TM 5-6115-232-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL

GENERATOR SET

GASOLINE ENGINE: 10 KW, AC
120 V, 1 AND 3 PHASE
120/240 V, SINGLE PHASE
120/208 V, 3 PHASE
60 CYCLE; SKID MOUNTED

(HOL-GAR MODEL CE-105-AC/WK8)
FSN 6115-631-6811

HEADQUARTERS, DEPARTMENT OF THE ARMY
FEBRUARY 1961

SAFETY PRECAUTIONS

BEFORE OPERATION

If the generator set is operated in an inclosed space, engine exhaust gases must be piped to the outside. Exhaust gases contain carbon monoxide which is a colorless, odorless, and poisonous gas.

When filling fuel tanks, keep open flames from the area and do not smoke. Maintain a metal-to-metal contact between the fuel container and tanks to prevent sparking of static electricity.

The fumes produced by the reaction of carbon tetrachloride and heat are deadly. When using a carbon tetrachloride type fire extinguisher in a confined or inclosed space, exercise extreme caution not to breath the fumes.

Do not use a lifting device of less than 2,000 pounds, capacity. Do not allow the generator set to swing back and forth when it is suspended. Failure to observe this warning can result in severe injury or death to personnel.

DURING OPERATION

The voltage developed by this generator set is dangerous to personnel coming into contact with all parts carrying the generated voltage when the unit is operating. Severe, possibly fatal shock, may result. Do not perform adjustments or changes in wiring on any part of the unit while it is in operation.

The fumes produced by the reaction of carbon tetrachloride and heat are deadly. When using a carbon tetrachloride type fire extinguisher in a confined or inclosed space, exercise extreme caution not to breath the fumes.

Do not operate the generator set with either the ac ammeter or the ammeter selector switch removed or disconnected unless the electrical leads to the ac ammeter or the ammeter selector switch are joined electrically and taped. High voltages developed in an open current transformer can cause death by electrocution.

AFTER OPERATION

When filling fuel tanks, keep open flames from the area and do not smoke. Maintain a metal-to-metal contact between the fuel container and tanks to prevent sparking of static electricity.

The fumes produced by the reaction of carbon tetrachloride and heat are deadly. When using a carbon tetrachloride type fire extinguisher in a confined or inclosed space, exercise extreme caution not to breath the fumes.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of the personnel to whom the Hol-Gar Model CE–105–AC/WK8 Generator Set is issued. They provide information on organizational maintenance of the equipment, its accessories, and auxiliaries. This manual also provides instructions on shipment and limited storage.

b. Appendix I contains a list of publications applicable to this manual. Appendix II contains the Maintenance Allocation Chart. The Organizational Maintenance Repair Parts and Special Tool Lists are contained in TM 5–6115–232–20P.

c. Report all deficiencies as specified in AR 700–38. Submit recommendations for changes, additions, or deletions to The Commanding General, U.S. Army Engineer Maintenance Center, Corps of Engineers, ATTN: EMCDM, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

2. Organizational Maintenance Record and Report Forms

For record and report forms applicable to second echelon maintenance, refer to TM 5–505.

Section II. DESCRIPTION AND DATA

3. Description

TM 5–6115–232–10 provides a general description of the generator set. Specific and detailed description of the components of the generator set are provided in the applicable maintenance paragraphs of this manual.

4. Identification

The location and data for the generator sets accessories identification plates, are as follows:

a. Magneto Identification Plate. The magneto identification plate is attached to the magneto that is installed at the front right side of the engine. This plate lists the manufacturer, model, and serial number of the magneto.

b. Engine Accessory Generator Identification Plate. The engine accessory generator identification plate is attached to the accessory generator that is installed at the front left side of the engine. This plate lists the manufacturer, model, serial number, and voltage of the accessory generator.

c. Engine Electrical Starter Identification Plate. The engine starter identification plate is attached to the starter that is installed at the lower rear left side of the engine. This plate lists the manufacturer, model, serial number, and voltage of the starter.

d. Magnetic Contactor Identification Plate. The magnetic contactor identification plate is attached to the magnetic contactor that is installed in the control box. This plate lists the manufacturer, type, catalog number, coil volts, cycles, and maximum ac (alternating current) ratings of the magnetic contactor.

e. Generator Voltage Regulator Identification Plate. The generator voltage regulator plate is attached to the generator voltage regulator that is installed in the control box. This plate lists the manufacturer, parts numbers, rating, and serial number of the generator voltage regulator.

5. Differences in Models

This manual covers only the Hol-Gar Model CE–105–AC/WK8 Generator Set. No known unit differences exist for the model covered in this manual.

6. Tabulated Data

a. Generator Set.

Manufacturer	Hol-Gar Mfg. Corp.
Model	CE–105–AC/WK8
Duty	Continuous
Mounting	Skid base, trailer mountable

b. Engine.

Manufacturer	Hercules Motors Corporation
Model	IXB–3ER
Type	4-cycle gasoline, L-head, liquid cooled.
No. of cylinders	4
Firing order	1–2–4–3
Type lubrication	Pressurized
Governed speed	1,800 rpm (revolutions per minute)
Engine rotation	Clockwise, viewed from front of unit.
Valve tappet clearance	Intake 0.008 in. (inch) cold, 0.006 in. hot. Exhaust 0.010 in. cold, 0.008 in. hot

c. Ac Generator.

Manufacturer	Hol-Gar Mfg. Corp.
Model number	H–15230
Type	AG
Cycles	60
Rpm	1,800
Kw (kilowatts)	10
Power factor	0.8
Voltages:	
1 phase 2 wire	120 v (volts)
1 phase 3 wire	120/240 v
3 phase 3 wire	120 v
3 phase 4 wire	120/208 v
Amperages:	
120 v 1 phase	104 amp (amperes)
120–240 v 1 phase	52 amp
120 v 3 phase	60 amp
120/208 v 3 phase	35 amp

d. Oil Filter.

Manufacturer	Fram Corp.
Model	F21–P2
Type	Removable element

e. Carburetor.

Manufacturer	Marvel-Schebler Products Division of Borg-Warner Corp.
Model	TSX–776
Type	Updraft

f. Fuel Pump.

Manufacturer	AC Spark Plug Division, General Motors Corp.
Model	5594125
Type	Mechanical diaphragm

g. Air Cleaner.

Manufacturer	Vortox Company
Model	S60L
Type	Oil bath

h. Governor.

Manufacturer	Hoof Product Company
Model	GD–505–C5216
Type	Centrifugal

i. Water Pump.

Manufacturer	Hercules Motor Corp.
Model	235153DS
Type	Impeller

j. Engine Accessory Generator.

Manufacturer	Delco-Remy Division, General Motors Corp.
Model	1105973
Output	18 amp
Type	24-v, dc (direct current)
Rotation	Clockwise, viewed from front of unit.
Control	Regulator
Brushes	2
Brush tension	28 oz (ounces)

k. Engine Generator Regulator.

Manufacturer	Delco-Remy Division, General Motors Corp.
Model	1118789
Polarity	Negative ground
Voltage	24 v
Voltage regulator:	
Air gap	0.075 in.
Voltage setting (open circuit)	28.5 v
Current regulator:	
Air gap	0.075 in.
Current setting	18 amp
Circuit breaker:	
Air gap	0.017 in.
Point opening	0.032 in.
Closing voltage	25 v

l. Engine Electrical Starter.

Manufacturer	Delco-Remy Division, General Motors Corp.
Model	1109901
Type	24-v, dc
Rotation	Clockwise, viewed from drive end
Drive	Over-running clutch
Brushes	4
Brush tension	24 oz-min (ounce-minimum)

m. Ignition Magneto.

Manufacturer	Fairbanks-Morse and Company
Model	FM–XE4B14E–1
Type	Shielded
Rotation	Clockwise
Breaker point opening	0.015 in.

n. Spark Plugs.

Manufacturer	Electric Auto-Lite Corp., Spark Plug Div.
Model	14MM AR8S
Gap	0.025 in.

o. Batteries.

Manufacturer	Electric Auto-Lite Corp., Spark Plug Div.

Model 2HNR-US
Type ..... Lead-acid
Voltage ..... 12 v

p. Coolant Heater Assembly.

Manufacturer ..... Southwind Division, Stewart Warner Corp.
Model 939–B24
Operating voltage ..... 28-v, dc (maximum) 18-v, dc (minimum).
Current consumption ..... 11 amp (starting) 1 amp (running)
Heater output per hr (hour):
Coolant ..... 15,000 Btu (British thermal unit)
Exhaust ..... 8,000 Btu
Total ..... 23,000 Btu
Fuel consumption ..... .26 gph (gallon per hour)

Dimensions:
Width ..... 6¼ in.
Height ..... 9½ in.
Length ..... 15¼ in.
Weight ..... 15 lb (pound)

q. Nut and Bolt Torque Data.

Cylinder head ..... 50 ft-lb (foot-pound)
Spark plug ..... 25–30 ft-lb

r. Base Plan. The base plan illustrated in figure 1 indicates dimensions of a base for the generator set.

s. Practical Wiring Diagram. A practical wiring diagram for the generator set is illustrated in figure 2.

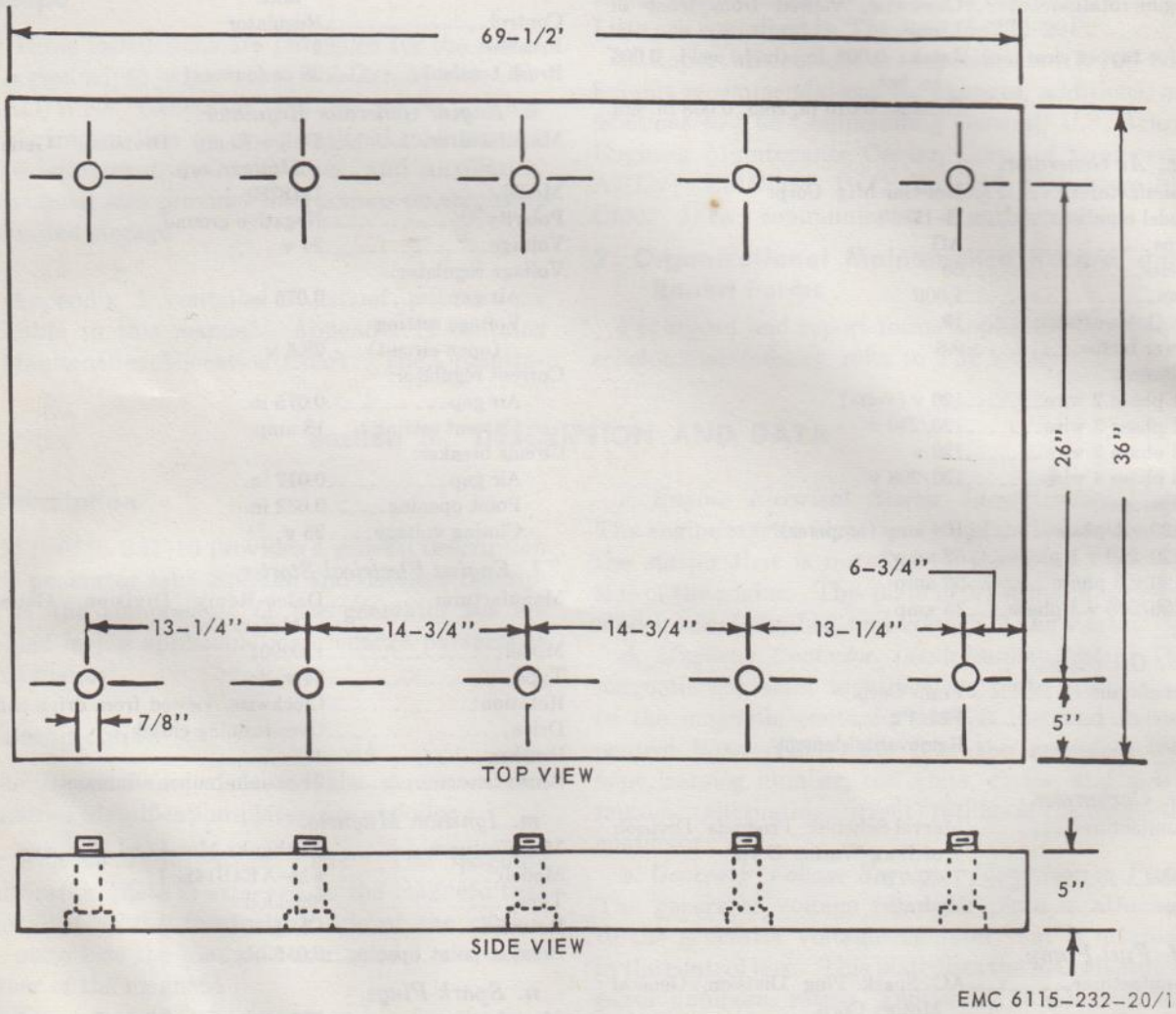

Figure 1. Base plan.

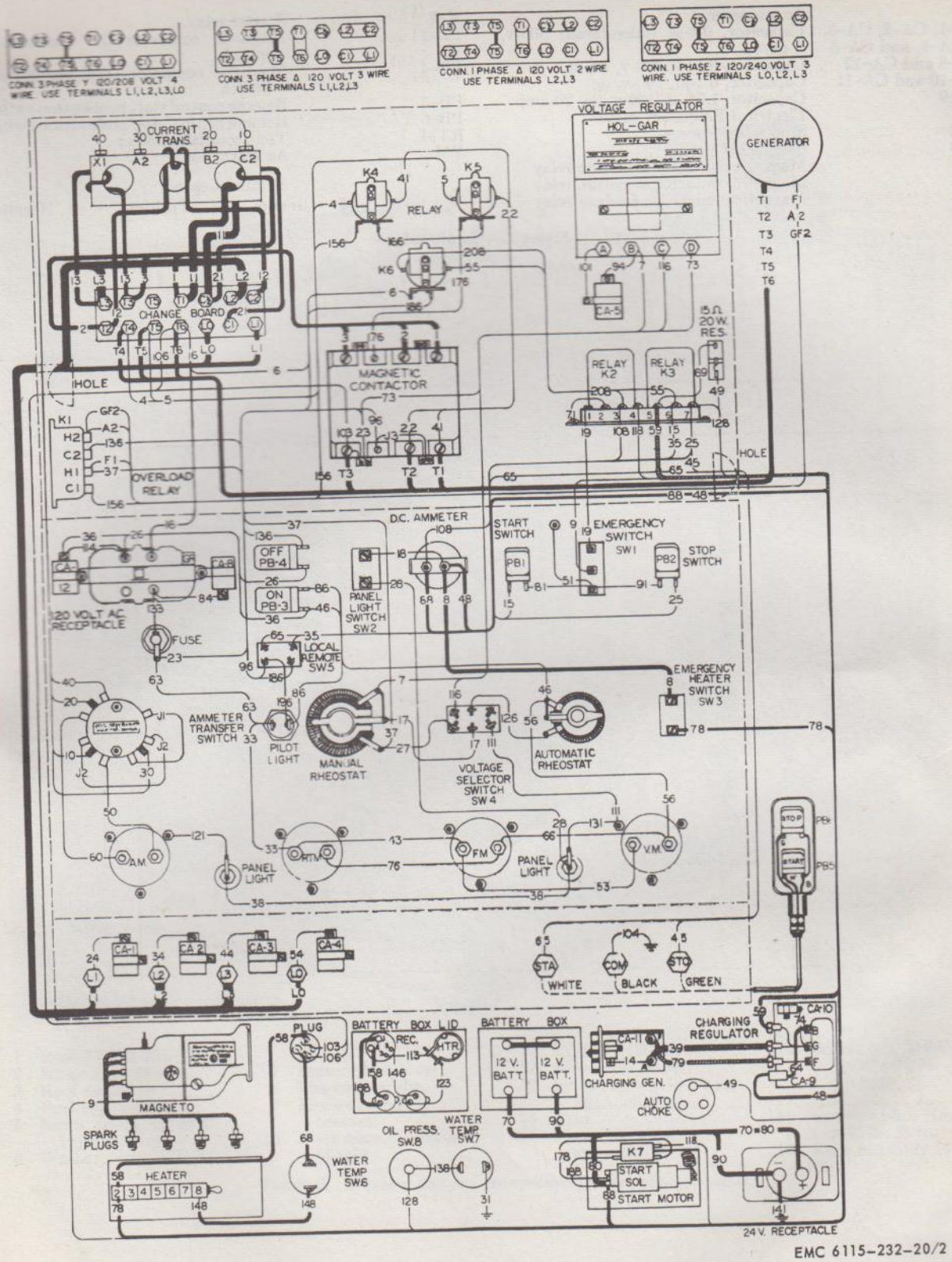

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Figure 2. Practical wiring diagram.

Device Legend

AM	Ac ammeter	K–7	Starter relay
CA–1, CA–2, CA–3, CA–4, and CA–5	Capacitor, 0.1-μf (microfarad) 500-v, ac/dc	PB-3	Magnetic contactor ON pushbutton switch
CA–8 and CA–12	Capacitor, 0.1-μf, 400-v, ac/dc	PB–4	Magnetic contactor OFF pushbutton switch
CA–10 and CA–11	Capacitor, 0.1-μf, 100-v, dc		
CA–9	Capacitor, 1.75-μf, 100-v, dc, 20-amp	PB–5	Remote control start pushbutton switch
FM	Electrical Frequency meter	PB–6	Remote control stop pushbutton switch
K–2	Stop relay	RTM	Time totalizing meter
K–3	Start relay	VM	Ac voltmeter
K–4	Magnetic contactor armature relay		
K–5	Magnetic contactor armature relay		
K–6	Magnetic contactor armature relay		

Symbol Legend

V Volts ⏚ Ground + Positive — Negative

Figure 2.—Continued.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

7. Unloading of Equipment

a. Remove any tiedowns and blocking that secure the generator set to the carrier.

b. Make up a sling of sufficient strength to support the crated generator set and install it. Attach the sling to a suitable hoist and remove the generator set from the carrier. An uncrated generator set can be moved by attaching the hoist to the U-bolt located on top of the unit. The generator set may also be moved from the carrier to a loading ramp with suitable bars and rollers.

Warning: **Do not use a lifting device of less than 2,000 pounds capacity. Do not allow the generator set to swing back and forth when it is suspended. Failure to observe this warning can result in damage to the equipment and severe injury or death to personnel.**

8. Unpacking New Equipment

a. Unpacking. Place the generator set as close as possible to the site where it will be used and carefully unpack to avoid damage to the unit. Remove the steel straps. Remove the top of the crate as a unit, then remove the 2 sides and the 2 ends. Remove the steel straps securing the box containing the separately packed components to the crate and remove the box. Open this box and remove the separately packed components.

b. Removal of Protective Material and Devices.

(1) Remove the protective tape from the following:
- (*a*) Fuel tank cap.
- (*b*) Fuel gage door.
- (*c*) Fuel gage.
- (*d*) Lifting U-bolt.
- (*e*) Radiator fill door.
- (*f*) Radiator cap.
- (*g*) Battery box cover.
- (*h*) Auxiliary fuel tank adapter.
- (*i*) Battery filler caps.
- (*j*) Controls and instruments.
- (*k*) Muffler.
- (*l*) Muffler mounting holes.

(2) Remove the oil-resistant paper from the fire extinguisher, muffler, and fuel tank gage.

9. Inspection and Servicing New Equipment

a. Inspect the entire generator set for loss or damage which may have occurred in shipment. Report uncorrected deficiencies to field maintenance.

(1) Inspect the generator set thoroughly for bent, cracked, or missing parts and see that all common hardware is secure.

(2) Inspect the generator set control box and engine instrument panel gages and meters for broken or cracked glass.

(3) Inspect all tubes and lines for loose connections, kinks, cracks, and other damage.

(4) Inspect visible wiring and insulation for cuts, fraying, and loose connections.

(5) Inspect the engine, ac generator and exciter for insecure mounting or other defects.

(6) Inspect the engine accessories for insecure mounting or other defects.

b. Perform the quarterly preventive maintenance services (par. 17).

c. Lubricate the generator set as directed in the current lubrication order.

d. Batteries. When the batteries are received dry, proceed as follows:

(1) Remove the batteries (TM 5–6115–232–10).

(2) Fill the battery cells with electrolyte to three-eights inch above the battery plates.

Warning: **If electrolyte is spilled, wipe up and flush with water or a mixture of water and soda. Electrolyte contains sulphuric acid and can cause severe burns.**

If the electrolyte comes in contact with the body or clothing, rinse immediately with clean water. Avoid spilling electrolyte on painted surfaces.

(3) Install the batteries (TM 5–6115–232–10).

e. Battery Test. Test the specific gravity of the battery electrolyte with a hydrometer, drawing electrolyte from each cell. Correct the specific gravity readings of the hydrometer for the temperature of the electrolyte. The temperature corrected readings should be 1.280. Recharge batteries if the corrected specific gravity readings are less then 1.280 or if freezing temperatures are expected. Refer to TM 9–6140–200–15.

Note. When new batteries are received dry and must be serviced with electrolyte prior to installation, operate the generator set for at least 24 hours before testing the specific gravity.

f. Cooling System. If freezing temperatures are expected, protect the engine cooling system with antifreeze. In arctic areas, use an arctic antifreeze compound. In other areas, add ethylene-glycol antifreeze in accordance with table I. Protect the engine cooling system to at least 10° F below the lowest temperature expected. Use a hydrometer to check the freezing point of the coolant after it is thoroughly mixed and up to operating temperature.

Table I. Freezing Points, Composition and Specific Gravities of Military Antifreeze Materials.

Lowest expected ambient temp. °F	Pints of inhibited glycol per gal of coolant [1]	Compound Antifreeze Arctic [2]	Ethylene glycol coolant solution specified gravity at 68° F [3]
+20	1½	Issued full-strength	1.022
+10	2	and ready mixed	1.036
0	2¾	for 0° to −65° F	1.047
−10	3¼	temperatures for	1.055
−20	3½	both initial installa-	1.062
−30	4	tion and replenish-	1.067
−40	4¼	ment of losses.	1.073
−50	Arctic anti-	*Do not dilute with*	
−60	freeze	*water or any other*	
−75	preferred.	*substance.*	

[1] Maximum protection is obtained at 60 percent by volume, that is 4.8 pints of ethylene glycol per gallon of solution.

[2] Military Specifications MIL–C–11755 Arctic type, nonvolatile antifreeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines for protection against freezing primarily in Arctic regions where the ambient temperature remains for extended periods of time close to −40° F or drops below, to as low as −90° F.

[3] Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol type antifreeze to 2 parts water. This should produce a hydrometer reading of 0° F.

Note. Fasten a tag near the radiator filler cap indicating the type of antifreeze.

10. Installation of Separately Packed Components

a. Install the fire extinguisher bracket (par. 50).

b. Install the muffler (par. 48).

c. Install the batteries and remote control cable (TM 5–6115–232–10).

11. Installation or Setting-Up Instructions

a. Outdoor Installation. Move the generator set as close to the work site as practical, selecting a level area. Avoid if possible, dusty or sandy locations. Use suitable planks, logs, or other material for a base in areas where the ground is soft.

b. Indoor Installation.

(1) Position the generator set on a suitable base of sufficient strength to support the weight of the unit. Secure the generator set to the base with one-half inch bolts. Refer to figure 1.

(2) Provide sufficient ventilation for the engine as well as cooling air for both the engine and generator.

(3) Connect the flexible exhaust hose to the muffler and an outside vent to exhaust the engine gases to the outside. Make sure the exhaust system does not leak and that it is of the shortest practical length with a minimum number of bends and turns.

***Warning:* Do not operate the generator set in a closed structure unless the exhaust gases are piped to the outside. Exhaust gases contain carbon monoxide, a colorless, odorless, and poisonous gas.**

c. Grounding. Ground the generator set (TM 5–6115–232–10).

d. Auxiliary Fuel Supply. Connect the auxiliary fuel supply to the generator set (TM 5–6115–232–10).

e. Load Connections. Connect the load to the generator set (TM 5–6115–232–10).

Section II. MOVEMENT TO NEW WORK SITE

12. Dismantling for Movement

a. Disconnect electrical and ground lines and drain fuel (TM 5–6115–232–10).

b. Disconnect any auxiliary fuel lines.

c. Disconnect exhaust extensions.

d. Load the generator set on the carrier by use of a suitable hoist or loading ramp.

e. Secure the generator set to the carrier with suitable blocking and tiedowns.

f. For short distance movement, skid the generator set.

13. Reinstallation After Movement to a New Work Site

Reinstall the generator set as outlined in paragraph 11.

CHAPTER 3
GENERAL MAINTENANCE INSTRUCTIONS

Note. No special tools or equipment are required to perform organizational maintenance.

Section I. LUBRICATION

14. General

This section contains instructions for the lubrication of the generator set engine starter bearing. Refer to the current lubrication order for the proper time interval, type, and grade of lubricant to be used.

15. Engine Starter Bearing

a. Removal. Remove the engine electrical starter (par. 66).

b. Lubrication. Lubricate the inboard bearing of the engine starter.

c. Installation. Install the engine electrical starter (par. 66).

Section II. PREVENTIVE MAINTENANCE SERVICES

16. General

a. Preventive maintenance is performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equivalent to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The preventive maintenance services to be performed at quarterly intervals are listed and described in paragraph 17. The number opposite each service refers to a corresponding number on DA Form 464 and indicates the services to be performed. The number listed under "Inspection" indicates the minimum inspection requirements for the equipment.

17. Quarterly Preventive Maintenance Services

Service	
Inspection	Quarterly
	GENERAL
1	1 *Before-operation services.* Perform the daily before-operation services (TM 5–6115–322–10).
2	2 *Lubrication.* Inspect the entire unit for indications of insufficient lubrication. Inspect the lubricant level in the crankcase. Inspect for lubricant leaks and defective oil and grease seals.
	2 Lubricate as specified in the current lubrication order. Correct any deficiencies or report them to field maintenance.
3	3 *Tools and equipment.* Inspect the condition of all tools and equipment assigned to the generator set. Inspect the condition and mounting of the toolbox.
	3 See that all tools and equipment assigned to the generator set are clean, serviceable, and properly stowed or mounted. See that the toolbox closes and fastens properly and that the handcrank is properly stowed beneath the generator.
4	4 *Fire extinguisher.* Inspect the carbon tetrachloride-type fire extinguisher every 4 months for improper charge and damage. Refer to TM 5–687 and TM 9–1799. Weigh the monobromotrifluoromethane-type fire extinguisher every 6 months and replace the cylinder if the gross weight has decreased 4 ounces or more. Lubricate cylinder neck threads with 1 drop of OE 30 oil before reassembly.
	4 Replace a defective fire extinguisher.

Inspection	Service: Quarterly	
5	5	*Publications.* See that a copy of TM 5–6115–232–10, the current lubrication order, and DA Form 285 are on or with the generator set and in serviceable condition.
6	6	*Appearance.* Inspect the general appearance of the generator set, paying special attention to dirty or oily areas, illegibility of identification markings, and poor condition of painted surfaces.
	6	Correct or report all deficiences to field maintenance.
7	7	*Modifications.* See that all modification work orders applying to this generator set have been complied with and recorded on DA Form 478, DA Form 5–73, and DA Form 5–73*a* as applicable.
		ENGINE AND ACCESSORIES
11	11	*Cylinder head, manifold, and gaskets.* Inspect the cylinder head, manifold, and exhaust pipe for leaks, loose mounting nuts and bolts, and defective gaskets.
	11	Tighten all loose manifold and exhaust pipe mounting nuts and bolts. Replace all missing nuts and bolts and replace any defective gaskets. Test the cylinder head bolts for tightness (par. 118).
12	12	*Valve mechanism.* Inspect the valve cover and gasket for oil leaks. If excessive tappet noise or loss of power is noticed, check for proper valve clearance (par. 120).
	12	Replace a leaking valve cover and gasket (par. 119). Adjust the valve lifter clearance, if necessary (par. 120).
13	13	*Compression test.* Open the throttle, remove a spark plug, and insert a compression gage into the spark plug hole. Crank the engine with the starter until the gage reading stabilizes. Test the other cylinders in a similar manner and record all the readings on the DA Form 464. Variation of the several readings in excess of 15 psi (pounds per square inch) indicate faulty valves, pistons, piston rings, and/or a cylinder head gasket. To determine if the trouble is related to faulty pistons and piston rings or faulty valves and cylinder head gasket, pour 1 fluid ounce of an approved crankcase lubricant into the cylinder or cylinders that indicate low compression. *Note.* Compression test should be performed only after the valve clearances have been checked and after the engine has been brought up to operating temperature. A faulty head gasket will be indicated by extremely low readings of adjacent cylinders, presence of water in a cylinder, or an overheated engine.
	13	If, after the addition of the crankcase lubricant, the variation of the several readings is within 15 psi, the trouble is with the pistons and/or piston rings. Report this condition to field maintenance. If the addition of the crankcase lubricant does not correct the variation of the several readings, the trouble is with the valves. Report the condition to field maintenance.
15	15	*Oil filter.* Inspect the lines leading to the oil filter for kinks, leaks, and other damage when the engine is running. Inspect the oil filter body for cracks and leakage.
	15	Correct all deficiencies (pars. 73 and 75). Service the oil filter as specified in the current lubrication order.
16	16	*Radiator.* Inspect the radiator core and coolant hoses for signs of leaking. Inspect the radiator mountings for looseness. Examine the coolant for rust or other foreign matter. Check the coolant temperature when the engine is up to operating temperature. If the indicated temperature is greater than 190° F. the thermostat or the radiator shutter control may be defective. Inspect the cooling system for lack of antifreeze. Refer to Table I. Inspect the air passages of the radiator core for obstructions.
	16	Replace a defective radiator (par. 81). Tighten loose or replace defective coolant hoses (par. 77). Drain, flush, and refill the cooling system if the coolant is contaminated with rust or dirt. Add antifreeze as required. Replace a defective thermostat (par. 78). Replace a defective shutter control assembly (par. 80). Remove all obstructions from the air passages of the radiator core. Report other deficiencies noted to field maintenance.
17	17	*Coolant blade assembly and fan guard.* Inspect the mounting hardware for loose and missing parts. Inspect the condition of the coolant blade assembly and fan guard.
	17	Tighten or replace loose or missing nuts and bolts. Replace a defective coolant blade assembly or fan guard (pars. 79 and 82).
18	18	V-BELTS. Inspect the V-belts for wear, fraying, and other damage. Test the V-belt tension (par. 64).
	18	Replace defective V-belts (par. 64). Adjust V-belts tension (TM 5–6115–232–10).
19	19	*Oil pressure regulator.* Check the oil pressure reading on the gage during normal engine operation. The normal operating pressure is 40 psi. In the event the oil pressure varies widely from the normal reading, inspect the oil lines and the oil pressure regulator.
	19	Remove the oil lines and clean. Pay particular attention to cleaning the passages (par. 75). Clean and adjust the oil pressure regulator (par. 74). If the oil pressure continues to vary, report the condition to field maintenance.
20	20	*Governor and connecting rod.* Inspect the governor connecting rod for worn, damaged, or defective parts. Note engine operation to determine if it is hunting or surging.
	20	Replace a defective governor and connecting rod (par. 58). Adjust the governor if necessary (par. 58).

Inspection	Service: Quarterly	
		FUEL SYSTEM
38	38	*Fuel pump.* Inspect the fuel pump for loose or missing mounting hardware. Inspect the fuel pump and lines for leaks, cracks, or breaks.
	38	Tighten or replace loose or missing mounting hardware. Tighten loose fuel line connections (par. 61). Replace a defective fuel pump (par. 56).
39	39	*Carburetor and linkage.* Inspect the carburetor for loose mounting, incorrect automatic choke setting, and other damage. Inspect the choke and throttle cables for kinks, insecure mounting, and other defects.
	39	Tighten loose linkage and mounting hardware, adjust incorrect automatic choke setting, or replace a defective carburetor (par. 57). Tighten or replace a loose or insecure throttle cable (par. 57).
40	40	*Fuel strainer.* Inspect the fuel strainer for leaks, loose mounting, and defective parts. Inspect the glass bowl for water and dirt.
	40	Replace a defective fuel strainer. Remove any water or dirt from the glass bowl (pars. 55 and 56). Tighten loose connections.
41	41	*Air cleaner.* Inspect the air cleaner for loose mountings, connections, or damaged condition. Inspect the cup chamber for dirt and incorrect oil level.
	41	Tighten or replace loose or missing mounting hardware. Tighten loose connections, or replace a damaged air cleaner (par. 54). Clean and service the air cleaner (par. 54).
43	43	*Fuel tank, cap, and gasket.* Inspect the fuel tank for loose mounting hardware and damage. Inspect the fuel tank cap for defective gasket, plugged vent, and improper seating.
	43	Tighten or replace loose mounting hardware. Replace a defective fuel tank (par. 59). Clean the fuel tank cap vent.
44	44	*Fuel lines.* Inspect the fuel lines and fittings for breaks, kinks, and leaks.
	44	Tighten loose connections. Replace a damaged fuel line or fitting (par. 61).
45	45	*Engine primer pump.* Inspect the engine primer pump for insecure mounting and improper working condition.
	45	Tighten or replace loose or missing mounting hardware. Replace or service an inoperative engine primer pump (par. 60)
		ELECTRICAL SYSTEM
46	46	*Spark plugs.* Inspect the spark plugs for looseness and bad connections. Remove the spark plugs and inspect for dirty or cracked insulators, burned electrodes, and improper gap (par. 71).
	46	Tighten loose connections, clean dirty spark plugs, and set the gap for 0.025 inch. Replace defective spark plugs (par. 71).
47	47	*Batteries.* Inspect the batteries for cracks. leaks, loose connections, corroded terminals and fittings, electrolyte level, and specific gravity.
	47	Clean corroded terminals, tighten loose connections, or replace a defective battery (TM 5–6115–232–10). Add distilled water to the electrolyte as necessary. Record specific gravity readings on DA Form 464.
48	48	*Generator and starter.* Inspect for loose mounting bolts and for loose external wiring connections. Test the engine accessory generator on the unit (par. 63). Test the electrical starter (par. 66).
	48	Tighten all loose mountings or connections. Replace a defective engine accessory generator and electrical starter (pars. 63 and 66).
49	49	*Ignition magneto.* Inspect the magneto for loose or missing mounting hardware and loose connectors. Remove the magneto cap and examine the contact set for burning, pitting, improper alinement, and gap, and plugged vent caps.
	49	Tighten or replace loose or missing mounting hardware. Tighten loose connectors. Clean and adjust the contact set. Clean the vent caps. Replace a defective magneto (par. 67).
50	50	*Wiring and switches.* Inspect the wiring for frayed or broken insulation, broken strands or shielding, and loose or corroded connectors. Inspect the mounting and condition of the switches.
	50	Replace frayed or broken wiring, clean corroded connectors, and tighten loose connectors. Replace defective switches (pars. 89, 91, 92, 94, 96, 98, 100, 101, and 102).
51	51	*Engine generator regulator.* Inspect the engine generator regulator for improper operation, loose connections, and insecure mounting.
	51	Tighten any loose connections and adjust or replace a defective engine generator regulator (par. 68).
52	52	*Lights.* Inspect the panel light receptacles for insecure mounting and loose wiring connections.
	52	Replace a defective lamp (TM 5–6115–232–10). Tighten loose mountings and wires. Replace a defective light receptacle (par. 95).

Service	
Inspection	Quarterly
53	53	*Coolant heater.* Inspect the coolant heater for loose or missing mounting hardware and for improper operation.
	53	Tighten or replace loose or missing mounting hardware. Adjust or replace a defective coolant heater (par. 128).
57	57	*Gages.* Inspect gages for broken windows, loose mounting, and improper operation.
	57	Tighten or replace mounting hardware. Replace defective or damaged gages (pars. 110 and 111).
58	58	*Meters.* Inspect the meters for broken windows, loose mounting, and improper operation.
	58	Tighten or replace mounting hardware. Replace damaged or defective meters (pars. 85, 86, 87, 88, and 99).
59	59	*Safety devices.* Inspect the safety devices for loose mounting, loose or corroded connections, and improper operation.
	59	Clean and tighten loose connections, and replace defective safety devices (pars. 114 and 115).
80	80	*Frame.* Inspect the frame for loose or missing nuts and bolts and other damage.
	80	Tighten or replace loose or missing nuts and bolts. Report a damaged frame to field maintenance.
84	84	*Panels, doors, and roof.* Inspect the panels, doors, and roof for loose or missing mounting hardware, broken or bent parts, and other damage.
	84	Tighten or replace loose or missing mounting hardware and repair or replace damaged parts (par. 50).
172	172	*Brushes and brush holders.* Inspect the brushes and brush holders for wear, improper adjustment, and other defects.
	172	Correct improperly adjusted brush holders or replace defective brushes (par. 125).

Section III. TROUBLESHOOTING

18. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the generator set and its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any operational trouble that is beyond the scope of organizational maintenance must be reported to field maintenance, 3d echelon.

19. Engine Hard to Start or Fails to Start

Probable cause	*Possible remedy*
Fuel line assemblies obstructed.	Clean the fuel tank and lines (pars. 59 and 61).
Carburetor assembly out of adjustment.	Adjust the carburetor (par. 57).
Spark plugs dirty or damaged.	Remove, clean, inspect, and adjust the spark plugs (par. 71). Replace defective spark plugs.
Cylinder head gasket damaged.	Replace the cylinder head gasket (par. 118).
Ignition magneto defective.	Check spark and the contact set. Adjust the contacts or replace the magneto (par. 67).
Spark plug leads defective or connected to wrong spark plug.	Clean, inspect, and replace defective spark plug leads (par. 70). Correct wrong spark plug connections.
Safety switches defective	Replace defective switches (pars. 114 and 115).
Compression poor	Adjust the valve lifters and check for broken valve springs (par. 120).
Ignition magneto wired to wrong spark plugs.	Remove and correctly reinstall the spark plug leads (par. 70).
Starter switches defective	Replace the starter switches (pars. 100 and101).
Engine electrical starter defective.	Replace the engine electrical starter (par. 66).
Engine not timed properly	Time the engine (par. 67).

20. Engine Misses or Operates Erratically

Probable cause	*Possible remedy*
Spark plugs dirty or damaged.	Remove, clean, inspect, and adjust the spark plugs (par. 71). Replace defective spark plugs.
Spark plug leads loose or shorted.	Tighten all connections or replace the spark plug leads (par. 70).
Ignition magneto contacts pitted or out of adjustment.	Adjust the ignition magneto contact set (par. 67).
Valve lifters improperly adjusted.	Adjust the valve lifters (par. 120).
Carburetor out of adjustment.	Adjust the carburetor (par. 57).
Fuel lines obstructed	Clean the fuel tank and lines (pars. 59 and 61).
Air leaks between the carburetor, manifold, and block assembly.	Tighten the manifold bolts or replace a defective manifold or gasket (par. 117).
Water leaks at cylinder head.	Replace a warped cylinder head or damaged head gasket (par. 118).
Engine not timed properly	Time the engine (par. 67).

21. Engine Stops Suddenly

Probable cause	*Possible remedy*
Fuel line assemblies obstructed.	Clean the fuel tank and lines (pars 59 and 61).
Ignition magneto defective.	Test the magneto, adjust the contact set, or replace the magneto (par. 67).
Temperature safety switch defective.	Replace the temperature safety switch (par. 114).
Pressure safety switch defective.	Replace the pressure safety switch (par. 115).
Oil pressure low	Adjust the oil pressure regulator (par. 74).
Spark plug leads defective.	Test or replace the spark plug leads (par. 70).
Engine overheated	Refer to paragraph 22.

22. Engine Overheats

Probable cause	*Possible remedy*
V-belts loose or slipping	Adjust or replace the V-belts (par. 64).
Radiator assembly air passages clogged.	Clean the radiator air passages with compressed air.
Flow control thermostat defective.	Replace the flow control thermostat (par. 78).

23. Engine Lacks Power

Probable cause	*Possible remedy*
Carburetor out of adjustment.	Adjust the carburetor (par. 57).
Carburetor defective	Replace the carburetor (par. 57).
Engine not developing proper speed.	Adjust the governor (par. 58).
Spark weak	Inspect, adjust, or replace the spark plugs or ignition magneto (pars. 67 and 71).
Compression poor	Adjust the valve lifters (par. 120).

24. Engine Noisy

Probable cause	*Possible remedy*
Oil pressure low	Adjust the oil pressure regulator (par. 74).
Valve lifters improperly adjusted.	Adjust the valve lifters (par. 120).

25. Engine Has Low or No Oil Pressure

Probable cause	*Possible remedy*
Oil line assemblies obstructed.	Clean or replace the oil line (par. 75).
Defective oil pressure gage.	Test the oil pressure gage.

26. Engine Oil Consumption High

Probable cause	*Possible remedy*
Oil leaks	Replace a damaged cover plate or gasket (par. 121). Replace damaged oil lines or fittings (par. 75).

27. Engine Exhaust Smoky

Probable cause	*Possible remedy*
Carburetor improperly adjusted or defective.	If the exhaust smoke is black, adjust or replace the carburetor (par. 57). If exhaust smoke is blue, report to field maintenance.

28. Engine Electrical Starter Fails to Operate

Probable cause	*Possible remedy*
Battery cables loose or defective.	Clean, tighten, or replace the battery cables (par. 69).
Engine start switches defective.	Replace the engine start switches (pars. 100 and 101).
Engine electrical starter defective.	Replace the engine electrical starter (par. 66).

29. Engine Accessory Generator Charging Rate Improper

Probable cause	*Possible remedy*
Engine generator regulator defective or improperly adjusted.	Adjust or replace the engine generator regulator (par. 68).
Wiring faulty	Inspect all wiring between the engine generator, regulator, battery-charging ammeter, and battery. Tighten loose connections, or replace defective wiring (pars. 63 and 66–69).
V-belts improperly adjusted or defective.	Adjust or replace the V-belts (par. 64).
Engine accessory generator defective.	Replace the engine accessory generator (par. 63).

30. Batteries Discharge Through the Engine Accessory Generator

Probable cause	*Possible remedy*
Engine generator regulator assembly improperly adjusted or defective.	Adjust or replace the engine generator regulator (par. 68).

31. AC Generator Fails to Build Up Rated Voltage

Probable cause	*Possible remedy*
Generator or exciter brushes worn.	Replace the generator or exciter brushes (par. 125).

32. AC Generator Overheats

Probable cause	*Possible remedy*
Guard screens dirty or plugged.	Remove and clean the guard screens (par. 124).

33. AC Generator Voltage Fluctuates or Drifts

Probable cause	*Possible remedy*
Engine speed erratic	Adjust the governor assembly (par. 58).
Brushes sticking in brush holder.	Clean the exciter and generator brushes (par. 125).

34. AC Generator Voltage Drops Upon Load Increase

Probable cause	*Possible remedy*
Generator or exciter brushes worn or dirty.	Clean or replace the generator or exciter brushes (par. 125).

35. Coolant Heater Fails to Ignite

Probable cause	*Possible remedy*
Heater overheat control switch defective.	Replace the heater overheat control switch (par. 127).
Igniter assembly defective.	Replace the igniter assembly (par. 128).
Battery box thermostat defective.	Replace a defective battery box thermostat (par. 129).
Fuel solenoid valve defective.	Replace the fuel solenoid valve (par. 128).

36. Coolant Heater Fails to Keep Burning

Probable cause	*Possible remedy*
Air inlet or exhausts obstructed or clogged.	Remove obstructions or clogging or replace the heater (par. 128).
Heater overheat control switch defective.	Replace the heater overheat control switch (par. 127).
Fuel line clogged	Clean fuel tank, strainer, and line (pars. 55, 59, and 61).
Fuel solenoid valve defective.	Replace the valve (par. 128).

37. Coolant Heater Smokes Excessively

Probable cause	*Possible remedy*
Igniter assembly defective.	Replace the igniter assembly (par. 128).
Fuel solenoid valve defective.	Replace the fuel solenoid valve (par. 128).

38. Coolant Heater Overheats

Probable cause	*Possible remedy*
Heater overheat control switch defective.	Replace the heater overheat control switch (par. 127).
Fuel solenoid valve defective.	Replace the fuel solenoid valve (par. 128).

39. Field Expedient Repairs

Operational troubles may occur while the generator set is operating in the field where supplies and repair parts are not available and normal remedial action cannot be performed. When this condition exists, the expedient remedies listed below may be used only upon the decision of the unit commander. Equipment so repaired must be removed from operation at the earliest possible moment and properly repaired before being placed in operation again.

Trouble	*Expedient remedy*
a. Engine start switch defective.	Place a jumper around the start switch (par. 100*c*).
b. Engine start push-button switch defective.	Use a suitable wire to momentarily jump the engine start push-button switch to crank the engine (par. 101*c*).
c. Battery cable clamp broken.	Wrap a strip of metal around the battery post and secure the battery cable to the metal strip by installing a suitable screw and nut (par. 69*d*).
d. Fuel pump defective.	Bypass the fuel pump (par. 56*f*).

Caution: **Continued operation without a fuel filter may result in damage to the engine.**

e. Fuel pump vapor locked.	Wrap rags around the fuel pump and pour cold water over the rags (par. 56*g*).
f. Air cleaner assembly clogged.	Remove the air cleaner-to-carburetor hose from the carburetor (par. 57*e*).

Caution: **Operating the generator set in sandy or dusty areas without the protection of the air cleaner can damage the engine.**

g. Temperature safety switch grounded.	Disconnect the electrical leads from the temperature safety switch (par. 114*f*).

Caution: **Operating the generator set at temperatures above the cutout point of the high-temperature stop switch can damage the engine.**

h. Cooling system hoses collapsed.	Insert a heavy wire formed into a coil into the inside of the hose (par. 77*d*).
i. Fuel line assemblies coupling nuts defective.	Pack the coupling nuts with string (par. 61*d*).
j. Oil filter gasket defective.	Turn the gasket over and reinstall (par. 73*f*).
k. Oil line assemblies cracked.	Wrap the cracked parts of the lines with friction tape (par. 75*f*).
l. Fuse blown	Remove the fuse, wrap it with tinfoil and reinstall (TM 5-6115-232-10).

Caution: **Items connected to duplex receptacle will have no over load protection.**

m. Electrical frequency meter shorted or grounded.	Disconnect the electrical leads from the meter and tape the leads separately. Check or adjust the engine speed as directed in paragraph 87*c*.
n. Ac ammeter open	Remove the electrical leads and tape them together (par. 85*c*).

Caution: **Carefully check the total load on the generator set. Do not overload the unit.**

o. Ac voltmeter defective.	Remove the electrical leads from the voltmeter and tape them separately (par. 88*c*).

Section IV. RADIO INTERFERENCE SUPPRESSION

40. Definitions

a. Interference. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are created by the generator set and which may interfere with the proper operation of radio receivers or other electronic equipment.

b. Interference Suppression. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference created by the generator set.

41. Purpose of Interference Suppression

The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbances created by the generator set are composed partially of electrical waves in the radio frequency range, they must be suppressed for two important reasons. First, they will interfere with the proper operation of the friendly radio net and second, they will enable the enemy to locate the equipment and its associated units.

42. General Sources of Interference

Generally, radio interference is created anywhere a spark occurs or where a high-frequency current is present. A spark is a small amount of electrical current jumping an air gap in response to the force of a relatively high voltage. The gasoline engine ignition system is a common source. Magneto breaker points, generator commutators, relay contacts, and static charges collecting on the frame are other common sources which in some way must be suppressed.

43. General Methods Used to Attain Proper Suppression

Essentially, suppression is attained by providing a low-resistance path-to-ground for the stray currents. The methods used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors where necessary. For general information on radio interference suppression, refer to TM 11–483.

44. Interference Suppression Components

a. Primary Interference Suppression Components.

(1) *Load terminal capacitors.* There are four load terminal capacitors (1 and 5, A, fig. 3) located at the rear of the terminal board and grounded to the terminal board angle support. These capacitors are all rated at 0.1-μf, 500–v, ac/dc.

(2) *Generator voltage regulator capacitor.* The generator voltage regulator capacitor (6, B, fig. 3) is located within the control box, below and to the left of the generator voltage regulator. This capacitor is rated at 0.1-μf, 500-v, ac/dc.

(3) *Generator field capacitor.* The generator field capacitor (8, C, fig. 3) is located on the generator bearing bracket. This capacitor is rated at 0.1-μf, 500-v, ac/dc.

(4) *Generator exciter capacitor.* The generator exciter capacitor (3) is located on the generator bearing bracket. This capacitor is rated at 0.1-μf, 500-v, ac/dc.

(5) *Duplex receptacle capacitors.* Two duplex receptacle capacitors (5, D, fig. 3) are located on the rear side of the control panel. These capacitors are rated at 0.1-μf, 500-v, ac/dc.

(6) *Engine generator regulator capacitor.* The engine generator regulator capacitor (9, E, fig. 3) is located in the engine generator regulator box. This capacitor is rated at 0.1-μf, 100-v, dc.

(7) *Engine generator regulator through-capacitor.* The engine generator regulator through-capacitor (11) is located on the engine generator regulator box. This capacitor is rated at 1.75-μf, 20-amp, 100-v, dc.

(8) *Engine accessory generator capacitor.* The engine accessory generator capacitor (3, F, fig. 3) is located on the engine accessory generator. This capacitor is rated at 0.1-μf, 100-v, ac/dc.

