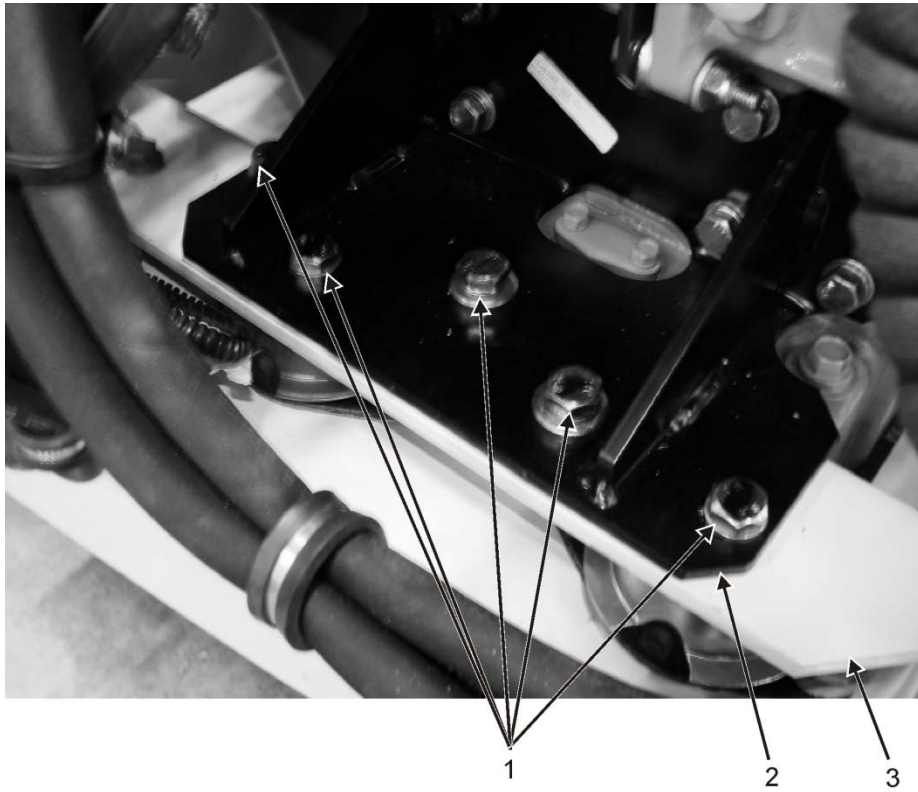


Figure 22. Outboard Engine Mount Bracket Bolts.

REPLACE – CONTINUED

9. Loosen five bolts (Figure 23, Item 1) on inboard engine mount bracket (Figure 23, Item 2) to chassis (Figure 23, Item 3). Do not remove bolts.

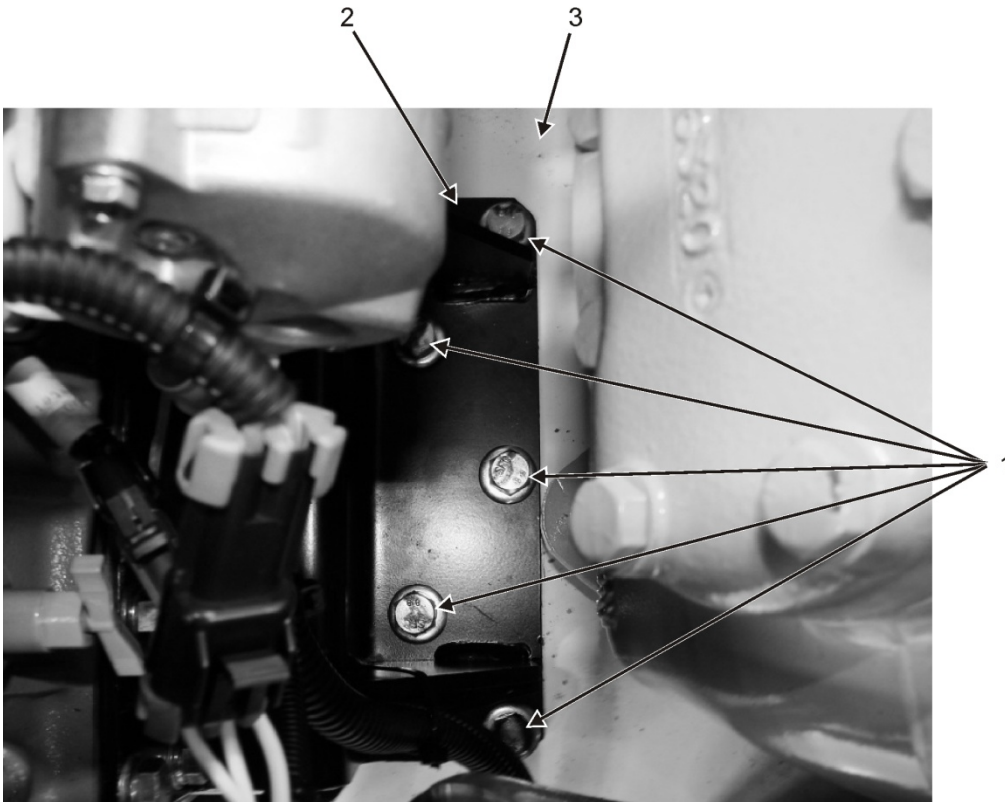


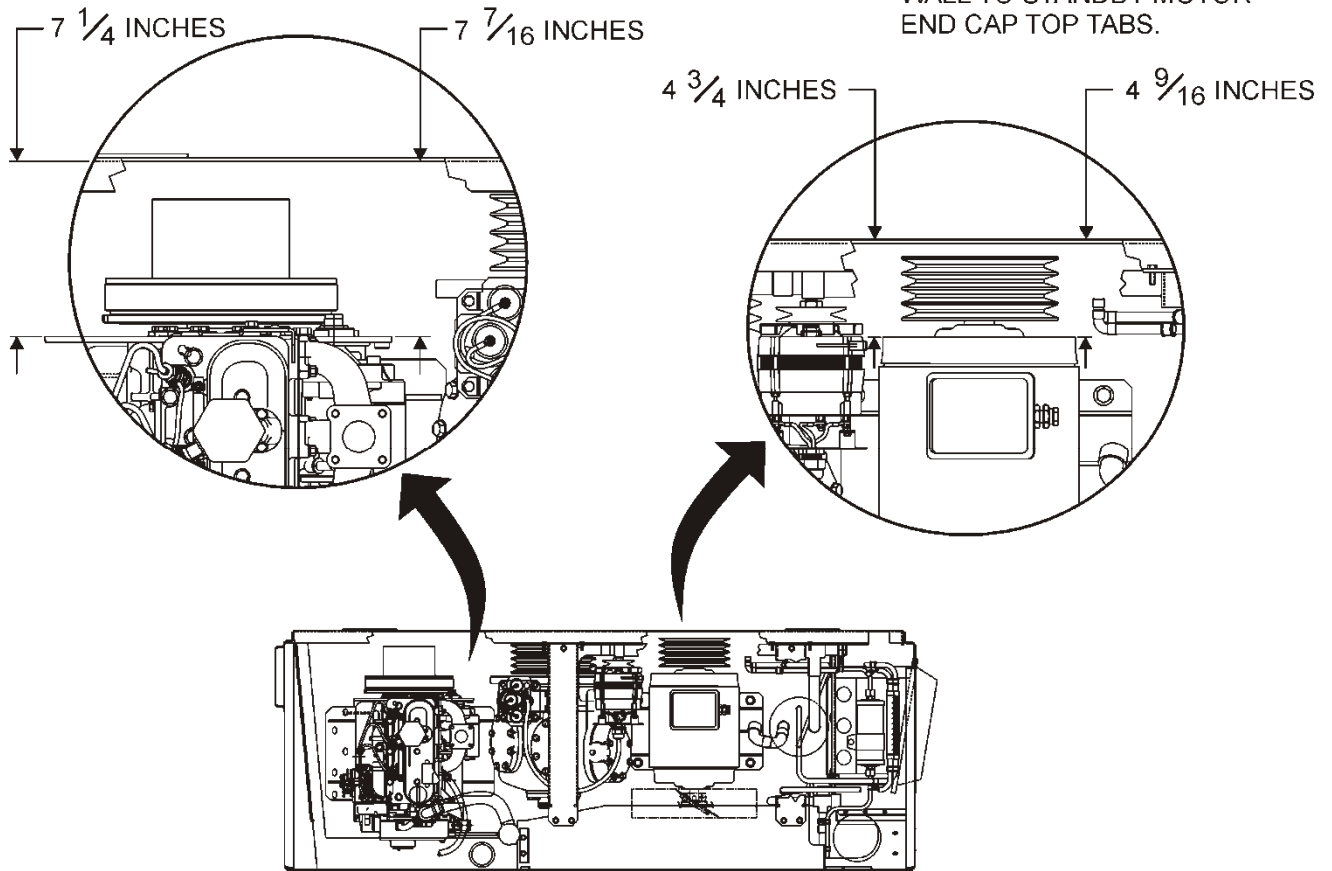
Figure 23. Inboard Engine Mount Bracket Bolts.

REPLACE – CONTINUED

10. Use a rubber mallet to tap diesel engine so that a measurement of 7 1/4-inches is obtained between refrigeration unit back wall and engine bell housing on outboard side and 7 7/16-inches is obtained between refrigeration unit back wall and engine bell housing on inboard side (Figure 24).

NOTE: DISTANCE FROM BACK WALL TO ENGINE BELL HOUSING.

NOTE: DISTANCE FROM BACK WALL TO STANDBY MOTOR END CAP TOP TABS.



NOTE: THE COMPRESSOR MOUNTING IS FIXED AND CANNOT BE ADJUSTED.

Figure 24. Alignment Clearances.

11. Tighten five bolts (Figure 23, Item 1) on inboard engine mount bracket (Figure 23, Item 2) to 50 foot-pounds.
12. Tighten five bolts (Figure 23, Item 1) on outboard engine mount bracket (Figure 23, Item 2) to 50 foot-pounds.
13. Check that clearance measurements still exist after tightening all bolts.
14. Install muffler (WP 0056, Install).

REPLACE – CONTINUED

15. Install top-right panel (WP 0031, Install).
16. Install top-middle panel (WP 0031, Install).
17. Exit top of MTRCS.
18. Install right-side panel (WP 0031, Install).
19. Install front panel assembly (WP 0031, Install).
20. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
IDLER PULLEY
REPLACE

INITIAL SETUP:

Tools and Special Tools

SATS (WP 0107, Table 2, Item 8)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005 WP 0054
 WP 0031 WP 0070
 WP 0053 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External electrical power disconnected (WP 0005)
 Battery disconnected (WP 0070)

REPLACE

Standby Motor to Compressor V-Belt Idler

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Access top of MTRCS using roof access.
2. Make sure emergency stop switch (Figure 1, Item 1) is in PUSH TO STOP position.

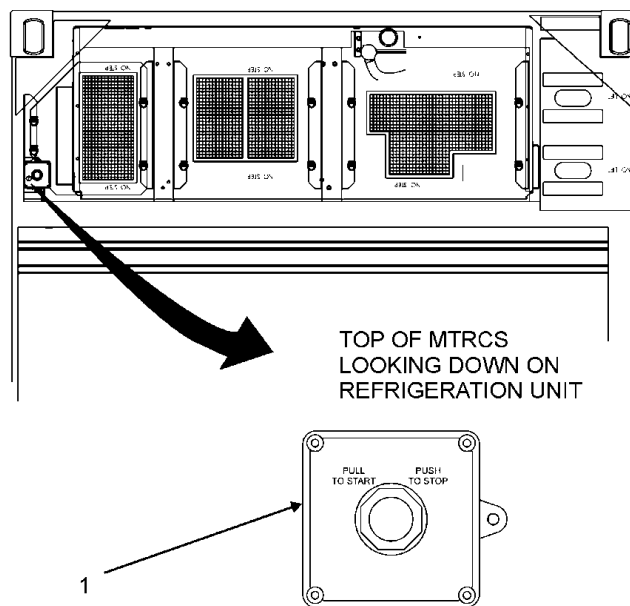


Figure 1. Emergency Stop Switch.

REPLACE – CONTINUED

3. Remove top-right panel (WP 0031, Remove).
4. Remove top-middle panel (WP 0031, Remove).
5. Remove standby motor to compressor V-belt (WP 0053, Remove).
6. Remove tensioner adjustment bolt (Figure 2, Item 1) and nut (Figure 2, Item 2) from idler (Figure 2, Item 3) and bracket (Figure 2, Item 4).
7. Remove lock nut (Figure 2, Item 5) and washer (Figure 2, Item 6) from idler assembly shaft (Figure 2, Item 7). Discard lock nut.
8. Remove idler (Figure 2, Item 3) and idler pulley (Figure 2, Item 8) from idler assembly shaft (Figure 2, Item 7).
9. Remove idler assembly shaft (Figure 2, Item 7) from bracket (Figure 2, Item 8).

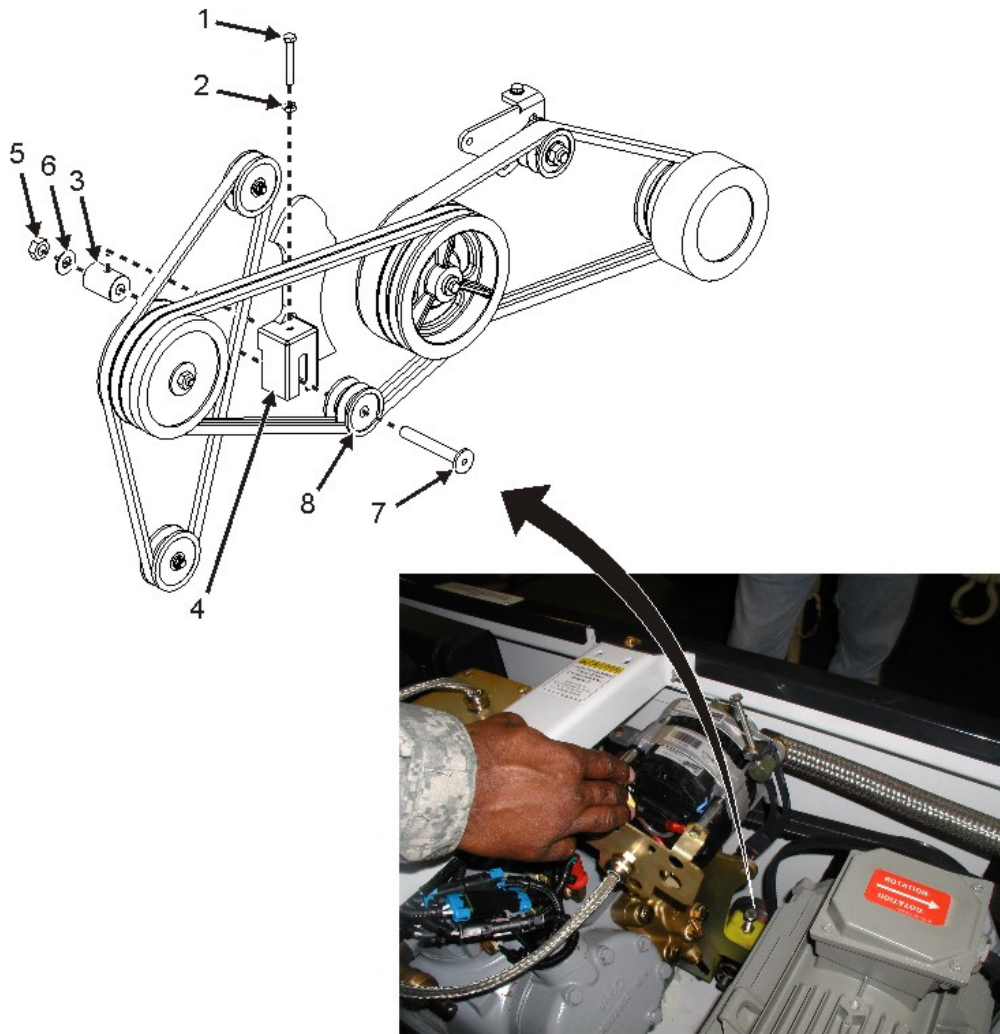


Figure 2. Standby Motor to Compressor V-Belt Idler Pulley.

REPLACE – CONTINUED

10. Install new idler assembly shaft (Figure 2, Item 7) through idler pulley (Figure 2, Item 8) and bracket (Figure 2, Item 4)
11. Install idler (Figure 2, Item 3) and washer (Figure 2, Item 6) onto idler assembly shaft (Figure 2, Item 7) and secure in place using new lock nut (Figure 2, Item 5).

NOTE

Adjustment of the tensioner adjustment bolt will be accomplished during the reinstallation of the engine to compressor V-belt.

12. Install tensioner adjustment bolt (Figure 2, Item 1) and nut (Figure 2, Item 2) through bracket (Figure 2, Item 4) and into idler (Figure 2, Item 3).
13. Install engine to compressor V-belt (WP 0054, Install).
14. Install top-middle panel (WP 0031, Install).
15. Install top-right panel (WP 0031, Install).
16. Place emergency stop switch (Figure 1, Item 1) is in PULL TO START position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

17. Exit top of MTRCS using roof access.
18. Perform refrigeration unit operation under usual conditions (WP 0005, Operating Procedures).
19. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Engine to Compressor V-Belt Idler**WARNING**

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Access top of MTRCS using roof access.
2. Make sure emergency stop switch (Figure 1, Item 1) is in PUSH TO STOP position.
3. Remove top-right panel (WP 0031, Remove).
4. Remove top-middle panel (WP 0031, Remove).
5. Remove engine to compressor V-belt (WP 0054, Remove).

REPLACE – CONTINUED

6. Remove tensioner adjustment bolt (Figure 3, Item 1) and washer (Figure 3, Item 3) from idler assembly (Figure 3, Item 4), and bracket (Figure 3, Item 8).
7. Remove lock nut (Figure 3, Item 5) and washer (Figure 3, Item 6) from idler assembly (Figure 3, Item 4). Discard lock nut.
8. Remove pulley (Figure 3, Item 7) from idler assembly (Figure 3, Item 4).
9. Remove idler assembly (Figure 3, Item 4) from bracket (Figure 3, Item 8).
10. Install idler assembly (Figure 3, Item 4) onto bracket (Figure 3, Item 8).
11. Install pulley (Figure 3, Item 7) onto new idler assembly (Figure 3, Item 4) and secure using one washer (Figure 3, Item 6) and new lock nut (Figure 3, Item 5).

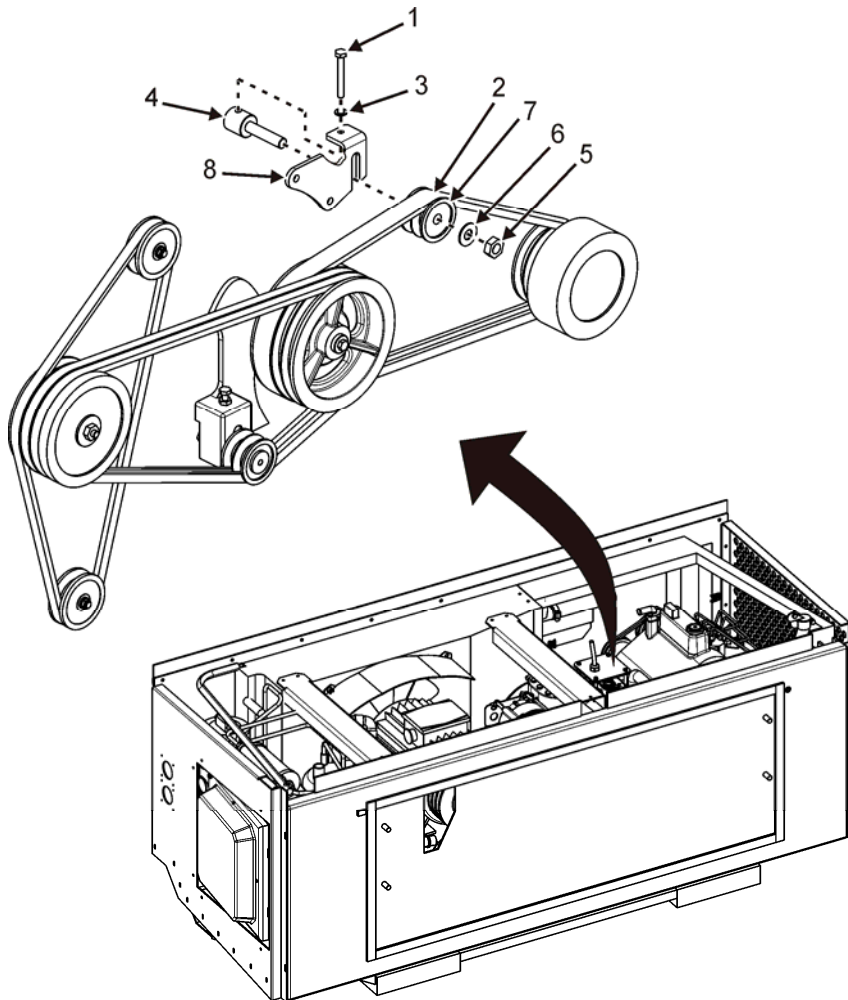


Figure 3. Engine to Compressor V-Belt Idler.

REPLACE – CONTINUED

12. Install tensioner adjustment bolt (Figure 3, Item 1) and washer (Figure 3, Item 3) through bracket (Figure 3, Item 8) and into idler assembly (Figure 3, Item 4).
13. Install engine to compressor V-belt (WP 0054, Install).
14. Install and check tension of engine to compressor V-belt (WP 0054, Install).
15. Install muffler (WP 0070, Install).
16. Install top-middle panel (WP 0031, Install).
17. Install top-right panel (WP 0031, Install).
18. Place emergency stop switch (Figure 1, Item 1) is in PULL TO START position.

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

19. Exit top of MTRCS using roof access.
20. Perform refrigeration unit operation under usual conditions (WP 0005, Operating Procedures).
21. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
ENGINE MOUNTED CENTRIFUGAL CLUTCH
REPLACE

INITIAL SETUP:

Tools and Special Tools

SATS (WP 0107, Table 2, Item 8)

Materials/Parts

Lock Washer, ³/₈-in ID (WP 0111, Item 13)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005 WP 0056
 WP 0031 WP 0070
 WP 0054 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)
 Battery disconnected (WP 0070)

REPLACE

WARNING

Falling from the roof of the MTRCS can cause serious personal injury or death. Keep three points of contact on the MTRCS at all times.

1. Remove top-right panel (WP 0031, Remove).
2. Remove top-middle panel (WP 0031, Remove).

NOTE

The muffler is removed to provide access to the clutch. When performing muffler removal, it will not be required to remove the muffler pipe.

3. Remove muffler (WP 0056, Remove).

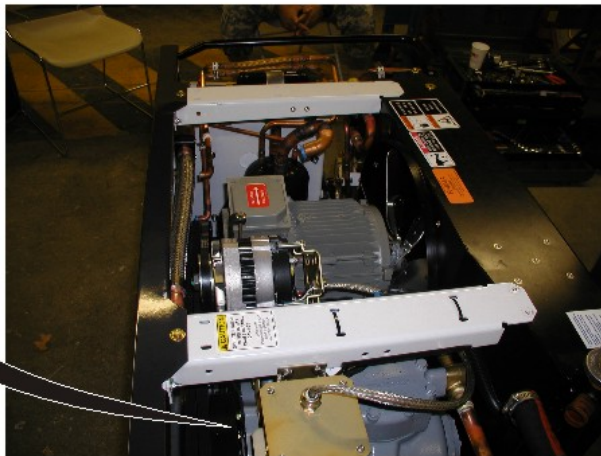
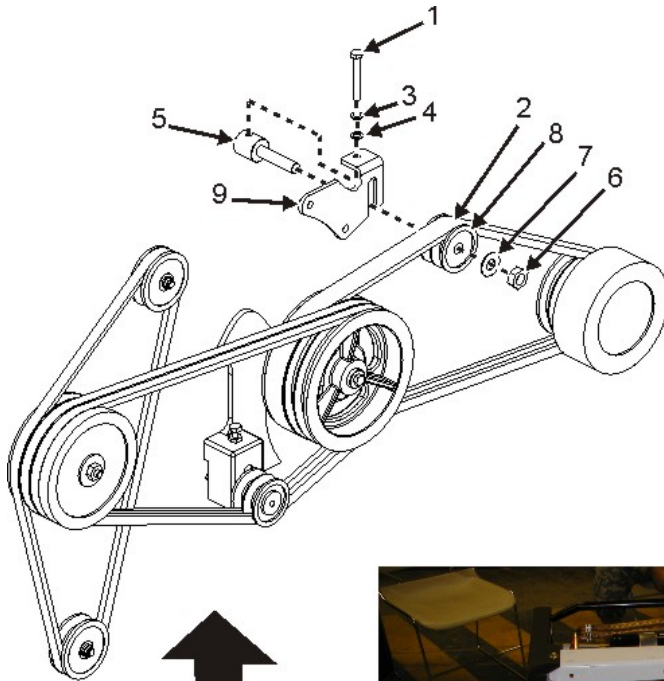
NOTE

The engine to compressor V-belt must be partially removed from the engine side in order to remove the clutch. The clutch and engine to compressor V-belt will be removed in tandem due to the tension applied to the belt. Removing the idler pulley will ease the tension on the belt and aid the removal of the engine to compressor V-belt and clutch combination. The V-belt will remain partially installed over the compressor and does not need to be fully removed.

4. Remove engine to compressor V-belt (WP 0054, Remove).

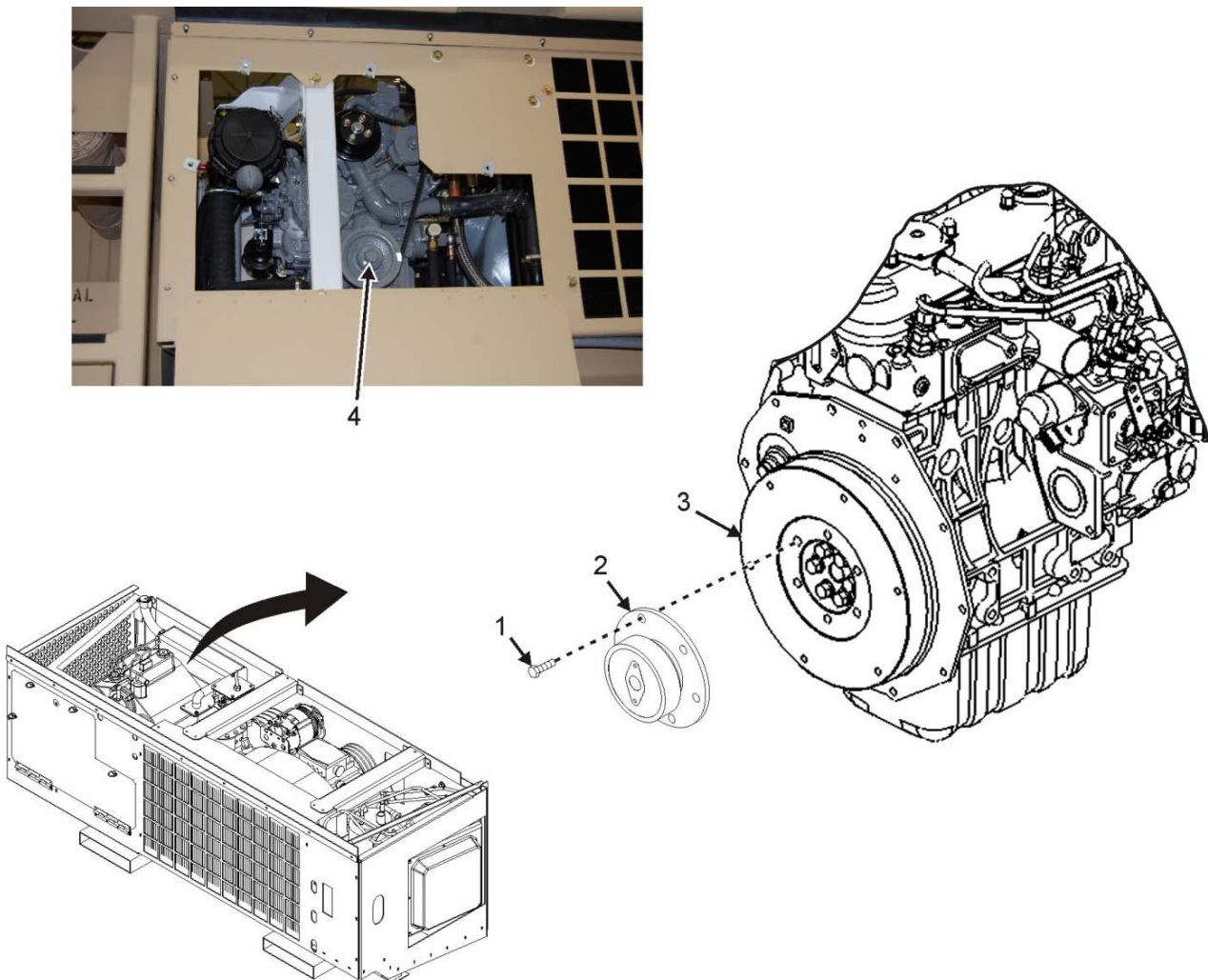
REPLACE – CONTINUED

5. Remove tensioner adjustment bolt (Figure 1, Item 1), lock washer (Figure 1, Item 3) and washer (Figure 1, Item 4) from idler pulley shaft (Figure 1, Item 5) and bracket (Figure 1, Item 9). Discard lock washer.
6. Remove nut (Figure 1, Item 6) and lock washer (Figure 1, Item 7) securing idler pulley shaft (Figure 1, Item 5) and idler pulley (Figure 1, Item 8) to bracket (Figure 1, Item 9). Discard lock washer.
7. Remove idler pulley (Figure 1, Item 8) and idler pulley shaft (Figure 1, Item 5) from bracket (Figure 1, Item 9).
8. Partially remove engine to compressor V-belt while leaving belt wrapped around compressor (WP 0054, Remove).

**Figure 1. Idler Pulley.**

REPLACE – CONTINUED

9. Immobilize flywheel (Figure 2, Item 3) by holding crankcase pulley (Figure 2, Item 4) with a wrench or socket.
10. Remove six 5/16-inch bolts (Figure 2, Item 1) securing clutch assembly (Figure 2, Item 2) to flywheel (Figure 2, Item 3).
11. Remove clutch (Figure 2, Item 2) and engine to compressor V-belt.
12. Immobilize flywheel (Figure 2, Item 3) by holding crankcase pulley (Figure 2, Item 4) with a wrench or socket.
13. Install engine to compressor V-belt and new clutch (Figure 2, item 2) to flywheel (Figure 2, Item 3) and secure using six 5/16-inch bolts (Figure 2, Item 1).

**Figure 2. Clutch.**

REPLACE – CONTINUED

14. Install idler pulley (Figure 1, Item 8) idler pulley shaft (Figure 1, Item 5) onto bracket (Figure 1, Item 9) and secure using nut (Figure 1, Item 6) and new lockwasher (Figure 1, Item 7).
15. Install tensioner adjustment bolt (Figure 1, Item 1), new lock washer (Figure 1, Item 3) and washer (Figure 3, Item 4) to idler pulley shaft (Figure 1, Item 5).

NOTE

Adjustment of the tensioner adjustment bolt will be accomplished during the reinstallation of the engine to compressor V-belt.

16. Install engine to compressor V-belt (WP 0054, Install).
17. Install and check tension of engine to compressor V-belt (WP 0054, Install).
18. Install muffler (WP 0056, Install).
19. Install top-middle panel (WP 0031, Install).
20. Install top-right panel (WP 0031, Install).
21. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
MICROPROCESSOR CONTROLLER ASSEMBLY
REPLACE, SERVICE

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
WP 0070

Personnel Required

Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
External electrical power disconnected (WP 0005)

REPLACE**WARNING**

Electrical voltage and current cannot be seen, and when contacted can result in death, render you unconscious, or severely burn you. Use extreme care when working around or with energized equipment. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning.

Do not perform any maintenance on electrical equipment unless all power is removed.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Open control panel door (Figure 1, Item 7).
3. Remove 24 screws (Figure 1, Item 1) securing cover assembly (Figure 1, Item 2) to controller. Retain screws for reinstallation.
4. Remove cover assembly (Figure 1, Item 2). Retain for reinstallation.
5. Remove two screws (Figure 1, Item 3) securing controller (Figure 1, Item 4) to controller bracket (Figure 1, Item 5).
6. Carefully pull controller (Figure 1, Item 4) away from control panel assembly to access electrical connector (Figure 1, Item 6).
7. Disconnect electrical connector (Figure 1, Item 6) from controller (Figure 1, Item 4).
8. Remove controller (Figure 1, Item 4) from control panel assembly.
9. Install replacement controller (Figure 1, Item 4) into control panel assembly and secure to controller bracket (Figure 1, Item 5) using two screws (Figure 1, Item 3).
10. Reconnect electrical connector (Figure 1, Item 6) to controller (Figure 1, Item 4).
11. Install cover assembly (Figure 1, Item 2) onto controller (Figure 1, Item 4) and secure using 24 screws (Figure 1, Item 1).

REPLACE – CONTINUED

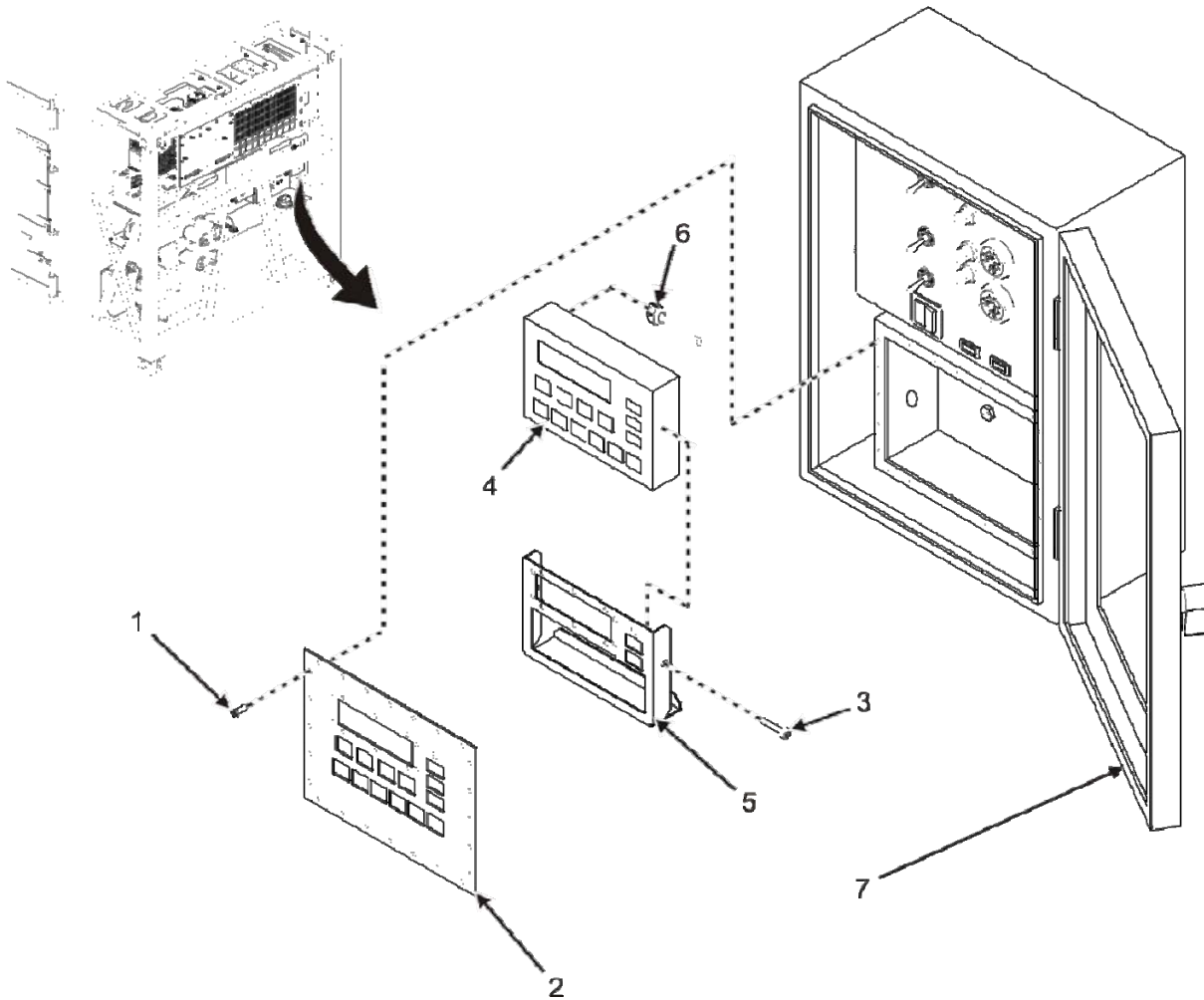


Figure 1. Controller.

12. Close control panel door (Figure 1, Item 7).
13. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
14. Perform refrigeration unit operation under normal conditions (WP 0005, Operating Procedures).
15. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**SERVICE**

Servicing the microprocessor controller assembly consists of performing a re-programming of the controller in order to set the controller up in the same configuration it was prior to replacement (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
ELECTRICAL BOX
REPAIR

INITIAL SETUP:**Tools and Special Tools**

Electrical Connector Kit (WP 0107, Table 2, Item 3)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Lock Nut M4 (WP 0111, Item 7)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External electrical power disconnected (WP 0005)

REPAIR**Preparation****WARNING**

Electrical voltage and current cannot be seen, and when contacted can result in death, render you unconscious, or severely burn you. Use extreme care when working around or with energized equipment. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning.

Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

High voltage is present inside the power input box. Do not perform any maintenance on electrical equipment unless all power is removed.

Be careful not to contact high-voltage connections of 115 VAC input connections when installing or operating this equipment.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Remove four screws (Figure 1, Item 1) and washers (Figure 1, Item 2) securing cover (Figure 1, Item 3) to electrical box (Figure 1, Item 11).
3. Remove electrical box cover (Figure 1, Item 3).

REPAIR – CONTINUED

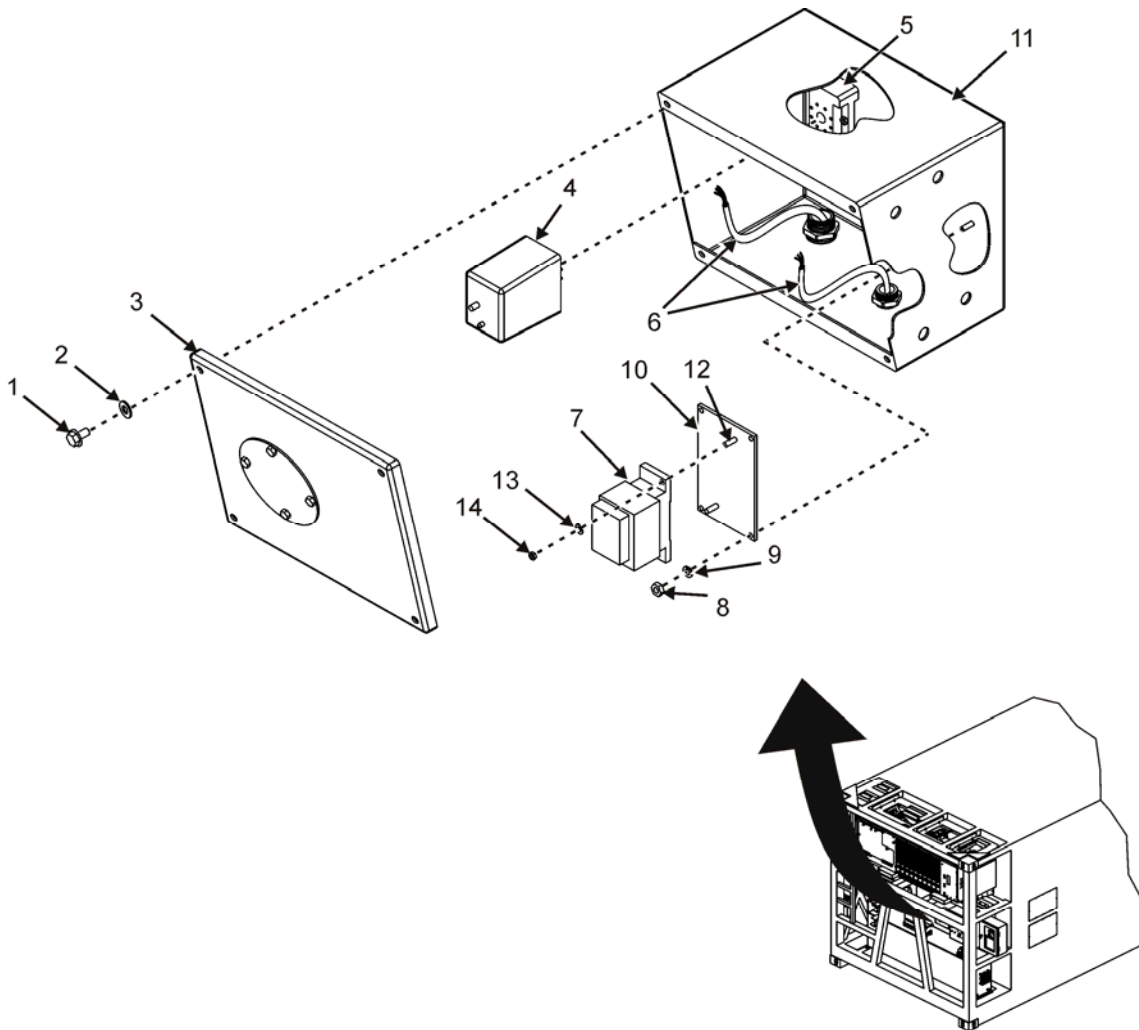


Figure 1. Electrical Box Repair.

Replace Voltage Monitor Relay

1. Perform Preparation procedure per this WP.
2. Unplug and remove voltage monitor relay (Figure 1, Item 4) from voltage monitor relay socket (Figure 1, Item 5) by pulling on relay.

CAUTION

Use care when installing voltage monitor relay into the socket so as not to damage any relay contacts.

3. Install replacement voltage monitor relay (Figure 1, Item 4) by plugging it into voltage monitor relay socket (Figure 1, Item 5).

REPAIR – CONTINUED

4. Install electrical box cover (Figure 1, Item 3) and secure using four screws (Figure 1, Item 1), and washers (Figure 1, Item 2).
5. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
6. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of Voltage Monitor Relay.
7. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Contactor

1. Perform Preparation procedure per this WP.
2. Tag and disconnect wiring (Figure 2, Item 6) to contactor (Figure 2, Item 7).
3. Remove four lock nuts (Figure 2, Item 8) and four washers (Figure 2, Item 9) securing contactor (Figure 2, Item 7) and mount plate (Figure 2, Item 10) to electrical box (Figure 2, Item 11).
4. Remove contactor (Figure 2, Item 7) and mount plate (Figure 2, Item 10).
5. Remove two lock nuts (Figure 2, Item 14) and washers (Figure 2, Item 13) securing contactor (Figure 2, Item 7) to studs (Figure 2, Item 12) on mount plate (Figure 2, Item 10). Discard lock nuts.
6. Remove contactor (Figure 2, Item 7).
7. Install replacement contactor (Figure 2, Item 7) onto mount plate (Figure 2, Item 10) and secure to studs (Figure 2, Item 12) using two new lock nuts (Figure 2, Item 14), and washers (Figure 2, Item 13).
8. Reconnect electrical wiring (Figure 2, Item 6) to contactor (Figure 2, Item 7) as tagged.
9. Install contactor (Figure 2, Item 7) and mount plate (Figure 2, Item 10) into electrical box (Figure 2, Item 11) and secure using four washers (Figure 2, Item 9) and four lock nuts (Figure 2, Item 8).
10. Remove tags from wiring (Figure 2, Item 6).
11. Install electrical box cover (Figure 2, Item 3) and secure using four screws (Figure 2, Item 1) and washers (Figure 2, Item 2).

REPAIR – CONTINUED

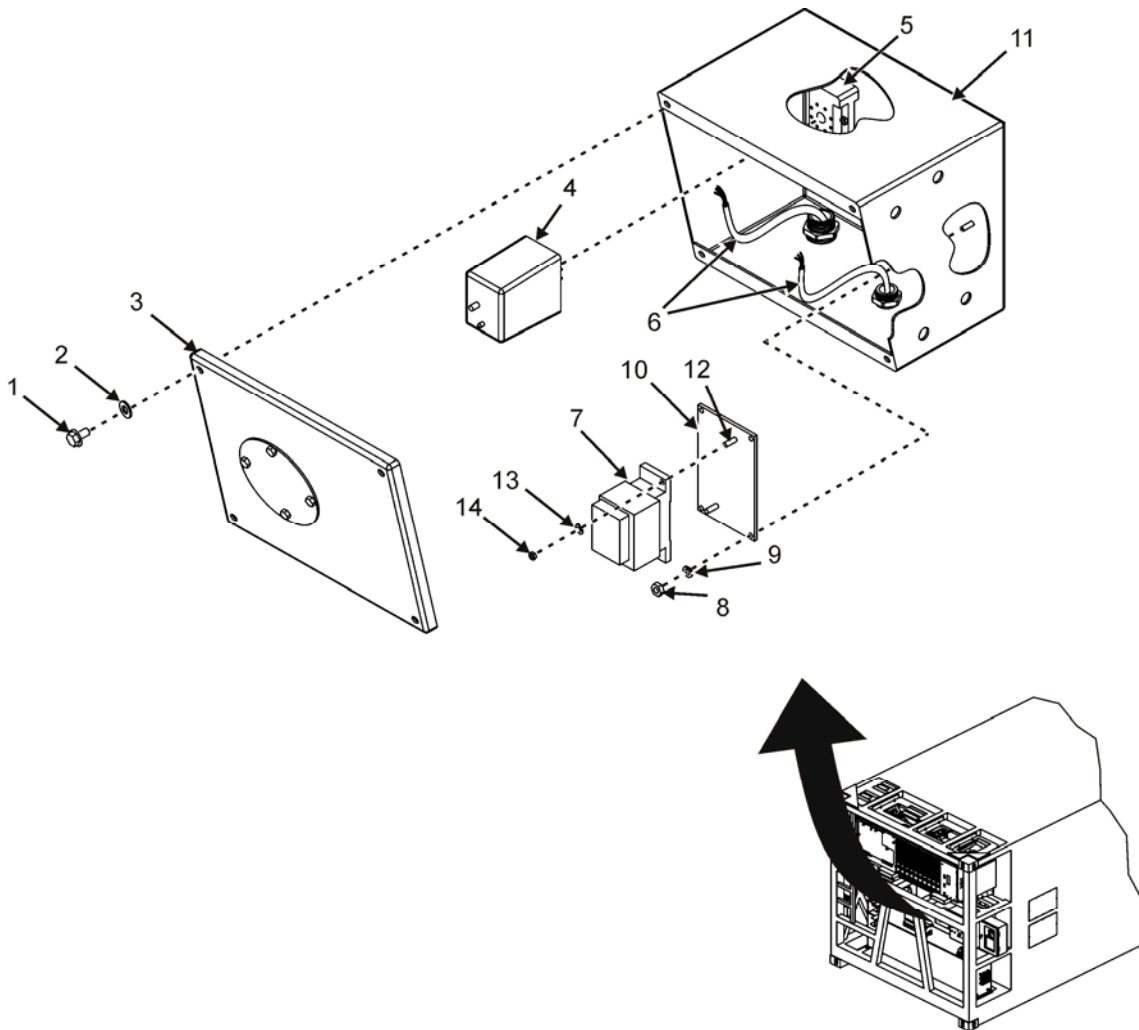


Figure 2. Contactor Repair.

12. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
13. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of contactor (WP 0005, Operating Procedures).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
STANDBY MOTOR/SINGLE-PHASE ALTERNATOR
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Hoist, Chain (WP 0107, Table 2, Item 2)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)
Strap, Lifting (WP 0110, Item 46)

Materials/Parts

Lock Washer (12mm ID) (WP 0111, Item 6)
Oil, Lubricating (WP 0110, Item 33)
Tie Wrap (WP 0110, Item 55)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
WP 0031
WP 0048
WP 0052
WP 0053
WP 0070
WP 0075
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit removed (WP 0075)
External electrical power disconnected (WP 0005)

REPLACE**Remove****NOTE**

In order to remove and replace the single-phase alternator, the standby motor has to be removed first to gain access to component. This procedure provides instruction on removing the standby motor and single-phase alternator as one complete assembly. After the assembly is removed from the MTRCS, the standby motor and the single-phase alternator can be separated and replaced individually.

1. Remove four screws (Figure 1, Item 1) and washers (Figure 1, Item 2) securing standby motor electrical wiring cover (Figure 1, Item 3) to standby motor (Figure 1, Item 4).
2. Remove cover (Figure 1, Item 3) from standby motor (Figure 1, Item 4).
3. Tag and disconnect electrical wiring (Figure 1, Item 5) from standby motor (Figure 1, Item 4).

REPLACE – CONTINUED

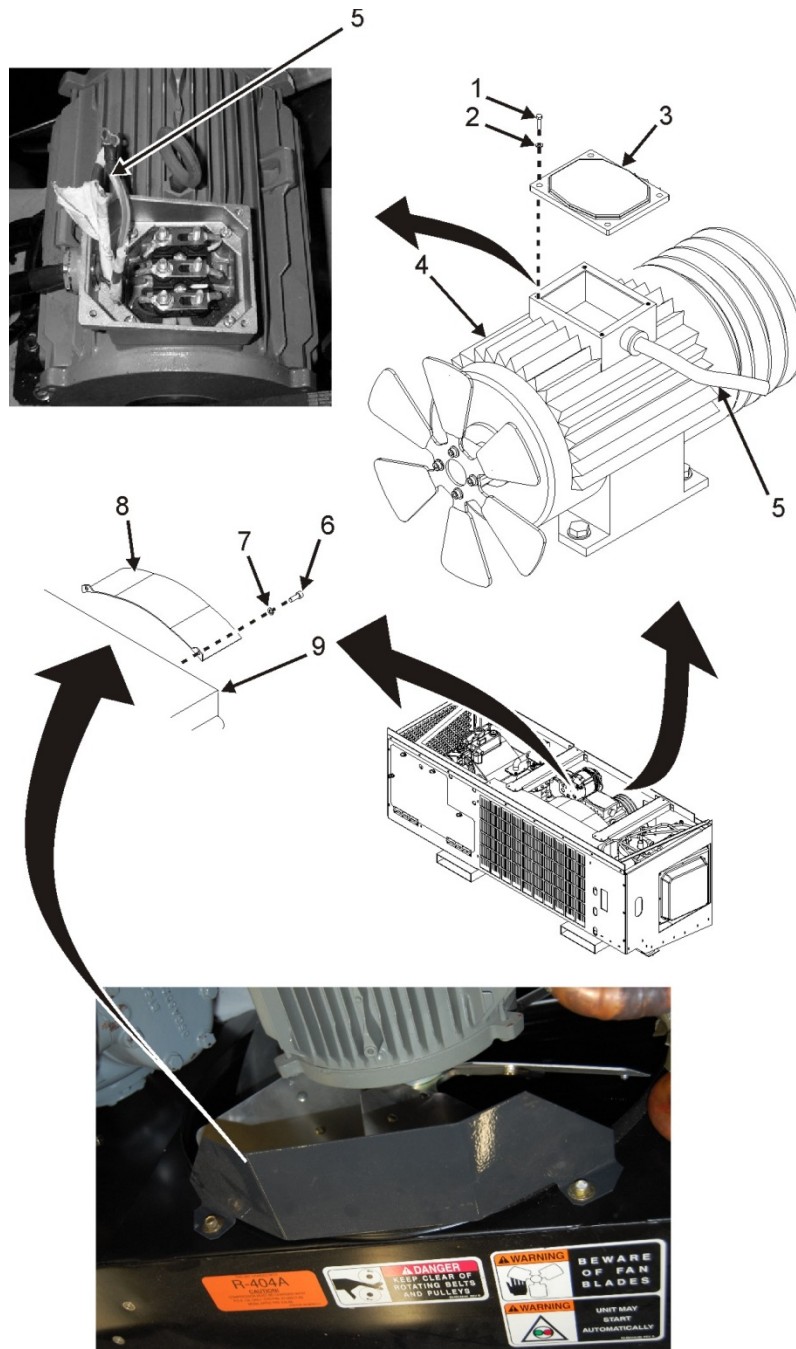


Figure 1. Standby Motor Electrical Connection.

REPLACE – CONTINUED

4. Remove standby motor to compressor V-belt (WP 0053, Remove).
5. Remove standby motor to single-phase alternator V-belt (WP 0052, Remove).

NOTE

In order to gain access for removal of standby motor, it will be necessary to position the alternator located at the pulley end of the standby motor out of the way.

6. Tag and disconnect wire leads (Figure 2, Item 1) and ground wire (Figure 2, Item 2) from alternator (Figure 2, Item 3) and loosen strain relief; then, pull ground wire (Figure 2, Item 2) so that it does not catch when standby motor/single-phase alternator assembly is lifted.
7. Remove alternator (WP 0048, Removal).
8. Swing alternator (Figure 2, Item 3) away from standby motor (Figure 2, Item 7) and secure to frame of container using a tie wrap.
9. Remove one bolt (Figure 2, Item 4), washer (Figure 2, Item 5), and nut (Figure 2, Item 6) securing alternator brackets (Figure 2, Item 8 and Item 9) to bracket mount on standby motor (Figure 2, Item 10).
10. Remove alternator bracket (Figure 2, Item 9) if necessary for additional clearance. Retain for reinstallation.
11. Remove two screws (Figure 1, Item 6) and washers (Figure 1, Item 7) securing fan shroud (Figure 1, Item 8) to radiator (Figure 1, Item 9).
12. Remove fan shroud (Figure 1, Item 8). Retain for reinstallation.