(9) *Blower motor through-capacitor.* The blower motor through-capacitor (4, G, fig. 3) is located on the coolant heater motor. This capacitor is rated at 0.25-μf, 20-amp, 100-v, dc.

(10) *Engine generator regulator box.* The engine generator regulator box (2, H, fig. 3) is located on the left side of the generator set and to the rear of the engine. This box and cover completely surround and shield the engine generator regulator.

(11) *Control panel-to-control box lead assembly.* The control panel-to-control box lead assembly (10, B, fig. 3) is located inside of the control box and behind the control panel.

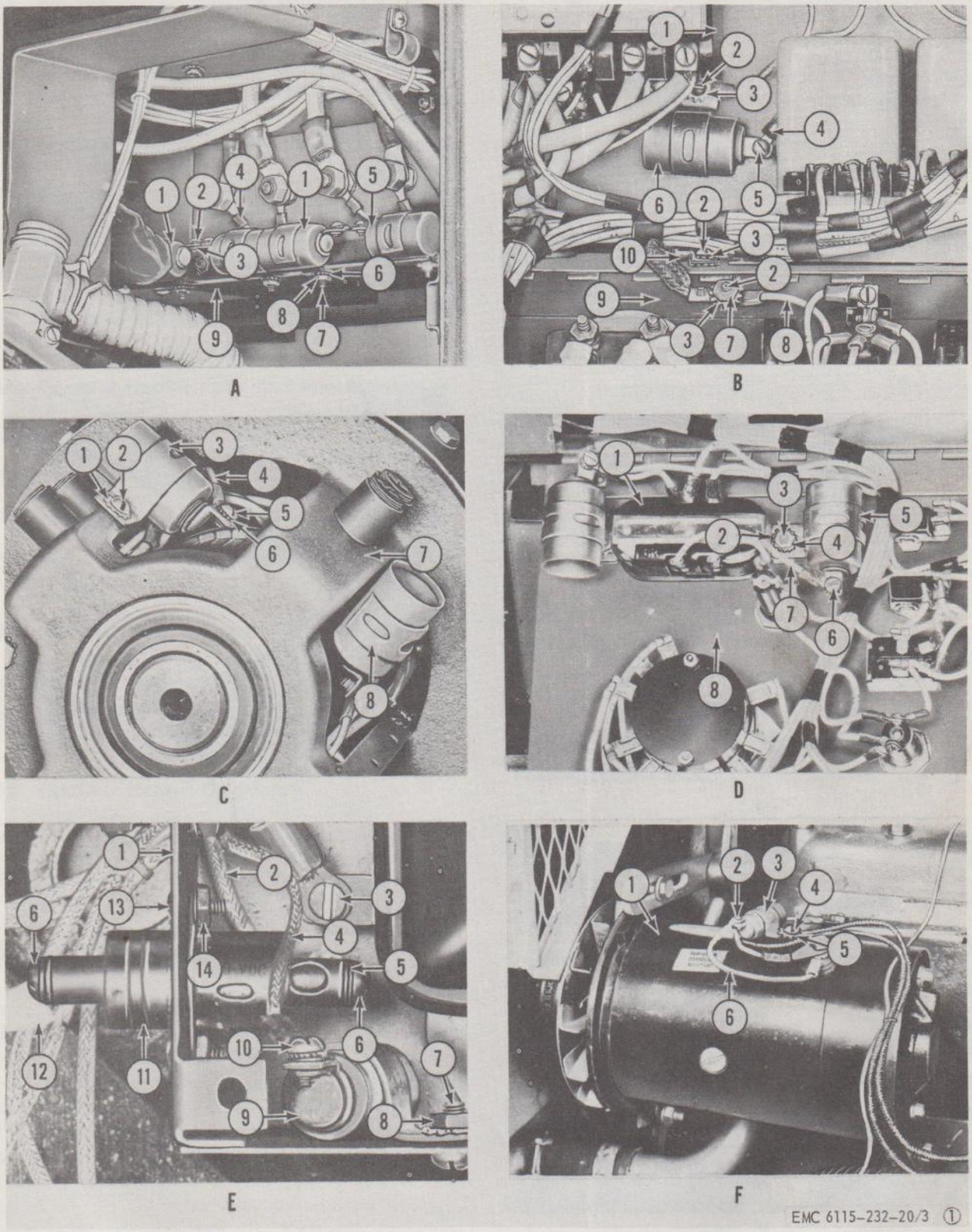


Figure 3. Radio interference suppression components.

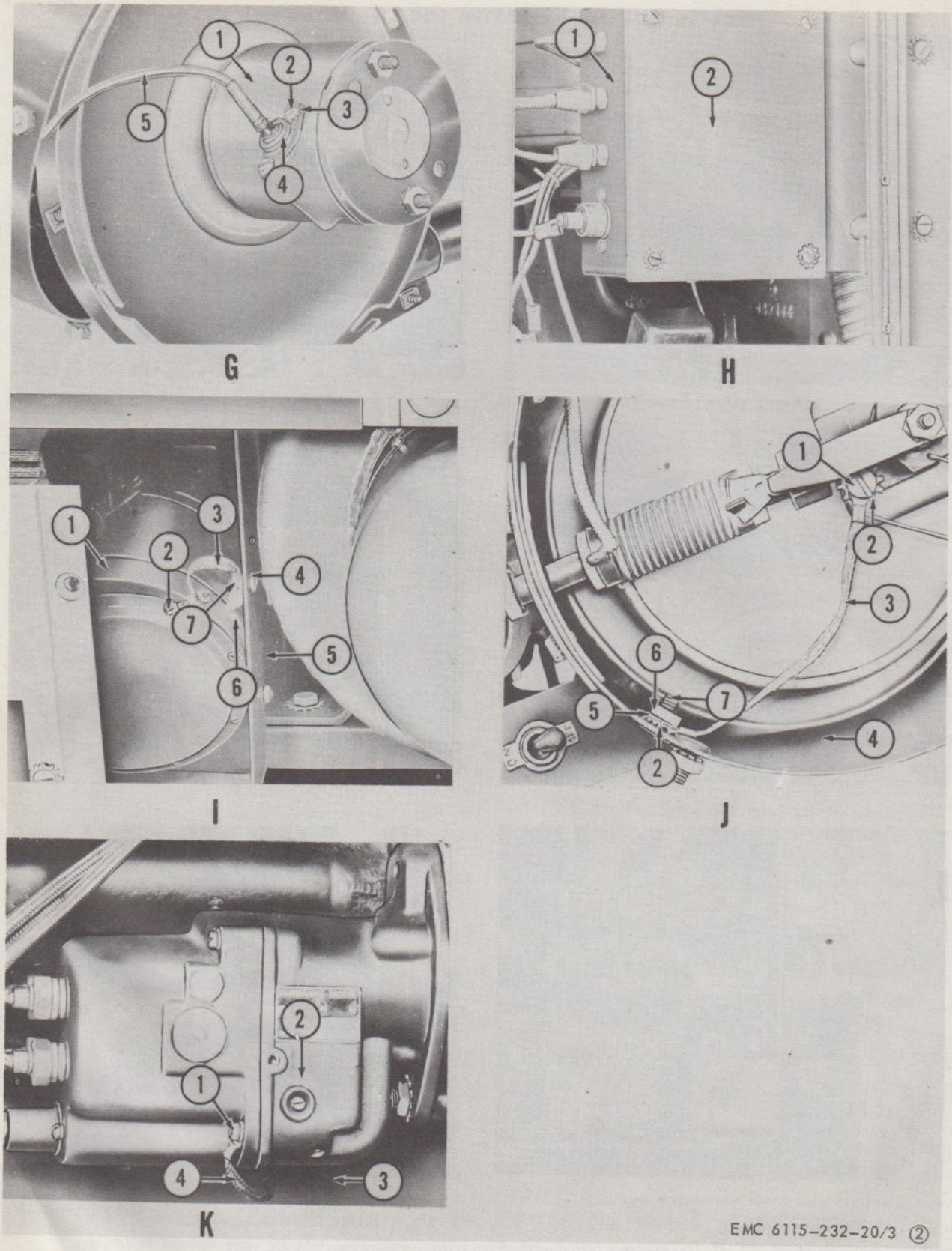


Figure 3—Continued.

1 Capacitor, 0.1-μf, 500-v, ac/dc (2 rqr)
2 Screw, rd-hd, No. 8–32 x ¼ in. (4 rqr)
3 Washer, lock, ET, No. 8 (4 rqr)
4 Capacitor lead (4 rqr)
5 Capacitor, 0.1-μf, 500-v, ac/dc (2 rqr)
6 Washer, lock, IET, No. 10 (8 rqr)
7 Screw, rd-hd, No. 10–32 x ½ in. (4 rqr)
8 Nut, hex, No. 10–32 (4 rqr)
9 Panel

A—Load terminal capacitors

1 Control box
2 Screw, rd-hd, No. 8–32 x ½ in. (3 rqr)
3 Washer, lock, IET, No. 8 (8 rqr)
4 Capacitor lead
5 Screw, rd-hd, No. 8–32 x ¼ in.
6 Capacitor, 0.1-μf, 500-v, ac/dc
7 Nut, hex, No. 8–32 (3 rqr)
8 Electrical lead
9 Instrument panel
10 Lead assembly

B—Generator voltage regulator capacitor and panel-to-control box, lead assembly

1 Washer, lock, IET, No. 10 (4 rqr)
2 Screw, rd-hd, No. 10–32 x ⅜ in. (2 rqr)
3 Capacitor, 01.-μf, 500-v, ac/dc
4 Capacitor lead
5 Screw, rd-hd, No. 8-32 x ¼ in. (2 rqr)
6 Washer, lock, ET, No. 8 (2 rqr)
7 Bearing bracket
8 Capacitor, 0.1-μf, 500-v, ac/dc

C—Generator exciter and field capacitors

1 Duplex receptacle
2 Washer, lock, IET, No. 8 (6 rqr)
3 Screw, rd-hd, No. 8–32 x ½ in. (2 rqr)
4 Nut, hex, No. 8–32 (2 rqr)
5 Capacitor, 0.1-μf, 500-v, ac/dc (2 rqr)
6 Screw, rd-hd, No. 8–32 x ¼ in. (2 rqr)
7 Capacitor lead (2 rqr)
8 Control panel

D—Duplex receptacle capacitors

1 Engine generator regulator box
2 Capacitor lead
3 Screw (spec)
4 Capacitor lead
5 Washer, lock, IT, No. 10 (2 rqr)
6 Screw, rd-hd, No. 10–32 x 5/16 in. (2 rqr)
7 Screw, rd-hd, No. 10–32 x ⅜ in.
8 Nut, hex, No. 10–32
9 Capacitor, 0.1-μf, 100-v, dc
10 Screw, rd-hd, No. 8–32 x ¼ in.
11 Through-capacitor, 1.75-μf, 20-amp, 100-v, dc
12 Electrical lead
13 Screw, rd-hd, No. 6–32 x ⅜ in. (2 rqr)
14 Nut, hex, No. 6–32 (2 rqr)

E—Engine generator regulator capacitors

1 Engine accessory generator
2 Screw, rd-hd, No. 8–32 x ¼ in.
3 Capacitor, 0.1-μf, 100-v, ac/dc
4 Screw, rd-hd, ¼–20 x ½ in.
5 Washer, lock, IET, ¼ in. (3 rqr)
6 Electrical lead

F—Engine accessory generator capacitor

1 Blower motor
2 Screw, pan-hd, No. 6–32 x ¼ in. (2 rqr)
3 Washer, lock, ET, No. 6 (2 rqr)
4 Through-capacitor, 0.25-μf, 20-amp, 100-v, dc
5 Electrical lead

G—Blower motor through-capacitor

1 Cover
2 Box

H—Engine generator regulator box

1 Blower assembly
2 Screw, binding-hd, thd-forming, No. 6
3 Lead assembly
4 Nut, hex, ¼–20
5 Heater bracket
6 Heater support bracket
7 Screw, cap, hex-hd ¼–20 x ½ in.

I—Coolant heater-to-bracket lead assembly

1 Screw, rd-hd, No. 8–32 x ¼ in.
2 Washer, lock, IET, No. 8 (2 rqr)
3 Lead assembly
4 Coolant heater housing
5 Washer, lock, ET, No. 8 (2 rqr)
6 Nut, hex, No. 8–32
7 Screw, rd-hd, No. 8–32 x ½ in.

J—Igniter-to-housing lead assembly

1 Screw, fil-hd, No. 10–24 x ⅝ in.
2 Magneto
3 Oil pan
4 Lead assembly

K—Magneto-to-engine lead assembly

Figure 3.—Continued.

(12) *Coolant heater-to-bracket lead assembly.* The coolant heater-to-bracket lead assembly (3, I, fig. 3) is located between the motor end of the coolant heater and the generator set frame.

(13) *Coolant heater igniter-to-housing lead assembly.* The coolant heater igniter-to-housing lead assembly (3, J, fig. 3) is located between the igniter and housing of the coolant heater.

(14) *Magneto-to-engine lead assembly.* The magneto-to-engine lead assembly (4, K, fig. 3) is located between the magneto and engine.

b. Secondary Interference Suppression Components.

(1) *Spark plugs.* The spark plugs used with the generator set engine are completely shielded and internally suppressed.

(2) *Ignition cables.* The ignition cables connecting the spark plugs to the magneto are of the copper-conductor, neoprene-jacket type and are covered by double braid shielded loom, with ferrule-type connectors.

(3) *Ignition magneto.* The ignition magneto is internally suppressed and shielded by a complete metal closure. The metal closure is grounded to the engine by a bonding strap and to the ground of the engine electrical system through the magneto condenser.

(4) *Lock washers.* Lock washers of the IT (internal tooth), ET (external tooth), and IET (internal-external tooth) type are used to insure a complete metal-to-metal bond between parts of the generator set.

45. Replacement of Interference Suppression Components

a. General. Radio interference suppression exists wholly or not at all. Extra care must be exercised in the replacement of suppression components to assure that full metal-to-metal contact is obtained between contiguous parts. In the replacement of interference suppression components, use only components of like rating, size, and/or type.

b. Primary Interference Suppression Components.

(1) *Load terminal capacitor.*

(*a*) *Removal.*

1. Remove the screw (2, A, fig. 3) and lockwasher (3) and remove the capacitor lead (4) from the load terminal capacitor (1).

2. Remove the nut (8), lockwasher (6), capacitor, lockwasher, and screw (7) from the panel (9).

3. Remove the remaining three load terminal capacitors in a similar manner.

(*b*) *Installation.*

1. Position the capacitor (1) to the panel (9) and install the lockwasher and screw (7), then secure the capacitor to the panel by installing the lockwasher (6) and nut (8) on the screw.

2. Position the capacitor lead (4) to the terminal of the capacitor (1) and secure by installing the lockwasher (3) and screw (2).

3. Install the remaining three capacitors in a similar manner.

(2) *Generator voltage regulator capacitor.*

(*a*) *Removal.*

1. Remove the screw (5, B, fig. 3) and lockwasher and remove the capacitor lead (4) from the terminal of the generator voltage regulator capacitor (6).

2. Remove the screw (2), three lockwashers (3), and nut and remove the capacitor from the control box (1) and contactor base.

(*b*) *Installation.*

1. Position the generator voltage regulator capacitor (6) to the control box (1) and contactor base and secure by installing the three lockwashers (3), screw (2), and nut.

2. Position the capacitor lead (4) to the terminal of the capacitor and secure by installing the lockwasher and screw (5).

(3) *Generator exciter capacitor.*

(*a*) *Removal.*

1. Remove the bearing bracket cover (par. 123).

2. Remove the screw (5, C, fig. 3) and lockwasher (6) and remove the capacitor lead (4) from the generator exciter capacitor (3).

3. Remove the screw (2), two lockwashers (1), and capacitor from the bearing bracket (7).

(*b*) *Installation.*

1. Position the lockwasher (1) and generator exciter capacitor (3) to the bearing

bracket (7) and secure by installing the lockwasher (1) and screw (2).

2. Position the capacitor lead (4) to the terminal of the capacitor and secure by installing the lockwasher (6) and screw (5).

3. Install the bearing bracket cover (par. 123).

(4) *Generator field capacitor.*

(*a*) *Removal.* Remove the generator field capacitor (8) in a manner similar to *b*(3) above.

(*b*) *Installation.* Install the generator field capacitor (8) in a manner similar to *b*(3) above.

(5) *Duplex receptacle capacitors.*

(*a*) *Removal.*

1. Remove the screw (6, D, fig. 3) and lockwasher to remove the capacitor lead (7) from the terminal of the duplex receptacle capacitor (5).

2. Remove the nut (4), three lockwashers (2), screw (3), and capacitor from the duplex receptacle (1) and control panel (8).

3. Remove the other duplex receptacle capacitor in a similar manner.

(*b*) *Installation.*

1. Position the duplex receptacle capacitor (5) to the duplex receptacle (1) and control panel (8) and secure by installing the screw (3), lockwasher, three lockwashers (2), and nut (4).

2. Position the capacitor lead (7) to the terminal of the capacitor and secure by installing the lockwasher and screw (6).

3. Install the other duplex receptacle capacitor in a similar manner.

Note. Should it be necessary to replace the outside capacitor, bend the capacitor mounting bracket so that the installed capacitor will clear the control box when closing the control panel.

(6) *Engine generator regulator capacitor.*

(*a*) *Removal.*

1. Remove the cover of the engine generator regulator box (par. 68).

2. Remove the screw (10, E, fig. 3) and lockwasher and remove the capacitor lead (4) from the terminal of the engine generator regulator capacitor (9).

3. Remove the nut (8) and lockwasher from the screw (7) and remove the screw and second lockwasher from the engine generator regulator box (1) along with the capacitor.

(*b*) *Installation.*

1. Position the engine generator regulator capacitor (9) in the engine generator regulator box (1).

2. Install a lockwasher and the screw (7) from beneath the box and secure the capacitor to the box by installing the lockwasher and nut (8) on the screw.

3. Position the capacitor lead (4) to the terminal of the capacitor and secure by installing the lockwasher and screw (10).

4. Install the engine generator regulator box cover (par. 68).

(7) *Engine generator regulator through-capacitor.*

(*a*) *Removal.*

1. Remove the cover of the engine generator regulator box (par. 68).

2. Remove the engine generator regulator capacitor in a manner similar to *b*(6) above.

3. Tag and remove the capacitor lead (2) from the engine generator regulator by removing the screw (3) and lockwasher.

4. Remove the screw (6) and lockwasher and remove the electrical lead (12) from the external terminal of the engine generator regulator through-capacitor (11).

5. Remove the 2 nuts (14), 4 lockwashers, and 2 screws (13) and remove the capacitor from the engine generator regulator box (1).

6. Remove the screw (6) and lockwasher (5) and remove the capacitor lead (2) from the capacitor.

(*b*) *Installation.*

1. Position the capacitor lead (2) to the internal terminal of the engine generator regulator through-capacitor (11) and secure by installing the lockwasher (5) and screw (6).

2. Position the capacitor to the engine generator regulator box (1) and secure by installing the 2 screws (3), 4 lockwashers, and 2 nuts (14).

3. Position the capacitor lead (2) to the engine generator regulator and secure by installing the lockwasher and screw (3).

4. Position the electrical lead (12) to the external terminal of the capacitor and secure by installing the lockwasher and screw (6).
5. Install the engine generator regulator capacitor in a manner similar to *b*(6) above.
6. Install the cover of the engine generator regulator (par. 68).

(8) *Engine accessory generator capacitor.*

(*a*) *Removal.*

1. Remove the screw (2, F, fig. 3) and lockwasher and remove the electrical lead (6) from the terminal of the engine accessory generator capacitor (3).
2. Remove the screw (4), 3 lockwashers (5), 2 electrical leads, and capacitor (3) from the engine accessory generator (1).

(*b*) *Installation.*

1. Position the engine accessory generator capacitor (3), 2 electrical leads, and 3 lockwashers (5) to the engine accessory generator (1) and secure by installing the screw (4).
2. Position the electrical lead (6) to the terminal of the capacitor and secure by installing the lockwasher and screw (2).

(9) *Blower motor through-capacitor.*

(*a*) *Removal.*

1. Remove the blower motor assembly (par. 128).
2. Remove the electrical lead (5, G, fig. 3) from the external terminal of the through-capacitor (4) by unsoldering.
3. Remove the two screws (2) and lockwashers (3) and carefully withdraw the capacitor from the blower motor (1).
4. Remove the capacitor from the blower motor lead by unsoldering the joint.

(*b*) *Installation.*

1. Position the blower motor lead to the inside terminal of the through-capacitor (4) and secure by soldering.
2. Insert the capacitor in the cavity of the blower motor (1) and secure by installing the two lockwashers (3) and screws (2).
3. Position the electrical lead (5) to the external terminal of the capacitor and secure by soldering.
4. Install the blower motor assembly (par. 128).

(10) *Engine generator regulator box.*

(*a*) *Removal.* Remove the engine generator regulator box (par. 68).

(*b*) *Installation.* Install the engine generator regulator box (par. 68).

(11) *Control panel-to-control box lead assembly.*

(*a*) *Removal.*

1. Remove the nut and lockwasher from beneath the control box (1, B, fig. 3).
2. Remove the screw (2) and two lockwashers (3) and remove the control panel-to-control box lead assembly (10) and shielded lead ground from the control box (1).
3. Remove the nut (7), two lockwashers (3), electrical lead (8), and lead assembly from the screw (2) and remove the screw, lockwasher, and lead assembly from the instrument panel (9).

(*b*) *Installation.*

1. Position the screw (2) and lockwasher on the instrument panel (9).
2. Position the lockwasher (3), electrical lead (8), one end of the control panel-to-control box lead assembly (10) and the second lockwasher (3) on the screw (2) and secure by installing the nut (7).
3. Position the lockwasher (3), shielded lead ground, free end of the lead assembly, and second lockwasher (3) in the control box. Install the screw (2) and secure by installing the lockwasher and nut from beneath the control box.

(12) *Coolant heater-to-bracket lead assembly.*

(*a*) *Removal.*

1. Remove the screw (2, I, fig. 3) and nut and remove one end of the coolant heater-to-bracket lead assembly (3) from the blower assembly (1).
2. Remove the nut (4), two lockwashers, and screws (2) and remove the lead assembly from the heater bracket (5).

(*b*) *Installation.*

1. Position the two lockwashers and one end of the coolant heater-to-bracket lead assembly (3) to the heater bracket (5) and secure by installing the screw (2) and nut (4).

2. Position the free end of the lead assembly to the blower assembly (1) and secure by installing the screw (2) and nut.

(13) *Coolant heater igniter-to-housing lead assembly.*

(a) *Removal.*

1. Remove the coolant heater end plate (par. 128).
2. Remove the nut (6, J, fig. 3), screw (7), two lockwashers (2 and 5), and lead assembly (3) from the coolant heater housing (4).
3. Remove the screw (1) and two lockwashers (2) from the igniter and remove the lead assembly (3).

(b) *Installation.*

1. Position the lead assembly (3) to the igniter and secure by installing the two lockwashers (2) and screw (1).

Note. Be sure the loop of wire from igniter is engaged by the installed screw.

2. Position the lead assembly (3) to the coolant heater housing (4) and secure by installing the screw (7), two lockwashers (2 and 5), and nut (6).
3. Install the coolant heater end plate (par. 128).

(14) *Magneto-to-engine lead assembly.*

(a) *Removal.*

1. Remove the screw (1, K, fig. 3) and lockwasher and remove one end of the magneto-to-engine lead assembly (4) from the magneto (2).
2. Remove the other end of the lead assembly from the oil pan (3) by removing the screw and lockwasher located behind the magneto.

(b) *Installation.*

1. Position the one end of the magneto-to-engine lead assembly (4) to the oil pan (3), behind the magneto, and secure by installing the lockwasher and screw.
2. Position the free end of the lead assembly to the magneto (6) and secure by installing the lockwasher and screw (1).

c. *Secondary Interference Suppression Components.*

(1) *Spark plugs.* Remove and install the spark plugs (par. 71).

(2) *Spark plug leads.* Remove and install the spark plug leads (par. 70).

(3) *Ignition magneto.* Remove and install the ignition magneto (par. 67).

(4) *Lockwashers.* Remove and install lockwashers outlined in the appropriate paragraphs.

46. Testing of Radio Interference Suppression Components

Test the capacitors for leaks and shorts on a capacitor tester. Replace a defective capacitor. If test equipment is not available and interference is indicated, isolate the cause of interference by the trial and error method of replacing each capacitor in turn until the cause of interference is determined and eliminated.

Section V. EXHAUST SYSTEM

47. General

The exhaust system, comprised of the engine exhaust manifold, adapter, muffler, and rain cap, vents exhaust gases from the engine. The adapter is mounted on the engine exhaust manifold. The muffler is mounted on the roof of the generator set and the rain cap is attached to the outlet of the muffler.

48. Muffler Assembly and Rain Cap

a. *Removal.*

(1) Loosen the screw (9, fig. 4) on the clamp (3) and remove the muffler inlet pipe (1) from the adapter (4).

(2) Remove the two nuts (7, fig. 5) and lockwashers from the U-bolt (6) and remove the U-bolt.

(3) Remove the muffler assembly (4) from the roof assembly (9).

(4) Remove the three nuts, lockwashers, and screws (1) and remove the muffler bracket (8) from the roof.

b. *Disassembly.*

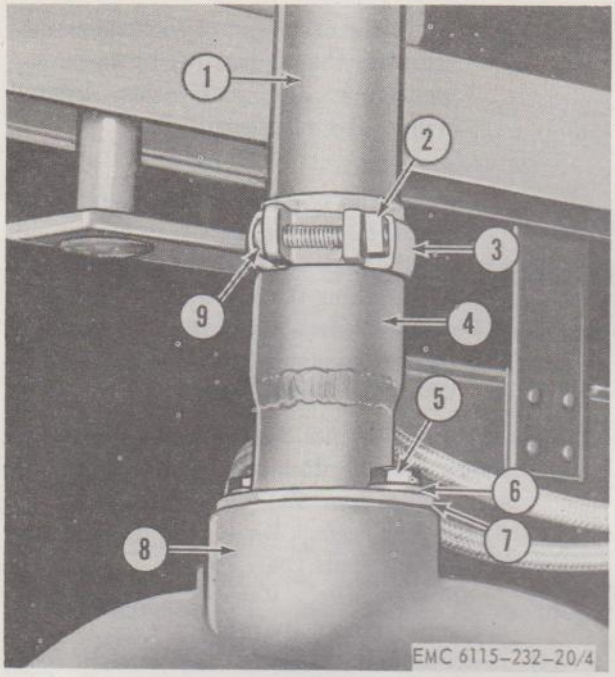
(1) Loosen the screw and remove the rain cap (5) and sleeve from the muffler assembly (4).

(2) Remove the screw, lockwasher, and nut from the rain cap.

c. *Cleaning and Inspection.*

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the muffler assembly for corrosion, holes, breaks, and cracks. Replace a defective muffler assembly.



1 Muffler inlet pipe
2 Nut, sq, ¼–20
3 Clamp
4 Adapter
5 Screw, cap, hex-hd, 5/16–18 x 5/8 in. (2 rqr)
6 Washer, lock, 5/16 in. (2 rqr)
7 Gasket
8 Intake and exhaust manifold
9 Screw, ¼–20 x 1¼ in.

Figure 4. Muffler assembly and adapter, removal points.

(3) Inspect the rain cap for free movement and for cracks or other damage. Replace a defective rain cap.

(4) Inspect the mounting hardware for cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly.

(1) Install the screw, lockwasher, and nut on the rain cap (5).

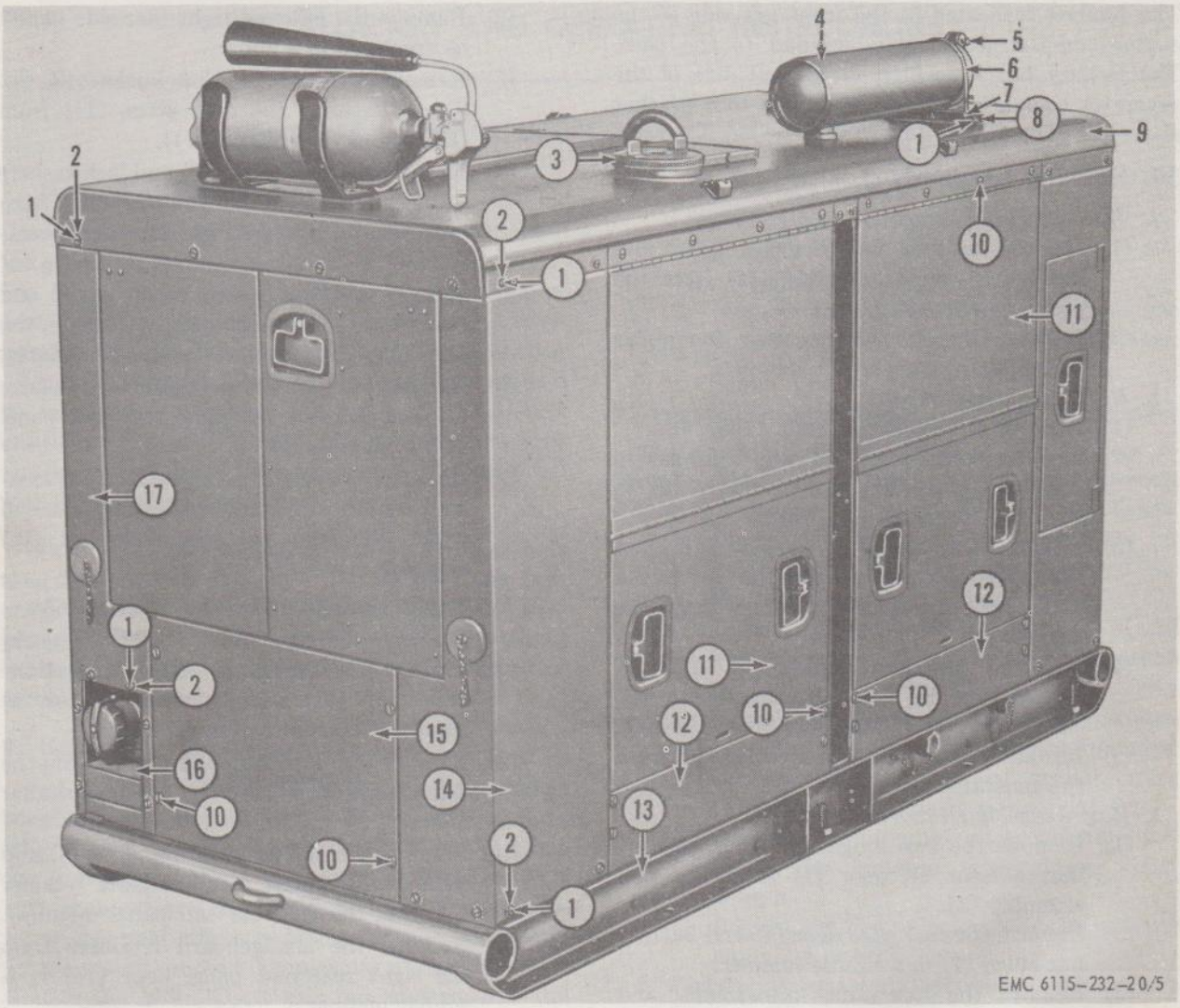
(2) Position the sleeve and rain cap, properly oriented, on the muffler assembly (4) and secure by tightening the screw.

e. Installation.

(1) Position the muffler bracket (8) to the roof assembly (9) and secure by installing the three screws (1), lockwashers, and nuts.

(2) Position the muffler assembly (4) on the roof assembly (9), engage the muffler inlet pipe (1, fig. 4) with the adapter (4), and secure the clamp (3) by tightening the screw (9).

(3) Position the U-bolt (6, fig. 5) to the muffler assembly (4) and muffler bracket (8) and secure by installing the two lockwashers and nuts (7).



1 Screw, rd-hd, ¼–20 x ½ in. (43 rqr)
2 Washer, lock, IET, ¼ in. (52 rqr)
3 Fuel tank cap
4 Muffler assembly
5 Rain cap
6 U-bolt
7 Nut, hex, ¼–20 (2 rqr)
8 Muffler bracket
9 Roof assembly
10 Fastener (36 rqr)
11 Door assembly (4 rqr)
12 Side panel (4 rqr)
13 Skid
14 Right rear end panel
15 Lower rear panel
16 Receptacle box
17 Left rear end panel

Figure 5. Muffler and housing, removal points.

Section VI. HOUSING, TOOLBOX, AND BATTERY BOX

49. General

A sheet metal housing encloses the generator set. The housing is secured to the generator set skid and is made up of panels and doors. The doors provide access for servicing, operation, and maintenance. The toolbox is located in the front left side of the engine compartment and is secured to the base. The battery box is located in the left side of the generator compartment and is secured to a bracket above the generator.

50. Housing Assembly

a. Door Assembly Removal.

(1) Release the four fasteners (10, fig. 5) and remove the door assembly (11) from the roof assembly (9).

(2) Remove the other three door assemblies in a similar manner.

b. Roof Assembly Removal.

(1) Remove the muffler assembly (par. 48).

(2) Remove the 20 screws (1) and lockwashers (2) that secure the roof assembly (9) to the installed panels and frame.

(3) Remove the fuel tank cap (3) and open the safety pin that secures the cap to the fuel tank to remove the cap from the generator.

(4) Remove the two screws (5, fig. 6), lockwashers (6), and nuts that secure the center of the roof assembly (3) to the frame.

(5) Lift and remove the roof assembly (3) from the generator set.

c. Roof Assembly Disassembly.

(1) Remove the two hinge rivets (2) and lift the radiator fill door (1) from the roof assembly (3).

(2) Remove the fuel gage door (4) and battery box cover (7) in a similar manner.

(3) Remove the two nuts, lockwashers, and screws (18) and remove the door assembly hook (10) from the roof assembly (3).

(4) Remove the other three door assembly hooks in a similar manner.

(5) Remove the fire extinguisher (8) from the fire extinguisher bracket (9).

(6) Remove the two screws and remove the fire extinguisher bracket from the roof assembly (3).

d. Side Panel Removal.

(1) Release the four fasteners (11) and remove the side panel (12) from the generator set.

(2) Remove the other three side panels in a similar manner.

e. Left and Right Rear End Panels Removal.

(1) Remove the roof assembly as described in *b* above.

(2) Remove the left and right rear side panels as described in *d* above.

(3) Remove the two knurled knobs (13, fig. 7) and remove the door stops (11) from the stud of the channel (14).

(4) Remove the two screws (9) and lockwashers (10) and remove the channel (14) from between the left and right rear end panels (12 and 15).

(5) Release the four fasteners (10, fig. 5) and remove the lower rear panel (15) from the left and right rear end panels (17 and 14).

(6) Remove the four screws (1) and lockwashers (2) and remove the right rear end panel (14) from the skid (13).

(7) Remove the eight screws (1) and lockwashers (2) and remove the left rear end panel (17) from the receptacle box (16) and skid (13).

f. Left and Right Rear End Panels Disassembly.

(1) Remove the two nuts (7, fig. 7), lockwashers (6), and screws (8) and remove the door stop (11) and door stop spacer (5) from the left rear end panel door (4).

(2) Remove the door stop and spacer from the right rear end panel door (16) in a similar manner.

(3) Remove the nut (2) from the stud (3) and remove the wiring diagram plate retainer (1) from the left rear end panel door (4).

(4) Remove the changeboard retainers from the right rear end panel door (16) in a similar manner.

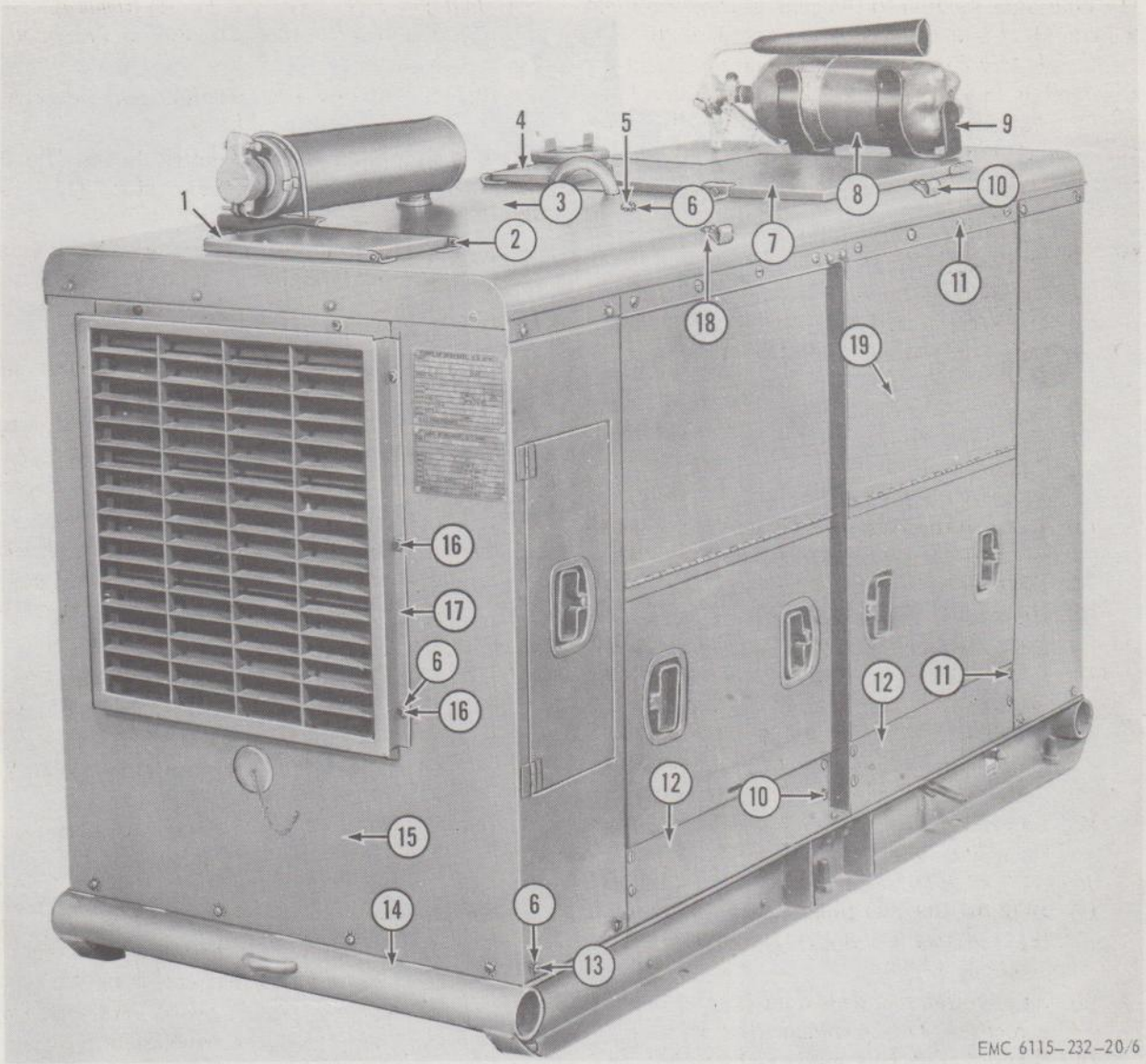
g. Front End Panel Assembly Removal.

(1) Remove the roof assembly as described in *b* above.

(2) Remove the left and right front side panels as described in *d* above.

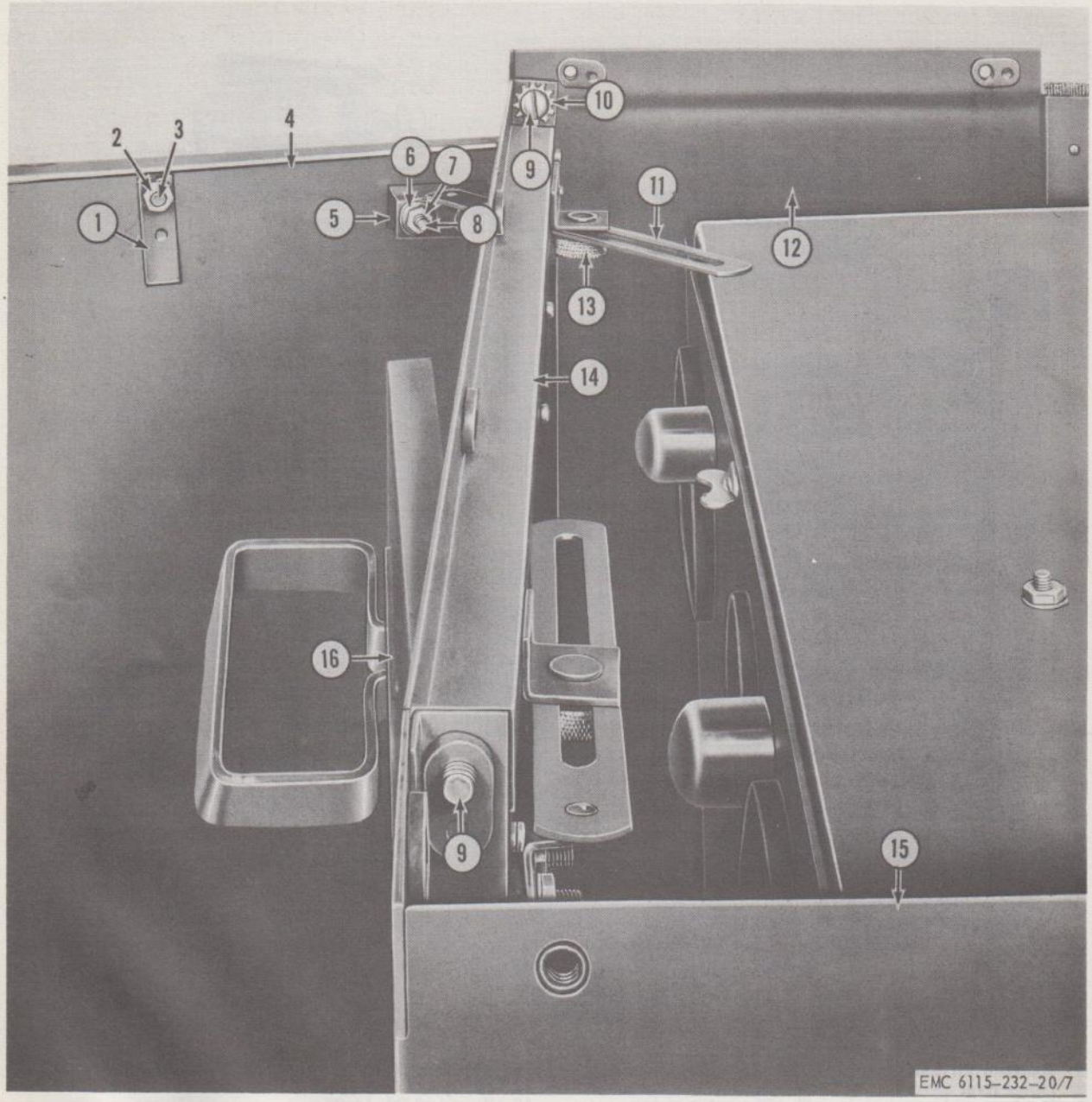
(3) Unhook the spring (3, fig. 8) from the stud (2) of the shutter assembly (4) and remove the rod assembly (1) from the stud.

(4) Remove the eight screws (13, fig. 6) and lockwashers (6) and remove the front end panel assembly (15) from the skid (14).



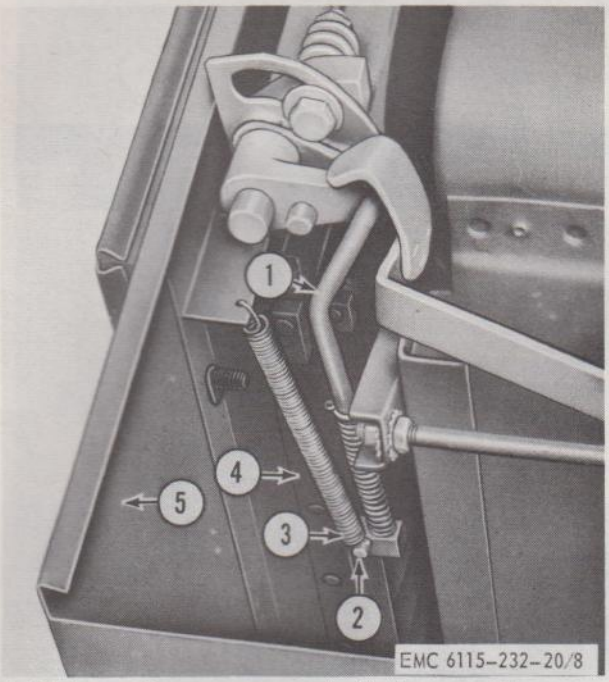
1 Radiator fill door
2 Hinge rivet (6 rqr)
3 Roof assembly
4 Fuel gage door
5 Screw, rd-hd, ¼–20 x 1¼ in. (2 rqr)
6 Washer, lock, IET, ¼ in. (52 rqr)
7 Battery box cover
8 Fire extinguisher
9 Fire extinguisher bracket
10 Door assembly hook (4 rqr)
11 Fastener (36 rqr)
12 Side panel (4 rqr)
13 Screw, rd-hd, ¼–20 x ½ in. (40 rqr)
14 Skid
15 Front end panel assembly
16 Screw, cap, hex-hd, ¼–20 x ½ in. (10 rqr)
17 Grill
18 Screw, rd-hd, No. 10–32 x ⅜ in. (8 rqr)
19 Door assembly (4 rqr)

Figure 6. Housing and fire extinguisher bracket, removal points.



1 Wiring diagram plate retainer
2 Nut, hex, ¼–20 (3 rqr)
3 Stud (spec) (3 rqr)
4 Left rear end panel door
5 Door stop spacer (2 rqr)
6 Washer, lock, IT, No. 10 (4 rqr)
7 Nut, hex, No. 10–32 (4 rqr)
8 Screw, rd-hd, No. 10–32 x 1½ in. (4 rqr)
9 Screw, rd-hd, ¼–20 x ½ in. (2 rqr)
10 Washer, lock, IET, ¼ in. (2 rqr)
11 Door stop (2 rqr)
12 Left rear end panel
13 Knurled knob (spec) (2 rqr)
14 Channel
15 Right rear end panel
16 Right rear end panel door

Figure 7. Left and right rear end panels, removal points.



1 Rod assembly
2 Stud
3 Spring
4 Shutter assembly
5 Front end panel

Figure 8. Front end panel assembly, removal points.

h. Front End Panel Assembly Disassembly.

(1) Remove the four screws (16) and lockwashers (6) from around the bottom of the grill (17).

(2) Remove the four screws (16) and lockwashers (6) from around the top of the grill (17) and remove the grill from the front end panel assembly (15).

(3) Remove a screw (16) and lockwasher (6) from each side of the shutter frame opening in the front end panel assembly (15) and remove the shutter assembly (4, fig. 8) from the front end panel (5).

(4) Unhook and remove the spring (3) from the shutter assembly.

i. Hose Retainer Bracket Removal. Remove the two nuts, lockwashers, and screws and remove the hose retainer bracket (2, fig. 9) from the frame (1).

j. Crank and Drum Adapter Clamps and Spacers Removal.

(1) Remove the wingnut (3) and remove the clamp (8) from the stud of the spacer (7).

(2) Remove the two screws (4) and lockwashers (5) and remove the spacer (7) from the base pan (9).

(3) Remove the clamp and spacer from the drum adapter mounting (6) in a similar manner.

k. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all panels and brackets for breaks, cracks, dents, and other defects. Repair or replace a defective panel.

(3) Inspect all hinges for bends, cracks, broken or loose fastenings, and other defects. Repair loose fastenings and repair or replace a broken hinge.

(4) Inspect all mounting hardware for cracks, bends, breaks, defective threads, or other defects. Replace all defective hardware.

(5) Inspect the weatherstripping for missing sections and insecure mounting. Replace all missing sections and secure loose mountings.

(6) Remove any loose paint and repaint as directed in TM 9–2851.

l. Crank and Drum Adapter Clamps and Spacers Installation.

(1) Position the spacer (7, fig. 9) to the base pan (9) and secure by installing the two lockwashers (5) and screws (4).

(2) Position the clamp (8) on the stud of the spacer (7) and secure by installing the wingnut (3).

(3) Install the spacer and clamp on the drum adapter mounting (6) in a similar manner.

m. Hose Retainer Bracket Installation. Position the hose retainer bracket (2) to the frame (1) and secure by installing the two screws, lockwashers, and nuts.

n. Front End Panel Assembly Reassembly.

(1) Hook the spring (3, fig. 8) to the hole in the upper left hand corner of the shutter assembly (4).

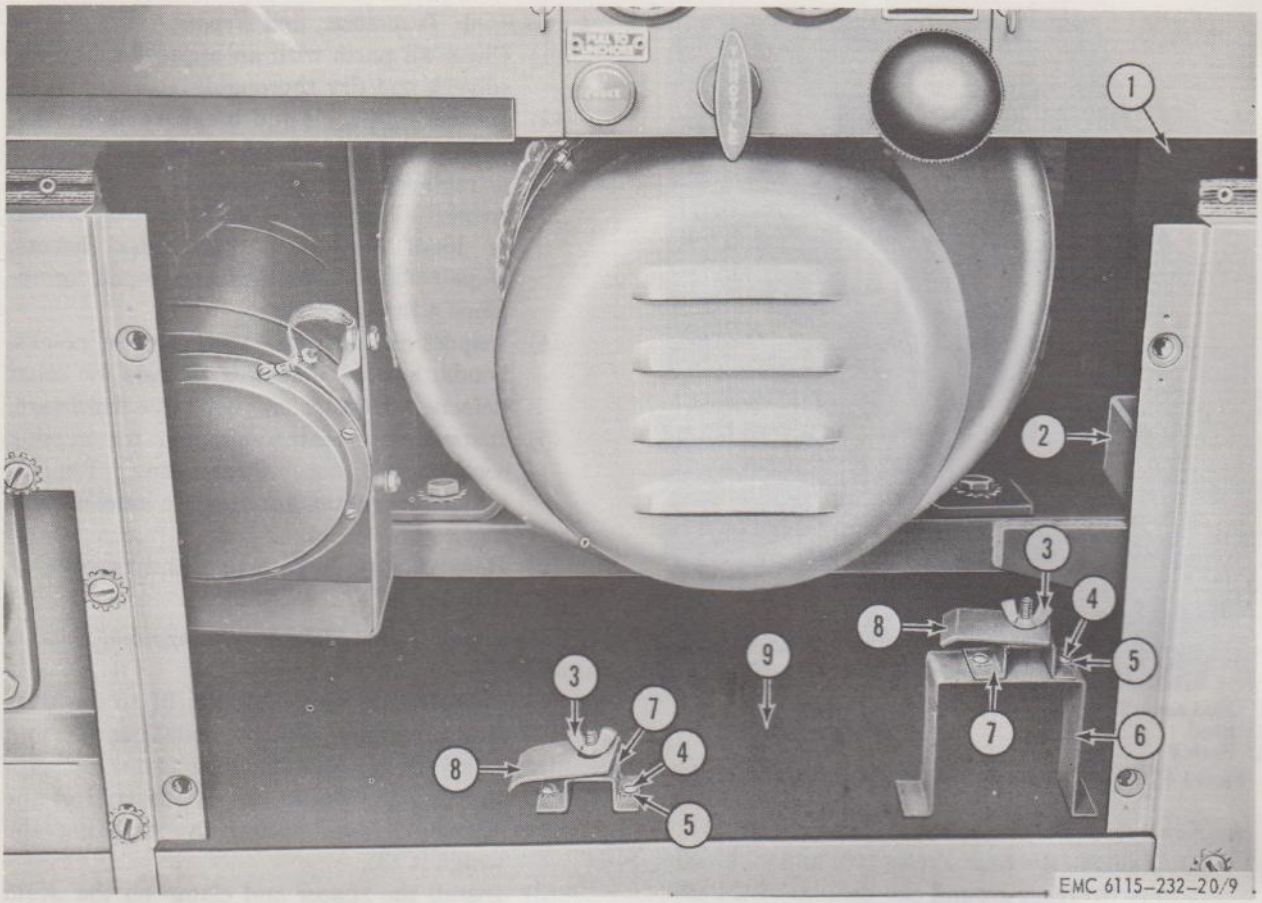
(2) Position the shutter assembly (4) to the front end panel (5) and secure by installing a lockwasher and screw (16, fig. 6) on each side.

(3) Position the grill (17) to the front end panel assembly (15) and secure by installing the eight lockwashers (6) and screws (16).

o. Front Panel Assembly Installation.

(1) Position the front end panel assembly (15) to the skid (14) and secure by installing the eight lockwashers (6) and screws (13).

(2) Engage the rod assembly (1, fig. 8) on the stud (2) of the shutter assembly (4) and secure by hooking the spring (3) to the stud.



1 Frame
2 Hose retainer bracket
3 Wingnut, ¼–20 (2 rqr)
4 Screw, rd-hd, No. 10–32 x ⅜ in. (4 rqr)
5 Washer, lock, IET, No. 10 (4 rqr)
6 Drum adapter mounting
7 Spacer (2 rqr)
8 Clamp (2 rqr)
9 Base pan

Figure 9. Crank and drum adapter clamps and spacers, removal points.

p. Left and Right Rear End Panels Reassembly.

(1) Position the wiring diagram plate retainer (1, fig. 7) to the stud (3) on the left rear end panel door (4) and secure by installing the nut (2).

(2) Install the changeover board retainers on the right rear end panel door (16) in a similar manner.

(3) Position the door stop spacer (5) and door stop (11) to the left rear end panel door (4) and secure by installing the two screws (8), lockwashers (6), and nuts (7).

(4) Install the door stop spacer and door stop on the right rear end panel door (16) in a similar manner.

q. Left and Right Rear End Panels Installation.

(1) Position the left rear end panel (17, fig. 5) to the skid (13) and receptacle box (16) and secure by installing the eight lockwashers (2) and screws (1).

(2) Position the right rear end panel (14) to the skid (13) and secure by installing the four lockwashers (2) and screws (1).

(3) Position the lower rear panel (15) to the left and right rear end panels (17) and 14) and secure with the four fasteners (10).

(4) Position the channel (14, fig. 7) between the left and right rear end panels (12 and 15) and secure by installing the two lockwashers (10) and screws (9).

(5) Engage the two door stops (11) with the studs on the channel (14) and secure by installing the knurled knobs (13).

r. Side Panel Installation.

(1) Position the side panel (12, fig. 6) to the generator set and secure with the four fasteners (11).

(2) Install the other three side panels in a similar manner.

s. Roof Assembly Reassembly.

(1) Position the fire extinguisher bracket (9) to the roof assembly (3) and secure by installing the two screws.

(2) Install the fire extinguisher (8) in the fire extinguisher bracket (9).

(3) Position the door assembly hook (10) to the roof assembly (3) and secure by installing the two screws (18), lockwashers, and nuts.

(4) Install the other three door assembly hooks in a similar manner.

(5) Position the radiator fill door (1) to the roof assembly (3) and secure by installing the two hinge rivets (2).

(6) Install the fuel gage door (4) and battery box cover (7) in a similar manner.

t. Roof Assembly Installation.

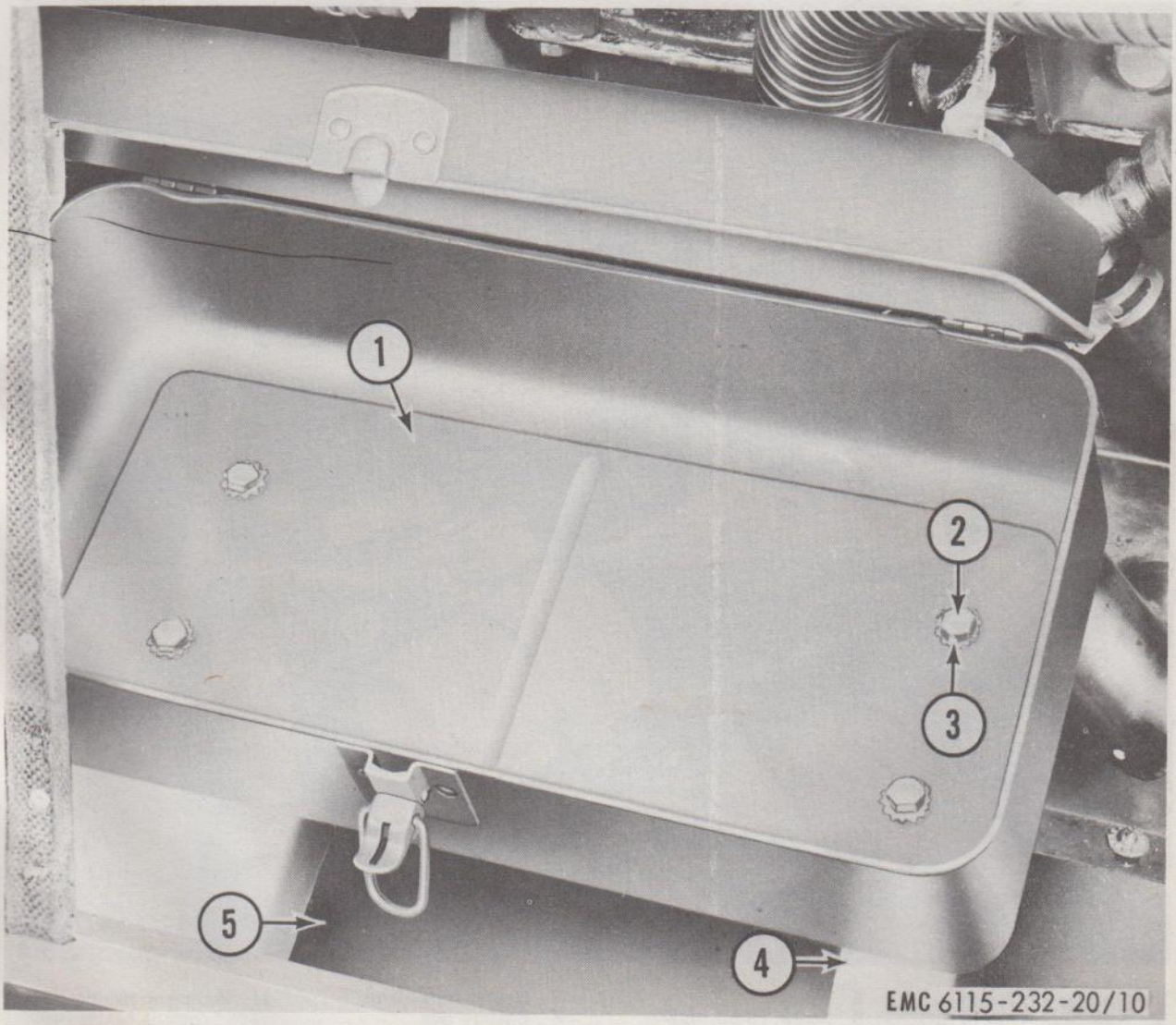
(1) Position the roof assembly (3) to the generator set.

(2) Install the two lockwashers (6) and screws (5) to secure the center of the roof assembly (3) to the lifting frame.

(3) Secure the chain of the fuel tank cap (3, fig. 5) to the fuel tank with the safety pin and install the cap on the fuel tank.

(4) Install the 20 lockwashers (2) and screws (1) to secure the roof assembly (9) to the installed panels and frame.

(5) Install the muffler assembly (par. 48).



1 Toolbox
2 Screw, cap, hex-hd, ¼–20 x ½ in. (4 rqr)
3 Washer, lock, IET, ¼ in. (4 rqr)
4 Mounting bracket
5 Skid

Figure 10. Toolbox, removal points.

u. Door Assembly Installation.

(1) Position the door assembly (11) to the roof assembly (9) and secure by engaging the four fasteners (10).

(2) Install the other three door assemblies in a similar manner.

51. Toolbox

a. Removal. Remove the four screws (2, fig. 10) and lockwashers (3) and remove the toolbox (1) from the mounting bracket (4) welded to the skid (5).

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the toolbox for cracks, bends, dents, a defective hasp and hinge, and other damage. Repair or replace a defective toolbox.

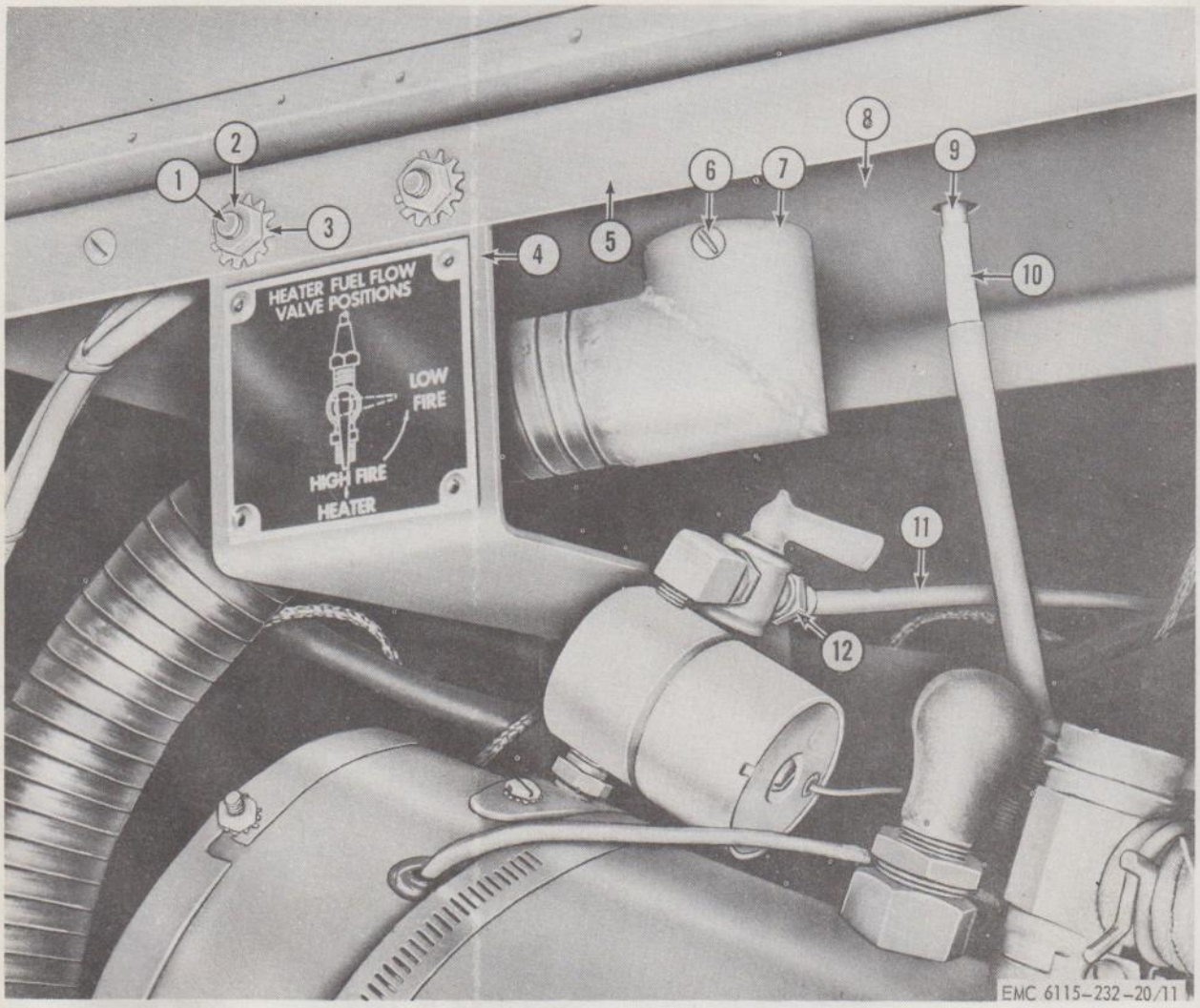
(3) Inspect the mounting hardware for cracks, bends, defective threads, and other damage. Replace a defective part.

c. Installation. Position the toolbox (1) to the mounting bracket (4) and skid (5) and secure by installing the four lockwashers (3) and screws (2).

52. Battery Box Assembly

a. Removal and Disassembly.

(1) Remove the battery box cover, batteries, and battery leads (TM 5–6115–232–10).



1 Stud (spec) (8 rqr)
2 Nut, hex, ¼–20 (8 rqr)
3 Washer, lock, IET, ¼ in. (8 rqr)
4 Heater bracket
5 Frame
6 Screw, rd-hd, thd-forming, No. 10–24 x ½ in.
7 Heater tube elbow
8 Battery box
9 Inner shell drain
10 Battery drain hose
11 Sediment strainer-to-coolant heater fuel line assembly
12 Coupling nut

Figure 11. Battery box and heater bracket, removal points.

(2) Remove the screw (6, fig. 11) and remove the heater tube elbow (7) from the adapter at the bottom of the battery box (8).
(3) Remove the four nuts (5, fig. 12) and lockwashers (6) from the studs and remove the battery box (3) from the frame (5, fig. 11).
(4) Remove the inner shell (2, fig. 12) from the battery box (3).

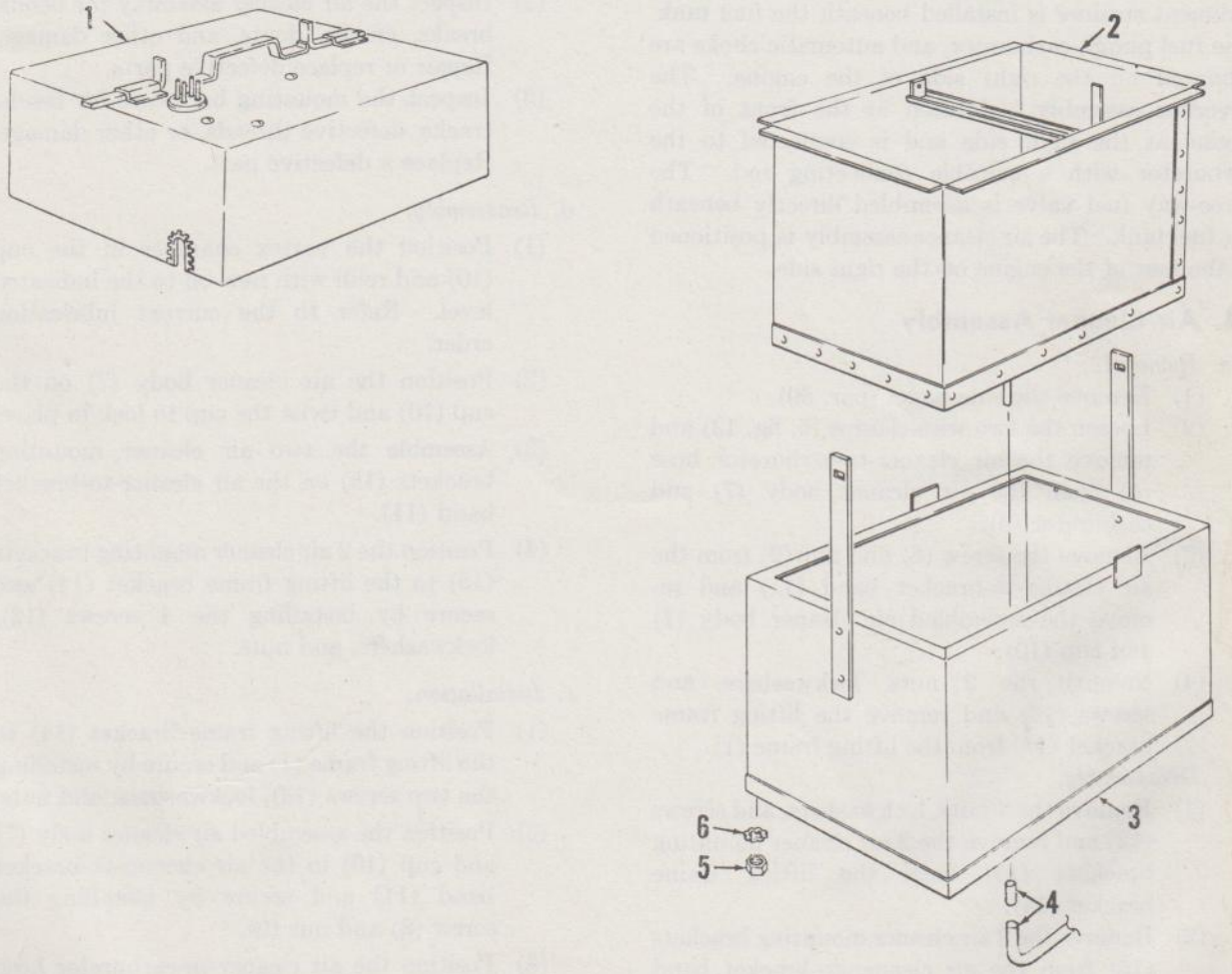
b. Cleaning, Inspection, and Repair.

(1) Clean the exterior surfaces of the battery box with an approved cleaning solvent and dry thoroughly.
(2) Clean the inner shell and the interior surfaces of the battery box with a soda solution and dry thoroughly.
(3) Inspect the battery box for bends, breaks, cracks, dents, and other damage. Repair or replace a defective battery box.
(4) Inspect the inner shell for bends, breaks, cracks, dents, loose liner strips, loose drain connection, defective drain line adapter, and other damage. Repair or replace a defective inner shell.
(5) Inspect the mounting hardware for bends, cracks, defective threads, and other damage Replace a defective part.

c. Reassembly and Installation.

(1) Install the inner shell (2) in the battery box (3).

Note. Carefully thread the drain line of the inner shell drain through the opening in the bottom of the battery box during installation.



1 Battery box cover
2 Inner shell
3 Battery box
4 Battery drain hose
5 Nut, hex, ¼–20 (4 rqr)
6 Washer, lock, IET, ¼ in. (4 rqr)

Figure 12. Battery box, exploded view.

(2) Position the battery box (3) to the frame (5, fig. 11), engaging the studs of the battery box with the openings in the frame, and secure by installing the four lockwashers (6, fig. 12) and nuts (5).
(3) Engage the inner shell drain (9, fig. 11) with the battery drain hose (10).
(4) Position the heater tube elbow (7) to the adapter at the bottom of the battery box (8) and secure by installing the screw (6).
(5) Install the batteries, battery cables, and battery box cover (TM 5–6115–232–10).

Section VII. FUEL SYSTEM

53. General

The generator set fuel system consists of a fuel tank, fuel sediment strainer, fuel pump, a carburetor fitted with an automatic climatic control, governor assembly, primer, air cleaner assembly, three-way valve for using fuel from an auxiliary source, and appropriate fuel line assemblies and fittings. The fuel tank is mounted above the generator. The fuel sediment strainer is installed beneath the fuel tank. The fuel pump, carburetor, and automatic choke are mounted on the right side of the engine. The governor assembly is located at the front of the engine at the right side and is connected to the carburetor with a suitable connecting rod. The three-way fuel valve is assembled directly beneath the fuel tank. The air cleaner assembly is positioned at the rear of the engine on the right side.

54. Air Cleaner Assembly

a. Removal.
(1) Remove the side panel (par. 50).
(2) Loosen the two wire clamps (5, fig. 13) and remove the air cleaner-to-carburetor hose (4) from the air cleaner body (7) and carburetor (6).
(3) Remove the screw (8) and nut (9) from the air cleaner-to-bracket band (11) and remove the assembled air cleaner body (7) and cup (10).
(4) Remove the 2 nuts, lockwashers, and screws (13) and remove the lifting frame bracket (14) from the lifting frame (1).

b. Disassembly.
(1) Remove the 4 nuts, lockwashers, and screws (12) and remove the 2 air cleaner mounting brackets (15) from the lifting frame bracket (14).
(2) Remove the 2 air cleaner mounting brackets (15) from the air cleaner-to-bracket band (11).
(3) Twist to release the cup (10) and remove it from the air cleaner body (7).
(4) Remove the vortex chamber from the cup.

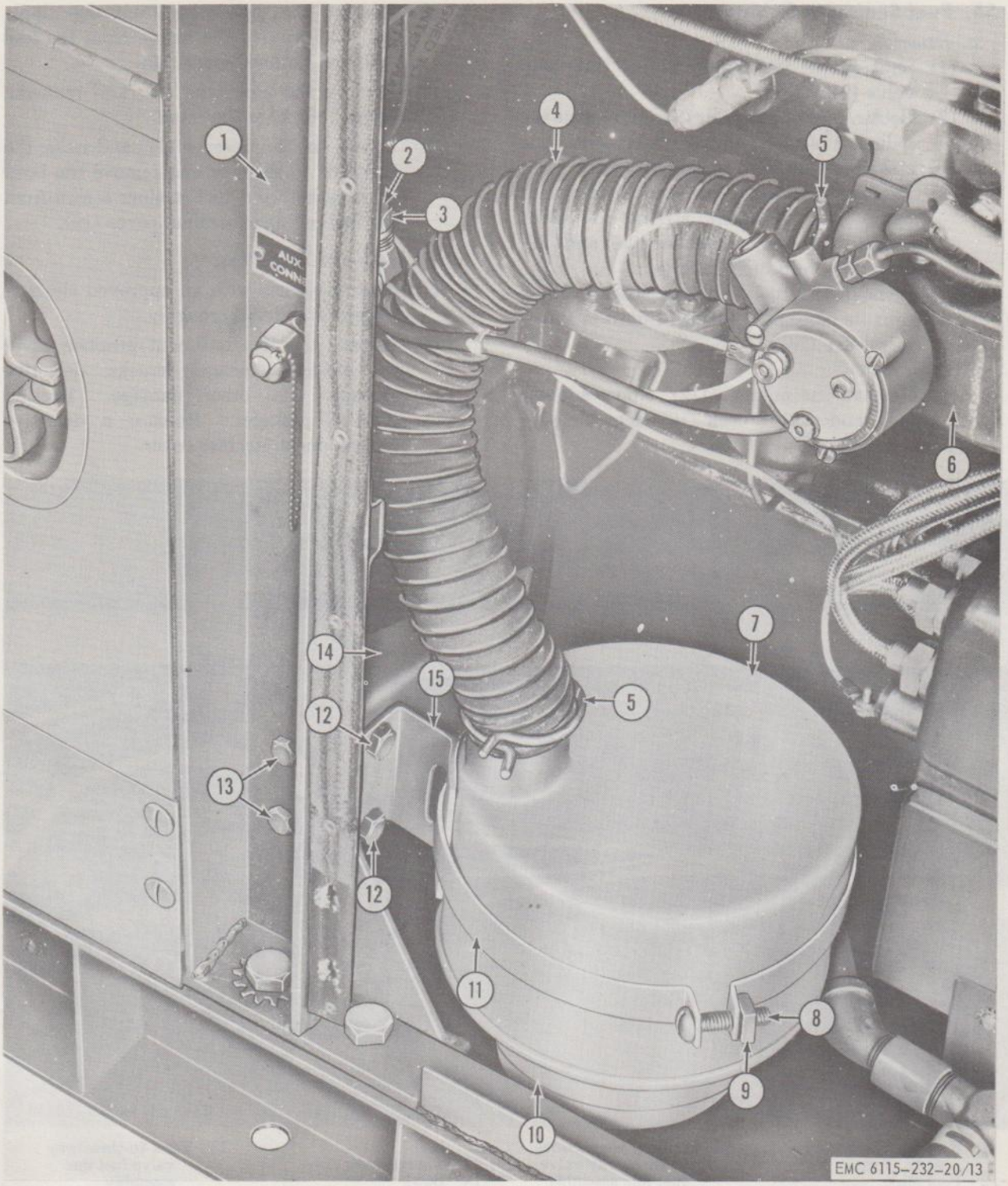
c. Cleaning, Inspection, and Repair.
(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

> ***Caution:*** **The air cleaner body must be thoroughly dry when it is installed; shake to remove any excess cleaning solvent.**

(2) Inspect the air cleaner assembly for bends, breaks, cracks, dents, and other damage. Repair or replace defective parts.
(3) Inspect the mounting hardware for bends, cracks, defective threads, or other damage. Replace a defective part.

d. Reassembly.
(1) Position the vortex chamber in the cup (10) and refill with new oil to the indicated level. Refer to the current lubrication order.
(2) Position the air cleaner body (7) on the cup (10) and twist the cup to lock in place.
(3) Assemble the two air cleaner mounting brackets (15) on the air cleaner-to-bracket band (11).
(4) Position the 2 air cleaner mounting brackets (15) to the lifting frame bracket (14) and secure by installing the 4 screws (12), lockwashers, and nuts.

e. Installation.
(1) Position the lifting frame bracket (14) to the lifting frame (1) and secure by installing the two screws (13), lockwashers, and nuts.
(2) Position the assembled air cleaner body (7) and cup (10) in the air cleaner-to-bracket band (11) and secure by installing the screw (8) and nut (9).
(3) Position the air cleaner-to-carburetor hose (4) to the air cleaner body (7) and carburetor (6) and secure with the two wire clamps (5).
(4) Install the side panel (par. 50).



1 Lifting frame
2 Auxiliary connection-to-three-way valve fuel line assembly
3 Coupling nut
4 Air cleaner-to-carburetor hose
5 Wire clamp (2 rqr)
6 Carburetor
7 Air cleaner body
8 Screw, rd-hd, 5/16–18 x 1¼ in.
9 Nut, hex, 5/16–18
10 Cup
11 Air cleaner-to-bracket band
12 Screw, cap, hex-hd, 5/16–18 x ¾ in. (4 rqr)
13 Screw, cap, hex-hd, ¼–20 x ½ in. (2 rqr)
14 Lifting frame bracket
15 Air cleaner mounting bracket (2 rqr)

Figure 13. Air cleaner assembly, removal points.

55. Fuel Sediment Strainer

a. Removal.

(1) Shut off the fuel supply at the three-way valve (24, fig. 14).

(2) Loosen the coupling nut (8) and remove the sediment strainer-to-fuel pump fuel line assembly (11) from the adapter (12).

(3) Remove the sediment strainer-to-primer pump and sediment strainer-to-coolant heater fuel line assemblies (20 and 27) from their respective fittings.

(4) Remove the fuel sediment strainer along with its associated fittings from the three-way valve (24).

b. Disassembly.

(1) Remove the adapter (12), elbow adapter (14), and shutoff cock (10) from the pipe cross (13).

(2) Remove the pipe cross from the nipple (28) and remove the nipple from the fuel sediment strainer cover (19).

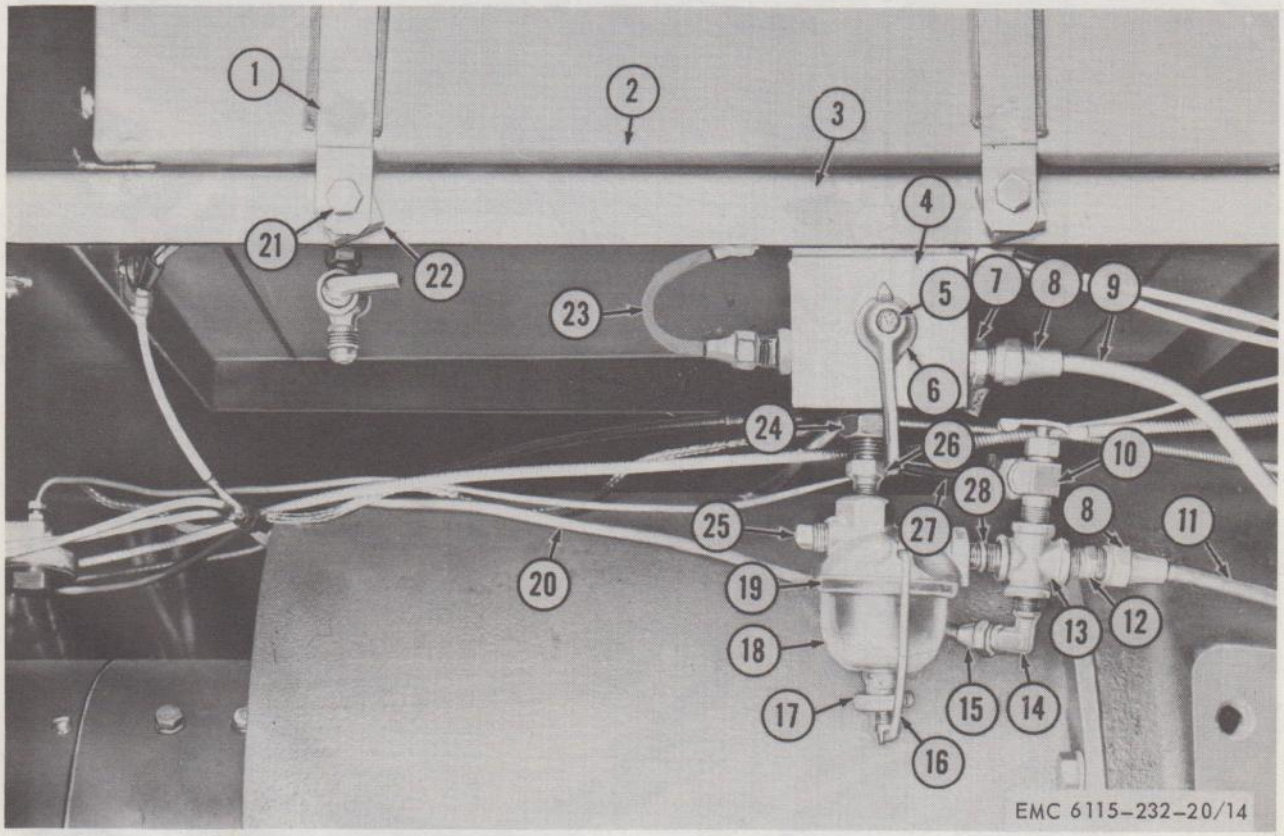
(3) Remove the pipe plug (25) and reducing nipple (26) from the cover.

(4) Loosen the thumbscrew (17) and swing the bail (16) to the side and remove the bowl (18), gasket, and fuel strainer screen from the fuel sediment strainer cover (19).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the fuel sediment strainer cover for blocked passages, cracks, defective threads, and other damage. Reclean blocked passages. Replace a defective fuel sediment strainer cover.



1 Fuel tank holddown strap (2 rqr)
2 Fuel tank
3 Frame
4 Valve bracket
5 Screw, rd-hd, cross-recess
6 Handle
7 Adapter (2 rqr)
8 Coupling nut (4 rqr)
9 Auxiliary connection-to-three-way valve fuel line assembly
10 Shutoff cock
11 Sediment strainer-to-fuel pump fuel line assembly
12 Adapter
13 Cross, pipe, ⅛ in.
14 Elbow adapter
15 Coupling nut
16 Bail
17 Thumbscrew
18 Bowl
19 Fuel sediment strainer cover
20 Sediment strainer-to-primer pump fuel line assembly
21 Screw, cap, hex-hd, ¼–20 x ¾ in. (2 rqr)
22 Spacer (2 rqr)
23 Tank-to-three-way valve fuel line assembly
24 Three-way valve
25 Plug, pipe, ⅛ in.
26 Nipple, reducing, ¼ x ⅛ in.
27 Sediment strainer-to-coolant heater fuel line assembly
28 Nipple, close, ⅛ in.

Figure 14. Fuel tank and fuel sediment strainer, removal points.

(3) Inspect the bail and sediment bowl for cracks, chips, and other damage. Replace a defective part.
(4) Inspect the gasket and fuel strainer screen for breaks, tears, and other damage.
(5) Inspect the pipe, fittings, and thumbscrew for cracks, breaks, defective threads, and other damage. Replace a defective part.

d. Reassembly.
(1) Position the fuel strainer screen, gasket, and bowl (18) to the fuel sediment strainer cover (19) and secure by swinging the bail (16) into place and tightening the thumbscrew (17).
(2) Install the pipe plug (25) and reducing nipple (26) on the fuel sediment strainer cover (19).
(3) Install the nipple (28) on the cover and install the pipe cross (13) on the nipple.
(4) Install the elbow adapter (14), adapter (12), and shutoff cock (10) on the pipe cross.

e. Installation.
(1) Install the fuel sediment strainer and its associated fittings on the three-way valve (24).
(2) Position the sediment strainer-to-fuel pump fuel line assembly (11) to the adapter (12) and secure by tightening the coupling nut (8).
(3) Position and secure the sediment strainer-to-primer pump and sediment strainer-to-coolant heater fuel line assemblies (20 and 27) to their respective fittings.

56. Fuel Pump

a. Removal.
(1) Shut off the fuel supply at the three-way valve (24, fig. 14).
(2) Remove the air cleaner-to-carburetor hose from the carburetor (par. 54).
(3) Loosen the coupling nut (2, fig. 15) and remove the fuel pump-to-carburetor fuel line assembly (3) from its adapter (1).
(4) Loosen the coupling nut (5) and remove the sediment strainer-to-fuel pump fuel line assembly (6) from the elbow adapter (4).
(5) Remove the two screws (11) and lockwashers and remove the fuel pump (12) and gasket from the block assembly (10). Discard the gasket.

b. Disassembly.
(1) Remove the elbow adapter (4) from the fuel pump (12).
(2) Remove the adapter (1) from the street ell and the street ell from the fuel pump (12).
(3) Loosen the thumbscrew (8), swing the bail (9) to the side, and remove the sediment bowl (7), gasket, and sediment strainer element from the fuel pump (12).

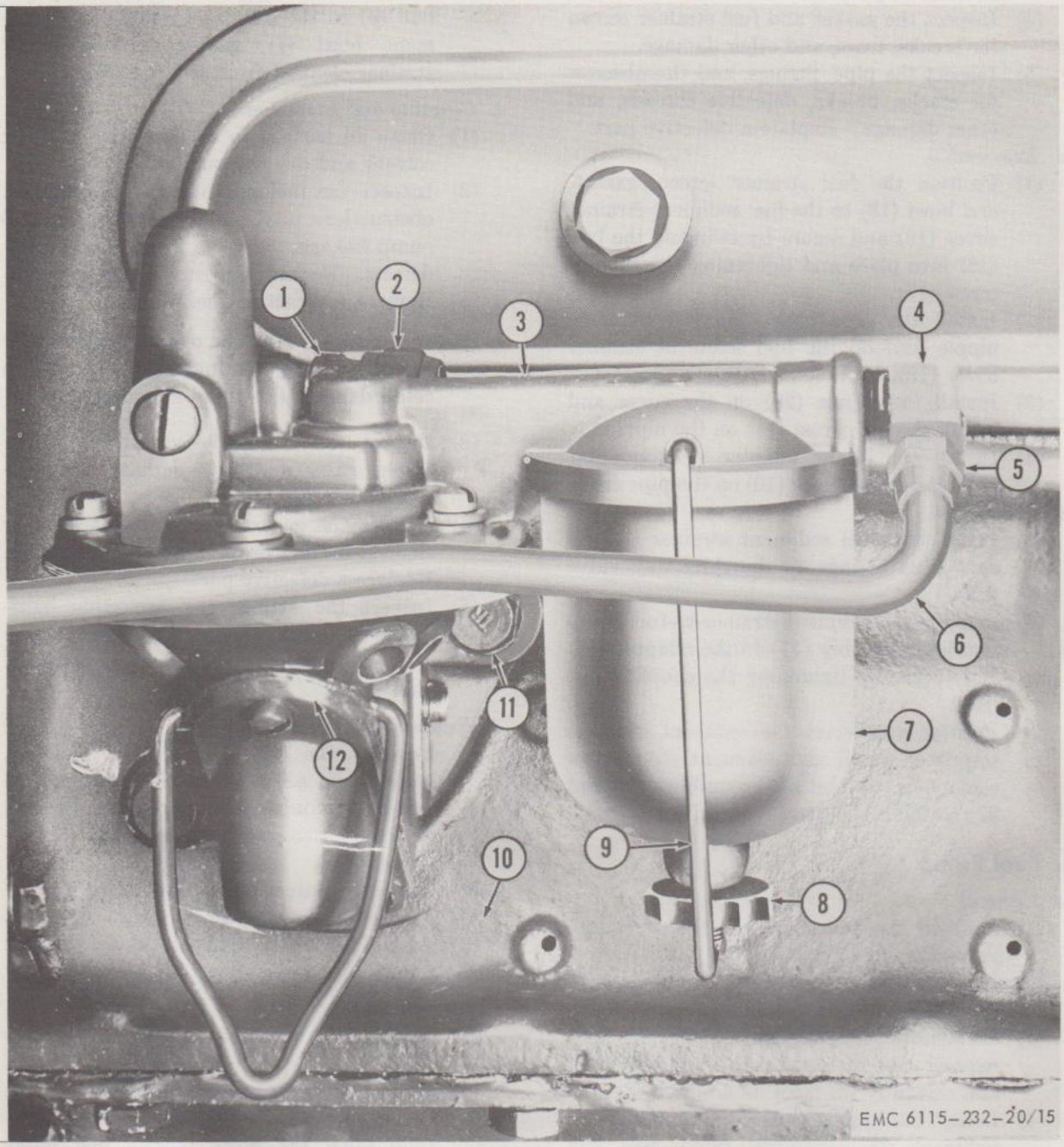
c. Cleaning and Inspection.
(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Inspect the fuel pump for breaks, cracks, obstructions in the fuel passages, jammed pump linkage, defective threads, and other defects. Reclean obstructed fuel passages. Replace a defective fuel pump.

Caution: **Do not use compressed air to clean or dry the fuel pump. Pressure could damage the pump diaphragm.**

(3) Inspect the bail and sediment bowl for cracks, chips, and other damage. Replace a defective part.
(4) Inspect the gasket and sediment strainer element for breaks, tears, and other damage. Replace a defective part.
(5) Inspect the fittings and mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly.
(1) Position the sediment strainer element, gasket, and sediment bowl (7) to the fuel pump (12) and secure by swinging the bail (9) into place and tightening the thumbscrew (8).
(2) Install the street ell on the fuel pump (12) and install the adapter (1) on the street ell.
(3) Install the elbow adapter (4) on the fuel pump.

e. Installation.
(1) Position a new gasket to the block assembly (10).
(2) Insert the rocker arm of the fuel pump (12) in the opening of the block assembly, carefully aline the holes in the fuel pump mounting flange with the tapped holes in the block assembly, and secure the fuel pump to the block by installing the two lockwashers and screws (11).
(3) Position the sediment strainer-to-fuel pump fuel line assembly (6) to the elbow adapter (4) and secure by tightening the coupling nut (5).



1 Adapter
2 Coupling nut
3 Fuel pump-to carburetor fuel line assembly
4 Elbow adapter
5 Coupling nut
6 Sediment strainer-to-fuel pump fuel line assembly
7 Sediment bowl
8 Thumbscrew
9 Bail
10 Block assembly
11 Screw, cap, hex-hd, 5/16-18 x 3/4 in. (2 rqr)
12 Fuel pump

Figure 15. Fuel pump, removal points.

(4) Position the fuel pump-to-carburetor fuel line assembly (3) to the adapter (1) and secure by tightening the coupling nut (2).
(5) Install the air cleaner-to-carburetor hose on the carburetor (par. 54).

f. Field Expedient Repair.

(1) If the engine is hard to start, fails to start, or stops suddenly due to a defective fuel pump, disconnect the two fuel line assemblies from the fuel pump and, with suitable pipe, fittings, and/or tubing, connect the fuel supply directly to the carburetor.

Caution: **Continued operation without a fuel filter may result in damage to the engine.**

(2) If the engine fails to start or stops suddenly due to a vapor lock in the fuel pump, wrap rags around the fuel pump and pour cold water over the rags.

57. Carburetor Assembly

a. Removal.

(1) Shut off the fuel supply at the three-way valve (24, fig. 14).
(2) Remove the air cleaner-to-carburetor hose from the carburetor (par. 54).
(3) Loosen the coupling nut (35, fig. 16) and remove the fuel pump-to-carburetor fuel line assembly (15) from the elbow adapter (36).
(4) Remove the knurled nut (19) from the stud on the automatic choke (18) and tag and remove the electrical lead (22).
(5) Loosen the two coupling nuts (32) and remove the carburetor-to-manifold vacuum line (38).
(6) Remove the nut and lockwasher and remove the ball joint assembly (42) of the governor connecting rod (46) from the control arm (41) of the carburetor.
(7) Remove the 2 nuts (43), lockwasher (44), and throttle cable assembly bracket (29) from the 2 studs and carefully remove the carburetor (16) and gasket from the intake and exhaust manifold (1).

Note. Exercise care in removing the carburetor, as the choke cable assembly is attached to the carburetor. The choke wire is linked to the carburetor choke arm with a swivel block. The swivel block is held on the choke wire by stops that are held in place with setscrews. The choke cable assembly outer cover is attached to the carburetor by a bracket and clip.

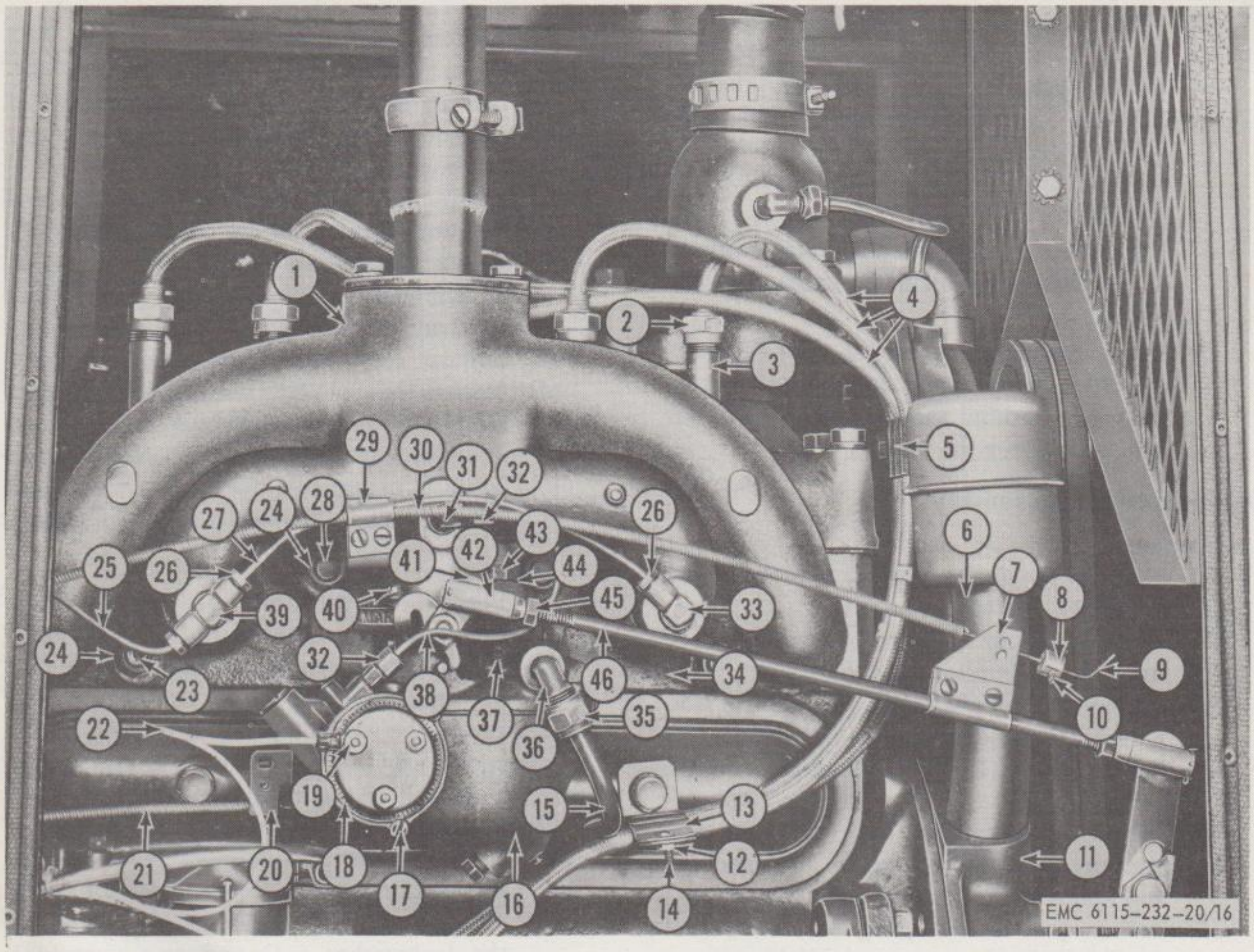
(8) Remove the safety pin that secures the stud of the swivel block to the choke wire. Loosen the screw that secures the clip to the choke bracket (20) to release the choke cable assembly (21) and remove the carburetor.

b. Cleaning and Inspection.

(1) Clean the exposed surfaces of the carburetor assembly, using a cloth saturated with an approved cleaning solvent and dry thoroughly.
(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.
(3) Inspect the carburetor assembly for breaks, cracks, loose or missing screws, and other damage. Tighten loose or replace missing screws. Replace a defective carburetor.
(4) Inspect the mounting hardware and linkage for bends, cracks, defective threads, and other damage. Replace a defective part.
(5) Inspect the gasket for tears, wear, and other damage. Replace a defective gasket.

c. Installation.

(1) Position the carburetor (16) to the choke cable assembly and secure the choke cable assembly (21) to the choke bracket (20) by tightening the screw to set the clip. Insert the stud of the swivel block in the choke arm of the carburetor and secure by installing the safety pin.
(2) Position a new gasket and the carburetor to the intake and exhaust manifold (1). Install the throttle cable assembly bracket (29) on a stud and secure by installing the lockwasher (44) and two nuts (43).
(3) Position the ball joint assembly (42) of the governor connecting rod (46) on the control arm (41) of the carburetor and secure by installing the lockwasher and nut.
(4) Position the carburetor-to-mainfold vacuum line (38) to its respective adapters and secure by drawing up the two coupling nuts (32).
(5) Position the tagged electrical lead (22) on the stud of the automatic choke (18) and secure by installing the knurled nut (19).
(6) Position the fuel pump-to-carburetor fuel line assembly (15) to its elbow adapter (36) and secure by drawing up the coupling nut (35).
(7) Install the air cleaner-to-carburetor hose on the carburetor (par. 54).