REPLACE – CONTINUED

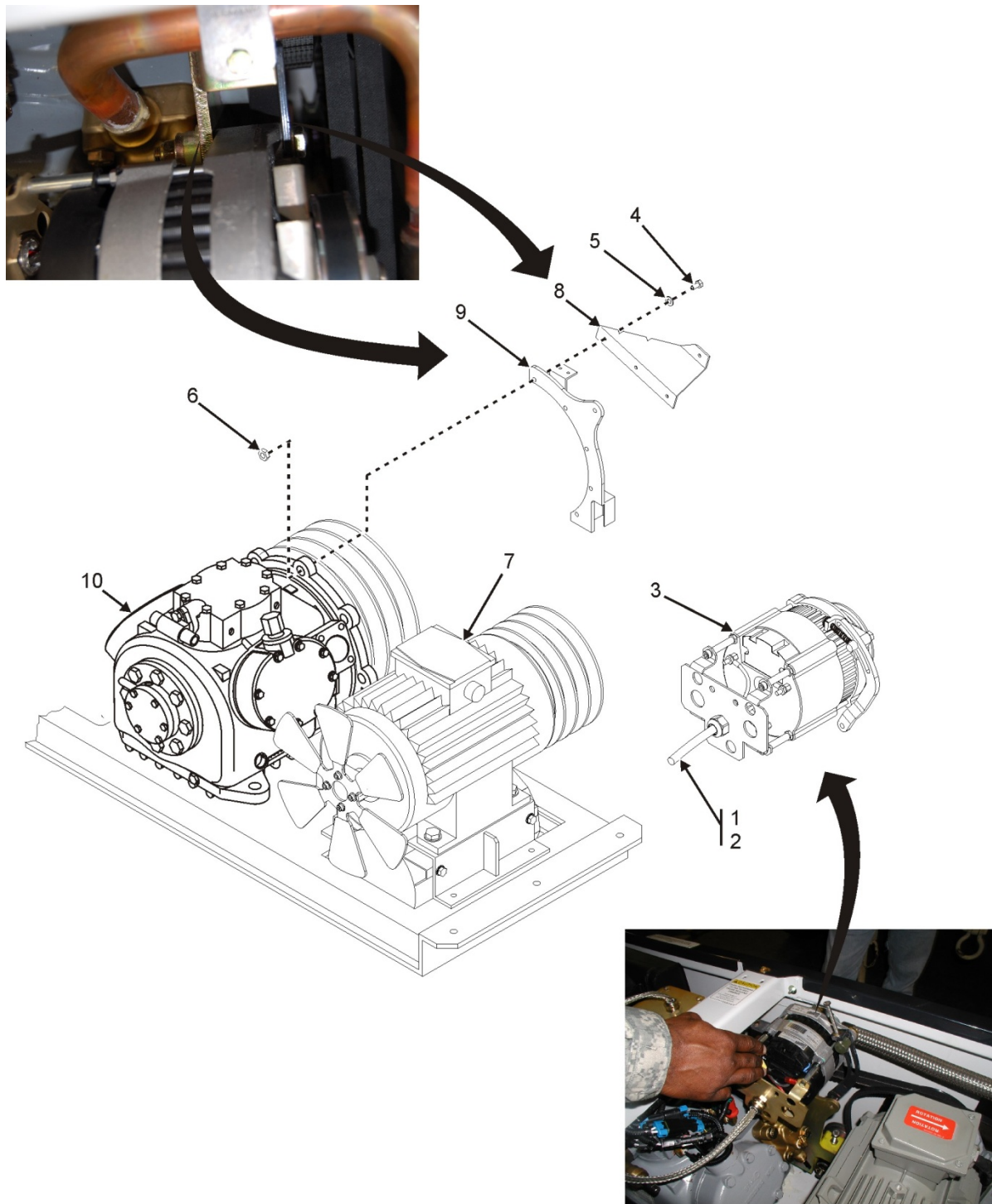


Figure 2. Alternator Attaching Hardware Removal.

REPLACE – CONTINUED**NOTE**

Before removing fan, mark a fan blade to note the orientation of the blade so that it is reinstalled with the same orientation.

13. Loosen two condenser fan setscrews (Figure 3, Item 1) from condenser fan collar (Figure 3, Item 2).

CAUTION

The radiator coils damage easily. In order to remove the standby motor, the fan will have to rest inside the radiator housing against the coils until the standby motor is removed. Use extreme care so as not to damage the radiator coils.

14. Gently slide condenser fan (Figure 3, Item 3) forward until it stops against radiator coils.

NOTE

It is important to note the distance that the pulley sits in relation to the rear wall of the refrigeration unit before loosening the mounting bolts. This distance will have to be matched during re-installation in order to make sure the belt alignment is proper.

15. Measure and record distance from edge of standby motor pulley (Figure 3, Item 5) to refrigeration unit rear wall below vibrator.
16. Remove six bolts (Figure 3, Item 6) and washers (Figure 3, Item 7) securing standby motor/single-phase alternator bracket assembly (Figure 3, Item 12) to refrigeration unit chassis (Figure 3, Item 8).
17. Attach hoist and eye bolt (Figure 3, Item 9) to standby motor and lift motor slightly to allow it to slide back until standby motor pulley (Figure 3, Item 5) end rests against container front wall.
18. Raise standby motor/single-phase alternator assembly (Figure 3, Item 11) slowly to allow room to disconnect ground wire (Figure 3, Item 13) and electrical connector (Figure 3, Item 14).
19. Disconnect single-phase alternator electrical connector (Figure 3, Item 14).
20. Remove one screw (Figure 3, Item 15) and washer (Figure 3, Item 16) securing ground wire (Figure 3, Item 13) to single-phase alternator (Figure 3, Item 17).

NOTE

At this time, the condenser fan can be completely removed from the standby motor shaft by sliding it further forward on shaft until removed. Inspect blades for damage and unless replacing the condenser fan (WP 0051, Replace), leave the fan inside the radiator housing.

21. Remove condenser fan (Figure 3, Item 3) from standby motor shaft (Figure 3, Item 10) but leave inside radiator housing carefully resting against coils unless replacing fan.
22. Remove and retain machine key (Figure 3, Item 4).
23. Slowly raise standby motor/single-phase alternator assembly (Figure 3, Item 11) and guide around until standby motor pulley (Figure 3, Item 5) rests on adjacent plumbing and motor shaft (Figure 3, Item 10) points upward away from condenser fan (Figure 3, Item 3).

REPLACE – CONTINUED

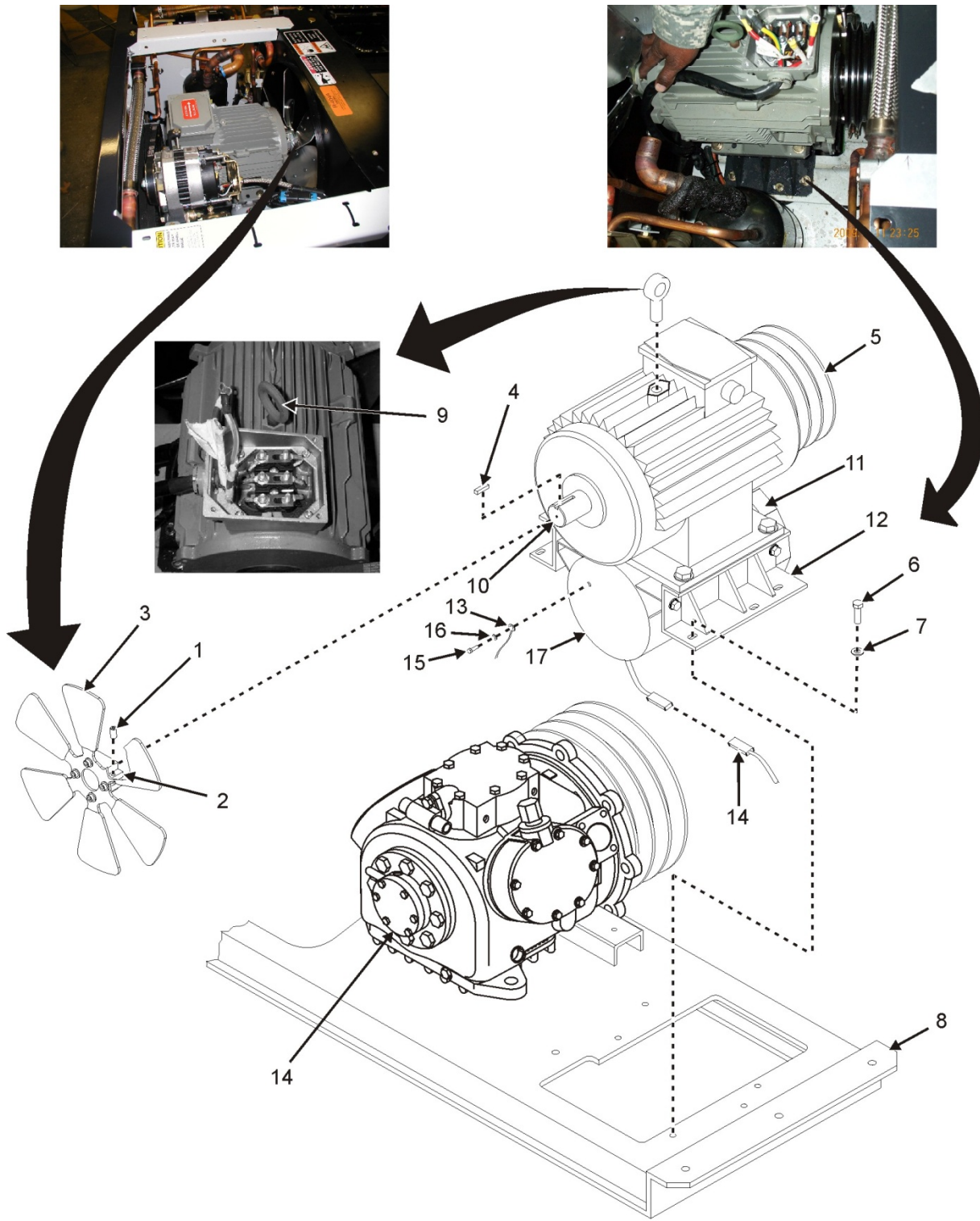


Figure 3. Standby Motor/Single-Phase Alternator Attaching Hardware Removal.

REPLACE – CONTINUED

24. Lift standby motor/single-phase alternator assembly (Figure 3, Item 11) slowly allowing it to swing forward until rear standby motor pulley (Figure 3, Item 5) is forward of plumbing.

NOTE

While lifting and guiding the standby motor/single-phase alternator out of the installation, it may be necessary to use a flat tip screwdriver to aid in the movement of the assembly around and over the compressor.

25. Continue to slowly lift standby motor/single-phase alternator assembly (Figure 4, Item 1) while guiding from side to side to avoid plumbing and compressor (Figure 3, Item 12) until assembly is free of container.

CAUTION

Use extreme care when positioning the unit on a flat surface for further separation as the unit will not be stable. Leave the assembly secured to the hoist until the standby motor and single-phase alternator are separated.

26. Place removed standby motor/single-phase alternator assembly (Figure 4, Item 1) on a flat surface and leave attached to hoist.
27. Remove four bolts (Figure 4, Item 2), washers (Figure 4, Item 3), lock washers (Figure 4, Item 4), and nuts (Figure 4, Item 5) securing standby motor (Figure 4, Item 6) to right and left motor brackets (Figure 4, Item 7 and Item 8). Discard lock washers.
28. Remove standby motor (Figure 4, Item 6), and place on flat surface.
29. Disconnect hoist from eyebolt (Figure 4, Item 13).
30. Remove four bolts (Figure 4, Item 9), lock washers (Figure 4, Item 10), and washers (Figure 4, Item 11) securing single-phase alternator (Figure 4, Item 12) to right and left motor brackets (Figure 4, Item 7 and Item 8). Discard lock washers.
31. Remove single-phase alternator (Figure 4, Item 12).
32. Remove condenser fan (Figure 3, Item 3) from radiator housing and inspect blades for damage. Replace fan if required (WP 0051, Replace).

REPLACE – CONTINUED

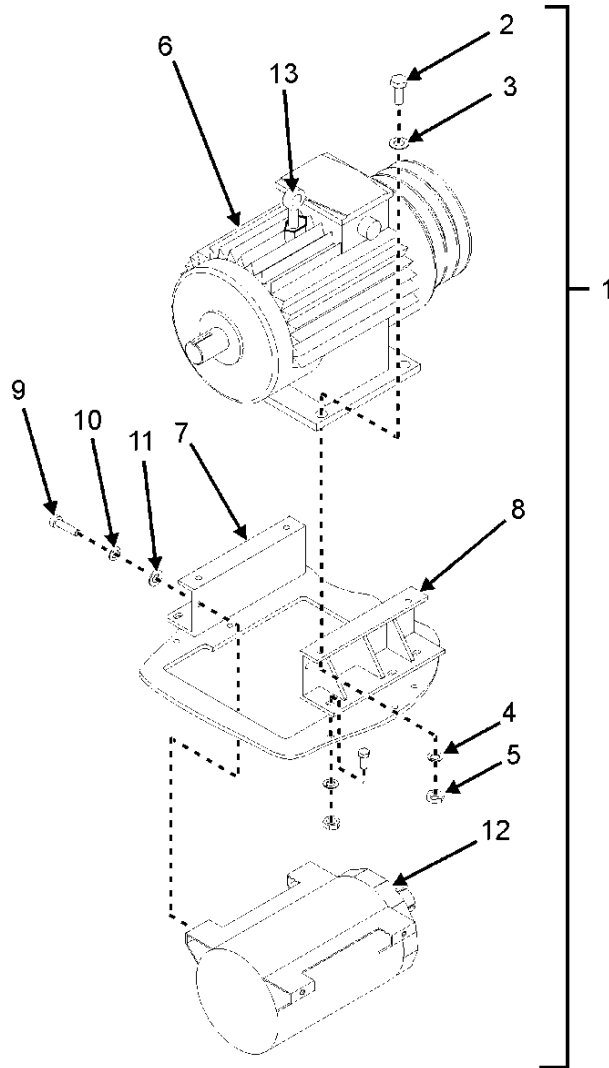


Figure 4. Standby Motor/Single-Phase Alternator Assembly.

REPLACE – CONTINUED**Install****CAUTION**

The radiator coils damage easily. In order to remove the standby motor, the fan will have to rest inside the radiator housing against the coils until the standby motor is removed. Use extreme care so as not to damage the radiator coils.

1. Temporarily position condenser fan (Figure 3, Item 3) inside radiator housing and gently rest against radiator coils using care not to damage coils.
2. Attach new single-phase alternator (Figure 4, Item 12) to right and left motor brackets (Figure 4, Item 7 and Item 8) and secure using four bolts (Figure 4, Item 9), new lock washers (Figure 4, Item 10), and washers (Figure 4, Item 11).
3. Attach hoist to replacement standby motor eye bolts (Figure 4, Item 13) and lower into place on right and left motor brackets (Figure 4, Item 7 and Item 8).
4. Secure standby motor (Figure 4, Item 6) to right and left motor brackets (Figure 4, Item 7 and Item 8) by installing four bolts (Figure 4, Item 2), washers (Figure 4, Item 3), new lock washers (Figure 4, Item 4), and nuts (Figure 4, Item 5).

CAUTION

The radiator coils damage easily. In order to reinstall the standby motor, the condenser fan will have to rest inside the radiator housing against the coils until the standby motor is in place and the fan is ready to be reattached to the standby motor shaft. Use extreme care so as not to damage the radiator coils.

5. Make sure condenser fan (Figure 5, Item 3) is in radiator housing resting carefully against coils before installing standby motor/single-phase alternator assembly (Figure 4, Item 1).
6. Using hoist, lift standby motor/single-phase alternator assembly (Figure 5, Item 11) and carefully lower into place on refrigeration unit chassis so that right and left motor bracket holes align with chassis holes. Do not install mounting hardware at this time.
7. Reconnect single-phase alternator ground wire (Figure 5, Item 13) to single-phase alternator (Figure 5, Item 17) housing using one screw (Figure 5, Item 15) and washer (Figure 5, Item 16).
8. Reconnect electrical connector (Figure 2, Item 1) to alternator (Figure 2, Item 3).
9. Clean inside of condenser fan (Figure 5, Item 3) using silicone based spray cleaner.
10. Reinstall machine key (Figure 5, Item 4) to standby motor shaft (Figure 5, Item 10).

NOTE

In order to ease the installation of the condenser fan completely onto the standby motor shaft, it will be necessary to spread the fan collar slightly using a screwdriver in order to make it easier for the fan to slide completely onto the standby motor shaft.

11. Carefully spread fan collar (Figure 5, Item 2) using screwdriver to ease installation of condenser fan (Figure 5, Item 3) onto standby motor shaft (Figure 5, Item 10).

REPLACE – CONTINUED

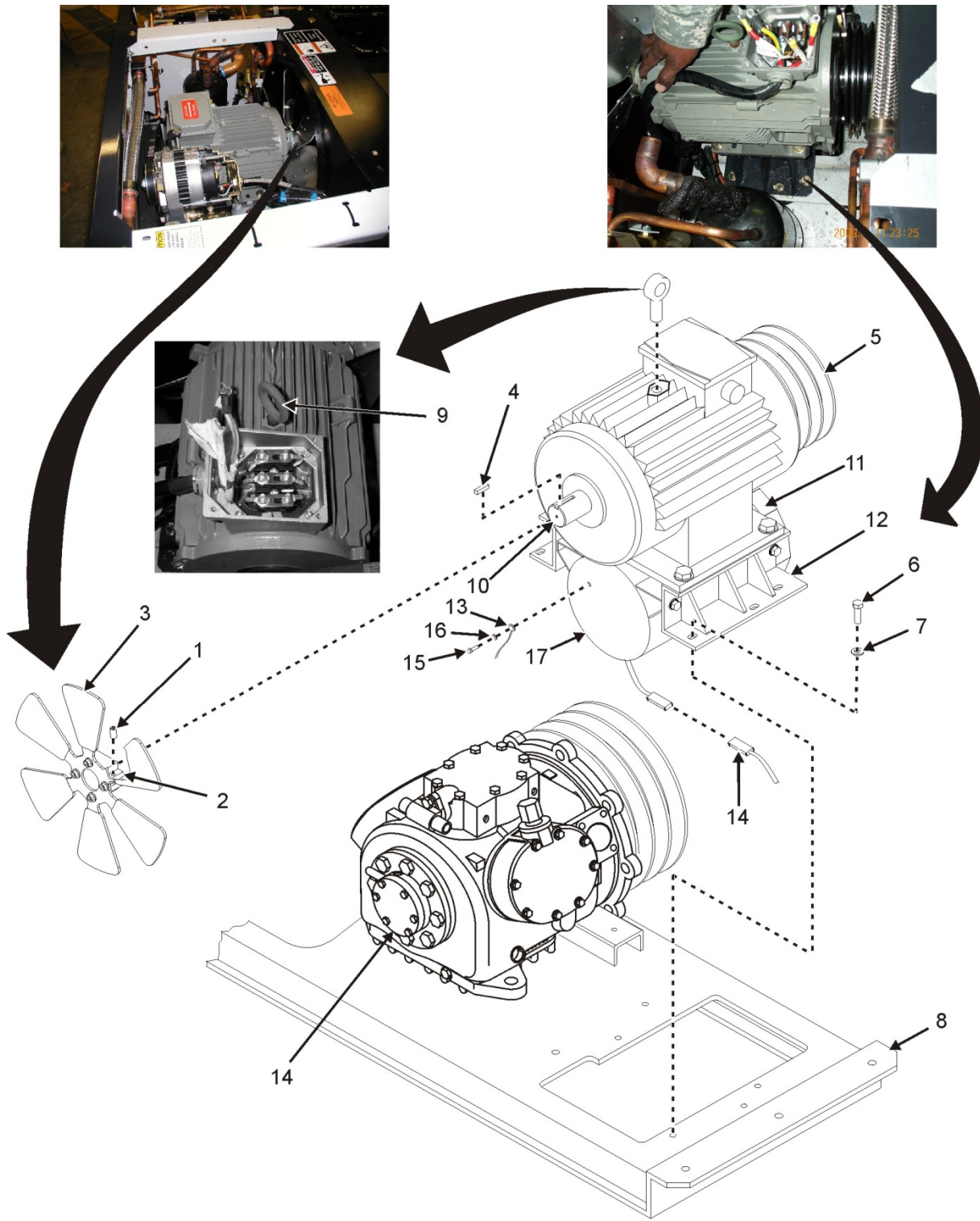


Figure 5. Standby Motor/Single-Phase Alternator Attaching Hardware Installation.

REPLACE – CONTINUED**CAUTION**

The radiator coils damage easily. When installing condenser fan onto standby motor shaft, use extreme care so as not to damage the radiator coils.

The condenser fan must be a minimum of 1-inch away from radiator to make sure adequate clearance is provided. Failure to comply can result in damage to the radiator and/or condenser fan.

NOTE

There must be a gap on the fan shaft to provide clearance between rotating fan blades and standby motor housing. If you just obtain a clearance of 3/8-inch between base of standby motor and fan collar, this will provide adequate clearance.

Spray a small amount of lubricating oil onto the standby motor shaft before attempting to install the condenser fan.

12. Install condenser fan (Figure 5, Item 3) onto standby motor shaft (Figure 5, Item 10) making sure there is a clearance of 3/8-inch between base of standby motor and fan collar.
13. Tighten two setscrews (Figure 5, Item 1) to secure fan onto standby motor shaft (Figure 5, Item 10).
14. Install fan shroud (Figure 1, Item 8) to radiator (Figure 1, Item 9) and secure using two screws (Figure 1, Item 6) and washers (Figure 1, Item 7).
15. Make sure to match measurement, taken during Removal procedure, for distance between standby motor pulley (Figure 5, Item 5) edge and container front wall to align standby motor.
16. Secure standby motor/single-phase alternator assembly (Figure 5, Item 11) to chassis (Figure 5, Item 8) using six bolts (Figure 5, Item 6) and washers (Figure 5, Item 7).
17. Install standby motor to single-phase alternator V-belt (WP 0052, Install).
18. Install standby motor to compressor V-belt (WP 0053, Install).
19. Install alternator brackets (Figure 6, Item 8 and Item 9) and secure using one bolt (Figure 6, Item 4), washer (Figure 6, Item 5), and nut (Figure 6, Item 6).

REPLACE – CONTINUED

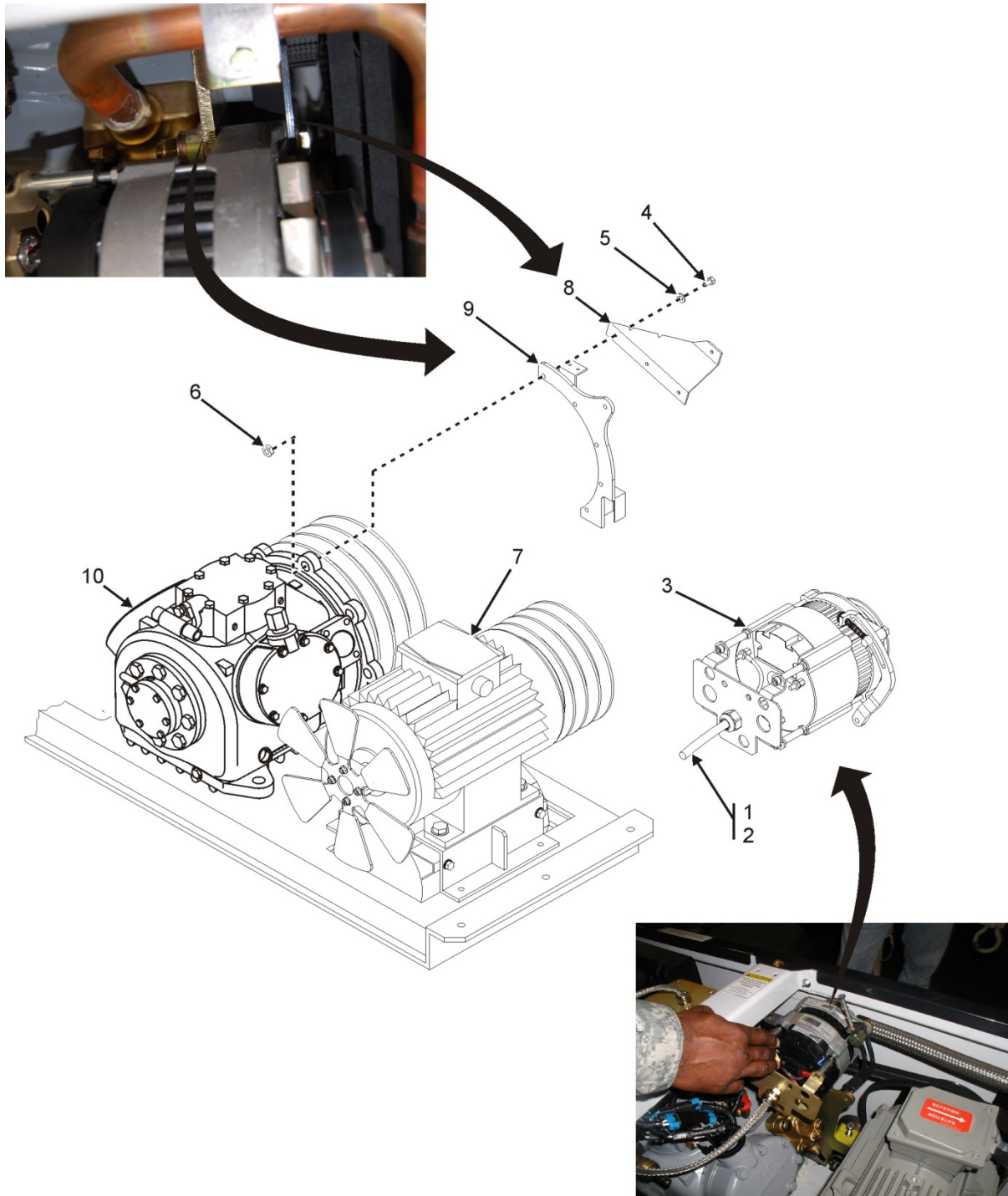


Figure 6. Alternator Attaching Hardware Installation.

REPLACE – CONTINUED

20. Install alternator (WP 0048, Install).

CAUTION

Overtightening of nuts on studs will cause damage to the alternator.

21. Using tags on wiring leads (Figure 6, Item 1 and Item 2) to identify connection points, connect wiring leads (Figure 6, Item 1 and Item 2) to back of alternator (Figure 6, Item 3).
22. Install alternator V-belt (WP 0052, Install).
23. Reconnect electrical wiring (Figure 6, Item 10) to standby motor (Figure 6, Item 11) as tagged.
24. Install standby motor electrical wiring cover (Figure 6, Item 12) to standby motor and secure using four screws (Figure 6, Item 13) and washers (Figure 6, Item 14).
25. Perform alignment of diesel engine, compressor, and standby motor belts per this Work Package.
26. Install refrigeration unit (WP 0075, Install).
27. Place emergency stop switch in PULL TO START position.
28. Exit top of MTRCS using roof access.
29. Perform Operation Under Usual Conditions (WP 0005, Operating Procedures).
30. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPLACE – CONTINUED**Alignment**

Alignment of the three major refrigeration unit components (diesel engine, compressor, and standby motor) is important so that the belts interconnecting these components wear evenly. Misalignment of these three components could cause belt failure and subsequent system shutdown. Standby motor alignment is accomplished by loosening six bolts at the base of the standby motor in order to adjust the position of the standby motor.

1. Loosen three bolts (Figure 7, Item 1) securing inboard standby motor mount bracket (Figure 7, Item 2) to frame (Figure 7, Item 3). Do not remove bolts.
2. Loosen three bolts (Figure 7, Item 4) securing outboard standby motor mount bracket (Figure 7, Item 5) to frame (Figure 7, Item 3). Do not remove bolts.

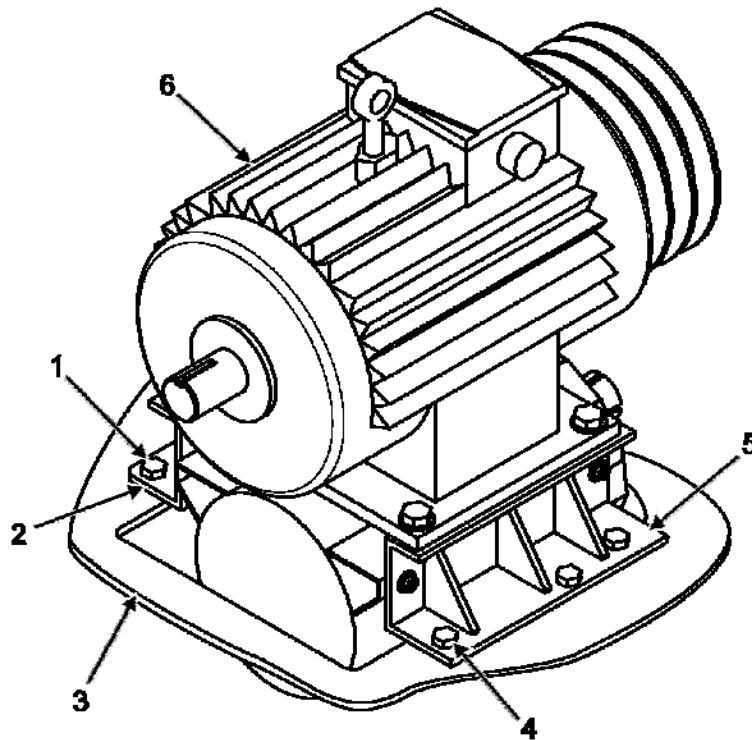


Figure 7. Standby Motor Mount Bracket Bolts.

REPLACE – CONTINUED

- Use a rubber mallet to tap standby motor (Figure 7, Item 6) so that a measurement of 4 3/4-inches is obtained between refrigeration unit back wall and standby motor end cap top tab on inboard side and 4 9/16-inches is obtained between refrigeration unit back wall and standby motor end cap top tab on outboard side (Figure 8).

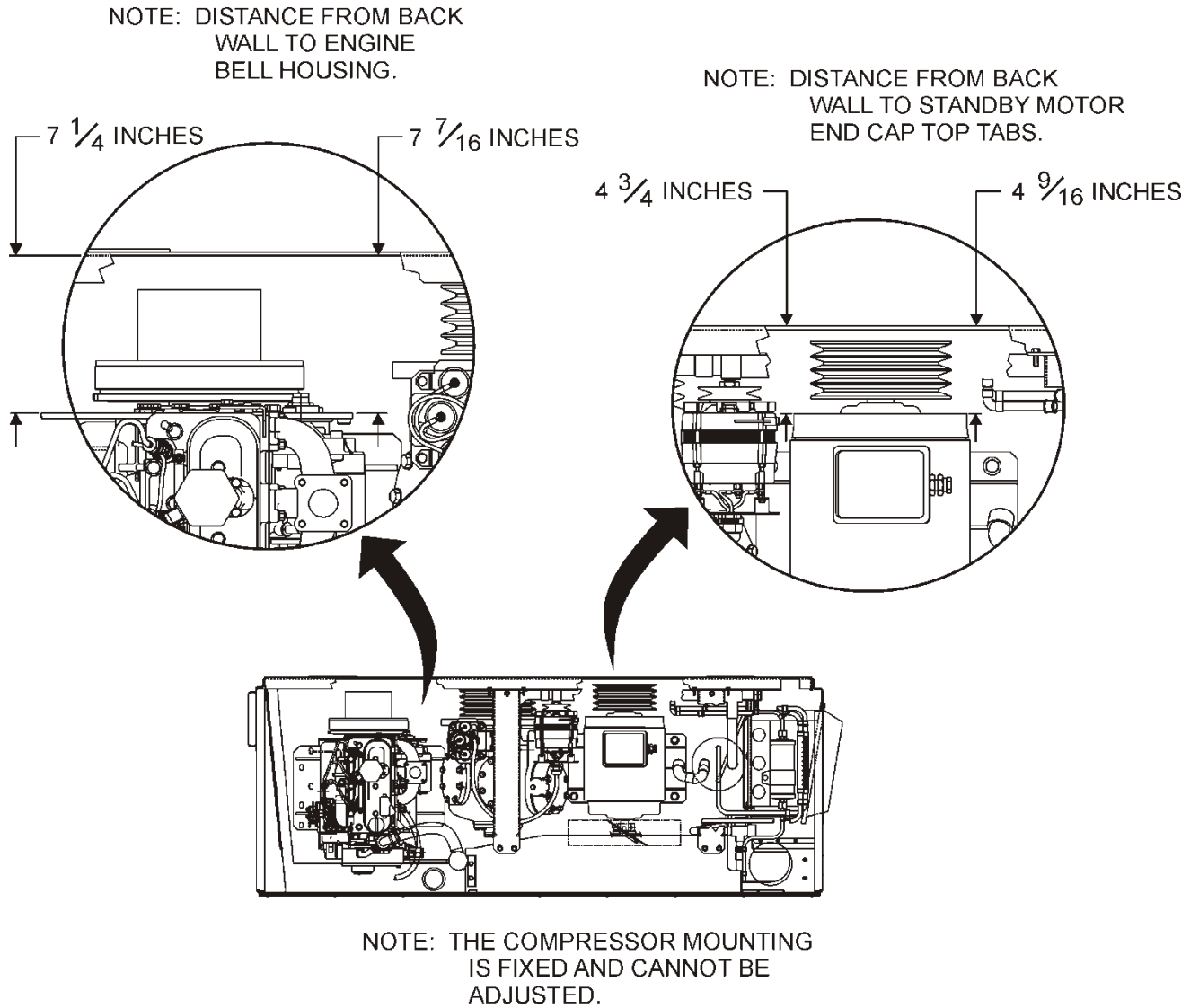


Figure 8. Alignment Clearances.

REPLACE – CONTINUED

4. Tighten three bolts (Figure 7, Item 1) on inboard standby motor mount bracket (Figure 7, Item 2) to 40 foot-pounds.
5. Tighten three bolts (Figure 7, Item 1) on outboard standby motor mount bracket (Figure 7, Item 2) to 40 foot-pounds.
6. Check that clearance measurements still exist after tightening all bolts.
7. Install top-left panel (WP 0031, Install).
8. Install top-middle panel (WP 0031, Install).
9. Exit top of MTRCS.
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
MICROPROCESSOR CONTROL BOX
REPAIR

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Personnel Required

Utilities Equipment Repairer

References

WP 0005 WP 0070
WP 0007 WP 0089
WP 0012 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

REPAIR**WARNING**

Capacitors can store electrical power for extended periods of time after being disconnected from power supply. A bleed resistor is connected across the capacitor terminal to discharge this power more quickly. Do not touch capacitor terminals for the first five minutes after the power has been disconnected.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Loosen two screws (Figure 1, Item 1) on Microprocessor Control (MPC) box cover (Figure 1, Item 2).
3. Open cover (Figure 1, Item 2).
4. Proceed to appropriate procedure below.

REPAIR – CONTINUED

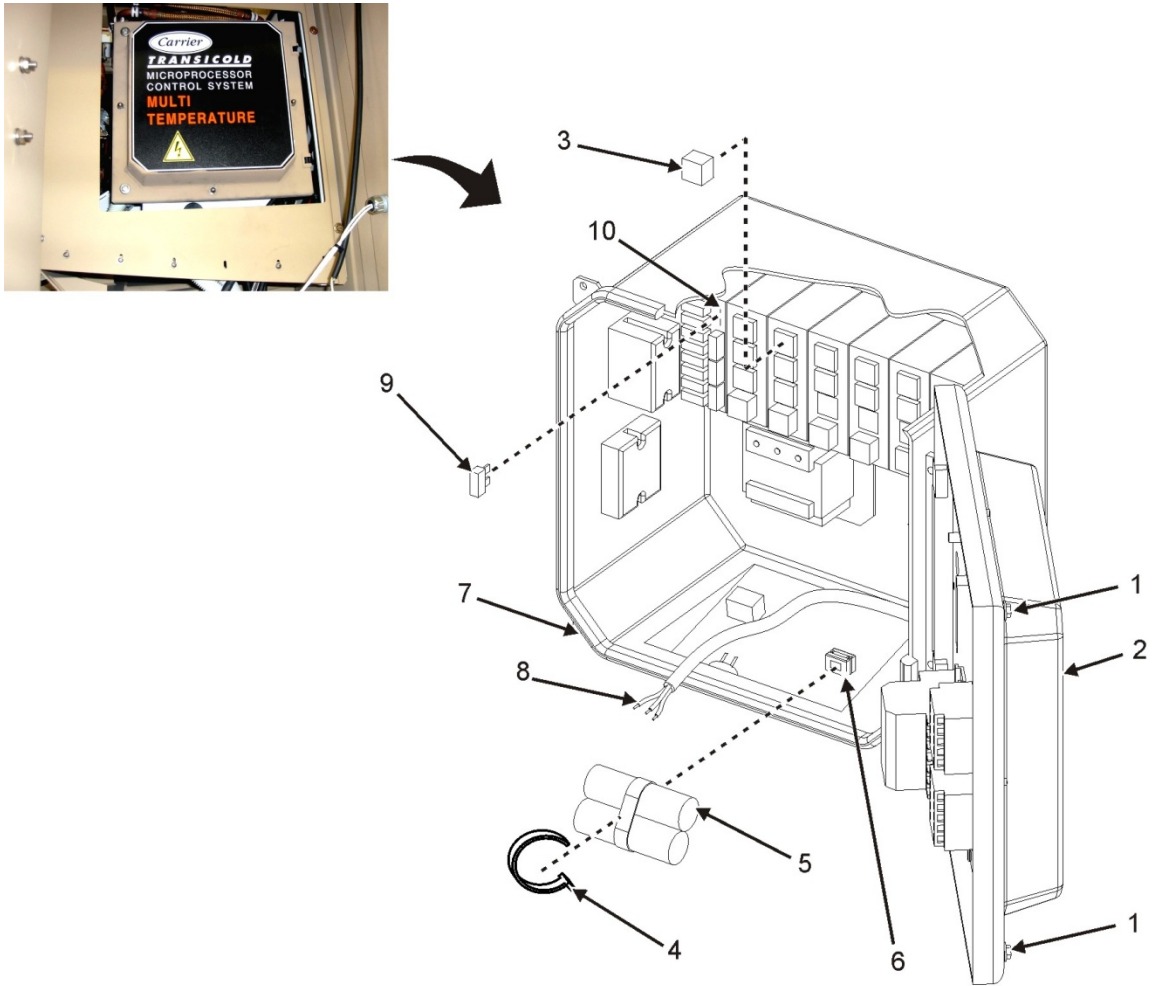


Figure 1. MPC Box Relays, Capacitors, and Fuses.

REPAIR – CONTINUED**Test Relay****NOTE**

The plug and play socket type relay used in the MPC box is tested using a 9-volt DC battery. When power is applied to the relay, an audible click will be heard if the coil is operating correctly.

1. Pull defective relay (Figure 1, Item 3) out of relay socket (Figure 1, Item 10).
2. Connect positive end of 9-volt battery (Figure 2, Item 1) to pin 86 on relay (Figure 2, Item 2).
3. Connect negative end of 9-volt battery (Figure 2, Item 3) to pin 85 on relay (Figure 2, Item 4).
4. Listen for an audible click indicating coil has energized.
 - If audible click is not heard, coil is bad. Replace relay.
5. If audible click is heard, check for continuity between pin 30 (Figure 2, Item 5) and pin 87a (Figure 2, Item 6) on relay.
 - If there is continuity, relay is good. Reinstall relay.
 - If there is no continuity, relay is defective. Replace relay.

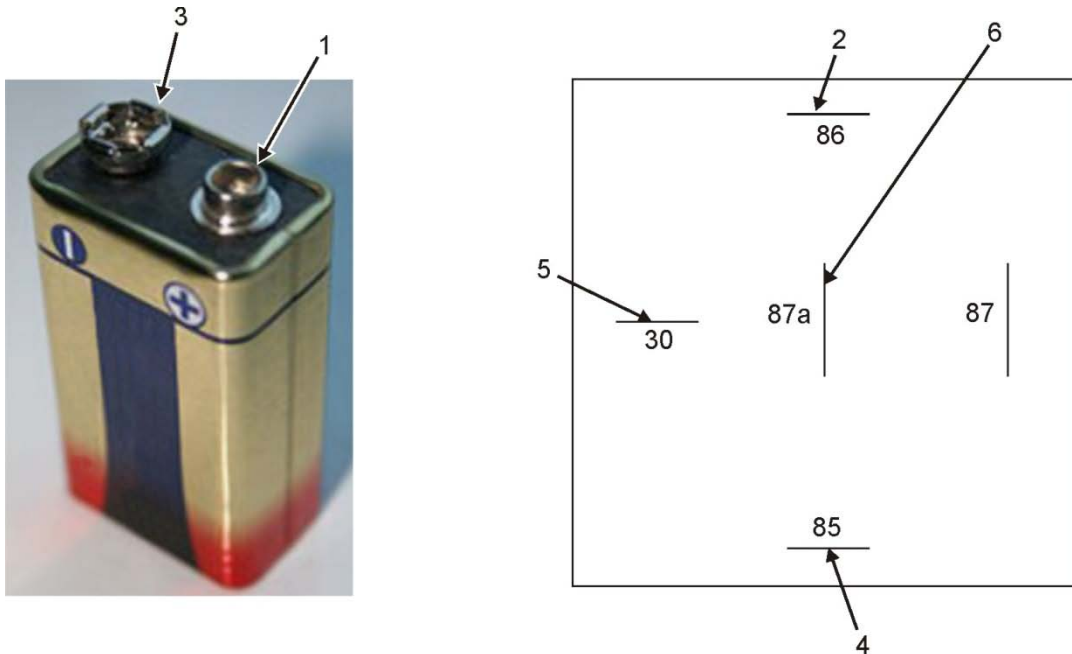


Figure 2. MPC Box Relay Test.

REPAIR – CONTINUED

6. Close cover (Figure 1, Item 2) and secure using two screws (Figure 1, Item 1).
7. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of relay.
8. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Relay

1. Pull defective relay (Figure 3, Item 3) out of relay socket.
2. Verify new relay is identical to removed relay.
3. Insert new relay (Figure 3, Item 3) into relay socket.
4. Close cover (Figure 3, Item 2) and secure using two screws (Figure 3, Item 1).

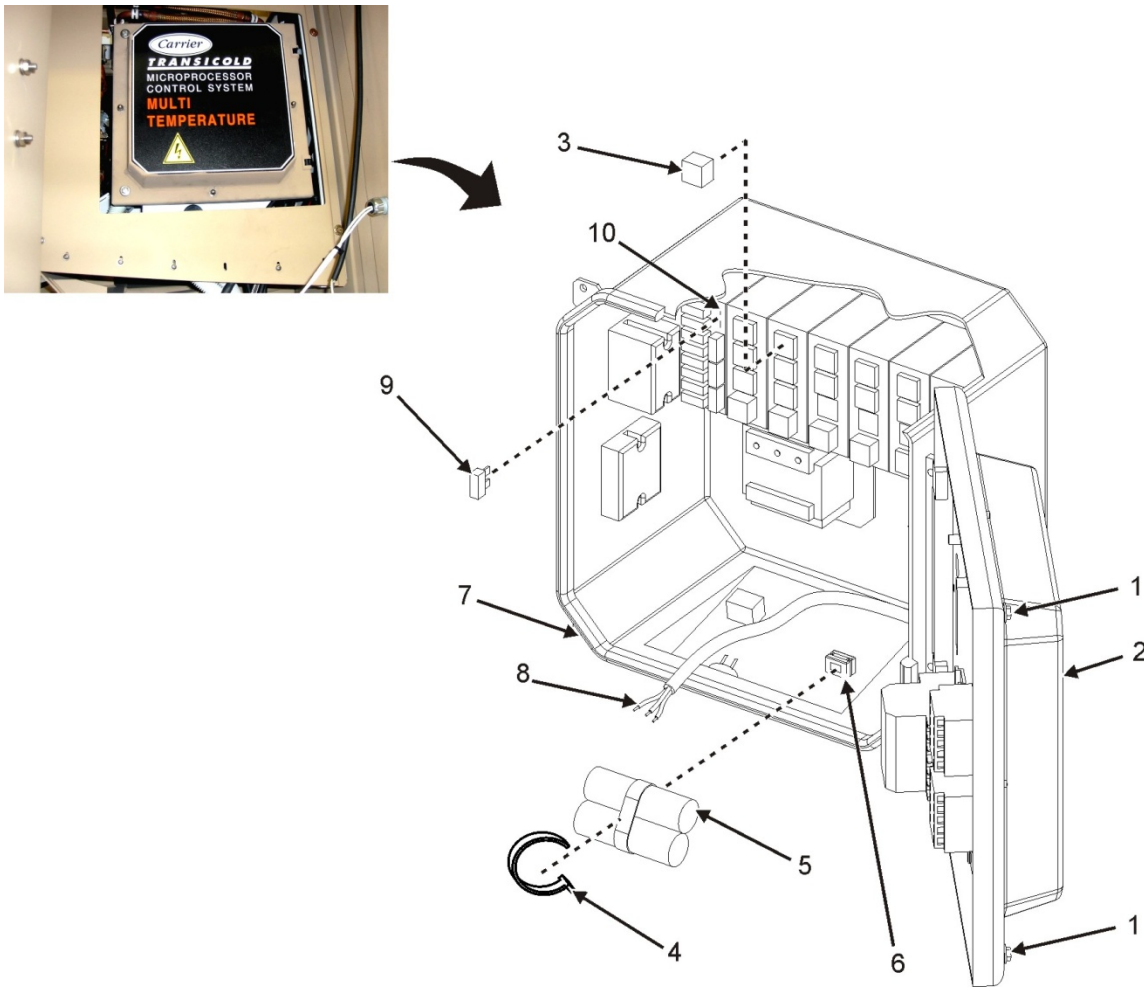


Figure 3. MPC Box Relays, Capacitors, and Fuses.

REPAIR – CONTINUED

5. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of relay.
6. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Capacitor**WARNING**

Capacitors can store electrical power for extended periods of time after being disconnected from power supply. A bleed resistor is connected in the capacitor circuit to discharge this power more quickly. Do not touch capacitors terminals for the first five minutes after the power is disconnected.

NOTE

There are two capacitors (C4 and C5) installed within the MPC box. If replacing a capacitor, always replace both capacitors, as the likelihood of both being damaged is high. This procedure is applicable to replacing either capacitor C4 or C5.

1. Wait five minutes to allow stored energy to dissipate from capacitors (Figure 4, Item 5) through bleed resistor.
2. Cut and remove mounting strap (Figure 4, Item 4) securing capacitor (Figure 4, Item 5) to holder (Figure 4, Item 6) on base of MPC box (Figure 4, Item 7).
3. Remove wire ties as needed along length of capacitor wiring to facilitate removal of capacitors.
4. Remove capacitor (Figure 4, Item 5) from base of MPC box (Figure 4, Item 7).
5. Cut two wires (Figure 4, Item 8) from capacitor (Figure 4, Item 5) as close as possible to capacitor.
6. Remove capacitor (Figure 4, Item 5).
7. Prepare existing wires (Figure 4, Item 8) and wires on new capacitor (Figure 4, Item 5) for splicing.
8. Splice new capacitor (Figure 4, Item 8) to existing wires (Figure 4, Item 8).
9. Secure capacitors (Figure 4, Item 8) together using tape.
10. Install capacitors (Figure 4, Item 5) onto holder (Figure 4, Item 6) on base of MPC box (Figure 4, Item 7) and secure using mounting strap (Figure 4, Item 4).

REPAIR – CONTINUED

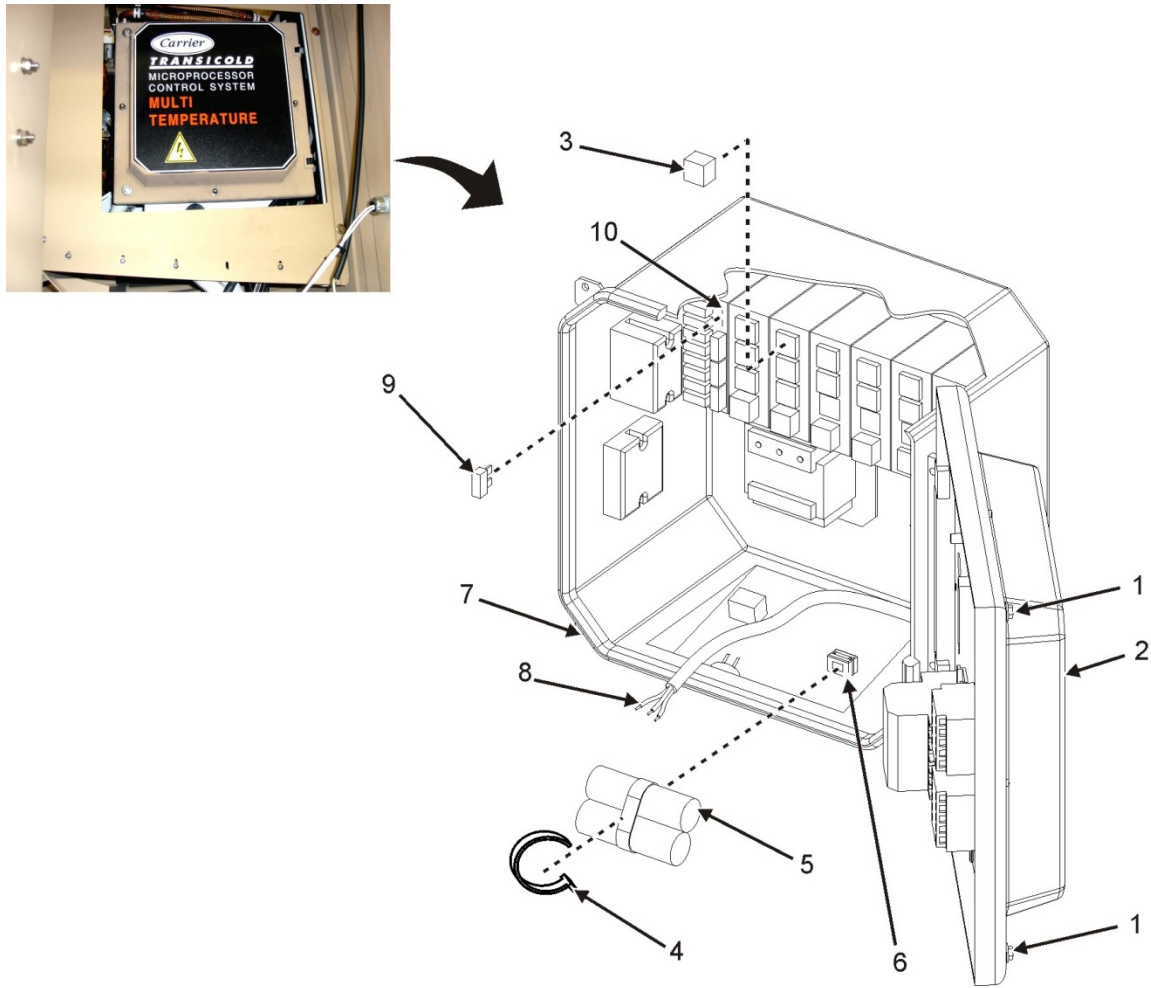


Figure 4. MPC Box Relays, Capacitors, and Fuses - Continued.

11. Install wire ties as needed along length of capacitor wiring where previously removed.
12. Operate unit in accordance with normal operation procedures to verify proper operation after replacement of capacitor (WP 0005, Operating Procedures).
13. Close cover (Figure 1, Item 2) and secure using two screws (Figure 1, Item 1).
14. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED**Replace Fuse**

1. Remove fuse (Figure 5, Item 1) by pulling fuse from fuse socket (Figure 5, Item 2).
2. Verify amperage on new fuse (Figure 5, Item 1) is same as old fuse.
3. Install fuse (Figure 5, Item 1) into fuse socket (Figure 5, Item 2).
4. Close cover (Figure 5, Item 3) and secure using two screws (Figure 5, Item 4).



Figure 5. MPC Box Fuses.

5. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of fuse (WP 0005, Operating Procedures).
6. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED**Replace Resistor**

1. Tag and disconnect wiring (Figure 6, Item 1) from resistor (Figure 6, Item 3).
2. Remove two nuts (Figure 6, Item 2) securing resistor (Figure 6, Item 3) to MPC box.
3. Install new resistor (Figure 6, Item 3) and secure to MPC box using with two nuts (Figure 6, Item 2).
4. Reconnect wiring (Figure 6, Item 1) to resistor (Figure 6, Item 3) as tagged.
5. Close cover (Figure 5, Item 3) and secure using two screws (Figure 5, Item 4).
6. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of resistor (WP 0005, Operating Procedures).
7. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Time Delay

1. Tag and disconnect wiring to time delay (Figure 6, Item 8).
2. Remove two nuts (Figure 6, Item 9) and two washers (Figure 6, Item 10) securing time delay (Figure 6, Item 8) to inside of MPC box.
3. Insert new time delay (Figure 6, Item 8) and secure using two nuts (Figure 6, Item 9) and washers (Figure 6, Item 10).
4. Connect wiring to time delay (Figure 6, Item 8) as tagged.
5. Remove tags.
6. Close cover (Figure 5, Item 3) and secure using two screws (Figure 5, Item 4).
7. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of time delay (WP 0005, Operating Procedures).
8. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

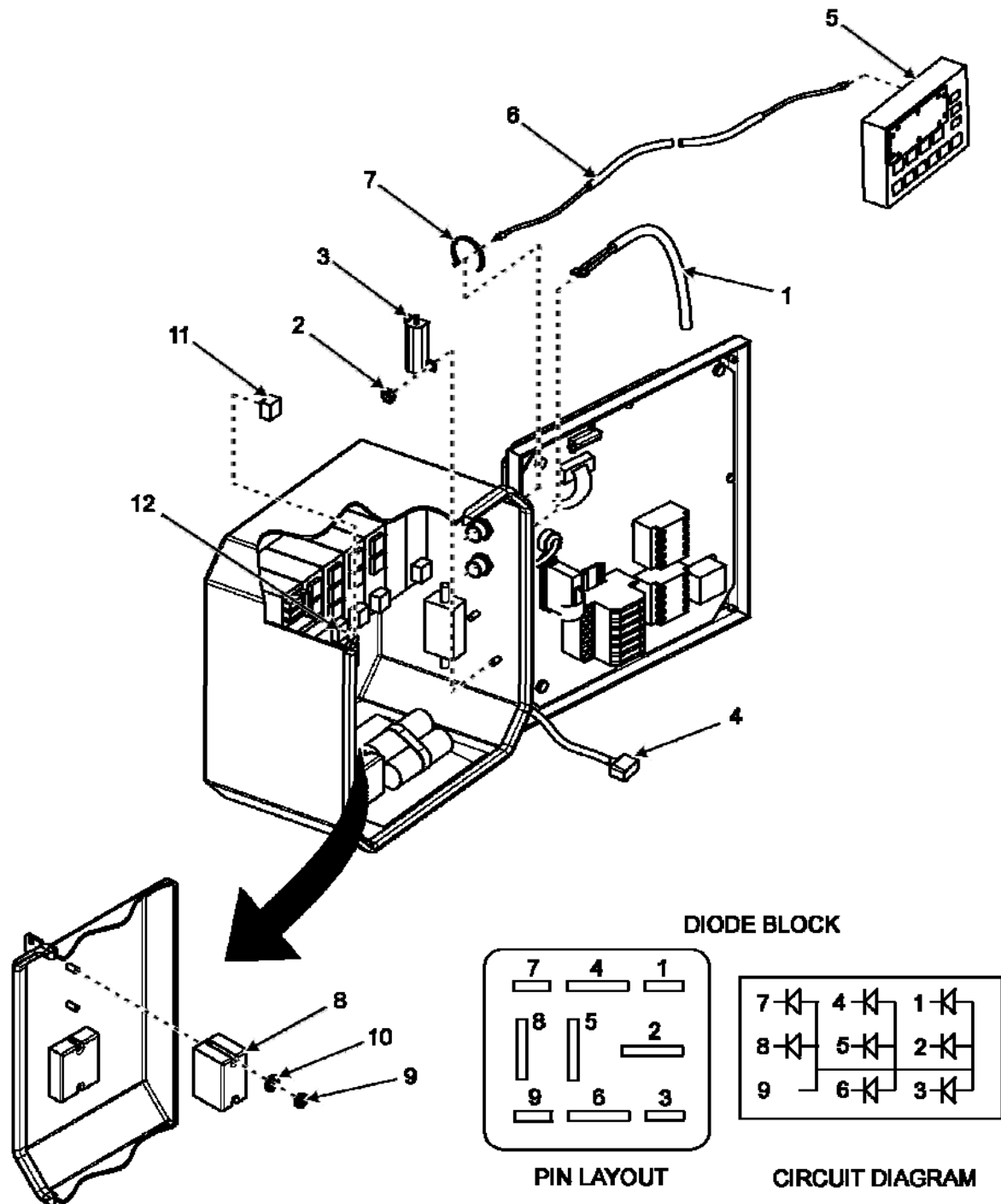


Figure 6. MPC Box Resistor, Ribbon Cable, Time Delay, and Diode.

REPAIR – CONTINUED**Test Diode Block**

There are three diode blocks in the MPC box, DB1, DB2, and DB3. Each diode block contains eight diodes connected as illustrated in Figure 2. Diodes are labeled on the electrical schematic (FO-1) using a two-digit format, for example – 36. The first digit represents the diode block associated with the diode and the second digit represents the individual diode in that block, so diode 36 would be the sixth diode in DB3. The number 9 terminal on each diode block is common to all diodes contained within that diode block.

If a diode is suspected to be faulty, test as follows –

1. Pull diode block (Figure 6, Item 11) straight out from diode block socket (Figure 6, Item 12).

NOTE

A diode can be tested using an analog meter or a digital meter, but the testing methods are different, as a digital meter will not indicate an accurate resistance reading for a diode. A digital meter has a diode tester function. Both methods are provided below.

2. If using an analog meter (Figure 7, Item 1), set meter to Rx1 scale and check between pin 9 (Figure 7, Item 2) and suspected faulty diode pin in both directions.
 - A good diode will read very low resistance in one direction and very high resistance in opposite direction. If not, replace diode block per this WP.
3. If using a digital meter (Figure 7, Item 3), set meter to diode test scale and check between pin 9 (Figure 7, Item 4) and suspected faulty diode pin in both directions.
 - A good diode will read 0.4 – 0.7 V in one direction and open circuit or OL in opposite direction. If not, replace diode block per this WP.
4. If diode block test is good, reinstall diode block (Figure 6, Item 11) into diode block socket (Figure 6, Item 12).
5. Operate unit, if required, in accordance with normal operating procedures to verify proper operation after replacement of diode block (WP 0005, Operating Procedures).
6. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

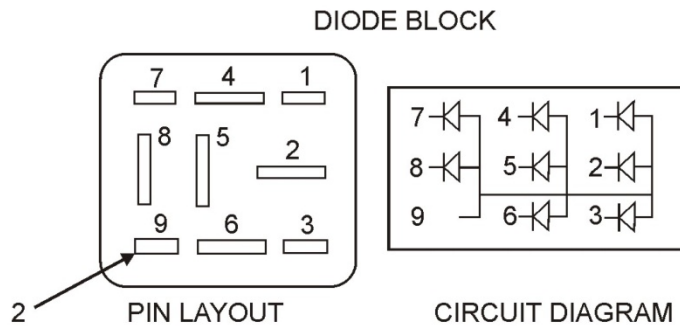
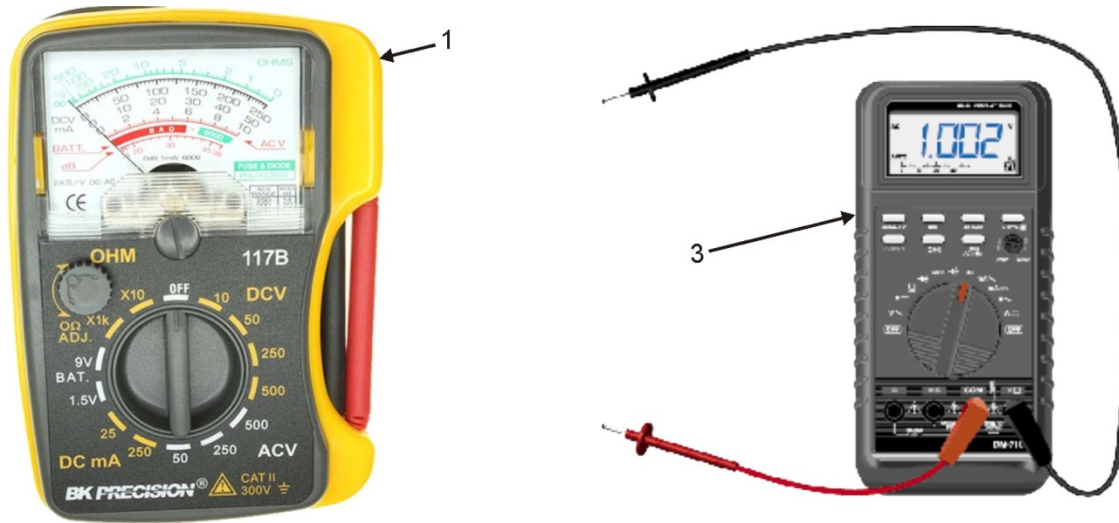


Figure 7. Diode Test.

Replace Diode Block

CAUTION

Care should be given when replacing diode so that pins are not damaged or bent.

1. Pull diode block (Figure 8, Item 11) straight out from diode block socket (Figure 8, Item 12).
2. Verify that new diode block is same as old diode block.
3. Install new diode block (Figure 8, Item 11) into diode block socket (Figure 8, Item 12).
4. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of diode block (WP 0005, Operating Procedures).
5. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

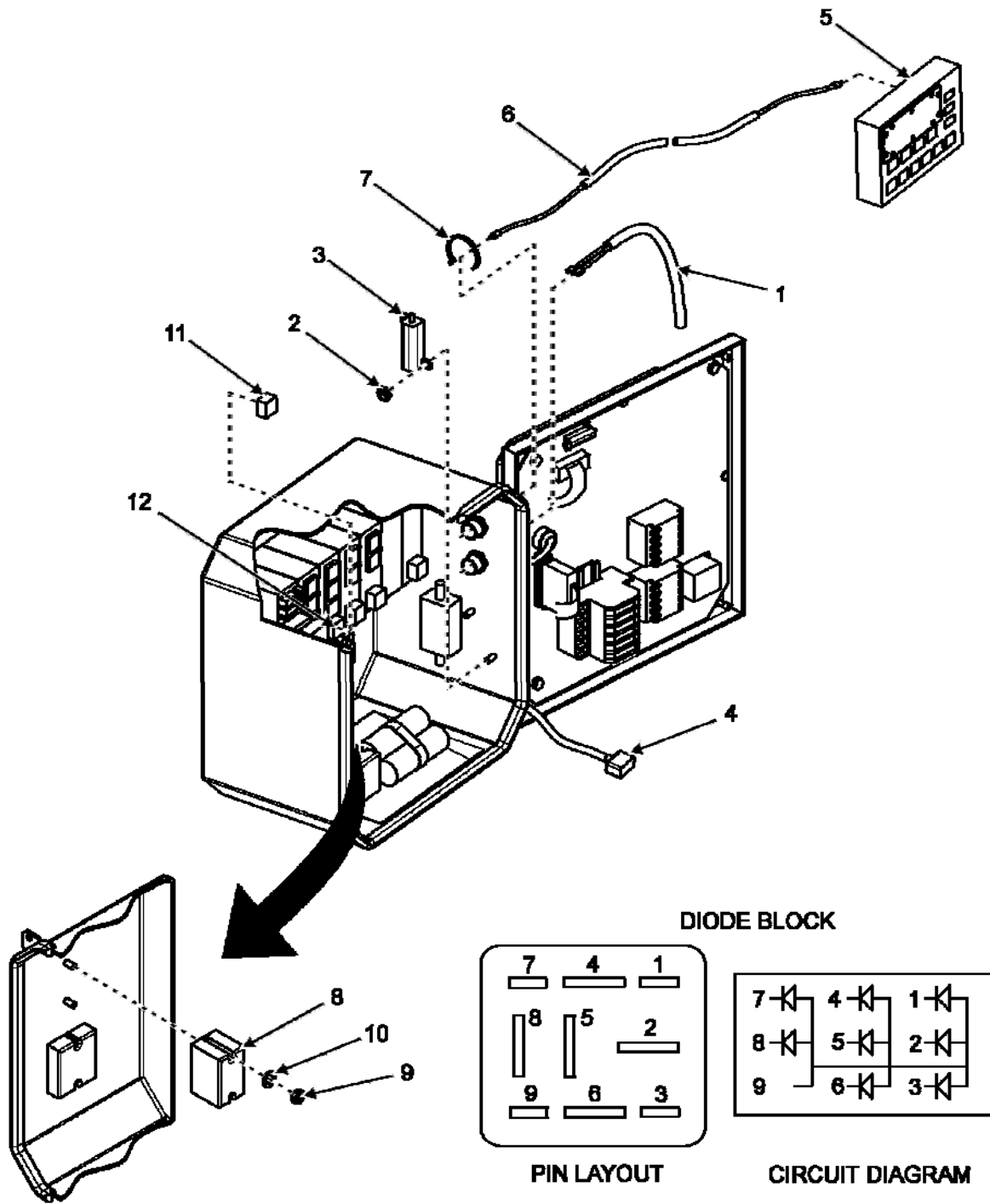


Figure 8. MPC Box Resistor, Ribbon Cable, Time Delay, and Diode.

REPAIR – CONTINUED**Replace MPC Circuit Board**

1. Remove bolt (Figure 9, Item 1) securing ground wires (Figure 9, Item 2) to MPC panel (Figure 9, Item 3).
2. Remove three bolts (Figure 9, Item 4) securing panel (Figure 9, Item 3) to door (Figure 9, Item 5).
3. Remove four captive nuts (Figure 9, Item 18) securing panel (Figure 9, Item 3) to door (Figure 9, Item 5).

NOTE

The panel will remain attached to the door with the wiring attached to the panel and components located on the front of the panel.

4. Carefully remove panel (Figure 9, Item 3) with MPC circuit board (Figure 9, Item 6) attached.
5. Disconnect electrical connector P2 (Figure 9, Item 12) from MPC circuit board (Figure 9, Item 6).
6. Cut tie wrap (Figure 9, Item 14) securing P2 cable (Figure 9, Item 12) to MPC circuit board (Figure 9, Item 6).
7. Remove one nut (Figure 9, Item 8), washer (Figure 9, Item 9), and nylon washer (Figure 9, Item 10) securing ground wires (Figure 9, Item 13) to MPC circuit board (Figure 9, Item 6).
8. Remove two screws (Figure 9, Item 15) and washers (Figure 9, Item 16) securing two electrical connectors (Figure 9, Item 17) and wiring (Figure 9, Item 7) to MPC circuit board (Figure 9, Item 6).
9. Disconnect two electrical connectors (Figure 9, Item 17) from MPC circuit board (Figure 9, Item 6).
10. Remove seven remaining nuts (Figure 9, Item 8), washers (Figure 9, Item 9), nylon washers (Figure 9, Item 10), and eight spacers (Figure 9, Item 11) securing MPC circuit board (Figure 9, Item 6) to panel (Figure 9, Item 3).
11. Remove MPC circuit board (Figure 9, Item 6) from panel (Figure 9, Item 3).
12. Install new MPC circuit board (Figure 9, Item 6) and ground wires (Figure 9, Item 13) onto panel (Figure 9, Item 3) and secure using eight nuts (Figure 9, Item 8), washers (Figure 9, Item 9), nylon washers (Figure 9, Item 10), and spacers (Figure 9, Item 11).
13. Connect two electrical connectors (Figure 9, Item 17) to MPC circuit board (Figure 9, Item 6) and secure with two screws (Figure 9, Item 15) and washers (Figure 9, Item 16).
14. Connect electrical connector P2 (Figure 9, Item 12) to MPC circuit board (Figure 9, Item 6).
15. Secure P2 cable (Figure 9, Item 12) to MPC circuit board (Figure 9, Item 6) with tie wrap (Figure 9, Item 14).
16. Install panel (Figure 9, Item 3) to door (Figure 9, Item 5) and secure using four captive nuts (Figure 9, Item 18).
17. Secure panel (Figure 9, Item 3) onto door (Figure 9, Item 5) using three bolts (Figure 9, Item 4).
18. Install bolt (Figure 9, Item 1) securing ground wires (Figure 9, Item 2) to MPC panel (Figure 9, Item 3).

REPAIR – CONTINUED

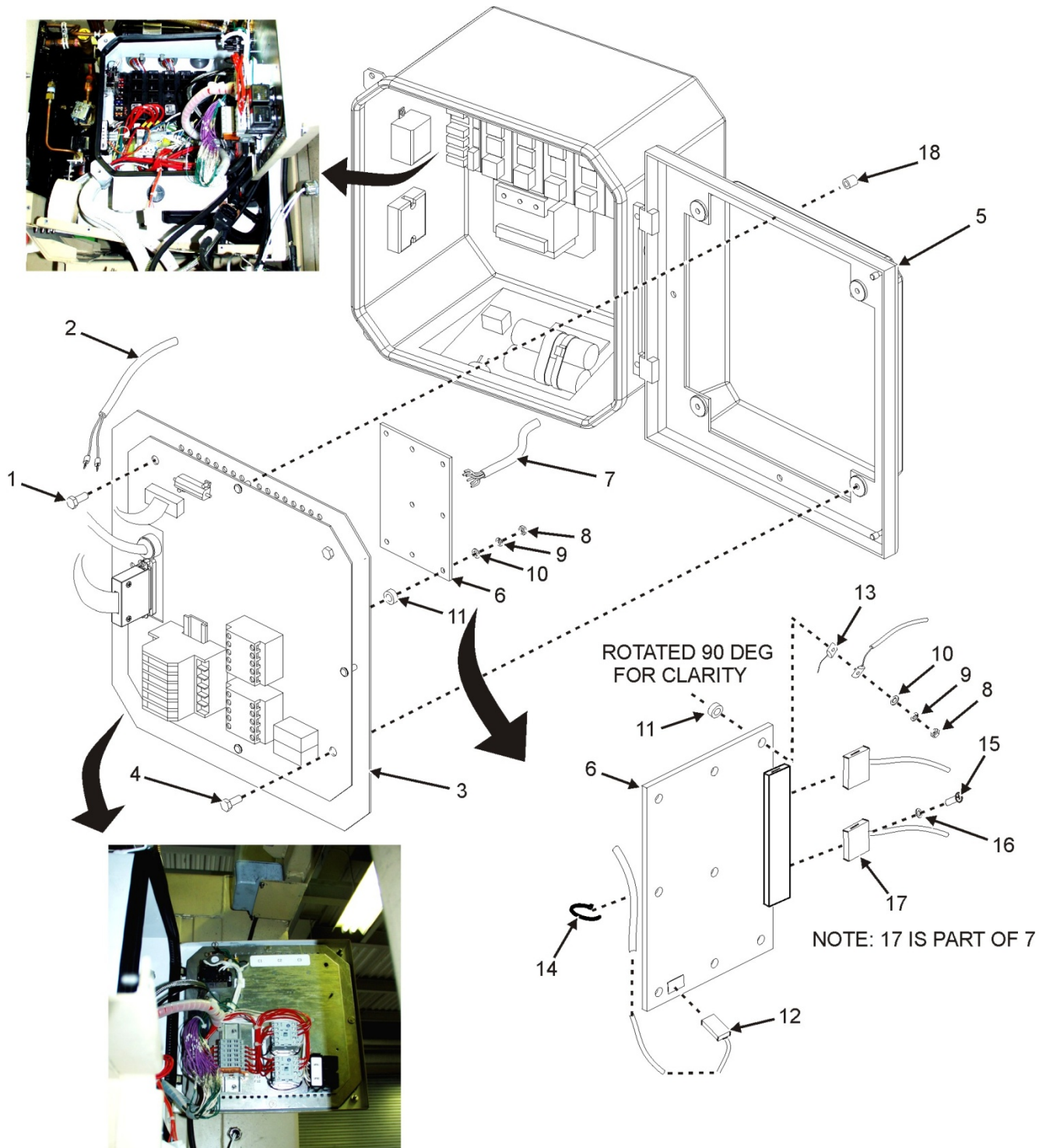


Figure 9. MPC Board.

REPAIR – CONTINUED

19. Close cover (Figure 5, Item 3) and secure using two screws (Figure 5, Item 4)
20. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of MPC board (WP 0005, Operating Procedures).
21. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Microprocessor Control Box Component Identification

Table 1 and Figure 10, Figure 11, and Figure 12 provides identification and location information for all components contained within the microprocessor control box.

Table 1. Microprocessor Control Box Component Identification.

Figure	Item	Component	MPC Box Location	Nomenclature
10	1	Fuse	Back Wall	F11-4A
10	2	Fuse	Back Wall	F2-5A
10	3	Fuse	Back Wall	F3-25A
10	4	Fuse	Back Wall	F4-15A
10	5	Fuse	Back Wall	F5-7.5A
10	6	Fuse	Back Wall	F7-10A
10	7	Fuse	Back Wall	F8-10A
10	8	Relay	Back Wall	Run Control Relay (RCR)
10	9	Relay	Back Wall	Speed Relay (SR)
10	10	Relay	Back Wall	Defrost Relay Compartment 1 (1DR)
10	11	Relay	Back Wall	Run Relay Compartment 1 (1RR)
10	12	Relay	Back Wall	Cool Relay Compartment 1 (1CR)
10	13	Relay	Back Wall	Hot Gas Relay Compartment 1 (1HGR)
10	14	Relay	Back Wall	Glow Plug Relay (GPR)
10	15	Relay	Back Wall	Diesel Electric Relay (DER)
10	16	Relay	Back Wall	Defrost Relay Compartment 2 (2DR)
10	17	Relay	Back Wall	Run Relay Compartment 2 (2RR)
10	18	Relay	Back Wall	Cool Relay Compartment 2 (2CR)
10	19	Relay	Back Wall	Hot Gas Relay Compartment 2 (2HGR)
10	20	Relay	Back Wall	Starter Solenoid Relay (SSR)
10	21	Relay	Back Wall	Main Heat Relay (MHR)
10	22	Diode Block	Back Wall	Diode Block 1 (DB1)
10	23	Diode Block	Back Wall	Diode Block 2 (DB2)

REPAIR – CONTINUED

Table 1. Microprocessor Control Box Component Identification – Continued.

Figure	Item	Component	MPC Box Location	Nomenclature
10	24	Diode Block	Back Wall	Diode Block 3 (DB3)
10	25	Relay	Back Wall	Run Relay (RR)
10	26	Relay	Back Wall	Run Control Relay (RCR1)
10	27	Protector	Back Wall	Overload Protector (OP)
10	28	Relay	Bottom	Capacitor Alternator Relay (CAR)
10	29	Buzzer	Bottom	Buzzer (B)
10	30	Capacitor	Bottom	C4
10	31	Capacitor	Bottom	C5
11	1	Relay	Forward Wall	Defrost Compartment Relay (DCR)
11	2	Detector	Forward Wall	Detector Power Supply (DPS)
11	3	Shunt	Door	Shunt (SH)
11	4	Relay	Door	Flash Relay (FLR)
11	5	Switch	Door	Run-stop Switch (RS)
11	6	Junction Block	Door	Junction Block
11	7	Relay	Door	Electric Heat Relay (Compartment 1)
11	8	Relay	Door	Electric Heat Relay (Compartment 2)
11	9	Relay	Door	Unloader Front Relay (UFR1)
11	10	Relay	Door	Unloader Front Relay (UFR2)
11	11	Board	Door	Microprocessor Board (MP)
11	12	Connector	Door	P1 L-Y Connector
11	13	Connector	Door	P1 A-K Connector
12	1	Resistor	Aft Wall	Resistor (R)
12	2	Fuse	Aft Wall	F1-80A

REPAIR – CONTINUED

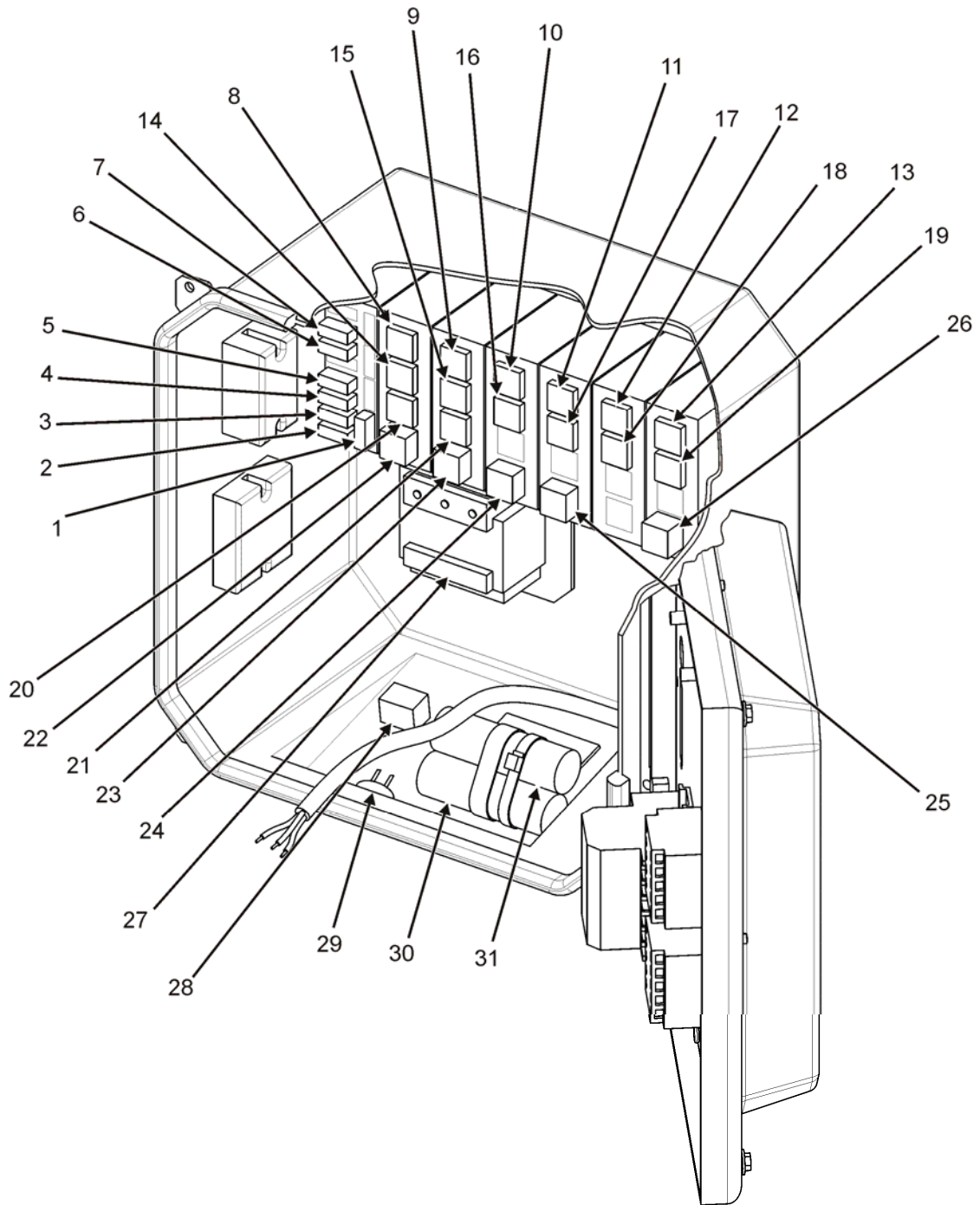


Figure 10. Microprocessor Control Box Back Wall and Bottom.

REPAIR – CONTINUED

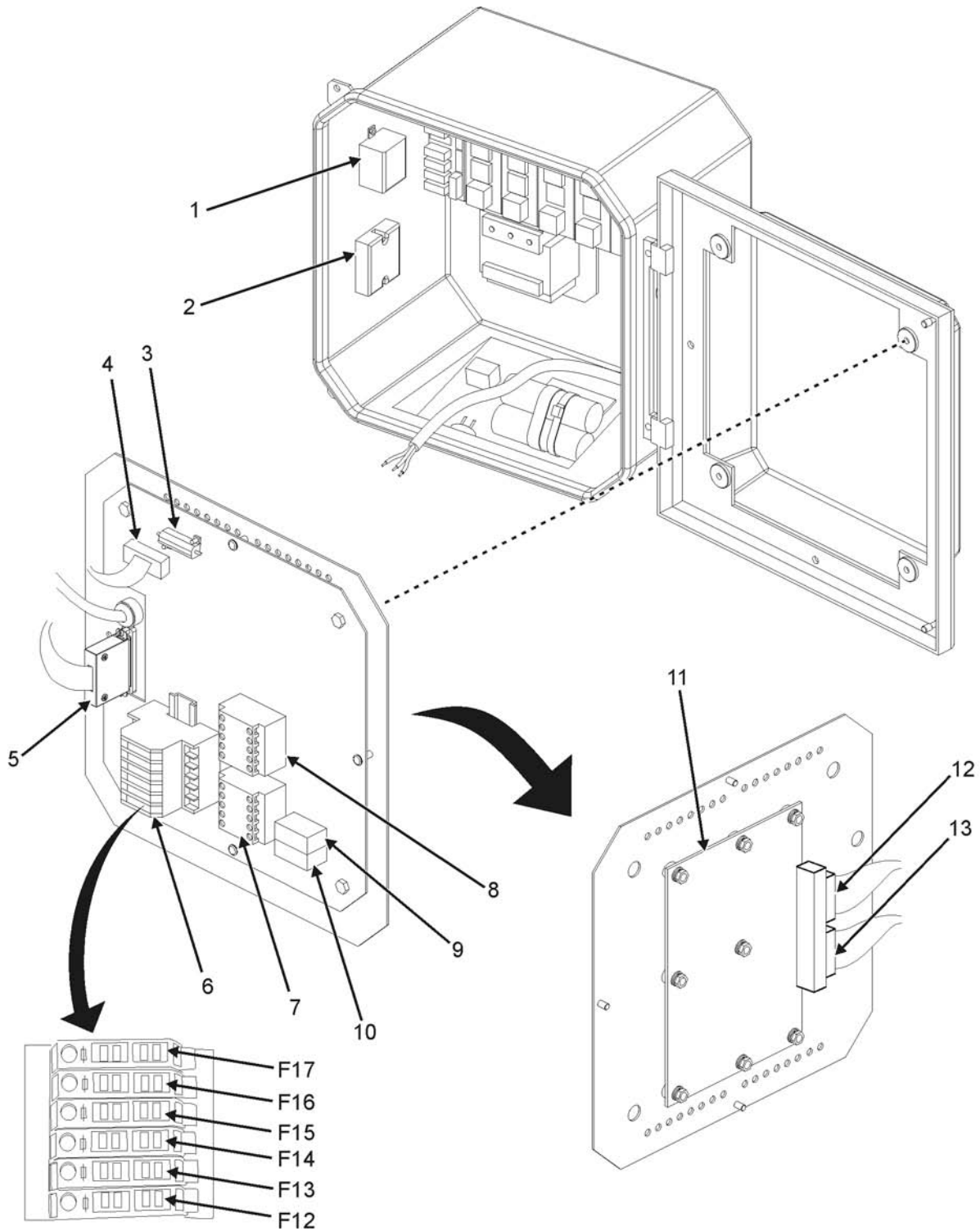


Figure 11. Microprocessor Control Box Door and Forward Wall.

REPAIR – CONTINUED

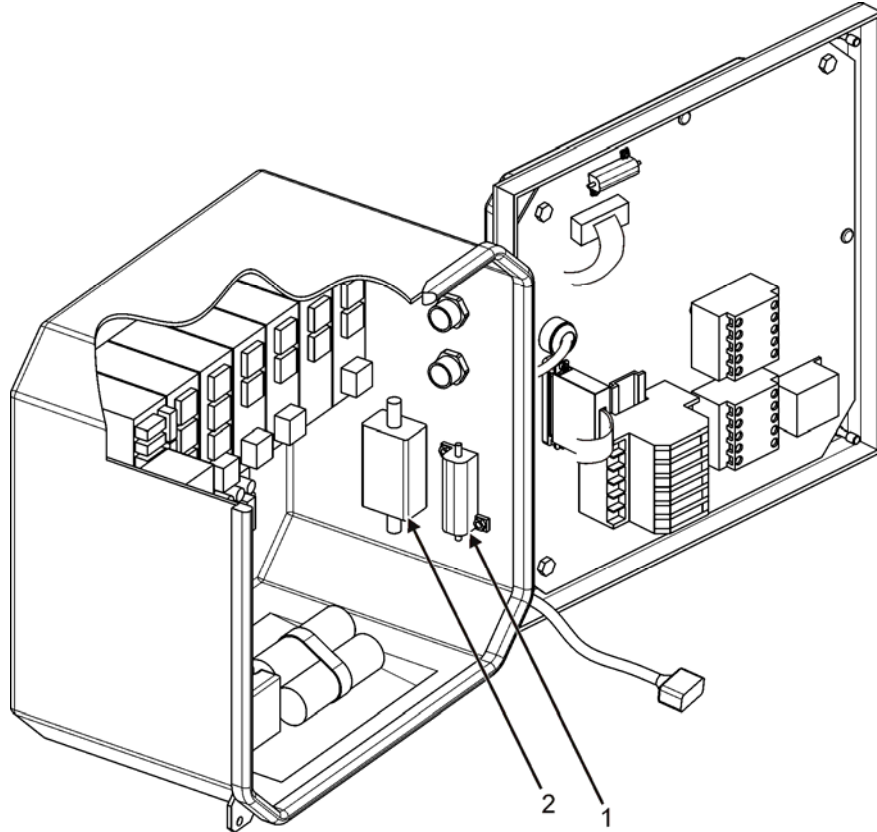


Figure 12. Microprocessor Control Box Aft Wall.

REPAIR - CONTINUED**Hybrid Standby Panel Relay Replace (Overload Protector OL)**

1. Disconnect the battery terminals.
2. Remove pin and swing temperature chart recorder out of the way of the microprocessor controller on the left side of the MTRCS.
3. Remove two bolts and open microprocessor control panel on left side of refrigeration unit.
4. Locate overload protector (Figure 13, Item 1).
5. Record the current settings and dial positions on the face of the device.
6. Tag and remove 2 ground wires (Figure 13, Item 2) on stud on right side of device mounting plate.
7. Tag and remove 12 remaining wires (Figure 13, Item 3) (six are on the top and six are on the bottom of the device).
8. Remove 3 nuts (Figure 13, Item 4) from the metallic mounting plate on the back of the device.
9. Remove the overload protector (Figure 13, Item 1).
10. Match the settings of the new device to the removed device.
11. Mount the new overload protector (Figure 13, Item 1) using the 3 nuts (Figure 13, Item 4) previously removed.
12. Secure the two ground wires (Figure 13, Item 2) to the stud on the mounting plate using the nut and washer previously removed.
13. Reinstall the 12 wires (Figure 13, Item 3) on the top and bottom of the device.
14. Reconnect the battery terminals.
15. Replace two bolts and close microprocessor control panel on left side of refrigeration unit.
16. Swing temperature chart recorder back into place and re-pin.
17. Start the refrigeration unit and confirm proper operation of the unit per WP 0005.

REPAIR – CONTINUED

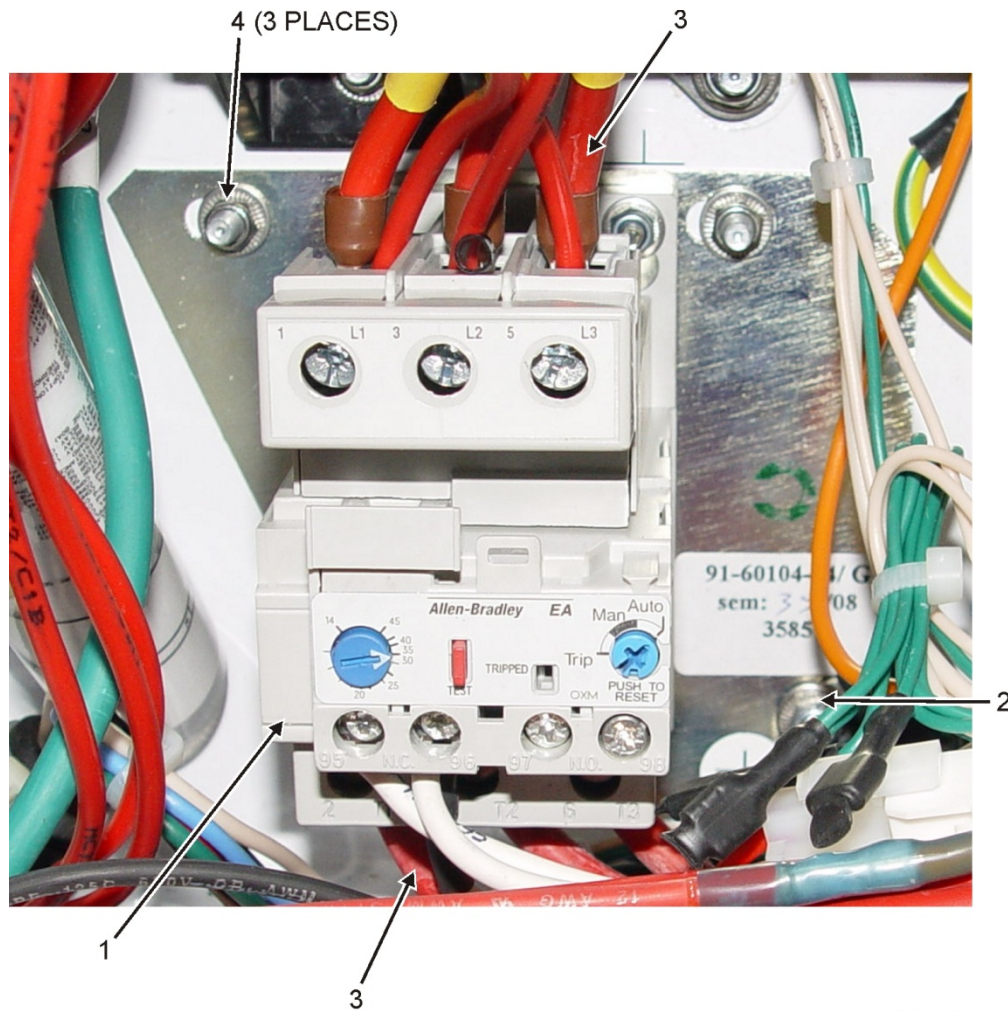


Figure 13. Hybrid Standby Panel Relay.

Evaporator Heater Relay Replace

1. Disconnect the battery terminals.
2. Remove pin and swing temperature chart recorder out of the way of the microprocessor controller on the left side of the MTRCS.
3. Remove two bolts and open microprocessor control panel on left side of refrigeration unit.
4. Locate 1EHR (Figure 14, Item 1) and 2EHR (Figure 14, Item 2) relays on the hinged microprocessor control panel door.
5. Remove UFR1/UFR2 module (Figure 14, Item 3) to the right of the 1EHR. To do this, tag and remove the two relays that are inserted into the UFR1/UFR2 module. Remove two nuts (Figure 7, Item 4) on the module. Leave wires attached to the UFR1/UFR2 module.
6. Tag and remove 11 wires (Figure 14, Item 5) on the 1EHR or 2EHR relay.

REPAIR – CONTINUED

7. Remove two nuts and washers from the 1EHR or 2EHR relay and remove the relay.
8. Install the new relay by reinstalling the two nuts and washers.
9. Reconnect the 11 wires (Figure 14, Item 5) to the relay as tagged.
10. Reinstall the UFR1/UFR2 module.
11. Reinstall the two relays (if previously removed) back into the UFR1/UFR2 module.
12. Close the MP control panel door and bolt shut with two bolts.
13. Insert pin to secure temperature recorder.
14. Reconnect the battery.



Figure 14. Evaporator Heater Relay.

REPAIR – CONTINUED**Shielded Ribbon Cable J12 Replace**

1. Disconnect the battery terminals.
2. Remove pin and swing temperature chart recorder out of the way of the microprocessor controller on the left side of the MTRCS.
3. Remove two bolts and open microprocessor control panel on left side of refrigeration unit.
4. Locate the shielded J12-P12 cable (Figure 15, Item 1).
5. Remove the four outer acorn nuts on the MPC box.
6. Unplug UFR2 module (Figure 14, Item 3).
7. Remove the four interior hex bolts that hold the MPC board to the hinged door.
8. Tag and remove the six colored wires (Figure 15, Item 1) from the P2 connector on the micro (at the small red connector at the lower corner of the microboard). Depress the connector retainers to allow the wires to pull out.
9. Remove nut and washer (Figure 15, Item 2) at the corner of the microboard and remove the two ground wires (Figure 15, Item 3).
10. Remove the bulkhead fitting (Figure 16, Item 2) where the shielded cable passes through the microboard panel.
11. Remove the wire ties (Figure 15, Item 5) to free the large black cable at the microboard.
12. Pull the shielded cable (Figure 15, Item 6) through the microboard panel.
13. Tag the single black cable that is coming off of the shielded cable (Figure 16, Item 3).
14. Cut and remove the two butt splices at the two green wires (Figure 16, Item 4).
15. Unclip the black EMI suppression device off of the cable wire (Figure 16, Item 5).

REPAIR – CONTINUED

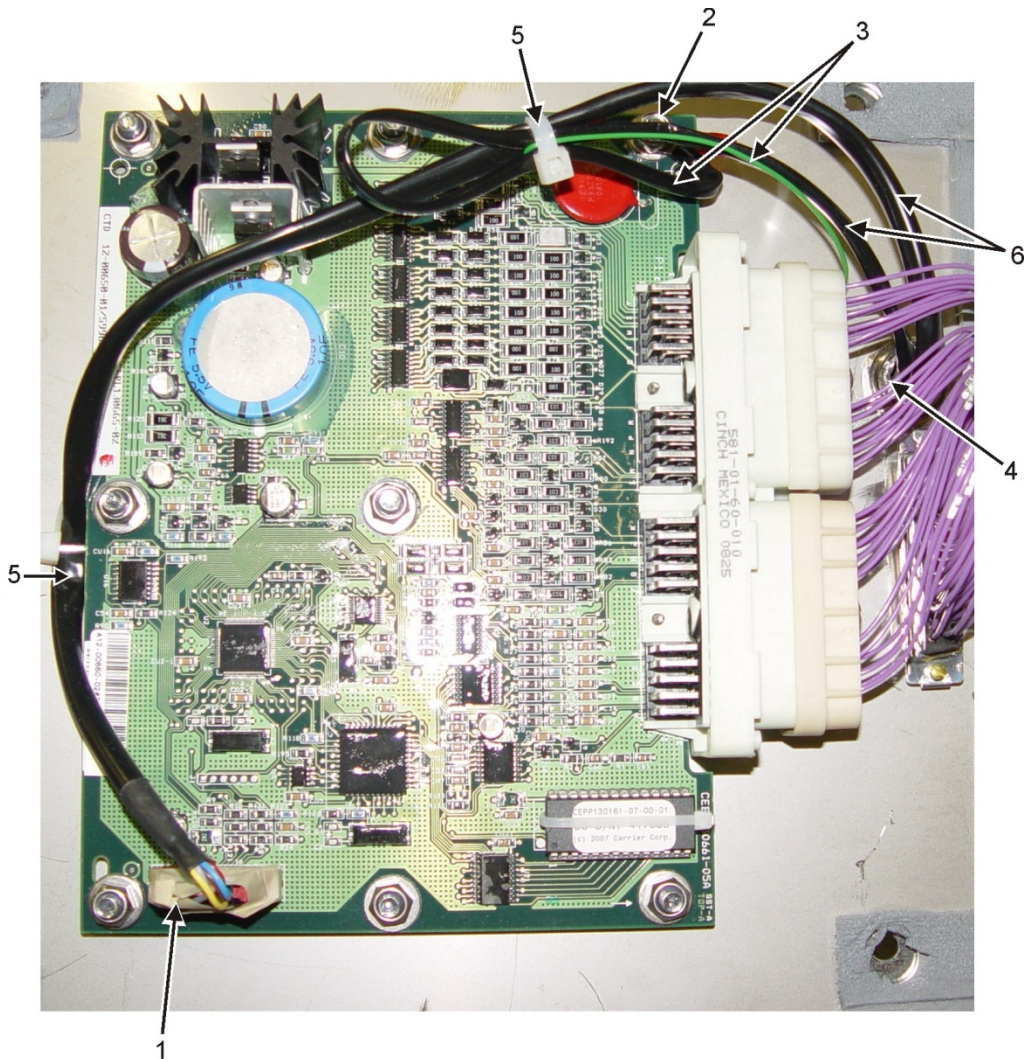


Figure 15. J12-P12 Connector.

16. Pull shielded cable assembly through the grommet at the rear base of the MPC box and remove the cable from the unit.
17. Install the new shielded cable assembly up through the grommet at the base of the MPC box.
18. Clip the EMI suppression device (Figure 16, Item 5) onto the black wire on the new shielded line.
19. Butt splice the two new green ground wires to the existing green ground wires.
20. Pull the shielded cable (Figure 15, Item 6) through the microboard panel.
21. Install wire ties (Figure 15, Item 5) to fasten the new black wire back to the microboard.
22. Install the bulkhead fitting (Figure 16, Item 2) to secure the shielded line to the MPC panel.

REPAIR – CONTINUED

23. Install the two ground wires (Figure 15, Item 3) onto the microboard by installing one nut (Figure 15, Item 2) and washer.
24. Install the six colored wires (Figure 15, Item 1) into the red connector by depressing the connector retainers and inserting each wire.
25. Put sheet metal panel back in place and secure to the hinged MPC box panel with four hex bolts.
26. Install UFR2 module (Figure 14, Item 3).
27. Install the four outer acorn nuts on the outside of the hinged panel.
28. Close the hinged microprocessor control panel on left side of refrigeration unit and install two bolts to secure.
29. Swing temperature chart recorder back into place and install pin.
30. Reconnect battery terminals.

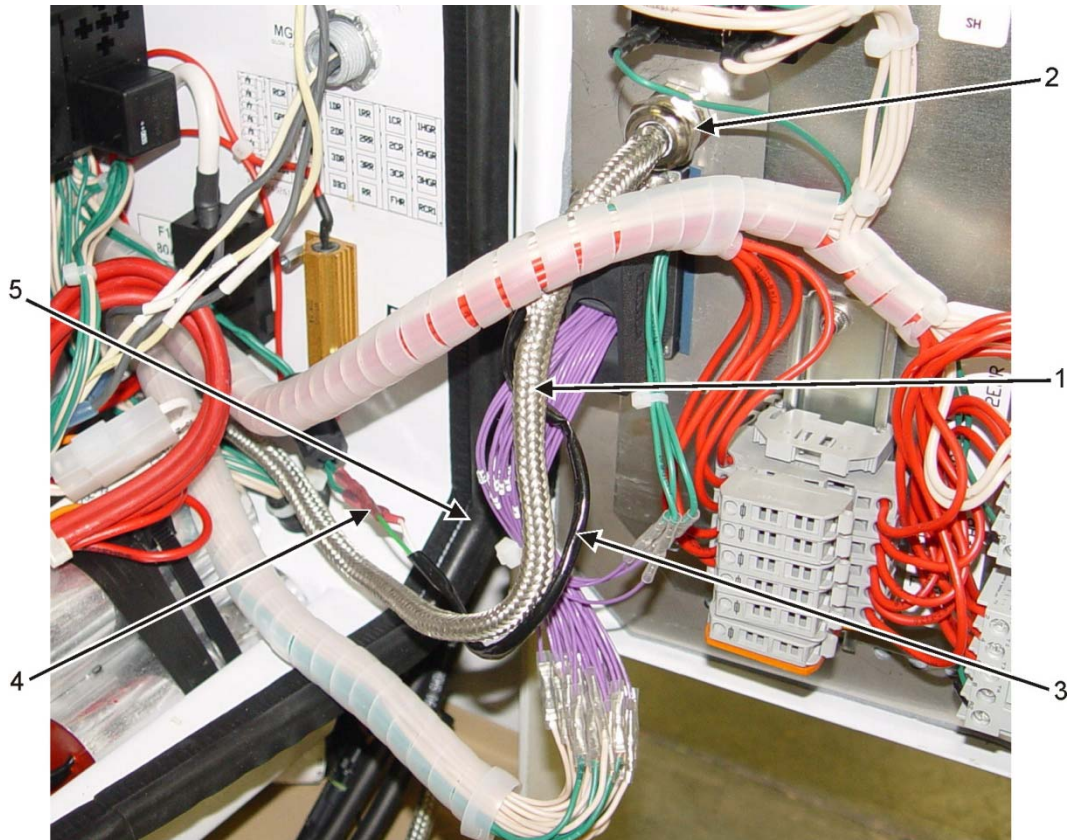


Figure 16. J12-P12 Connector – Continued.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
EVAPORATOR
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Lock Washer, #10 ID (WP 0111, Item 11)
 Lock Washer, $\frac{3}{8}$ -in ID (WP 0111, Item 13)
 Tie Wrap (WP 0110, Item 55)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
 WP 0024
 WP 0032
 WP 0070
 TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External power cables disconnected (WP 0005)

REPLACE**Remove****NOTE**

The following replacement procedure is applicable to compartment 1 (forward) and compartment 2 (aft) evaporator. Any differences in the procedure will be annotated in the text where applicable.

1. Pump refrigeration unit down (WP 0032, Service).
2. Open control panel assembly door (Figure 1, Item 1).
3. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to OFF position.
4. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to OFF position.
5. Place POWER ON/DOWN switch (Figure 1, Item 4) to DOWN position.
6. Close control panel assembly (Figure 1, Item 1) door and secure closed using latch (Figure 1, Item 5).

REPLACE – CONTINUED

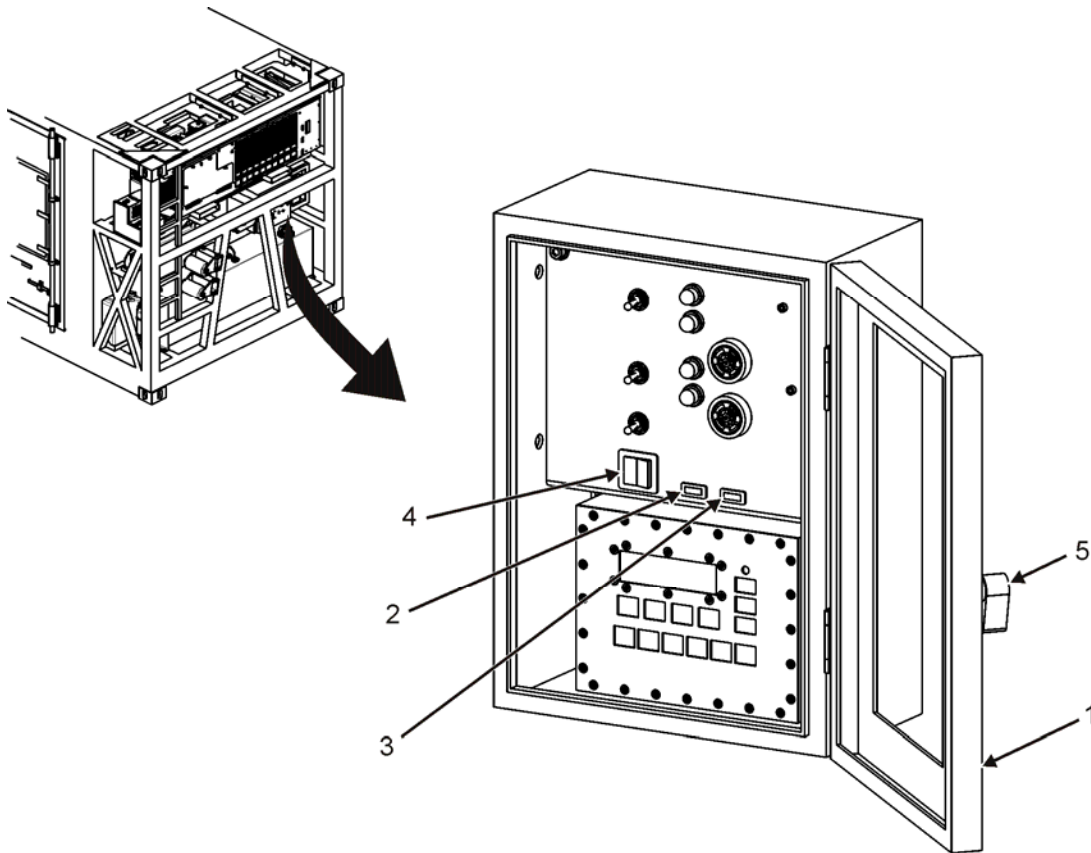


Figure 1. Control Box.

7. Disconnect battery (-) negative terminal (WP 0070, Disconnect).

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

8. Open side and rear doors and secure using attached door chain.
9. Remove interior bulkhead if installed (WP 0024, Remove).

REPLACE – CONTINUED

10. Tag and disconnect evaporator electrical connector (Figure 2, Item 1) on forward side of evaporator (Figure 2, Item 2).

NOTE

The evaporator cover is hinged to the evaporator front cover and swings down after removal of mounting hardware. After removal of the sensors attached to the cover, the cover can be completely removed by unhooking it from the front panel.

11. Remove two bolts (Figure 2, Item 5) and washers (Figure 2, Item 6) securing evaporator cover (Figure 2, Item 7) closed.
12. Remove one screw (Figure 2, Item 3), washer (Figure 2, Item 23), and nut (Figure 2, Item 24) securing ground strap (Figure 2, Item 4) to evaporator (Figure 2, Item 2).
13. Cut and remove tie wraps (Figure 2, Item 8) securing return air sensor (Figure 2, Item 9) and temperature chart recorder sensor (Figure 2, Item 10) to evaporator cover (Figure 2, Item 7).
14. Carefully pull sensors (Figure 2, Item 9 and Item 10) through hole in cover (Figure 2, Item 7).
15. Disconnect electrical connector (Figure 2, Item 11) from return air sensor (Figure 2, Item 9) and remove sensor. Retain for reinstallation.
16. Cut tie wraps as needed from temperature chart recorder sensor cable (Figure 2, Item 10) and pull sensor carefully through cutout on forward side of evaporator.
17. Remove evaporator cover (Figure 2, Item 7) from evaporator front cover (Figure 2, Item 18) by lifting up and out of evaporator front panel hinged area.
18. Disconnect two drain tubes (Figure 2, Item 12) from evaporator (Figure 2, Item 2).
19. Carefully pull two heating element wires from two drain tubes (Figure 2, Item 12) and let hang from evaporator.
20. Remove two elbows (Figure 2, Item 13) from evaporator (Figure 2, Item 2) forward and aft sides.
21. Remove two screws (Figure 2, Item 14), lock washers (Figure 2, Item 15), washers (Figure 2, Item 16), and clamps (Figure 2, Item 17) securing drain hoses (Figure 2, Item 12) to evaporator (Figure 2, Item 2). Let drain hoses hang below evaporator. Discard lock washers.
22. Label two solenoid valve coils (Figure 2, Item 21 and Item 22) as top and bottom.
23. Tag and disconnect liquid solenoid valve coil electrical connector (Figure 2, Item 19).
24. Tag and disconnect hot gas solenoid valve coil electrical connector (Figure 2, Item 20).
25. Remove clip (Figure 2, Item 25) securing liquid solenoid valve coil and remove coil (Figure 2, Item 21). Retain for reinstallation.
26. Remove clip (Figure 2, Item 26) securing hot gas solenoid valve coil and remove coil (Figure 2, Item 22). Retain for reinstallation.