1 Intake and exhaust manifold
2 Connector (4 rqr)
3 Spark plug (4 rqr)
4 Spark plug lead (4 rqr)
5 Straight bracket
6 Oil filler tube
7 Throttle bracket
8 Stop
9 Throttle wire
10 Setscrew, recessed-hd No. 6–32 x 3/8 in.
11 Timing gear housing
12 Nut, hex, No. 6–32 (2 rqr)
13 Angle bracket
14 Screw, machine, No. 6–32 x 1/2 in.
15 Fuel pump-to-carburetor fuel line assembly
16 Carburetor
17 Screw, pan-hd, No. 6–32 x 1/4 in. (3 rqr)
18 Automatic chock
19 Knurled nut (spec)
20 Choke bracket
21 Choke cable assembly
22 Electrical lead
23 Stud, 7/16–20 x 7/16–14 x 1 5/8 in. (2 rqr)
24 Nut, hex, 7/16–20 (4 rqr)
25 Engine primer pump-to-manifold fuel line assembly
26 Coupling nut (3 rqr)
27 Manifold primer fuel line assembly
28 Stud, 7/16–20 x 7/16–14 x 2 7/16 in. (2 rqr)
29 Throttle cable assembly bracket
30 Throttle cable assembly
31 Elbow adapter
32 Coupling nut (2 rqr)
33 Elbow assembly (spec)
34 Block assembly
35 Coupling nut
36 Elbow adapter
37 Air adjusting screw
38 Carburetor-to-manifold vacuum line
39 Tee assembly (spec)
40 Throttle stop screw
41 Control arm
42 Ball joint assembly
43 Nut, hex, 5/16–24 (2 rqr)
44 Washer, lock, 5/16 in. (2 rqr)
45 Lock nut (spec)
46 Governor connecting rod

Figure 16. Carburetor, removal points.

d. Adjustment.

(1) *General.* There are two carburetor adjustments, throttle idling and choke. The throttle idling is for low-engine speed. An automatic choke is assembled to the carburetor and can be overridden by the choke knob on the control panel. The automatic choke acts to enrich the air-fuel mixture to a cold engine by restricting the air intake of the carburetor. Both throttle and choke adjustments should be made after the engine has reached normal operating temperature and with no-load on the ac generator.

(2) *Throttle idling adjustment.*

(*a*) Start the engine and allow it to reach normal operating temperature with no-load on the ac generator (TM 5–6115–232–10).

(*b*) Pull the governor connecting rod (46) as far as possible toward the carburetor (16) and hold it in this position during adjustment. Adjust the throttle stop screw (40) to attain a speed of 400 rpm.

(*c*) Loosen the setscrew (10) to free the stop (8) on the throttle wire (9). Pull the throttle lever, located on the control panel, out one and one-half inches. Pull the governor connecting rod (46) fully toward the carburetor and hold firmly in this position. Move the loosened stop (8) along the throttle wire (9) and position it firmly against the throttle bracket (7). Tighten the setscrew (10) and secure the stop in this location to the throttle wire and then release the governor linkage.

(*d*) Turn the air adjusting screw (37) counterclockwise until the engine falters, then turn it slowly clockwise until the engine runs smoothly.

(*e*) Shut down the engine (TM 5–6115–232–10).

(3) *Automatic choke and choke adjustment.*

(*a*) Start the engine and allow it to reach normal operating temperature with no-load on the ac generator (TM 5–6115–232–10).

(*b*) Set the engine throttle at idling speed.

(*c*) Remove the air cleaner-to-carburetor hose from the carburetor (par. 54).

(*d*) Push the choke control knob on the control panel all the way in.

(*e*) Loosen the 3 screws (17) on the automatic choke (18) and turn the choke cap clockwise until the butterfly valve at the carburetor air intake is fully open. Turn the cap counterclockwise until the butterfly valve just barely begins to close and secure the cap in this position by tightening the 3 screws (17).

(*f*) Loosen the stops on the choke wire at the inner side of the carburetor (16) by loosening the setscrews. Pull the choke control knob, located on the control panel, out about one and one-half inches. Reach under the carburetor and manually turn and hold the lever of the choke shaft in the fully clockwise position. Position the choke wire stops firmly against the lever and secure the stops in this position on the choke wire by tightening the setscrews. This adjustment will hold the choke open so long as the choke control knob on the control panel is pulled out. Push the choke control knob in.

(*g*) Install the air cleaner-to-carburetor hose on the carburetor (par. 54).

(*h*) Shut down the engine (TM 5–6115–232–10).

e. Field Expedient Repair. If the engine fails to start or stops suddenly due to a clogged air cleaner, remove the air cleaner-to-carburetor hose from the carburetor.

Caution: **Operating the generator set in sandy or dusty areas without the protection of the air cleaner can damage the engine.**

58. Governor Assembly

a. Removal.

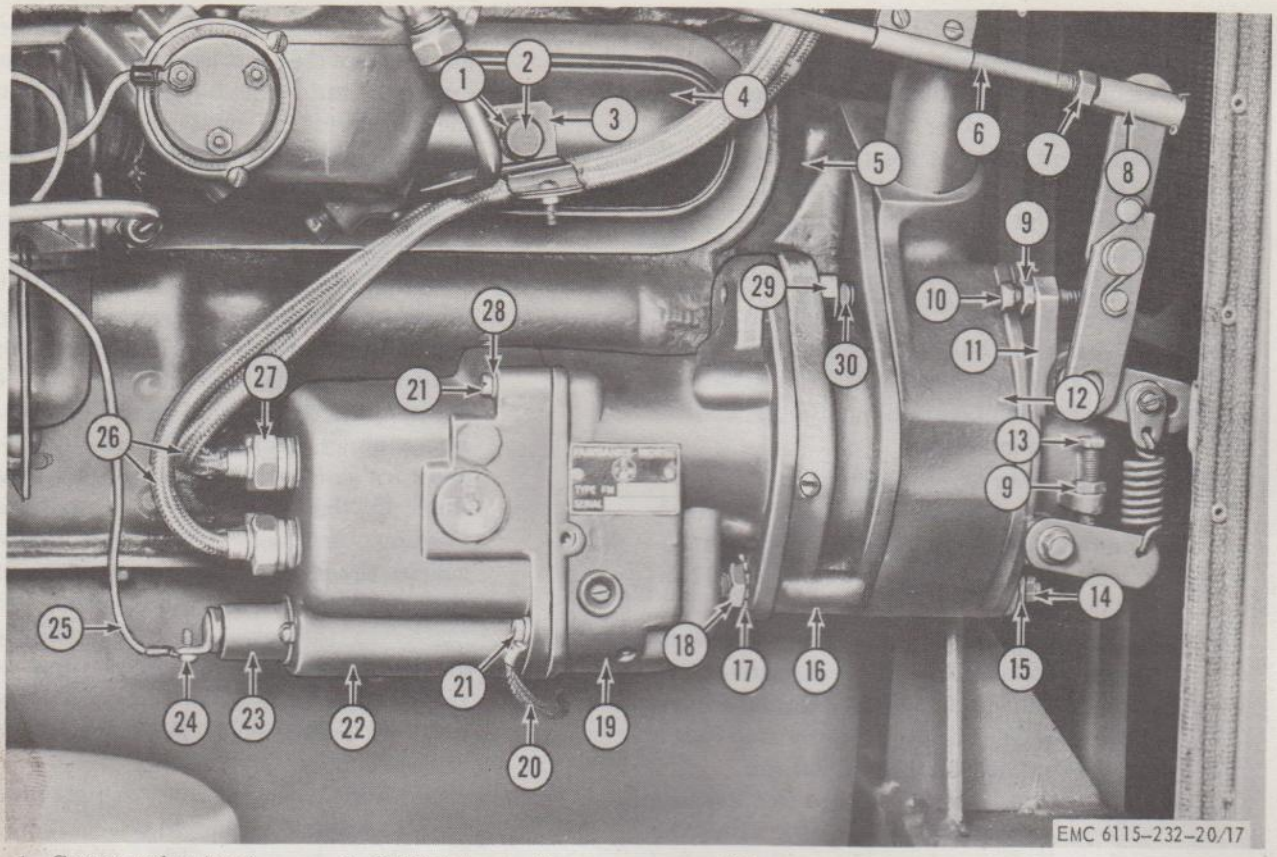
(1) Remove the roof and front end panel assemblies (par. 50).

(2) Remove the governor connecting rod from the carburetor (par. 57).

(3) Remove the nut and lockwasher, and remove the ball joint assembly (8, fig. 17) of the governor connecting rod (6) from the arm of the governor assembly (11).

(4) Remove the nut (18), lockwasher (17), bolt (14), spacer (16), and flat washer (15) from the bottom of the timing gear housing (12) and block assembly (5).

(5) Remove the screw (30), lockwasher, and flat washer from the top of the governor



1 Copper gasket (spec) (2 rqr)
2 Screw, cap, hex-hd, ⅜–16 x 1½ in. (2 rqr)
3 Angle bracket
4 Valve cover
5 Block assembly
6 Governor connecting rod
7 Lock nut (spec)
8 Ball joint assembly
9 Nut, hex, ¼–20 (2 rqr)
10 Screw (spec)
11 Governor assembly
12 Timing gear housing
13 Screw, cap, hex-hd, ¼–20 x 1¼ in.
14 Bolt, machine, ⅜–16 x 4½ in.
15 Washer, flat, ¾ in. od x ⅜ in. id x $^{3}/_{32}$ in. thk
16 Spacer
17 Washer, lock, IET, ⅜ in.
18 Nut (spec)
19 Magneto housing
20 Lead assembly
21 Screw, fil-hd, No. 10–24 x ⅝ in. (4 rqr)
22 Magneto cap
23 Capacitor
24 Screw, rd-hd, No. 6–32 x ½ in.
25 Start switch electrical lead
26 Spark plug lead (4 rqr)
27 Connector (4 rqr)
28 Washer, lock, IT, No. 10 (4 rqr)
29 Nut, hex, ⅜–24
30 Screw, cap, hex-hd, ⅜–16 x 2¾ in.

Figure 17. Governor assembly and magneto, removal points.

assembly and remove the governor assembly and gasket from the timing gear housing. Discard the gasket.

(6) Manually rotate the engine clockwise until the camshaft gear and governor gear timing marks (4 and 3, fig. 18) are visible, through the opening in the timing gear housing (1) and at the same time alined. Remove the governor gear (2) from the gear housing.

Note. The governor gear times the magneto. The removal procedure described above will assure proper timing of the magneto upon installation of the governor after inspection. Observe that the governor gear has two teeth marked with numbers. The numbers used as timing marks on the governor gear, when alined with the camshaft gear timing mark, will give different degrees of engine timing if the governor gear is removed.

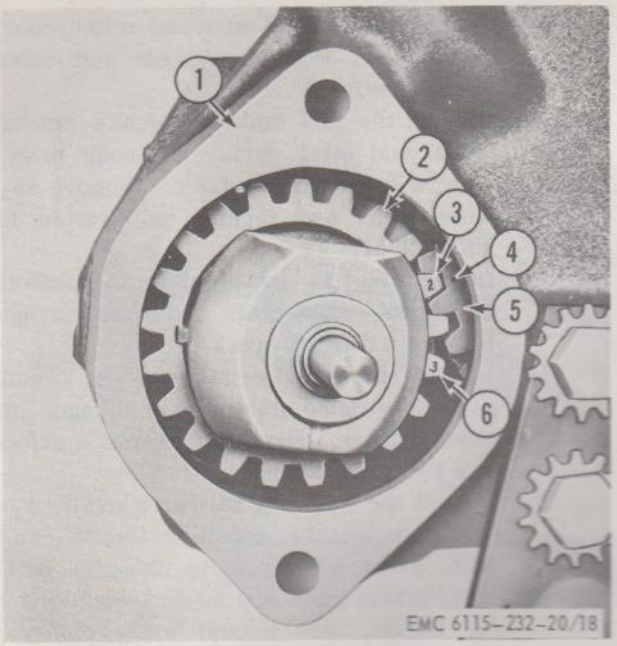
b. Cleaning and Inspection.

(1) Clean the governor assembly and governor gear with an approved cleaning solvent and dry thoroughly.

(2) Inspect the governor assembly for breaks, cracks, restricted movement, bent or broken arms, and other damage. Replace a defective governor assembly.

(3) Inspect the governor gear and assembled parts for pitted, galled, spalled, or cracked gear teeth, broken or cracked flyweights, restricted movement of the flyweights, and other damage. Replace a defective governor gear and flyweight mechanism.

(4) Inspect the governor linkage for bends, cracks, and other damage. Replace defective governor linkage.



1 Timing gear housing
2 Governor gear
3 Governor gear timing mark "2"
4 Camshaft gear timing mark
5 Camshaft gear
6 Governor gear timing mark "3"

Figure 18. Governor and camshaft gears, timing marks.

(5) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation and Timing.

(1) Remove the ignition magneto (par. 67).

(2) Engage the governor gear timing mark (3) with the camshaft gear timing mark (4) and push the gear with assembled parts fully into position within the timing gear housing (1).

Note. This positioning of the governor gear gives the basic timing of the magneto.

(3) Position a new gasket on the governor assembly (11, fig. 17) and place about two tablespoons of engine crankcase oil inside the timing gear housing (12). Position the governor assembly on the timing gear housing and secure by installing the spacer (16), flat washer (15), bolt (14), lockwasher (17), and nut (18).

(4) Install the flat washer, lockwasher, and screw (30).

(5) Position the ball joint assembly (8) of the governor connecting rod (6) to the arm of the governor assembly (11) and secure by installing the lockwasher and nut.

(6) Install the governor connecting rod on the carburetor (par. 57).

(7) Install the roof and front end panel assemblies (par. 50).

(8) Install the ignition magneto (par. 67).

d. Adjustment.

(1) Start the engine (TM 5–6115–232–10) and allow it to reach normal operating temperature.

(2) Governed engine speed is adjusted by loosening the locking nut (9) on the lower speed adjusting screw (13) and running the screw downward to increase, and upward to decrease governed engine speed. Adjust governed engine speed until the electrical frequency meter registers 60 cycles and tighten the locking nut (9) to hold the lower speed adjusting screw (13) int his position.

(3) Shut down the engine (TM 5–6115–232–10). Inspect the length of the governor connecting rod (6) to determine if the carburetor is wide open when the arm of the governor assembly (11) is pushed towards the radiator to the full limit of its travel. If the carburetor is not wide open, adjust as follows:

(*a*) Shut down the engine (TM 5–6115–232–10).

(*b*) Free the governor connecting rod from the carburetor (par. 57).

(*c*) Loosen the locknut (45, fig. 16) and adjust the position of the ball joint assembly (42) on the governor connecting rod (46) so that the governor connecting rod will hold the carburetor to its wide open position when the arm of the governor assembly is pushed firmly towards the radiator.

(*d*) Tighten the locknut (45) against the ball joint assembly (42).

(*e*) Reconnect the governor connecting rod with the carburetor (par. 57).

(4) Set the engine throttle at idling speed. Loosen the locking nut (9, fig. 17) on the upper speed adjusting screw (10) and position the screw in the governor assembly (11) so that the spring attached to its end is compressed one-sixteenth inch and tighten the locking nut (9).

(5) If the governor surges or hunts, inspect the spark plugs for cleanliness and proper operation and the governor connecting rod

ball joints for free operation without binding or lost motion. If the surging persists, readjust the governed engine speed as described in (2) above and/or loosen the locking nut (9) on the upper speed adjusting screw (10) and turn the screw out several turns. Then screw it back slowly until the surging stops and tighten the locking nut.

59. Fuel Tank

a. Removal.

(1) Drain the fuel tank (TM 5–6115–232–10).
(2) Remove the roof assembly (par. 50).
(3) Loosen the two coupling nuts and remove the fuel tank-to-three-way valve fuel line assembly (23, fig. 14).
(4) Remove the two screws (21), spaces (22), lockwashers, and nuts to free the outboard end of the fuel tank holddown straps (1) from the frame (3).
(5) Remove the 2 nuts and lockwashers to free the inboard end of the fuel tank holddown straps from the frame. Lift and remove the fuel tank (2), fuel tank side barrier, and the 2 fuel tank holddown straps from the generator set. Separate the fuel tank, fuel tank side barrier, and straps.
(6) Remove the 4 nuts (10, fig. 19), 4 lockwashers (9), and 4 screws (7 and 11) and remove the fuel tank front barrier (12) from the bracket (13) and 2 barrier mounting clips (8).
(7) Remove the 2 nuts (10), lockwashers (9), and screws (7 and 11) and remove the 2 barrier mounting clips (8) from the lifting frame.
(8) Remove the two nuts (10), lockwashers (9), and screws (7 and 11) and remove the bracket (13) from the frame.

b. Disassembly.

(1) Remove the four screws (4) and remove the fuel gage assembly (5) and gasket (6) from the fuel tank (3).
(2) Remove the fuel tank strainer (21) from the fuel tank assembly.
(3) Remove the draincock (19) from the fuel tank.

c. Cleaning, Inspection, and Repair.

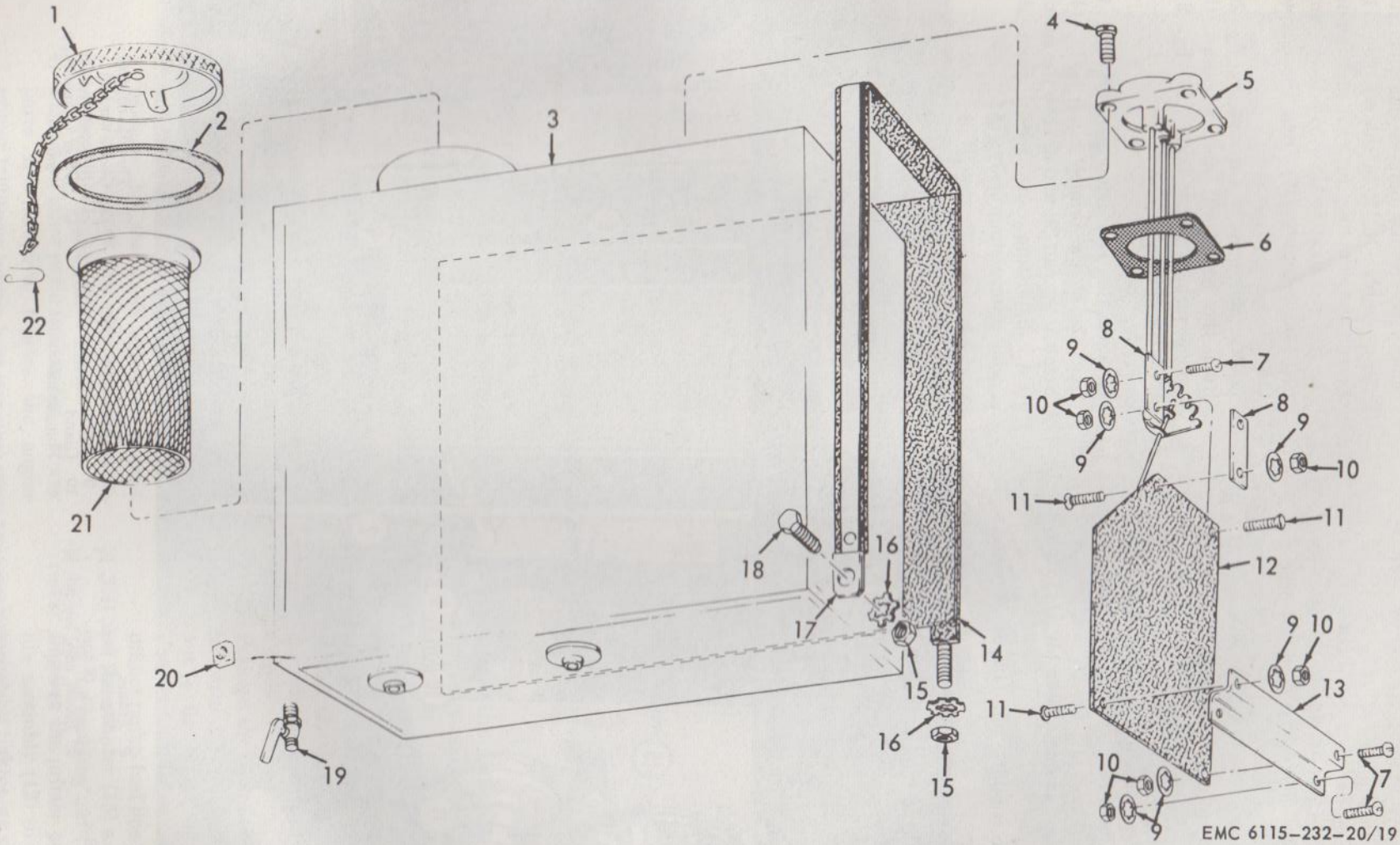
(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Flush the fuel tank with an approved cleaning solvent and use steam or hot water, if available, to remove scale and other foreign matter.
(3) Inspect the fuel tank for breaks, cracks, dents, and other damage. Repair or replace a defective fuel tank. Remove any loose paint and repaint as directed in TM 9–2851.
(4) Inspect the fuel tank strainer and gaskets for breaks, cracks, tears, and other damage. Replace a defective part.
(5) Inspect the fuel gage assembly for bends, cracks, restricted movement of linkage, and other damage. Repair or replace a defective fuel gage assembly.
(6) Inspect the mounting hardware and fittings for bends, cracks, defective threads, and other damage. Replace a defective part.
(7) Inspect the fuel tank front and side barriers for breaks, cracks, and other damage. Replace a defective barrier.

d. Reassembly.

(1) Install the draincock (19) on the fuel tank (3).
(2) Install the fuel tank strainer (21) in the fuel tank.
(3) Position the gasket (6) and fuel gage assembly (5) on the fuel tank and secure by installing the four screws (4).

e. Installation.

(1) Position the bracket (13) to the frame and secure with the two screws (7 and 11), lockwashers (9), and nuts (10).
(2) Position the 2 barrier mounting clips (8) to the lifting frame and secure by installing the 2 screws (7 and 11), lockwashers (9), and nuts (10).
(3) Position the fuel tank front barrier (12) to the 2 barrier mounting clips (8) and bracket (13) and secure by installing the 4 screws (7 and 11), 4 lockwashers (9), and 4 nuts (10).
(4) Position the fuel tank (3) and fuel tank side barrier (14) to the frame (3, fig. 14) and set the fuel tank holddown straps (1) in place over the fuel tank (3, fig. 19) and fuel tank side barrier (14).
(5) Secure the inboard end of the fuel tank holddown straps (17) to the frame (3, fig. 14) with the 2 lockwashers (16, fig. 19) and nuts (15). Secure the outboard end of the fuel tank holddown straps to the frame



1 Fuel tank cap
2 Gasket
3 Fuel tank
4 Screw, fil-hd, ¼–20 x ½ in. (4 rqr)
5 Fuel gage assembly
6 Gasket
7 Screw, rd-hd, No. 8–32 x ⅜ in. (4 rqr)
8 Barrier mounting clips (2 rqr)
9 Washer, lock, IT, No. 10 (8 rqr)
10 Nut, hex, No. 10 (8 rqr)
11 Screw, csk, No. 10–32 x ½ in. (4 rqr)
12 Fuel tank front barrier
13 Bracket
14 Fuel tank side barrier
15 Nut, hex, ¼–20 (4 rqr)
16 Washer, lock, IET, ¼ in. (4 rqr)
17 Fuel tank holddown strap (2 rqr)
18 Screw, hex-hd, ¼–20 x ¾ in. (2 rqr)
19 Draincock
20 Spacer (2 rqr)
21 Strainer
22 Safety pin

Figure 19. Fuel tank assembly, exploded view.

with the 2 screws (18), spacers (20), lockwashers (16), and nuts (15).

(6) Position the fuel tank-to-three-way fuel line assembly (23, fig. 14) to its respective adapters and secure by tightening the two coupling nuts.

(7) Install the roof assembly (par. 50).

60. Engine Primer Pump

a. Removal.

(1) Shut off the fuel supply at the three-way valve (24, fig. 14).

(2) Loosen the gland (10, fig. 20) and remove the gland and plunger assembly (11) from the barrel (9).

(3) Loosen the coupling nut (12, fig. 21) and remove the primer pump-to-manifold fuel line assembly (13) from the adapter (11).

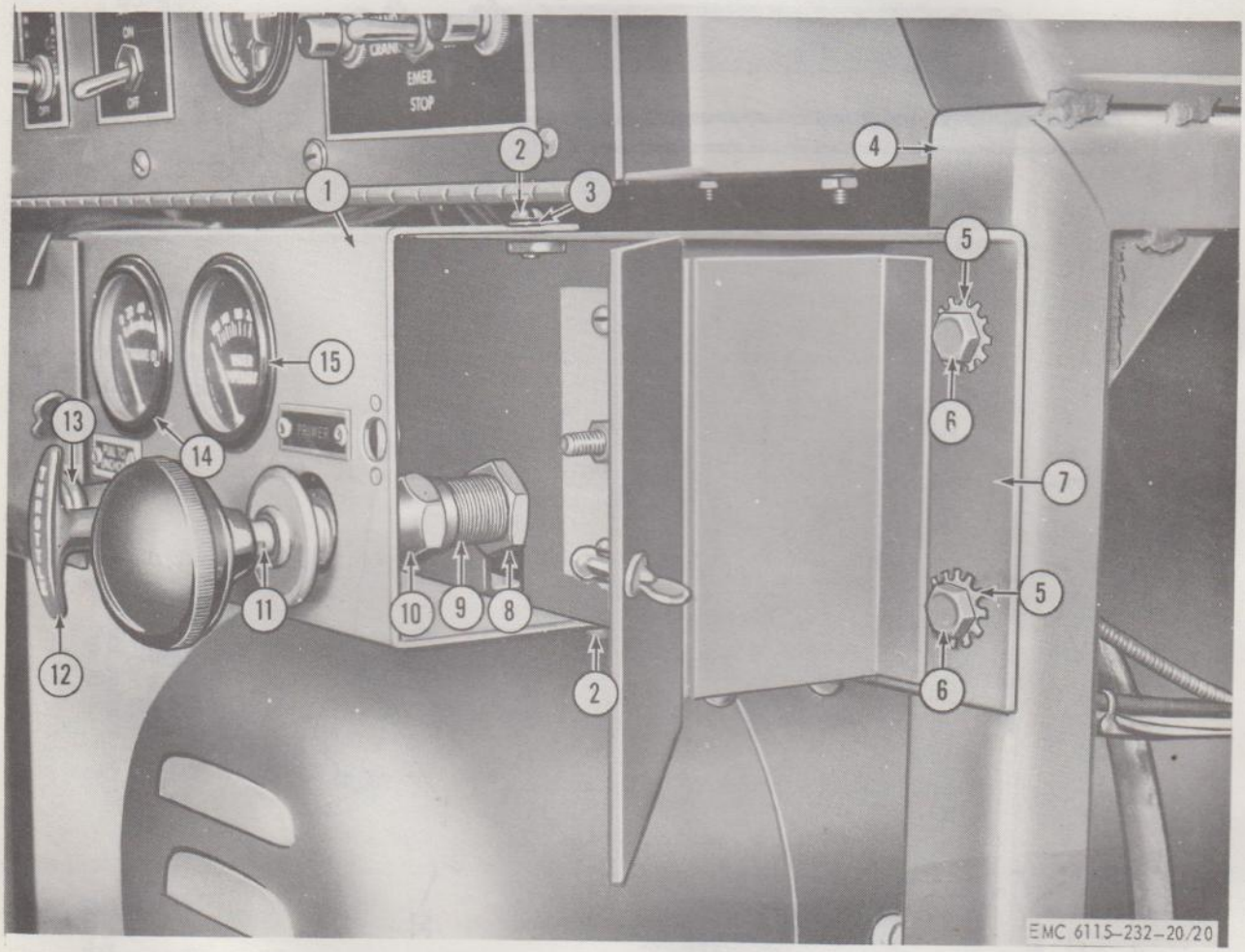
(4) Loosen the coupling nut (16) and remove the fuel sediment strainer-to-primer pump fuel line assembly (17) from the adapter (15).

(5) Loosen and remove the nut (8, fig. 20) from the barrel (9) and withdraw the engine primer pump body (14, fig. 21) from the panel (8).

b. Disassembly.

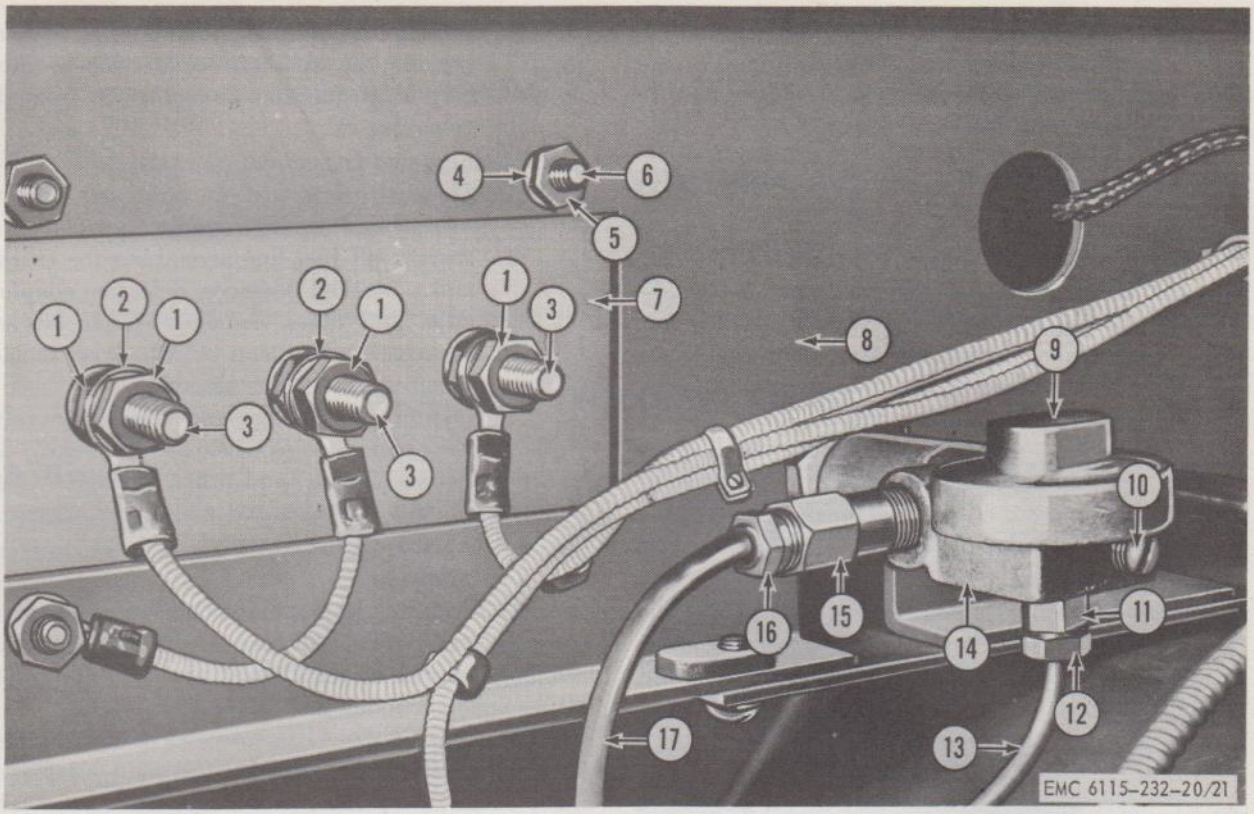
(1) Remove the two adapters (11) and 15 from the engine primer pump body (14).

(2) Remove the cap (9) and remove the spring, seat, diaphragm, and screen from the engine primer pump body (14).



1 Engine instrument panel
2 Screw, rd-hd, ¼–20 x ⅜ in. (rqr)
3 Washer, lock, IT, ¼ in. (4 rqr)
4 Frame
5 Washer, lock, IET, ¼ in. (8 rqr)
6 Screw, cap, hex-hd, ¼–20 x ¾ in. (4 rqr)
7 Panel
8 Nut (spec)
9 Barrel
10 Gland
11 Plunger assembly
12 Throttle control
13 Choke control
14 Oil pressure gage
15 Water temperature gage

Figure 20. Engine primer pump and engine instrument panel, removal points.



1 Nut, hex, brass, ¼–20 (12 rqr)
2 Washer, plain, brass, ¼ in. (3 rqr)
3 Remote terminal, brass, ¼–20 x 2 in. (3 rqr)
4 Washer, lock, IT, No. 10 (4 rqr)
5 Nut, hex, No. 10–32 (4 rqr)
6 Screw, rd-hd, No. 10–32 x ⅝ in. (4 rqr)
7 Remote control terminal block
8 Panel
9 Cap
10 Plug, pipe, ⅛ in.
11 Adapter
12 Coupling nut
13 Primer pump-to-manifold fuel line assembly
14 Engine primer pump body
15 Adapter (spec)
16 Coupling nut
17 Fuel sediment strainer-to-primer pump fuel line assembly

Figure 21. Engine primer pump and remote control terminal block assembly, removal points.

(3) Remove the pipe plug (10) and remove the spring and ball from the engine primer pump body (14).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the engine primer pump body for cracks, chips, blocked internal passages, and other damage. Use a soft probe to open blocked passages and reclean. If the engine primer pump body is otherwise defective, replace the engine primer pump.

(3) Inspect the adapters for blocked passages and other damage. Clean out blocked passages by the most expedient means. If the adapters are otherwise defective, replace the engine primer pump.

(4) Inspect all other parts for damage. If any parts are defective, replace the engine primer pump.

d. Reassembly.

(1) Install the ball and spring in the engine primer pump body (14) and install the plug (10).

(2) Install the screen, diaphragm, seat, and spring in the engine primer pump body (14) and install the cap (9).

(3) Install the two adapters (11 and 15) in the primer pump body (14).

e. Installation.

(1) Position the engine primer pump body (14) in panel (8) and secure by installing the nut (8, fig. 20) on the barrel (9).

(2) Position the fuel sediment strainer-to-primer pump fuel line assembly (17, fig. 21) on the adapter (15) and secure by tightening the coupling nut (16).

(3) Position the primer pump-to-manifold fuel line assembly (13) to the adapter (11) and secure by tightening the coupling nut (12).

(4) Carefully guide the lip of the leather cup of the plunger assembly (11, fig. 20) into the opening of the barrel (9) and secure by tightening the gland (10).

61. Fuel Lines, Fittings, and Three-Way Valve

a. Removal.

(1) Drain the fuel tank (TM 5–6115–232–10).
(2) Remove the fuel sediment strainer (par. 55).
(3) Loosen the coupling nut (5, fig. 15) and remove the sediment strainer-to-fuel pump fuel line assembly (6) from the generator set.
(4) Loosen the coupling nut (2) and remove the fuel pump-to-carburetor fuel line assembly (3) from the fuel pump (12).
(5) Loosen the coupling nut (35, fig. 16) and remove the fuel pump-to-carburetor fuel line assembly (15) from the generator set.
(6) Loosen the two coupling nuts (26) and remove the manifold primer fuel line assembly (27) from the elbow and tee assemblies (33 and 39).
(7) Loosen the coupling nut (26) and remove the engine primer pump-to-manifold fuel line assembly (25) from the tee assembly.
(8) Remove the elbow and tee assemblies (33 and 39) from the intake and exhaust manifold (1).
(9) Loosen the coupling nut (12, fig. 21) and remove the engine primer pump-to-manifold fuel line assembly (13) from the generator set.
(10) Loosen the coupling nut (16) and remove the fuel sediment strainer-to-primer pump fuel line assembly (17) from the generator set.
(11) Loosen the coupling nut (12, fig. 11) and remove the fuel sediment strainer-to-coolant heater fuel line assembly (11) from the generator set.
(12) Loosen the two coupling nuts and remove the fuel tank-to-three-way valve fuel line assembly (23, fig. 14) from the generator set.
(13) Loosen the coupling nut (8) and free the auxiliary connection-to-three way valve fuel line assembly (9) from the three-way valve (24).
(14) Remove the screw (5) and remove the handle (6) from the three-way valve (24).
(15) Remove the two nuts, lockwashers, and screws and remove the three-way valve (24) from the valve bracket (4).
(16) Loosen the coupling nut (3, fig. 13) and remove the auxiliary connection-to-three-way valve fuel line assembly (2) from the generator set.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Inspect all fuel line assemblies for cracks, kinks, blocked passages, defective coupling nuts, and other damage. Clear blocked passages and reclean or otherwise replace a defective fuel line assembly.
(3) Inspect the fittings and three-way valve for cracks, chips, blocked passages, defective threads, and other damage. Clear blocked passages and reclean or otherwise replace a defective part.

c. Installation.

(1) Position the auxiliary connection-to-three-way valve fuel line assembly (2) to its adapter on the lifting frame (1) and tighten the coupling nut (3).
(2) Position the three-way valve (24, fig. 14) to the valve bracket (4) and secure by installing the two screws, lockwashers, and nuts.
(3) Position the handle (6) to the stem of the three-way valve and secure by installing the screw (5).
(4) Position the auxiliary connection-to-three-way valve fuel line assembly (9) to the adapter (7) on the three-way valve (24) and secure by tightening the coupling nut (8).
(5) Position the fuel tank-to-three-way valve fuel line assembly (23) to its respective adapters and secure by tightening the two tube nuts.
(6) Position the fuel sediment strainer-to-coolant heater fuel line assembly (11, fig. 11) to its adapter and secure by tightening the coupling nut (12).
(7) Position the fuel sediment strainer-to-primer pump fuel line assembly (17, fig. 21) to its adapter (15) and secure by tightening the coupling nut (16).
(8) Position the engine primer pump-to-manifold fuel line assembly (13) to its adapter (11) and secure by tightening the coupling nut (12).
(9) Install the elbow and tee assemblies (33 and 39, fig. 16) in the intake and exhaust manifold (1).

(10) Position the primer pump-to-manifold fuel line assembly (25) to the tee assembly (39) and secure by tightening the coupling nut (26).

(11) Position the manifold primer fuel line assembly (27) to the elbow and tee assemblies (33 and 39) and secure by tightening the two coupling nuts (26).

(12) Position the fuel pump-to-carburetor fuel line assembly (15) to its adapter (26) and secure by tightening the coupling nut (35).

(13) Position the fuel pump-to-carburetor fuel line assembly (3, fig. 15) to its adapter and secure by tightening the coupling nut (2).

(14) Position the sediment strainer-to-fuel pump fuel line assembly (6) to its adapter (4) and secure by tightening the coupling nut (5).

(15) Install the fuel sediment strainer (par. 55).

Section VIII. ELECTRICAL SYSTEM

62. General

The engine electrical system is depicted in figure 2. It provides for starting and stopping the engine either at the unit or from a remote location. Two series-connected, 12-volt batteries furnish 24-volt panel light, engine control, and engine starting power while the ignition spark current is generated and timed by the magneto. The output current of the engine accessory generator is controlled as to amperes and voltage by the engine generator regulator. A pressure switch and a thermostatic switch stop the engine by actuating the stop relay which grounds out the magneto current whenever the oil pressure is too low or the coolant temperature is too high. Maintenance instructions for only the engine accessory generator, engine generator regulator, engine electrical starter, ignition magneto, and ignition components are contained in this section. For on-equipment testing of the engine accessory generator and the engine generator regulator, see paragraph 68.

63. Engine Accessory Generator

a. On-equipment Testing. Refer to paragraph 68 for information covering on-equipment testing of both the engine accessory generator and the engine generator regulator.

b. Removal.

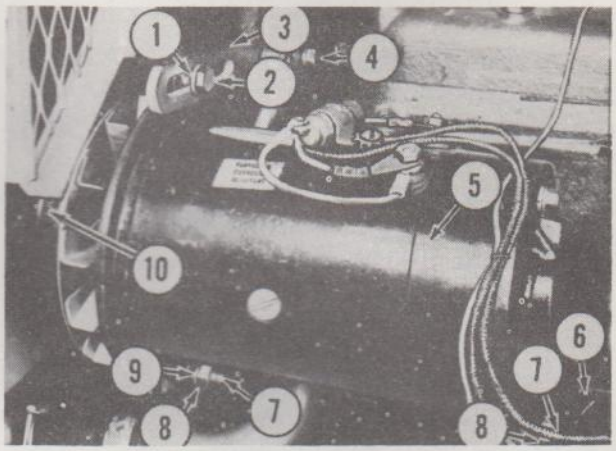
(1) Remove the engine accessory generator capacitor (par. 45).

(2) Tag and remove the electrical leads from the engine accessory generator (5, fig. 22).

(3) Remove the screw (2) and two lockwashers (1) that secure the strap (3) to the engine accessory generator (5).

(4) Remove the screw (4), lockwasher, and strap (3) from the water pump housing.

(5) Remove the 2 nuts (8), 4 lockwashers (9), and 2 screws (7) and remove the engine accessory generator (5) from the bracket and cover plate (6), engine mounting bracket, and the 2 fan and generator drive V-belts (10).



1 Washer, lock, 3/8 in. (2 rqr)
2 Screw, cap, hex-hd, 3/8–16 x 1 in.
3 Strap
4 Screw, cap, hex-hd, 5/16–18 x 1 in.
5 Engine accessory generator
6 Bracket and cover plate
7 Screw, cap, hex-hd, 7/16–14 x 1 1/2 in. (2 rqr)
8 Nut, hex, 7/16–14 (2 rqr)
9 Washer, lock, IET, 7/16 in. (4 rqr)
10 Fan and generator drive V-belt (2 rqr)

Figure 22. Engine accessory generator, removal points.

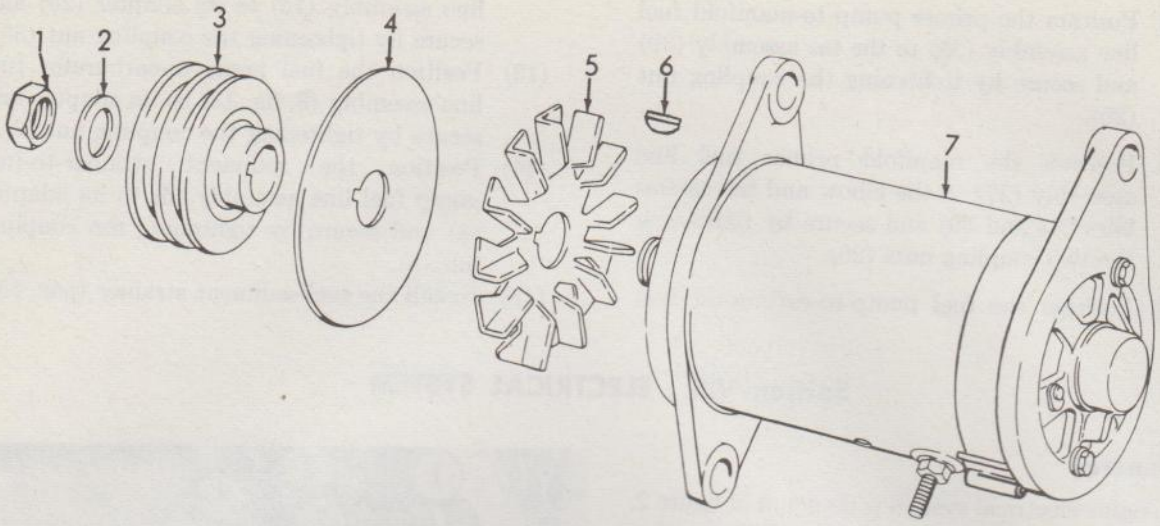
c. Disassembly.

(1) Remove the nut (1, fig. 23) and washer (2) from the shaft of the engine accessory generator (7).

(2) Remove the pulley (3), baffle plate (4), fan (5), and woodruff key (6) from the shaft of the generator.

d. Cleaning and Inspection.

(1) Clean the exposed surfaces of the engine accessory generator using a cloth saturated with an approved cleaning solvent and dry thoroughly.



EMC 6115-232-20/23

1 Nut (spec)
2 Washer (spec)
3 Pulley
4 Baffle plate
5 Fan
6 Woodruff key
7 Engine accessory generator

Figure 23. Engine accessory generator, partially exploded view.

(2) Inspect the generator for obvious damage. Replace a damaged generator or a generator that does not test out properly.

(3) Inspect the mounting hardware for bends, chips, defective threads, and other damage. Replace a defective part.

e. Reassembly.

(1) Position the woodruff key (6) on the shaft of the engine accessory generator (7), then assemble the fan (5), baffle plate (4), and pulley (3) on the shaft of the generator.

(2) Secure the assembled fan, baffle plate, and pulley by installing the washer (2) and nut (1) on the shaft of the generator.

f. Installation.

(1) Position the engine accessory generator (5, fig. 22) to the bracket and cover plate (6) and engine mounting bracket and secure with the 2 screws (7), 4 lockwashers (9), and 2 nuts (8).

(2) Engage the two fan and generator drive V-belts (10) with the pulley of the engine accessory generator.

(3) Position the strap (3) to the water pump housing and secure by installing the lockwasher and 1 screw (4).

(4) Secure the strap (3) to the engine accessory generator (5) with the 2 lockwashers (1) and 1 screw (2).

(5) Reconnect the tagged electrical leads with the engine accessory generator.

(6) Install the engine accessory generator capacitor (par. 45).

(7) Adjust the tension on the fan and generator drive V-belts (par. 64).

(8) Polarize the generator as instructed in paragraph 68.

64. Fan and Generator Drive V-Belts

a. Removal.

(1) Loosen, but do not remove, the 3 screws (2 and 7, fig. 22) and 2 nuts (8) to loosen the engine accessory generator (5).

(2) Push the engine accessory generator (5) towards the engine and disengage the two fan and generator drive V-belts (10) from the pulley of the engine accessory generator.

(3) Remove the fan guard assembly (par. 79).

(4) Remove the two fan and generator drive V-belts from the crankshaft and fan pulleys and remove the V-belts.

b. Cleaning and Inspection.

(1) Clean the fan and generator drive V-belts with a clean, dry cloth.

(2) Inspect the V-belts for wear, deterioration, and damage. Replace a defective V-belt.

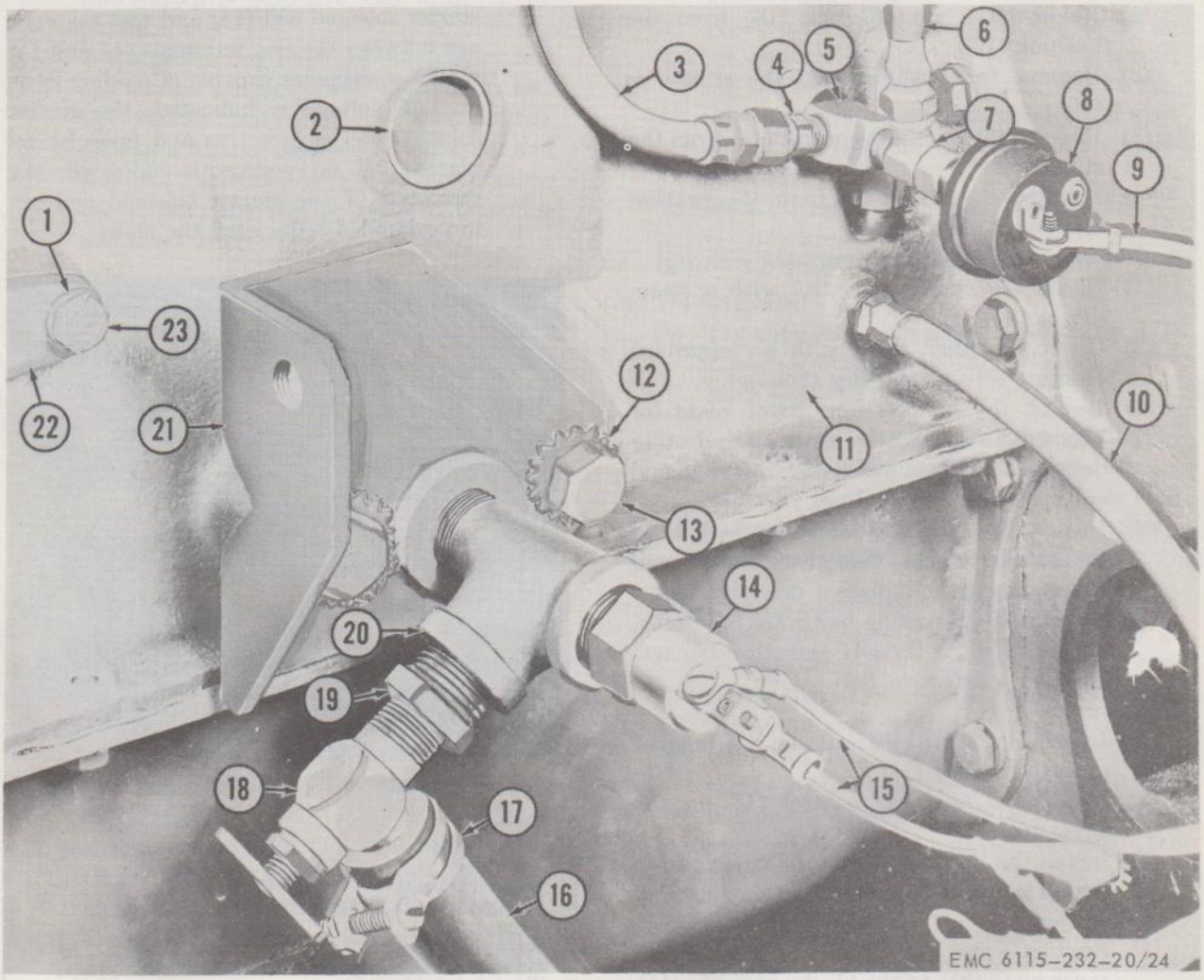
Caution: **The two V-belts used to drive the water pump and generator are matched, comprising a set, so that the tension is the same on each belt. If it is necessary to replace one V-belt, discard both V-belts and install a new matched set.**

c. Installation.

(1) Install the fan and generator drive V-belts (10) over the crankshaft and fan pulleys.
(2) Install the fan guard assembly (par. 79).
(3) Engage the two fan and generator drive V-belts with the pulley of the engine accessory generator (5).
(4) Tighten the 3 screws (2 and 7) and 2 nuts (8).

d. Adjustment.

(1) Test the tension on the two fan and generator drive V-belts by pushing the V-belts inward midway between the crankshaft and fan pulleys. Correctly tensioned V-belts will be displaced approximately one-half inch by finger pressure.
(2) Adjust incorrect tension on the V-belts by slightly loosening the 3 screws (2 and 7), and 2 nuts (8), to loosen the engine accessory generator (5).
(3) Push the engine accessory generator towards the engine to loosen tight V-belts and pull the engine accessory generator away from the engine to tighten loose V-belts.
(4) Secure the adjusted position of the engine accessory generator (5) by tightening the 3 screws (2 and 7) and 2 nuts (8).



1 Washer, lock, ¼ in. (2 rqr)
2 Expansion plug (5 rqr)
3 Oil line assembly
4 Straight adapter
5 Tee, street, ⅛ in.
6 Oil line assembly
7 Pipe-to-tube tee
8 Pressure safety switch
9 Electrical lead
10 Oil line assembly
11 Block assembly
12 Washer, lock, IET, ½ in. (2 rqr)
13 Screw, cap, hex-hd, ½–13 x 1 in. (2 rqr)
14 Overheat control
15 Electrical lead (2 rqr)
16 Hose
17 Hose clamp
18 Shutoff cock
19 Bushing, pipe, ⅜ x ½ in.
20 Tee, street, ½ in.
21 Bracket and cover plate
22 Oil filter cover plate
23 Screw, cap, hex-hd, ¼–20 x ¾ in. (2 rqr)

Figure 24. Bracket and cover plate and oil filter cover plate, removal points.

65. Bracket and Cover Plate

a. Removal.

(1) Drain the cooling system (TM 5–6115–232–10).

(2) Remove the engine accessory generator (par. 63).

(3) Loosen the clamp (17, fig. 24) and remove the hose (16) from the shutoff cock (18).

(4) Tag and remove the two electrical leads (15) from the overheat control (14).

(5) Remove the two screws (13) and lockwashers (12) and remove the bracket and cover plate (21) and gasket from the block assembly (11). Discard the gasket.

b. Disassembly.

(1) Remove the shutoff cock (18) from the bushing (19).

(2) Remove the bushing from the street tee (20).

(3) Remove the overheat control (14) from the street tee.

(4) Remove the street tee from the bracket and cover plate (21).

c. Cleaning and Inspection.

(1) Clean the overheat control with a clean, dry cloth.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(3) Inspect the bracket and cover plate for bends, cracks, defective threads, and other damage. Replace a defective bracket and cover plate.

(4) Inspect the shutoff cock and pipe fittings for breaks, cracks, defective threads, and other damage. Replace a defective part.

(5) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly.

(1) Install the street tee (20) in the bracket and cover plate (21).

(2) Install the overheat control (14) in the street tee.

(3) Install the bushing (19) in the street tee.

(4) Install the shutoff cock (18) in the bushing.

e. Installation.

(1) Position a new gasket and the bracket and cover plate (21) to the block assembly (11) and secure by installing the two lockwashers (12) and screws (13).

(2) Reconnect the two tagged electrical leads (15) with the overheat control (14).

(3) Install the hose (16) and clamp (17) on the shutoff cock (18) and secure by tightening the clamp.

(4) Install the engine accessory generator (par. 63).

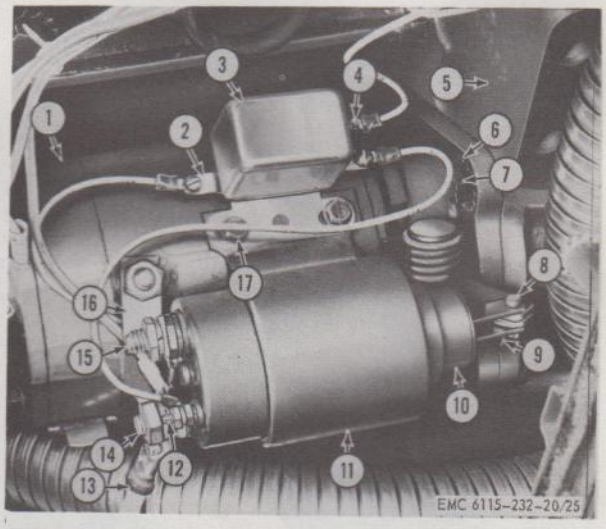
(5) Refill the cooling system (TM 5–6115–232–10).

66. Engine Electrical Starter

a. On-equipment Testing.

(1) If the engine electrical starter will not crank the engine, test the batteries installed in the generator set for full charge and inspect all battery and starter cables for serviceability and proper installation.

(2) Disconnect the plate (16, fig. 25) from the starter solenoid coil (11) and test the voltage between the two terminals (14 and 15) with a multimeter capable of reading 24-v, dc. If voltage is indicated, the starter solenoid coil is defective and must be replaced. If no voltage is indicated, the terminals of the starter solenoid coil are not grounded. Reinstall the plate.



1 Engine electrical starter
2 Terminal
3 Starter relay
4 Terminal
5 Endbell housing
6 Washer, lock, IET, ⅜ in. (3 rqr)
7 Screw, cap, hex-hd, ⅜–16 x 1 in. (3 rqr)
8 Pin, headed, 3/16 x ½ in.
9 Pin, cotter, 1/16 x ½ in.
10 Solenoid plunger
11 Solenoid coil
12 Terminal
13 Battery cable
14 Terminal
15 Terminal
16 Plate
17 Screw, spin-lock, ¼–20 x ⅝ in. (4 rqr)

Figure 25. Engine electrical starter, removal points.

(3) Check the plate (16) to insure that it is making good contact and again test the voltage between the two terminals (14 and

15). If no voltage is indicated, the starter is defective and must be replaced.

(4) Again test the voltage between the same two terminals (14 and 15) but with a jumper momentarily in place between terminal (12) and terminal (15). This jumper will actuate a serviceable starter solenoid coil and result in a serviceable starter cranking the engine. In this test, if voltage is indicated when the jumper is in place, the starter solenoid coil is defective and must be replaced. If however, the voltage drops to zero and at the same time the starter does not crank the engine, the starter is defective and must be replaced.

(5) If the proceeding tests are satisfactory and the starter will not crank the engine, test the starter relay (3) by momentarily placing a jumper between terminal (2) and terminal (4). If the starter now cranks the engine, the starter relay is defective and must be replaced.

b. Removal.

(1) Remove the side panel (par. 50).

(2) Tag and remove the electrical leads from the starter relay (3) and the starter solenoid coil (11).

(3) Remove the three screws (7) and lockwashers (6) and remove the engine electrical starter (1) from the endbell housing (5).

(4) Remove the two nuts and lockwashers from the terminals and remove the plate (16).

(5) Remove the four screws (17) and remove the starter relay (3) and starter solenoid coil (11) from the engine electrical starter (1) and solenoid plunger (10).

(6) Remove the cotter pin (9) and headed pin (8) and remove the solenoid plunger (10) from the linkage of the engine electrical starter (1).

c. Cleaning and Inspection.

(1) Clean the exterior of any serviceable electrical parts with a clean, dry cloth.

(2) Clean the mounting hardware with an approved cleaning solvent and dry thoroughly.

(3) Inspect the unserviceable electrical parts for bends, cracks, loose terminals, defective insulation, and other damage. Replace a defective part.

(4) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Installation.

(1) Position the solenoid plunger (10) to the linkage of the engine electrical starter (1) and secure by installing the headed pin (8) and cotter pin (9).

(2) Engage the starter solenoid coil (11) with the solenoid plunger (10) and position the starter solenoid coil and starter relay (3) to the engine electrical starter (1) and secure with the four screws (17).

(3) Position the plate (16) to the starter and solenoid and secure by installing the lockwashers and nuts.

(4) Position the engine electrical starter (1) to the endbell housing (5) and secure with the three lockwashers (6) and screws (7).

(5) Reconnect the tagged electrical leads with the starter solenoid coil (11) and starter relay (3).

(6) Install the side panel (par. 50).

67. Ignition Magneto

a. On-equipment Testing.

(1) Tag the four spark plug leads (26, fig. 17). Loosen the connectors (27) and remove the leads from the magneto cap (22).

***Caution:* Do not pull the spark plug lead or twist the braided shielding. Gently work the spark plug lead from side to side to free the rubber seal. Do not use sharp metal tools to install the rubber seal.**

(2) Insert an insulated wire, bared at both ends, into one of the terminal openings of the magneto, and hold the other end one-eighth inch away from the engine crankcase.

(3) Turn the start switch to the NORMAL OPERATING position and crank the engine by pushing the ENGINE START button (TM 5-6115-232-10). An intense blue spark should appear between the bared end of the wire and the engine crankcase.

(4) Continue this test by inserting the wire into the remaining three terminal openings of the magneto cap.

(5) If no spark is observed, disconnect the start switch electrical lead (25) from the capacitor (23) and retest for spark as outlined above. Should sparks now appear, either the electrical lead or the start switch

is defective. Test the wire for shorts and other damage. If the electrical lead tests good, the start switch is defective and should be replaced (par. 100).

(6) If sparks are not observed when the ignition switch electrical lead is disconnected, adjust the magneto contact set gap and retest for spark.

(7) If with continued testing, sparks are still not observed after the magneto contact set gap has been adjusted, the magneto is defective and must be replaced.

(8) Reinstall the four tagged spark plug leads (26) in their respective terminal openings of the magneto cap (22) and secure by tightening the connectors (27).

b. Removal.

(1) Tag the four spark plug leads (26). Loosen the connectors (27) and remove the leads from the magneto caps (22).

(2) Remove the screw (21) and lockwasher and free the lead assembly (20) from the magneto.

(3) Remove the nut (18), lockwasher (17), bolt (14), flat washer (15), and spacer (16) from the governor assembly (11), timing gear housing (12), and magneto.

(4) Remove screw (24) and remove the start switch electrical lead (25) from the capacitor (23)

(5) Remove the nut (29), lockwasher, and flat washer from the stud in the magneto mounting flange and remove the magneto and gasket from the block assembly (5).

c. Cleaning and Inspection.

(1) Clean the exterior surfaces of the magneto with a dry cloth.

(2) Clean the mounting hardware with an approved cleaning solvent and dry thoroughly.

(3) Inspect the magneto for visual damage. Replace a damaged or defective magneto.

(4) Inspect the mounting hardware for bends, cracks, defective threads, and other damage Replace a defective part.

d. Installation and Timing.

(1) Rotate the engine until the "C/D" markings on the flywheel (2, fig. 26) are visible through the opening in the endbell housing (1). Do not move the engine after this setting is accomplished.

(2) Install a spark plug lead in the terminal opening for the No. 1 cylinder of the magneto. Position the free end of this lead approximately one-eighth inch from the cylinder clock. Continuously twist the magneto impulse drive coupling slowly in a counterclockwise direction, when viewed from the coupling end, until the occurrence of a spark between the free end of the spark plug lead and the cylinder block. Leave the magneto impulse drive coupling in this position. Inspect the angular setting of the grooves in the governor gear and the drive tangs of the magneto impulse drive coupling. Make any slight adjustment necessary in the angular setting of the tangs of the magneto impulse drive coupling so that they will match with the grooves of the governor gear when the magneto is installed.

1 Endbell housing 2 Flywheel, timing mark

Figure 26. Engine flywheel, timing mark.

(3) Position a new gasket and the magneto to the block assembly (5, fig. 17) and secure with the flat washer, lockwasher, and nut (29) on the stud.

(4) Install the flat washer (15), bolt (14), spacer (16), lockwasher (17), and nut (18) to secure the governor assembly (11) and magneto to the timing gear housing (12) and block assembly (5).

(5) Position the lead assembly (20) to the magneto and secure with the lockwasher and screw (21).

(6) Reinstall the four tagged spark plug leads (26) in their respective terminal openings in the magneto cap (22) and secure by tightening the connectors (27).

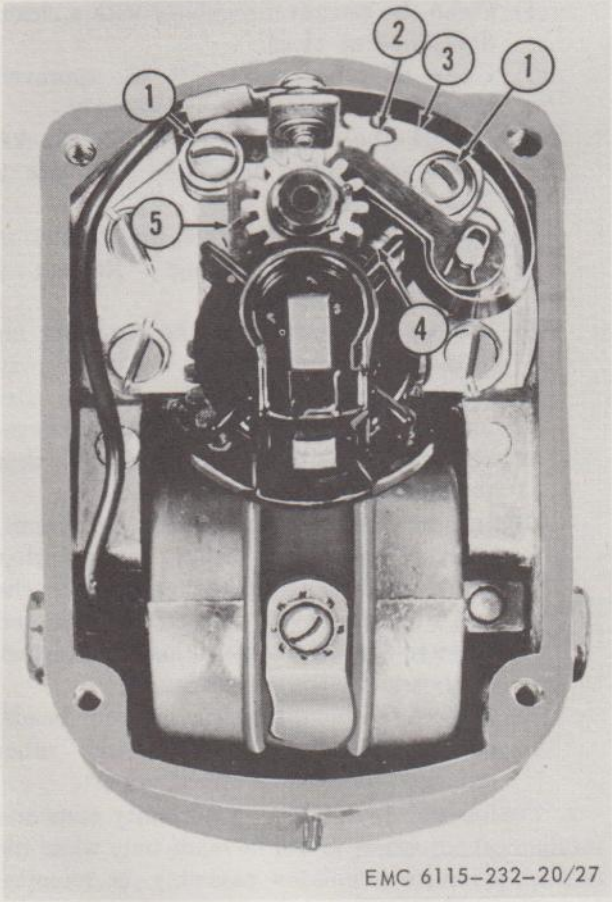
(7) Position the start switch electrical lead (25) to the capacitor (23) and secure with the screw (24).

e. Contact Set Adjustments.

(1) Remove the magneto as outlined in *b* above.

(2) Remove the three screws (21) and lockwashers (28) and remove the magneto cap (22) and gasket from the magneto housing (19).

(3) Twist the magneto impulse drive coupling until the contact set (4, fig. 27) is at its maximum opening.



1 Screw, machine, No. 8–32 x 3/8 in. (2 rqr)
2 Adjusting slot
3 Stationary support bracket and contact
4 Contact set
5 Cam wick

Figure 27. Magneto contact set, adjustment points.

(4) Measure the gap between the contacts of the contact set with a feeler gage. If the gap is not 0.015 inch, adjustment is required.

(5) Loosen slightly the two screws (1) and insert the blade of a screwdriver in the adjusting slot (2) of the stationary support bracket and contact (3), and adjust the location at the bracket by twisting the screwdriver. Continue checking the contact set gap and adjusting the location of the bracket until the gap width is 0.015 inch.

(6) Secure the adjusted location of the stationary support bracket and contact (3) by tightening the two screws (1).

(7) Recheck the gap of the contact set after securing the bracket. Readjust if necessary.

(8) Place one or two drops of light machine oil on the cam wick (5) prior to reassembly of the magneto.

(9) Position the gasket and magneto cap (22, fig. 17) to the magneto housing (19) and secure with the three lockwashers (28) and screws (21).

(10) Install and time the magneto as outlined in *d* above.

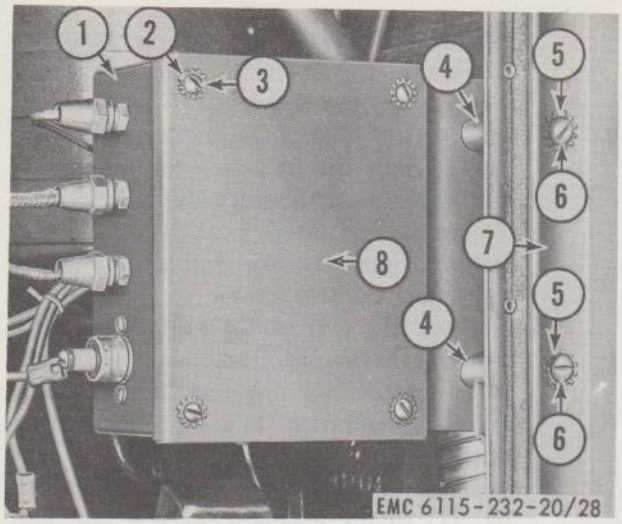
68. Engine Generator Regulator Assembly, Box, and Cover

a. General. The three unit engine generator regulator assembly automatically controls the output of the engine accessory generator to keep the batteries fully charged. The circuit breaker unit closes the circuit between the batteries and the generator when the generator voltage is above the battery voltage and opens the circuit when the battery voltage is above the generator voltage. The current regulator unit limits the current to the maximum rated value of the generator. The voltage regulator unit maintains the voltage of the system at the full-charge level.

b. On-equipment Testing. Defects in the battery-charging generator systems are indicated by a high-charging rate when the batteries are fully charged, or by a low- or no-charging rate when the batteries are low.

(1) Remove the four screws (3, fig. 28) and lockwashers (2) and remove the cover (8) from the box (1).

(2) When a high-charging rate with fully charged batteries is indicated, operate the generator set engine at half throttle. Tag and disconnect the field electrical lead (11, fig. 29) from the field terminal (10). If the output remains high, the fault is in the generator or wiring. If the output drops off, the trouble is in the regulator assembly and it must be adjusted or replaced.



1 Box
2 Washer, lock, IET, No. 10 (4 rqr)
3 Screw, rd-hd, No. 10–32 x ⅜ in. (4 rqr)
4 Spacer (4 rqr)
5 Washer, lock, IET, ¼ in. (8 rqr)
6 Screw, rd-hd, ¼–20 x 1¾ in. (4 rqr)
7 Lifting frame
8 Cover

Figure 28. Engine generator regulator assembly, box, and cover, removal points.

(3) When a low-or no-charging rate with partially or fully discharged batteries is indicated, inspect for loose connections or damaged wiring. If the connections and wiring are serviceable, stop the engine and polarize the generator by momentarily connecting a jumper between the terminals marked BATT and GEN on the regulator. Remove the jumper and restart the engine. If the generator still does not charge, operate the generator set engine at idle speed and connect the field terminal (10) to ground and slowly increase the engine speed. If there is no increase in the charging rate, the generator is at fault. If the charging rate increases, the fault is with the engine generator regulator assembly and it must be adjusted or replaced.

c. Removal.

(1) Remove the four screws (3, fig. 28) and lockwashers (2), and remove the cover (8) from the box (1).

(2) Remove the engine generator regulator capacitor and the engine generator regulator through-capacitor (par. 45).

(3) Tag the electrical leads and remove them from the three terminals of the engine generator regulator assembly (9, fig. 29).

(4) Remove the 3 nuts (2) and remove the 3 fittings (1) with their associated electrical leads from the box (3).

(5) Remove the three nuts (5) and lockwashers (4) from the studs (6) and remove the engine generator regulator assembly (9) from the box (3).

(6) Remove the two screws (7) and remove the cover (8) from the engine generator regulator assembly.

(7) Remove the 4 nuts and lockwashers from the screws (6, fig. 28) and remove the box (1), 4 spacers (4), screws (6), and lockwashers (5) from the lifting frame (7).

d. Cleaning and Inspection.

(1) Clean the generator regulator with a clean, dry, lint-free cloth.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(3) Inspect the base and cover for cracks, dents, and broken terminals. Replace a damaged terminal.

(4) Inspect the coils, resistors, and insulation for evidence of burning. Replace a defective regulator.

(5) Inspect the contacts of the regulator for burns, dirt, and pitting. Clean dirty contacts and dress pitted contacts. Replace an engine generator regulator assembly whose contacts are so pitted that they can not be dressed.

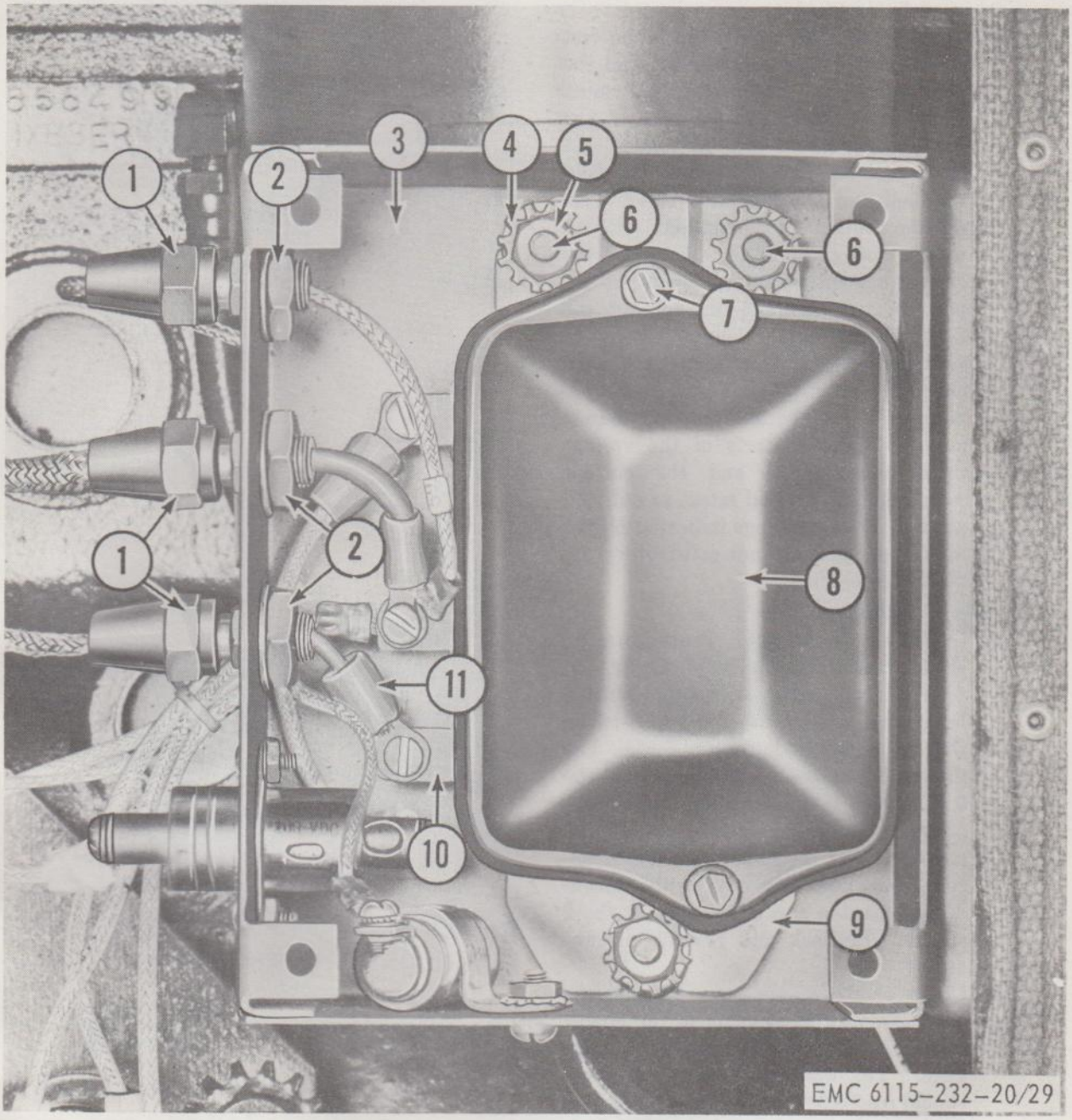
(6) Inspect the box and cover for bends, cracks, dents, and other damage that would prevent complete closure of the box with the cover. Repair the box and cover to effect a complete closure. Replace the box and cover as necessary.

(7) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

e. Testing and Adjustment. Continuity tests and mechanical adjustments will be made only when the engine generator regulator assembly is removed from the generator set.

(1) *Continuity test.* Use a multimeter to test the series and field circuits of the regulator.

(*a*) To test the series circuit, touch the test probes to the armature terminal (6, A, fig. 30) and the armature of the circuit breaker unit (1). If the circuit is open, the regulator is defective and must be replaced. Hold the circuit breaker armature down and test between the armature terminal (6) and the battery



1 Fitting (spec) (3 rqr)
2 Nut (spec) (3 rqr)
3 Box
4 Washer, lock, IET, ¼ in. (3 rqr)
5 Nut, hex, ¼–20 (3 rqr)
6 Stud (spec) (3 rqr)
7 Screw (spec) (2 rqr)
8 Cover
9 Engine generator regulator assembly
10 Field terminal
11 Field electrical lead

Figure 29. Engine generator regulator assembly, removal points.

terminal (7). If the circuit is open, redress and clean the circuit breaker contacts. Retest and if the circuit is still open, the regulator is defective and must be replaced.

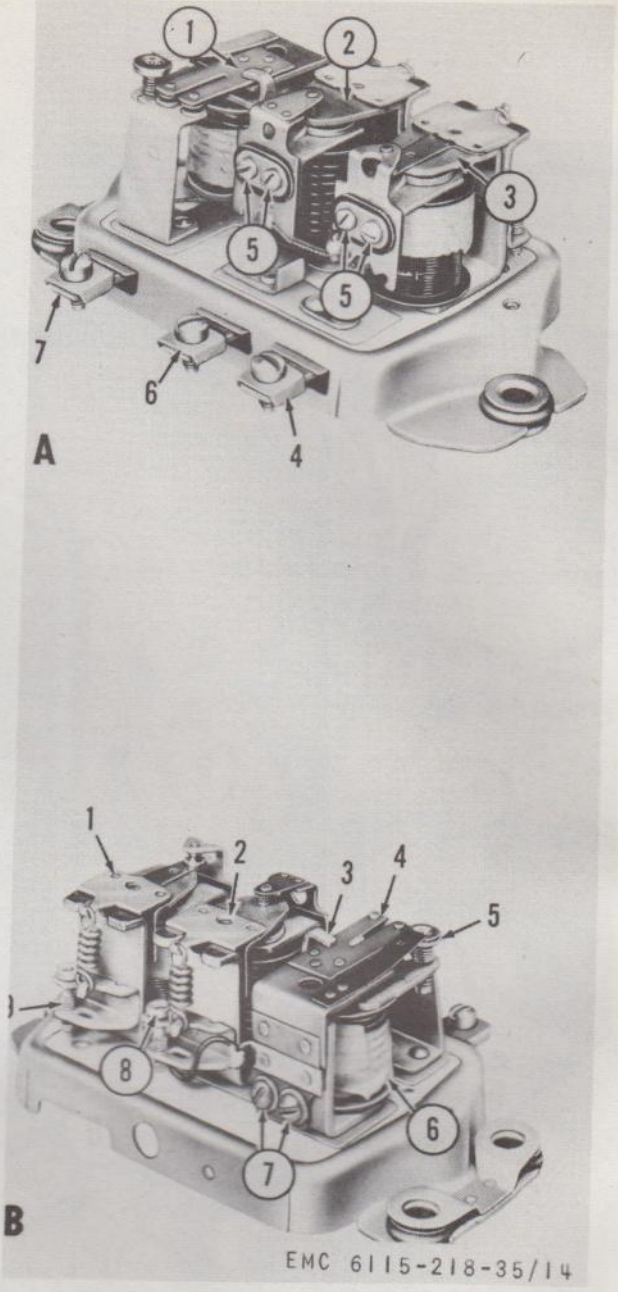
(*b*) To test the field circuit, touch the test probes to the field terminal (4) and the regulator base. The multimeter must show zero. Hold the contacts of the voltage regulator unit (3) open and again test the circuit between the field terminal and the regulator base. Permit the contacts of the voltage regulator unit to close and hold the contacts of the current regulator unit (2) open and repeat the test of the circuit between the field terminal and regulator base. In each instance the multimeter will indicate 150 ohms. If some other reading is obtained with the multimeter, redress and clean the contacts of the voltage regulator unit (3) and the current regulator unit (2) and retest as outlined above. If the readings indicated on the multimeter are still not satisfactory, replace the regulator.

(2) *Mechanical adjustment.*

(*a*) *Circuit breaker air gap.* Press down the circuit breaker armature (4, B, fig. 30) until the contacts just close. With a feeler gage, measure the air gap between the armature and center core. The dimension across this gap should be 0.017 inch. If the dimension is incorrect adjust by loosening the 2 screws (7) and raise or lower the circuit breaker armature (4) as necessary. When the dimension across the gap is set, tighten the 2 screws. Recheck and readjust if necessary.

(*b*) *Circuit breaker contact gap.* Measure the gap between the contacts of the circuit breaker unit (1, A, fig. 30) with a feeler gage. The dimension across this gap should read 0.032 inch. If the dimension between the contacts is incorrect, adjust by bending the upper armature stop (3, B, fig. 30) as necessary.

(*c*) *Voltage regulator air gap.* Carefully press down on the voltage regulator unit armature (1) until the contacts are at the point of opening. Hold the armature in this position and with a feeler gage,



1	Circuit breaker unit	5	Screw (spec) (4 rqr)
2	Current regulator unit	6	Armature terminal
3	Voltage regulator unit	7	Battery terminal
4	Field terminal		

A—Engine generator regulator circuit breaker, adjustment points.

1	Voltage regulator unit armature	5	Closing voltage adjusting screw
2	Current regulator unit armature	6	Circuit breaker relay
3	Upper armature stop	7	Screw (spec) (2 rqr)
4	Circuit breaker armature	8	Current adjusting screw
		9	Voltage adjusting screw

B—Engine generator regulator current and voltage, adjustment points.

Figure 30. Engine generator regulator assembly, adjustment points.

measure the air gap between the armature and the core. The dimension across this gap should be approximately 0.075 inch. If the dimension is incorrect, adjust by loosening the 2 screws (5, A, fig. 30) and raise or lower the armature as necessary. When the dimension across the gap is adjusted, tighten the 2 screws and recheck and readjust if necessary.

(*d*) *Current regulator air gap.* The dimension across the air gap between the armature and core of the current regulator unit (2) is approximately 0.075 inch. Measure the dimension across this gap and make any necessary adjustments following the procedure outlined in (*c*) above.

(3) *Electrical adjustment.* For the electrical adjustments the voltage generator regulator assembly should be reassembled in the box, the box installed on the generator set, and electrical leads reconnected. Do not install either the regulator cover or the box cover. A low-voltage test set is necessary for the adjustments. The test set used must include the following components; voltmeter, ammeter, fixed and variable resistors, carbon pile, and suitable switching devices.

Caution: **The circuit breaker contacts must not be closed by hand after the regulator assembly is installed and connected with the generator set electrical leads. The resultant high current will damage the contacts.**

(*a*) *Circuit breaker unit.* With the engine generator regulator assembly installed and connected with the generator set electrical leads, polarize the generator by momentarily placing a jumper wire between the armature and battery terminals (6 and 7). Connect a voltmeter between the base of the regulator and the armature terminal (6). Start the generator set and slowly increase the speed. The contacts of the circuit breaker unit (1) should close at 25 volts. If the closing voltage is incorrect, adjust setting of the closing voltage adjusting screw (5, B, fig. 30) by turning clockwise to increase the closing voltage and counterclockwise to decrease the closing voltage. After the correct closing voltage is obtained, stop the generator set.

(*b*) *Voltage regulator unit.* Tag and disconnect the electrical lead from the battery terminal (7, A, fig. 30). Connect the voltmeter and a fixed resistor between the battery terminal (7) and the regulator base. The fixed resistor shall have the following characteristics; 7 ohms, and capable of carrying 10 amperes without change in the ohms resistance. Install the regulator cover, start the generator set, and run at the normal operating speed for 15 minutes. The voltmeter should read 28.5 volts at an ambient temperature of 70° F. If the voltmeter does read 28.5 volts, remove the engine. generator cover and adjust the position of the voltage adjusting screw (9, B, fig. 30) by turning the screw clockwise to increase the voltage and turning the screw counterclockwise to decrease the voltage. After each adjustment, install the engine generator regulator cover and decrease the speed of the generator set until the circuit breaker contacts open. Slowly bring the speed of the generator set back up to normal and recheck the voltage reading of the voltmeter. If the reading is not 28.5 volts, readjust the position of the voltage adjusting screw. Test and adjust until the voltage remains constant.

Note. The voltage regulator unit is sensitive to ambient temperature; therefore, the voltage adjustment recommended is for average temperatures. If batteries deteriorate, due to overcharging at lower than average ambient temperatures, reduce the recommended voltage setting. When batteries deteriorate, due to undercharging at higher than average ambient temperatures, increase the recommended voltage setting. If the voltage setting has been changed, check the batteries for over or underchatge and adjust the voltage setting to suit.

(*c*) *Current regulator unit.* Connect the carbon pile across the battery. Connect one test probe of an ammeter to the battery terminal (7, A, fig. 30) and the other test probe to the battery cable. Again polarize the engine accessory generator, and start and run the generator set at normal operating speed for 15 minutes with the engine generator

regulator cover installed. With the generator set operating at normal speed, remove the engine generator regulator assembly cover. Manually close the contacts of the current regulator unit (2) and adjust the carbon pile until the ammeter reads approximately 20 amperes. This reading is approximately 10 percent above the rated output of the engine accessory generator. Release the contacts of the current regulator unit to permit them to open. The ammeter should now read 18 amps, the rated output of the engine accessory generator. If the ammeter reading is incorrect, adjust the position of the current adjusting screw (8, B, fig. 30) by turning clockwise to increase the current reading or by turning counterclockwise to decrease the current reading.

Caution: **Do not adjust the setting of the current regulator above the rated output of the engine accessory generator.**

(*d*) *Testing after adjustment.* Install the cover on the engine generator regulator assembly and test the operation of all three units at operating temperature. Repeat the electrical adjustments (*a*), (*b*), and (*c*) above, as necessary until the test readings cease to drift. If the engine generator regulator assembly cannot be adjusted, it must be replaced.

f. Installation.

(1) Position the 4 lockwashers (5, fig. 28) and screws (6) to the lifting frame (7), assemble the 4 spacers (4) and box (1) to the screws, and secure by installing the 4 lockwashers and nuts.

(2) Position the engine generator regulator assembly (9, fig. 29) to the 3 studs (6) in the box (3) and secure by installing 3 lockwashers (4) and nuts (5) on the studs.

(3) Position the cover (8) on the regulator and secure by installing the two screws (7).

(4) Position the 3 fittings (1), with their associated electrical leads, to the box (3) and secure with the 3 nuts (2).

(5) Reconnect the tagged electrical leads with the terminals of the engine generator regulator assembly (9).

(6) Install the engine generator regulator capacitor and the engine generator regulator through-capacitor (par. 45).

Caution: **The engine accessory generator must be polarized whenever the electrical leads to the generator or regulator have been removed or any adjustments have been made to the generator set or regulator. Failure to polarize the generator may cause damage to the regulator contacts.**

(7) Position the cover (8, fig. 28) to the box (1) and secure with the four screws (3) and lockwashers (2).

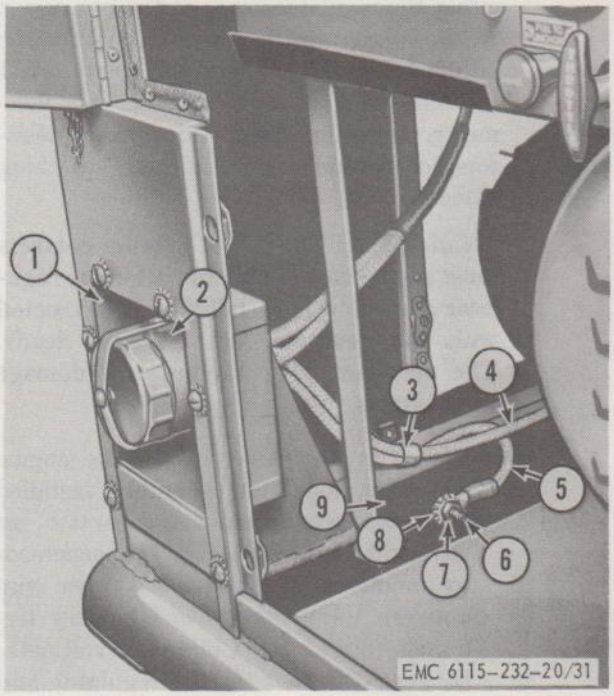
69. Battery Cables and Charging Receptacle

a. Removal.

(1) Remove the battery cables from the batteries (TM 5–6115–232–10).

(2) Remove the nut, lockwasher, and battery cable (13, fig. 25) from the terminal of the starter solenoid coil (11).

(3) Remove the nut (7, fig. 31), two lockwashers (8), and ground cable (5) from the ground terminal (6).



1 Battery-charging receptacle box
2 Battery-charging receptacle
3 Wire clamp
4 Engine starter cable
5 Ground cable
6 Ground terminal
7 Nut, hex, brass, 5/16–18
8 Washer, lock, IET, 5/16 in.
9 Skid

Figure 31. Battery-charging receptacle and ground cable, removal points.

(4) Remove the ground terminal and nameplate from the skid (9).

(5) Remove the nut, lockwasher, and screw that secure the wire clamp (3) to the skid (9) and remove the wire clamp from the engine starter cable (4) and ground cable (5). In a similar manner, remove the second wire clamp from the engine starter cable.
(6) Remove the four nuts, lockwashers, and screws and free the battery-charging receptacle (2) from the battery-charging receptacle box (1).
(7) Carefully withdraw the battery-charging receptacle with the attached cables from the battery-charging receptacle box.
(8) Remove the O-ring from the battery-charging receptacle box.

b. Cleaning, Inspection, and Repair.
(1) Clean the battery-charging receptacle, attached battery cables, and fittings, using a dry cloth for the cable, approved cleaning solvent for metal parts, and a wire brush, if necessary, for the fittings.
(2) Inspect the battery-charging receptacle, battery cables, and fittings for loose connections. Resolder loose connections.
(3) Inspect the battery-charging receptacle for breaks, cracks, and other damage. Replace a defective battery-charging receptacle.
(4) Inspect the battery cables for broken or frayed insulation, breaks, and other damage. Replace a defective battery cable.
(5) Inspect the battery cable fittings for breaks, cracks, corrosion, wear, and other damage. Replace a defective fitting.
(6) Inspect the O-ring for breaks, tears, wear, and other damage. Replace a defective O-ring.
(7) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation.
(1) Position the O-ring in the battery-charging receptacle box (1).
(2) Carefully thread the cables through the O-ring and opening in the battery-charging receptacle box.
(3) Position the battery-charging receptacle (2) to the battery-charging receptacle box and secure with the four screws, lockwashers, and nuts.
(4) Assemble and position the ground terminal (6) and nameplate to the skid (9).
(5) Position a lockwasher and the ground cable (5) on the ground terminal and secure with the lockwasher (8) and nut (7).
(6) Assemble the wire clamp (3) over the ground cable (5) and engine starter cable (4) and secure the wire clamp to the skid (9) with the screw, lockwasher, and nut. In a similar manner, secure, the engine starter cable with the second wire clamp.
(7) Position the battery cable (13, fig. 25) to the terminal of the starter solenoid coil (11) and secure with the lockwasher and nut.
(8) Install the battery cables (TM 5–6115–232–10).

d. Field Expedient Repair. If the engine will not start due to a broken battery cable clamp, wrap a strip of metal around the battery terminal and secure the battery cable to the metal strip by installing a suitable screw and nut.

70. Spark Plug Leads

a. Testing.
(1) Loosen the connector (2, fig. 16) and remove the spark plug lead (4) from the spark plug (3).
(2) Position the terminal of the spark plug lead approximately one-eighth inch away from the engine and crank the engine. A spark should jump from the terminal of the spark plug lead to the engine. If no spark is observed, the spark plug lead is defective and must be replaced.
(3) Test the remaining three spark plug leads in a similar manner and replace defective spark plug leads.

b. Removal.
(1) Loosen the four connectors (27, fig. 17), tag, and remove the spark plug leads (26) from the magneto cap (22).

***Caution:* Do not pull on the cable or twist the braided shielding. Gently work the cable from side to side and free the rubber seal. Do not use sharp metal tools to install the rubber shield.**

(2) Remove the two nuts (12, fig. 16) and screws (14). Separate the angle and straight brackets (13 and 5) and free the spark plug leads from the brackets.

(3) Loosen the four connectors (2), tag, and remove the spark plug leads (4) from the spark plugs (3).

c. Cleaning and Inspection.

(1) Clean the spark plug leads with a dry cloth.

(2) Inspect the spark plug leads for broken wires, damaged insulation, frayed shielding, loose or defective connectors, and other damage. Replace a defective connector.

d. Installation.

(1) Position the tagged spark plug leads (4) to their respective spark plugs (3) and secure by tightening the connectors (2).

(2) Position the spark plug leads in the angle and straight brackets (13 and 5). Clamp the brackets around the spark plug leads and secure with the two screws (14) and nuts (12).

(3) Position the spark plug leads (26, fig. 17) to their identified location in the magneto cap (22) and secure by tightening the connectors (27).

71. Spark Plugs

a. Removal.

(1) Tag and remove the spark plug leads (3, fig. 32) from the spark plugs (4).

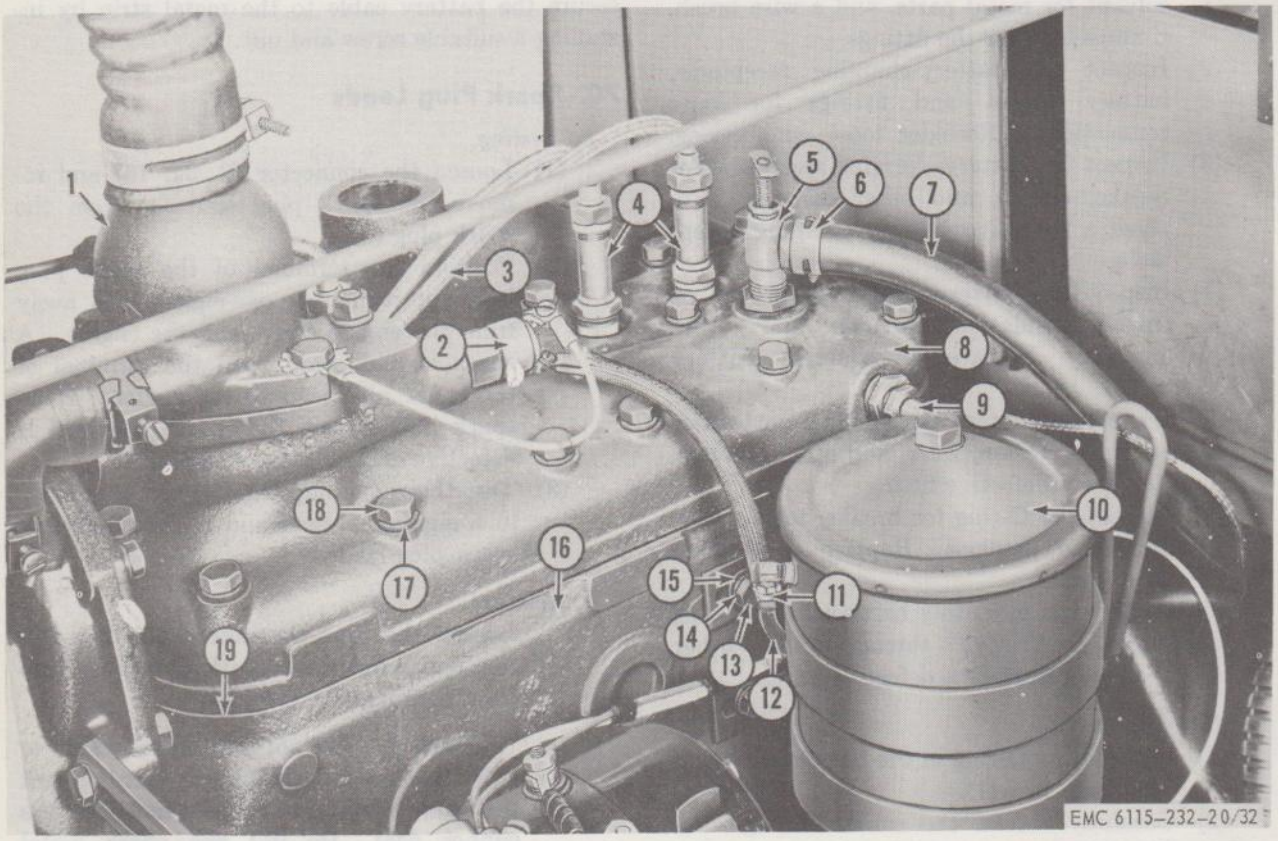
(2) Remove the spark plugs and gasket from the cylinder head (8).

b. Cleaning, Inspection, and Adjusting.

(1) Clean spark plugs, paying particular attention to the removal of carbon from the electrodes and insulator, and wipe all traces of foreign matter from each plug.

(2) Inspect the spark plugs for cracked insulators, loose or broken electrodes, defective threads, and other damage. Replace a defective spark plug.

(3) Inspect the gaskets for tears, breaks, and other damage. Replace a defective gasket.



1 Thermostat housing
2 Temperature safety switch
3 Spark plug lead (4 rqr)
4 Spark plug (4 rqr)
5 Water shutoff valve
6 Hose clamp
7 Hose
8 Cylinder head
9 Capillary tube
10 Oil filter
11 Coupling nut
12 Oil line assembly
13 Screw, cap, hex-hd, 5/16–18 x 5/8 in. (4 rqr)
14 Washer, lock, 5/16 in. (4 rqr)
15 Washer, flat, 5/16 in. (4 rqr)
16 Block assembly
17 Washer, flat, 0.35 in. id x 0.638 in. od x 0.111 in. thk (18 rqr)
18 Bolt, 3/8–16 x 2 1/2 in. (18 rqr)
19 Gasket

Figure 32. Oil filter and cylinder head, removal points.

(4) Check the gap between the electrodes with a wire feeler gage. The gap between the electrodes should measure 0.025 inch. If the dimension across the gap is incorrect, adjust by bending the outer electrode as necessary and recheck the gap. Readjust and recheck until the dimension across the gap is correct.

Caution: **Do not attempt adjustments by positioning the center electrode as damage would result.**

c. Testing. Test each spark plug in a spark plug cleaner and tester. Discard any plug that does not test satisfactorily.

d. Installation.

(1) Install the gaskets and spark plugs (4) in the cylinder head (8).

(2) Install the tagged spark plug leads (3) on the spark plugs.

Section IX. LUBRICATION SYSTEM

72. General

The lubrication system provides pressurized lubrication for the engine. Components include a bypass oil filter with a removal element, an adjustable oil pressure regulator, and suitable line assemblies and fittings.

73. Oil Filter

a. Removal.

(1) Drain the oil (TM 5–6115–232–10).

(2) Loosen the 2 coupling nuts (11, fig. 32), tag, and remove the 2 oil line assemblies (12) from the oil filter (10).

(3) Remove the four screws (13), lockwashers (14), and flat washers (15) and remove the oil filter (10) from the block assembly (16).

b. Disassembly.

(1) Remove the shoulder bolt (4, fig. 33) and copper washer (5) and remove the oil filter cover (6), spring (7), and nonmetallic washer (8) from the oil filter body (3). Discard the nonmetallic washer.

(2) Remove the spring (7) from the shoulder bolt (4) and remove the shoulder bolt and copper washer (5) from the oil filter cover (6).

(3) Remove the oil filter element (9) from the oil filter body (3) and discard the oil filter element.

(4) Remove the 2 screws (13), lockwashers (12), and nuts (18) and remove the 2 mounting clamps (17) from the oil filter body (3).

(5) Remove the straight adapter (11) and the elbow adapter (2) from the oil filter body.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the oil filter body and cover for bends, cracks, defective threads, and other damage. Replace a defective part.

(3) Inspect the spring for cracks, set, and other damage. Replace a defective spring.

(4) Inspect the adapters for cracks, defective threads, and other damage. Replace a defective part.

(5) Inspect the mounting hardware for bends, breaks, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly.

(1) Install the straight adapter (11) and the elbow adapter (2) in the oil filter body (3).

(2) Position the 2 mounting clamps (17) on the oil filter body and secure with the 2 lockwashers (12), nuts (18), and screws (13).

(3) Install a new oil filter element (9) in the oil filter body (3).

(4) Install the copper washer (5) and shoulder bolt (4) on the oil filter cover (6) and install the spring (7) on the shoulder bolt.

(5) Position a new nonmetallic washer (8) and oil filter cover, with assembled parts, on the oil filter body (3) and secure by tightening the bolt (4).