REPLACE – CONTINUED

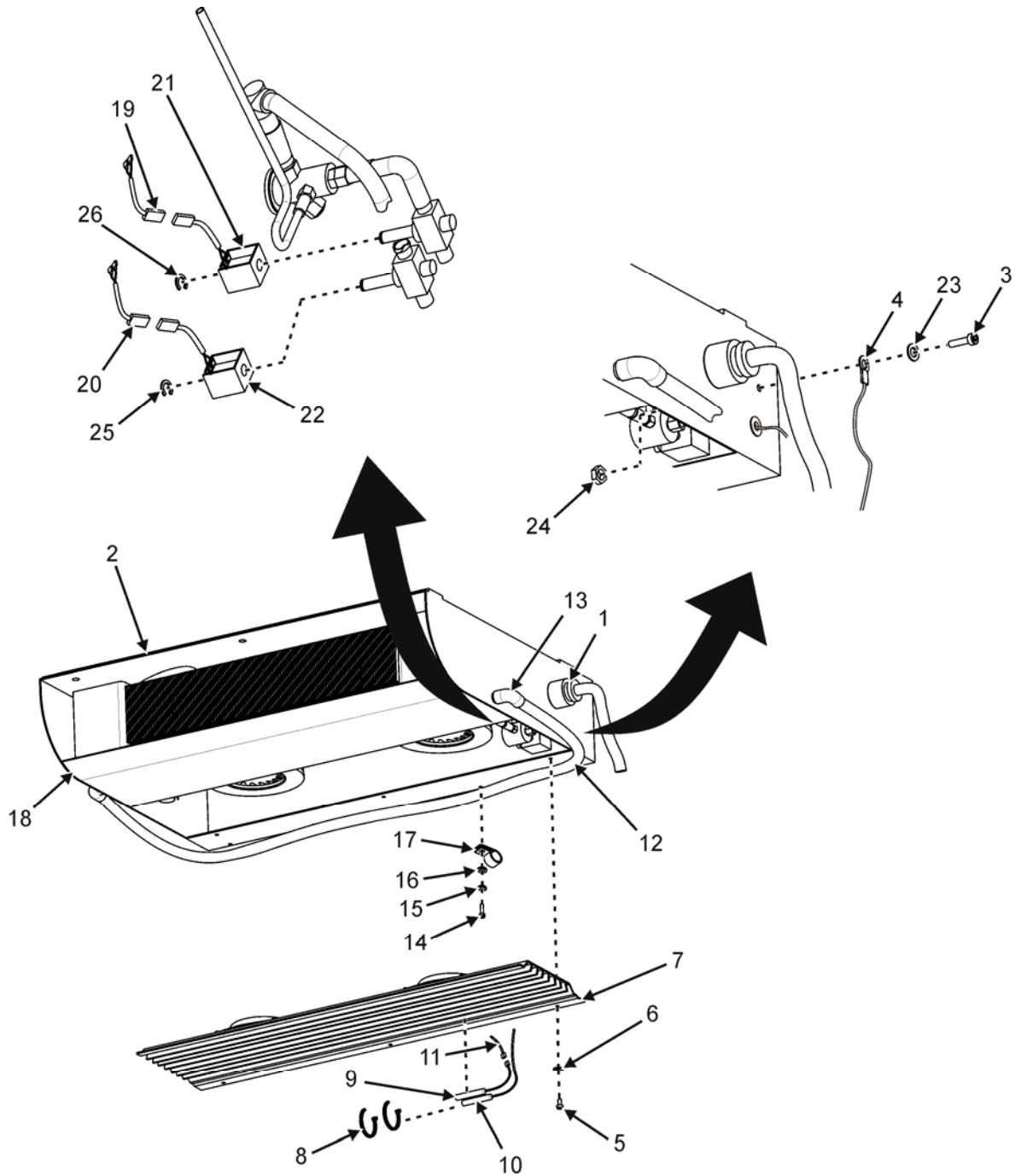


Figure 2. Evaporator Cover and Drain Line Disconnect.

REPLACE – CONTINUED

27. Remove two bolts (Figure 3, Item 1) and lock washers (Figure 3, Item 2) securing saddle clamp (Figure 3, Item 5) to 7/8-inch evaporator pipe (Figure 3, Item 3).
28. Remove both halves of saddle clamp (Figure 3, Item 5). Retain for reinstallation.
29. Cut 7/8-inch refrigerant pipe (Figure 3, Item 3) at cut location (Figure 3, Item 4) midway between saddle clamp bracket and cutout hole in evaporator.

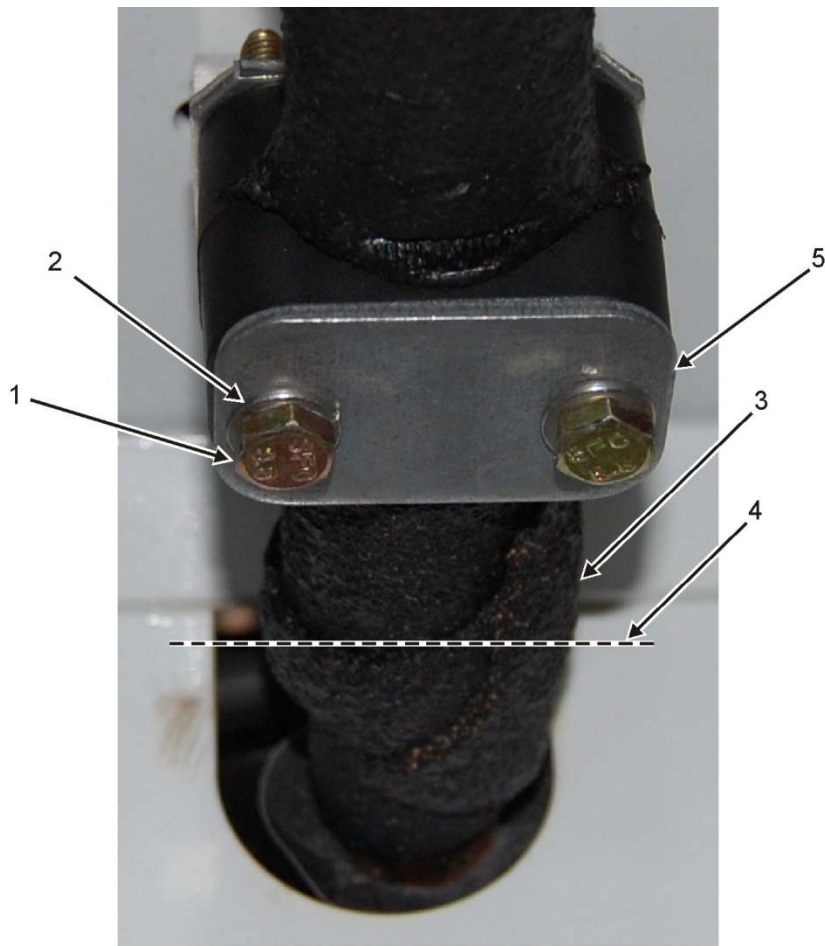


Figure 3. 7/8-Inch Refrigerant Pipe Saddle Clamp.

REPLACE – CONTINUED

30. Pull any insulation away from piping as needed for better access. Retain for reinstallation.
31. Cut 3/8-inch refrigerant pipe (Figure 4, Item 3) at cut location (Figure 4, Item 4) midway between solenoid valve mount bracket and cutout in evaporator.
32. Cut 1/2-inch refrigerant pipe (Figure 4, Item 1) at cut location (Figure 4, Item 2) midway between solenoid valve mount bracket and cutout in evaporator.
33. Remove grommet (Figure 4, Item 5) on rear of evaporator near 3/8-inch and 1/2-inch refrigerant pipes.

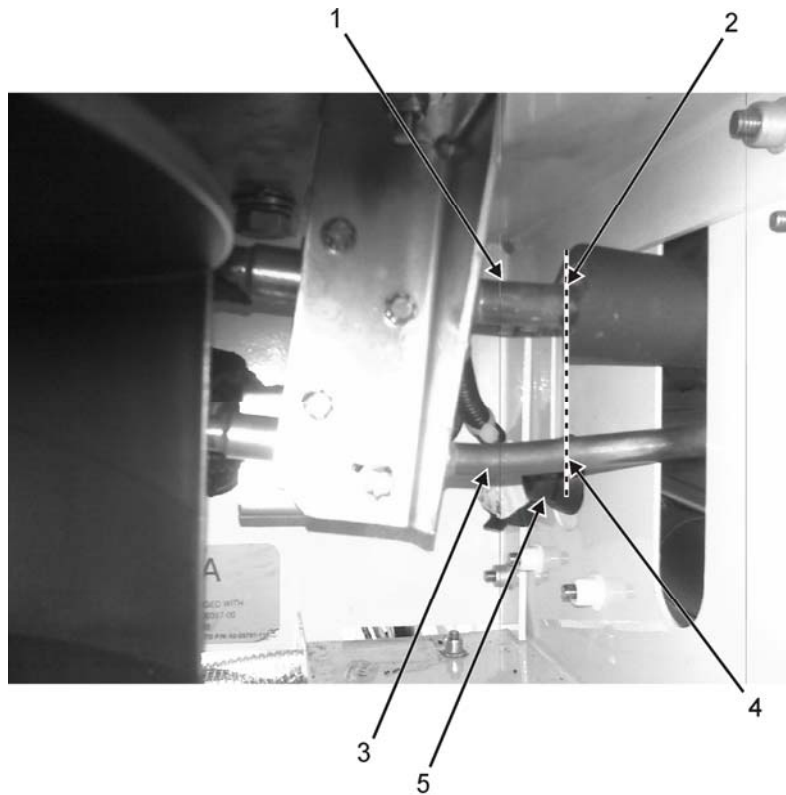


Figure 4. 1/2-Inch and 3/8-Inch Refrigerant Pipes.

REPLACE – CONTINUED**NOTE**

Steps 34 and 35 are for compartment 2 (aft) evaporator only. If removing compartment 1 (forward) evaporator, omit steps 34 and 35.

34. Remove seven screws (Figure 5, Item 8) securing aft evaporator air deflector (Figure 5, Item 9) to evaporator (Figure 5, Item 4).
35. Remove air deflector (Figure 5, Item 9).

WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury. The evaporator weighs 120 pounds and is bulky to work with. Never attempt to move more than 42 pounds alone. Use a minimum of four people. Three people holding unit while one removes mounting bolts.

36. Remove six evaporator mount bolts (Figure 5, Item 1), washers (Figure 5, Item 2), and lock washers (Figure 5, Item 3) securing evaporator (Figure 5, Item 4) to ceiling (Figure 5, Item 5). Discard lock washers.

WARNING

The guard and spacers installed on the compartment 2 (aft) evaporator will move freely once mount bolts for the evaporator are removed. Use care so as not to allow the guard and spacers to fall from the evaporator and hit you.

NOTE

The compartment 2 (aft) evaporator is equipped with spacers and a guard on the aft side of the unit that protects the evaporator from inadvertent collisions during loading procedures. The guard and spacers are installed between the evaporator and the ceiling. These items will be removed and then reinstalled when replacing the compartment 2 (aft) evaporator. The spacers and guard are not installed on the compartment 1 (forward) evaporator and will not be removed when removing the compartment 1 (forward) evaporator.

Step 37 is for compartment 2 (aft) evaporator only. If removing compartment 1 (forward) evaporator, omit step 36.

37. Carefully remove evaporator (Figure 5, Item 4) from ceiling (Figure 5, Item 5) and place on a flat work surface.
38. Remove evaporator guard (Figure 5, Item 7), and two spacers (Figure 5, Item 6). Retain spacers and evaporator guard for reinstallation.

REPLACE – CONTINUED

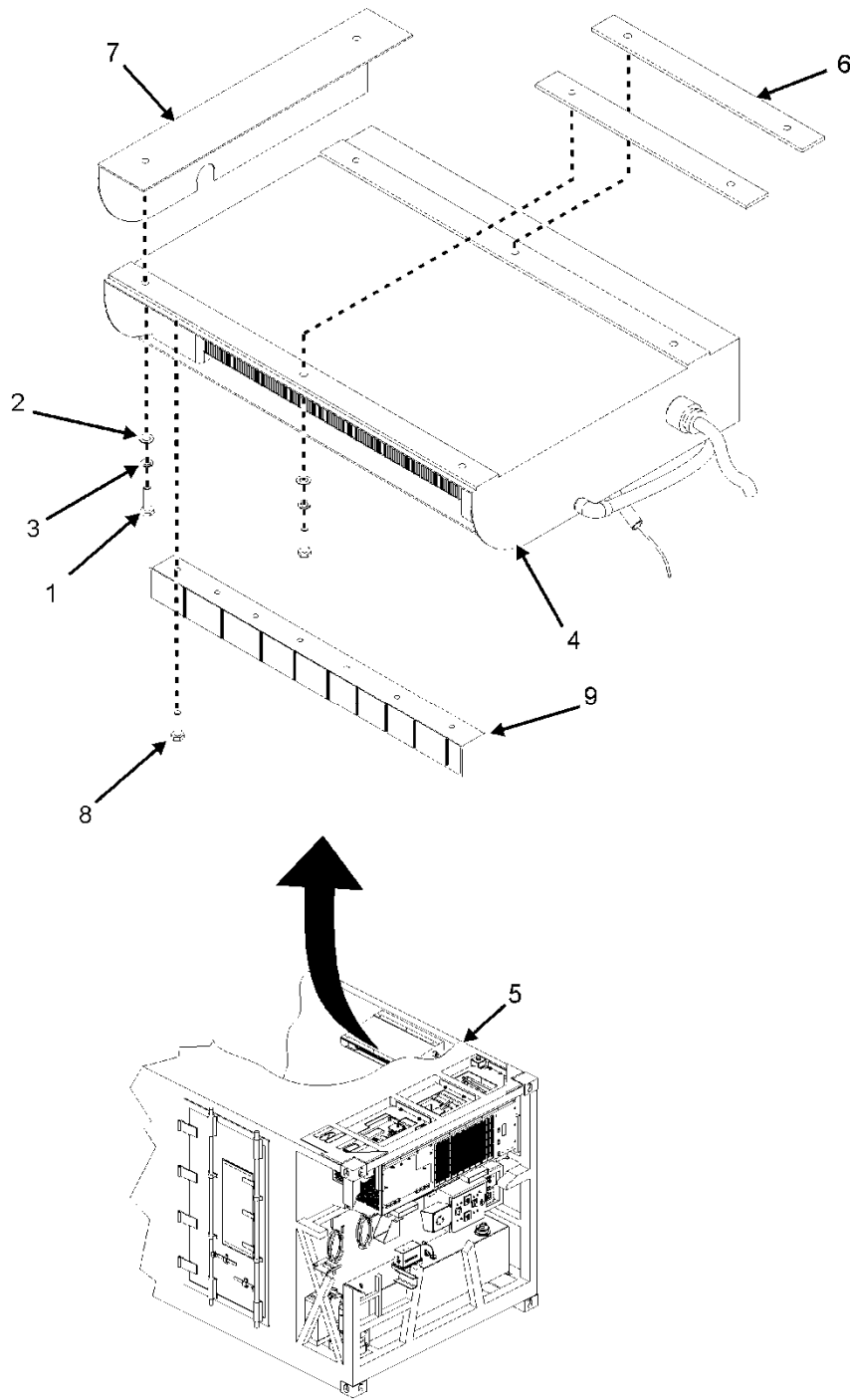


Figure 5. Evaporator Mounting Removal.

REPLACE – CONTINUED**Install****NOTE**

Installation of compartment 1 (forward) and compartment 2 (aft) evaporators is nearly identical. The following installation procedure is applicable to both compartment evaporators. Any differences in the procedure will be annotated in the text where applicable.

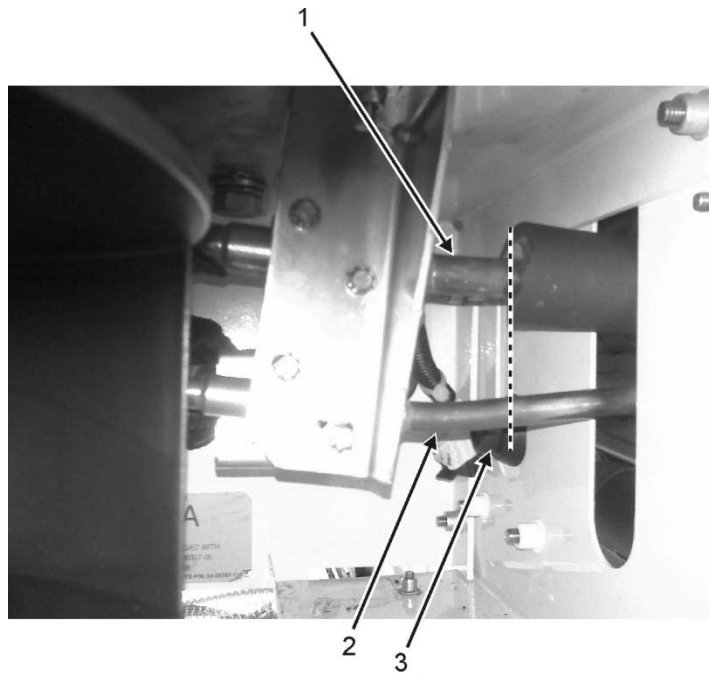
1. Clean each pipe connection to be soldered on replacement evaporator and on container refrigerant piping connections.

CAUTION

Use wet rags on either side of soldering points in order to dissipate heat. Use a reflective plate (stainless steel) behind fittings when soldering in order to protect walls from heat. Failure to observe precautions can cause equipment damage.

2. Solder a 3/8-inch coupling to container 3/8-inch refrigerant pipe stubout (Figure 6, Item 2) on wall.
3. Solder a 1/2-inch coupling to container 1/2-inch refrigerant pipe stubout (Figure 6, Item 1) on wall.
4. Solder a 7/8-inch coupling to container 7/8-inch refrigerant pipe stubout (Figure 7, Item 2) on wall.

REPLACE – CONTINUED



1/2-Inch and 3/8-Inch Refrigerant Pipes

Figure 6. Refrigerant Piping Stubout

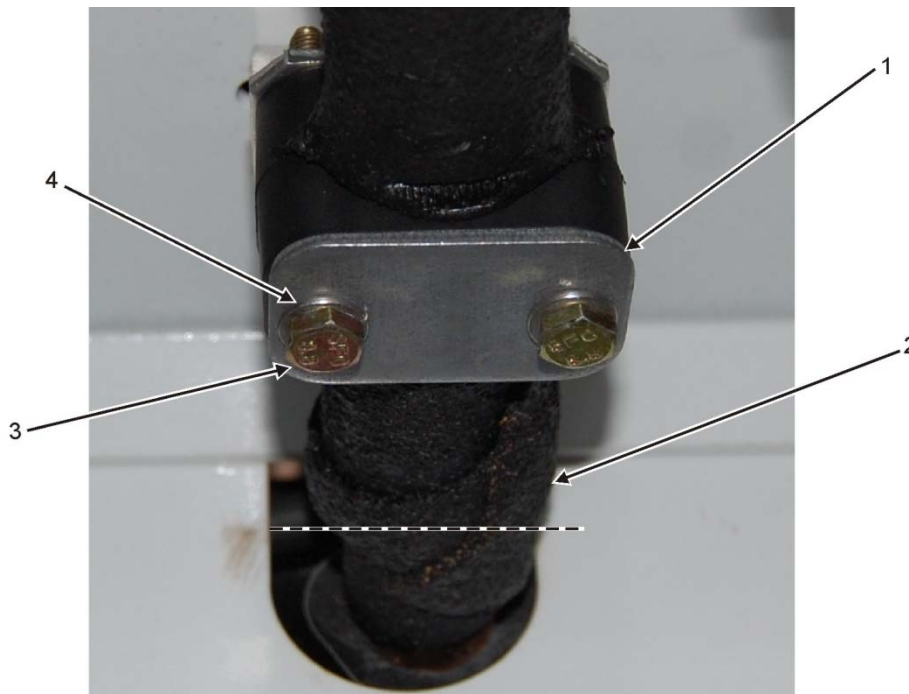


Figure 7. Refrigerant Piping Saddle Clamp

REPLACE – CONTINUED**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. The evaporator weighs 120 pounds and is bulky to work with. Never attempt to move more than 42 pounds alone. Use a minimum of four people. Three people holding the unit, while one aligns piping on the evaporator with piping on the container, performs soldering tasks, and installs evaporator mounting hardware.

NOTE

Step 5 is for compartment 2 (aft) evaporator only. If installing compartment 1 (forward) evaporator, omit step 5 and proceed to step 6. If installing compartment 2 (aft) evaporator, omit step 6.

5. Install evaporator guard (Figure 8, Item 7) and two spacers (Figure 8, Item 6) on evaporator (Figure 8, Item 4) and carefully lift evaporator into position inside container.
6. Carefully lift evaporator (Figure 8, Item 4) into position inside container.
7. Align three refrigerant pipes on evaporator with three pre-mounted couplings of corresponding mating refrigerant pipes on container and carefully slide evaporator piping into couplings.
8. Install six evaporator (Figure 8, Item 4) mount bolts (Figure 8, Item 1), washers (Figure 8, Item 2), and new lock washers (Figure 8, Item 3) and tighten until lock washers compress.

NOTE

Step 9 is for compartment 2 (aft) evaporator only. If installing compartment 1 (forward) evaporator, omit step 9 and proceed to step 10.

9. Install aft evaporator air deflector (Figure 8, Item 9) to evaporator (Figure 8, Item 4) and secure using seven screws (Figure 7, Item 8).

REPLACE – CONTINUED

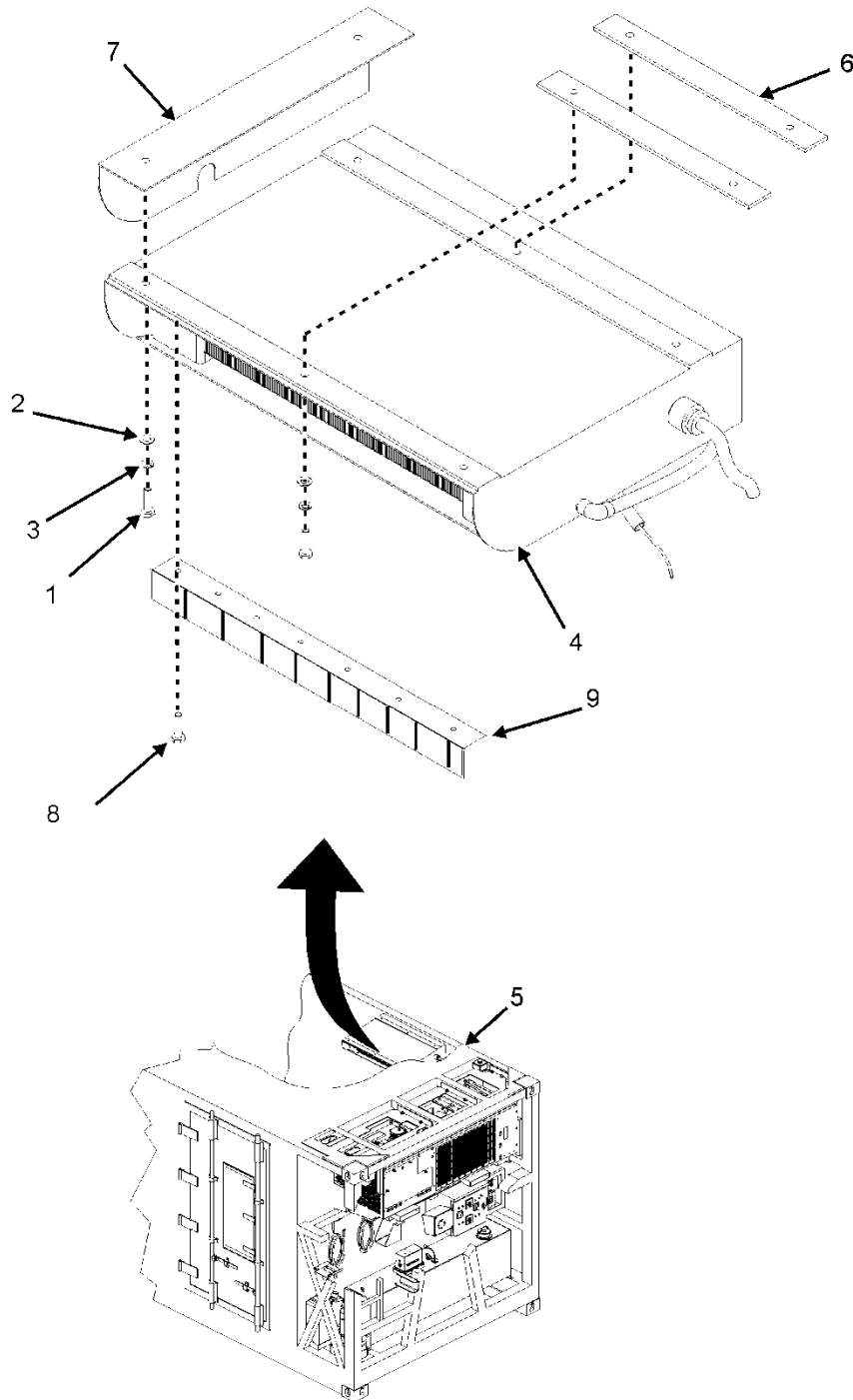


Figure 8. Evaporator Installation.

REPLACE – CONTINUED**CAUTION**

Use wet rags on either side of soldering points in order to dissipate heat. Use a reflective plate (stainless steel) behind fittings when soldering in order to protect walls from heat. Failure to observe precautions can cause equipment damage.

10. Remove grommet (Figure 6, Item 3) on rear hole of evaporator near 3/8-inch and 1/2-inch refrigerant pipes before performing soldering procedures.
11. Solder evaporator 1/2-inch refrigerant pipe (Figure 6, Item 1) to existing 1/2-inch container refrigerant pipe coupling (Figure 4, Item 2).
12. Solder evaporator 3/8-inch refrigerant pipe (Figure 6, Item 2) to existing 3/8-inch container refrigerant pipe coupling (Figure 4, Item 4).
13. Solder evaporator 7/8-inch refrigerant pipe (Figure 7, Item 2) to existing 7/8-inch container refrigerant pipe (Figure 3, Item 4).
14. Route temperature chart recorder sensor cable (Figure 9, Item 10) through cutout on forward side of evaporator (Figure 9, Item 2) and pull sensor carefully into evaporator and install grommet in cutout.
15. Reinstall any insulation removed from piping to gain better access.
16. Connect evaporator return air sensor (Figure 9, Item 9) to evaporator return air sensor electrical connector (Figure 9, Item 11).
17. Install evaporator cover (Figure 9, Item 7) onto evaporator hinged area.
18. Route temperature chart recorder sensor (Figure 9, Item 10) and return air sensor (Figure 9, Item 9) wiring through evaporator cover (Figure 9, Item 7).
19. Mount return air sensor (Figure 9, Item 9) and temperature chart recorder sensor (Figure 9, Item 10) to cover and secure with two tie wraps (Figure 9, Item 11).
20. Connect evaporator electrical connector (Figure 9, Item 1) to forward side of evaporator (Figure 9, Item 2) as tagged. Remove tag.
21. Install ground strap (Figure 9, Item 4) to evaporator (Figure 9, Item 2) and secure using one screw (Figure 9, Item 3), washer (Figure 9, Item 23), and nut (Figure 9, Item 24).

NOTE

Heating element wires are located inside the drain lines. The heating element wires will have to be fed into the evaporator drain tubes.

22. Route two heating element wires through two elbows (Figure 9, Item 13) and install elbows on evaporator (Figure 9, Item 2).
23. Carefully feed two heating element wires into two drain tubes (Figure 9, Item 12) on forward and aft side of evaporator (Figure 9, Item 2).

REPLACE – CONTINUED

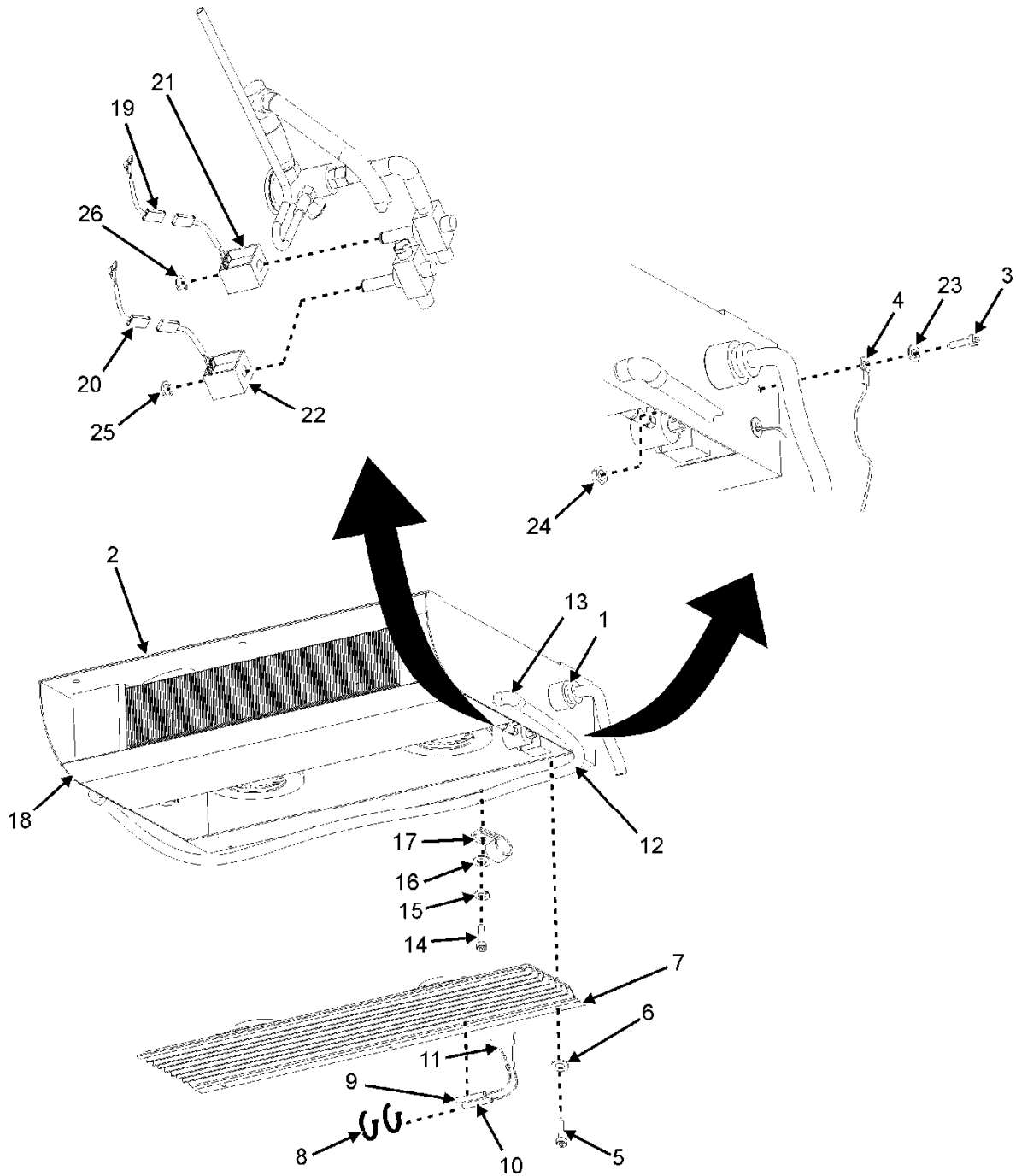


Figure 9. Evaporator Cover and Drain Line Installation.

REPLACE – CONTINUED

24. Install drain tubes (Figure 9, Item 12) onto elbows (Figure 9, Item 13).
25. Install drain tubes (Figure 3, Item 12) to evaporator (Figure 9, Item 2) using two clamps (Figure 9, Item 17) and secure using two screws (Figure 9, Item 14), new lock washers (Figure 9, Item 15), and washers (Figure 9, Item 16).
26. Install hot gas solenoid valve coil (Figure 9, Item 21) and secure using clip.
27. Install liquid solenoid valve coil (Figure 9, Item 21) and secure using clip.
28. Connect liquid solenoid valve coil electrical connector (Figure 9, Item 19).
29. Connect hot gas solenoid valve coil electrical connector (Figure 9, Item 20).
30. Install saddle clamp (Figure 7, Item 1) to 7/8-inch evaporator pipe (Figure 7, Item 2) and secure using two bolts (Figure 7, Item 3) and lock washers (Figure 7, Item 4).
31. Secure any loose wiring or connectors with tie wraps as needed.
32. Close evaporator cover (Figure 9, Item 7) on evaporator (Figure 9, Item 2) and secure using two bolts (Figure 9, Item 5) and washers (Figure 9, Item 6).
33. Connect battery (-) negative terminal (WP 0070, Reconnect).
34. Open control panel assembly door (Figure 10, Item 1).
35. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 10, Item 2) to ON position.
36. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 10, Item 3) to ON position.
37. Close control box panel assembly (Figure 10, Item 1) and secure closed using latch (Figure 10, Item 5).
38. Place POWER SWITCH (Figure 10, Item 4) on control panel to POWER ON position.
39. Release refrigerant back into system (WP 0032, Service).
40. Start refrigeration unit and operate under normal conditions to check for leaks and proper operation of evaporator (WP 0005, Operating Procedures).
41. Shut down refrigeration unit (WP 0005, Operating Procedures).
42. Reinstall interior bulkhead if necessary (WP 0024, Install).

REPLACE – CONTINUED

WARNING

MTRCS doors are very heavy and solid objects. Make sure that doors are secured to the frame of the container when open. Wind gusts can be strong enough to slam the doors shut with great force causing serious injury or death to personnel.

43. Close and secure both rear and side doors (WP 0007, Loading).
44. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

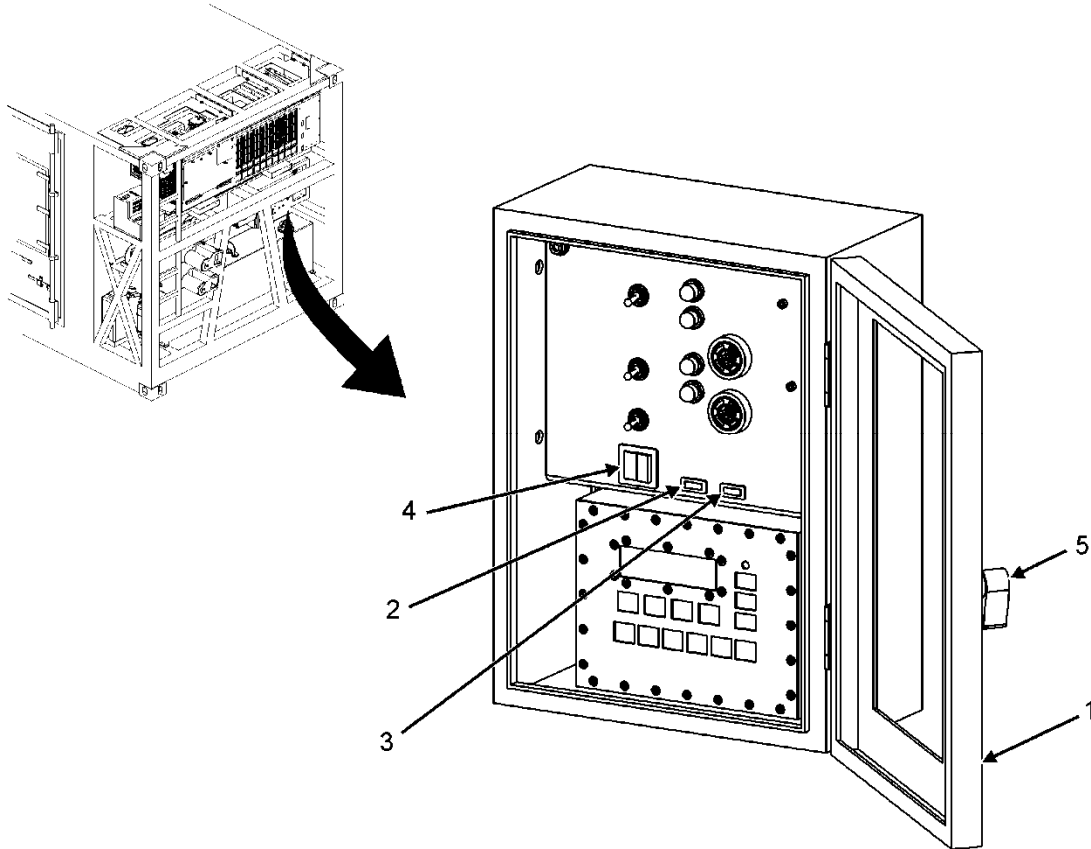


Figure 10. Control Box Assembly.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
EVAPORATOR THERMOSTATIC EXPANSION VALVE
REPLACE

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
Gloves, Rubber (WP 0110, Item 21)
Refrigeration Equipment
Tool Kit (supplement) (WP 0107, Table 2, Item 7)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Alcohol, Isopropyl (WP 0110, Item 2)
Insulation Tape (WP 0110, Item 26)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0032
TM 10-8145-222-23P

Equipment Condition

MTRCS operating with refrigeration unit on (WP 0005)

REPLACE

Perform the following steps to replace either evaporator TXV.

WARNING

Dry nitrogen cylinders are under high pressure. Never use dry nitrogen cylinders without using a pressure regulator. Always maintain a constant awareness of the condition of pressurized systems. Never use oxygen in or around refrigerant systems as an explosion could result. Failure to comply with this warning can result in serious injury or death to personnel.

1. Pump refrigeration unit down (WP 0032, Service).
2. Open MTRCS control panel assembly door (Figure 1, Item 1).
3. On control box, place COMPARTMENT 1 ON/OFF rocker switch (Figure 1, Item 2) to OFF position.
4. Place COMPARTMENT 2 ON/OFF rocker switch (Figure 1, Item 3) to OFF position.
5. Place POWER ON/DOWN switch (Figure 1, Item 4) on control panel to DOWN position.
6. Close MTRCS control panel assembly door (Figure 1, Item 1) and latch.

REPLACE – CONTINUED

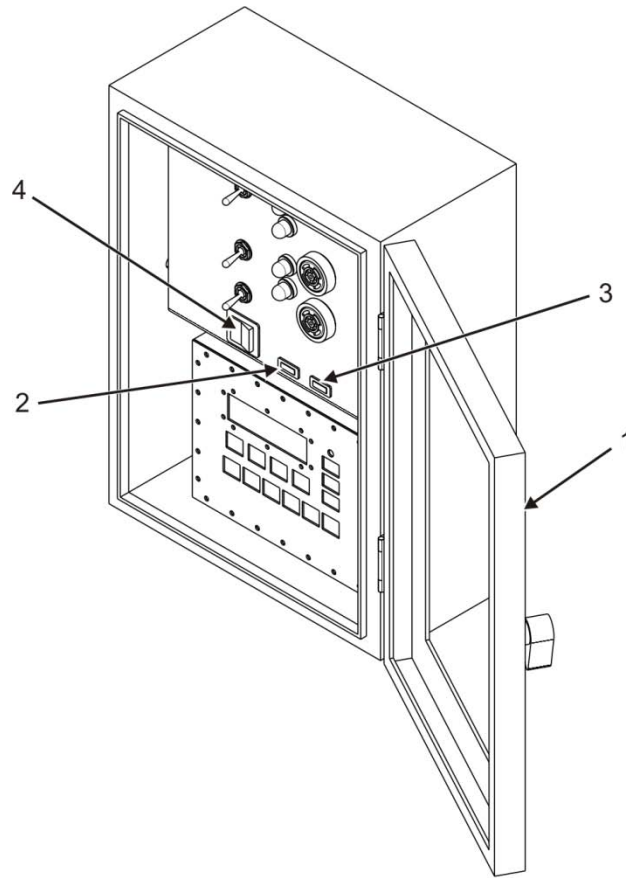


Figure 1. Control Panel.

7. Remove two bolts (Figure 2, Item 2) and washers (Figure 2, Item 3) securing evaporator cover (Figure 2, Item 1) closed.
8. Tag and disconnect two solenoid (Figure 2, Item 4) electrical connectors and move out of way.
9. Remove insulation (Figure 2, Item 15) from TXV bulb (Figure 2, Item 5).
10. Cut wires ties as needed securing TXV bulb capillary line (Figure 2, Item 6) to refrigerant piping.
11. Remove two screws (Figure 2, Item 16) and lock nuts (Figure 2, Item 17) securing solenoid bracket (Figure 2, Item 18) to evaporator.
12. Remove bracket (Figure 2, Item 18) with solenoids (Figure 2, Item 4) attached and position away from TXV (Figure 2, Item 12).
13. Remove one nut (Figure 2, Item 19), washer (Figure 2, Item 20), and clamp (Figure 2, Item 21) securing TXV to pipe (Figure 2, Item 22).

REPLACE – CONTINUED

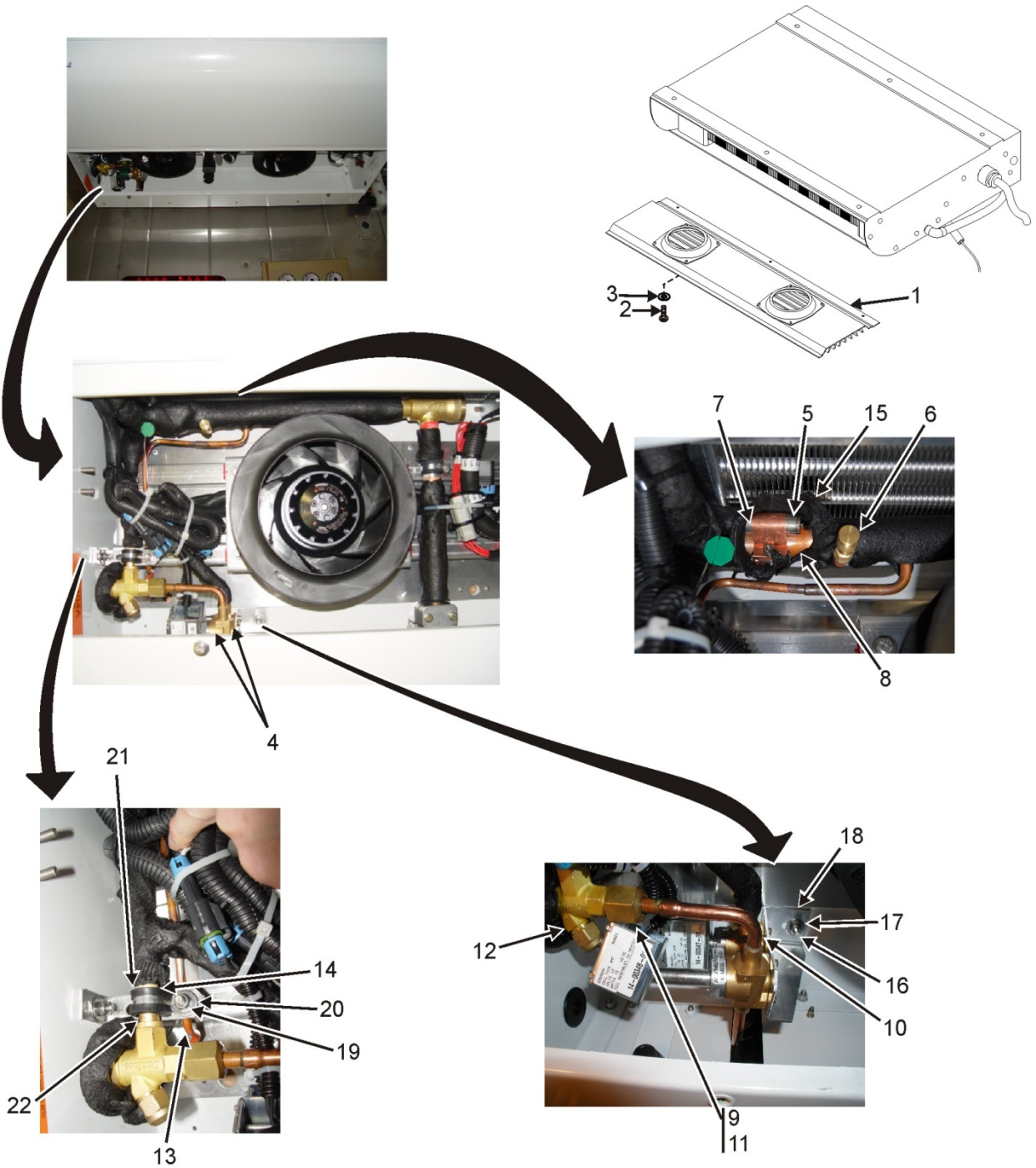


Figure 2. TXV Replacement.

REPLACE – CONTINUED**NOTE**

When removing the TXV bulb, it is important to note the position of the bulb relative to the suction line to aid in the installation of the replacement valve.

14. Loosen clamp (Figure 2, Item 7) and remove TXV bulb (Figure 2, Item 5) from suction line (Figure 2, Item 8) while noting position removed from.

WARNING

Wear protective gloves and eye protection when using Isopropyl alcohol. If contact with eyes is made, flush with clean water and seek immediate medical first aid for eyes. Rinse and dry hands immediately after exposure. Failure to observe this warning may result in drying and/or serious damage to the skin.

15. Clean outside of suction line (Figure 2, Item 8) where TXV bulb (Figure 2, Item 5) was attached using isopropyl alcohol.
16. Loosen and remove O-ring Seal (ORS) fitting (Figure 2, Item 9) on liquid line (Figure 2, Item 10).

CAUTION

Use a wrench to secure TXV body when loosening fittings.

17. Remove O-ring (Figure 2, Item 11) from ORS fitting (Figure 2, Item 9).
18. Wrap TXV (Figure 2, Item 12) in wet rags to act as a heat sink.
19. Desolder equalizer line (Figure 2, Item 13) from TXV (Figure 2, Item 12).
20. Desolder distributor pipe (Figure 2, Item 14) from TXV (Figure 2, Item 12).
21. Remove TXV (Figure 2, Item 12).
22. Clean surfaces of replacement TXV and refrigerant piping.
23. Remove metering internals of replacement TXV.

CAUTION

Overheating the thermostatic expansion valve can damage the valve, making it inoperable. Use care when soldering valve into the system so as not to overheat the valve. Wrapping the valve in wet rags will act as a heat sink and minimize valve exposure to heat.

Use care not to allow moisture to enter the refrigeration system. If moisture is allowed to enter the refrigeration system, the entire refrigeration system must be evacuated.

24. Wrap new TXV (Figure 2, Item 12) in wet rags to act as a heat sink.
25. Solder distributor pipe (Figure 2, Item 14) into TXV (Figure 2, Item 12).

REPLACE – CONTINUED

26. Solder equalizer line (Figure 2, Item 13) into TXV (Figure 2, Item 12).
27. Install replacement O-ring (Figure 2, Item 11) into ORS fitting (Figure 2, Item 9).
28. Install clamp (Figure 2, Item 21) around refrigerant pipe (Figure 2, Item 22) and secure using one nut (Figure 2, Item 19) and washer (Figure 2, Item 20).
29. Install solenoid bracket (Figure 2, Item 18) to evaporator and secure using two screws (Figure 2, Item 16) and lock nuts (Figure 2, Item 17).
30. Install metering internals into replacement TXV.
31. Apply a small amount of refrigerant oil to ORS fitting (Figure 2, Item 9) with O-ring (Figure 2, Item 11) in place.
32. Install TXV (Figure 2, Item 12) and tighten ORS fitting (Figure 2, Item 9) onto liquid line (Figure 2, Item 10).
33. Install TXV bulb (Figure 2, Item 5) with clamp (Figure 2, Item 7) into position on suction line (Figure 2, Item 8) where previously noted during removal, and tighten.
34. Secure capillary tube (Figure 2, Item 6) to refrigerant piping with wire ties as needed.
35. Install insulation (Figure 2, Item 15) onto TXV bulb (Figure 2, Item 5) and suction line (Figure 2, Item 8).
36. Install evaporator cover (Figure 2, Item 1) using two bolts (Figure 2, Item 2) and two washers (Figure 2, Item 3).
37. Perform evacuation and dehydration (WP 0032, Service).

NOTE

The thermostatic expansion valve replacement is preset in the factory and should not require any adjustment. If the refrigeration unit is slow in pulling temperatures, or pressures do not correspond to relevant temperatures after replacement of the valve, diagnose and repair any other possible malfunctions.

38. Check refrigerant level and charge system with refrigerant as required (WP 0032, Service).
39. Operate refrigeration unit under normal conditions to ensure proper operation (WP 0005, Operating Procedures).
40. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).
41. Refer to Table 1 for R-404A pressure – temperature chart to determine S^T.

REPLACE – CONTINUED

Table 1. R-404A Pressure – Temperature Chart to Determine S^T.

Temperature		Pressure		
°F	°C	PSIG	Kg/cm ²	Bar
-40	-40	4.5	0.32	0.31
-35	-37	7.1	0.50	0.49
-30	-34	9.9	0.70	0.68
-25	-32	12.9	0.91	0.89
-20	-29	16.3	1.15	1.12
-18	-28	17.7	1.24	1.22
-16	-27	19.2	1.35	1.32
-14	-26	20.7	1.46	1.43
-12	-24	22.3	1.57	1.54
-10	-23	23.9	1.68	1.65
-8	-22	25.6	1.80	1.77
-6	-21	27.3	1.92	1.88
-4	-20	29.1	2.05	2.01
-2	-19	30.9	2.17	2.13
0	-18	32.8	2.31	2.26
2	-17	34.8	2.45	2.40
4	-16	36.8	2.59	2.54
6	-14	38.9	2.73	2.68
8	-13	41.1	2.89	2.83
10	-12	43.3	3.04	2.99
12	-11	45.6	3.21	3.14
14	-10	48.0	3.37	3.31
16	-9	50.4	3.54	3.47
18	-8	52.9	3.72	3.65
20	-7	55.5	3.90	3.83
22	-6	58.1	4.08	4.01
24	-4	60.9	4.28	4.20
26	-3	63.7	4.48	4.39
28	-2	66.5	4.68	4.59
30	-1	69.5	4.89	4.79

Temperature		Pressure		
°F	°C	PSIG	Kg/cm ²	Bar
32	0	72.5	5.10	5.00
34	1	75.6	5.32	5.21
36	2	78.8	5.54	5.43
38	3	82.1	5.77	5.66
40	4	85.5	6.01	5.90
42	6	89.0	6.26	6.14
44	7	92.5	6.50	6.38
46	8	96.2	6.76	6.63
48	9	99.9	7.02	6.89
50	10	103.7	7.29	7.15
55	13	115.4	8.11	7.96
60	16	126.1	8.87	8.69
65	18	137.4	9.66	9.47
70	21	149.4	10.50	10.30
75	24	162.1	11.40	11.18
80	27	175.5	12.34	12.10
85	29	189.6	13.33	13.07
90	32	204.5	14.38	14.10
95	35	220.2	15.48	15.18
100	38	236.8	16.65	16.33
105	41	254.2	17.87	17.53
110	43	272.4	19.15	18.78
115	46	291.6	20.50	20.11
120	49	311.8	21.92	21.50
125	52	332.9	23.41	22.95
130	54	355.0	24.96	24.48
135	57	378.1	26.58	26.07
140	60	402.3	28.28	27.74
145	63	427.6	30.06	29.48
150	66	454.0	31.92	31.30

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
CONTROL PANEL ASSEMBLY
REPAIR

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Personnel Required

Utilities Equipment Repairer

References

WP 0005
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)
Battery negative (-) terminal disconnected (WP 0070)

REPAIR

1. Open and secure control panel assembly access door (Figure 1, Item 8).
2. Proceed to appropriate repair procedure below.

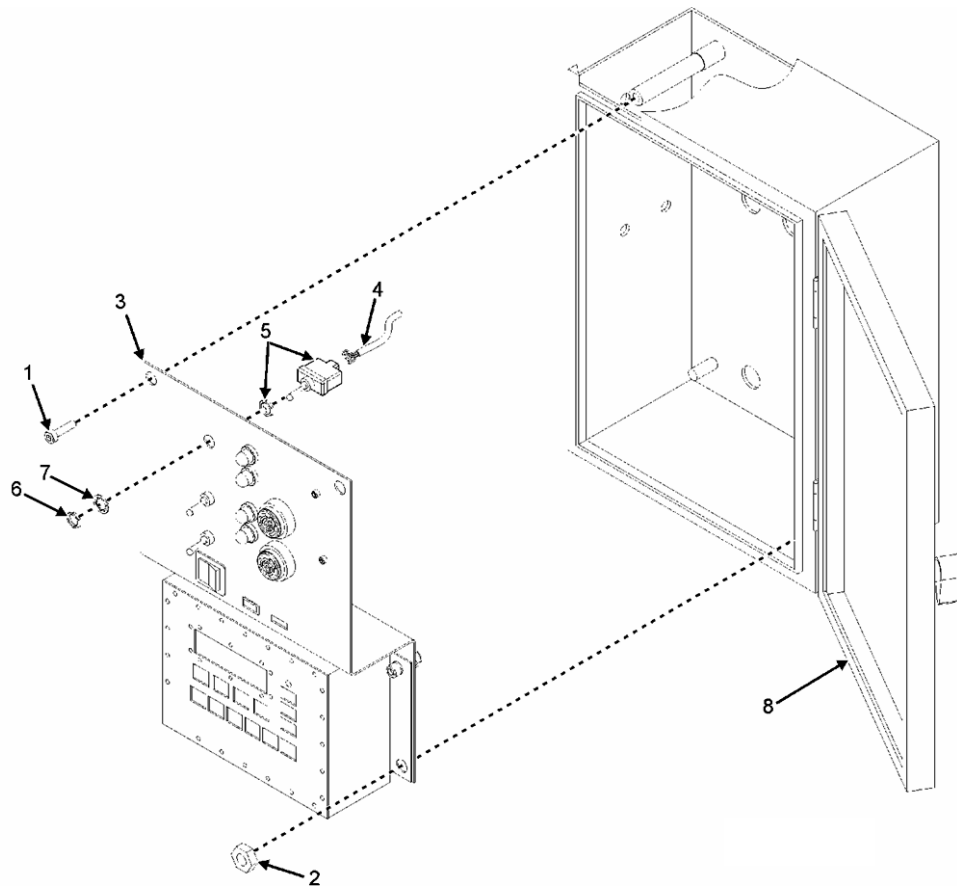


Figure 1. Control Panel – Toggle Switches.