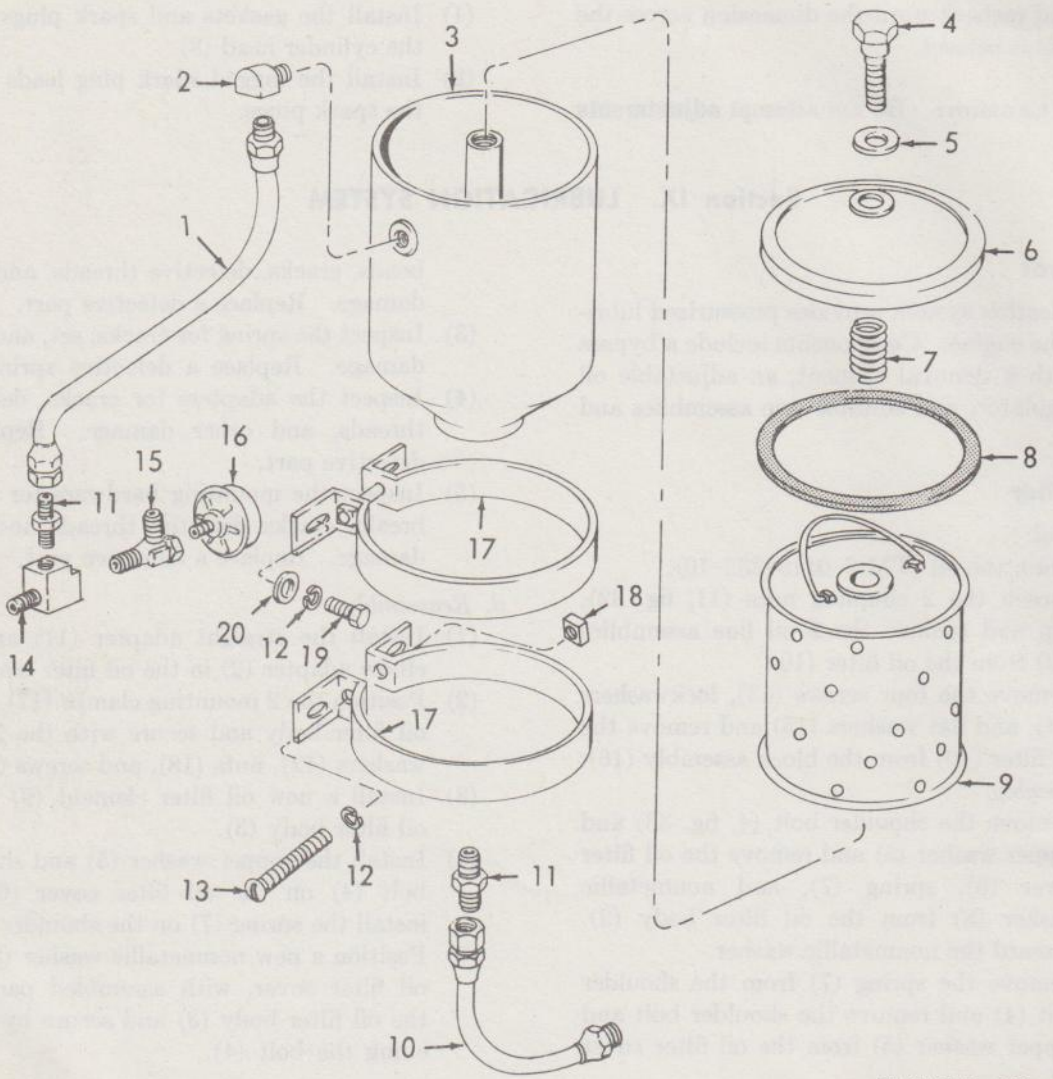
e. Installation.

(1) Position the oil filter (10, fig. 32) to the block assembly (16) and secure with the four flat washers (15), lockwashers (14), and screws (13).

(2) Position the 2 oil line assemblies (12) to their respective fittings and secure by tightening the 2 coupling nuts (11).

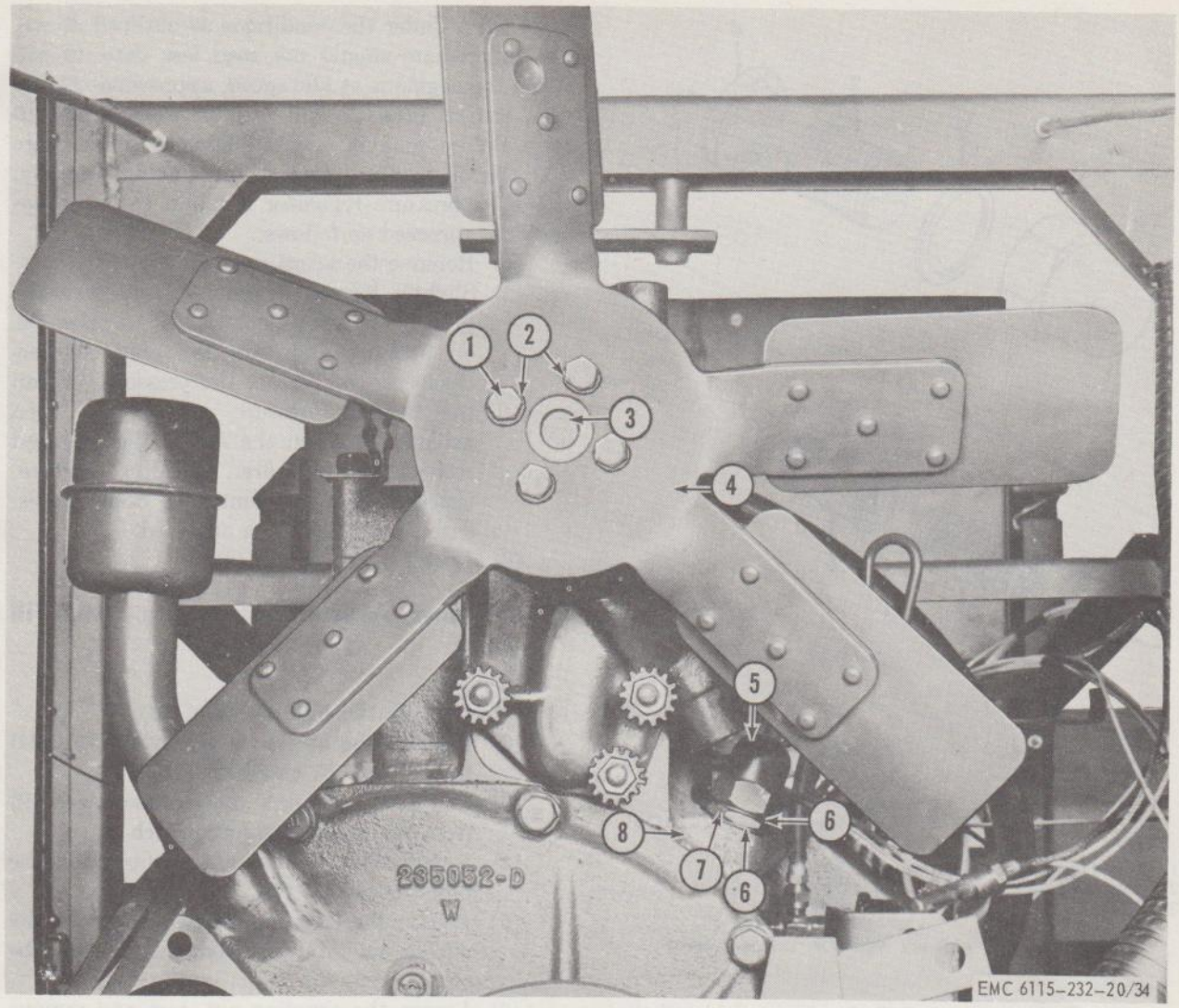
(3) Refill the engine with oil (TM 5–6115–232–10).

f. Field Expedient Repair. If oil is leaking from the oil filter cover, remove the gasket and turn it over.



1	Oil line assembly	8	Washer, nonmetallic	13	Screw, rd-hd, 5/16–18 x 2½ in. (2 rqr)	18	Nut, sq, 5/16–18 (2 rqr)
2	Elbow adapter	9	Oil filter element			19	Screw, cap, hex-hd, 5/16–18 x 5/8 in. (4 rqr)
3	Oil filter body	10	Oil line assembly	14	Tee, street, 1/8 in.		
4	Bolt (spec)	11	Straight adapter (2 rqr)	15	Pipe-to-tube tee		
5	Copper washer (spec)	12	Washer, lock, 5/16 in. (6 rqr)	16	Pressure safety switch	20	Washer, flat, 5/16 in. (4 rqr)
6	Oil filter cover			17	Mounting clamp (2 rqr)		
7	Spring						

Figure 33. Oil filter, exploded view.



1 Screw, cap, hex-hd, 5/16–18 x 3/4 in. (4 rqr)
2 Washer, lock, 5/16 in. (4 rqr)
3 Fan and water pump pulley
4 Coolant blade assembly
5 Acorn nut
6 Gasket (2 rqr)
7 Nut (spec)
8 Block assembly

Figure 34. Fan and oil pressure regulator, removal points.

74. Oil Pressure Regulator

a. Removal and Disassembly.

(1) Remove the acorn nut (5, fig. 34) and gasket (6) from the oil pressure regulator plug.

(2) Loosen the nut (7) and remove the plug (3, fig. 35) and gasket (2) from the engine.

(3) Remove the nut (4) from the plug (3).

(4) Remove the spring (6) and plunger (5) from the engine.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the plunger for cracks, nicks, and other damage. Replace a defective plunger.

(3) Inspect the spring for cracks, set, and other damage. Replace a defective spring.

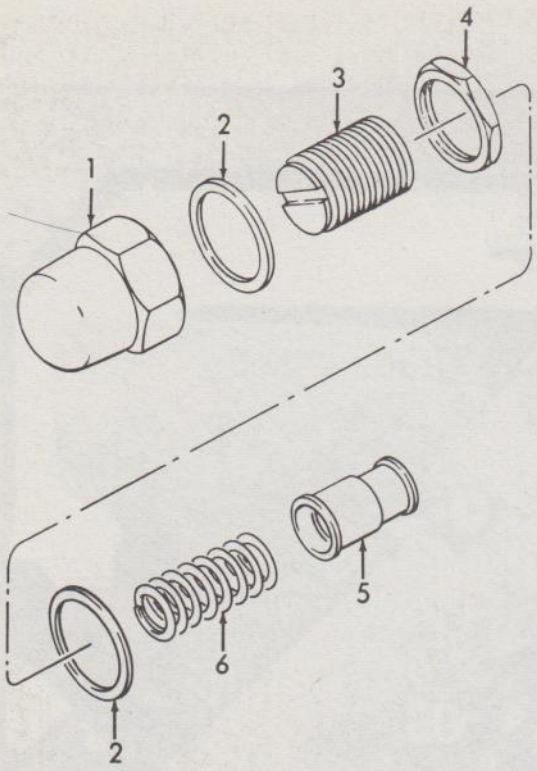
(4) Inspect the gaskets for breaks, tears, and other damage. Replace a defective gasket.

(5) Inspect the threaded parts for cracks, defective threads, and other damage. Replace a defective threaded part.

c. Reassembly and Installation.

(1) Install the plunger (5) and spring (6) in the block assembly (8, fig. 34).

(2) Assemble the nut (4, fig. 35) and both gaskets (2) on the plug (3) and install the plug in the block assembly.



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1	Acorn nut	4	Nut (spec)
2	Gasket (2 rqr)	5	Plunger
3	Plug	6	Spring

Figure 35. Oil pressure regulator, exploded view.

(3) Tighten the nut (7, fig. 34) and install the acorn nut (5).

d. Adjusting. Engine oil pressure is automatically controlled by the spring-loaded oil pressure regulator. Several additional factors will control the engine oil pressure as well as the setting of the oil pressure regulator. Incorrect weight of oil for ambient weather conditions will raise or lower the engine oil pressure. Worn bearings will reduce the engine oil pressure by providing greater annular clearance between the bearing and journal for the oil to escape. It is not advisable to increase the oil pressure regulator setting to compensate for worn bearings as the cylinder walls and piston rings will be over lubricated due to the over supply of oil from the worn bearings. An increase in the oil pressure would only aggrevate the over lubrication of the parts. When the engine is operating at normal operating temperature and running at a speed of 1,800 rpm, the oil pressure should read between 20 to 24 psi. Under the conditions as outlined above, the oil pressure should not read less than 10 psi. When the engine is at idle speed, approximately 400 rpm, the oil pressure will read between 5 and 10 psi. Before making any adjustment, make sure that the oil pressure gage is functioning properly. If the oil pressure regulator is found to be improperly set, proceed as follows:

(1) Remove the acorn nut (5).

(2) Slightly loosen the nut (7) and turn the plug (3, fig. 35) clockwise to increase the oil pressure and turn the plug counterclockwise to decrease the pressure. When the desired pressure setting has been achieved, tighten the nut (7, fig. 34) and recheck the pressure. Readjust and recheck as necessary until the desired pressure setting has been achieved.

(3) Install the acorn nut (5).

75. Oil Line Assemblies, Fitting, and Fill Tube

a. Removal.

(1) Remove the oil filter (par. 73).

(2) Remove the oil line assembly (10, fig. 24) from the block assembly (11).

(3) Tag and disconnect the electrical lead (9) from the pressure safety switch (8).

(4) Remove the pressure safety switch from the pipe-to-tube tee (7).

(5) Loosen the coupling, tag, and remove the oil line assembly (6) from the pipe-to-tube tee.

(6) Loosen the coupling nut, tag, and remove the oil line assembly (3) from the straight adapter (4).

(7) Remove the assembled pipe-to-tube tee (7), street tee (5), and straight adapter (4) from the block assembly (11) and disassemble.

(8) Loosen the two hose clamps (8, fig. 36) and remove the hose (9) from the shutoff cock (6) and the fittings in the skid.

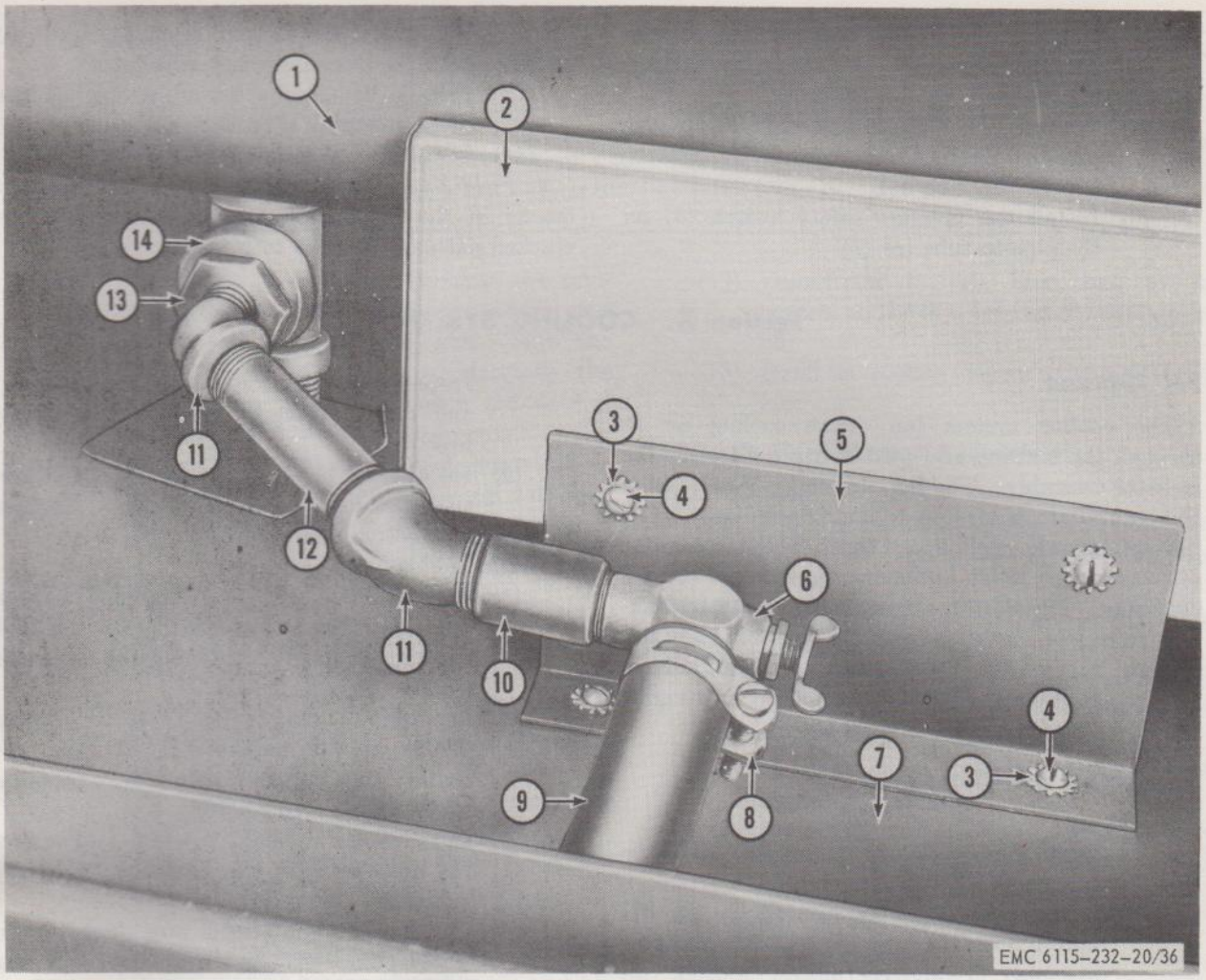
(9) Remove the shutoff cock from the coupling (10) and remove the coupling from the street elbow (11).

(10) In a similar manner, remove the balance of the pipe fittings from the oil pan (1).

(11) Remove the oil filler tube (6, fig. 16) from the timing gear housing (11).

b. Cleaning and Inspection.

(1) Clean the pressure safety switch with a dry cloth.



1 Oil pan
2 Oil pan shroud
3 Washer, lock, IET, No. 8 (8 rqr)
4 Screw, rd-hd, No. 8–32 x 3/8 in. (8 rqr)
5 Shroud mounting bracket (2 rqr)
6 Shutoff cock
7 Base pan
8 Hose clamp (2 rqr)
9 Hose
10 Coupling, pipe, 3/8 in.
11 Elbow, street, 3/8 in.
12 Nipple, 3/8 x 3 3/4 in.
13 Bushing, reducing, 3/4 x 3/8 in.
14 Tee, street, 3/4 in.

Figure 36. Oil drain line and oil pan shroud, installed view.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.
(3) Inspect all hoses and oil lines for breaks, cracks, tears, loose connectors, and other damage. Tighten loose connectors, otherwise replace a defective part.
(4) Inspect all nipples, fittings, and mounting hardware for bends, cracks, breaks, defective threads, and other damage. Replace a defective part.

c. Installation.

(1) Position the oil filler tube (6) to the timing gear housing (11) and install firmly.
(2) Install the drain plug in the street tee (14, fig. 36) and install the street tee in the oil pan (1).
(3) Install the reducing bushing (13) in the street tee and the street elbow (11) in the bushing.
(4) In a similar manner, install the balance of the pipe fittings onto the street elbow.
(5) Install the hose (9) on the shutoff cock (6) and on the fitting on the skid and secure by tightening the two hose clamps (8).
(6) Assemble the pipe-to-tube tee (7, fig. 24), street tee (5), and straight adapter (4) and install the assembly on the block assembly (11).

(7) Position the oil line assembly (3) to the straight adapter (4) and secure by tightening the coupling nut.
(8) Position the oil line assembly (6) to the pipe-to-tube tee (7) and secure by tightening the coupling nut.
(9) Install the pressure safety switch (8) on the pipe-to-tube tee (7).
(10) Reconnect the tagged electrical lead (9) with the pressure safety switch.
(11) Install the oil line assembly (10) on the block assembly (11).
(12) Install the oil filter (par. 73).

d. Field Expedient Repair. If oil is leaking from cracks in the lubrication system lines, wrap the cracked parts of the lines with friction tape.

Section X. COOLING SYSTEM

76. General

The cooling system fan draws cooling air in through the housing and pushes it out through the radiator assembly. The fan, driven by V-belts from the crankshaft, is located behind the radiator. The flow of outside cooling air through the generator set is governed by an automatic shutter and control assembly. The shutter setting is controlled by linkage from the control assembly in the radiator. Coolant is circulated through the engine and radiator by a coolant pump. The radiator, pump, and engine are interconnected with suitable hoses.

77. Hoses and Clamps

a. Removal.
(1) Drain the radiator and engine (TM 5-6115-232-10).
(2) Loosen the two hose clamps (2, fig. 37) and remove the hose (4) from the radiator assembly (1) and thermostat housing (5).
(3) Loosen the two hose clamps (23) and remove the preformed hose (24) from the water pump (25) and thermostat housing (5).
(4) Loosen the two hose clamps (10) and remove the hose (11) from the bottom of the radiator assembly (1) and the preformed tube (9).
(5) In a similar manner, loosen the two hose clamps and remove the hose and preformed tube from the bottom of the water pump (25).
(6) Loosen the two hose clamps (10, fig. 38) and remove the hose (11) from beneath the radiator assembly (12) and the fitting on the skid (9).

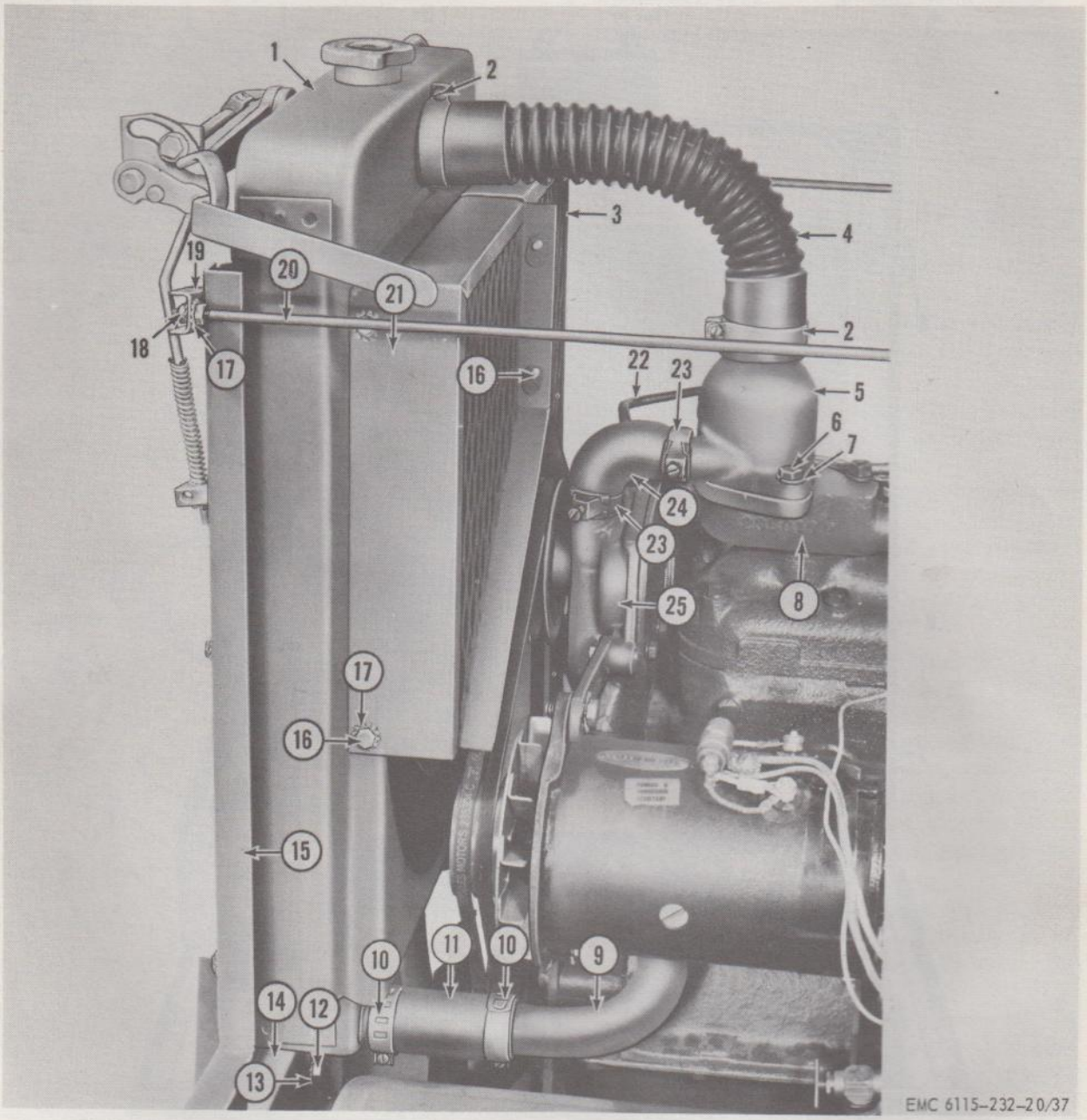
b. Cleaning and Inspection.
(1) Clean the hoses with clean water and dry thoroughly.
(2) Clean the hose clamps with an approved cleaning solvent and dry thoroughly.
(3) Inspect the hoses for breaks, cracks, tears and other damage. Replace a defective hose.
(4) Inspect the hose clamps for cracks, defective threads, and other damage. Replace a defective hose clamp.

c. Installation.
(1) Position the hose (11) on the radiator assembly (12) and the fitting on the skid (9) and secure by tightening the two hose clamps (10).
(2) Position the hose (11, fig. 37) to the bottom of the radiator assembly (1) and the preformed tube (9) and secure by tightening the two hose clamps (10).
(3) In a similar manner, position and secure the hose between the preformed tube (9) and water pump (25).
(4) Position the preformed hose (24) to the water pump (25) and thermostat housing (5) and secure by tightening the two hose clamps (23).
(5) Position the hose (4) to the thermostat housing (5) and radiator assembly (1) and secure by tightening the two hose clamps (2).
(6) Refill the engine and radiator (TM 5-6115-232-10).

d. Field Expedient Repair. If the engine overheats due to collapsed cooling system hoses, insert a heavy wire formed into a coil into the inside of the hose.

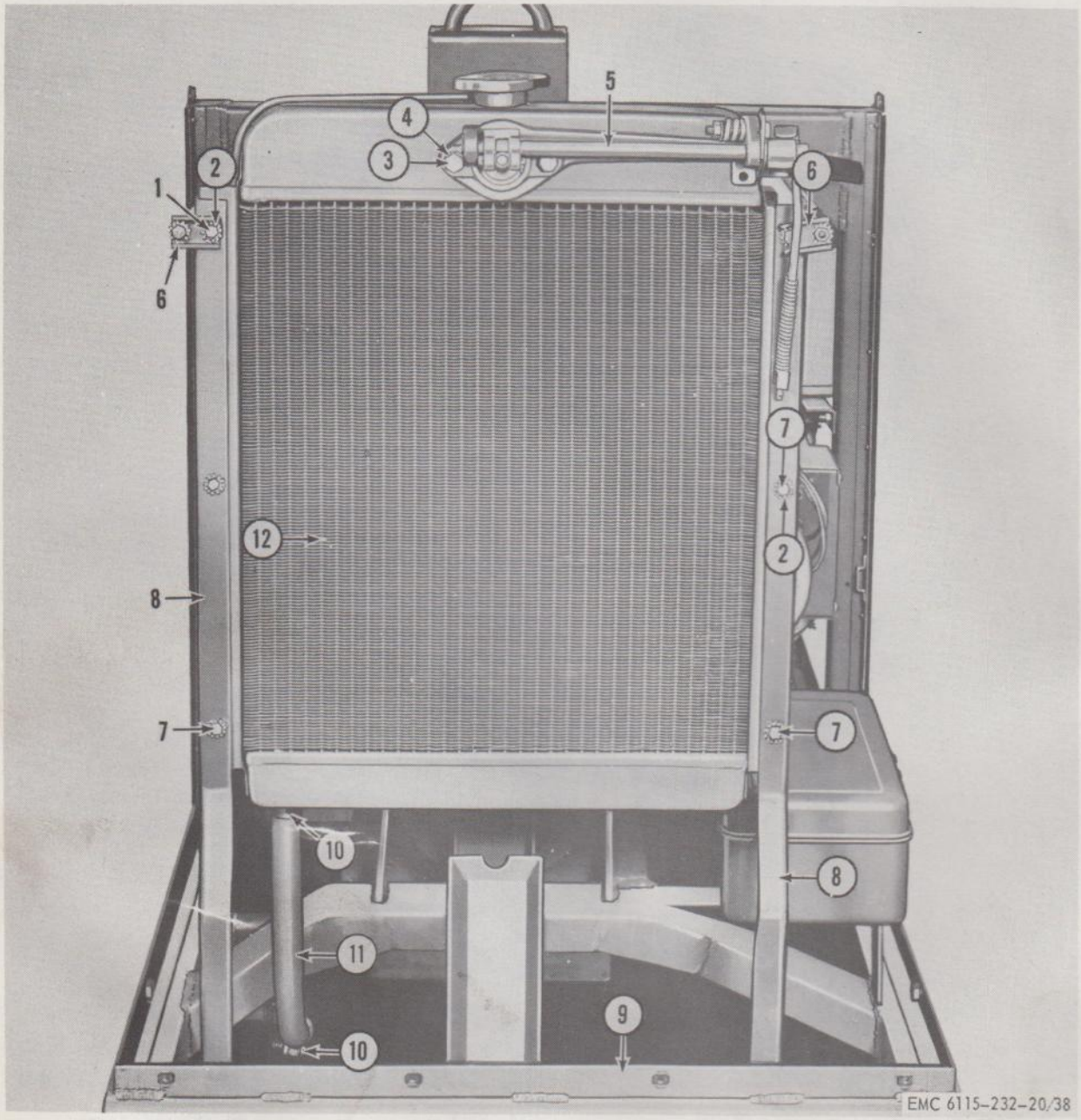
78. Thermostat Housing and Flow Control Thermostat

a. Removal and Disassembly.
(1) Drain the radiator (TM 5-6115-232-10).
(2) Remove the temperature safety switch (par. 114).
(3) Loosen the 2 hose clamps (2 and 23, fig. 37) and free the 2 hoses (4 and 24) from the thermostat housing (5).



1 Radiator assembly
2 Hose clamp (2 rqr)
3 Right side fan guard
4 Hose
5 Thermostat housing
6 Screw, cap, hex-hd, $\frac{3}{8}$–16 x 1 in. (2 rqr)
7 Washer, lock, $\frac{3}{8}$ in. (2 rqr)
8 Lower outlet water pipe
9 Preformed tube
10 Hose clamp (2 rqr)
11 Hose
12 Nut, hex, $\frac{3}{8}$–16 (2 rqr)
13 Washer, lock, IET, $\frac{3}{8}$ in. (2 rqr)
14 Skid
15 Radiator support
16 Screw, cap, hex-hd, $\frac{1}{4}$–20 x $\frac{1}{2}$ in. (5 rqr)
17 Washer, lock, IET, $\frac{1}{4}$ in. (14 rqr)
18 Nut, hex, $\frac{1}{4}$–20 (4 rqr)
19 Tie rod bracket (2 rqr)
20 Tie rod (2 rqr)
21 Left side fan guard
22 Water pump-to-thermostat housing tube assembly
23 Hose clamp (2 rqr)
24 Preformed hose
25 Water pump

Figure 37. Hoses and fan guard, removal points.



1 Screw, cap, hex-hd, ¼–20 x ¾ in. (2 rqr)
2 Washer, lock, IET, ¼ in. (12 rqr)
3 Screw, cap, hex-hd, ⅜–16 x 1 in. (2 rqr)
4 Washer, lock, ⅜ in. (2 rqr)
5 Radiator shutter control assembly
6 Tie rod bracket (2 rqr)
7 Screw, cap, hex-hd, ¼–20 x ½ in. (4 rqr)
8 Radiator support
9 Skid
10 Hose clamp
11 Hose
12 Radiator assembly

Figure 38. Radiator assembly and radiator drain hose, removal points.

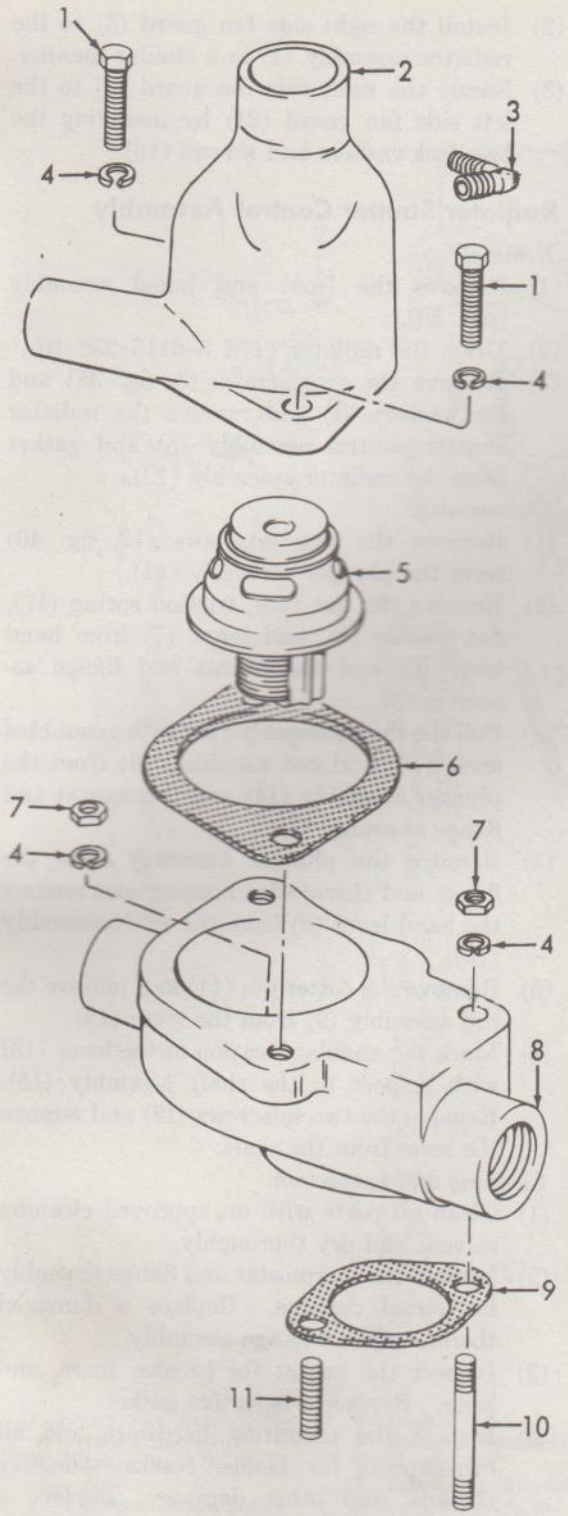


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Figure 39. Thermostat housing and lower outlet water pipe, exploded view.

1 Screw, cap, hex-hd, ⅜–16 x 1 in. (2 rqr)
2 Thermostat housing
3 Elbow adapter
4 Washer, lock, ⅜ in. (4 rqr)
5 Flow control thermostat
6 Gasket
7 Nut, hex, ⅜–24 (2 rqr)
8 Lower outlet water pipe
9 Gasket
10 Stud, ⅜–16 x ⅜–24 x 2½ in.
11 Stud, ⅜–16 x ⅜–24 x 1¼ in.

Figure 39.—Continued.

(4) Loosen the two coupling nuts and remove the water pump-to-thermostat housing tube assembly (22) from its respective adapters.
(5) Remove the two screws (6) and lockwashers (7) and remove the thermostat housing (5) and gasket from the lower outlet water pipe (8).
(6) Lift and remove the flow control thermostat (5, fig. 39) from the lower outlet water pipe (8).
(7) Remove the elbow adapter (3) from the thermostat housing (2).
(8) Remove the 2 nuts (7) and lockwashers (4) from the 2 studs (10 and 11) and remove the lower outlet water pipe (8) and gasket (9) from the engine.

b. Cleaning, Inspection, and Testing.
(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Inspect the thermostat housing and lower outlet water pipe for breaks, cracks, and other damage. Replace a defective part.
(3) Inspect the flow control thermostat for visual defects. Replace a damaged flow control thermostat.
(4) Inspect the tube assembly and adapter, and mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.
(5) Test the flow control thermostat by positioning it in a suitable container filled with water. Suspend a thermometer in the water. Heat the water slowly and observe the thermometer readings and the action of the flow control thermostat. A serviceable flow control thermostat will start to open when the water temperature is approximately 155° F and be fully open at approximately 165° F. Replace a faulty flow control thermostat.

c. Reassembly and Installation.
(1) Position the gasket (9) and lower outlet water pipe (8) over the 2 studs (10 and 11)

and to the engine. Place the ground lead on the stud (10) and secure by installing the 2 lockwashers (4) and nuts (7) on the studs (10 and 11).

(2) Position the gasket (6) and flow control thermostat (5) on the lower outlet water pipe (8).

Note. Orient the flow control thermostat so that the word FRONT stamped on the thermostat will be positioned at the front end of the engine.

(3) Install the elbow adapter (3) on the thermostat housing (2).

(4) Install the thermostat housing on the lower outlet water pipe (8) and secure by installing the two lockwashers (4) and screws (1).

(5) Position the water pump-to-thermostat housing tube assembly (22, fig. 37) on its respective adapters and secure by tightening the two coupling nuts.

(6) Position the 2 hoses (4 and 24) to the thermostat housing (5) and secure by tightening the 2 hose clamps (2 and 23).

(7) Install the temperature safety switch (par. 114).

(8) Refill the radiator (TM 5–6115–232–10).

79. Fan Guard Assembly

a. Disassembly and Removal.

(1) Remove the two screws (16, fig. 37) and lockwashers that secure the right side fan guard (3) and the left side fan guard (21) to each other.

(2) Remove the two screws (16) and lockwashers (17) and remove the left side fan guard (21) from the radiator assembly (1).

(3) Remove the right side fan guard (3) from the radiator assembly (1) in a similar manner.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the left and right side fan guards for bends, broken welds, cracks, and other damage. Repair or replace a defective fan guard.

(3) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation and Reassembly.

(1) Position the left side fan guard (21) to the radiator assembly (1) and secure by installing the two lockwashers (17) and screws (16).

(2) Install the right side fan guard (3) to the radiator assembly (1) in a similar manner.

(3) Secure the right side fan guard (3) to the left side fan guard (21) by installing the two lockwashers and screws (16).

80. Radiator Shutter Control Assembly

a. Removal.

(1) Remove the front end panel assembly (par. 50).

(2) Drain the radiator (TM 5–6115–232–10).

(3) Remove the two screws (3, fig. 38) and lockwashers (4) and remove the radiator shutter control assembly (5) and gasket from the radiator assembly (12).

b. Disassembly.

(1) Remove the two setscrews (12, fig. 40) from the plunger assembly (14).

(2) Remove the nut (16), friction spring (17), flat washer (8), and screw (7) from hand lever (6) and thermostat and flange assembly (3).

(3) Pull the shaft assembly (15) with assembled lever (13) and rod assembly (9) from the plunger assembly (14) and thermostat and flange assembly (3).

(4) Remove the plunger assembly from the flange and thermostat housing and remove the hand lever (6) from the shaft assembly (15).

(5) Remove the cotter pin (11) and remove the rod assembly (9) from the lever (13).

(6) Mark the angular location of the lever (13) with respect to the shaft assembly (15). Remove the two setscrews (12) and remove the lever from the shaft.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

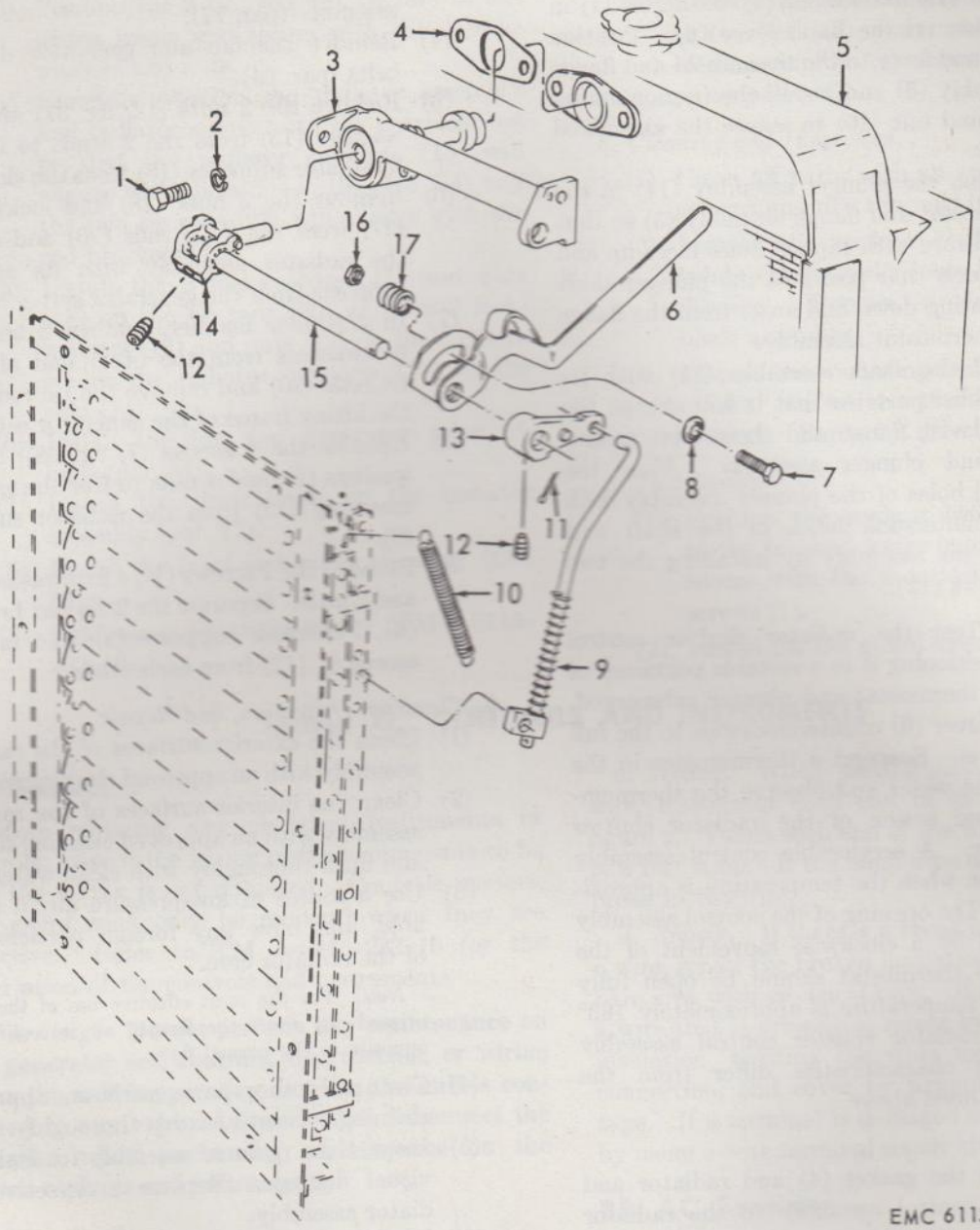
(2) Inspect the thermostat and flange assembly for visual damage. Replace a damaged thermostat and flange assembly.

(3) Inspect the gasket for breaks, tears, and wear. Replace a defective gasket.

(4) Inspect the mounting hardware and all other parts for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly.

(1) Position the lever (13) to its premarked radial relationship with the shaft assembly (15) and secure by installing the two setscrews (12).



EMC 6115-232-20/40

1 Screw, cap, hex-hd, $\frac{3}{8}$–16 x 1 in. (2 rqr)
2 Washer, lock, $\frac{3}{8}$ in. (2 rqr)
3 Thermostat and flange assembly
4 Gasket
5 Radiator assembly
6 Hand lever
7 Screw, cap, hex-hd, $\frac{5}{16}$–24 x $1\frac{3}{4}$ in.
8 Washer, flat, $\frac{5}{16}$ in.
9 Rod assembly
10 Spring
11 Pin, cotter, $\frac{5}{8}$ x $\frac{1}{16}$ in.
12 Setscrew, $\frac{1}{4}$–20 x $\frac{5}{16}$ in. (4 rqr)
13 Lever
14 Plunger assembly
15 Shaft assembly
16 Nut, hex, $\frac{5}{16}$–24
17 Friction spring

Figure 40. Radiator shutter control assembly, exploded view.

(2) Install the bent end of the rod assembly (9) in the hole of the lever (13) and secure by installing the cotter pin (11).
(3) Install the flat washer (8) and screw (7) in position on the hand lever (6). Position the hand lever to the thermostat and flange assembly (3) and install the friction spring (17) and nut (16) to secure the assembled parts.
(4) Position the plunger assembly (14) in the thermostat and flange assembly (3) so that the surface with tapped holes faces up and the clevis that positions the plunger shaft is pointing down and away from the flange and thermostat assembly.
(5) Install the shaft assembly (15) with its assembled parts so that it will engage the hand lever, flange and thermostat assembly, and plunger assembly. Aline the tapped holes of the plunger assembly with the countersunk holes in the shaft and secure the assembly by installing the two setscrews (12).

e. Testing. Test the radiator shutter control assembly by positioning it in a suitable container of water with the thermostat and plunger submerged. Push the hand lever (6) counterclockwise to the full limit of its travel. Suspend a thermometer in the water. Heat the water and observe the thermometer readings and action of the radiator shutter control assembly. A serviceable control assembly will start to open when the temperature is approximately 155° F. The opening of the control assembly will be reflected by a clockwise movement of the lever (13). The thermostat should be open fully when the water temperature is approximately 165° F. Replace a radiator shutter control assembly whose operating characteristics differ from the specifications outlined above.

f. Installation.
(1) Position the gasket (4) and radiator and shutter control assembly to the radiator assembly (5) and secure by installing the two lockwashers (2) and screws (1).
(2) Fill the radiator (TM 5–6115–232–10).
(3) Install the front end panel assembly (par. 50).

81. Radiator Assembly and Supports

a. Removal and Disassembly.
(1) Drain the radiator and engine (TM 5–6115–232–10).
(2) Remove the front end panel assembly (par. 50).
(3) Remove the three hoses from the radiator assembly (par. 77).
(4) Remove the fan and generator drive V-belts (par. 64).
(5) Remove the 2 nuts (12, fig. 37) and lockwashers (13) from the 2 studs to free the 2 radiator supports (15) from the skid (14).
(6) Remove the 2 nuts (18) and lockwashers (17) from the 2 tie rods (20) and remove the radiator assembly with its attached supports from the generator set.
(7) In a similar manner, remove 2 nuts and lockwashers from the other end of the 2 tie rods (20) and remove the tie rods from the lifting frame of the generator set.
(8) Remove the 4 screws (7, fig. 38), 8 lockwashers (2), and 4 nuts to free the radiator assembly (12) from the radiator supports (8).
(9) Remove the 2 screws (1), 4 lockwashers (2), and 2 nuts. Separate the 2 tie rod brackets (6), 2 radiator supports (8), and radiator assembly (12) from each other.

b. Cleaning, Inspection, and Repair.
(1) Clean the exterior surfaces of the radiator assembly with an approved cleaning solvent.
(2) Clean the interior surfaces of the radiator assembly with an approved cleaning solvent and flush thoroughly with clean water.
(3) Use a source of low-pressure air, if available, and blow any foreign particles out of the radiator core.

Note. For the most effective use of the compressed air, direct the flow of air in a direction opposite to the normal flow.

(4) Clean all other parts with an approved cleaning solvent and dry thoroughly.
(5) Inspect the radiator assembly for leaks an visual damage. Replace a defective radiator assembly.
(6) Inspect the mounting hardware, radiator supports, and tie rods for bends, breaks, cracks, defective threads, and other damage Replace a defective part.

c. Reassembly and Installation.
(1) Position the 2 radiator supports (8) and the 2 tie rod brackets (6) to the radiator assembly (12) and secure the assembly with the 2 screws (1), 4 lockwashers (2), and 2 nuts.

(2) Secure the radiator supports (8) to the radiator assembly (12) with the 4 screws (7), 8 lockwashers (2), and 4 nuts.
(3) Position the 2 tie rods (20, fig. 37) to the lifting frame and secure with the 4 lockwashers and nuts.
(4) Carefully position the radiator assembly and radiator supports to the generator set so that the radiator supports (15) will engage with the studs in the skid (14) and the two tie rods (20) will engage with the rod brackets (19).
(5) Install the 2 lockwashers (17) and nuts (18) on the tie rods (20) and the 2 lockwashers (13) and nuts (12) on the studs to secure the radiator supports (15) to the skid (14).
(6) Install the fan and generator drive V-belts (par. 64).
(7) Install the three hoses on the radiator assembly (par. 77).
(8) Install the front end panel assembly (par. 50).
(9) Refill the radiator and engine (TM 5–6115–232–10).

82. Coolant Blade Assembly

a. Removal.
(1) Remove the fan guard assembly (par. 79).
(2) Remove the four screws (1, fig. 34) and lockwashers (2) and remove the coolant blade assembly (4) from fan and water pump pulley (3).

b. Cleaning and Inspection.
(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Inspect the coolant blade assembly for bends, cracks, nicks, loose blades, and other damage. Replace a defective coolant blade assembly.
(3) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation.
(1) Position the coolant blade assembly (4) to the fan and water pump pulley (3) and secure with the four lockwashers (2) and screws (1).
(2) Install the fan guard assembly (par. 79).

Section XI. CONTROLS AND INSTRUMENTS

83. General

Before replacing any electrical instruments or controls, inspect the wiring of the components to be sure the wiring is not damaged. Controls, meters, and gages need only be replaced when they are defective. Refer to TM 5–6115–232–10 for the description of the controls and instruments.