REPAIR – CONTINUED**Replace Toggle Switches****NOTE**

There are three toggle switches on the control panel assembly – FUEL LEVEL INDICATOR toggle switch S5, LIGHTING toggle switch S3, and ALARM toggle switch S6. This procedure is applicable to the replacement of any of these switches.

1. Remove top two screws (Figure 1, Item 1) and bottom two nuts (Figure 1, Item 2) securing control panel cover (Figure 1, Item 3).
2. Carefully pull control panel cover (Figure 1, Item 3) out and away from control panel assembly to access wiring (Figure 1, Item 4).
3. Tag and disconnect wiring (Figure 1, Item 4) from switch (Figure 1, Item 5).
4. Remove nut (Figure 1, Item 6) and washer (Figure 1, Item 7) securing switch (Figure 1, Item 5) to control panel cover (Figure 1, Item 3).
5. Remove switch (Figure 1, Item 5) from control panel cover (Figure 1, Item 3).
6. Install replacement switch (Figure 1, Item 5) into control panel cover (Figure 1, Item 3) and secure to control panel cover with washer (Figure 1, Item 7) and nut (Figure 1, Item 6).
7. Reconnect wiring (Figure 1, Item 4) to switch (Figure 1, Item 5) as tagged. Remove tags.
8. Install control panel cover (Figure 1, Item 3) onto control panel and secure top with two screws (Figure 1, Item 1) and bottom with two nuts (Figure 1, Item 2).
9. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
10. Start refrigeration unit (WP 0005, Operating Procedures).
11. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of toggle switches (WP 0005, Operating Procedures).
12. Close and secure control panel assembly access door (Figure 1, Item 8).
13. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED**Replace Indicator Light Incandescent Lamps****NOTE**

There are four indicator lights on the Control Panel Assembly – FUEL LEVEL GOOD DS3, FUEL LEVEL LOW DS4, COMPARTMENT 1 TEMP ALARM OVER/UNDER DS1, and COMPARTMENT 2 TEMP ALARM OVER/UNDER DS2. This procedure is applicable to the replacement of the incandescent lamps in each of these indicator lights.

1. Unscrew light lens (Figure 2, Item 1) in counterclockwise direction from indicator light assembly (Figure 2, Item 2) and remove light lens (Figure 2, Item 1) and gasket. Inspect gasket for any nicks or cuts and replace light lens and gasket if necessary.
2. Remove incandescent lamp (Figure 2, Item 9) from indicator light assembly (Figure 2, Item 2).
3. Install replacement incandescent lamp (Figure 2, Item 3) into indicator light assembly (Figure 2, Item 2).
4. Install light lens (Figure 2, Item 1) and gasket onto indicator light assembly (Figure 2, Item 2) by turning in clockwise direction.
5. Reconnect battery negative (-) terminal (WP 0070, Disconnect).
6. Start refrigeration unit (WP 0005, Operating Procedures).
7. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of indicator lights (WP 0005, Operating Procedures).
8. Close and secure control panel assembly access door (Figure 2, Item 4).
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

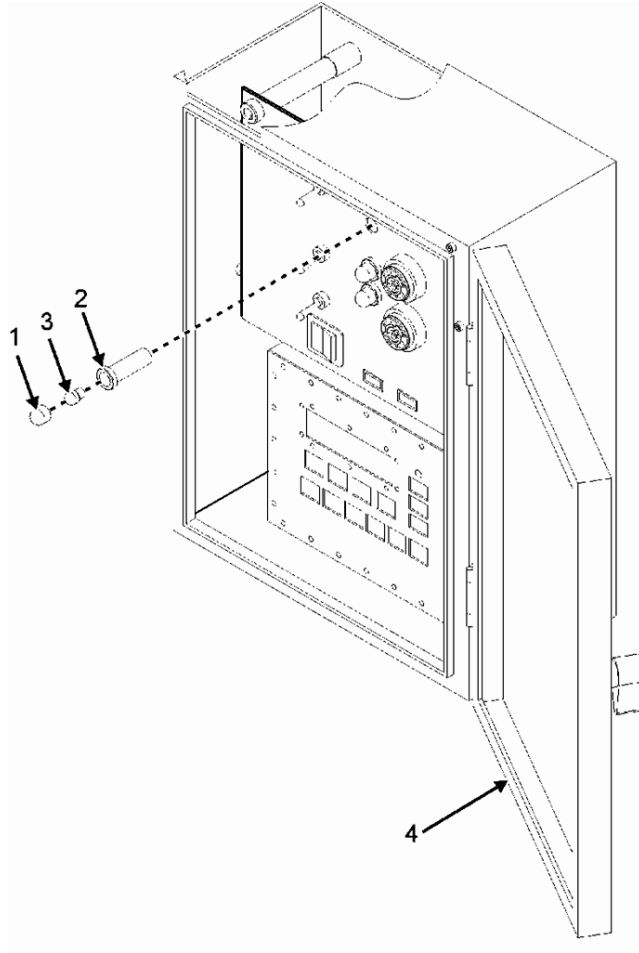


Figure 2. Control Panel – Indicator Light Incandescent Lamps.

REPAIR – CONTINUED**Replace Indicator Lights****NOTE**

There are four indicator lights on the Control Panel Assembly – FUEL LEVEL GOOD DS3, FUEL LEVEL LOW DS4, COMPARTMENT 1 TEMP ALARM OVER/UNDER DS1, and COMPARTMENT 2 TEMP ALARM OVER/UNDER DS2. This procedure is applicable to the replacement of each of these indicator lights.

1. Remove top two screws (Figure 3, Item 1) and bottom two nuts (Figure 3, Item 2) securing control panel cover (Figure 3, Item 3).
2. Carefully pull control panel cover (Figure 3, Item 3) out and away from control panel to access wiring (Figure 3, Item 4).
3. Unscrew light lens (Figure 3, Item 5) in counterclockwise direction from indicator light assembly (Figure 3, Item 6) and remove light lens (Figure 3, Item 5) and gasket. Inspect gasket for any nicks or cuts and replace light lens and gasket if necessary.
4. Remove incandescent lamp (Figure 3, Item 7) from indicator light assembly (Figure 3, Item 6).
5. Tag and disconnect wiring (Figure 3, Item 4) from indicator light assembly (Figure 3, Item 6) by desoldering electrical leads from light assembly.
6. Loosen and remove nut (Figure 3, Item 8) securing indicator light assembly (Figure 3, Item 6) to control panel cover (Figure 3, Item 3).
7. Remove indicator light assembly (Figure 3, Item 6).
8. Install replacement indicator light assembly (Figure 3, Item 6) into control panel cover (Figure 3, Item 3) and secure with nut (Figure 3, Item 8).
9. Reconnect wiring (Figure 3, Item 4) to indicator light assembly (Figure 3, Item 6) by soldering as tagged. Remove tags.
10. Install replacement incandescent lamp (Figure 3, Item 7) into indicator light assembly (Figure 3, Item 6).
11. Install light lens (Figure 3, Item 5) and gasket onto indicator light assembly (Figure 3, Item 6) by turning in clockwise direction.
12. Install control panel cover (Figure 3, Item 3) onto control panel and secure top with two screws (Figure 3, Item 1) and bottom with two nuts (Figure 3, Item 2).
13. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
14. Start refrigeration unit (WP 0005, Operating Procedures).
15. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of indicator lights (WP 0005, Operating Procedures).

REPAIR – CONTINUED

16. Close and secure control panel assembly access door (Figure 3, Item 13).
17. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

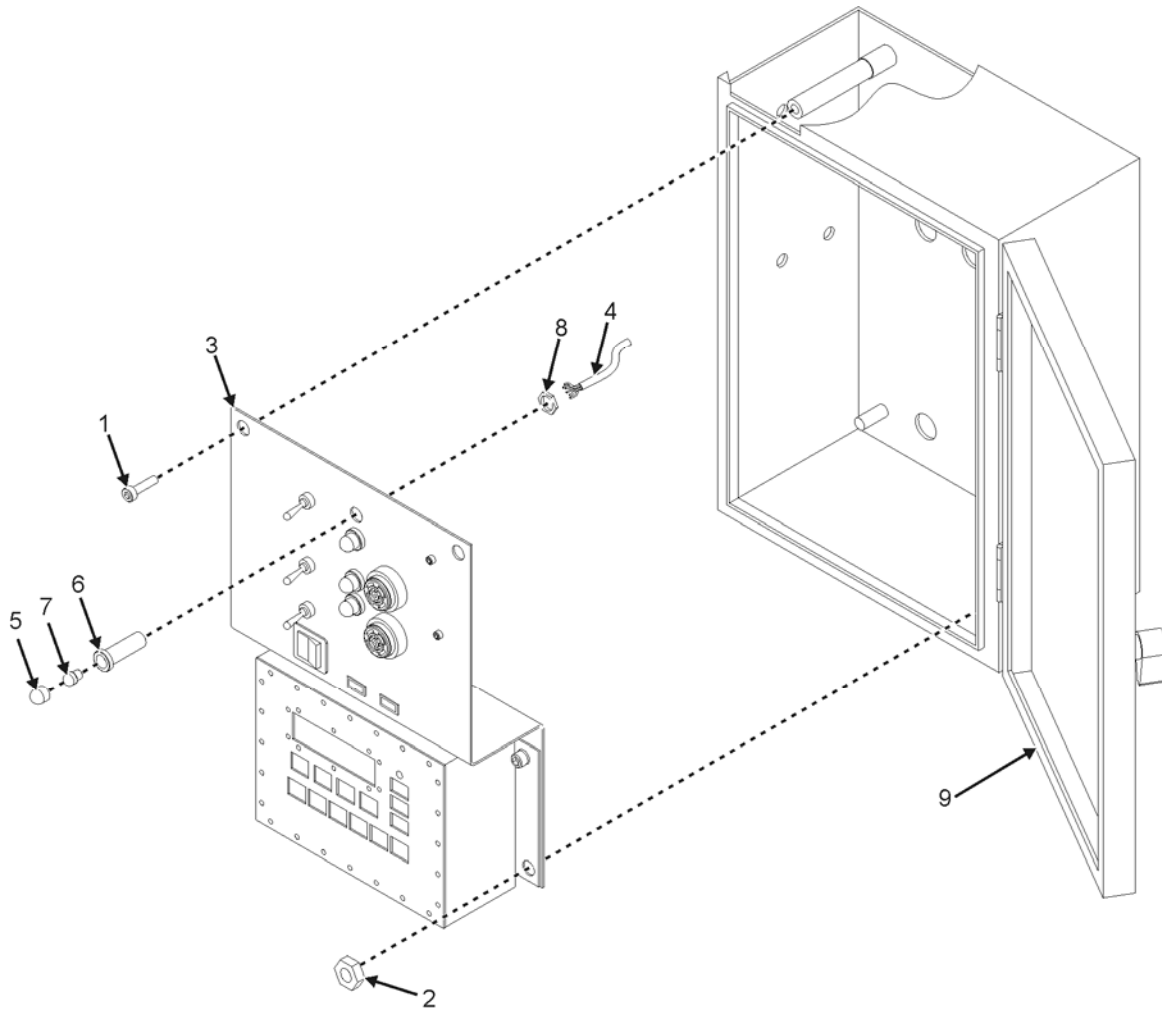


Figure 3. Control Panel – Indicator Lights.

REPAIR – CONTINUED**Replace Alarm Horns****NOTE**

There are two alarm horns on the Control Panel Assembly – COMPARTMENT 1 TEMP ALARM OVER/UNDER horn HN1, and COMPARTMENT 2 TEMP ALARM OVER/UNDER horn HN2. This procedure is applicable to the replacement of either alarm horn.

1. Remove top two screws (Figure 4, Item 1) and bottom two nuts (Figure 4, Item 2) securing control panel cover (Figure 4, Item 3).
2. Carefully pull control panel cover (Figure 4, Item 3) out and away from control panel to access wiring (Figure 4, Item 4).
3. Tag and disconnect wiring (Figure 4, Item 4) to alarm horn (Figure 4, Item 5).
4. Loosen and remove knurled nut (Figure 4, Item 6) securing alarm horn (Figure 4, Item 5) to control panel cover (Figure 4, Item 3).
5. Remove alarm horn (Figure 4, Item 5).
6. Install replacement alarm horn (Figure 4, Item 5) into control panel cover (Figure 4, Item 3) and secure with knurled nut (Figure 4, Item 6).
7. Reconnect wiring (Figure 4, Item 4) to alarm horn (Figure 4, Item 5) as tagged. Remove tags.
8. Install control panel cover (Figure 4, Item 3) onto control panel and secure top with two screws (Figure 4, Item 1) and bottom with two nuts (Figure 4, Item 2).
9. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
10. Start refrigeration unit (WP 0005, Operating Procedures).
11. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of alarm horns (WP 0005, Operating Procedures).
12. Close and secure control panel assembly access door (Figure 4, Item 7).
13. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

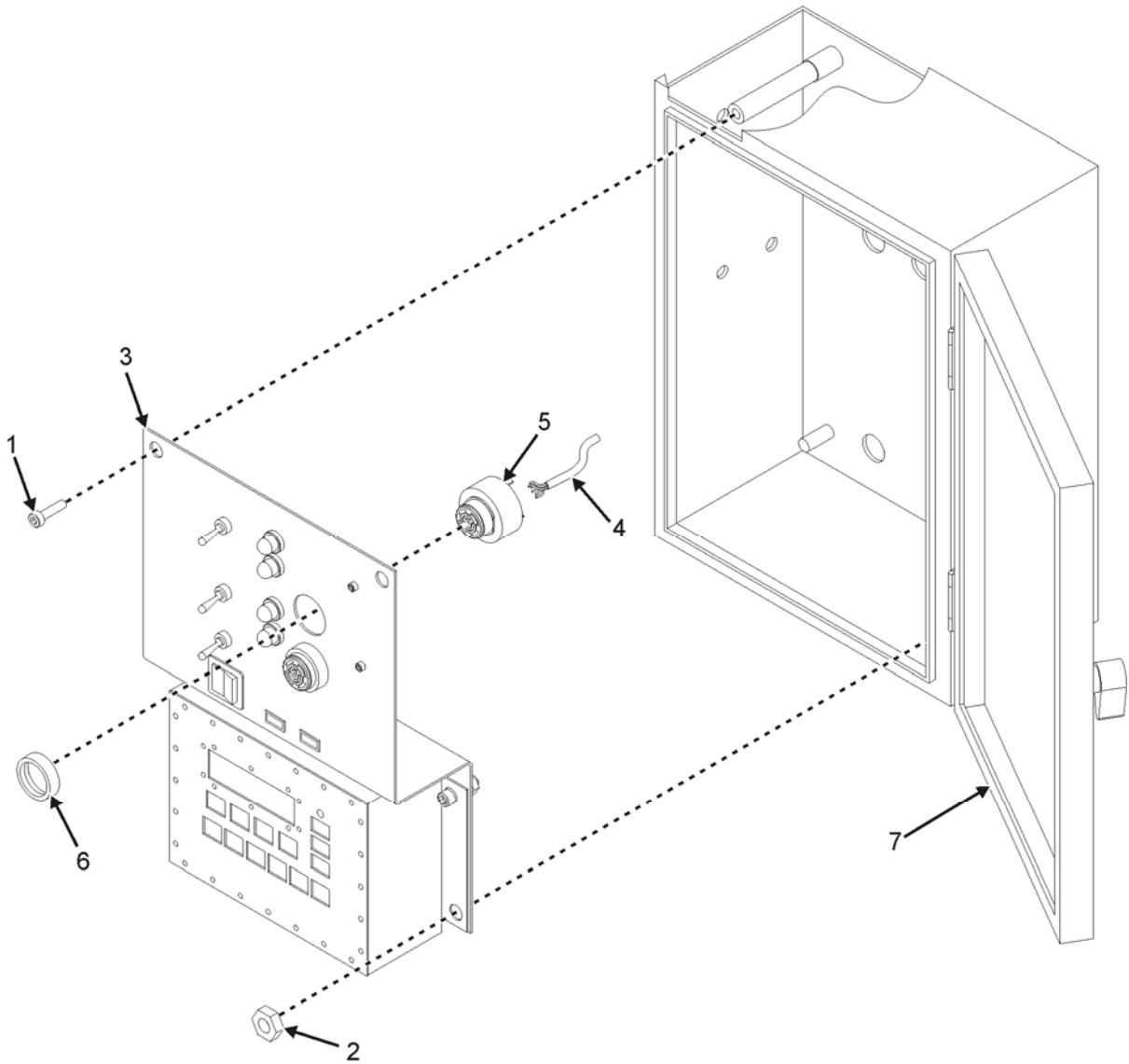


Figure 4. Control Panel – Alarm Horns.

REPAIR – CONTINUED**Replace Terminal Board**

1. Remove top two screws (Figure 5, Item 1) and bottom two nuts (Figure 5, Item 2) securing control panel cover (Figure 5, Item 3).
2. Carefully pull control panel cover (Figure 5, Item 3) out and away from control panel to access wiring (Figure 5, Item 4).
3. Tag and disconnect wiring (Figure 5, Item 4) from terminal board (Figure 5, Item 5).
4. Remove two nuts (Figure 5, Item 6), two lock washers (Figure 5, Item 7), and two screws (Figure 5, Item 8) securing terminal board (Figure 5, Item 5) to control panel cover (Figure 5, Item 3). Discard lock washers.
5. Remove terminal board (Figure 5, Item 5).
6. Install replacement terminal board (Figure 5, Item 5) onto control panel cover (Figure 5, Item 3) and secure with two screws (Figure 5, Item 8), two new lock washers (Figure 5, Item 7), and two nuts (Figure 5, Item 6).
7. Reconnect wiring (Figure 5, Item 4) to terminal board (Figure 5, Item 5) as tagged. Remove tags.
8. Install control panel cover (Figure 5, Item 3) onto control panel and secure top with two screws (Figure 5, Item 1) and bottom with two nuts (Figure 5, Item 2).
9. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
10. Start refrigeration unit (WP 0005, Operating Procedures).
11. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of terminal board (WP 0005, Operating Procedures).
12. Close and secure control panel assembly access door (Figure 5, Item 9).
13. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

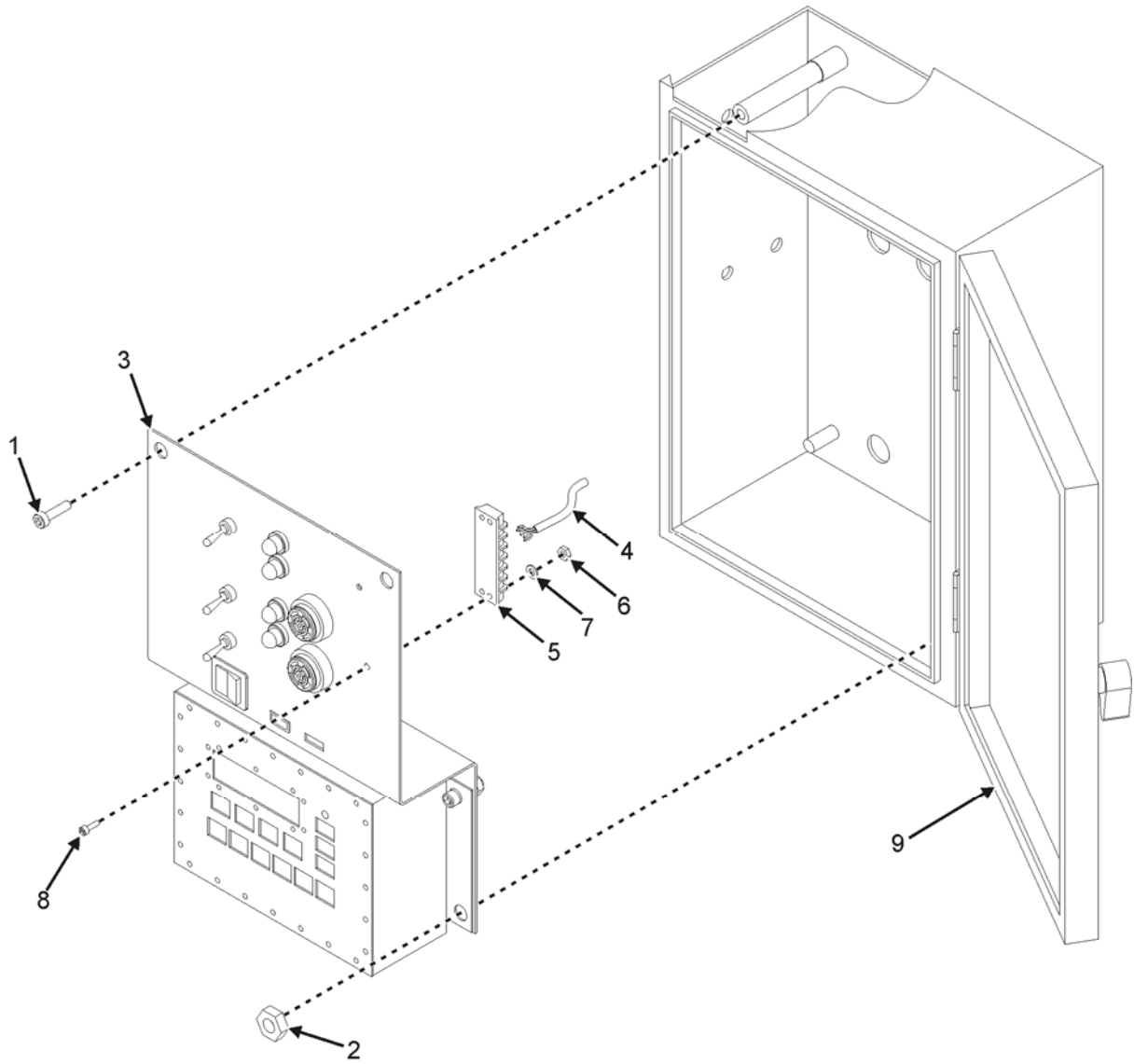


Figure 5. Control Panel – Terminal Board.

REPAIR – CONTINUED**Replace Compartment ON/OFF Switches****NOTE**

There are two switches for compartment ON/OFF control on the Control Panel Assembly; one for each compartment. This procedure is applicable to the replacement of either of these switches.

1. Remove top two screws (Figure 6, Item 1) and bottom two nuts (Figure 6, Item 2) securing control panel cover (Figure 6, Item 3).
2. Carefully pull control panel cover (Figure 6, Item 3) out and away from control panel to access wiring (Figure 6, Item 4).
3. Tag and disconnect wiring (Figure 6, Item 4) from switch (Figure 6, Item 5).
4. Squeeze locking tabs of switch from rear side to remove switch (Figure 6, Item 5) from control panel.
5. Install replacement switch (Figure 6, Item 5) into control panel by pressing into place until locked by tabs.
6. Reconnect wiring (Figure 6, Item 4) to switch (Figure 6, Item 5) as tagged. Remove tags.
7. Install control panel cover (Figure 6, Item 3) onto control panel and secure top with two screws (Figure 6, Item 1), and bottom with two nuts (Figure 6, Item 2).
8. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
9. Start refrigeration unit (WP 0005, Operating Procedures).
10. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation (WP 0005, Operating Procedures).
11. Close and secure control panel assembly access door (Figure 6, Item 6).
12. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

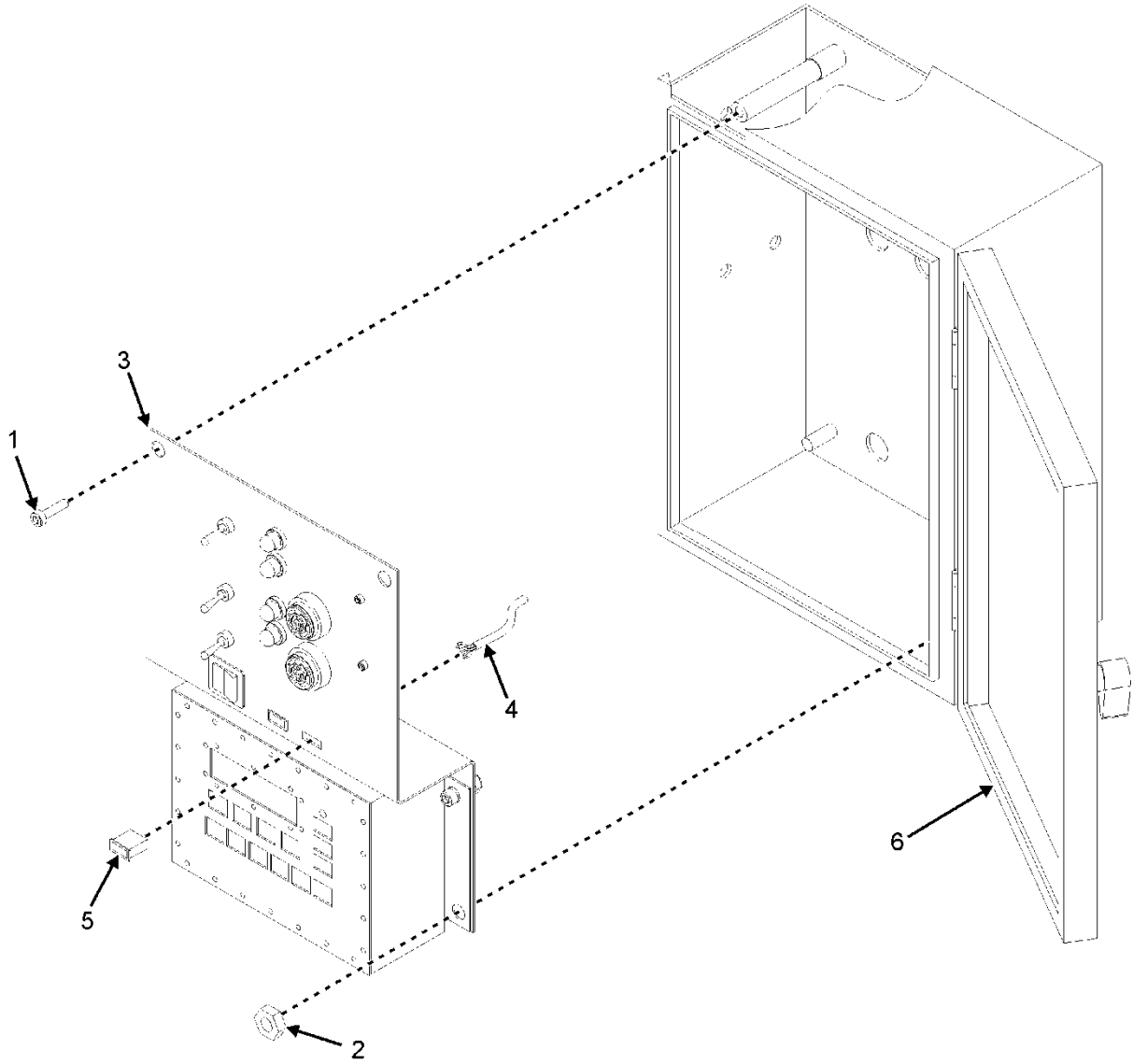


Figure 6. Control Panel – ON/OFF Switches.

REPAIR – CONTINUED**Replace POWER ON/DOWN Switch**

1. Remove top two screws (Figure 7, Item 1) and bottom two nuts (Figure 7, Item 2) securing control panel cover (Figure 7, Item 3).
2. Carefully pull control panel cover (Figure 7, Item 3) out and away from control panel to access wiring (Figure 7, Item 4).
3. Tag and disconnect wiring (Figure 7, Item 5) from switch (Figure 7, Item 6).
4. Squeeze locking tabs of switch from rear side to remove switch (Figure 7, Item 6) from control panel.
5. Install replacement switch (Figure 7, Item 6) into control panel by pressing into place until locked by tabs.
6. Reconnect wiring (Figure 7, Item 5) to switch (Figure 7, Item 6) as tagged. Remove tags.
7. Install control panel cover (Figure 7, Item 3) onto control panel and secure top with two screws (Figure 7, Item 1), and bottom with two nuts (Figure 7, Item 2).
8. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
9. Start refrigeration unit (WP 0005, Operating Procedures).
10. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of compartment on/off switches (WP 0005, Operating Procedures).
11. Close and secure control panel assembly access door (Figure 7, Item 7).
12. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

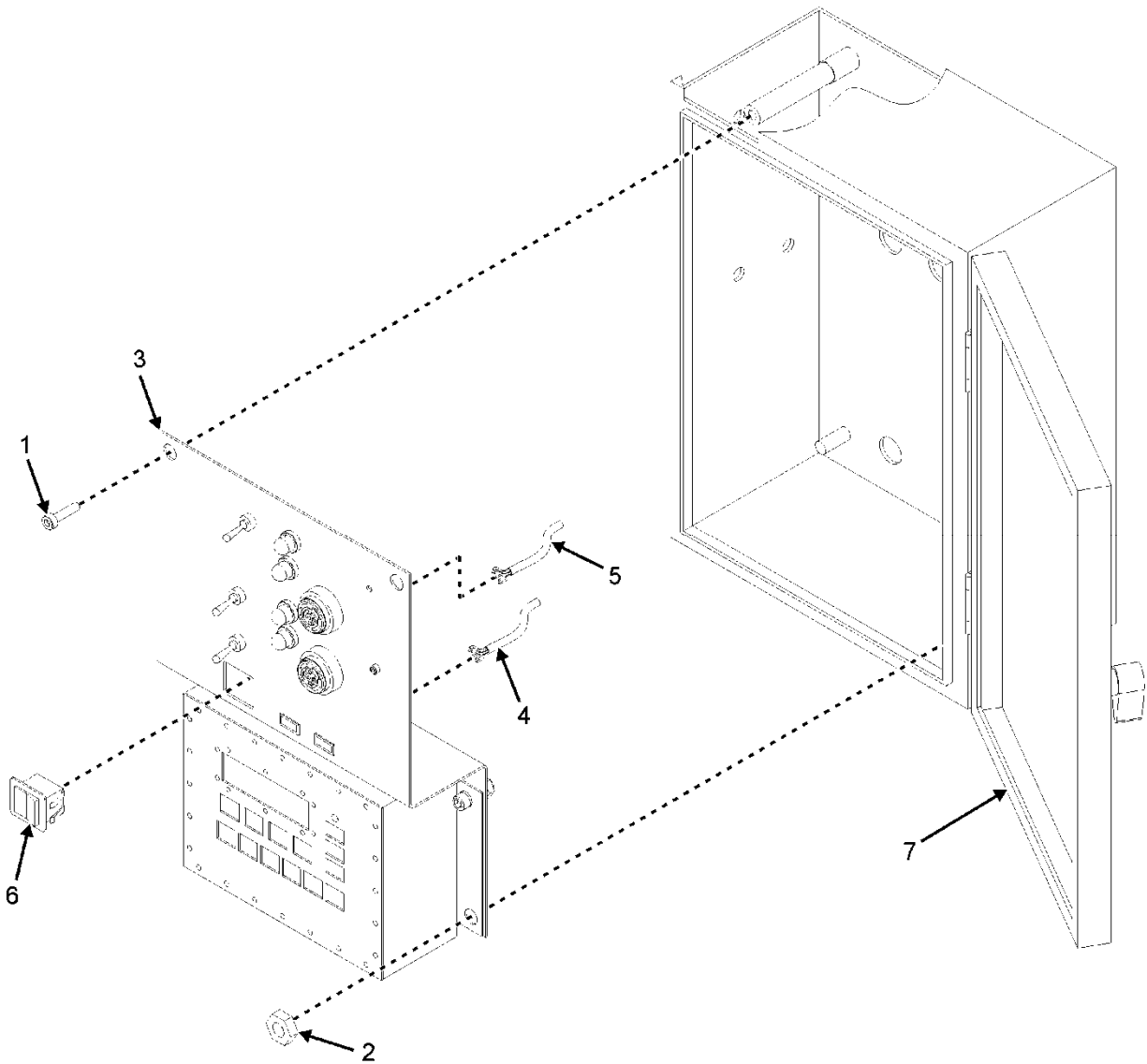


Figure 7. Control Panel – POWER ON/DOWN Switch.

REPAIR – CONTINUED**Replace Resistive Heating Element**

1. Open control box door (Figure 8, Item 1).
2. Remove 24 screws (Figure 8, Item 2) securing cover assembly (Figure 8, Item 3) to controller. Retain screws for reinstallation.
3. Pull cover assembly (Figure 8, Item 3) with controller attached out of control box and position out of way to gain access to hardware behind controller.
4. Remove two nuts (Figure 8, Item 4) securing bottom of control panel assembly (Figure 8, Item 5) to control box (Figure 8, Item 6).
5. Remove two screws (Figure 8, Item 7) securing top of control panel assembly (Figure 8, Item 5) to control box (Figure 8, Item 6).
6. Carefully pull control panel assembly (Figure 8, Item 5) and two spacers (Figure 8, Item 8) out of control box (Figure 8, Item 6).

NOTE

With wires disconnected from the resistive heating element, the element can be tested by checking resistance of the element is 5.0-ohms +/- 10%.

7. Tag and disconnect two wires attached to resistive heating element (Figure 8, Item 9).
8. Remove two screws (Figure 8, Item 10), washers (Figure 8, Item 11), lock washers (Figure 8, Item 12) and nuts (Figure 8, Item 13) securing resistive heating element (Figure 8, Item 9) to back of control panel assembly (Figure 8, Item 5).
9. Remove resistive heating element (Figure 8, Item 9).
10. Install replacement resistive heating element (Figure 8, Item 9) on back of control panel assembly (Figure 8, Item 5) and secure using two screws (Figure 8, Item 10), washers (Figure 8, Item 11), lock washers (Figure 8, Item 12) and nuts (Figure 8, Item 13).
11. Connect two wires to resistive heating element (Figure 8, Item 9) as tagged. Remove tags.
12. Install control panel assembly (Figure 8, Item 5) and two spacers (Figure 8, Item 8) inside control box (Figure 8, Item 6) and secure top with two screws (Figure 8, Item 7).
13. Secure bottom of control panel assembly (Figure 8, Item 5) to control box (Figure 8, Item 6) using two nuts (Figure 8, Item 4).
14. Install cover assembly (Figure 8, Item 3) with controller attached into control box and secure using 24 screws (Figure 8, Item 2).
15. Close control box door (Figure 8, Item 1).
16. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

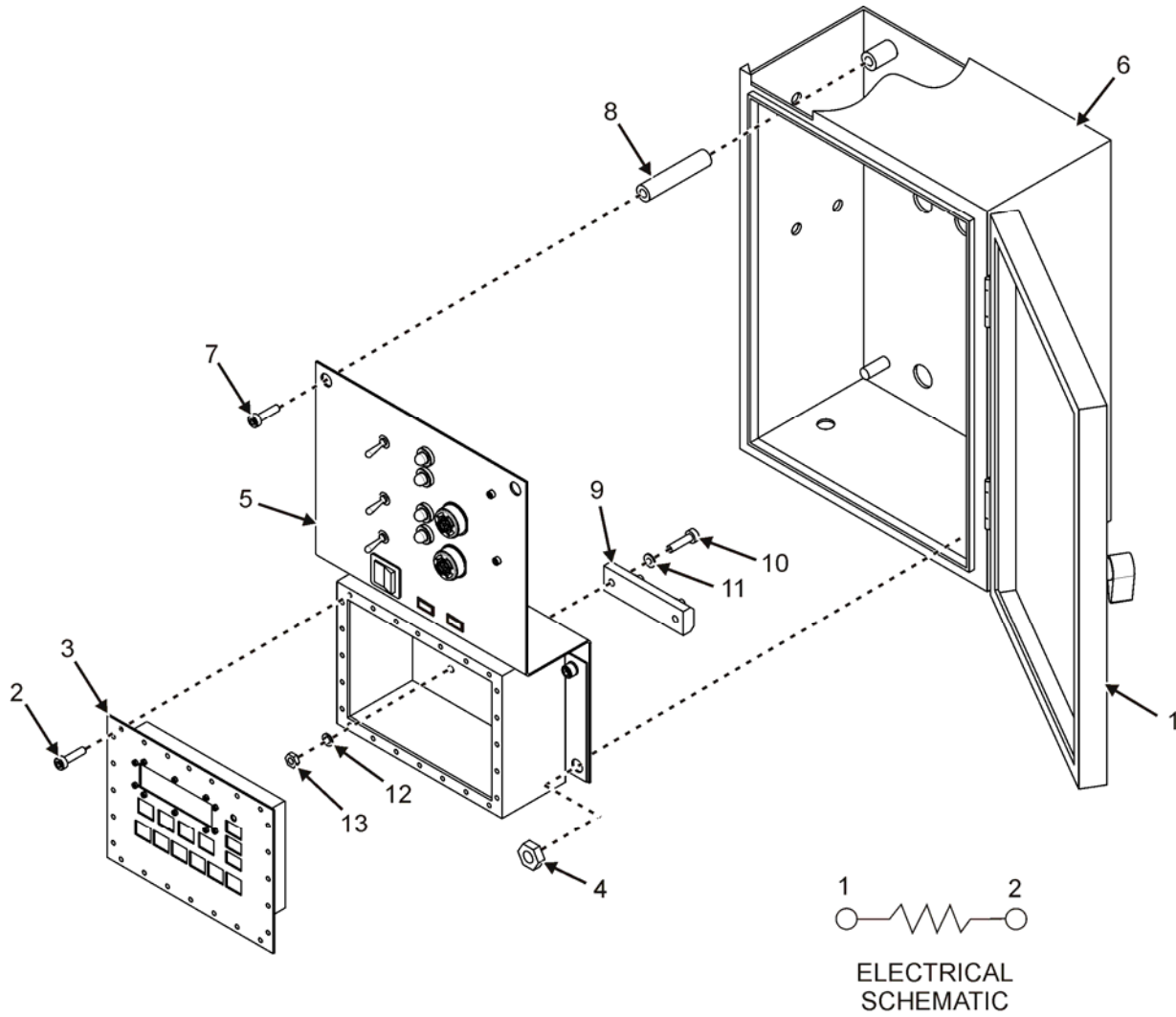


Figure 8. Resistive Heating Element.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
POWER BOX
REPAIR

INITIAL SETUP:**Tools and Special Tools**

Electrical Connector Kit (WP 0107, Table 2, Item 3)
Hoist, Chain (WP 0107, Table 2, Item 2)
SATS (WP 0107, Table 2, Item 8)
Sling (WP 0110, Item 46)

Materials/Parts

Tie Wrap (WP 0110, Item 55)

Personnel Required

Quartermaster and Chemical Equipment Repairer (3)

References

WP 0005
WP 0069
WP 0070
WP 0102
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Battery disconnected (WP 0070)
External power cables disconnected (WP 0005)

REPAIR**Replace Door Handle**

1. Open power box door (Figure 1, Item 1) and secure open.
2. Remove nut (Figure 1, Item 2) and lock washer (Figure 1, Item 3) securing latching mechanism (Figure 1, Item 4) to inside door (Figure 1, Item 1). Discard lock washer.
3. Remove latching mechanism (Figure 1, Item 4).
4. Remove two screws (Figure 1, Item 5) securing handle (Figure 1, Item 6) to door (Figure 1, Item 1).
5. Remove handle (Figure 1, Item 6).
6. Install new handle (Figure 1, Item 6) into door (Figure 1, Item 1) and secure using two screws (Figure 1, Item 5).

NOTE

Make sure that the new handle is oriented correctly so that rotation of the handle causes latching mechanism to contact power box frame.

7. Install latching mechanism (Figure 1, Item 4) onto door (Figure 1, Item 1) and secure using new lock washer (Figure 1, Item 3) and nut (Figure 1, Item 2).
8. Close and latch power box door (Figure 1, Item 1).
9. Operate unit in accordance with normal operating procedures to test for proper operation (WP 0005, Operating Procedures).
10. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

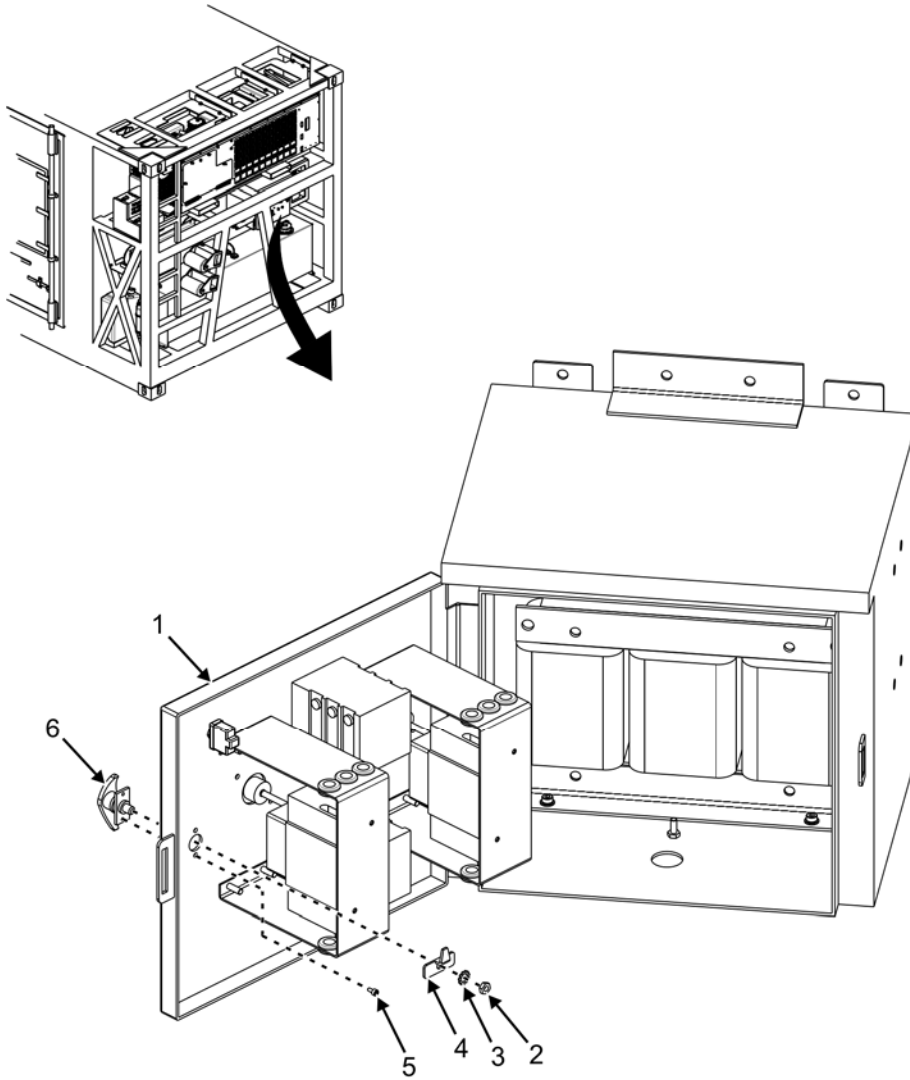


Figure 1. Power Control Box Door.

REPAIR – CONTINUED**Replace Selector Switches S1, S2****NOTE**

This WP procedure can be used to replace either of the rotary cam switches, S1 or S2. For this reason, no specific switch will be referred to in the procedure.

1. Open power box door (Figure 2, Item 1) and secure open.
2. Tag wiring (Figure 2, Item 2) to selector switch (Figure 2, Item 9).
3. Carefully cut and remove any tie straps (Figure 2, Item 4), if required, to gain access to selector switch terminal screws (Figure 2, Item 5).
4. Remove terminal screws (Figure 2, Item 5) and disconnect wiring (Figure 2, Item 2) from selector switch (Figure 2, Item 9).
5. Remove one screw (Figure 2, Item 6) securing selector switch knob (Figure 2, Item 3) to switch (Figure 1, Item 9) shaft.

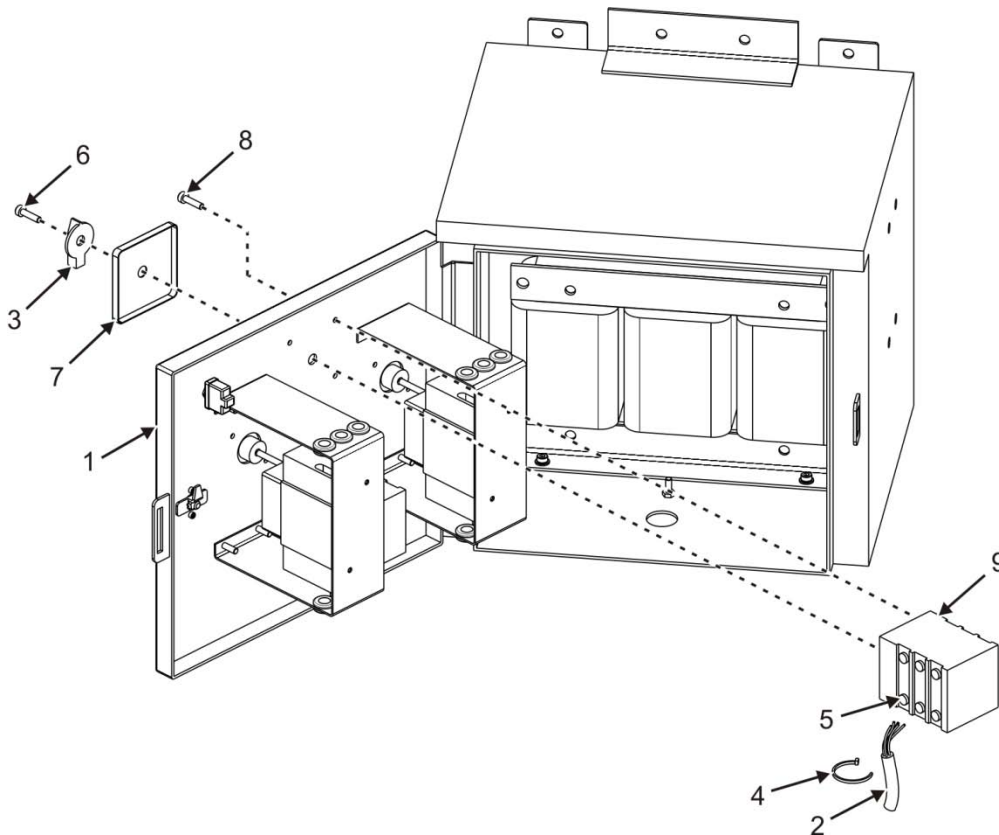


Figure 2. Power Control Box Selector Switch.

REPAIR – CONTINUED

6. Remove selector switch knob (Figure 2, Item 3) and selector switch plate (Figure 2, Item 7).
7. Remove four screws (Figure 2, Item 8) securing selector switch (Figure 2, Item 9) to power box door (Figure 2, Item 1).
8. Remove selector switch (Figure 2, Item 9) through rear side of power box door (Figure 2, Item 1).
9. Install new selector switch (Figure 2, Item 9) through rear side of power box door (Figure 2, Item 1) and secure using four screws (Figure 2, Item 8).
10. Install selector switch plate (Figure 2, Item 7) and selector switch knob (Figure 2, Item 3) and secure with screw (Figure 2, Item 6).
11. Reconnect wiring (Figure 2, Item 2) to selector switch (Figure 2, Item 9) as tagged and secure using terminal screws (Figure 2, Item 5).
12. Torque terminal screws (Figure 2, Item 5) to 20 to 25 inch-pounds (WP 0102).
13. Remove wire tags.
14. Reinstall tie straps (Figure 2, Item 4) as required to secure wiring (Figure 2, Item 2) inside of power box.
15. Close power box door (Figure 2, Item 1).
16. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
17. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of selector switches S1, S2 (WP 0005, Operating Procedures).
18. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

Replace Circuit Breakers CB1, CB2**NOTE**

This WP procedure can be used to replace either of the circuit breakers, CB1 or CB2. For this reason, no specific circuit breaker will be referred to in the procedure.

1. Open power box door (Figure 3, Item 1) and secure open.
2. Tag wiring (Figure 3, Item 2) to circuit breaker (Figure 3, Item 3).
3. Carefully cut and remove any tie straps (Figure 3, Item 4), if required, to gain access to terminal screws (Figure 3, Item 5).
4. Remove two screws (Figure 3, Item 13) securing circuit breaker handle mechanism (Figure 3, Item 6) to power box door (Figure 3, Item 1).
5. Remove circuit breaker handle mechanism (Figure 3, Item 6).
6. Remove four screws (Figure 3, Item 7), lock washers (Figure 3, Item 8), washers (Figure 3, Item 9), and nylon washers (Figure 3, Item 10) securing circuit breaker bracket (Figure 3, Item 11) to power box door (Figure 3, Item 1). Discard lock washers.

REPAIR – CONTINUED

7. Carefully pull circuit breaker bracket (Figure 3, Item 11), with circuit breaker (Figure 3, Item 3) attached, away from rear side of power box door (Figure 3, Item 1).
8. Remove two screws (Figure 3, Item 12) securing circuit breaker (Figure 3, Item 3) to circuit breaker bracket (Figure 3, Item 11).
9. Remove circuit breaker (Figure 3, Item 3) from circuit breaker bracket (Figure 3, Item 11).
10. Remove circuit breaker terminal screws (Figure 3, Item 5) and disconnect wiring (Figure 3, Item 2) from circuit breaker (Figure 3, Item 3).
11. Remove circuit breaker (Figure 3, Item 3).
12. Reconnect wiring (Figure 3, Item 2) to new circuit breaker (Figure 3, Item 3) as tagged and secure using terminal screws (Figure 3, Item 5). Torque terminal screws (Figure 3, Item 5) to 40 inch-pounds (WP 0102).

NOTE

Make sure that the replacement circuit breaker is low temperature rated to a -25°F.

13. Install new circuit breaker (Figure 3, Item 3) into circuit breaker bracket (Figure 3, Item 11) and secure with two screws (Figure 3, Item 12).
14. Install circuit breaker bracket (Figure 3, Item 11), with circuit breaker (Figure 3, Item 3) attached, onto power box door (Figure 3, Item 1) using four screws (Figure 3, Item 7), new lock washers (Figure 3, Item 8), washers (Figure 3, Item 9), and nylon washers (Figure 3, Item 10).
15. Tighten screws (WP 0102).
16. Install circuit breaker handle mechanism (Figure 3, Item 5) to front of power box door (Figure 3, Item 1) and secure using two screws (Figure 3, Item 13).
17. Remove tags from wiring (Figure 3, Item 2).
18. Install tie straps (Figure 3, Item 4) as required to secure wiring (Figure 3, Item 2) inside of power box (Figure 3, Item 1).
19. Close and secure power box door (Figure 3, Item 1).
20. Reconnect battery negative (-) terminal (WP 0070, Reconnect).
21. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of circuit breakers CB1, CB2 (WP 0005, Operating Procedures).
22. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED

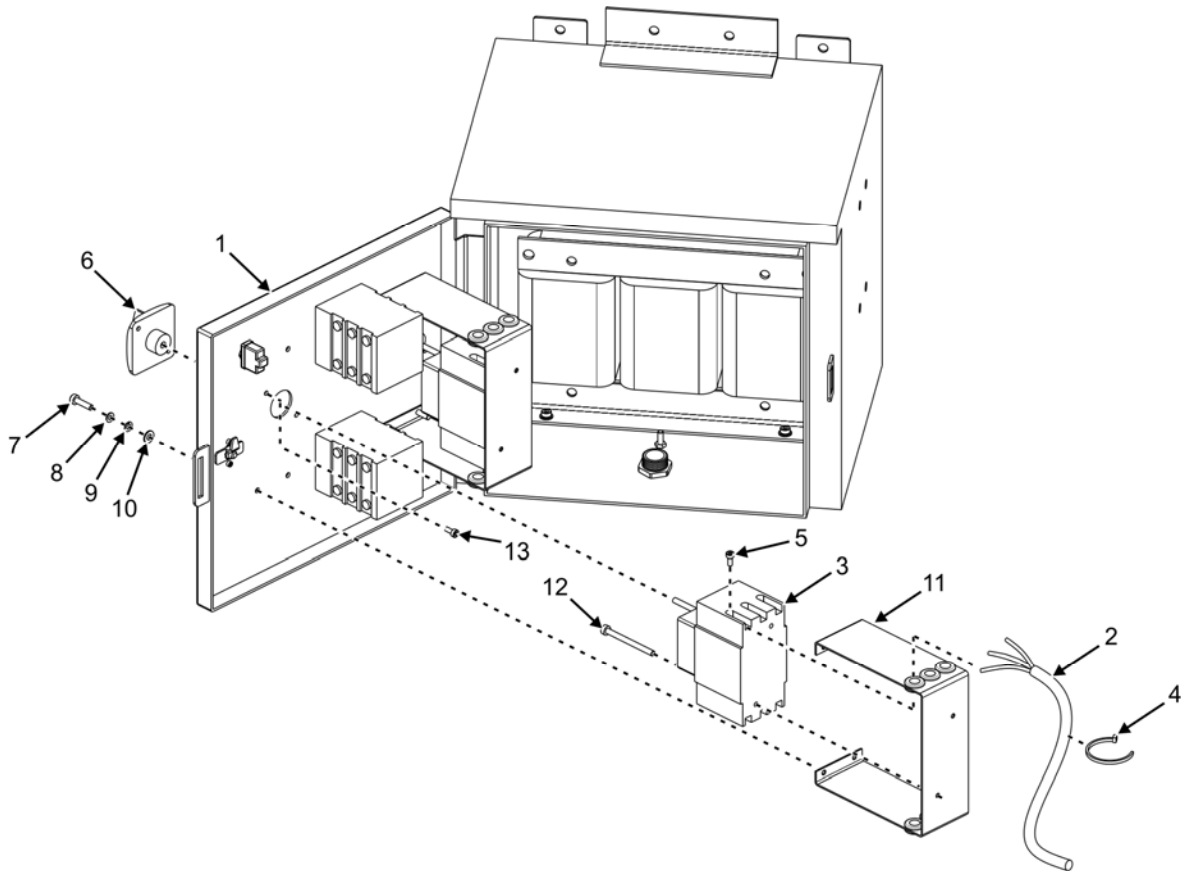


Figure 3. Power Control Box Circuit Breaker.