Warning: **Do not perform any maintenance on the generator set, controls, instruments, or wiring when the unit is operating or when the unit is connected to any external lines. Also disconnect the batteries when performing maintenance on the engine controls and instruments.**

84. Wiring

a. General. A wiring harness is utilized for the interconnection of the components on this generator set. Terminals and leads of the wiring harness may be removed from terminals for the replacement of components. Individual wires, not part of the wiring harness, may be replaced.

b. Tagging. When replacing controls and instruments, tag the electrical leads that have been disconnected to facilitate reinstallation.

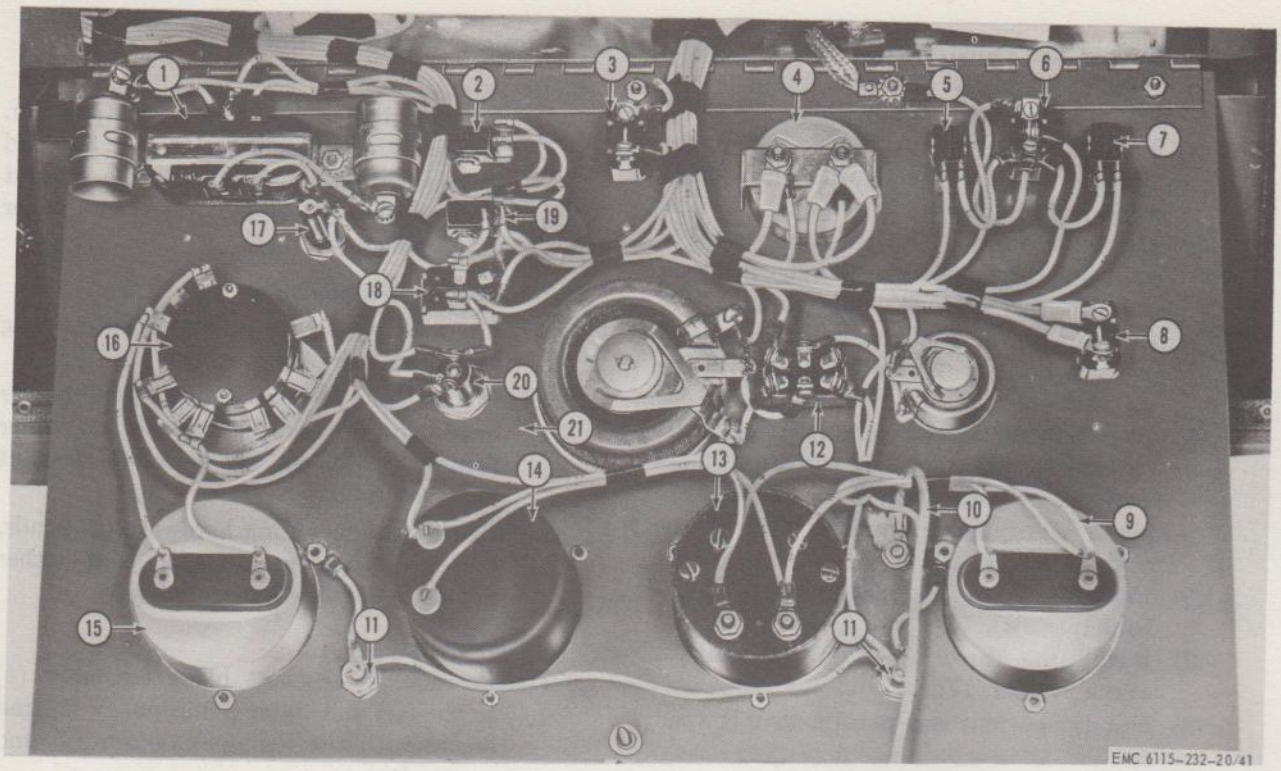
c. Testing. When testing the continuity of a wire, disconnect each end of the wire. Refer to figure 2. Touch each end of the wire with the probe of a test lamp. If the lamp does not light, there is a break in the wire.

d. Repair. If there is a break in the insulation of a wire, repair the broken insulation by wrapping the bare area with electrical tape. If there is a break in a wire that is accessible, repair by cutting back the insulation, twisting the ends together, solder the connection, and cover by wrapping with electrical tape. If a terminal is damaged or is lost, replace it by using a wire terminal repair kit.

85. AC Ammeter

a. Removal.
(1) Tag and remove the electrical leads from the ac ammeter (15, fig. 41).
(2) Remove the three nuts, lockwashers, and screws and remove the ac ammeter from the control panel (21).

Warning: **Do not operate the generator set with either the ac ammeter or the ammeter selector switch removed or dis-**



1 Duplex receptacle
2 Magnetic contractor OFF pushbutton switch
3 Panel lamp switch
4 Battery charging ammeter
5 Engine start pushbutton switch
6 Start switch
7 Engine stop pushbutton switch
8 Emergency heater switch
9 Ac voltmeter
10 Panel stop
11 Panel lamp receptacle (2 rqr)
12 Voltage adjustment emergency switch
13 Electrical frequency meter
14 Time totalizing meter
15 Ac ammeter
16 Ammeter selector
17 Fuseholder
18 Remote control toggle switch
19 Magnetic contactor ON pushbutton switch
20 Indicator light
21 Control panel

Figure 41. Controls and instruments, removal points.

connected unless the electrical leads to the ac ammeter or the ammeter selector switch are joined electrically and taped. High voltages developed in an open current transformer can cause death by electrocution.

b. Installation.

(1) Position the ac ammeter (15) to the control panel (21) and secure with the three screws, lockwashers, and nuts.

(2) Reconnect the tagged electrical leads with the ac ammeter.

c. Field Expedient Repair. If the ac ammeter is defective, remove the electrical leads and tape them together.

Caution: **Carefully check the total load of the generator set. Do not overload the unit.**

86. Time Totalizing Meter

a. Removal.

(1) Tag and remove the electrical leads from the time totalizing meter (14, fig. 41).

(2) Remove the three nuts, lockwashers, and screws and remove the time totalizing meter from the control panel (21).

b. Installation.

(1) Position the time totalizing meter (14) to the control panel (21) and secure with the three screws, lockwashers, and nuts.

(2) Reconnect the tagged electrical leads with the time totalizing meter.

87. Electrical Frequency Meter

a. Removal.

(1) Tag and remove the electrical leads from the electrical frequency meter (13, fig. 41).

(2) Remove the three nuts, lockwashers, and screws and remove the electrical frequency meter from the control panel (21).

b. Installation.

(1) Position the electrical frequency meter (13) to the control panel (21) and secure by installing the three screws, lockwashers, and nuts.

(2) Reconnect the tagged electrical leads with the electrical frequency meter.

c. Field Expedient Repairs. If the electrical frequency meter is defective, remove the electrical leads and tape the leads separately. Perform the following steps as necessary.

(1) Check and adjust the engine speed with a tachometer positioned against the end of the rotor assembly.

Caution: **Engine speed is critical when the power output of the generator set is being supplied to inductive devices such as electrical motors, transformers, electronic equipment and so on. A wide frequency devication results in damaged equipment or inaccurate operation.**

(2) To test and adjust the frequency, provide a source of 120-v, 60-cycle, power of known accuracy to the generator set. Operate the unit with no-load. Connect a suitable multimeter, set for 250-v, ac, between the output of the generator set and the 120-v, 60-cycle reference power source. Adjust the engine speed until the multimeter needle rises and falls very slowly, then increase the engine speed until the multimeter needle rises and falls three times per second. This corresponds to an engine speed at 1,880 rpm which is the correct no-load speed.

88. AC Voltmeter

a. Removal.

(1) Tag and remove the electrical leads from the ac voltmeter (9, fig. 41).

(2) Remove the three nuts, lockwashers, and screws and remove the ac voltmeter from the control panel (21).

b. Installation.

(1) Position the ac voltmeter (9) to the control panel (21) and secure with the three screws, lockwashers, and nuts.

(2) Reconnect the tagged electrical leads to the ac voltmeter.

c. Field Expedient Repair. If the ac voltmeter is defective, remove the electrical leads from the voltmeter and tape them separately. Check the voltage by connecting a suitable multimeter with the load terminals.

89. Ammeter Selector Switch

a. Removal.

(1) Tag and remove the electrical leads from the ammeter selector switch (16, fig. 41).

(2) Remove the two setscrews that secure the selector switch knob to the stem of the selector switch and remove the knob.

(3) Remove the two screws and lockwashers and remove the ammeter selector switch (16) and ammeter selector switch nameplate from the control panel (21).

Warning: **Do not operate the generator set with either the ac ammeter or the ammeter selector switch removed or disconnected unless the electrical leads to the ac ammeter or the ammeter selector switch are joined electrically and taped. High voltage developed in an open current transformer can cause death by electrocution.**

b. Installation.

(1) Position the ammeter selector switch nameplate and ammeter selector switch (16) to the control panel (21) and secure by installing the two lockwashers and screws.

(2) Install the selector switch knob on the stem of the switch and secure by installing the two setscrews.

(3) Reconnect the tagged electrical leads with the ammeter selector switch.

90. Indicator Light

a. Removal.

(1) Tag and remove the electrical leads from the indicator light (20, fig. 41).

(2) Remove the nut and lockwasher and remove the indicator light and nameplate from the control panel (21).

b. Installation.

(1) Position the indicator light (20) and nameplate to the control panel (21) and secure by installing the lockwasher and nut.

(2) Reconnect the tagged electrical leads with the indicator light.

91. Voltage Adjustment Emergency Switch

a. Removal.

(1) Tag and remove the electrical leads from the voltage adjustment emergency switch (12 fig. 41).

(2) Remove the nut and remove the voltage adjustment emergency switch from the control panel (21).

b. Installation.

(1) Position the voltage adjustment emergency switch (12) to the control panel (21) and secure by installing the nut.

(2) Reconnect the tagged electrical leads with the voltage adjustment emergency switch

92. Emergency Heater Switch

a. Removal.

(1) Tag and remove the electrical leads from the emergency heater switch (8, fig. 41).

(2) Remove the nut and remove the emergency heater switch from the control panel (21).

b. Installation.

(1) Position the emergency heater switch (8) to the control panel (21) and secure with the nut.

(2) Reconnect the tagged electrical leads with the emergency heater switch.

93. Duplex Receptacle

a. Removal.

(1) Tag and remove the electrical leads from the duplex receptacle (1, fig. 41).

(2) Remove the duplex receptacle from the control panel (21) by removing the two duplex receptacle capacitors (par. 45).

b. Installation.

(1) Install the duplex receptacle (1) on the control panel (21) by installing the two duplex receptacle capacitors (par. 45).

(2) Reconnect the tagged electrical leads with the duplex receptacle.

94. Magnetic Contactor on and off Push-button Switches

a. Removal.

(1) Tag and remove the electrical leads from the magnetic contactor OFF pushbutton switch (2, fig. 41) and the magnetic contactor ON pushbutton switch (19).

(2) Remove the two nuts and remove both pushbutton switches and the nameplate from the control panel (21).

b. Installation.

(1) Position the magnetic contactor OFF pushbutton switch (2), the magnetic contactor ON pushbutton switch (19), and the nameplate to the control panel (21) and secure by installing the two nuts.

(2) Reconnect the tagged electrical leads with the two pushbutton switches.

95. Panel Lamp Receptacles

a. Removal.

(1) Tag and remove the electrical leads from the two panel lamp receptacles (11, fig. 41).

(2) Remove the panel lamps (TM 5–6115–232–10).

(3) Remove the two nuts and remove both panel lamp receptacles from the control panel (21).

b. Installation.

(1) Position the 2 panel lamp receptacles (11) to the control panel (21) and secure by installing the 2 nuts.

(2) Install the panel lamps (TM 5–6115–232–10).

(3) Reconnect the tagged electrical leads with the two panel lamp receptacles.

96. Panel Lamp Switch

a. Removal.

(1) Tag and remove the electrical leads from the panel lamp switch (3, fig. 41).

(2) Remove the nut and remove the panel lamp switch from the control panel (21).

b. Installation.

(1) Position the panel lamp switch (3) to the control panel (21) and secure with the nut.

(2) Reconnect the tagged electrical leads with the panel lamp switch.

97. Fuseholder

a. Removal.

(1) Tag and remove the electrical leads from the fuseholder (17, fig. 41).

(2) Remove the nut and remove the fuseholder from the control panel (21).

b. Installation.

(1) Position the fuseholder (17) to the control panel (21) and secure with the nut.

(2) Reconnect the tagged electrical leads with the fuseholder.

98. Remote Control Toggle Switch

a. Removal.

(1) Tag and remove the electrical leads from

the remote control toggle switch (18, fig. 41).

(2) Remove the nut and remove the nameplate and remote control toggle switch from the control panel (21).

b. Installation.

(1) Position the remote control toggle switch (18) and nameplate to the control panel (21) and secure with the nut.

(2) Reconnect the tagged electrical leads with the remote control toggle switch

99. Battery-Charging Ammeter

a. Removal.

(1) Tag and remove the electrical leads from the battery-charging ammeter (4, fig. 41).

(2) Note the position and remove the mounting hardware and battery-charging ammeter from the control panel (21).

b. Installation.

(1) Position the battery-charging ammeter (4) to the control panel (21) and secure by installing the mounting hardware in its noted location.

(2) Reconnect the tagged electrical leads with the battery-charging ammeter.

100. Start Switch

a. Removal.

(1) Tag and remove the electrical leads from the start switch (6, fig. 41).

(2) Remove the nut and remove the start switch from the control panel (21).

b. Installation.

(1) Position the start switch (6) to the control panel (21) and secure by installing the nut.

(2) Reconnect the tagged electrical leads with the start switch.

c. Field Expedient Repair. If the engine will not start due to a defective start switch, use a jumper around the switch.

101. Engine Start Pushbutton Switch

a. Removal.

(1) Tag and remove the electrical leads from the engine start pushbutton switch (5, fig. 41).

(2) Remove the nut and remove the engine start pushbutton switch from the control panel (21).

b. Installation.

(1) Position the engine start pushbutton switch (5) to the control panel (21) and secure by installing the nut.

(2) Reconnect the tagged electrical leads with the engine start pushbutton switch.

c. Field Expedient Repair. If the engine will not start due to a defective engine start pushbutton switch not energizing the engine electrical starter to crank the engine, use a suitable wire to momentarily jump the engine start pushbutton switch to crank the engine.

102. Engine Stop Pushbutton Switch

a. Removal.

(1) Tag and remove the electrical leads from the engine stop pushbutton switch (7, fig. 41).

(2) Remove the nut and remove the engine stop pushbutton switch from the control panel (21).

b. Installation.

(1) Position the engine stop pushbutton switch (7) to the control panel (21) and secure by installing the nut.

(2) Reconnect the tagged electrical leads with the engine pushbutton stop switch.

103. Control Panel-To-Control Box Lead Assembly

a. Removal. Remove the control panel-to-control box lead assembly (par. 45).

b. Installation. Install the control panel-to-control box lead assembly (par. 45).

104. Panel Stop

a. Removal. Remove the mounting hardware and remove the panel stop (10, fig. 41) from the control panel (21) and control box.

b. Installation. Position the panel stop (10) to the control panel (21) and control box and secure by installing the mounting hardware.

105. Load Terminal Board Assembly

a. Removal.

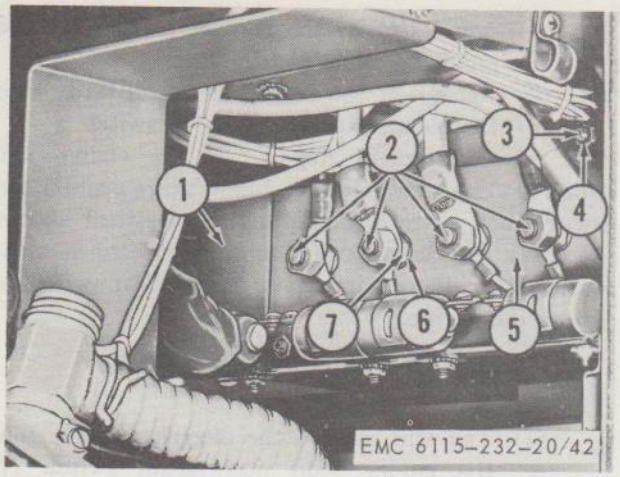
(1) Tag and remove the electrical leads from the load terminals (2, fig. 42).

(2) Remove the four nuts (4), lockwashers, and screws (3) and remove the load terminal board (5) from the panel (1).

b. Disassembly. Remove the four nuts (7) and lockwashers (6) and remove the load terminals (2) from the load terminal board (5).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.



1 Panel
2 Load terminal (4 rqr)
3 Screw, rd-hd, No. 10–32 x 5/8 in. (4 rqr)
4 Nut, hex, No. 10–32 (4 rqr)
5 Load terminal board
6 Washer, lock, IT, 3/8 in. (8 rqr)
7 Nut, hex, brass, 3/8–16 (8 rqr)

Figure 42. Load terminal board assembly, removal points

(2) Inspect the load terminal board for breaks, cracks, and other damage. Replace a defective load terminal board.

(3) Inspect the load terminals and mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly. Position the 4 load terminals (2) to load terminal board (5) and secure with the 4 lockwashers (6) and nuts (7).

e. Installation.

(1) Position the load terminal board (5) to the panel (1) and secure with the four screws (3), lockwashers, and nuts (4).

(2) Reconnect the tagged electrical leads with the load terminals (2).

106. Remote Control Terminal Block Assembly

a. Removal.

(1) Tag and remove the electrical leads from the remote terminals (3, fig. 21).

(2) Remove the four nuts (5), lockwashers (4), and screws (6) and remove the remote control terminal block (7) from the panel (8).

b. Disassembly. Remove the three nuts (1) and lockwashers and remove the remote terminals (3) from the remote control terminal block (7).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the remote control terminal block assembly for breaks, cracks, and other damage. Replace a defective remote control terminal block assembly.

(3) Inspect the load terminals and mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly. Position the 3 remote terminals (3) to the remote control terminal block (7) and secure by installing the 3 lockwashers and nuts (1).

e. Installation.

(1) Position the remote control terminal block (7) to the panel (8) and secure by installing the four screws (6), lockwashers (4), and nuts (5).

(2) Reconnect the tagged electrical leads with the remote terminals (3).

107. Engine Control Panel and Panel

a. Removal.

(1) Remove the electrical leads from the load terminals (par. 105).

(2) Remove the electrical leads from the remote terminals (par. 106).

(3) Remove the engine primer pump (par. 60).

(4) Remove the 4 nuts, 8 lockwashers (5, fig. 20), and 4 screws (6) and carefully pull the panel (7) away from the frame (4).

(5) Remove the four screws (2) and lockwashers (3) and remove the engine instrument panel (1) from the panel (7).

b. Cleaning and Inspection.

(1) Clean the engine control panel and panel with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the engine control panel and panel for bends, cracks, and other damage. Replace a defective part.

(3) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation.

(1) Position the engine instrument panel (1) to the panel (7) and secure with the four lockwashers (3) and screws (2).

(2) Carefully position the panel (7) to the frame (4) and secure with the 8 lockwashers (5), 4 screws (6), and 4 nuts.

(3) Install the engine primer pump (par. 60).

(4) Reconnect the electrical leads with the remote terminals (par. 106).

(5) Reconnect the electrical leads with the load terminals (par. 105).

108. Throttle Control Assembly

a. Removal.

(1) Remove the engine control panel and panel (par. 107).

(2) Remove the throttle cable assembly from the governor connecting rod (par. 58).

Note. Loosen brackets and other fastening devices as necessary.

(3) Remove the nut (3, fig. 43) and lockwasher (5) and remove the throttle control assembly (4) from the generator set and engine instrument panel (2).

b. Cleaning and Inspection.

(1) Clean the throttle control assembly using a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the throttle control assembly for bends, cracks, kinks, and other damage. Replace a defective throttle control.

c. Installation.

(1) Thread the throttle control assembly (4) through the engine instrument panel (2), lockwasher (5), and nut (3) and into the generator set. Secure by tightening the nut.

(2) Reconnect the throttle control assembly with the governor linkage (par. 58).

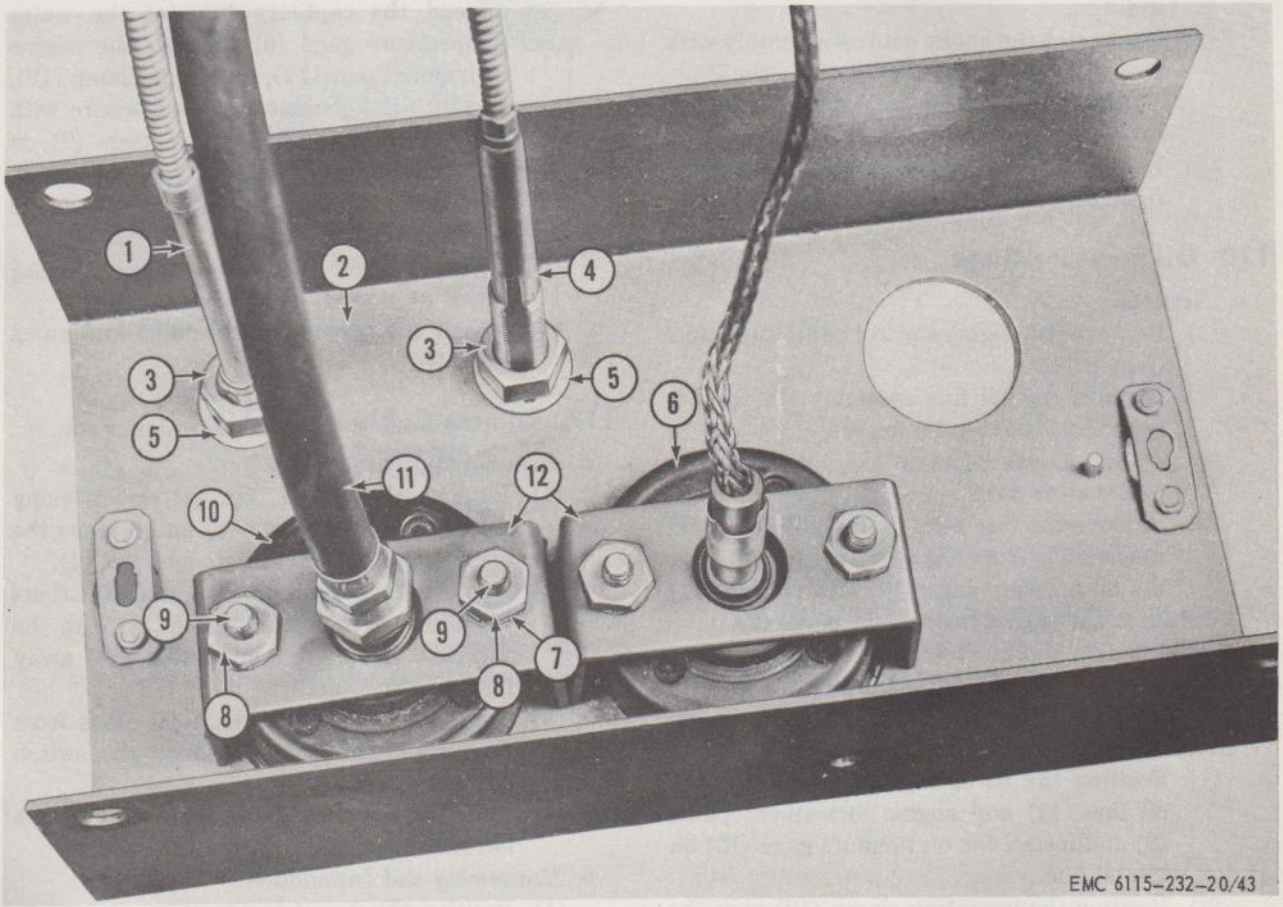
Note. Tighten brackets and other fastening devices as necessary.

(3) Install the engine control panel and panel (par. 107).

109. Choke Control Assembly

a. Removal.

(1) Remove the engine control panel and panel (par. 107).



1 Choke control assembly
2 Engine instrument panel
3 Hex nut (spec) (2 rqr)
4 Throttle control assembly
5 Washer, lock, IT, ⅜ in. (2 rqr)
6 Water temperature gage
7 Washer, lock, ¼ in. (4 rqr)
8 Nut, hex, ¼–20 (4 rqr)
9 Stud (4 rqr)
10 Oil pressure gage
11 Oil line
12 Mounting clamp (2 rqr)

Figure 43. Engine controls and instruments, removal points.

(2) Remove the choke control assembly from the carburetor (par. 57).

Note. Loosen brackets and other fastening devices as necessary.

(3) Remove the nut (3, fig. 43) and lockwasher (5) and remove the choke control assembly (1) from the generator set and engine instrument panel (2).

b. Cleaning and Inspection.

(1) Clean the choke control assembly using a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the choke control assembly for bends, cracks, kinks, and other damage. Replace a defective choke control assembly.

c. Installation.

(1) Thread the choke control assembly (1) through the engine instrument panel (2), lockwasher (5), and nut (3) and into the generator set. Secure by tightening the nut.

(2) Reconnect the choke control assembly with the carburetor (par. 57).

Note. Tighten brackets and other fastening devices as necessary.

(3) Install the engine control panel and panel (par. 107).

110. Oil Pressure Gage

a. Removal.

(1) Remove the engine control panel and panel (par. 107).

(2) Remove the oil line assembly (6, fig. 24) from the pipe-to-tube tee (7).

Note. Loosen brackets and other fastening devices as necessary.

(3) Remove the two nuts (8, fig. 43) and lockwashers (7) from the studs (9) and remove the oil pressure gage (10) and oil line (11) from the engine instrument panel (2).

(4) Remove the oil line from the oil pressure gage and remove the mounting clamp (12) from the oil line.

b. Installation.

(1) Position the mounting clamp (12) on the oil line (11) and engine instrument panel (2) and install the oil pressure gage (10) on the oil line.

(2) Position the mounting clamp (12) over the studs (9) and secure with the two lockwashers (7) and nuts (8).

(3) Install the engine control panel and panel (par. 107).

(4) Install the oil line assembly (6, fig. 24) on the pipe-to-tube tee (7).

Note. Tighten brackets and other fastening devices as necessary.

111. Water Temperature Gage

a. Removal.

(1) Remove the engine control panel and panel (par. 107).

(2) Remove the capillary tube (9, fig. 32) from the cylinder head (8).

Note. Loosen brackets and other fastening devices as necessary.

(3) Remove the two nuts (8, fig. 43) and lockwashers (7) from the studs (9) and remove the water temperature gage (6), with attached capillary tube, from the engine. instrument panel (2), mounting clamp (12), and the generator set.

b. Installation.

(1) Thread the capillary tube of the water temperature gage (6) through the engine instrument panel (2), mounting clamp (12), and into the generator set and secure with the two nuts (8) and lockwashers (7) on the studs (9).

(2) Install the capillary tube (9, fig. 32) in the cylinder head (8).

Note. Tighten brackets and other fastening devices as necessary.

(3) Install the engine control panel and panel (par. 107).

112. Remote Cable Assembly

a. Removal and Disassembly.

(1) Remove the nut (7, fig. 44) and bushing (6) from the connector (5) and remove the connector from the switch condulet (4).

(2) Remove the two screws (1) and lockwashers (9) and pull the switch plate (2), with the attached cable (8) and gasket (3), away from the condulet.

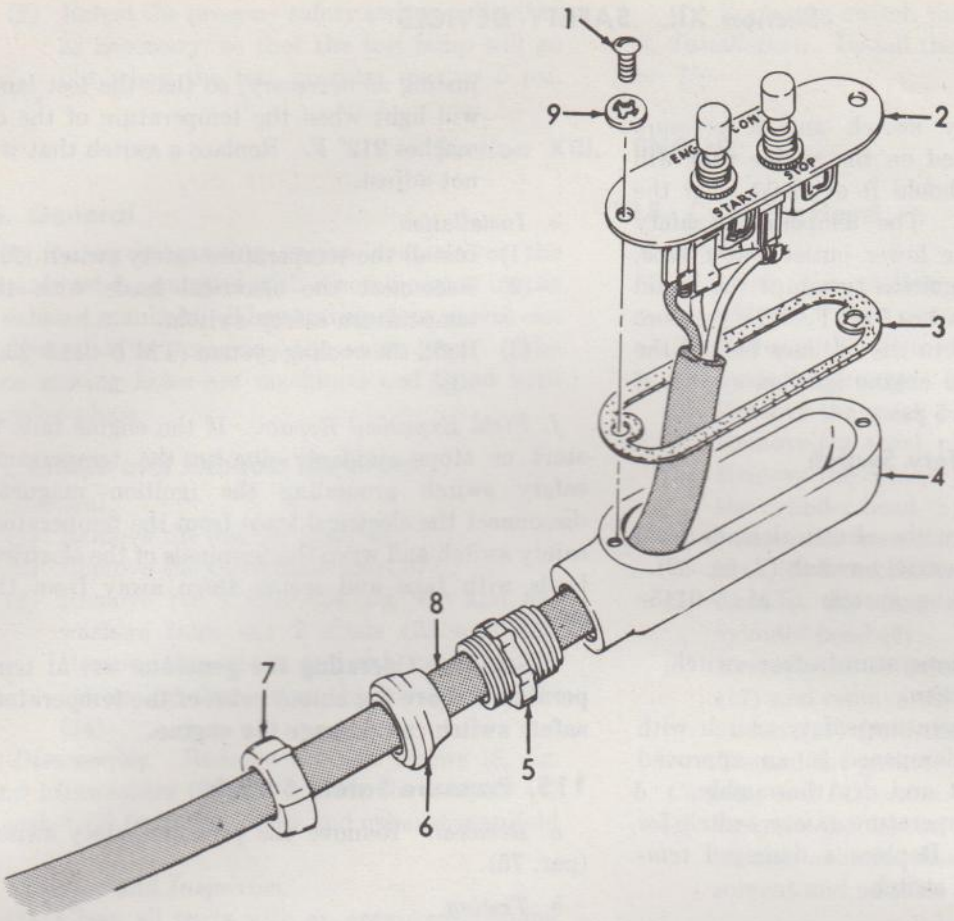
(3) Tag and remove the electrical leads from the two switches mounted on the switch plate.

(4) Remove the two nuts and remove the switches from the switch plate.

b. Reassembly and Installation.

(1) Position the 2 switches to the switch plate (2) and secure by installing the 2 nuts and position the gasket (3) on the condulet (4).

(2) Reconnect the tagged electrical leads with the two switches.



EMC 6115–232–20/44

1	Screw, rd-hd, No. 8–32 x 3/8 in. (2 rqr)	3	Gasket	6	Bushing	9	Washer, lock, IT, No. 8 (2 rqr)
2	Switch plate	4	Condulet	7	Nut		
		5	Connector	8	Cable		

Figure 44. Remote cable assembly, partially exploded.

(3) Position the gasket (3) and switch plate (2) to the condulet (4) by carefully pulling the attached cable (8) through the condulet and secure with the two lockwashers (9) and screws (1).

(4) Install the connector (5) in the condulet, position the bushing (6) in the connector, and secure by tightening the nut (7).

113. General

A temperature safety switch and a pressure safety switch are installed on the engine that will shut the engine down should it overheat or if the oil pressure is too low. The temperature safety switch, assembled to the lower outlet water pipe, will ground the engine ignition system if the liquid in the coolant system reaches 212° F. The pressure safety switch, assembled to the oil lines behind the oil filter, will ground the engine ignition system if the pressure drops below 5 psi.

114. Temperature Safety Switch

a. Removal.

(1) Tag and remove the electrical leads from the temperature safety switch (2, fig. 32).

(2) Drain the cooling system (TM 5–6115–232–10).

(3) Remove the temperature safety switch.

b. Cleaning and Inspection.

(1) Clean the temperature safety switch with a clean cloth dampened in an approved cleaning solvent and dry thoroughly.

(2) Inspect the temperature safety switch for visual defects. Replace a damaged temperature safety switch.

c. Testing.

(1) Connect a test lamp circuit to the terminals of the temperature safety switch (2). If the test lamp does not light, proceed with the testing. If the test lamp does light, adjust the switch (*d* below).

(2) Immerse the bulb of the temperature safety switch in a suitable container of a high-flash point oil.

(3) Place a thermometer, with a temperature range exceeding 212° F, in the container and apply heat. When the temperature of the oil reaches 212° F, the test lamp should light. If the test lamp does not light, adjust the switch (*d* below).

d. Adjusting.

(1) An adjustment screw is located between the terminals of the temperature safety switch. Turn this screw clockwise to increase the temperature which will close the switch and cause the test lamp to light. Turn the screw counterclockwise to decrease the temperature which will open the switch and cause the test lamp to go out.

(2) Retest the temperature safety switch, adjusting as necessary, so that the test lamp will light when the temperature of the oil reaches 212° F. Replace a switch that will not adjust.

e. Installation.

(1) Install the temperature safety switch (2).

(2) Reconnect the electrical leads with the temperature safety switch.

(3) Refill the cooling system (TM 5–6115–232–10).

f. Field Expedient Repair. If the engine fails to start or stops suddenly due to the temperature safety switch grounding the ignition magneto, disconnect the electrical leads from the temperature safety switch and wrap the terminals of the electrical leads with tape and secure them away from the switch.

Caution: **Operating the generator set at temperatures above the cutout point of the temperature safety switch can damage the engine.**

115. Pressure Safety Switch

a. Removal. Remove the pressure safety switch (par. 75).

b. Testing.

(1) Connect a test lamp circuit to the terminal of the pressure safety switch and the base of the switch. If the test lamp lights, continue with the test. If the test lamp does not light, adjust the switch (*c* below.)

(2) Connect the pressure safety switch with a source of air pressure that can be varied above and below 5 psi and at the same time connect a suitable pressure gage to the test circuit.

(3) Increase the pressure in the test circuit until the gage reads 5 psi. If the test light does not go out when the indicated pressure reaches this point, adjust the switch (*c* below).

c. Adjusting.

(1) An adjustment screw is located adjacent to the terminal of the pressure safety switch. Turn this screw clockwise to increase the pressure which will open the switch and cause the test lamp to go out. Turn this screw counterclockwise to decrease the pressure which will open the switch and cause the test lamp to go out.

(2) Retest the pressure safety switch, adjusting as necessary, so that the test lamp will go out when the test pressure reaches 5 psi. Replace a switch that will not adjust.

d. Installation. Install the pressure safety switch (par. 75).

Section XIII. ENGINE

116. General

The four-cycle gasoline engine that drives the generator set is equipped with a combination intake and exhaust manifold. The rotating-type valves can be adjusted after removing the valve cover. The engine casting holes are machined and fitted with expansion plugs.

117. Intake and Exhaust Manifold

a. Removal.

(1) Remove the muffler (par. 48).
(2) Remove the carburetor (par. 57).
(3) Remove the 4 nuts (24, fig. 16) and flat washers from the 2 studs (23 and 28). Remove the intake and exhaust manifold (1) and gaskets from the block assembly (34).

b. Disassembly. Remove the two screws (5, fig. 4) and lockwashers (6) and remove the adapter (4) and gasket (7) from the intake and exhaust manifold (8).

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Inspect the intake and exhaust manifold for breaks, cracks, and other damage. Replace a defective manifold.
(3) Inspect the adapter for bends, broken welds, cracks, and other damage. Replace a defective adapter.
(4) Inspect the gaskets for breaks, tears, and other damage. Replace a defective gasket.
(5) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

d. Reassembly. Position the gasket (7) and adapter (4) to the intake and exhaust manifold (8) and secure by installing the two lockwashers (6) and screws (5).

e. Installation.

(1) Position the gaskets and intake and exhaust manifold (1, fig. 16) to the block assembly (34) and secure by installing the 4 flat washers and nuts (24) on the 2 studs (23 and 28).
(2) Install the carburetor (par. 57).
(3) Install the muffler (par. 48).

118. Cylinder Head

a. Removal.

(1) Drain the cooling system (TM 5-6115-232-10).
(2) Remove the thermostat housing and flow control thermostat (par. 78).
(3) Remove the spark plug leads (par. 70).
(4) Remove the spark plugs (par. 71).
(5) Remove the capillary tube (9, fig. 32) from the cylinder head (8).
(6) Loosen the hose clamp (6) and remove the hose (7) from the water shutoff valve (5).
(7) Remove the water shutoff valve from the cylinder head (8).
(8) Remove the 18 bolts (18) and flat washers (17) and remove the cylinder head (8) and gasket (19) from the block assembly (16). Discard the gasket.

b. Cleaning and Inspection.

(1) Remove the carbon from the inner surface of the cylinder head with an approved solvent and suitable scrapers.

> *Caution:* **Exercise care so as not to nick, scratch, or otherwise damage the machined mating surface of the cylinder head.**

(2) Clean the cylinder head with an approved cleaning solvent and dry thoroughly.
(3) Protect the piston openings of the block assembly with suitable covering and carefully scrape any accumulated carbon from the top of the block assembly.
(4) Inspect the cylinder head for cracks, defective machined mating surface, warping, and other damage. Replace a defective cylinder head.
(5) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation.

(1) Position a new gasket (19) and the cylinder head (8) to the block assembly (16) and install the 18 flat washers (17) and bolts (18). Tighten the bolts in the sequence illustrated in figure 45 to a torque value of 50 ft-lb.

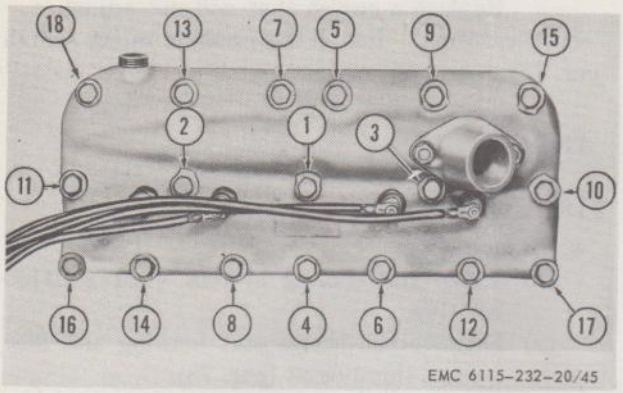


Figure 45. Cylinder head bolts tightening sequence.

(2) Install the water shutoff valve (5) on the cylinder head (8).
(3) Position the hose (7) on the water shutoff valve and secure by tightening the hose clamps (6).
(4) Install the capillary tube (9) in the cylinder head (8).
(5) Install the spark plugs (par. 71).
(6) Install the spark plug leads (par. 70).
(7) Install the thermostat housing and flow control thermostat (par. 78).
(8) Refill the cooling system (TM 5–6115–232–10).

119. Valve Cover

a. Removal.
(1) Remove the air cleaner-to-carburetor hose (par. 54).
(2) Remove the two screws (2, fig. 17) and gasket (1) and remove the valve cover (4), and spark plug lead angle bracket (3) from the block assembly (5).

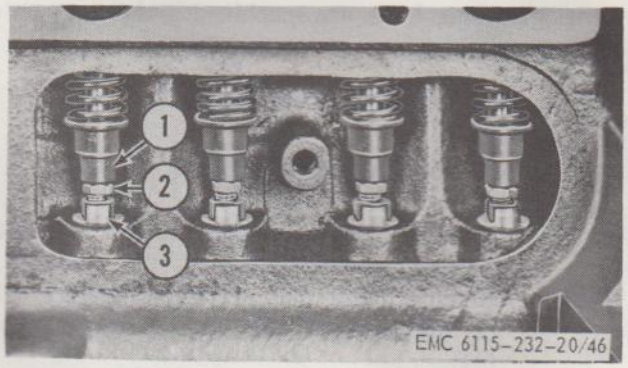
b. Cleaning and Inspection.
(1) Clean all parts with an approved cleaning solvent and dry thoroughly.
(2) Inspect the valve cover for cracks, dents, and other damage. Replace a defective valve cover.
(3) Inspect the gasket for cracks, tears, and other damage. Replace a defective gasket.
(4) Inspect the mounting hardware for bends, cracks, defective threads, and other damage cracks, defective threads, and other damage. Replace a defective part.

c. Installation.
(1) Position the gasket valve cover (4) and spark plug lead angle bracket (3) to the block assembly (5) and secure by installing the two gaskets (1) and screws (2).
(2) Install the air cleaner-to-carburetor hose (par. 54).

120. Valve Lifter Adjustment

a. Remove the valve cover (par. 119).

b. Crank the engine until the No. 1 piston is at the firing position which is indicated when both the intake and exhaust valves are in their lowest position and the valve lifter (3, fig. 46) moves away from the valve stem cap (1).



1 Valve stem cap
2 Adjusting screw
3 Valve lifter

Figure 46. Valve lifter, adjustment points.

c. Check the clearance between the valve stem cap (1) and the adjusting screw (2) with a feeler gage. The cold clearance for inlet valve is 0.008 inch and the cold clearance for the exhaust valve is 0.010 inch.

d. Adjust the clearance by using a wrench on the flats of the valve lifter (3) to hold it secure, and with a second wrench increase or decrease the clearance by turning the adjusting screw (2).

e. Install the valve cover (par. 119).

121. Oil Filter Plate Cover and Expansion Plug

a. Removal.
(1) Drain the oil from the crankcase (TM 5–6115–232–10).
(2) Remove the two screws (23, fig. 24) and lockwashers (1) and remove the oil filter cover plate (22) and gasket from the block assembly (11).
(3) Drain the coolant system before removing an expansion plug (TM 5–6115–232–10).
(4) Remove a defective expansion plug (2) from the block assembly (11) by driving a punch into the plug and pulling it free of the block. Discard the plug.

Note. A defective expansion plug will leak coolant from the block assembly. Replace a defective plug.

(5) Remove any of the other four expansion plugs that may be defective from the block assembly in a similar manner. Discard the plugs.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the oil filter cover plate for breaks cracks, and other damage. Replace a defective cover.

(3) Inspect the gasket for cracks, tears, and wear. Replace a defective gasket.

(4) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation.

(1) Install a replacement expansion plug (2) in the block assembly (11) by tapping it evenly into place.

(2) Refill the coolant system if drained (TM 5–6115–232–10).

(3) Position the gasket and oil filter cover plate (22) to the block assembly and secure by installing the two lockwashers (1) and screws (23).

(4) Add oil to the crankcase (TM 5–6115–232–10).

Section XIV. AC GENERATOR AND EXCITER

122. General

The ac generator and exciter is equipped with brushes which are located inside the bearing bracket cover. The ac generator is ventilated with an internal fan that pulls air in at one end and pushes heated air out of the other end. These ventilation openings are covered with guard screens.

123. Bearing Bracket Cover

a. Removal. Remove the four screws (1, fig. 47) and lockwashers (2) and remove the bearing bracket cover (8) from the bearing bracket (3).

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the bearing bracket cover for breaks, cracks, and other damage. Replace a defective bearing bracket cover.

(3) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Installation. Position the bearing bracket cover (8) to the bearing bracket (3) and secure by installing the four lockwashers (2) and screws (1).

124. Guard Screens

a. Removal.

(1) Remove the two screws (5, fig. 47) and lockwashers (4) and remove the guard screen (6) from the ac generator (7).

(2) Remove the other guard screen in a similar manner.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the guard screens for cracks, broken welds, and other damage. Replace a defective guard screen.

c. Installation.

(1) Position the guard screen (6) to the ac generator (7) and secure with the two lockwashers (4) and screws (5).

(2) Install the other guard screen in a similar manner.

125. Brushes

a. Removal.

(1) Remove the bearing bracket cover (par. 123).

(2) Remove the brush holder cap (4, fig. 48) from the brush holder (2) and remove the brush (3).

(3) Remove the other seven brushes in a similar manner.

Note. Note location of brushes prior to removal.

b. Cleaning and Inspection.

(1) Clean the brushes with a clean, lint-free cloth.

(2) Inspect the brushes for cracks, chips, wear, broken compression spring, and other damage. Discard a defective brush.

Note. Allowable wear limit for a brush is three-eights inch.

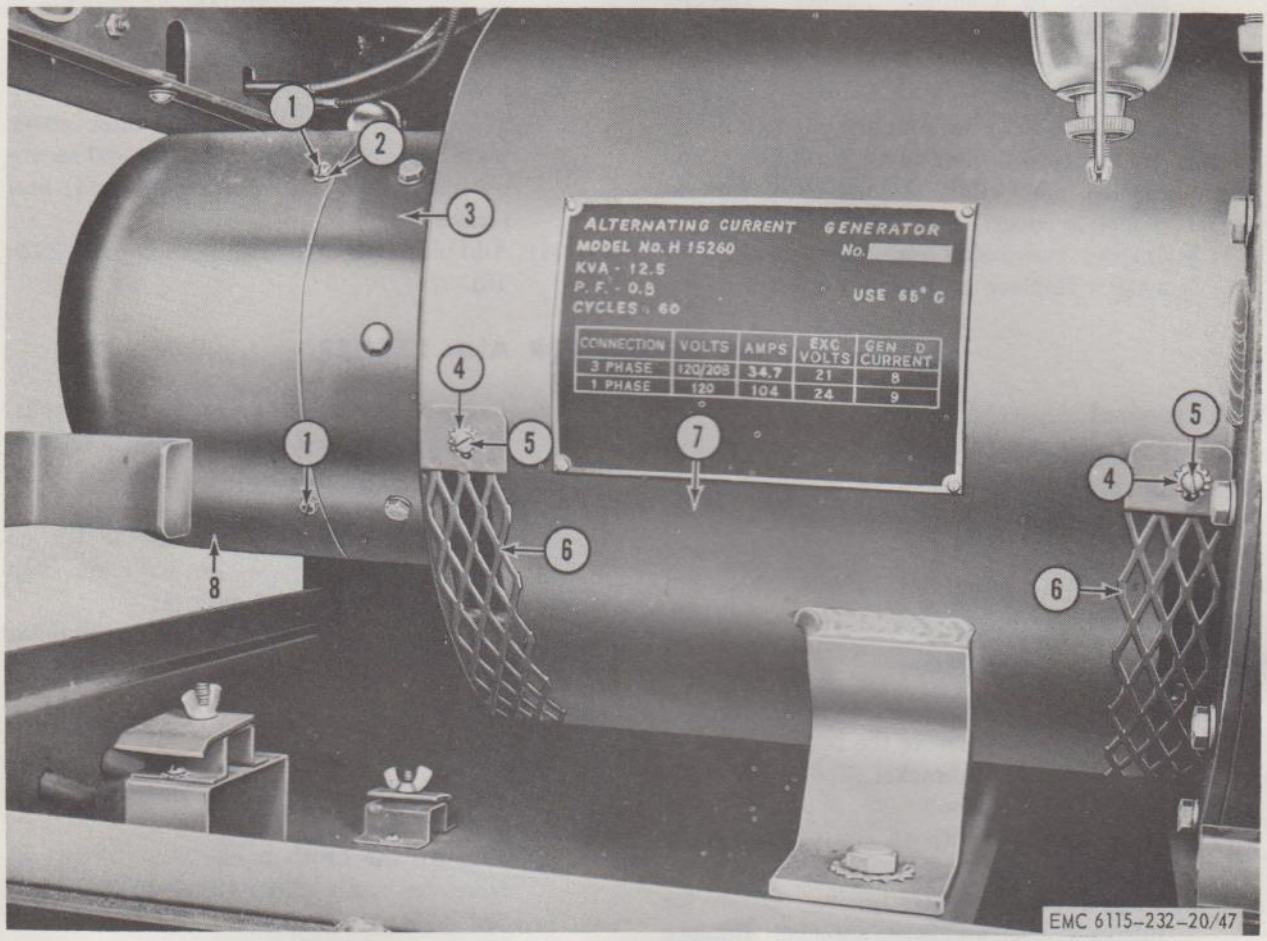
c. Installation.

(1) Position the brush (3) at its noted location in the brush holder (2) and secure by installing the brush holder cap (4).

(2) Install the other seven brushes in a similar manner.