REPAIR – CONTINUED**Replace Toggle Switch**

1. Open power box door (Figure 4, Item 1) and secure open.

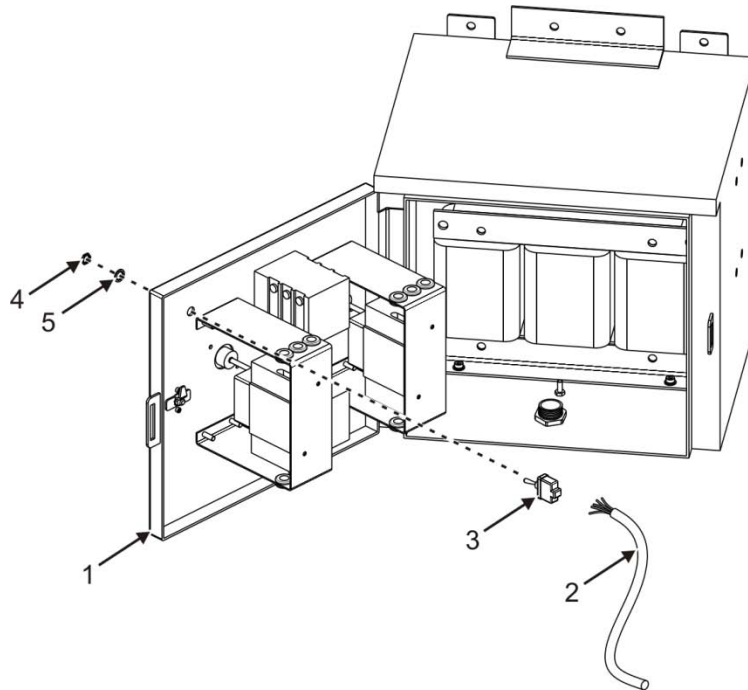


Figure 4. Replace Power Control Box Toggle Switch.

2. Tag and disconnect wiring (Figure 4, Item 2) to toggle switch (Figure 4, Item 3).
3. Remove nut (Figure 4, Item 4) and washer (Figure 4, Item 5) securing toggle switch (Figure 4, Item 3) to power box door (Figure 4, Item 1).
4. Remove toggle switch (Figure 4, Item 3).
5. Install new toggle switch (Figure 4, Item 3) onto power box door (Figure 4, Item 1) and secure using washer (Figure 4, Item 5) and nut (Figure 4, Item 4).
6. Reconnect wiring (Figure 4, Item 2) to toggle switch (Figure 4, Item 3) as tagged. Remove tags.
7. Close power box door (Figure 4, Item 1).
8. Operate unit in accordance with normal operating procedures to verify proper operation after replacement of toggle switch (WP 0005, Operating Procedures).
9. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

REPAIR – CONTINUED**Replace Transformer TR1**

1. Locate wire bundle (Figure 5, Item 1) above control panel (Figure 5, Item 2) and cut tie wraps to gain access to electrical connectors.

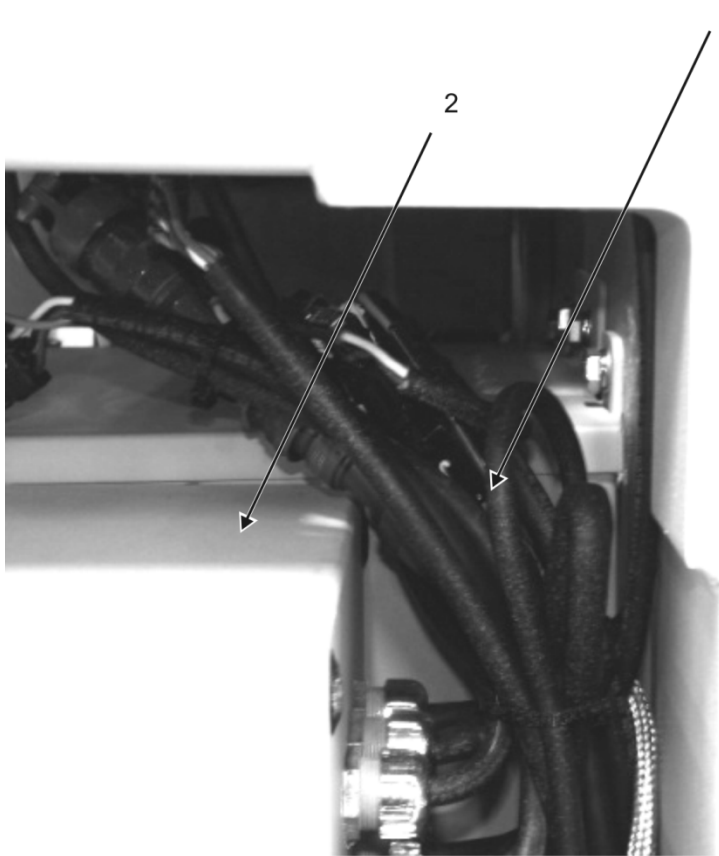


Figure 5. Control Panel Wire Bundle.

2. Tag and disconnect the following electrical connectors:
 - P3/J3
 - P4/J4
 - P5/J5
 - P6/J6
 - P7/J7
 - P8/J8
 - P9/J9
 - P10/J10
 - P11/J11
 - P12/J12
 - P13/J13

REPAIR – CONTINUED

3. Open power box door (Figure 6, Item 1).
4. Open control panel assembly door (Figure 6, Item 2).



Figure 6. Power Box and Control Panel Assembly Door.

5. Remove cable assembly P1A from storage hook (Figure 7).
6. Remove cable assembly P2A from storage hook (Figure 7).

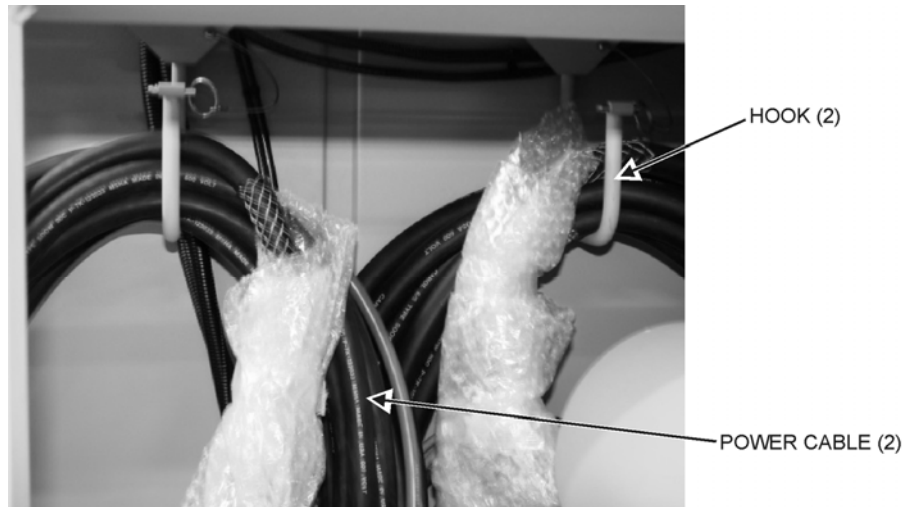


Figure 7. Cable Storage Hooks.

REPAIR – CONTINUED**NOTE**

The control panel assembly is mounted to the power box and will have to be removed in order to remove the power box. There are four bolts securing the control panel assembly to the power box. The bolts are accessible from inside the control panel assembly on the wall closest to the door handle. The nuts are accessible from inside the power box on the wall closest to the door handle.

7. Remove four nuts (Figure 8, Item 1), lock washers (Figure 8, Item 2), and washers (Figure 8, Item 3) securing control panel assembly (Figure 9, Item 3) to power box (Figure 8, Item 4).
8. Remove control panel assembly (Figure 9, Item 3) from power box (Figure 8, Item 4) and set aside with four bolts (Figure 9, Item 1) and spacers (Figure 9, Item 2).
9. Cut remaining tie wraps from wire beneath control box.
10. Pull large cables through and place to side of power box.

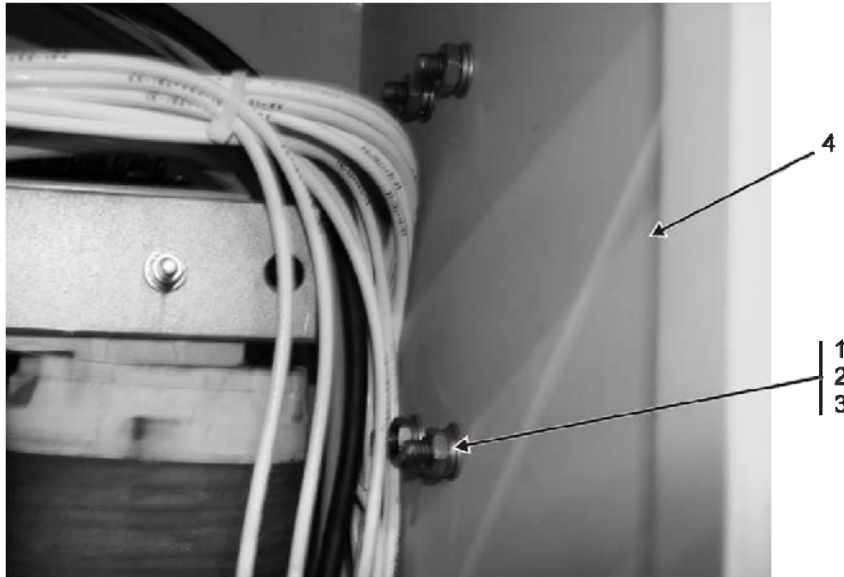


Figure 8. Power Box Attaching Hardware.

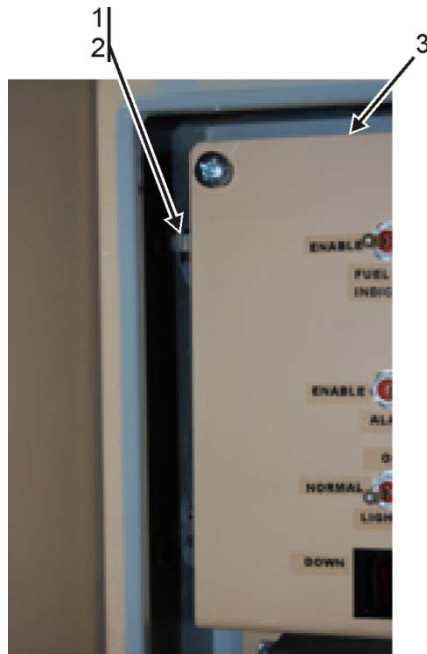
REPAIR – CONTINUED

Figure 9. Control Panel Assembly Bolts.

WARNING

Removal of the power box/transformer is performed using a forklift. The forklift operator must be aware of ground personnel at all times. Forklift can cause damage to the equipment.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

CAUTION

When positioning the fork lift tines to support the power box, make sure that you do not trap any wires between the forklift tines and the bottom of the power box.

11. Carefully position forklift tines on each side of center cable entering power box and raise tines slightly to support weight of power box during removal (Figure 10).

REPAIR – CONTINUED



Figure 10. Positioning Forklift Entering Power Box.

12. Remove four bolts (Figure 11, Item 1), lock washers (Figure 11, Item 2), and washers (Figure 11, Item 3) securing bottom of power box (Figure 11, Item 4) to container wall (Figure 11, Item 5).

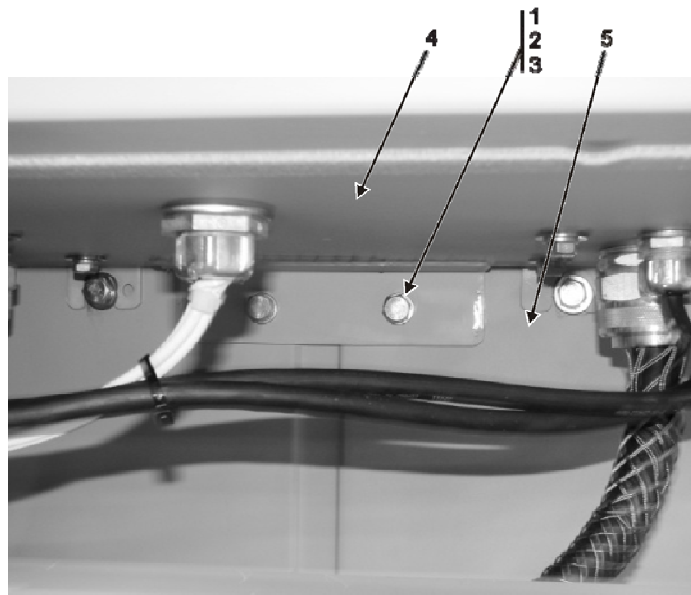


Figure 11. Bottom Power Box Mount Bolts.

REPAIR – CONTINUED

13. Remove four bolts (Figure 12, Item 1), lock washers (Figure 12, Item 2), and washers (Figure 12, Item 3) securing top of power box (Figure 12, Item 4) to container wall (Figure 12, Item 5).

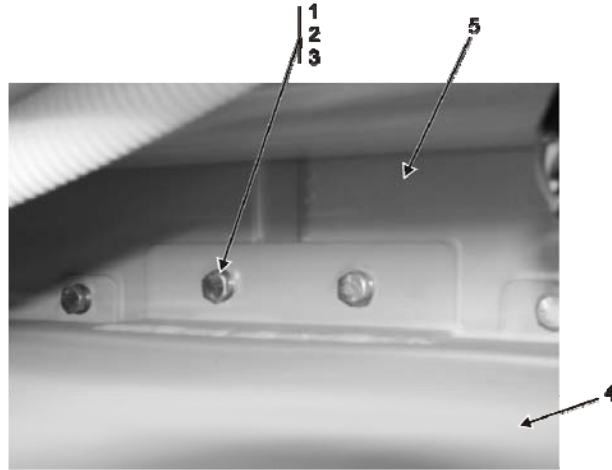


Figure 12. Top Power Box Mount Bolts.

CAUTION

Ensure wires and cables are clear of control panel and power box before moving forklift. It may be necessary to lower the power box slightly to allow the top mounting bracket to clear the frame.

14. Carefully and slowly reposition fork lift to ensure the power box and electrical box are supported and clear of frame on MTRCS front.
15. Slowly back forklift away from MTRCS until power box is clear of MTRCS.
16. Use three persons to lift power box (Figure 13, Item 1) off of forklift and lay power box on work bench with door (Figure 13, Item 2) facing up.

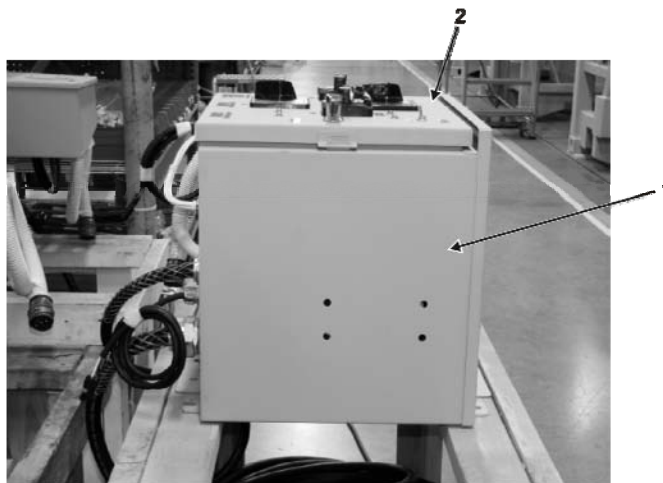


Figure 13. Power Box Removal.

REPAIR – CONTINUED

17. Remove four screws (Figure 14, Item 1) securing electrical box cover (Figure 14, Item 2) to electrical box (Figure 14, Item 3).
18. Remove electrical box cover (Figure 14, Item 2) from electrical box (Figure 14, Item 3).

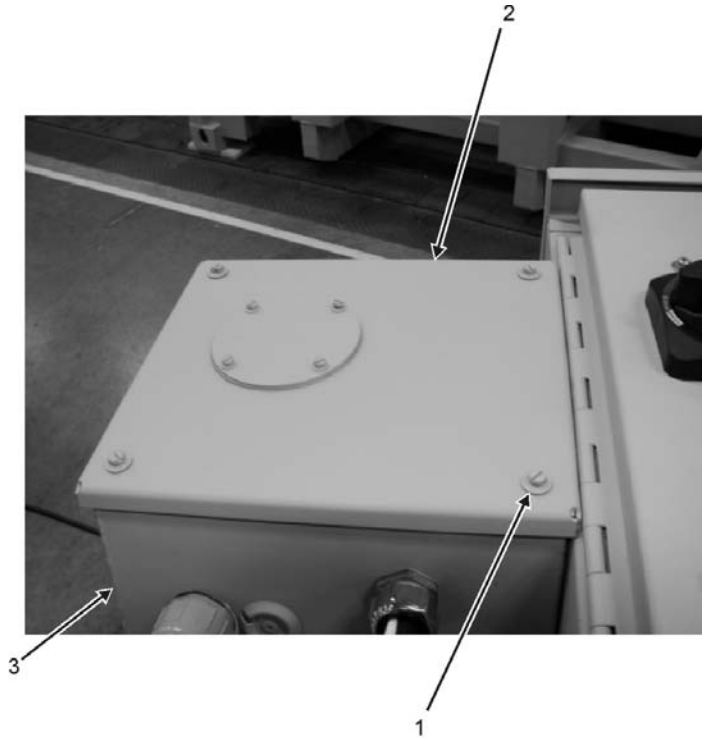


Figure 14. Electrical Box Cover.

19. Remove four nuts (Figure 15, Item 1), lock washers (Figure 15, Item 2), washers (Figure 15, Item 3), and rubber washers (Figure 15, Item 4) securing electrical box (Figure 14, Item 3) to power box (Figure 15, Item 5).
20. Remove electrical box (Figure 14, Item 3) and set aside.



Figure 15. Electrical Box Removal.

REPAIR – CONTINUED

21. Open power box door (Figure 16, Item 1) as far as possible and support door open using one Soldier/personnel (Figure 16, Item 2).



Figure 16. Power Box Door.

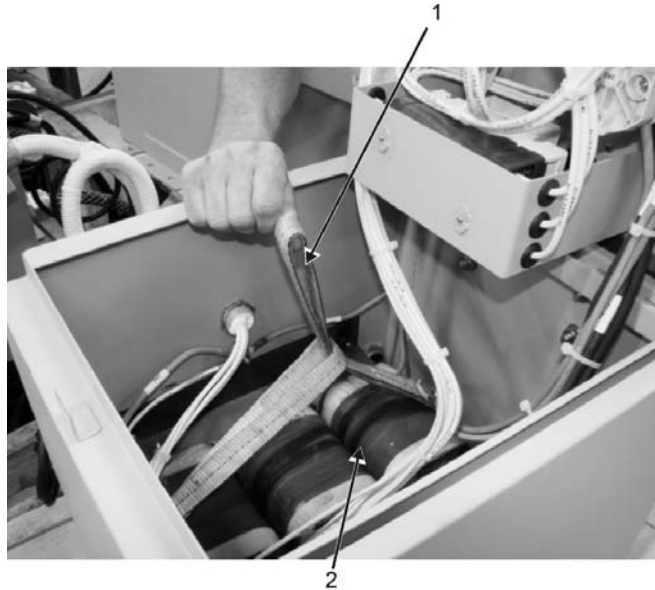
22. Remove screw from terminal X0 with slotted or Phillips screwdriver and remove two TR1-X0 wires. Move wires away from transformer (Figure 17).



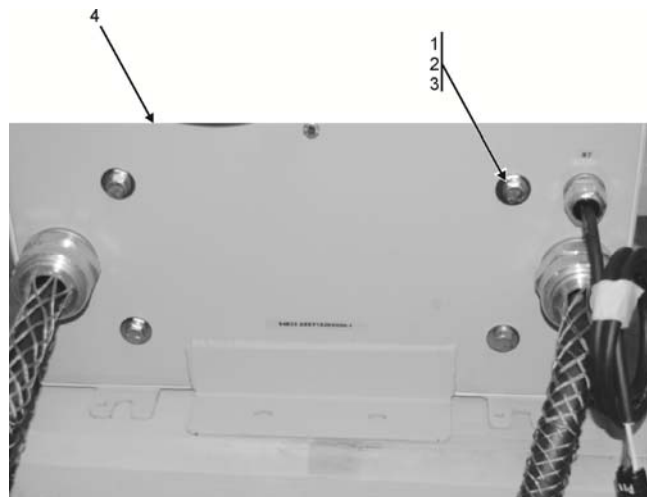
Figure 17. Removing TR1-X0 Wires from X0 Terminal.

REPAIR – CONTINUED

23. Carefully slide lifting strap (Figure 18, Item 1) over and behind transformer (Figure 18, Item 2), and position lifting strap in middle of transformer. Strap must be positioned between power cables wires (orange, black, and red wires) and transformer on each side of transformer.
24. Secure lifting strap (Figure 18, Item 1) to hoist.
25. Tighten lifting strap (Figure 18, Item 1) to transformer (Figure 18, Item 2) before removing transformer mounting hardware.

**Figure 18. Lifting Strap.**

26. Remove four bolts (Figure 19, Item 1), lock washers (Figure 19, Item 2), and washers (Figure 19, Item 3) securing transformer (Figure 18, Item 2) to power box (Figure 19, Item 4).

**Figure 19. Transformer Mounting Bolts.**

REPAIR – CONTINUED

27. Slowly lift transformer out of power box by guiding it around wires coming out of bottom of power box (Figure 20).



Figure 20. Lifting Transformer from Power Box.

28. With transformer suspended over power box, tag and disconnect wires from terminal blocks (Figure 21, Item 1) on top of transformer (Figure 21, Item 2).

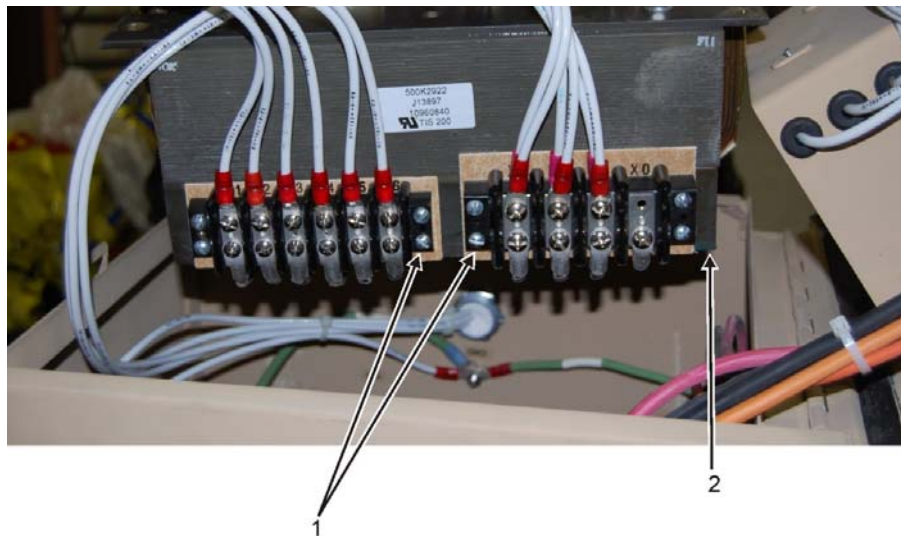


Figure 21. Removing Wires on Transformer Terminal Block.

REPAIR – CONTINUED

29. Remove U-nuts (Figure 22, Item 1) from transformer mounting bracket (Figure 22, Item 2). Retain for reinstallation.

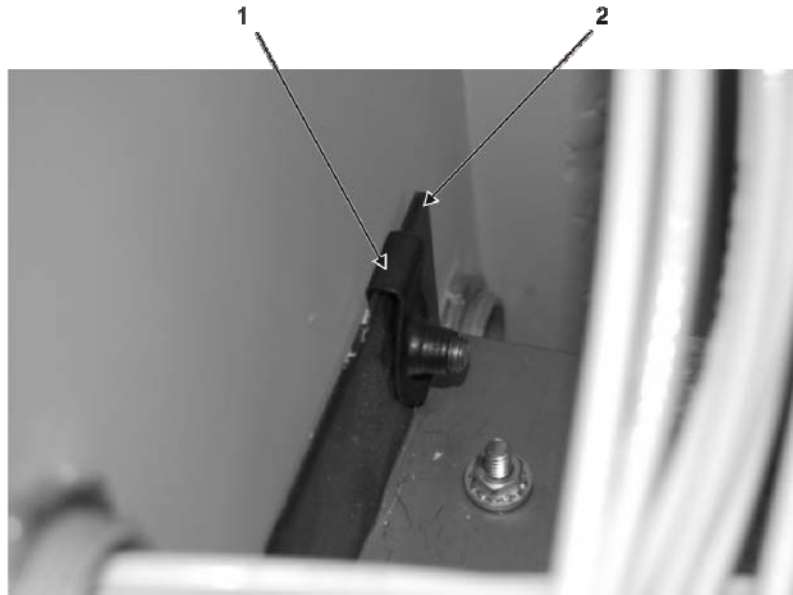


Figure 22. Transformer U-Nuts.

30. Lower transformer to bench.
31. Close power box door.

Install

1. Position lifting strap on bench and lay transformer, wire side down, over strap so that strap is around middle of transformer.
2. Open power box door (Figure 16, Item 1) as far as possible and support door open using a piece of dunnage (Figure 16, Item 2).
3. Lift transformer and position top of transformer with top of power box just above box (Figure 21).
4. Install four U-nuts (Figure 22, Item 1) on transformer mounting bracket (Figure 22, Item 2).
5. Connect wires to terminal block (Figure 21, Item 1) on top of transformer (Figure 21, Item 2) as tagged. Remove tags.
6. Slowly lower transformer (Figure 21, Item 2) into power box by guiding it around wires coming out of bottom of power box.
7. Secure transformer (Figure 18, Item 2) to power box (Figure 19, Item 4) using four bolts (Figure 19, Item 1), lock washers (Figure 19, Item 2), and washers (Figure 19, Item 3).
8. Remove lifting strap (Figure 18, Item 1).
9. Reconnect two TR1-X0 wires to terminal X0 on transformer (Figure 17).

REPAIR – CONTINUED

10. Using four bolts, secure electrical box (Figure 14, Item 3) to power box (Figure 15, Item 5). Secure using four nuts (Figure 15, Item 1), lock washers (Figure 15, Item 2), washers (Figure 15, Item 3), and rubber washers (Figure 15, Item 4).
11. Close power box cover.
12. Install electrical box cover (Figure 14, Item 2) to electrical box (Figure 14, Item 3) and secure using four screws (Figure 14, Item 1).

WARNING

Installation of the power box/transformer is performed using a forklift. The forklift operator must be aware of ground personnel at all times. Forklift can cause damage to equipment.

Always use hearing and head protection when working with or around a forklift. A forklift engine puts out high noise that can cause serious hearing damage. Many head injury hazard possibilities exist while using a forklift, such as falling loads and collision with the forklift itself. Head related injuries can cause serious additional health hazards or even death to personnel.

CAUTION

When positioning the power box onto the fork lift tines to support, make sure that you do not trap any wires between the forklift tines and the bottom of the power box.

13. Use three persons to lift power box (Figure 13, Item 1) onto forklift with bottom of power box resting on forklift tines (Figure 23).
14. Slowly move forklift, with power box, towards MTRCS.



Figure 23. Lifting Power Box with Forklift.

REPAIR – CONTINUED**NOTE**

It may be necessary to raise the power box slightly to allow the top mounting bracket to clear the frame.

15. Move power box into position on MTRCS.
16. After clearing front frame, align top power box mount holes with mount holes on container wall.
17. Secure top of power box (Figure 12, Item 4) to container wall (Figure 12, Item 5) using four bolts (Figure 12, Item 1), lock washers (Figure 12, Item 2), and washers (Figure 12, Item 3).
18. Secure bottom of power box (Figure 11, Item 4) to container wall (Figure 11, Item 5) using four bolts (Figure 11, Item 1), lock washers (Figure 11, Item 2), and washers (Figure 11, Item 3).
19. Carefully lower forklift tines and slowly back forklift away from MTRCS.
20. Install control panel assembly (Figure 9, Item 2) with four bolts (Figure 9, Item 1) and spacers (Figure 9, Item 4) to power box (Figure 8, Item 4) and secure using four nuts (Figure 8, Item 1), lock washers (Figure 8, Item 2), and washers (Figure 8, Item 3). Ensure nylon spacer/washer is between control panel and power box.
21. Close control panel assembly door (Figure 6, Item 2).
22. Install cable assembly P2A by pulling cable back into position on storage hooks (Figure 7).
23. Install cable assembly P1A by pulling cable back into position on storage hooks (Figure 7).
24. Close power box door (Figure 6, Item 1).
25. Connect the following electrical connectors as tagged.
 - P3/J3
 - P4/J4
 - P5/J5
 - P6/J6
 - P7/J7
 - P8/J8
 - P9/J9
 - P10/J10
 - P11/J11
 - P12/J12
 - P13/J13
26. Secure wire bundle (Figure 5, Item 1) above control panel (Figure 5, Item 2) using tie wraps.

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
POWER CABLE ASSEMBLIES
REPAIR

INITIAL SETUP:**Tools and Special Tools**

Electrical Connector Kit (WP 0107, Table 2, Item 3)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

References

WP 0005
WP 0070
TM 10-8145-222-23P

Materials/Parts

Lock Washer, $\frac{3}{8}$ -in ID (WP 0111, Item 13)
Silicone Sealant (WP 0110, Item 44)

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)
Battery disconnected (WP 0070)

Personnel Required

Utilities Equipment Repairer (2)

REPAIR**WARNING**

The MTRCS contains high voltage sources and exposed rotating parts. Make sure that power cables are disconnected from the power source and that the refrigeration unit is shut down before performing maintenance on the unit. Failure to comply with this warning can result in serious injury or death to personnel.

NOTE

The gland nut is left-hand threaded.

When replacing pins, all pins must be replaced. Do not replace single pins.

1. Loosen gland nut (Figure 1, Item 1).

NOTE

Compress cable grip to slide it back.

2. Slide gland nut (Figure 1, Item 1), cable grip (Figure 1, Item 2), gland (Figure 1, Item 3), and gland washer (Figure 1, Item 4) back along cable.
 3. Remove three hex screws (Figure 1, Item 5) and three lock washers (Figure 1, Item 6) from back adapter (Figure 1, Item 7). Retain lock washers.
 4. Slide back adapter (Figure 1, Item 7) back along cable.
 5. Remove pin spacer assembly (Figure 1, Item 8), with contacts (Figure 1, Item 9) installed, from shell and coupling nut assembly (Figure 1, Item 12).
 6. Tag wires (Figure 1, Item 11).
-

REPAIR – CONTINUED

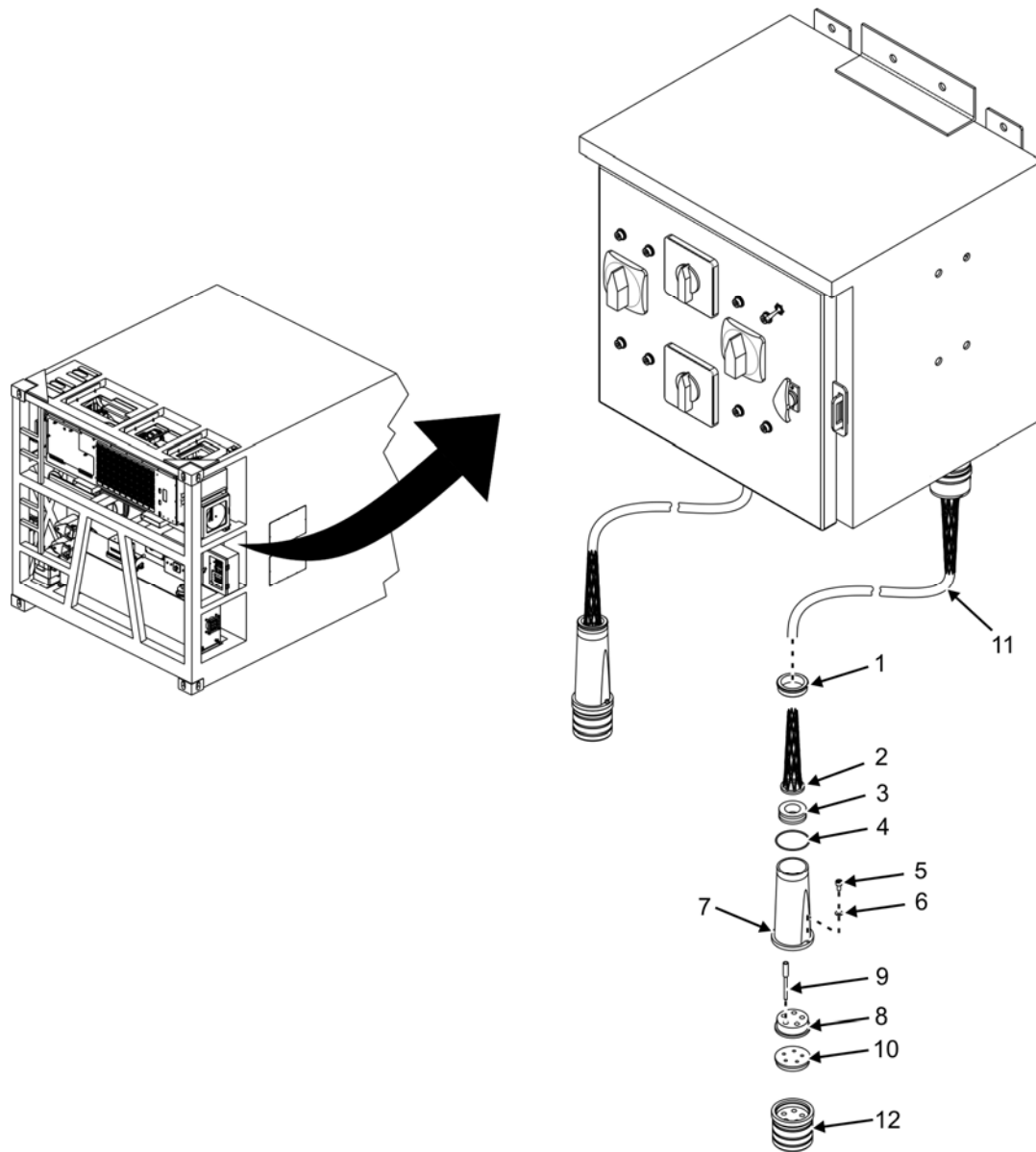


Figure 1. Connector Repair.

7. Use contact removal tool to remove each contact (Figure 1, Item 9) from pin spacer assembly (Figure 1, Item 8). Remove contact by placing on pin and applying light pressure to release the pin.
8. Cut each wire (Figure 1, Item 11) as close to rear of contact (Figure 1, Item 9) as possible.
9. Remove contacts (Figure 1, Item 9).
10. Strip approximately 3/8-inch to 1/2-inch insulation from each wire (Figure 1, Item 11).

REPAIR – CONTINUED**NOTE**

If appropriate crimp tools are not available, the electrical contacts may be attached to the wires by soldering. Wires shall be pre-tinned prior to soldering to contacts and no solder shall be present on shoulder or contact retention area.

11. Using contact crimp tool, locator, and die, crimp replacement contact (Figure 1, Item 9) onto wires (Figure 1, Item 11).
12. Align large tab on pin insert assembly (Figure 1, Item 10) with large slot in shell and coupling nut assembly (Figure 1, Item 12) if not already in proper position.
13. Push pin insert assembly (Figure 1, Item 10) in until it bottoms out in shell and coupling nut assembly (Figure 1, Item 12).
14. Apply thin coat of silicone sealant to contact (Figure 1, Item 9) holes in pin insert assembly (Figure 1, Item 10).
15. Push contacts (Figure 1, Item 9) into rear of pin spacer assembly (Figure 1, Item 8) until contacts snap and lock in place.
16. Align contacts (Figure 1, Item 9) with correct holes in connector pin insert assembly (Figure 1, Item 10). Match letters between pin spacer assembly and connector pin insert assembly.

NOTE

The small key of the pin insert assembly must align with the correct keyway in the pin spacer assembly.

17. Slide contacts (Figure 1, Item 9) into pin insert assembly (Figure 1, Item 10) holes until pin spacer assembly (Figure 1, Item 8) butts against pin insert assembly (Figure 1, Item 10).
18. Remove tags from wiring (Figure 1, Item 11).
19. Slide back adapter (Figure 1, Item 7) along cable until back adapter (Figure 1, Item 7) butts against pin spacer assembly (Figure 1, Item 8).
20. Secure back adapter (Figure 1, Item 7) by installing three hex screws (Figure 1, Item 5) and lock washers (Figure 1, Item 6) into back adapter (Figure 1, Item 7).

NOTE

The gland nut is left-hand threaded.

21. Install gland washer (Figure 1, Item 4), gland (Figure 1, Item 3), cable grip (Figure 1, Item 2), and gland nut (Figure 1, Item 1) onto back adapter (Figure 1, Item 7).
22. Tighten gland nut (Figure 1, Item 1).

REPAIR – CONTINUED

23. Reconnect battery (WP 0070, Reconnect).
24. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation (WP 0005, Operating Procedures).
25. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
BATTERY BOX
REPLACE, REPAIR

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Table 2, Item 8)

Materials/Parts

Lock Washer, #10 ID (WP 0111, Item 11)
Tie Wrap (WP 0110, Item 55)

Personnel Required

Quartermaster and Chemical Equipment Repairer

References

WP 0005
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

REPLACE

1. Remove battery (WP 0070, Remove).
2. Remove battery box (Figure 1, Item 1) from battery pan (Figure 1, Item 2) by lifting out of pan.
3. Install battery box (Figure 1, Item 1) into battery pan (Figure 1, Item 2).
4. Install battery (WP 0070, Install).
5. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

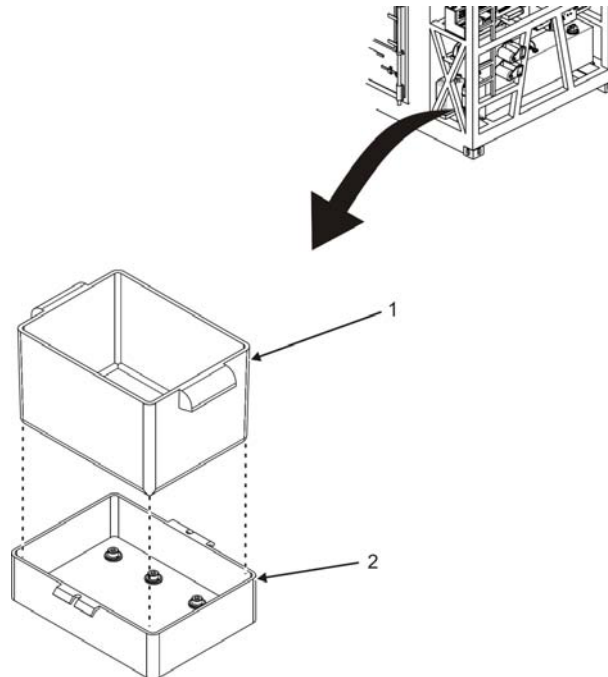


Figure 1. Battery Box.

END OF TASK

REPAIR**Replace Battery Cables****WARNING**

Exercise caution when using tools on or around the battery. Failure to follow this warning could result in serious burn injuries or death.

1. Remove seven screws (Figure 2, Item 1), lock washers (Figure 2, Item 2), and washers (Figure 2, Item 3) securing access cover (Figure 2, Item 4) to right-side panel (Figure 2, Item 5). Discard lock washers.
2. Remove access cover (Figure 2, Item 4).
3. Remove battery box cover (WP 0070, Remove).

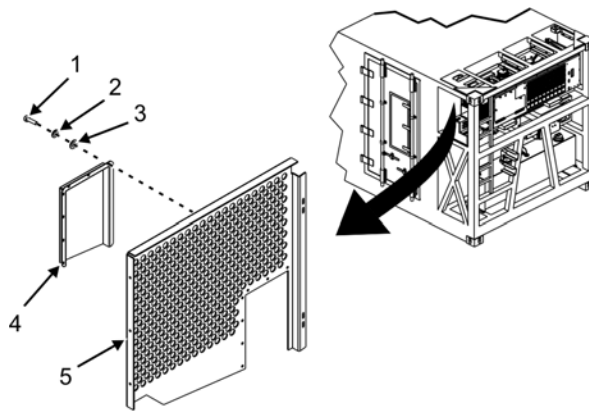


Figure 2. Access Cover.

4. Remove any tie wraps securing battery cables (Figure 3, Item 1 and Item 2) together between battery and terminal hookup on right side refrigeration unit frame.
5. Tag and disconnect battery negative (-) terminal (Figure 3, Item 3) from battery (Figure 3, Item 4).
6. Tag and disconnect battery positive (+) terminal (Figure 3, Item 5) from battery (Figure 3, Item 4).
7. Tag and disconnect negative (-) terminal lugs (Figure 3, Item 6) from side of refrigeration unit frame by removing one nut (Figure 3, Item 8) and washer (Figure 3, Item 9).
8. Remove negative (-) battery cable (Figure 3, Item 1).
9. Tag and disconnect positive (+) terminal lug (Figure 3, Item 7) from side of refrigeration unit frame by removing one nut (Figure 3, Item 10) and washer (Figure 3, Item 11). Discard lock washer.
10. Remove positive (+) battery cable (Figure 3, Item 2).
11. Install replacement positive (+) battery cable (Figure 3, Item 2) and secure positive (+) battery terminal lug (Figure 3, Item 7) to refrigeration unit frame using one washer (Figure 3, Item 11) and nut (Figure 3, Item 10).

REPAIR – CONTINUED

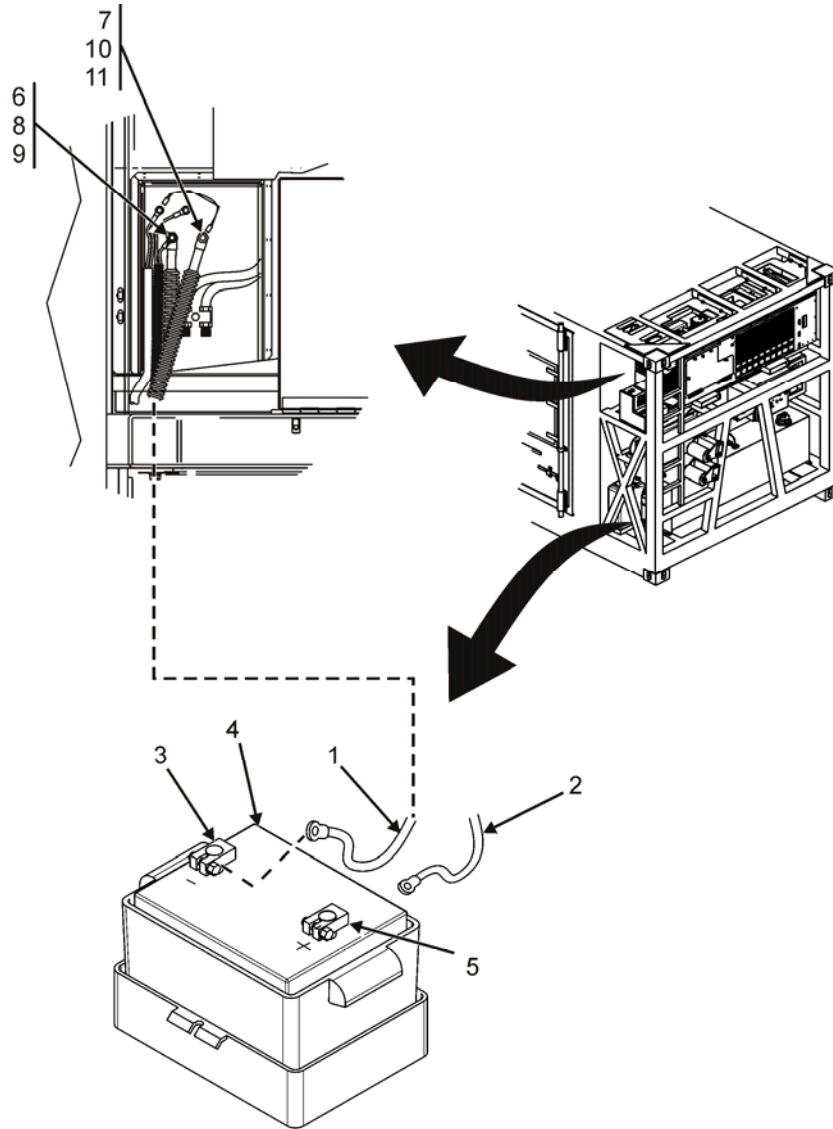


Figure 3. Battery Cables.

REPAIR – CONTINUED

12. Install negative (-) battery cable (Figure 3, Item 1) and secure negative (-) battery terminal lug (Figure 3, Item 6) to refrigeration unit frame using one washer (Figure 3, Item 9) and nut (Figure 3, Item 8).
13. Install opposite end of positive (+) battery cable (Figure 3, Item 2) to battery (Figure 3, Item 4) at battery positive (+) terminal (Figure 3, Item 5).
14. Install opposite end of negative (-) battery cable (Figure 3, Item 1) to battery (Figure 3, Item 4) at battery negative (-) terminal (Figure 3, Item 3).
15. Install tie wraps as required to secure battery cables (Figure 3, Item 1 and Item 2).
16. Install access cover (Figure 2, Item 4) to right-side panel (Figure 2, Item 5) and secure using seven screws (Figure 2, Item 1), new lock washers (Figure 2, Item 2), and washers (Figure 2, Item 3).
17. Install battery box cover (WP 0070, Install).
18. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of battery cables (WP 0005, Operating Procedures).
19. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
CAPACITOR BOX
REPAIR

INITIAL SETUP:**Tools and Special Tools**

Electrical Connector Kit (WP 0107, Table 2, Item 3)
Face Shield (WP 0110, Item 20)
Gloves, Rubber (WP 0110, Item 21)
Service Refrigeration Ordnance
Tool Kit (WP 0107, Table 2, Item 6)

Materials/Parts

Alcohol, Isopropyl (WP 0110, Item 2)
Sealant, RTV (WP 0110, Item 45)
Towel, Machine Wiping (WP 0110, Item 52)

Personnel Required

Utilities Equipment Repairer (2)

References

WP 0005
WP 0070
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
External power cables disconnected (WP 0005)

REPAIR**Replace Capacitor****WARNING**

High voltages are present at capacitor box. Whenever possible, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body. Avoid grounding yourself when touching any electrical components. Failure to follow this warning can result in personal injury or death.

Capacitors are electrical storage devices that are designed to hold a charge after power is disconnected from them. For this reason, extreme care must be taken when working on or around capacitors. Discharge capacitor with a shorting probe before performing maintenance on capacitors. Failure to comply with this warning can result in severe electrical shock resulting in serious injury or death.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Remove four bolts (Figure 1, Item 1), flat washers (Figure 1, Item 2), and nylon washers (Figure 1, Item 3) securing capacitor box cover (Figure 1, Item 4).
3. Remove cover (Figure 1, Item 4) and gasket (Figure 1, Item 9).
4. Discharge capacitors (Figure 1, Item 6) with shorting probe.

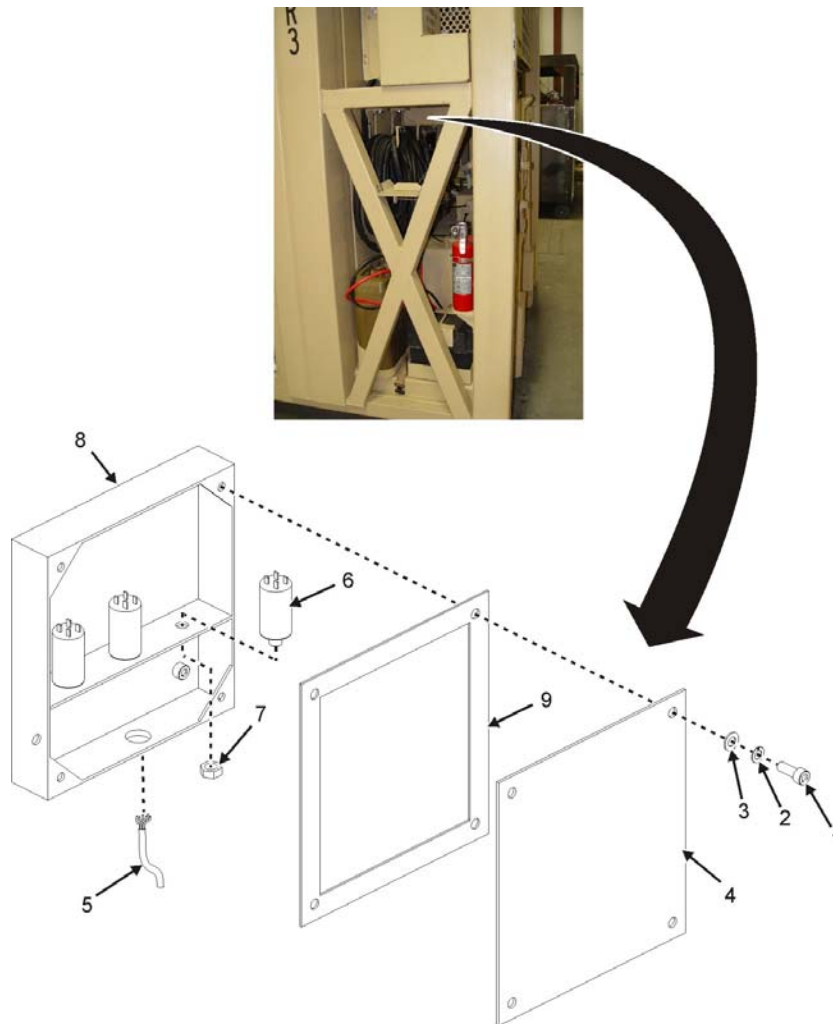
CAUTION

Make sure that wires are tagged before disconnecting them from the capacitors. Failure to comply can result in damage to equipment.

5. Tag and disconnect electrical connections (Figure 1, Item 5) from capacitor (Figure 1, Item 6).
6. Discharge capacitors (Figure 1, Item 6) with shorting probe.
7. Remove hex nut (Figure 1, Item 7) securing capacitor (Figure 1, Item 6) to capacitor box frame (Figure 1, Item 8) mounting strap.

REPAIR – CONTINUED

8. Remove capacitor (Figure 1, Item 6).
9. Install replacement capacitor (Figure 1, Item 6) into capacitor box (Figure 1, Item 8) and secure in place using capacitor box frame mounting strap and hex nut (Figure 1, Item 7). Tighten nut.
10. Reconnect electrical connections (Figure 1, Item 5) to capacitor (Figure 1, Item 6) as tagged. Remove tags.
11. Install capacitor box cover (Figure 1, Item 4) with gasket (Figure 1, Item 9) and secure using four bolts (Figure 1, Item 1), flat washers (Figure 1, Item 2), and nylon washers (Figure 1, Item 3).
12. Connect battery negative (-) terminal (WP 0070, Reconnect).
13. Operate refrigeration unit in accordance with normal operating procedures to verify proper operation after replacement of capacitors (WP 0005, Operating Procedures).
14. Place MTRCS into desired mode of operation (WP 0005, Operating Procedures).

**Figure 1. Capacitor Box.**

REPAIR – CONTINUED**Replace Capacitor Box Cover Seal****WARNING**

High voltages are present at capacitor box. Whenever possible, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body. Avoid grounding yourself when touching any electrical components. Failure to follow this warning can result in personal injury or death.

Capacitors are electrical storage devices that are designed to hold a charge after power is disconnected from them. For this reason, extreme care must be taken when working on or around capacitors. Discharge capacitors with a shorting plug before performing maintenance on capacitors. Failure to comply with this warning can result in severe electrical shock resulting in serious injury or death.

1. Disconnect battery negative (-) terminal (WP 0070, Disconnect).
2. Remove four bolts (Figure 2, Item 1), flat washers (Figure 2, Item 2), and nylon washers (Figure 2, Item 3) securing capacitor box cover (Figure 2, Item 4).
3. Remove cover (Figure 2, Item 4).
4. Discharge capacitors (Figure 2, Item 6) with shorting probe.
5. Remove old gasket (Figure 2, Item 9) using metal scraper if required.

WARNING

Wear protective gloves and eye protection when using Isopropyl alcohol. If contact with eyes is made, flush with clean water and seek immediate medical first aid for eyes. Rinse and dry hands immediately after exposure. Failure to observe this warning may result in drying and/or serious damage to the skin.

6. Clean area of excess gasket (Figure 2, Item 9) using metal scraper and isopropyl alcohol if needed.
7. Allow area to dry.

WARNING

RTV may cause eye and skin irritation. Over frequent or extended periods of use, RTV may cause irritation to the respiratory system. Wear eye protection and gloves when using RTV.

8. Apply thin bead of gasket sealant to area of cover (Figure 2, Item 4) where replacement gasket (Figure 2, Item 9) will be installed.
9. Install replacement gasket (Figure 2, Item 9) and press firmly in place.
10. Remove any excess sealant with clean damp rag.

REPAIR – CONTINUED

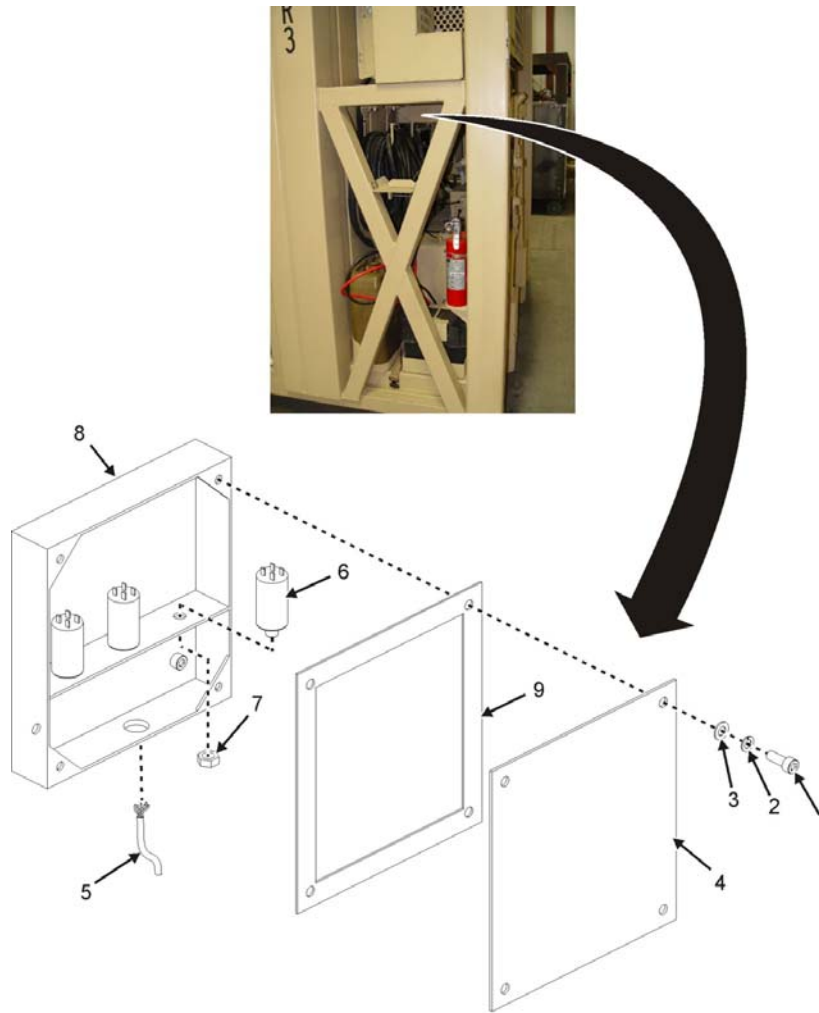


Figure 2. Capacitor Box Cover Seal.

NOTE

Sealant will begin to harden within two hours and is full strength after 24 hours.

11. Allow gasket (Figure 2, Item 9) installation to cure for two hours.
12. Install capacitor box cover (Figure 2, Item 4) to capacitor box (Figure 2, Item 8) and secure using four bolts (Figure 2, Item 1), flat washers (Figure 2, Item 2), and nylon washers (Figure 2, Item 3).
13. Connect battery negative (-) terminal (WP 0070, Connect).
14. Place MTRCS into desired mode of operation (WP 0005, Operating Procedures).

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
DOORS
REPAIR

INITIAL SETUP:**Tools and Special Tools**

SATS (WP 0107, Table 2, Item 8)

Materials/Parts

Alcohol, Isopropyl (WP 0110, Item 2)
Oil, Lubricating, General Purpose
(WP 0110, Item 13)

Personnel Required

Quartermaster and Chemical Equipment Repairer (2)

References

WP 0073
TM 10-8145-222-23P

Equipment Condition

Refrigeration unit shut down (WP 0005)
Insulated container doors open and secure
(WP 0005)

REPAIR**Skin Repair**

Skin repair can be accomplished in accordance with WP 0073.

Replace Door Seals**NOTE**

This procedure is applicable to both rear door gaskets and also the side door gasket.
Only one door will be referenced in the procedure.

1. Open applicable doors (Figure 1, Item 1) on container (Figure 1, Item 2) and secure open with chain. Apply lubricant between outer seal (Figure 1, Item 3) and door (Figure 1, Item 1).

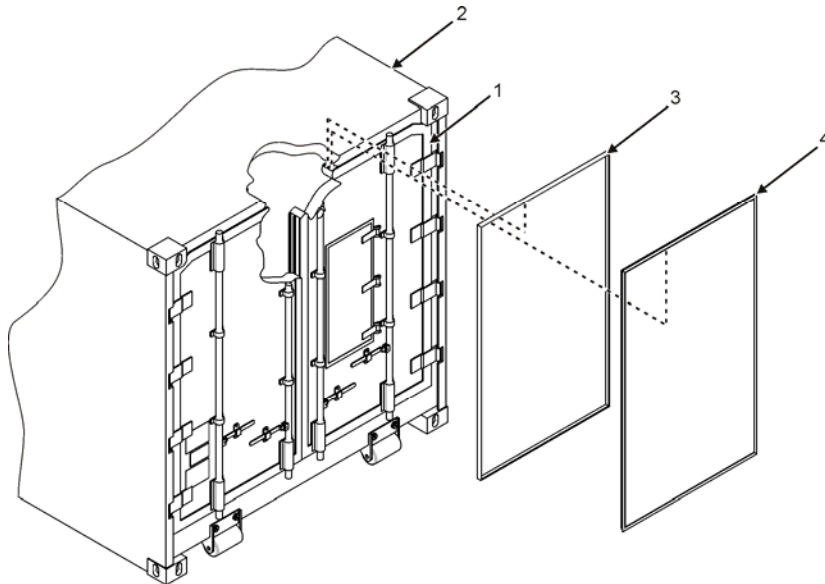


Figure 1. MTRCS Door Seals.

REPAIR – CONTINUED**CAUTION**

While removing the seal you can damage the door. Only use pressure needed on tools to remove the seal.

2. Using an appropriate prying tool (Figure 2, Item 1) between outer seal (Figure 1, Item 3) and door (Figure 1, Item 1), remove outer seal (Figure 1, Item 3) from door (Figure 1, Item 1).
3. Apply lubricant between inner seal (Figure 1, Item 4) and door (Figure 1, Item 1).
4. Using an appropriate prying tool (Figure 2, Item 1) between inner seal (Figure 1, Item 4) and door (Figure 1, Item 1), remove inner seal (Figure 1, Item 4) from door (Figure 1, Item 1).
5. Apply lubricant to back of new inner seal (Figure 1, Item 4).

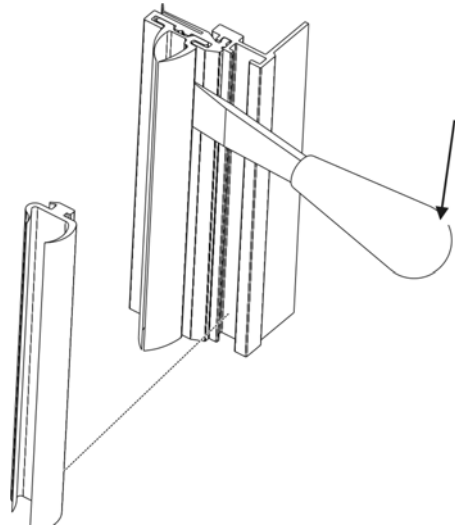


Figure 2. Prying Tool.

CAUTION

Do not use sharp objects to strike or aid in pushing the seal into the door. Using a sharp object will result in damage to the seal and failure of the seal to seal the door when closed.

NOTE

Seal may not easily press into heat break. If this occurs, a hammer or similar blunt tool can be used to apply additional pressing force.

6. Press inner seal (Figure 1, Item 4) into door (Figure 1, Item 1).
7. Apply lubricant to back of new outer seal (Figure 1, Item 3).

REPAIR – CONTINUED**CAUTION**

Seal may not easily press into slot in the door. If this occurs, a hammer or similar blunt tool can be used to apply additional pressing force. Do not use sharp objects to strike or aid in pushing the seal into the slot on the door. Using a sharp object will result in damage to the seal and failure of the seal to seal the door when closed.

8. Press new outer seal (Figure 1, Item 3) in slot on door (Figure 1, Item 1).
9. Wipe excess lubricant off door (Figure 1, Item 1) and seals (Figure 1, Item 3 and Item 4).
10. Close applicable doors (Figure 1, Item 1).

Replace Emergency Escape Hatch Gaskets**NOTE**

This procedure is applicable to either emergency escape hatch located in the side door or in the rear door.

1. Open applicable container doors (Figure 3, Item 1) on container (Figure 3, Item 2) and secure open with chain.
2. Open applicable emergency escape hatch (Figure 3, Item 3) on container door (Figure 3, Item 1).
3. Apply lubricant between outer gasket (Figure 3, Item 4) and emergency escape hatch (Figure 3, Item 3).

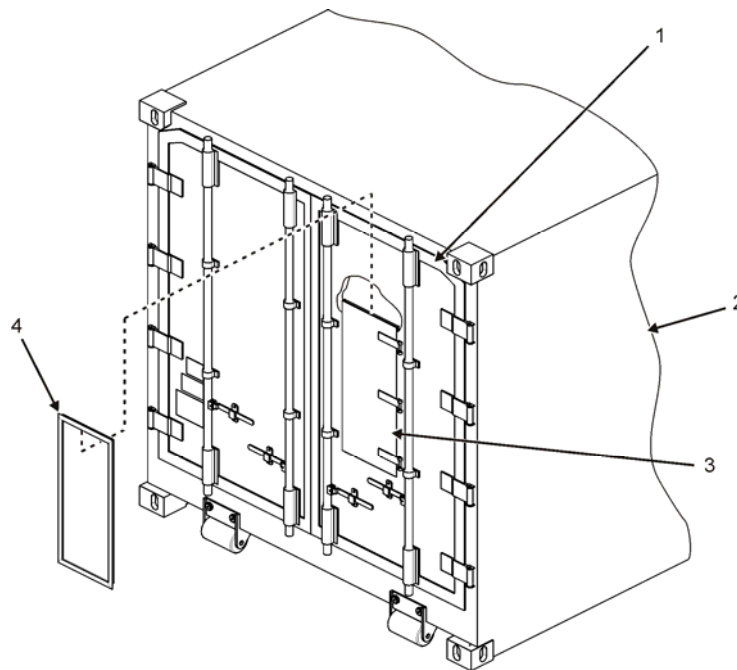


Figure 3. Emergency Escape Hatch Outer Seal.

REPAIR – CONTINUED**CAUTION**

While removing the gasket you can damage the emergency escape hatch. Only use pressure needed on tools to remove the gasket.

4. Using an appropriate prying tool (Figure 4, Item 1) between outer gasket (Figure 4, Item 2) and emergency escape hatch (Figure 4, Item 3), remove outer gasket (Figure 4, Item 2) from emergency escape hatch (Figure 4, Item 3).
5. Apply lubricant between inner gasket (Figure 4, Item 4) and emergency escape hatch (Figure 4, Item 5).
6. Using an appropriate prying tool (Figure 4, Item 6) between inner gasket (Figure 4, Item 4) and emergency escape hatch (Figure 4, Item 5), remove inner gasket (Figure 4, Item 4) from emergency escape hatch (Figure 4, Item 5).
7. Apply lubricant to back of new inner gasket (Figure 4, Item 4).

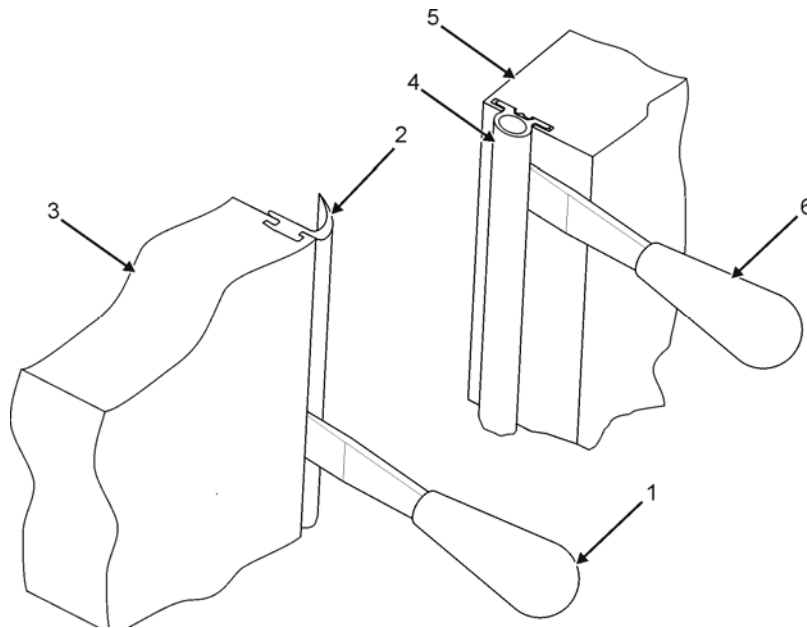


Figure 4. Using Prying Tool.

REPAIR – CONTINUED**CAUTION**

Gasket may not easily press into emergency escape hatch. If this occurs, a hammer or similar blunt tool can be used to apply additional pressing force. Do not use sharp objects to strike or aid in pushing the gasket into the emergency escape hatch. Using a sharp object will result in damage to the gasket and failure of the gasket to seal the emergency escape hatch when closed.

8. Press inner gasket (Figure 5, Item 1) into emergency escape hatch (Figure 5, Item 2).

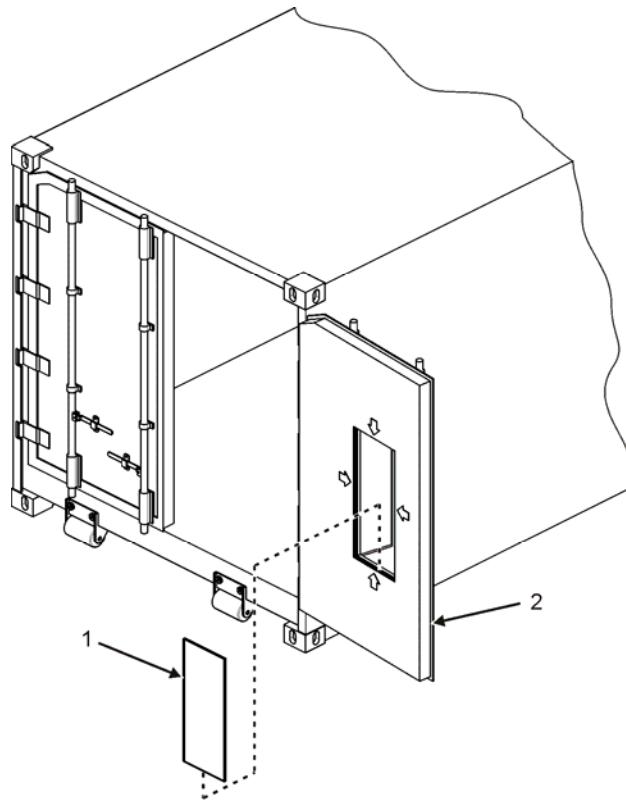


Figure 5. Emergency Escape Hatch Inner Seal.

REPAIR – CONTINUED

9. Apply lubricant to back of new outer gasket (Figure 3, Item 4).

CAUTION

Do not use sharp objects to strike or aid in pushing the gasket into the slot on the emergency escape hatch. Using a sharp object will result in damage to the gasket and failure of the gasket to seal the emergency escape hatch when closed.

NOTE

Gasket may not easily press into slot in the emergency escape hatch. If this occurs, a hammer or similar blunt tool can be used to apply additional pressing force.

10. Press new outer gasket (Figure 3, Item 4) in slot on emergency escape hatch (Figure 3, Item 3).
11. Wipe excess lubricant off emergency escape hatch (Figure 3, Item 3) and gaskets (Figure 4, Item 2 and Item 4).
12. Close and secure applicable emergency escape hatch (Figure 3, Item 3)
13. Close and secure applicable container doors (Figure 3, Item 1).

END OF TASK**END OF WORK PACKAGE**

**FIELD MAINTENANCE
REFRIGERATION PIPING
REPAIR**

INITIAL SETUP:**Tools and Special Tools**

Face Shield (WP 0110, Item 20)
 Gloves, Rubber (WP 0110, Item 21)
 Refrigeration Equipment
 Tool Kit (supplement) (WP 0107, Table 2, Item 7)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)

Personnel Required

Utilities Equipment Repairer

References

WP 0031
 WP 0032
 WP 0036

Equipment Condition

Refrigeration unit shut down (WP 0005)

REPAIR**Leak Test****WARNING**

Never pressurize refrigerant lines with oxygen; mixture with oil could cause an explosion.

The pressure in a nitrogen cylinder can exceed 2,000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.

Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

1. Test for leaks at all points of possible leakage using a refrigerant gas leak detector.
2. If a leak is found, take necessary steps to replace damaged components or repair leak in accordance with applicable work package for component that is leaking.
3. If no leak is found and refrigerant only was used to pressurize the system, refer to charge system with refrigerant to determine proper charge of system (WP 0032, Service).
4. If no leak was found and nitrogen was used to pressurize the system, recover refrigerant, perform evacuation and dehydration, and charge system with refrigerant (WP 0032, Service).

REPAIR – CONTINUED**WARNING**

Soldering alloys and flux contain materials that are hazardous to health. Avoid breathing vapors or fumes from soldering operations. Perform operations only in well ventilated areas. Wash hands with soap and water after handling soldering alloys and flux. Wear gloves and protective goggles or face shield to protect against burns.

Desolder

1. Recover refrigerant (WP 0032, Service).
2. Purge refrigerant system (WP 0032, Service).
3. Protect wiring harnesses and other components with appropriate heat shields.

NOTE

It may be easier to access a component by cutting or desoldering copper lines in accessible areas and removing part of interconnecting tubing.

4. If desoldering a joint on a valve, disassemble valve as much as possible and wrap all but joint with wet rag to act as heat sink.

WARNING

Never use a heating torch on any part that contains refrigerant. Heat may cause refrigerant to decompose and release irritating, toxic, and corrosive gases. All refrigerant must be removed and recovered from system and entire system must be purged with dry nitrogen before beginning any brazing operation.

CAUTION

If heat is applied slowly, or only on one side, entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted.

5. Check that system is being purged and apply sufficient heat uniformly around joint to quickly melt filler alloy.
6. Remove heat as soon as joint is separated.

Clean

1. Heat each piece of joint until filler has melted, then wipe it away with a wire brush.
2. Make sure no filler alloy or other debris remains inside any tubing, fitting, or component.
3. Use abrasive cloth as necessary to clean joints.
4. Apply flux to joints immediately after cleaning to avoid oxidation.

REPAIR – CONTINUED**Solder**

1. Protect wiring harnesses and other components with appropriate heat shields.

NOTE

All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required. Grade IV or VI brazing alloy (50% silver) and Type-B flux, as specified in MIL-B-7883, must be used for all copper to brass joints. Grade III (15% silver) brazing alloy may be substituted for Grade IV or VI for copper to copper joints; flux is not required for copper to copper joints.

2. If soldering a joint on a valve, disassemble valve to as much as possible and wrap all but joint with wet rag to act as heat sink.

NOTE

If interconnecting tubing was removed with a component, solder tubing to new components before installation. Ensure orientation of tubing is correct.

3. Position component or assembly into place.

WARNING

Never use a heating torch on any part that contains refrigerant. Heat may cause refrigerant to decompose and release irritating, toxic, and corrosive gases. All refrigerant must be removed and recovered from system and there must be adequate ventilation before beginning any brazing operation.

4. Make sure system is being purged and apply sufficient heat uniformly around joint to quickly melt filler alloy.
5. Remove heat and stop purging as soon as soldering is completed.
6. Complete purging (WP 0032, Service).
7. Install gauge set (WP 0032, Service).
8. Check suction pressure on gauge set.
 - If pressure is over 100 psi go to perform leak test.
 - If pressure is over 40 psi, go to step 6 of refrigerant charge less than 40 psi.
 - If pressure is below 40 psi, continue with step 1 of refrigerant charge less than 40 psi.

Refrigerant Charge Less Than 40 PSI

1. Connect service hose to R404A refrigerant tank.
2. Prepare refrigerant tank to deliver liquid refrigerant per instructions on tank.
3. Make sure all gauge set valves are closed.
4. Open refrigerant tank valve.

REPAIR – CONTINUED

5. Open gauge set discharge valve and pressurize system to at least 40 psi.
6. Close discharge valve.
7. Connect service hose to nitrogen tank.
8. Make sure gauge set service valve is closed.
9. Open nitrogen tank valve.
10. Open gauge set discharge valve and pressurize system to at least 350 psi.
11. Close gauge set discharge valve and nitrogen tank valve.
12. Disconnect service hose from nitrogen tank.
13. Perform Leak Test procedure, per this WP.

Recover

1. Recover refrigerant (WP 0032, Service).
2. Remove access panels as needed to gain access to piping or fittings.
3. Desolder any fitting or tubing that was leaking.

Installation

1. Install tubing or fittings and solder in place.
2. Replace filter-drier (WP 0036, Replace).
3. Perform evacuation and dehydration (WP 0032, Service).
4. Perform refrigerant leak check (WP 0032, Service).
5. Charge system with refrigerant (WP 0032, Service).
6. Install any panels removed to access piping and fittings (WP 0031, Install).

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
TORQUE LIMITS

INTRODUCTION

This work package provides torque limits for various fasteners on the MTRCS. In some cases, specific torque values for critical components are provided. Table 1 and Table 2 provide torque values to be used on various MTRCS components.

TORQUE VALUES**Table 1. MTRCS Component Torque Values (Foot-Pounds).**

Assembly	Foot-Pounds
Power Tray to Frame	40
Standby Motor to Power Tray	40
Engine to Mount Bracket (Outboard)	40
Engine to Mount Bracket (Inboard)	40
Engine Mount Brackets to Power Tray	50
Compressor to Power Tray	40
Standby Motor Pulley	32
Engine Pulley	22
Engine Glow Plugs	6-11
Compressor Pulley	22
Evaporator Fan Motor	13
Evaporator Fan Grille	7
Condenser Coil to Chassis	7
Tensioner to Power Tray	22
Suction Service Valve	55-80
Discharge Service Valve	20-30
Engine Support	40
Run Solenoid	7
Speed Solenoid	7
Condenser Fan Blade	18
Engine Clutch	40
Refrigeration Unit to Support Angle	36
Refrigeration Unit to Container Wall	80
Engine Oil Pressure Switch	11-14
Alternator 1ph	28

TORQUE VALUES – CONTINUED

Table 2. MTRCS Component Torque Values (Inch-Pounds).

Assembly	Inch-Pounds
Compressor Unloader Valve Enclosing Tube	100
Power Box Switch Terminals (S1, S2)	20-25
Power Box Circuit Breaker Terminals	40

Unless otherwise specified in the applicable work package, all fasteners should be tightened to the recommended torque values shown in the General Torque Specification Tables, Table 3 for U.S. threads, and Table 4 for Metric threads.

Table 3. Bolt Torque Values for U.S. Threads in Foot-Pounds.

Bolt Size – Thread Pitch	Grade 2	Grade 5	Grade 8
1/4-20	6	10	12
1/4-28	7	12	15
5/16-18	13	20	24
5/16-24	14	22	27
3/8-16	23	36	44
3/8-24	26	40	48
7/16-14	37	52	63
7/16-20	41	57	70
1/2-13	57	80	98
1/2-20	64	90	110
9/16-12	82	120	145
9/16-18	91	135	165
5/8-11	111	165	210
5/8-18	128	200	245
3/4-10	200	285	335
3/4-16	233	315	370

TORQUE VALUES – CONTINUED**Table 4. Bolt Torque Values for Metric Threads in Foot Pounds.**

Bolt Size	Low Grade	Grade 8.8	Grade 10.9	Grade 12.9
6mm	3-5	7	10	12
8mm	8-12	17	24	29
10mm	15-22	33	47	57
12mm	39	59	83	100
14mm	60	101	131	158
16mm	60-94	146	202	247
18mm	60-130	201	283	340
20mm	166-188	285	401	482

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
GENERAL WIRING REPAIR

Tools and Special Tools

Electrical Connector Kit (WP 0107, Table 2, Item 3)
 Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 SATS (WP 0107, Table 2, Item 8)

References

WP 0005
 WP 0031

Personnel Required

Quartermaster and Chemical Equipment Repairer
 Utilities Equipment Repairer

Equipment Condition

Refrigeration unit shut down (WP 0005)
 External electrical power disconnected (WP 0005)

INTRODUCTION

Wiring diagrams are provided for general repair methods consisting of replacing wire leads, cables, harnesses, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other make shift procedures. Make shift repair procedures may be appropriate for emergency field repairs, but should be properly repaired as soon as possible.

General Wiring Repair**WARNING**

Rotating parts and lethal voltage levels are used in operating the MTRCS. Be sure power source is disconnected. Injury or death can occur if connected to power source.

1. Shut down MTRCS (WP 0005, Operating Procedures).
2. Open or remove covers and panels as necessary to access repair area (WP 0031, Remove).

CAUTION

Extreme cold can cause electrical wire leads and insulation to become brittle. Do not disturb electrical wiring that has been exposed to extremely low temperatures. Damage to electrical wire leads or insulation can result if disturbed under these conditions.

3. If access to a repair requires removal of a component, refer to the Repair or Replace task for that component for removal instructions.
4. Cut and discard tie straps as necessary to make the repair.
5. Tag the wire lead, cable, or harness ends as necessary.
6. Disconnect wire lead, cable, or harness ends.
7. Cut off and discard splices or crimp nuts.
8. Disconnect connectors and cut off pins with housing as necessary.

INTRODUCTION – CONTINUED

9. Cut leads at solder connections then remove and discard insulation sleeve pieces from wire lead ends and component.
10. Disconnect wire leads from component.
11. Loosen strain relief fittings as necessary then note routing and remove wire lead, cable, or harness.
12. **Insulating Joints.** The preferred method of insulating bare electrical joints is by using insulation sleeves. To apply, slide a piece of insulation sleeve over the wire lead before making the joint. Make the joint then slide the insulation sleeve over the joint and shrink in place with heat gun.
13. **Crimping Terminals.** If the terminal is not insulated, refer to step 12 above. To install the terminal, strip 1/4-1/2 inch (0.6-1.3 cm) of insulation from the end of the wire lead, insert bare wire lead end into the shank of the terminal. Crimp the shank securely onto the wire lead

WARNING

Solder and flux contain materials which are hazardous to health. Avoid breathing vapors or fumes from soldering operations. Perform operations only in well ventilated areas. Wash hands with soap and water after handling solder and flux. Wear thermal gloves and protective goggles or face shield to protect against burns.

14. **Soldering Connections.** Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. Flux should be brushed onto the joint before soldering. Wires should always be heated with a soldering iron to the point at which the solder will melt completely when touched to joint and flow into all parts of the joint. Excessive build up of solder on the joint should be avoided or removed.
15. **Splicing Wire.** To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced by using a crimped splice installed per step 13 above or by wrapping the stripped wire lead ends onto themselves then soldering and insulating per step 12 and step 14 above.
16. Select appropriate wire lead, cable, or harness then route as noted during removal being sure to pass it through any grommets or strain relief fittings as necessary.
17. Tighten any strain relief fittings that were loosened for removal.
18. Connect wire lead, cable, or harness ends per tags and electrical schematic diagram (FO-1) at the end of the manual. Remove tags.
19. Connect wire leads to components.
20. Solder and insulate leads to components per step 12 and step 14 above.
21. Install connector pins per step 13 above and tab housings then connect cable or harness.
22. Install splice or crimp as appropriate per step 13 and step 15 above.
23. Secure wires, cables, or harnesses with tie straps as necessary. Cut to remove excess tie strap material.
24. Install any components that were removed for access.

INTRODUCTION – CONTINUED

25. Install any covers and panels that were removed for access (WP 0031, Install).
26. Connect MTRCS to power source and operate to verify proper operation (WP 0005, Operating Procedures).
27. Place MTRCS back into desired mode of operation (WP 0005, Operating Procedures).

WIRING DIAGRAMS, ELECTRICAL SCHEMATICS, AND REFRIGERATION SCHEMATICS

Full size diagrams for the electrical schematic (FO-1) and refrigeration schematic (FO-2) are provided at the end of the manual as foldout diagrams.

END OF WORK PACKAGE

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
PREPARATION FOR STORAGE OR SHIPMENT

INITIAL SETUP:**Tools and Special Tools**

Service Refrigeration Ordnance
 Tool Kit (WP 0107, Table 2, Item 6)
 SATS (WP 0107, Table 2, Item 8)

Equipment Condition

Refrigeration unit shut down (WP 0005)

Personnel Required

Utilities Equipment Repairer (2), or
 Quartermaster and Chemical Equipment Repairer (2)

References

WP 0008 WP 0030
 WP 0018 WP 0042
 WP 0019 WP 0069
 WP 0023 WP 0108
 WP 0024 TB MED 530
 DA Pam 738-750
 DA Pam 750-8

PREPARATION FOR STORAGE

1. If using an external electrical source, make sure to disconnect power cable (WP 0069, Replace).
2. Perform PMCS to inspect equipment for damage incurred during use. If equipment is damaged, repair damage in accordance with applicable repair procedure (WP 0019).
3. Inventory components against Components of End Item (COEI) and Basic Issue Items (BII) lists to verify unit is complete. Report all discrepancies following the instructions of DA Pam 738-750 or DA Pam 750-8 as applicable (WP 0108).
4. Check to see if equipment has been modified.
5. Empty fuel tank to appropriate level (WP 0030, Service).
6. Drain engine oil (WP 0042, Service).
7. Unload paper in temperature chart recorder (WP 0019).
8. Clean interior compartment in accordance with TB MED 530.
9. Secure PLS rollers in stowed position (WP 0023, Store).
10. Secure interior bulkhead in storage position (WP 0024, Store).
11. Secure cargo nets in stowed position (WP 0007, Unloading).
12. Make sure all doors are closed and properly secured.

END OF TASK

PREPARATION FOR SHIPMENT

1. If using an external electrical source, make sure to disconnect power cable assemblies in accordance with WP 0069.
2. Perform PMCS to inspect equipment for damage incurred during use. If equipment is damaged, repair damage in accordance with applicable repair procedure (WP 0019).
3. Inventory components against Components of End Item (COEI) and Basic Issue Items (BII) lists to verify unit is complete. Report all discrepancies following the instructions of DA Pam 738-750 or DA Pam 750-8 as applicable (WP 0108).
4. Check to see if equipment has been modified.
5. Clean interior compartment in accordance with TB MED 530.
6. Secure PLS rollers in stowed position (WP 0023, Store).
7. Secure interior bulkhead in storage position (WP 0024, Store).
8. Secure cargo nets in stowed position (WP 0008).
9. Make sure all doors are closed and properly secured.

END OF TASK**END OF WORK PACKAGE**

CHAPTER 7
SUPPORTING INFORMATION
FOR
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM
(MTRCS)

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
REFERENCES

SCOPE

This work package lists all forms, pamphlets, field manuals, technical manuals, bulletins, army regulations, military specifications, and military standards referenced in this manual.

DA PAMPHLETS

DA Pam 738-750	The Army Maintenance Management System (TAMMS)
DA PAM 750-8	Functional Users Manual for the Army Maintenance Management System
TB MED 530	Food Service Sanitation

FORMS

DA Form 2404	Equipment Inspection and Maintenance Worksheet
DA Form 2028-2	Recommended Changes to Equipment Technical Publications
DA Form 5988E	Equipment Inspection and Maintenance Worksheet – Electronic
SF 361	Discrepancy in Shipment Report
SF 364	Supply Discrepancy Report
SF 368	Product Quality Deficiency Report

TECHNICAL MANUALS

TM 10-8145-222-23P	Multi-Temperature Refrigerated Container System (MTRCS) Repair Parts and Special Tools List
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END OF WORK PACKAGE

FIELD MAINTENANCE**MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
INTRODUCTION FOR STANDARD MAINTENANCE ALLOCATION CHART (MAC)**

THE ARMY MAINTENANCE SYSTEM MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

This MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field – includes three sub columns, Crew (C), Service (O), and Field (F)

Sustainment – includes two sub columns, Below Depot (H) and Depot (D)

The maintenance to be performed below depot and in the field is described as follows:

1. Service maintenance. The responsibility of a using organization to perform maintenance on its assigned equipment. It normally consists of inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies. The replace function for this level of maintenance is indicated by the letter "O" in the third position of the SMR code. An "O" appearing in the fourth position of the SMR code indicates complete repair is possible at the service maintenance level.
2. Field maintenance. Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "F" appearing in the third position of the SMR code. An "F" appearing in the fourth position of the SMR code indicates complete repair is possible at the field maintenance level. Items are returned to the user after maintenance is performed at this level.
3. Below depot sustainment. Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "H" appearing in the third position of the SMR code. An "H" appearing in the fourth position of the SMR code indicates complete repair is possible at the below depot sustainment maintenance level. Items are returned to the supply system after maintenance is performed at this level.

The tools and test equipment requirements table (immediately following the MAC) lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks table (immediately following the tools and test equipment requirements) contains supplemental instructions and explanatory notes for a particular maintenance function.

MAINTENANCE FUNCTIONS

Maintenance functions are limited to and defined as follows:

1. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel). This includes scheduled inspection and gaugings and evaluation of cannon tubes.
2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
3. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:
 - a. **Unpack.** To remove from packing box for service or when required for the performance of maintenance operations.
 - b. **Repack.** To return item to packing box after service and other maintenance operations.
 - c. **Clean.** To rid the item of contamination.
 - d. **Touch up.** To spot paint scratched or blistered surfaces.
 - e. **Mark.** To restore obliterated identification.
4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. **Paint (ammunition only).** To prepare and spray color coats of paint so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.
9. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.
10. **Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

MAINTENANCE FUNCTIONS – CONTINUED**NOTE**

The following definitions are applicable to the “repair” maintenance function:

Services. Inspect, test, service, adjust, align, calibrate, and/or replace.

Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

Disassembly/assembly. The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

Actions. Welding, grinding, riveting, straightening, facing, machining, and/or re-surfacing.

11. **Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
12. **Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

EXPLANATION OF COLUMNS IN THE MAC

Column (1) Group Number. Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

Column (2) Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

Column (3) Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to “Maintenance Functions” outlined above).

Column (4) Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

EXPLANATION OF COLUMNS IN THE MAC – CONTINUEDField:

- C Crew maintenance
- O Service Maintenance
- F Field Maintenance

Sustainment:

- L Specialized Repair Activity
- H Below Depot Maintenance
- D Depot Maintenance

NOTE

The “L” maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the “H” column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

EXPLANATION OF COLUMNS IN THE TOOLS AND TEST EQUIPMENT REQUIREMENTS

Column (1) – Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) – Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3) – Nomenclature. Name or identification of the tool or test equipment.

Column (4) – National Stock Number (NSN). The NSN of the tool or test equipment.

Column (5) – Tool Number. The manufacturer's part number.

EXPLANATION OF COLUMNS IN THE REMARKS

Column (1) – Remarks Code. The code recorded in column (6) of the MAC.

Column (2) – Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

END OF WORK PACKAGE

**FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
MAINTENANCE ALLOCATION CHART (MAC)**

MAINTENANCE ALLOCATION CHART (MAC)

Table 1. MTRCS Maintenance Allocation Chart.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
00	MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)	INSPECT	0.4					16, 19, 23	A
		ADJUST	0.2					20	
		SERVICE		1.0				NONE	B
		REPAIR			4.0			1, 2, 16, 20, 24	C
0001	ROLLERS, PLS	REPLACE	0.5				1		
0002	BULKHEAD, INTERIOR	REPLACE	0.2				NONE		
0004	CARGO NETS, ROW 1 AND ROW 2	REMOVE/ INSTALL	0.5					NONE	
		REPLACE	0.5					NONE	
0005	CARGO NETS, ROW 3 AND ROW 4	REMOVE/ INSTALL	0.5					NONE	
		REPLACE	0.5					NONE	
0006	TANK, FUEL	SERVICE		1.0				15, 16, 17, 18, 21, 23	
		REPAIR			1.0			1, 2, 16, 17, 18, 23, 27	
		REPLACE			3.0			1, 2, 16, 17, 18, 23, 27	
		REPAIR					8.0	1, 2	
0007	PANELS, ACCESS	REPLACE		0.5			1		

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
01	UNIT, REFRIGERATION	INSPECT	0.3					NONE	A
		SERVICE		2.0				3, 4, 6, 10, 11, 16, 17, 18	
		REPLACE			4.0			1, 2, 3, 16, 17, 18, 23	
0101	CONDENSER								
010101	COMPRESSOR	SERVICE		1.0				1, 3, 9, 16, 17, 18	D
		REPLACE			6.0			2, 3, 4, 15, 26	
010102	COIL, COMPRESSOR UNLOADER VALVE	TEST		0.5				1, 2, 5, 16, 17, 18	
		REPLACE		0.4				1, 2, 5, 16, 17, 18	
010103	FILTER-DRIER	TEST		0.1				16, 17, 18	B
		REPLACE		0.4				3, 4, 16, 17, 18	
010104	SWITCH, HIGH PRESSURE CUTOUT/SWITCH, PRESSURE CONTROL	TEST		0.5				2, 3, 7, 8, 16, 17, 18	
		REPLACE		0.5				3, 7, 8, 16, 17, 18	
010105	SENSORS, COMPRESSOR	REPLACE		1.0				1, 15	
		TEST		1.0				1	
010106	COIL, CONDENSER	INSPECT		0.2				2	
		SERVICE		0.3				2, 3	
		REPLACE			8.0			1, 2, 4	
010107	VALVE, COMPRESSOR PRESSURE REGULATING	ADJUST		1.0				2, 3, 5	
		REPLACE			2.5			2, 3, 4	

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
010108	SOLENOID VALVE, MAIN HEAT	REPAIR			1.0			1, 2, 3, 4	
		REPLACE			3.0			1, 2, 3, 4	
010109	SOLENOID VALVE, RECEIVER PRESSURE	REPAIR			1.0			1, 2, 3, 4, 16, 18	
		REPLACE			3.0			1, 2, 3, 4, 16, 18	
010110	VALVE, DISCHARGE SERVICE	REPLACE			1.5			1, 2, 3, 4, 16, 18	
010111	VALVE, SUCTION SERVICE	REPLACE			1.5			1, 2, 3, 4, 16, 18	
010112	RECEIVER	REPLACE			1.5			1, 3, 4, 16, 17, 18	
010113	VALVE, CHECK	REPLACE			1.0			1, 2, 3, 4, 16	
010114	ACCUMULATOR/HEAT EXCHANGER	REPLACE			4.0			1, 2, 3, 4	
0102	DIESEL ENGINE, REFRIGERATION UNIT	SERVICE		0.3				1	
		REPLACE			6.0			1, 2, 3, 16, 17, 18, 23, 26	
010201	FILTER ELEMENT, AIR	INSPECT		0.3				1	B
		REPLACE	0.1						
010202	FILTER, OIL	REPLACE		0.1				1, 16, 17, 18, 23	

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
010203	FILTER, FUEL	REPLACE		0.5				1, 16, 17, 18, 23	
010204	SYSTEM, COOLING	SERVICE		1.0				1, 2, 23	
		REPAIR		1.5				1, 2, 23	
010205	RESISTOR, THERMAL WATER TEMPERATURE	REPLACE		0.4				1	
010206	THERMOSTAT	REPLACE		0.5				2, 23	
010207	STARTER	REPLACE		1.0				1	
010208	ALTERNATOR	TEST		0.2				2	E
		REPLACE		1.0				2	
010209	PUMP, DIESEL ENGINE FUEL FEED	SERVICE		0.6				1, 23	
		REPLACE		1.0				1, 23	
010210	PLUGS, DIESEL ENGINE GLOW	TEST		0.3				1	
		REPLACE		0.5				1	
010211	FAN, CONDENSER	REPLACE		1.5				1	
010212	PULLEY, IDLER	REPLACE			3.0			1	
010213	V-BELT, STANDBY MOTOR TO SINGLE-PHASE ALTERNATOR	REPLACE		1.0				3	
		ADJUST		0.5				3	
010214	V-BELT, STANDBY MOTOR TO COMPRESSOR	REPLACE		1.0				2	
		ADJUST		0.5				2	
010216	V-BELT, ENGINE TO COMPRESSOR	REPLACE		1.0				1	
		ADJUST		0.5				1	
010217	V-BELT, WATER PUMP	REPLACE		0.5				1	

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
010218	MUFFLER	REPAIR		0.5				1	
		REPLACE		0.5				1	
010219	CLUTCH, ENGINE MOUNTED CENTRIFUGAL	REPLACE			2.0			1, 2	
010220	SWITCH, OIL PRESSURE	REPLACE		0.5				1	
0103	ELECTRICAL, REFRIGERATION UNIT								
010301	DISPLAY, MICROPROCESSOR CONTROLLER	SERVICE		0.1				2	B
		REPLACE			0.3			2	
		SERVICE			0.1			2	B
010303	SOLENOID, RUN	REPLACE		0.7				1, 2	
		TEST		0.2				1, 2	
010304	SOLENOID, SPEED	REPLACE		1.0				1, 2, 12, 27	
		TEST		0.2					
010305	BOX, ELECTRICAL	SERVICE		0.5				1	B
		REPAIR			1.0			1	
010306	ALTERNATOR, STANDBY MOTOR/SINGLE PHASE	REPLACE			5.0			2, 26, 28	
010307	BOX, MICROPROCESSOR CONTROL	REPAIR			0.7			2	
010308	SWITCH, EMERGENCY STOP	REPLACE		0.5				1	

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
02	CONTAINER, INSULATED	SERVICE	2.0					14, 16, 17, 18	
0201	EVAPORATOR, COMPARTMENT 1	INSPECT		0.1				NONE	B
		SERVICE		0.3				1, 2, 3	
		REPLACE			4.0			1, 3, 4, 26	B
020101	MOTOR, EVAPORATOR BLOWER	REPLACE		0.6				2	
020102	CAPACITOR, EVAPORATOR BLOWER MOTOR	REPLACE		0.4				2	
020103	VALVE, EVAPORATOR THERMOSTATIC EXPANSION	INSPECT		1.0				2	
		REPLACE			2.5			2, 3, 16, 17, 18	
020104	HEATER	REPLACE		2.0				2, 27	
020105	COIL, LIQUID SOLENOID VALVE	REPLACE		0.4				2	
020106	COIL, HOT GAS VALVE	REPLACE		0.5				2	
020107	SENSORS, EVAPORATOR	INSPECT		0.5				2	
		REPLACE		0.5				2	
0202	EVAPORATOR, COMPARTMENT 2	INSPECT		0.1				NONE	B, F
		SERVICE		0.3				1, 2, 3	B, F
		REPLACE			4.0			1, 3, 4, 13, 26	F
020201	MOTOR, EVAPORATOR BLOWER	REPLACE		0.6				2	
020202	CAPACITOR, EVAPORATOR BLOWER MOTOR	REPLACE		0.4				1	

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
020203	VALVE, EVAPORATOR THERMOSTATIC EXPANSION	INSPECT		1.0				2	F
		REPLACE			2.5			2, 3, 16, 17, 18	
020204	HEATER	REPLACE		2.0				2, 27	F
020205	COIL, LIQUID SOLENOID VALVE	REPLACE		0.5				2	F
020206	COIL, HOT GAS VALVE SOLENOID	REPLACE		0.5				2	F
020207	SENSORS, EVAPORATOR	INSPECT		0.5				2	F
		REPLACE		0.5				2	F
0203	HOSES, DRAIN	REPLACE		2.0				1, 2	
0204	LIGHTING	REPLACE		1.0				1	
0205	ASSEMBLY, CONTROL PANEL	TEST		0.5				NONE	E
		REPAIR			0.4			2	
0206	BOX, POWER	REPAIR			2.0			2	
020601	ASSEMBLIES, POWER CABLE	TEST		0.2				1, 2	E
		REPLACE		1.0				1, 2	
		REPAIR			2.0			3, 27	
0207	BOX, BATTERY	REPLACE			0.2			1	
		REPAIR			0.3			1	
020701	BATTERY	SERVICE		0.2				1, 2, 16, 18, 21, 22, 23	
		REPLACE		0.2				1, 2, 16, 18, 21, 22, 23	

MAINTENANCE ALLOCATION CHART (MAC) – CONTINUED

Table 1. MTRCS Maintenance Allocation Chart – Continued.

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
0208	BOX, CAPACITOR	REPAIR			0.5			1, 16, 17, 18, 25, 27	
0209	RECORDER, TEMPERATURE CHART	ADJUST	0.1					NONE	
		SERVICE	0.5					NONE	
		TEST		0.3				2	E
		REPLACE		3.0				2	
0210	DOORS	SERVICE		0.3				NONE	B
		REPAIR			1.0			1, 2	
0211	HOLDER, DOCUMENT	REPLACE		0.1				1, 2	
		REPAIR		0.5				1, 2, 16, 17, 18	
0212	PIPING, REFRIGERATION	REPAIR			4.0			3, 4, 5, 6, 7, 8	
0213	WIRING, ELECTRICAL	REPAIR			4.0			1, 2, 27	

TOOLS AND TEST EQUIPMENT

Table 2. Tools and Test Equipment for MTRCS.

(1) TOOL OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
1	F	Forklift	3930-01-496-0409	
2	F	Hoist, Chain	3950-00-965-0098	2502 1/2TON
3	F	Maintenance Kit, Electrical Connector PUB #: 5935-92-101, LIN: M0339	5935-01-350-8391	13440042
4	F	Shears, Metal Cutting, Hand	5110-00-273-0128	B107.16M
5	O	Tool Kit , General Mechanics PUB #: 5180-95-B47-HR, LIN: T28688	5180-01-483-0249	12B470000-1
6	O	Tool Kit, Refrigeration Equipment (Service Refrigeration Ordnance Tool Kit) PUB #: 5180-95-N18-HR, LIN: W51362	5180-00-596-1474	SC 5180-90-CL- N18
7	F	Tool Kit, Refrigeration Equipment (Supplement)	5180-01-561-6082	
8	O	Tool Set,SATS,Base (Standard Automotive Tool Set)	4910-01-490-6453	

REMARKS

Table 3. Remarks for MTRCS.

(1) REMARKS CODE	(2) REMARKS
A	This consists of the unit crew/operator level PMCS.
B	This consists of the unit field level PMCS.
C	This consists of panel patching, floor patching, and other hardware replacements.
D	This consists of charging the MTRCS to the proper level of refrigerant.
E	This consists of the verification of the functionality of MTRCS.
F	Tasks are combined in manual.

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

INTRODUCTION

Scope

This work package lists COEI and BII for the MTRCS to help you inventory items for safe and efficient operation of the equipment.

GENERAL

The COEI and BII information is divided into the following lists:

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the MTRCS. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the MTRCS in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the MTRCS during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

EXPLANATION OF COLUMNS IN THE COEI AND BII LISTS

Column (1) Item Number. Gives you the reference number of the item listed.

Column (2) National Stock Number (NSN) and Illustration. Identifies the stock number of the item to be used for requisitioning purposes and provides an illustration of the item.

Column (3) Description, Part Number/(CAGEC). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

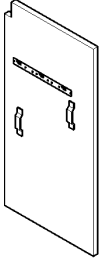
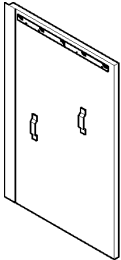
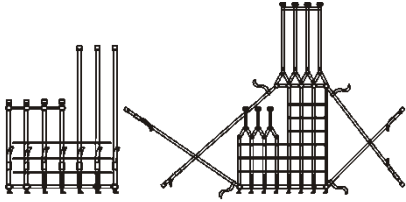
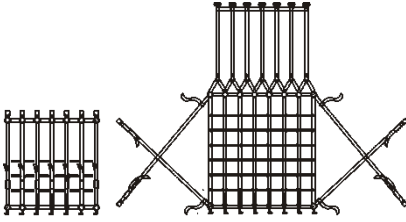
Column (4) Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (5) U/I. Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

Column (6) Qty Rqr. Indicates the quantity required.


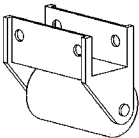
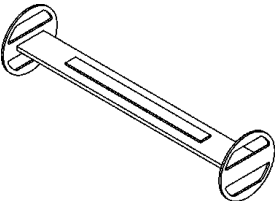
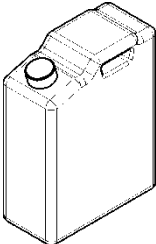
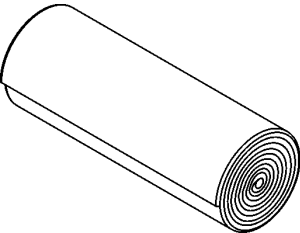
COMPONENTS OF END ITEM

Table 1. Components of End Item List (COEI) for MTRCS.

(1) Item Number	(2) National Stock Number (NSN) and Illustration	(3) Description, Part Number/(CAGEC)	(4) Usable On Code	(5) U/I	(6) Qty Rqr
1	2510-01-574-8401 	PANEL, BODY, VEHICULAR (LEFT) 500K3171-2 (94833)		EA	1
2	2510-01-574-8409 	PANEL, BODY, VEHICULAR (RIGHT) 500K3171-1 (94833)		EA	1
3	3940-01-573-9131 	NET, DRAFT COVER ROW 1 AND ROW 2 500K3263 (94833)		EA	2
4	3940-01-574-0271 	NET, DRAFT COVER ROW 3 AND ROW 4 500K3264 (94833)		EA	2

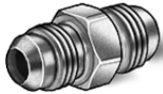
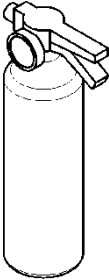



COMPONENTS OF END ITEM – CONTINUED

Table 1. Components of End Item List (COEI) for MTRCS – Continued.

(1) Item Number	(2) National Stock Number (NSN) and Illustration	(3) Description, Part Number/(CAGEC)	(4) Usable On Code	(5) U/I	(6) Qty Rqr
5	5315-01-574-2042 	PIN, STRAIGHT, HEADED TL-09MT-0211 (09PD1)		EA	4
6	3990-01-574-2050 	ROLLER, MATERIAL HANDLING TL-09MT-0210 (09PD1)		EA	2
7	8145-01-574-9191 	SUPPORT, SHIPPING AND STORAGE CONTAINER 182K0358-1 (94833)		EA	4
8	7240-01-337-5269 	TANK, FUEL, PORTABLE 182K0101-1 (94833)		EA	1
9	8340-01-579-3755 	TARPAULIN 182K0418-1 (98255)		EA	1

BASIC ISSUE ITEMS

Table 2. Basic Issue Items (BII) for MTRCS.

(1) Item Number	(2) National Stock Number (NSN) and Illustration	(3) Description, Part Number/(CAGEC)	(4) Usable On Code	(5) U/I	(6) Qty Rqr
1		COUPLING, HOSE 50715K261 (39428)		EA	1
2	<p>4210-01-574-6567</p> 	EXTINGUISHER, FIRE 6487T72 (39428)		EA	1
3	<p>TM 10-8145-222-13</p> <p>TECHNICAL MANUAL OPERATOR AND FIELD MAINTENANCE MANUAL FOR MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)</p> <p>NSN 8145-01-024-3387</p>  <p>HEADQUARTERS, DEPARTMENT OF THE ARMY 1 JANUARY 2009</p>	TECHNICAL MANUAL OPERATOR AND FIELD MAINTENANCE MANUAL TM 10-8145-222-13		EA	1
4	<p>TM 10-8145-222-23P</p> <p>TECHNICAL MANUAL FIELD MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST/ILLUSTRATIONS FOR MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM</p> <p>MODEL MTRCS NSN 8145-01-024-3387</p>  <p>HEADQUARTERS, DEPARTMENT OF THE ARMY 1 FEBRUARY 2009</p>	TECHNICAL MANUAL REPAIR PARTS AND SPECIAL TOOLS LIST TM 10-8145-222-23P		EA	1
5	<p>5210-01-577-5171</p> 	TESTER, BELT TENSION 07-00253-00 (10855)		EA	1

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
ADDITIONAL AUTHORIZATION LIST (AAL)**

INTRODUCTION**Scope**

This work package lists additional items you are authorized for the support of the MTRCS.

GENERAL

This list identifies items that do not have to accompany the MTRCS and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

EXPLANATION OF COLUMNS IN THE AAL LIST

Column (1) National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (2) Description, Part Number/(CAGEC). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (3) Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (4) U/I. Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (1).

Column (5) Qty Recm. Indicates the quantity recommended.

ADDITIONAL AUTHORIZATION LIST – CONTINUED

Table 1. Additional Authorization List (AAL) for MTRCS

(1) National Stock Number (NSN)	(2) Description, Part Number/(CAGEC)	(3) Usable On Code	(4) U/I	(5) Qty Rqr
6110-01-393-0895	CABLE, BOOSTER 7234K36 (39428)		EA	1
3930-01-496-0409	FORKLIFT SPECIFY ON REQUISITION (80244)		EA	1
7240-00-404-9794	FUNNEL 4HZ70 (25795)		EA	1
3950-00-965-0098	HOIST, CHAIN 2502 1/2TON (12128)		EA	1
4720-00-729-5338	HOSE ASSEMBLY, NONMETALLIC A-A-59270 (58536)		EA	1
4940-01-527-0070	PAN, DRIP 75-755 (77335)		EA	1
7105-00-782-3166	STOOL, STEP A-A-3014 (58536)		EA	1
3920-01-288-9739	TRUCK, LIFT, PALLET MOBILIZER PD3920-0070 (97403)		EA	1

END OF WORK PACKAGE

FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
EXPENDABLE AND DURABLE ITEMS LIST

INTRODUCTION**Scope**

This work package lists expendable and durable items that you will need to operate and maintain the MTRCS. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), CTA 50-909, Field and Garrison Furnishings and Equipment or CTA 8-100, Army Medical Department Expendable/Durable Items.

EXPLANATION OF COLUMNS IN THE EXPENDABLE/DURABLE ITEMS LIST

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use brake fluid (WP 0105, Item 5).

Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item (*C = Crew, O = Service/AMC, F = Field/ASB*).

Column (3) National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) Item Name, Description, Part Number/(CAGEC). This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (5) U/I. Unit of Issue (U/I) code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List for MTRCS.

(1) Item No.	(2) Level	(3) National Stock Number (NSN)	(4) Item Name, Description, Part Number/(CAGEC)	(5) U/I
1	O	8040-00-844-9707	Adhesive 1357 (1A9T3)	PT
2	O	6810-00-983-8551	Alcohol, Isopropyl TT-I-735 (81348)	QT
3	O	6850-01-481-4511	Anti-Freeze DEX-COOL CONC.(CODE 7994) (59595)	GL
4	O	8415-00-082-6108	Apron, Utility A-A-55063 (58536)	EA
5	O	6135-00-900-2139	Battery, Nonrechargeable,9-Volt, DC ANSI C18.1M (80204)	EA
6	O	6850-00-063-2841	Bleach, Laundry A-A-52091 (58536)	GL
7	O	7920-00-018-3581	Brush, Cleaning, Tool and Parts 7226T2 (39428)	EA

EXPENDABLE AND DURABLE ITEMS LIST – CONTINUED

Table 1. Expendable and Durable Items List for MTRCS – Continued.

(1) Item No.	(2) Level	(3) National Stock Number (NSN)	(4) Item Name, Description, Part Number/(CAGEC)	(5) U/I
8	O	8020-00-559-0389	Brush, Paint A-A-3193 (58536)	EA
9	O	7920-00-291-5815	Brush, Wire 7920-00-291-5815 (83421)	EA
10	O		Cartridge, Pen, Green R25-4 (8ALR0)	EA
11	O		Cartridge, Pen, Red R25-2 (8ALR0)	EA
12	O	8030-00-180-6339	Caulking Compound, Silicone, Clear A-A-272 (58536)	CA
13	O	7530-01-577-3454	Chart, Recording Instrument 99290107 (8ALR0)	BX
14	O	7530-01-575-6749	Chart, Recording Instrument, Setup CCW R18-270 (8ALR0)	EA
15	O	6850-01-053-2540	Cleaning Compound, Engine Cooling SYSTEMMACS SUPER FAST FLUSH 1500 (72527)	BT
16	O	5350-00-584-4653	Cloth, Abrasive 051144-02432 (73681)	EA
17	O	8030-00-850-7076	Coating Compound, Metal Pretreatment, Resin-Acid DOD-P-15328 (81349)	KT
18	C	7930-00-282-9699	Detergent, General Purpose 7930-00-282-9699 (83421)	GL
19	O	8010-01-309-0328	Epoxy Primer Coating Kit, White MIL-P-53022B, Type II (81349)	KT
20	O	4240-00-202-9473	Face Shield, Industrial ANSI Z87.1 (80204)	EA
21	O	8415-01-013-7384	Gloves, Chemical and Oil Protective MIL-G-87066 (81349)	PR
22	O	8330-01-566-1796	Gloves, Leather Palm 6077T7 (2V507)	PR
23	O	8415-00-268-7860	Gloves, Welders A-A-50022 (58536)	PR
24	C	9150-01-086-4163	Grease, General Purpose ALVANIA 2 (54527)	EA
25	O	4720-00-592-9426	Hose, Assembly, Nonmetallic 7454T23 (39428)	EA
26	O	5640-00-510-4199	Insulation Tape, Thermal 5958 (14451)	EA
27	O	5460-01-237-8048	Insulation, Foam 8551K11 (39428)	CN
28	O	9150-00-451-6947	Lubricating Oil, Engine MIL-L-46152 (81349)	GL
29	O	9150-01-387-4469	Lubricating Oil, Refrigerant Compressor Mobil EAL ARCTIC 68 (77988)	GL

EXPENDABLE AND DURABLE ITEMS LIST – CONTINUED

Table 1. Expendable and Durable Items List for MTRCS – Continued.

(1) Item No.	(2) Level	(3) National Stock Number (NSN)	(4) Item Name, Description, Part Number/(CAGEC)	(5) U/I
30	O	9150-01-413-6892	Lubricating Oil, Engine A-A-52039 (58536)	CO
31	O	9150-00-247-0481	Lubricating Oil, Engine MIL-L-2104 (81349)	QT
32	O	6830-01-499-7805	Monochlorodifluoromethane Refrigerant, R-404a R-404A/(9V583)	CN
33	C	9150-00-231-2361	Oil, Lubricating, General Purpose MIL-PRF-3150 (81349)	QT
34	O	7240-00-274-3875	Pail, Utility Metal 12 (9C665)	EA
35	O	7240-00-246-1097	Pail, Utility Plastic 7240-00-246-1097 (0HFR0)	EA
36	O	9150-00-261-7899	Penetrating Oil A-A-50493 (81348)	PT
37	O	8010-01-285-3554	Polyurethane Coating MIL-PRF-85285C, Type 1 (81349)	KT
38	F	5975-01-029-4176	Probe, Safety Shorting DSCR-PD-4176 (13873)	EA
39	O	4240-01-527-4051	Safety Glasses, Revision Sawfly Eyewear 4-0076-9800 (30VZ5)	EA
40	O	7930-01-393-6753	Scouring Pad C322 (76381)	BX
41	O	8030-00-148-9833	Sealing Compound, Threadlocker HM128 (3R2V1)	BX
42	F	5110-00-273-0128	Shears, Metal Cutting, Hand B107.16 (05047)	EA
43	O	6850-01-518-9990	Silicone Compound 01516 (0YJB5)	EA
44	O	6850-00-880-7616	Silicone Compound AS8660 8OZTU (81343)	EA
45	O	8030-01-299-1762	Silicone Compound, RTV, Blue 81724 (1PBQB)	TU
46	O	3940-01-379-5670	Sling, Endless (8 Foot) 33995T112 (39428)	EA
47	F	1670-00-753-3788	Sling, Cargo, Aerial Delivery 63J4261-1 (81337)	EA
48	C	6810-00-264-6618	Sodium Bicarbonate, Technical A-A-374 (58536)	LB
49	O	4235-01-423-7221	Spill Clean-Up Kit, Hazardous Material 11056 (07TH4)	KT
50	O	5970-00-012-1276	Tape, Insulation, Electrical, 3/4 by 66 88 (75037)	EA
51	O	8010-00-181-8080	Thinner, Paint Products MIL-T-81772B, Type 1 (81349)	GL

EXPENDABLE AND DURABLE ITEMS LIST – CONTINUED

Table 1. Expendable and Durable Items List for MTRCS – Continued.

(1) Item No.	(2) Level	(3) National Stock Number (NSN)	(4) Item Name, Description, Part Number/(CAGEC)	(5) U/I
52	C	7920-01-177-3633	Towel, Machinery Wiping 33350 (5U446)	BX
53	O	4720-01-572-0897	Tubing, Nonmetallic 5046K12 (39428)	FT
54	C	9130-01-031-5816	Turbine Fuel, Aviation JP-8 MIL-T-83133 GR JP8 (81349)	GL
55	O	5975-00-156-3253	Wraps, Tie, 13-inch MS3367-2-9 (81343)	HD

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
MULTI-TEMPERATURE REFRIGERATED CONTAINER SYSTEM (MTRCS)
MANDATORY REPLACEMENT PARTS LIST**

INTRODUCTION

Scope

This work package includes a list of all mandatory replacement parts referenced in the task initial setups and procedures. These are items that must be replaced during maintenance whether they have failed or not. This includes items based on usage intervals such as miles, time, rounds fired, etc.

EXPLANATION OF COLUMNS IN THE MANDATORY REPLACEMENT PARTS LIST

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Replace lock washer (WP 0111, Item 5).

Column (2) Part Number/(CAGEC). This column identifies the part number and manufacturer's Commercial and Government Entity Code (CAGEC).

Column (3) National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) Nomenclature. This column provides information you need to identify the item.

Column (5) Qty. Lists the quantity required to replace parts removed during repair.

Table 1. Mandatory Replacement Parts List for MTRCS.

(1) Item No.	(2) Part Number/ CAGEC	(3) National Stock Number (NSN)	(4) Nomenclature	(5) Qty
1	13214E3789-3/ (97403)	5320-01-555-9964	Blind Rivet (0.125 shank diameter x 0.125 grip length)	A/R
2	14-00326-00/ (10855)	4130-01-574-2039	Filter Dryer	1
3	16-60001-01/ (10855)	5330-01-574-2013	Gasket and Seal Kit for Solenoid Valve	1
4	30-00323-00/ (10855)	2910-01-574-2019	Filter Element, Fluid (Oil Filter)	1
5	34-00663-11 /10855	5310-01-575-3213	Lock Washer (1/4-in ID)	4
6	34-00945-10 /10855	5310-01-574-2034	Lock Washer (12mm ID)	4
7	34-01184-54 /10855	5310-01-574-3844	Lock Nut M4	2
8	34-60057-17 /10855	5310-01-574-7949	Spring Washer	1

MANDATORY REPLACEMENT PARTS LIST – CONTINUED

Table 1. Mandatory Replacement Parts List for MTRCS – Continued.

(1) Item No.	(2) Part Number/ CAGEC	(3) National Stock Number (NSN)	(4) Nomenclature	(5) Qty
9	AD64H/ 07707	5320-00-956-7355	Blind Rivet, (0.187 shank diameter x 0.25 grip length)	4
10	MS35338-137/ (80205)	5310-00-933-8119	Lock Washer (0.175 ID)	9
11	MS35338-138/ (80205)	5310-00-933-8120	Lock Washer, #10 ID	29
12	MS35338-139/ (80205)	5310-00-933-8121	Lock Washer, ¼-in ID	5
13	MS35338-141/ 80205	5310-00-984-7042	Lock Washer, ⅜-in ID	6

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These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@avma27.army.mil>
To: TACOMLCMC.DAForm2028@us.army.mil

Subject: DA Form 2028

1. From: Joe Smith
2. Unit: home
3. Address: 4300 Park
4. City: Hometown
5. St: MO
6. Zip: 77777
7. Date Sent: 19-OCT-93
8. Pub no: 55-2840-229-23
9. Pub Title: TM
10. Publication Date: 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. Submitter FName: Joe
14. Submitter MName: T
15. Submitter LName: Smith
16. Submitter Phone: 123-123-1234
17. Problem: 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. Text:

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 21 October 2003
TO: (Forward to proponent of publication or form) (Include ZIP Code) US ARMY TACOM LIFE CYCLE MANAGEMENT COMMAND ATTN: AMSTA-LCL-MPP/TECHPUBS 1 Rock Island Arsenal ROCK ISLAND, IL 61299-7360						FROM: (Activity and location) (Include ZIP Code) PFC JANE DOE Co A 3 RD Engineer Br. Ft Leonard Wood, MO 63108	
PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER TM 10-1670-296-23&P						DATE 30 October 2002	TITLE Unit Manual for Ancillary Equipment for Low Velocity Air Drop Systems
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).	
	0036 00-2				1	<p><i>In Table 1, Sewing Machine Code Symbols, the second sewing machine code symbol should be MDZZ not MD22</i></p> <p><i>Change the manual to show Sewing Machine, Industrial: Zig-Zag; 308 stitch; medium-duty; NSN 3530-01-181-1421 as a MDZZ code symbol.</i></p>	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE Jane Doe, PFC				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION (508) 233-4141 DSN 256-4141		SIGNATURE Jane Doe <i>Jane Doe</i>	

TO: <i>(Forward direct to addressee listed in publication)</i> US ARMY TACOM LIFE CYCLE MANAGEMENT COMMAND ATTN: AMSTA-LCL-MPP/TECHPUBS 1 Rock Island Arsenal ROCK ISLAND, IL 61299-7360	FROM: <i>(Activity and location) (Include ZIP Code)</i> PFC JANE DOE Co A 3 RD Engineer Br. Ft Leonard Wood, MO 63108	DATE 21 October 2003
--	--	--------------------------------

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER TM 10-1670-296-23&P	DATE 30 October 2002	TITLE Unit Manual for Ancillary Equipment for Low Velocity Air Drop Systems
---	-------------------------	--

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
0066 00-					4			<i>Callout 16 in figure 4 is pointed to a <u>D-Ring</u>. In the Repair Part List key for Figure 4, item 16 is called a <u>Snap Hook</u>. Please correct one or the other.</i>

PART III – REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--	-----------

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is ODISC4.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
---	---	------

TO: (Forward to proponent of publication or form) (Include ZIP Code) US ARMY TACOM LIFE CYCLE MANAGEMENT COMMAND ATTN: AMSTA-LCL-MPP/TECHPUBS 1 Rock Island Arsenal ROCK ISLAND, IL 61299-7360	FROM: (Activity and location) (Include ZIP Code)
---	---

PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER TM 10-8145-222-13	DATE 1 SEPTEMBER 2010	TITLE Operator and Field Maintenance Manual for Multi-Temperature Refrigerated Container System (MTRCS)
--	--------------------------	--

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON <i>(Provide exact wording of recommended changes, if possible).</i>
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**Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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TO: (Forward to proponent of publication or form) (Include ZIP Code) US ARMY TACOM LIFE CYCLE MANAGEMENT COMMAND ATTN: AMSTA-LCL-MPP/TECHPUBS 1 Rock Island Arsenal ROCK ISLAND, IL 61299-7360	FROM: (Activity and location) (Include ZIP Code)	DATE
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PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER TM 10-10-8145-222-13	DATE 1 SEPTEMBER 2010	TITLE Operator and Field Maintenance Manual for Multi-Temperature Refrigerated Container System (MTRCS)
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

Empty space for remarks

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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TO: (Forward to proponent of publication or form) (Include ZIP Code) US ARMY TACOM LIFE CYCLE MANAGEMENT COMMAND ATTN: AMSTA-LCL-MPP/TECHPUBS 1 Rock Island Arsenal ROCK ISLAND, IL 61299-7360	FROM: (Activity and location) (Include ZIP Code)	DATE
---	---	-------------

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER TM 10-10-8145-222-13	DATE 1 SEPTEMBER 2010	TITLE Operator and Field Maintenance Manual for Multi-Temperature Refrigerated Container System (MTRCS)
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PART III – REMARKS (Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

Empty space for remarks

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

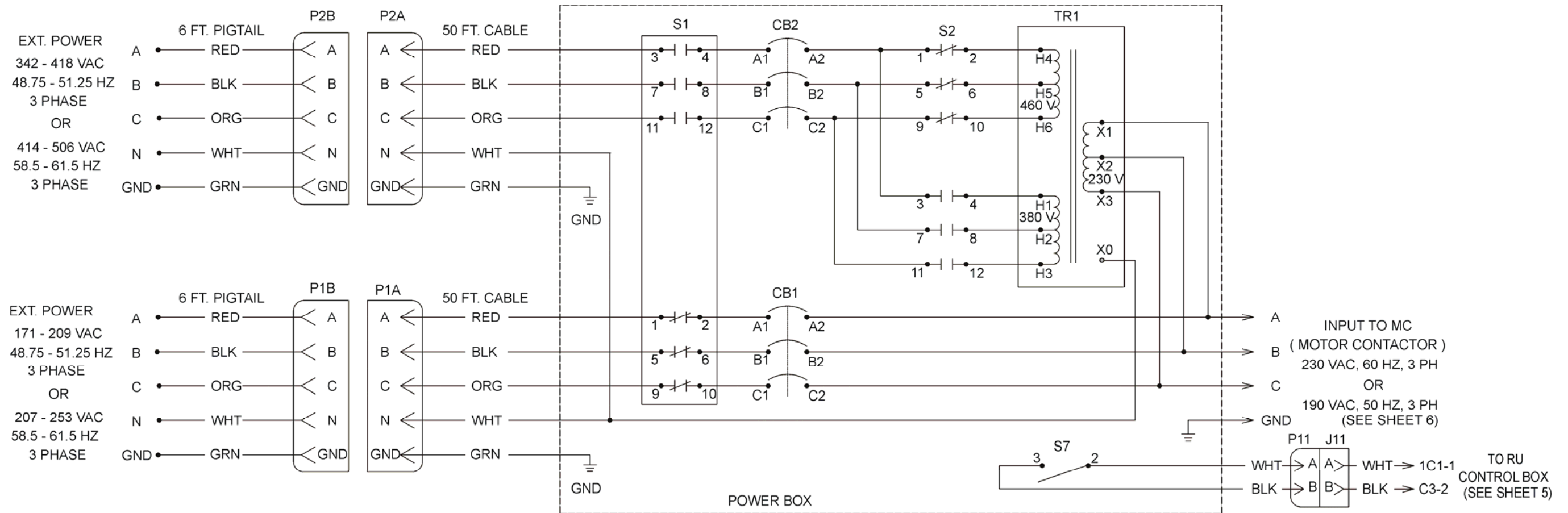
Official:



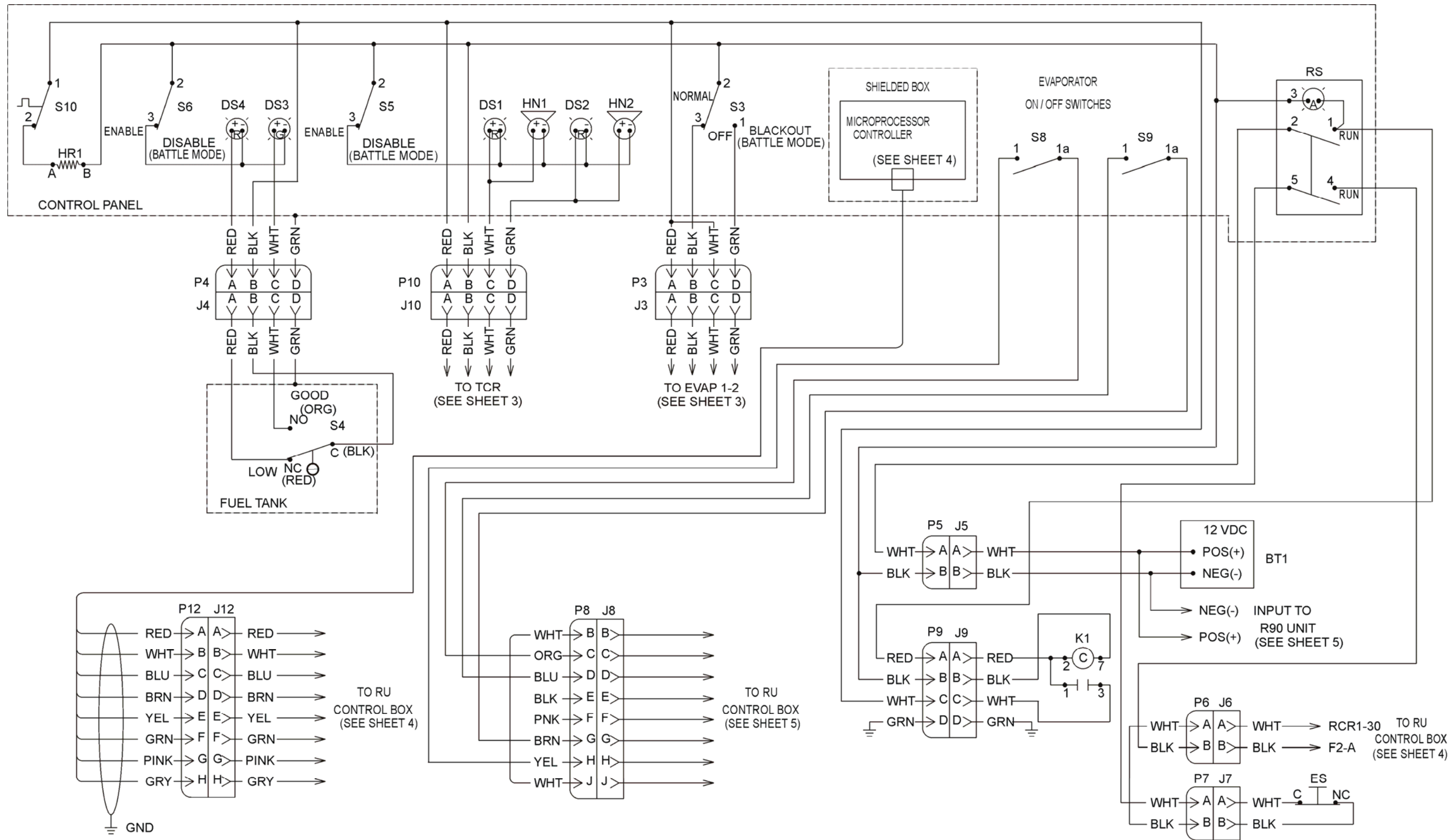
JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
1021501

DISTRIBUTION:

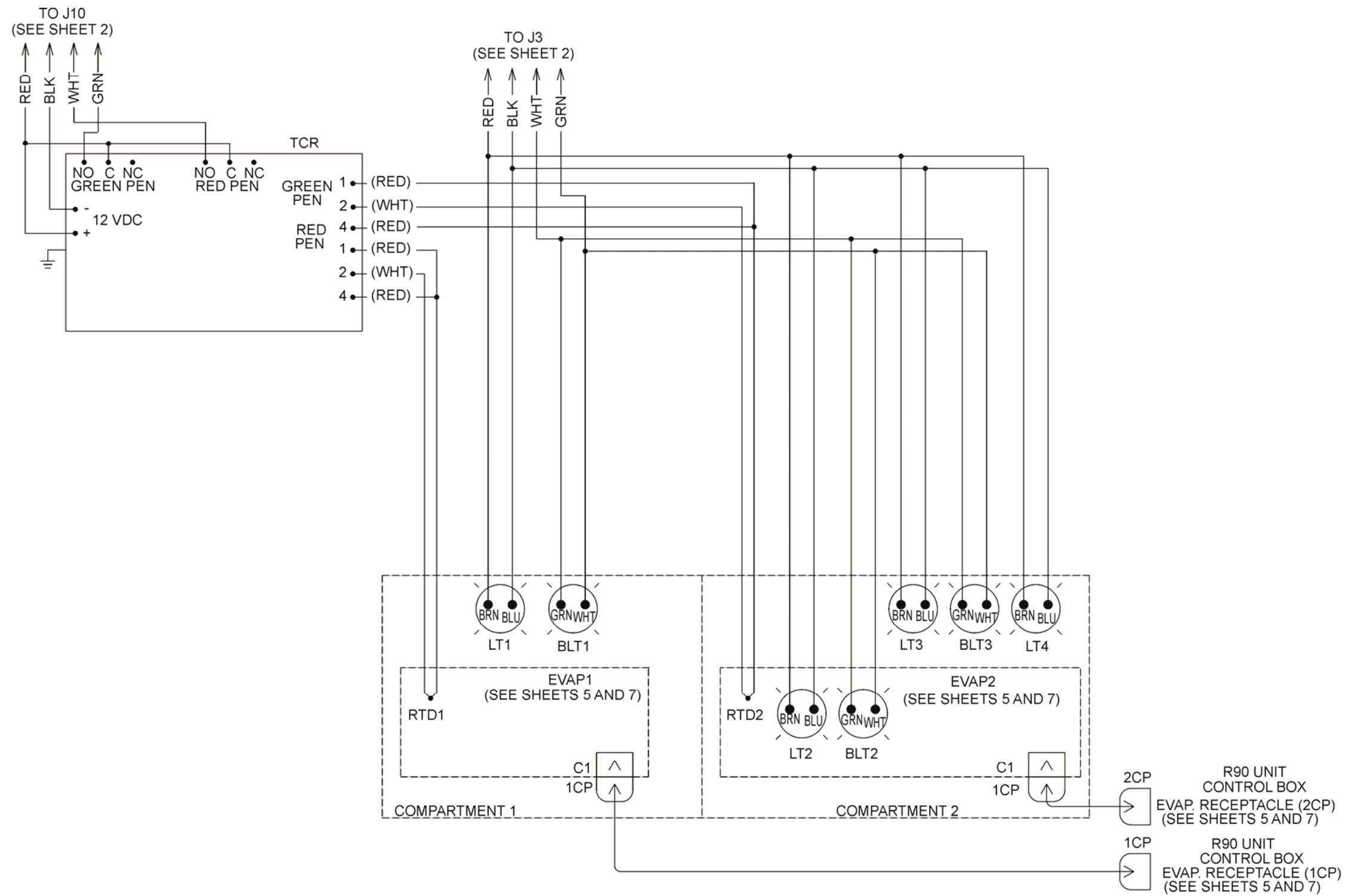
To be distributed in accordance with initial distribution number (IDN) 257832 requirements for TM 10-8145-222-13.



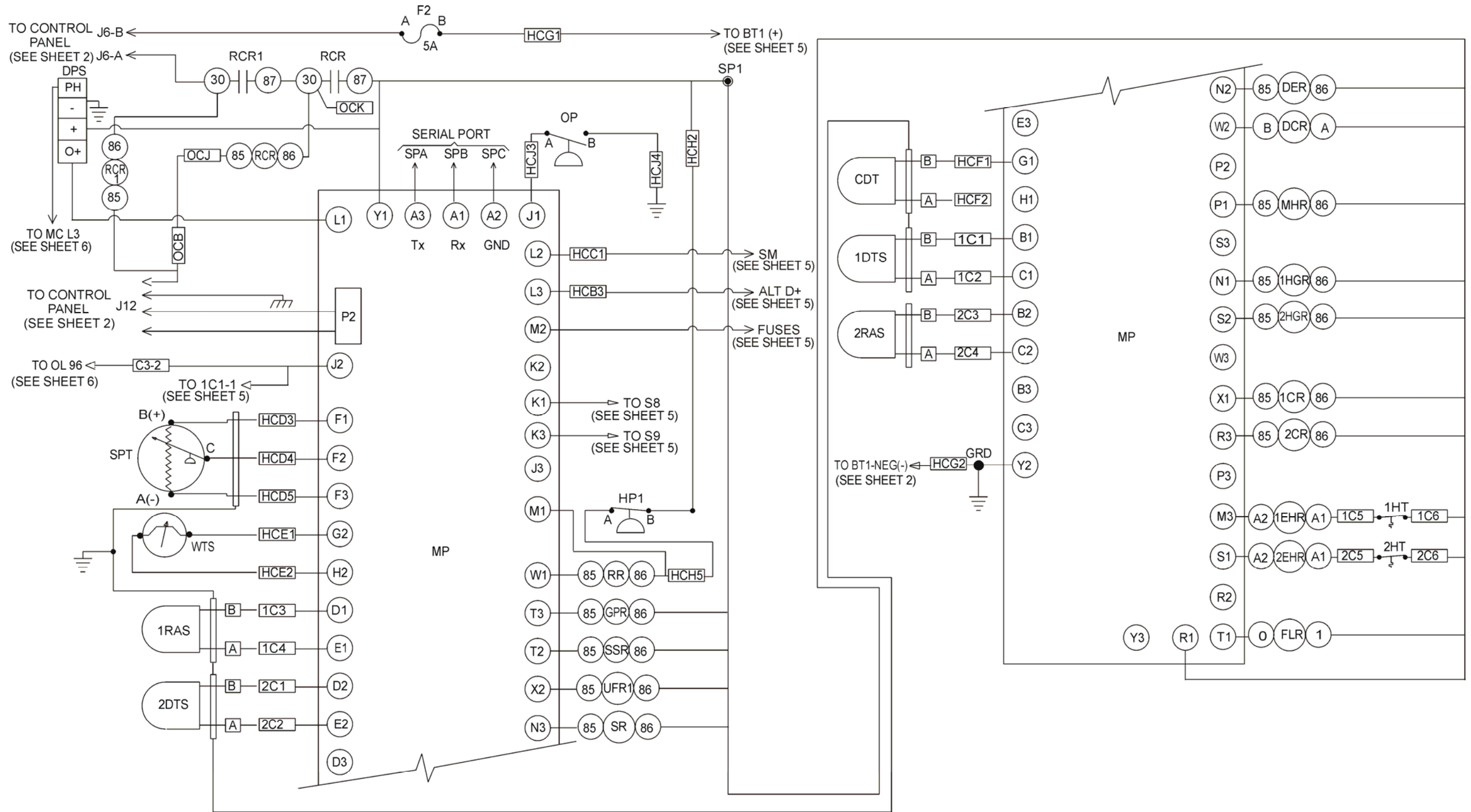
FO 1. MTRCS Electrical Schematic (Sheet 1)



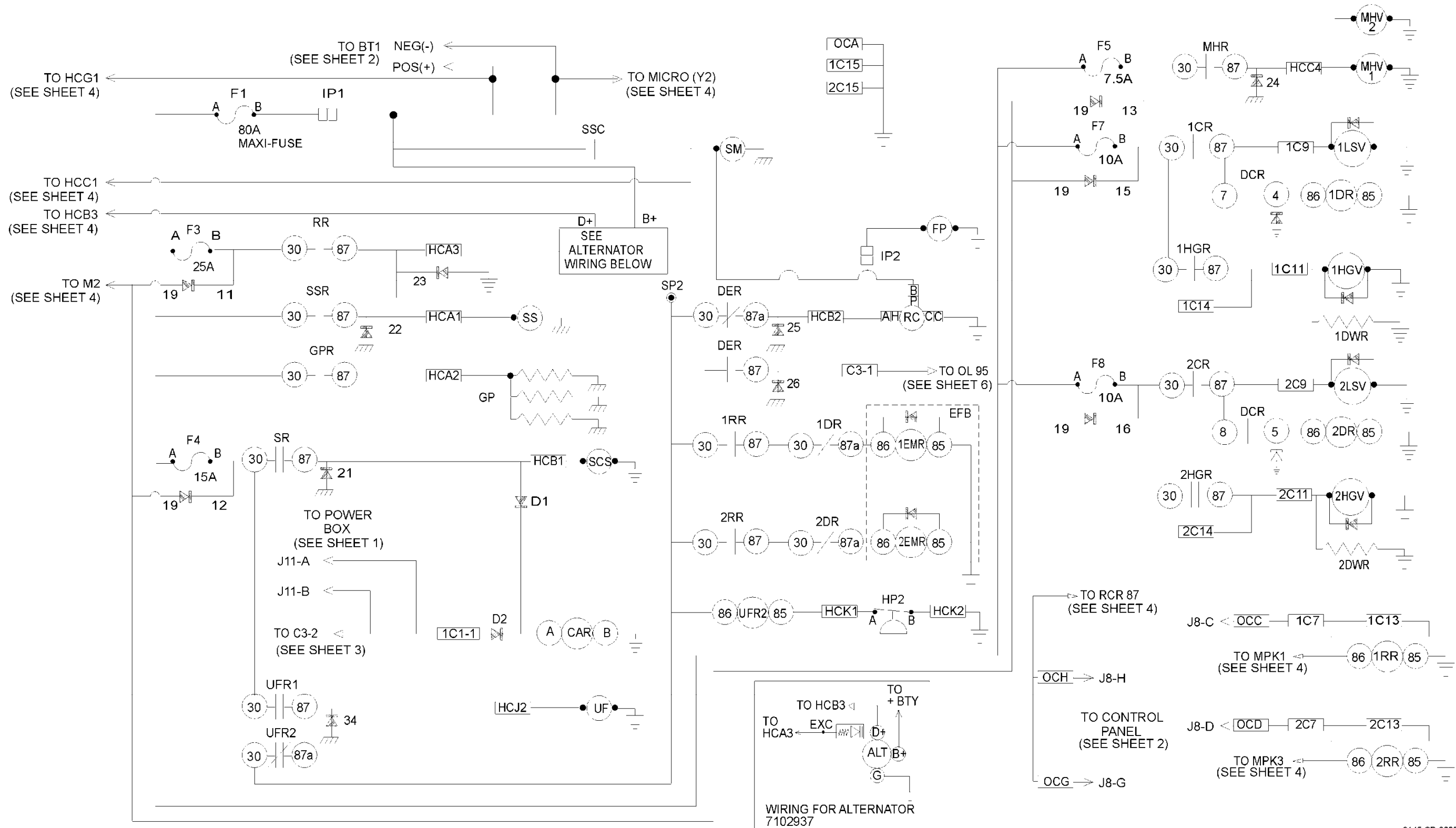
FO 1. MTRCS Electrical Schematic (Sheet 2)



FO 1. MTRCS Electrical Schematic (Sheet 3)

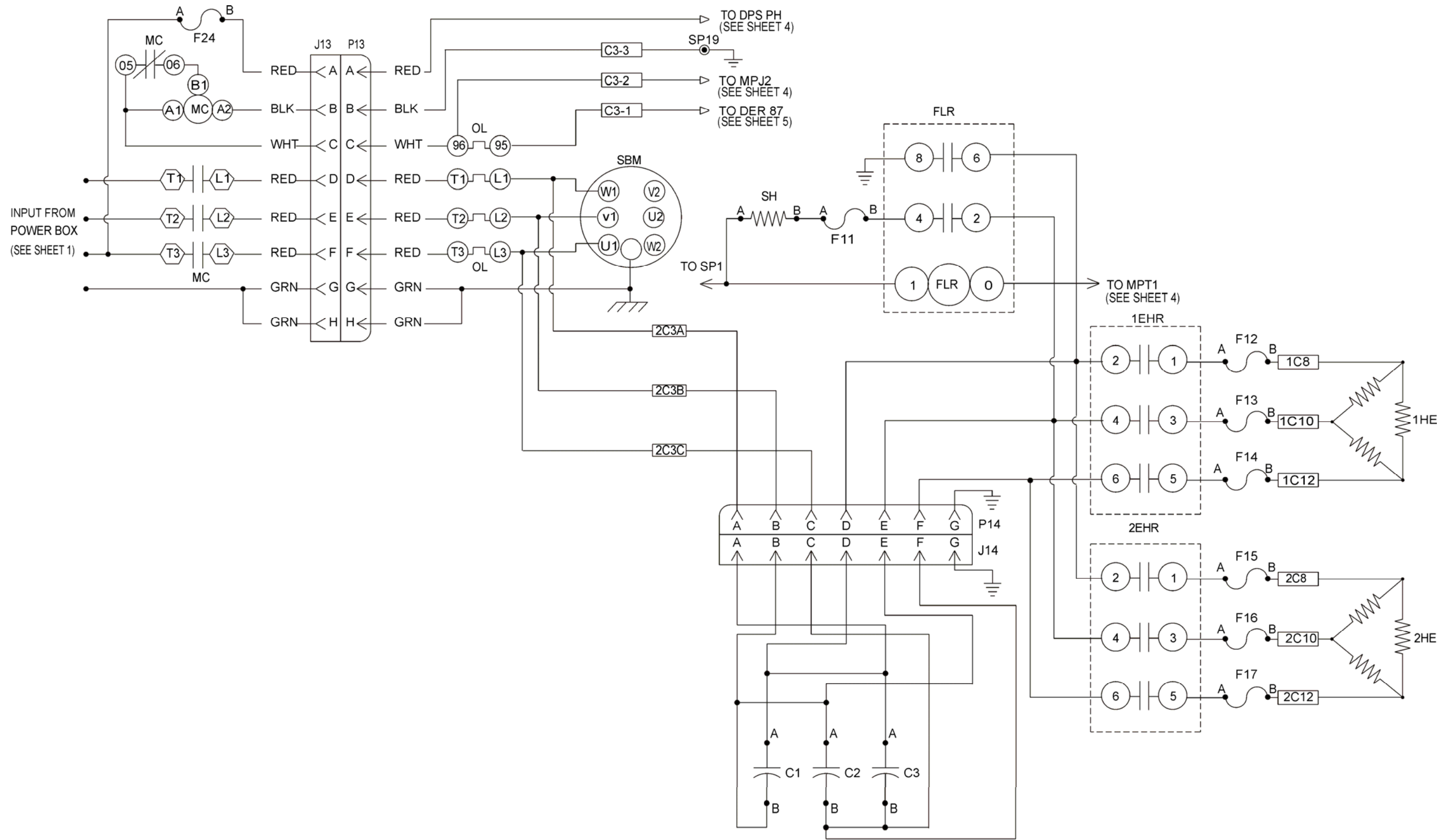


FO 1. MTRCS Electrical Schematic (Sheet 4)

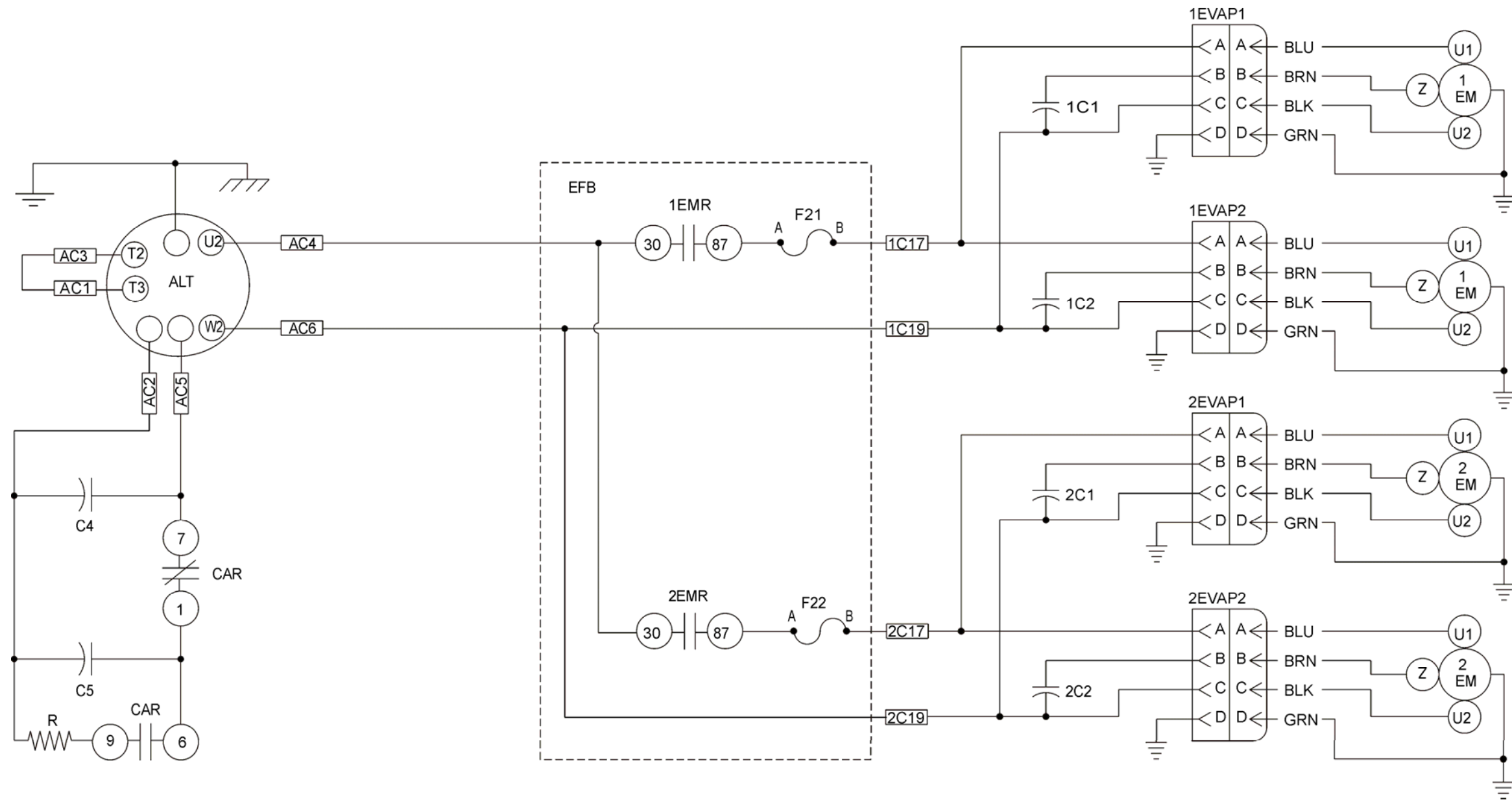


8145-SD-0005B

FO 1. MTRCS Electrical Schematic (Sheet 5)



FO 1. MTRCS Electrical Schematic (Sheet 6)

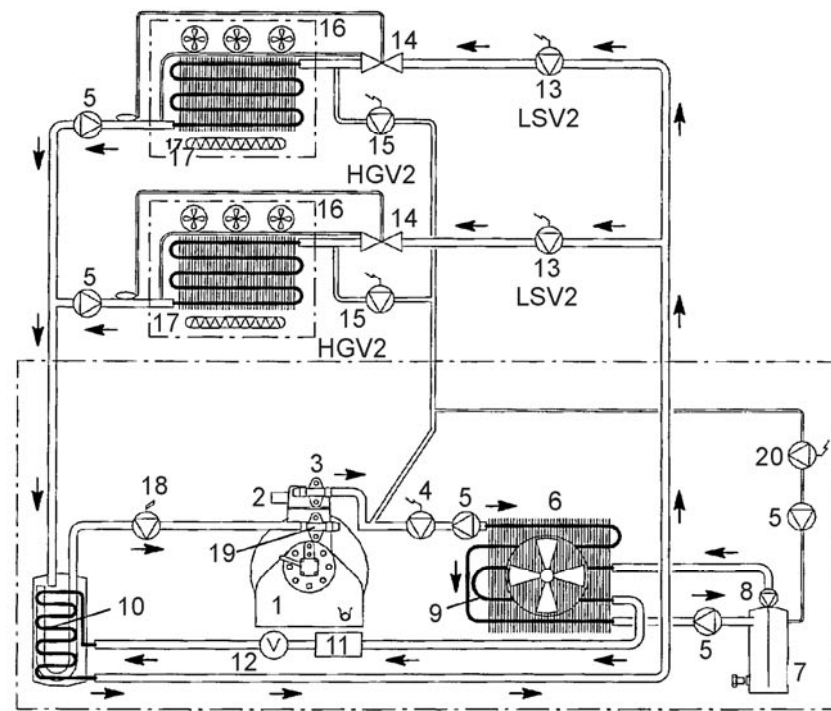


FO 1. MTRCS Electrical Schematic (Sheet 7)

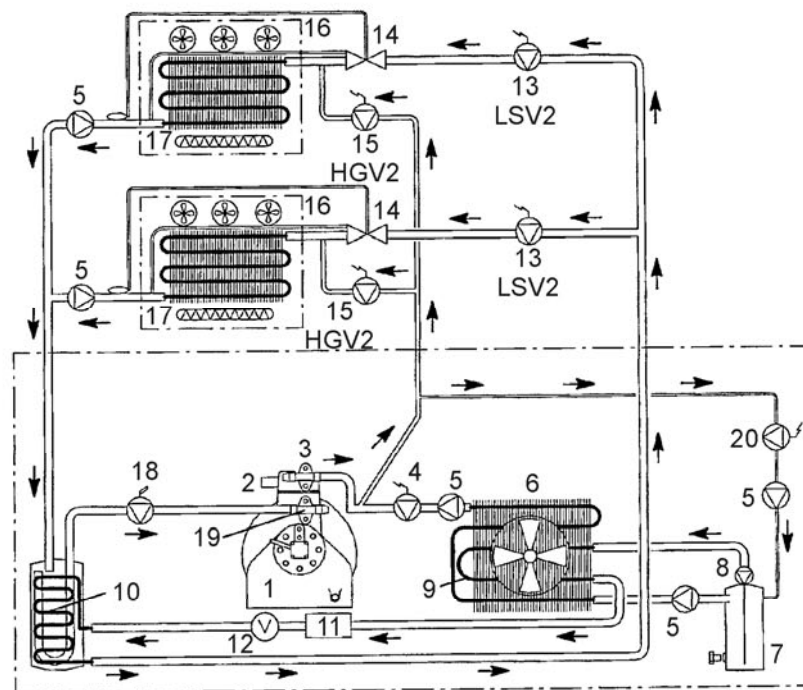
SYMBOL	DESCRIPTION	LOCATION IN FRAME	SYMBOL	DESCRIPTION	LOCATION IN FRAME	SYMBOL	DESCRIPTION	LOCATION IN FRAME
BLT1-3	LED LIGHT BAR (BLACKOUT LIGHTING)	COMPARTMENTS 1 & 2	EFB	ELECTRIC FAN BOARD	CONTROL BOX	C1	CAPACITOR (HEATERS)	CONTROL BOX
BT1	BATTERY, 12 VDC	ENGINE	1EHR	ELECTRIC HEAT RELAY (COMPARTMENT 1)	CONTROL BOX	C2	CAPACITOR (HEATERS)	CONTROL BOX
CB1	CIRCUIT BREAKER, 3 POLE (60 AMP)	POWER BOX	2EHR	ELECTRIC HEAT RELAY (COMPARTMENT 2)	CONTROL BOX	C3	CAPACITOR (HEATERS)	CONTROL BOX
CB2	CIRCUIT BREAKER, 3 POLE (30 AMP)	POWER BOX	F1	FUSE (MAXI FUSE 80A)	CONTROL BOX	C4	CAPACITOR (ALTERNATOR) 8mF	CONTROL BOX
DS1,2	LIGHT, IND. (TEMP. ALARM OVER / UNDER)	CONTROL PANEL	F3	FUSE 25A	CONTROL BOX	C5	CAPACITOR (ALTERNATOR) 8mF	CONTROL BOX
DS3	LIGHT, IND. (FUEL LEVEL - GOOD)	CONTROL PANEL	F4	FUSE 15A	CONTROL BOX	EFB	ELECTRIC FAN BOARD	CONTROL BOX
DS4	LIGHT, IND. (FUEL LEVEL - LOW)	CONTROL PANEL	F5	FUSE 7.5A	CONTROL BOX	1EM	ELECTRIC MOTOR (COMPARTMENT 1)	EVAPORATOR
ES	SWITCH, PUSH - PULL (EMERGENCY STOP)	FRAME	F2	FUSE 5A	CONTROL BOX	2EM	ELECTRIC MOTOR (COMPARTMENT 2)	EVAPORATOR
HN1,2	HORN (TEMP. ALARM OVER / UNDER)	CONTROL PANEL	F7,8	FUSE 10A	CONTROL BOX	1EMR	ELECTRIC MOTOR RELAY (COMPARTMENT 1)	CONTROL BOX
HR1	HEATER (CONTROL PANEL DEFROST)	CONTROL PANEL	FLR	FLASHING RELAY	CONTROL BOX	2EMR	ELECTRIC MOTOR RELAY (COMPARTMENT 2)	CONTROL BOX
K1	RELAY, VOLTAGE MONITOR (LOW BATTERY VOLTAGE)	POWER BOX	FR	FAULT RELAY	CONTROL BOX	1EHR	ELECTRIC HEATER (COMPARTMENT 1)	CONTROL BOX
LT1-4	WATERPROOF RIGID LED BAR (NORMAL LIGHTING)	COMPARTMENTS 1 & 2	FP	FUEL PUMP	FUEL TANK	2EHR	ELECTRIC HEATER (COMPARTMENT 2)	CONTROL BOX
P1A	CONNECTOR, PLUG, ELECTRICAL	FRAME	GP	GLOW PLUG	ENGINE	F11	FUSE (4 AMPS)	CONTROL BOX
P1B	CONNECTOR, PLUG, ELECTRICAL	FRAME	GPR	GLOW PLUG RELAY	CONTROL BOX	F12	FUSE (6.3 AMPS)	CONTROL BOX
P2A	CONNECTOR, PLUG, ELECTRICAL	FRAME	1HGR	HOT GAS RELAY (COMPARTMENT 1)	CONTROL BOX	F13	FUSE (6.3 AMPS)	CONTROL BOX
P2B	CONNECTOR, PLUG, ELECTRICAL	FRAME	2HGR	HOT GAS RELAY (COMPARTMENT 2)	CONTROL BOX	F14	FUSE (6.3 AMPS)	CONTROL BOX
RTD1,2	TEMPERATURE SENSOR (RTD)	COMPARTMENTS 1 & 2	1HGV	HOT GAS VALVE (COMPARTMENT 1)	EVAPORATOR	F15	FUSE (6.3 AMPS)	CONTROL BOX
RS	SWITCH, TOGGLE (RUN)	CONTROL PANEL	2HGV	HOT GAS VALVE (COMPARTMENT 2)	EVAPORATOR	F16	FUSE (6.3 AMPS)	CONTROL BOX
S1	SWITCH, ROTARY (230V/190V - OFF - 460V/380V)	POWER BOX	HGV1	HOT GAS VALVE 1	EVAPORATOR	F17	FUSE (6.3 AMPS)	CONTROL BOX
S2	SWITCH, ROTARY (380V - OFF - 460V)	POWER BOX	HP1	HIGH PRESSURE CUT-OUT SWITCH 1	COMPRESSOR	F21	FUSE 2 FAN (3.15A)	CONTROL BOX
S3	SWITCH, TOGGLE (LIGHTING)	CONTROL PANEL	HP2	HIGH PRESSURE CUT-OUT SWITCH 2	COMPRESSOR	F22	FUSE 2 FAN (3.15A)	CONTROL BOX
S4	SWITCH, LIQUID LEVEL (FUEL LEVEL)	FUEL TANK	1HT	HEAT THERMOSTAT (COMPARTMENT 1)	EVAPORATOR	F24	FUSE (10.0A)	CONTROL BOX
S5	SWITCH, TOGGLE (ALARM)	CONTROL PANEL	2HT	HEAT THERMOSTAT (COMPARTMENT 2)	EVAPORATOR	FLR	FLASH RELAY	CONTROL BOX
S6	SWITCH, TOGGLE (FUEL LEVEL INDICATOR)	CONTROL PANEL	IP1	INSULATING PLUG 1	CONTROL BOX	1HE	HEATER ELEMENT (COMPARTMENT 1)	EVAPORATOR
S7	SWITCH, TOGGLE (50 HZ - 60 HZ)	POWER BOX	IP2	INSULATING PLUG 2	FRAME	2HE	HEATER ELEMENT (COMPARTMENT 2)	EVAPORATOR
S8	SWITCH, START- STOP (EVAPORATOR 1)	CONTROL PANEL	J1	JUMPER 1	CONTROL BOX	MC	MOTOR CONTACTOR	CONTROL BOX
S9	SWITCH, START- STOP (EVAPORATOR 2)	CONTROL PANEL	1LSV	LIQUID SOLENOID VALVE (COMPARTMENT 1)	EVAPORATOR	OL	OVERLOAD PROTECTOR	CONTROL BOX
S10	SWITCH, THERMOSTAT (HR1)	CONTROL PANEL	2LSV	LIQUID SOLENOID VALVE (COMPARTMENT 2)	EVAPORATOR	R	RESISTOR	CONTROL BOX
TCR	TEMPERATURE CHART RECORDER	FRAME	MHR	MAIN HEAT RELAY	CONTROL BOX	SBM	STANDBY MOTOR	FRAME
TR1	TRANSFORMER	POWER BOX	MHV	MAIN HEAT VALVE	FRAME	SH	SHUNT	CONTROL BOX
			MP	MICROPROCESSOR BOARD	CONTROL BOX			
			OC	OPTION CONNECTOR (10 WAY)	ENGINE			
			OP	OIL PRESSURE SAFETY SWITCH (NO)	ENGINE			
			P1	CAB COMMAND PLUG CONNECTOR	CONTROL BOX			
			P2	MICROPROCESSOR-CAB COMMAND PLUG CONNECTOR	CONTROL BOX			
			1RAS	RETURN AIR SENSOR (COMPARTMENT 1)	EVAPORATOR			
			2RAS	RETURN AIR SENSOR (COMPARTMENT 2)	EVAPORATOR			
			RCR	RUN CONTROL RELAY	CONTROL BOX			
			RC	RUN COIL	ENGINE			
			1RR	RUN RELAY (COMPARTMENT 1)	CONTROL BOX			
			2RR	RUN RELAY (COMPARTMENT 2)	CONTROL BOX			
			SCS	SPEED CONTROL SOLENOID	ENGINE			
			SM	STARTER MOTOR	ENGINE			
			SP	SERIAL PORT (CONNECTOR 3 WAY) RS232	CONTROL BOX			
			SPT	SUCTION PRESSURE TRANSDUCER	COMPRESSOR			
			SR	SPEED RELAY	CONTROL BOX			
			SS	STARTER SOLENOID	STARTER			
			SSC	STARTER SOLENOID CONTACTOR	STARTER			
			SSR	STARTER SOLENOID RELAY	CONTROL BOX			
			UFR1	UNLOADER FRONT RELAY 1	CONTROL BOX			
			UFR2	UNLOADER FRONT RELAY 2	CONTROL BOX			
			WTS	WATER TEMPERATURE SENSOR	ENGINE			

SYMBOL	DESCRIPTION	LOCATION IN FRAME
ALT	ALTERNATOR	MID FRAME
CAR	CAPACITOR ALTERNATOR RELAY	CONTROL BOX
CDT	COMPRESSOR DISCHARGE TEMPERATURE SENSOR	COMPRESSOR
1CR	COOL RELAY (COMPARTMENT 1)	CONTROL BOX
2CR	COOL RELAY (COMPARTMENT 2)	CONTROL BOX
D1	DIODE	CONTROL BOX
D2	DIODE	CONTROL BOX
DCR	DEFROST COMPARTMENT RELAY	CONTROL BOX
DER	DIESEL ELECTRIC RELAY	CONTROL BOX
DPS	DETECTOR POWER SUPPLY	CONTROL BOX
1DR	DEFROST RELAY (COMPARTMENT 1)	CONTROL BOX
2DR	DEFROST RELAY (COMPARTMENT 2)	CONTROL BOX
1DTS	DEFROST THERMISTOR SENSOR (COMPARTMENT 1)	EVAPORATOR
2DTS	DEFROST THERMISTOR SENSOR (COMPARTMENT 2)	EVAPORATOR
1,2DWR	DRAIN WATER RESISTANCE (COMPARTMENTS 1 & 2)	EVAPORATOR

1. PARENTHETICAL IDENTITIES ARE FOR REFERENCE ONLY.



COOLING MODE



HEATING MODE

1. COMPRESSOR, REFRIGERANT
2. SWITCH, HIGH PRESSURE
3. VALVE, DISCHARGE SERVICE
4. VALVE, MAIN HEAT
5. VALVE, CHECK
6. CONDENSER COIL, REFRIGERANT
7. RECEIVER, LIQUID REFRIGERANT
8. VALVE, RECEIVER
9. SUBCOOLER
10. ACCUMULATOR / HEAT EXCHANGER
11. FILTER - DRIER, REFRIGERANT
12. INDICATOR, SIGHT, LIQUID
13. VALVE, SOLENOID, LIQUID LINE
14. VALVE, EXPANSION
15. VALVE, HOT GAS
16. EVAPORATOR COIL, REFRIGERANT
17. HEATER, ELECTRIC
18. VALVE, COMPRESSOR PRESSURE REGULATING
19. VALVE, SUCTION SERVICE
20. VALVE, RECEIVER PRESSURE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

 °F Fahrenheit temperature $\times \frac{5}{9}$ (after subtracting 32) = Celsius temperature °C

PIN: 086535-000