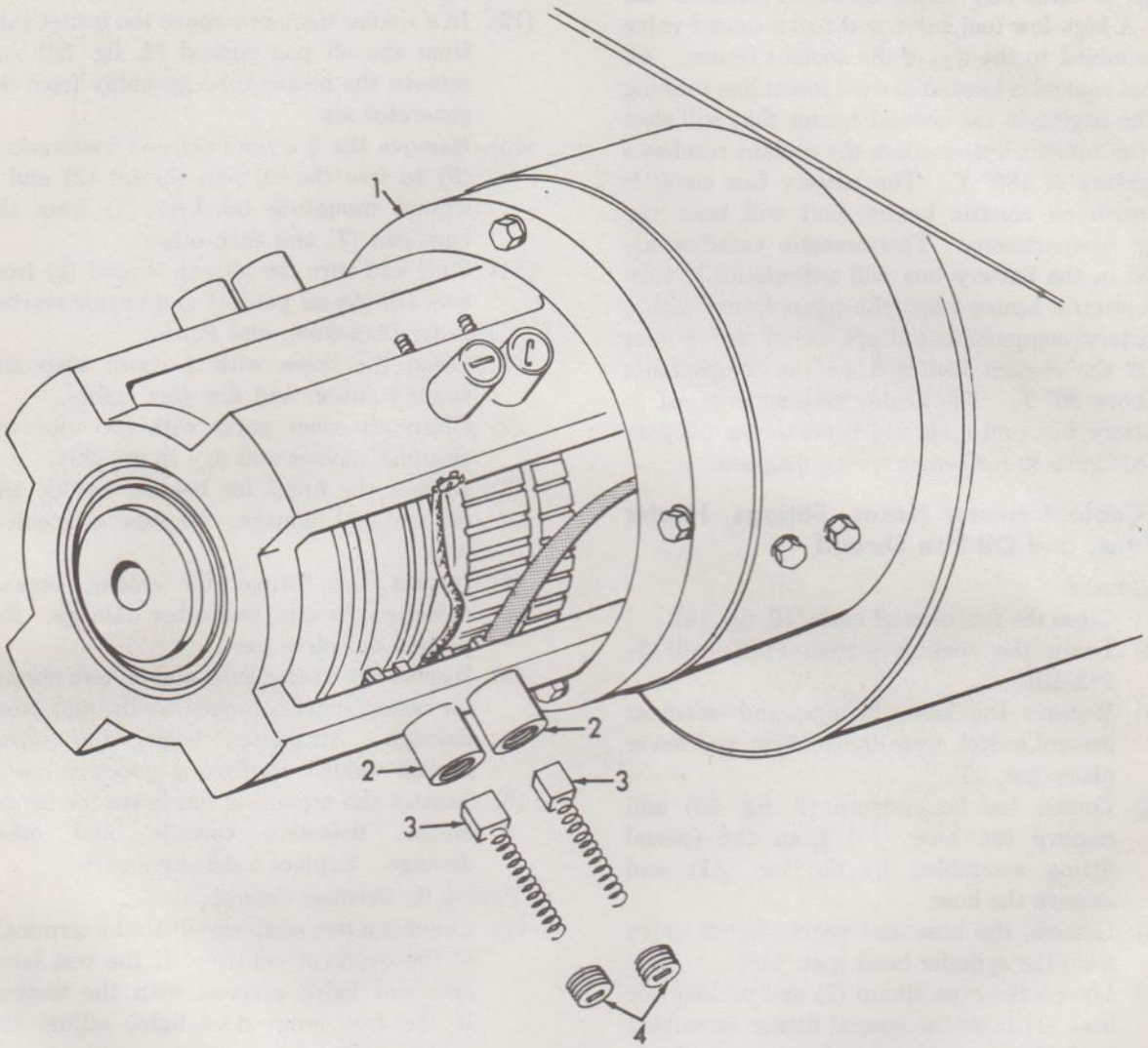
(3) Install the bearing bracket cover (par. 123).

d. Brush Replacement. When replacing brushes, it is important that they be carefully fitted to the commutator or collector rings. To fit brushes, slip a piece of grade 00 flint paper between the commutator or collector ring with the flint surface facing the brush, being sure that the paper is the same width as the commutator or collector ring. Move the paper in one direction only until the proper brush surface is obtained.



1 Screw, machine, hex-hd, slotted, No. 10–32 x ½ in. (4 rqr)
2 Washer, lock, IT, No. 10 (4 rqr)
3 Bearing bracket
4 Washer, lock, IET, No. 10 (4 rqr)
5 Screw, rd-hd, No. 10–32 x ⅜rn. (4 rqr)
6 Guard sceen (2 rqrr)
7 Ac generator
8 Bearing bracket cover

Figure 47. Bearing bracket cover and guard screen, removal points.



EMC 6115–232–20/48

1 Bearing bracket 2 Brush holder (8 rqr) 3 Brush (8 rq.) 4 Brush holder cap (8 rqr)

Figure 48. Ac generator and exciter brushes, exploded view.

126. General

The generator set is provided with a coolant heater assembly and accessories to enable the unit to operate at low ambient temperatures. Gasoline is gravity fed from the generator set fuel tank through a three-way valve mounted beneath the tank. A high-low fuel valve and fuel solenoid valve are assembled to the top of the coolant heater. An overheat control is located in the coolant line running from the engine to the coolant heater that will shut down the coolant heater when the coolant reaches a temperature of 180° F. The battery box cover is fitted with an electric heater that will heat the battery compartment. Thermostatic switches assembled in the battery box will automatically turn on the electric heater when the temperature within the battery compartment drops below 40° F and turn off the coolant heater when the temperature goes above 60° F. The heater exhaust is piped to the battery box and a shroud beneath the oil pan. Refer to figure 49 for heater wiring diagram.

127. Coolant Heater Hoses, Fittings, Heater Tube, and Oil Pan Shroud

a. Removal.

(1) Close the fuel shutoff cock (10, fig. 14).

(2) Drain the cooling system (TM 5–6115–232–10).

(3) Remove the hose, fittings, and overheat control switch from the bracket and cover plate (par. 65).

(4) Loosen the hose clamp (2, fig. 50) and remove the hose (13) from the special fitting assembled to the tee (11) and remove the hose.

(5) Remove the hose and water shutoff valve from the cylinder head (par. 118).

(6) Loosen the hose clamp (2) and remove the hose (1) from the special fitting assembled to the street elbow (3) and remove the hose.

(7) Remove the coolant heater drain hose (12) from the coolant heater drain shutoff cock (9) and from the hole in the skid and remove the drain hose.

(8) Remove the coolant heater drain shutoff cock from the bushing (10) and remove the bushing from the tee (11).

(9) Remove the tee from the close nipple (8), remove the close nipple from the bushing (4), and remove the bushing from the coolant heater assembly (7).

(10) Remove the screw (15) and remove the heater tube elbow (14) from the coolant heater assembly.

(11) Remove the screw (6, fig. 11) and remove the heater tube elbow (7) from the battery box (8).

(12) In a similar manner remove the heater tube from the oil pan shroud (2, fig. 36) and remove the heater tube assembly from the generator set.

(13) Remove the 8 screws (4) and lockwashers (3) to free the oil pan shroud (2) and 2 shroud mounting brackets (5) from the base pan (7) and each other.

(14) Slide and turn the oil pan shroud (2) from beneath the oil pan (1) and engine starter.

b. Cleaning, Inspection, and Repair.

(1) Clean the hoses with a warm soap and water solution and dry thoroughly.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(3) Inspect the hoses for breaks, cracks, and other visual damage. Replace a defective hose.

(4) Inspect the fittings for cracks, breaks, defective threads, and other damage. Replace a defective part.

(5) Inspect the heater tube and oil pan shroud for bends, cracks, broken welds, and other damage. Straighten bends and repair broken welds. Replace a defective part.

(6) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Testing the Overheat Control.

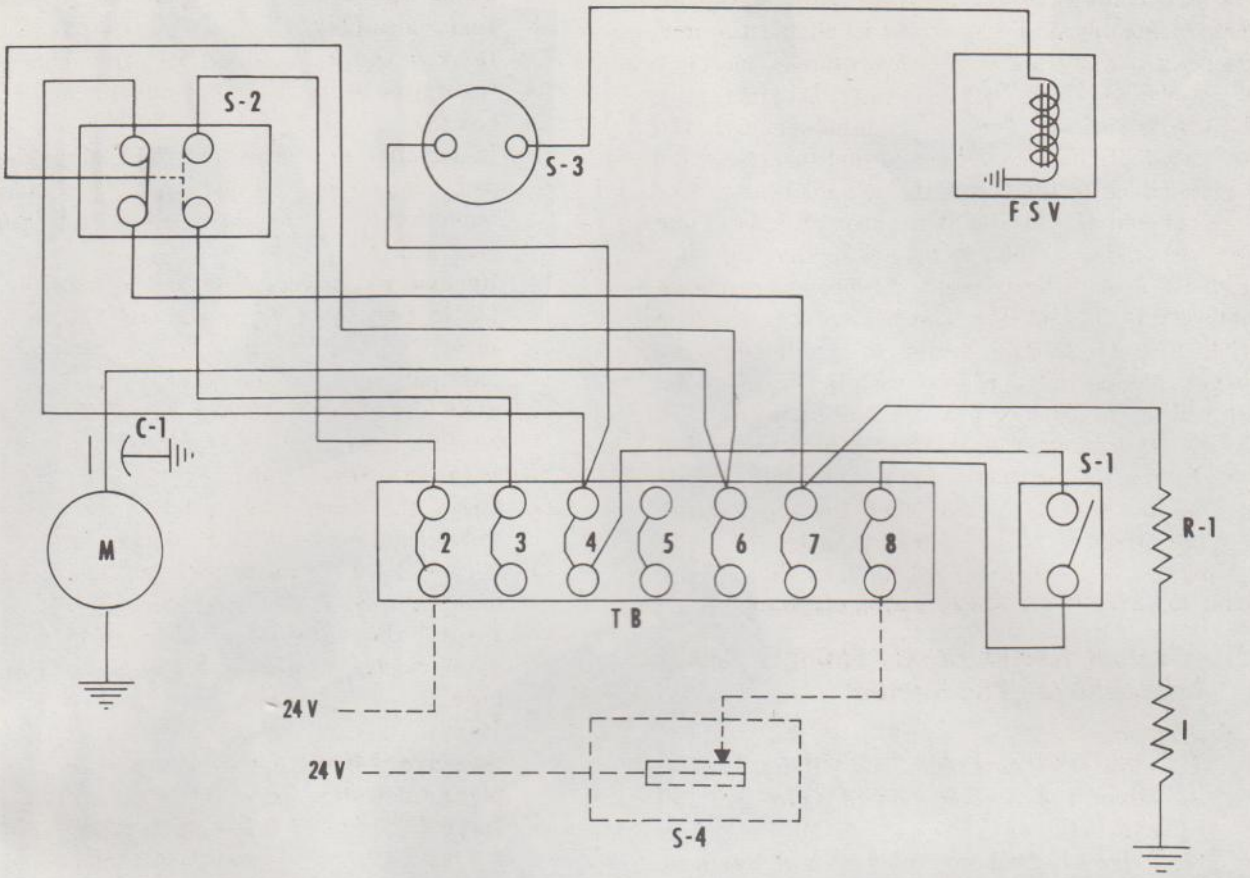
(1) Connect a test lamp circuit to the terminals of the overheat control. If the test lamp does not light, proceed with the testing. If the test lamp does light, adjust the control (*d* below).

(2) Immerse the bulb of the overheat control in a suitable container of water.

(3) Place a thermometer, with a temperature range exceeding 212° F, in the container and apply heat. When the temperature of the water reaches 180° F, the test lamp should light. If the test lamp does not light, adjust the control (*d* below.)

d. Adjusting the Overheat Control.

(1) An adjustment screw is located between the terminals of the overheat control. Turn



DEVICE LEGEND

C-1	FEED-THRU CAPACITOR, 0.25 UF, 100 V, DC, 20 AMPS
FSV	FUEL SOLENOID VALVE
I	IGNITER, 0.4 OHMS
M	MOTOR
R-1	FIXED RESISTOR, 1.75 OHMS, 250 WATTS
S-1	ON-OFF SWITCH
S-2	FLAME DETECTOR SWITCH
S-3	OVERHEAT CONTROL THERMOSTAT
S-4	THERMOSTATIC SWITCH (COOLANT TEMP.)
TB	TERMINAL BOARD

SYMBOL LEGEND

RESISTOR

FEED-THRU CAPACITOR

COIL

SINGLE POLE - SINGLE THROW SWITCH

TRANSFER SWITCH

GROUND

V VOLTS

EMC 6115-232-20/49

Figure 49. Coolant heater assembly wiring diagram.

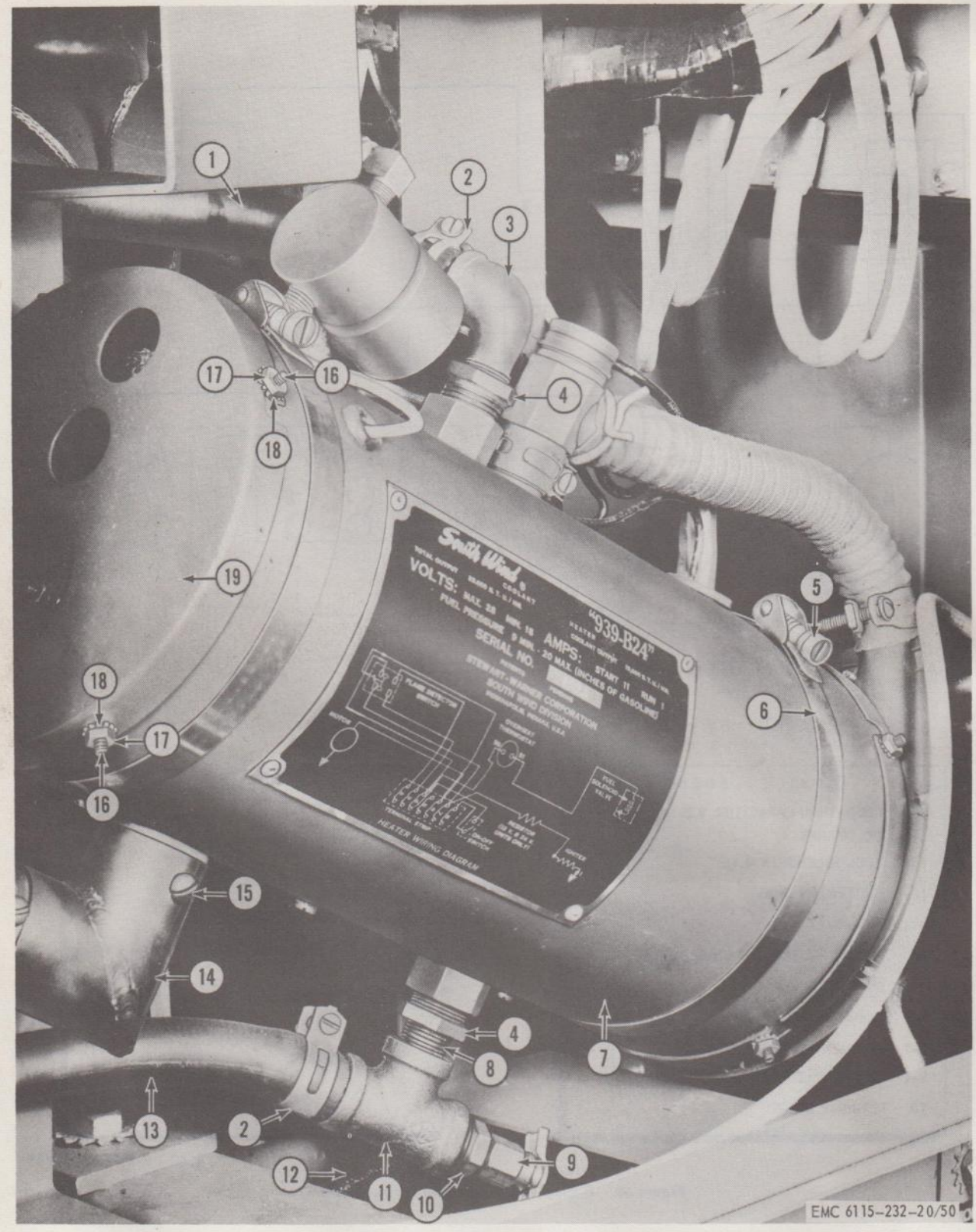


Figure 50. Coolant heater assembly, removal points.

1 Hose
2 Hose clamp (4 rqr)
3 Elbow, street, ⅜ in.
4 Bushing, pipe, ½ x ⅜ in. (2 rqr)
5 Screw (spec) (2 rqr)
6 Mounting clamp
7 Coolant heater assembly
8 Nipple, close, ⅜ in.
9 Coolant heater drain shutoff cock
10 Bushing, pipe, ⅜ x ¼ in.
11 Tee, pipe, ⅜ in.
12 Drain hose
13 Hose
14 Heater tube elbow
15 Screw, rd-hd, thd-forming No. 10–24 x ½ in.
16 Stud (spec) (4 rqr)
17 Nut, hex, No. 8–32 (4 rqr)
18 Washer, lock, IET, No. 8 (4 rqr)
19 Igniter end plate

Figure 50.—Continued.

this screw clockwise to increase the temperature which will close this control and cause the test lamp to light. Turn the screw counterclockwise to decrease the temperature which will open the control and cause the test lamp to go out.

(2) Retest the overheat control, adjusting as necessary, so that the test lamp will light when the temperature of the water reaches 180° F. Replace a control that will not adjust.

e. Installation.

(1) Position the oil pan shroud (2) by turning and sliding it beneath the engine starter and the oil pan (1) and pushing it into place.

(2) Position the 2 shroud mounting brackets (5), one on each side of the shroud and to the base pan (7) and secure by installing the 8 lockwashers (3) and screws (4).

(3) Position the heater tube elbow (7, fig. 11) to the battery box (8) and secure by installing the screw (6).

(4) Position the heater tube elbow (14, fig. 50) to the coolant heater assembly (7) and secure by installing the screw (15).

(5) In a similar manner connect the heater tube to the oil pan shroud (2, fig. 36).

(6) Install the bushing (4, fig. 50) on the coolant heater assembly (7), install the close nipple (8) on the bushing, and install the tee (11) on the close nipple.

(7) Install the bushing (10) on the tee and install the coolant heater drain shutoff cock (9) on the bushing.

(8) Install the coolant heater drain hose (12) through the hole in the skid and on the coolant heater drain shutoff cock.

(9) Position the hose (1) on the special fitting assembled to the street elbow (3) and secure by tightening the hose clamp (2).

(10) Install the water shutoff valve and hose on the cylinder head (par. 118).

(11) Install the hose (13) on the special fitting assembled to the tee (11) and secure by tightening the hose clamp (2).

(12) Install the fittings, hose, and overheat control on the bracket and cover plate (par. 65).

(13) Refill the cooling system (TM 5–6115–232–10).

128. Coolant Heater Assembly

a. Removal.

(1) Remove the hoses, fittings, and heater tube from the coolant heater assembly (par. 127).

(2) Remove the sediment strainer-to-coolant heater fuel line assembly (par. 61).

(3) Tag and remove the external electrical leads from the coolant heater assembly terminal board. Refer to figure 49.

(4) Remove the coolant heater-to-bracket lead assembly (par. 45).

(5) Loosen the two screws (5, fig. 50), separate the mounting clamps (6), and remove the coolant heater assembly (7).

b. Testing and Adjustment.

(1) *Igniter assembly.*

(*a*) Remove the coolant heater assembly (*a* above).

(*b*) Loosen the four nuts (17) and lockwashers (18) on the studs (16) and twist the igniter end plate (19) to remove it.

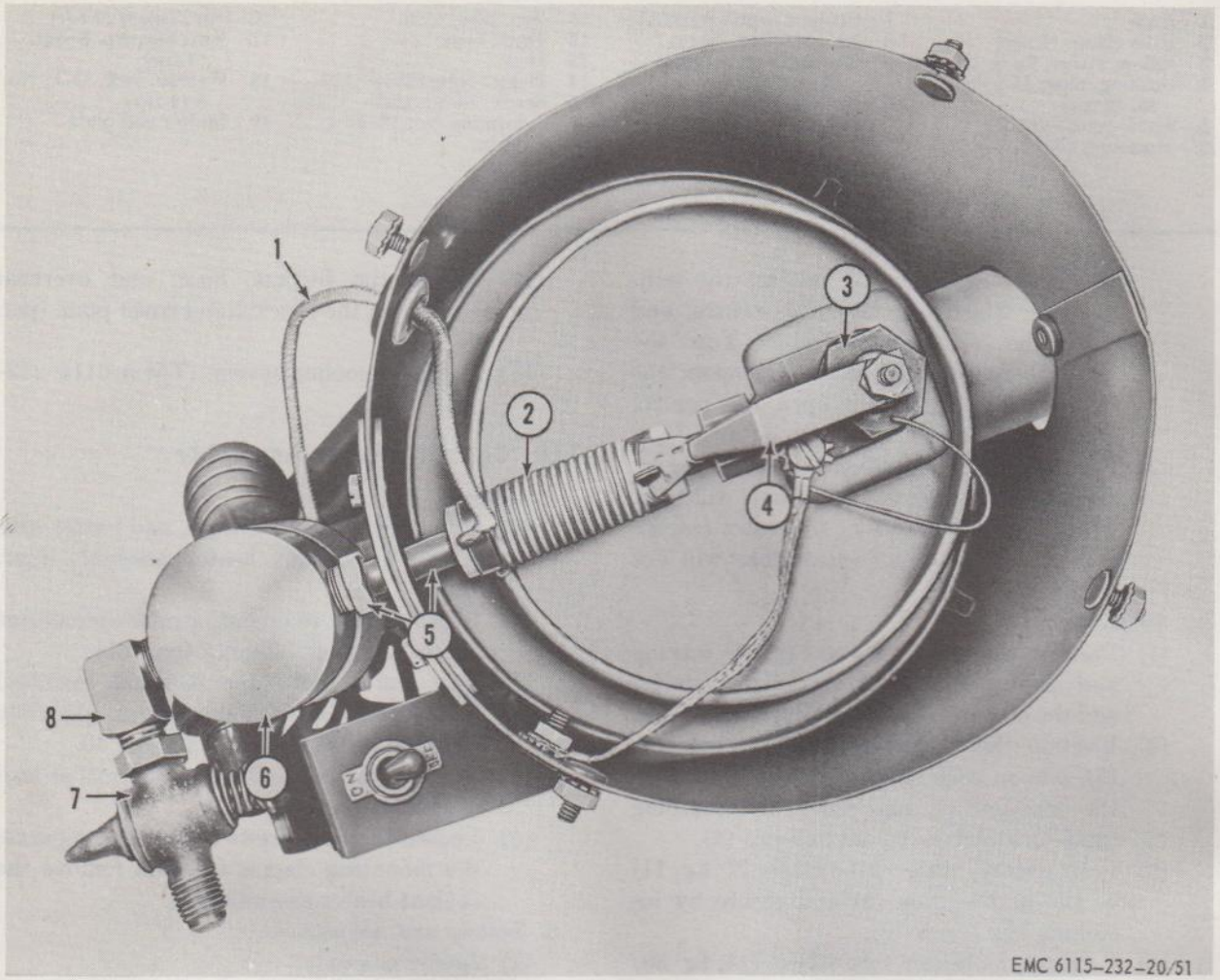
(*c*) Disconnect the electrical lead (4, fig. 51) of the resistor assembly (2) from the terminal of the igniter assembly (3). Connect a multimeter between the terminal of the igniter assembly and ground. The reading should not vary more than 5 percent above or below 0.4 ohms. If the reading is not within these limits, replace the igniter.

(2) *Resistor assembly.*

(*a*) Remove the coolant heater assembly (*a* above).

(*b*) Remove the igniter end plate ((1) above).

(*c*) Disconnect the electrical lead (4) of the resistor assembly (2) from the terminal of the igniter assembly (3). Tag the electrical lead (1) and remove it from the



1	Electrical lead	3	Igniter assembly	5	Fuel standpipe	7	High-low valve
2	Resistor assembly	4	Electrical lead	6	Fuel solenoid valve	8	Elbow, street, ⅛ in.

Figure 51. Resistor and fuel solenoid valve assemblies, testing points.

coolant heater assembly terminal board. Connect a multimeter across the resistor assembly. The reading should not vary more than 5 percent above or below 1.75 ohms. If the reading is not within these readings, replace the resistor.

(3) *Temperature overheat control thermostat.* The temperature overheat control thermostat is located adjacent to the coolant heater assembly terminal board and is accessible for testing through the housing. Tag and disconnect an electrical lead from one of the terminals of the temperature overheat control thermostat. Connect a multimeter across the terminals and test for continuity. The temperature overheat control thermostat is a normally closed switch, as such, the multimeter should show continuity when the coolant heater assembly is not in use. Replace a temperature overheat control thermostat that does not show continuity under these conditions.

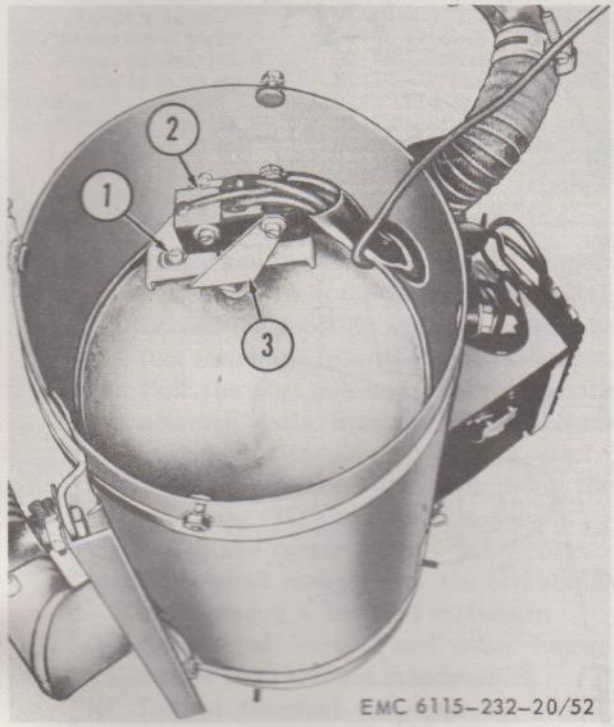
(4) *Flame detector switch.* Tag and disconnect the five flame detector switch electrical leads from the coolant heater assembly terminal board, refer to figure 49. Connect a multimeter and test successively between the electrical leads removed from the following pairs of terminals 4 and 6, 6 and 7, and 4 and 7 for continuity. Then connect the multimeter between the electrical leads removed from terminals 2 and 3 and test for an open circuit. If the indicated

readings are not obtained, adjust the flame detector switch as follows:

(*a*) Remove the blower assembly (*d* below).

Note. This adjustment must be made at a normal room temperature.

(*b*) Remove the cement that secures the adjusting screw (1, fig. 52) to the switch bracket (3).



1 Adjusting screw
2 Microswitch
3 Switch bracket

Figure 52. Flame detector switch, adjustment points.

(*c*) Loosen, but do not remove, the nuts and screws that secure the microswitch (2) to the switch bracket (3).

(*d*) Back the adjusting screw (1) away from the switch bracket until the microswitch makes a distinct click.

(*e*) Slowly tighten the adjusting screw to the point that the microswitch again clicks, then continue tightening for three-quarters of a turn.

Caution: **Exercise care in tightening the adjusting screw. Rough handling can break the quartz rod in the flame detector switch.**

(*f*) Secure the adjusting screw (1) in its set position with a drop of an approved cement.

Caution: **Excessive use of cemen can effect the free movement of the flame detector switch components.**

(*g*) Secure the microswitch (2) to the switch bracket (3) by tightening the two nuts and screws.

(*h*) Retest the flame detector switch. If the circuits do not test satisfactorily, replace the switch.

(5) *Fuel solenoid valve.*

(*a*) Remove the coolant heater assembly (*a* above).

(*b*) Remove the igniter end plate ((1) above).

(*c*) Tag and remove the fuel solenoid valve and electrical lead from the temperature overheat control. Refer to figure 49.

(*d*) Remove the fuel solenoid valve (6, fig. 51) with the assembled street elbow (8) and heater high-low valve (7) from the fuel standpipe (5).

(*e*) Place the fuel solenoid valve over a container, connect the coolant heater high-low valve to a suitable supply of fuel, and connect the electrical lead of the fuel solenoid valve to a source of 24-v, dc power. Using the body of the valve for the ground, complete the circuit and observe the flow of fuel from the solenoid valve. If fuel does not flow or if it flows unevenly, replace the fuel solenoid valve.

c. Burner Wick Replacement.

(1) *Removal.*

(*a*) Remove the coolant heater assembly (*a* above).

(*b*) Remove the igniter end plate (*b*(1) above).

(*c*) Remove the screw (5, fig. 53) and lockwasher (39). Tag and disconnect the resistor assembly electrical lead from the terminal board (48).

(*d*) Pull the freed electrical lead into the coolant heater housing.

(*e*) Tag and disconnect the fuel solenoid valve electrical lead from the temperature overheat control thermostat (49).

(*f*) Remove the two nuts (23 and 26) and disconnect the resistor assembly electrical lead from the terminal of the igniter assembly (25).

(*g*) Remove the two screws (34) and lockwashers (22) to free the support plate (32) and tube flange (33) from the coolant

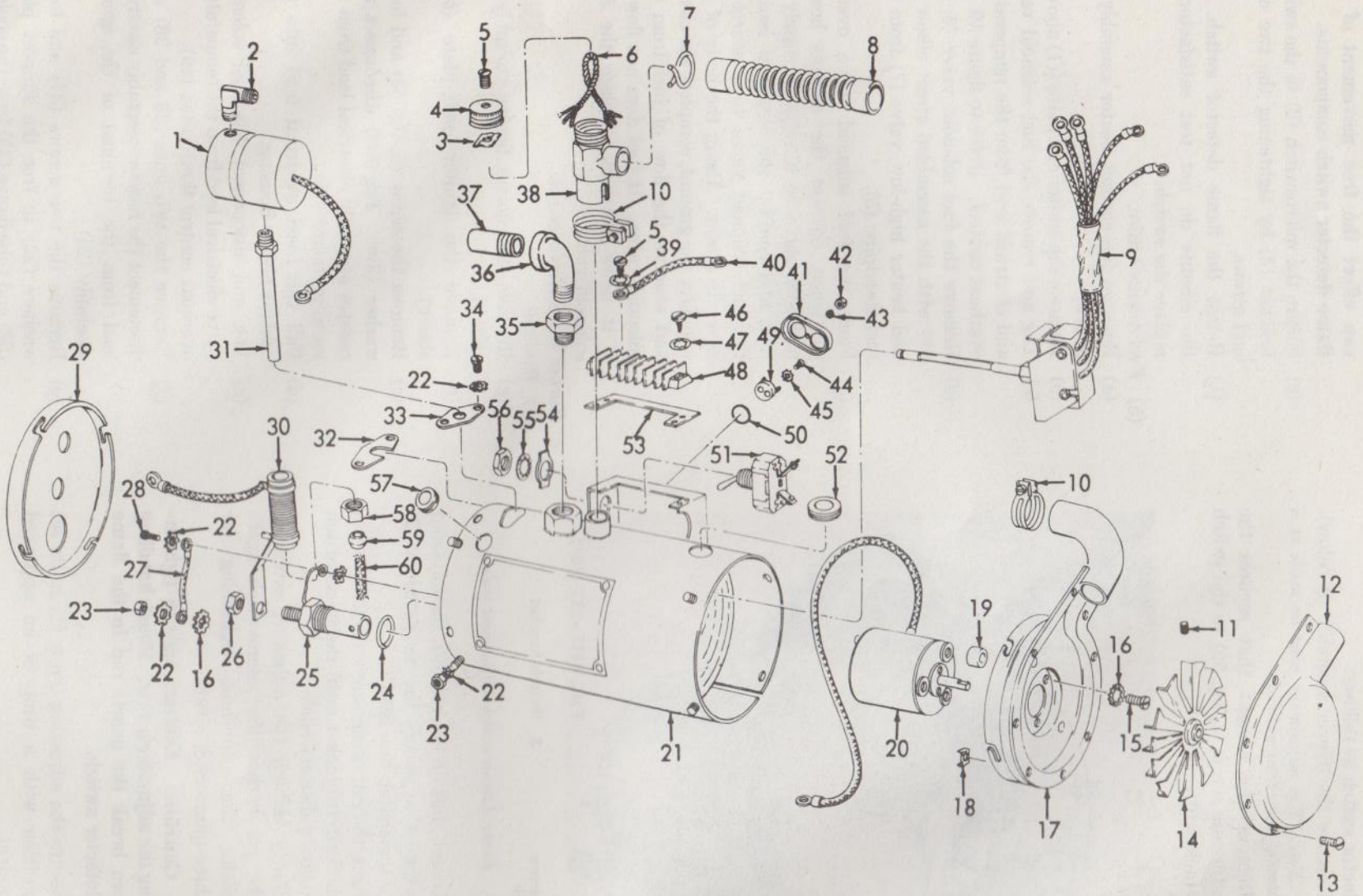


Figure 53. Coolant heater, exploded view.

1 Fuel solenoid valve
2 Elbow adapter
3 Spring nut (spec)
4 Wick cap
5 Screw, rd-hd, No. 6–32 x 5/8 in. (15 rqr)
6 Wick
7 Hose clamp
8 Air duct hose
9 Flame detector switch assembly
10 Hose clamp (2 rqr)
11 Setscrew, socket-hd, 3/16–24 x 1/4 in.
12 Access cover plate
13 Screw, pan-hd, No. 6–32 x 1/4 in. (9 rqr)
14 Fan
15 Screw, pan-hd, No. 8–32 x 3/16 in. (3 rqr)
16 Washer, lock, IET, No. 8 (5 rqr)
17 Plate assembly
18 Lock nut (spec) (9 rqr)
19 Spacer (3 rqr)
20 Blower motor
21 Coolant heater housing
22 Washer, lock, ET, No. 8 (12 rqr)
23 Nut, hex, No. 8–32 (9 rqr)
24 Igniter gasket, copper
25 Igniter assembly
26 Nut, hex, brass, No. 8–32 (3 rqr)
27 Bonding strap
28 Screw, pan-hd, No. 8–32 x 1/4 in.
29 Igniter end plate
30 Resistor assembly
31 Fuel standpipe
32 Support plate
33 Tube flange
34 Screw, hex-hd, No. 8–32 x 1/4 in. (2 rqr)
35 Bushing, reducer, 1/2 x 3/8 in.
36 Elbow, street, 3/8 in.
37 Nipple, pipe, 3/8 x 1 1/2 in.
38 Wick holder
39 Washer, lock, IT, No. 6 (14 rqr)
40 Electrical lead assembly
41 Thermostat cover
42 Nut, hex, No. 10–32
43 Washer, lock, No. 10
44 Screw, pan-hd, No. 4–40 x 5/16 in. (2 rqr)
45 Washer, lock, IET, No. 4 (2 rqr)
46 Screw, fil-hd, No. 8–32 x 5/8 in. (4 rqr)
47 Washer, lock, IT, No. 8 (4 rqr)
48 Terminal board
49 Overheat control thermostat
50 Preformed packing
51 ON–OFF switch
52 Grommet
53 Marker strip
54 ON–OFF marker plate
55 Washer, lock, IT, 15/32 in.
56 Hex nut (spec)
57 Grommet
58 Coupling nut
59 Compression collar
60 Burner wick

Figure 53.—Continued.

heater housing (21) and slide the support plate away from the fuel standpipe (31).

(*h*) Loosen the coupling nut (58) to free the fuel standpipe from the heat exchanger.

(*i*) Pull the fuel solenoid valve (1), with attached parts, from the coolant heater assembly.

(*j*) Pull the burner wick (60) from the standpipe (31) and discard it.

(2) *Cleaning and Inspection.*

(*a*) Remove all carbon from the fuel standpipe opening in the heat exchanger.

(*b*) Remove all carbon and other foreign matter from the fuel standpipe.

(*c*) Inspect the fuel standpipe for bends, cracks, corrosion, and other damage. Replace a defective fuel standpipe.

(*d*) Inspect all other parts for visual damage. Replace a defective part.

(3) *Installation.*

(*a*) Install a new burner wick (60) in the fuel standpipe (31).

(*b*) Position the fuel solenoid valve (1), with its attached parts, to the coolant heater assembly.

(*c*) Secure the fuel standpipe (31) to the heat exchanger by tightening the coupling nut (58).

(*d*) Position the support plate (32) to the fuel standpipe and secure the tube flange (33) and support plate to the coolant heater housing (21) by installing the two lockwashers (22) and screws (34).

(*e*) Position the resistor assembly electrical lead to the terminal of the igniter assembly (25) and secure by installing the two nuts (26 and 23).

(*f*) Reconnect the tagged fuel solenoid valve electrical lead with the temperature overheat control thermostat (49).

(*g*) Thread the tagged resistor assembly electrical lead through the coolant heater housing (21) and secure the lead to the terminal board (48) by installing the lockwasher (39) and screw (5).

(*h*) Position the igniter end plate (19, fig. 50) and coolant heater assembly (7) and twist to engage the studs (16). Tighten the lockwashers (18) and nuts (17) to secure.

(*i*) Reinstall the coolant heater assembly (*g* below).

d. Disassembly.

(1) Loosen the two hose clamps (7 and 10, fig. 53) and remove the air duct hose (8) from the blower assembly and wick holder (38).

(2) Remove the wick cap (4) from the wick holder and remove the nut (3) and screw (5) and remove the wick (6) from the wick cap.

(3) Loosen the clamp (10) and remove the wick holder (38) from the coolant heater.

(4) Tag and disconnect the electrical leads from the temperature overheat control thermostat (49).

(5) Remove the nut (42) and lockwasher (43) and remove the thermostat cover (41), temperature overheat control thermostat (49), and packing (50) from the coolant heater.

(6) Tag and disconnect all the electrical leads from the terminal board (48).

(7) Remove the four screws (46) and lockwashers (47) and remove the terminal board (48) and marker strip (53) from the coolant heater.

(8) Remove the street elbow (36) from the reducer bushing (35) and remove the reducer bushing from the coolant heater.

(9) Remove the nut (56) and lockwasher (55) from the ON-OFF switch (51) and carefully remove the switch and ON-OFF marker plate (54) from the coolant heater Tag and disconnect the electrical leads from the terminals of the switch.

(10) Remove the two nuts (23 and 26) and remove the resistor assembly electrical lead from the terminal of the igniter assembly (25).

(11) Remove the two screws (34) and lockwashers (22) to free the support plate (32) and tube flange (33) from the coolant heater housing (21) and slide the support plate away from the fuel standpipe (31).

(12) Loosen the coupling nut (58) to free the fuel standpipe from the heat exchanger.

(13) Pull the fuel solenoid valve (1), with attached parts, from the coolant heater assembly.

(14) Remove the burner wick (60), compression collar (59), coupling nut (58), resistor assembly (30), and tube flange (33) from the fuel standpipe (31).

(15) Remove the elbow adapter (2) and fuel standpipe (31) from the fuel solenlid valve (1).

(16) Remove the heat exchanger bonding strap (par. 45).

(17) Remove the igniter assembly (25) and igniter gasket (24) from the heat exchanger.

(18) Remove the four nuts and lockwashers from the studs. Twist and remove the blower assembly from the coolant heater housing (21).

(19) Loosen the compression nut and remove the flame detector switch assembly (9) from the heat exchanger.

(20) Remove the two rubber grommets (52 and 57) from the coolant heater housing (21).

(21) Remove the nine screws (13) and nuts (18) and remove the access cover plate (12) from the plate assembly (17).

(22) Remove the setscrew (11) and remove the fan (14) from the shaft of the blower motor (20).

(23) Remove the three screws (15) and lockwashers (16) and remove the plate assembly (17) and spacers (19) from the blower motor (20).

(24) Remove the two nuts (2, fig. 11) and lockwashers (3) from the studs (1) to free the top of the heater bracket (4) from the frame (5).

(25) In a similar manner, free the bottom of the heater bracket from the skid and remove the bracket.

(26) Remove the second heater bracket in a similar manner.

e. Cleaning, Inspection, and Repair.

(1) Clean the blower motor as well as other electrical components with a clean, dry cloth.

(2) Clean the coolant heater housing and heat exchanger with a cloth dampened with an approved cleaning solvent.

(3) Remove accumulated carbon from the heat exchanger with a wire brush.

(4) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(5) Inspect the heat exchanger for cracks, broken welds, defective threads, and other damage. Report a defective heat exchanger to field maintenance.

(6) Inspect the electrical components for loose terminals, loose or broken electrical wires or leads, and other damage. Replace a defective part.

(7) Inspect all sheet metal parts for bends, cracks, corrosion, and other damage. Straighten bends, otherwise replace a defective part.

(8) Inspect the orifice located at the upper end of the fuel standpipe for obstructions and other damage. Remove deposits with an approved solvent. Replace a defective fuel standpipe.

(9) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

f. Reassembly.

(1) Position the heater bracket (4) to the frame (5) and skid and secure by installing the four lockwashers (3) and nuts (2) on the studs (1).

(2) Install the second heater bracket in a similar manner.

(3) Position the plate assembly (17, fig. 53) to the blower motor (20) and spacers (19) and

secure by installing the three lockwashers (16) and screws (15).

(4) Position the fan (14) on the shaft of the blower motor and secure by installing the setscrew (11).

(5) Position the access cover plate (12) to the plate assembly (17) and secure by installing the nine screws (13) and nuts (18).

(6) Install the two rubber grommets (52 and 57) in the coolant heater housing (21).

(7) Position the flame detector switch assembly (9) to the heat exchanger and secure by tightening the coupling nut.

(8) Position the blower assembly to the coolant heater housing (21) and twist to install. Secure by installing the four lockwashers and nuts.

(9) Install the igniter gasket (24) and igniter assembly (25) in the heat exchanger.

(10) Install the heat exchanger bonding strap (par. 45).

(11) Install the fuel standpipe (31) and elbow adapter (2) on the fuel solenoid valve (1).

(12) Install the tube flange (33), resistor assembly (30), coupling nut (58), compression collar (59), and burner wick (60) on the fuel standpipe (31).

(13) Position the fuel solenoid valve (1), with attached parts, to the coolant heater assembly.

(14) Tighten the coupling nut (58) to secure the fuel standpipe (31) to the heat exchanger.

(15) Slide the support plate (32) into position on the fuel standpipe and secure the tube flange (33) and support plate to the coolant heater housing (31) by installing the two lockwashers (22) and screws (34).

(16) Position the resistor assembly electrical lead to the terminal of the igniter assembly (25) and secure by installing the two nuts (23 and 26).

(17) Reconnect the tagged electrical leads with the terminals of the ON-OFF switch (51). Position the switch and ON-OFF marker plate (54) to the coolant heater and secure by installing the lockwasher (55) and nut (56).

(18) Install the reducer bushing (35) on the coolant heater and the street elbow (36) on the reducer bushing.

(19) Position the marker strip (53) and terminal board (48) to the coolant heater and secure by installing the four lockwashers (47) and screws (46).

(20) Reconnect the tagged electrical leads to the terminal board (48).

(21) Position the packing (50), temperature overheat control thermostat (49), and thermostat cover (41) to the coolant heater and secure by installing the lockwasher (43) and nut (42).

(22) Reconnect the tagged electrical leads with the temperature overheat control thermostat (49).

(23) Position the wick holder (38) to the coolant heater and secure by tightening the clamp (10).

(24) Position the wick (6) to the wick cap (4) and secure by installing the screw (5) and nut (3). Install the wick cap on the wick holder.

(25) Position the air duct hose (8) to the blower assembly and wick holder (38) and secure by installing the two clamps (7 and 10).

(26) Position the igniter end plate (29) to the coolant heater housing (21), twist, and secure by installing the four lockwashers (22) and nuts (23).

g. Installation.

(1) Position the coolant heater assembly (7, fig. 50) to the mounting clamps (6) and secure by tightening the two screws (5).

(2) Install the coolant heater-to-bracket lead assembly (par. 45).

(3) Reconnect the external tagged electrical leads with the terminal board of the coolant heater assembly. Refer to figure 49.

(4) Install the sediment strainer-to-coolant heater fuel line assembly (par. 61).

(5) Install the heater tube, fittings, and hoses on the coolant heater assembly (par. 127).

129. Battery Box Cover

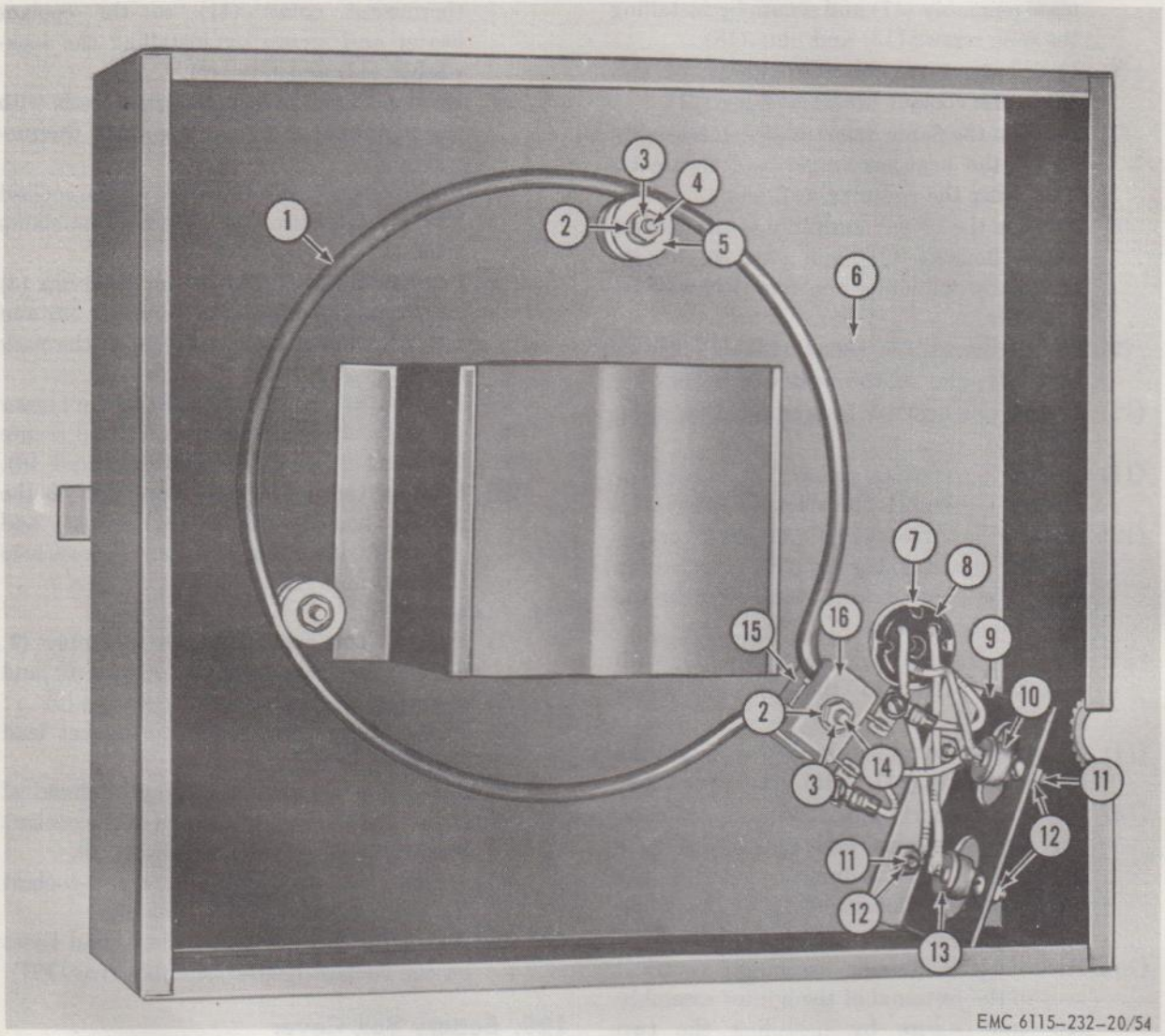
a. Removal and Disassembly.

(1) Remove the battery box cover from the generator set (TM 5-6115-232-10).

(2) Tag and remove the electrical leads from the terminals of the heater element (1, fig. 54) and the two thermostats (10 and 13).

(3) Remove the two nuts (12), lockwashers, and screws (11) and remove the bracket (9) from the cover (6).

(4) Remove the two nuts (12), lockwashers, and screws (11) and remove the thermostat (10) from the bracket.



1 Heater element
2 Washer, flat, No. 10 (3 rqr)
3 Nut, hex, No. 10–32 (3 rqr)
4 Screw, rd-hd, No. 10–32 x 1¼ in. (2 rqr)
5 Insulator bushing (2 rqr)
6 Cover
7 Retaining ring
8 Electrical socket (6 rqr)
9 Bracket
10 Thermostat
11 Screw, rd-hd, No. 8–32 x ⅜ in. (6 rqr)
12 Nut, hex, No. 8–32
13 Thermostat
14 Screw, rd-hd, No. 10–32 x 1¾ in.
15 Botton element cleat
16 Top element cleat

Figure 54. Battery box cover, assembled view.

(5) Remove the other thermostat (13) from the bracket in a similar manner.

(6) Remove the nut (3), lockwasher, and flat washer (2) from the screw (4) and remove the screw and insulator bushing (5) from the cover (6).

(7) Remove the other insulator bushing in a similar manner.

(8) Remove the nut (3), lockwasher, flat washer (2), and top element cleat (16) from the screw (14) and remove the heater element (1). Remove the screw and bottom element cleat (15) from the cover.

(9) Remove the retaining ring (7) from the electrical socket (8) and remove the electrical socket from the cover.

b. Cleaning and Inspection.

(1) Clean the electrical components with a dry cloth.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(3) Inspect the electrical components for loose terminals, broken or frayed insulation, evidences of burning, and other damage. If possible, tighten or replace loose terminals, otherwise replace a defective part.

(4) Inspect the box and bracket for bends, cracks, and other damage. Replace a defective part.

(5) Inspect the mounting hardware for bends, cracks, defective threads, and other damage. Replace a defective part.

c. Reassembly and Installation.

(1) Position the electrical socket (8) to the cover (6) and secure by installing the retaining ring (7).

(2) Install the screw (14) and bottom element cleat (15) on the cover (6). Position the heater element (1) to the bottom element cleat and secure by installing the top element cleat (16), flat washer (2), lockwasher, and nut (3) on the screw.

(3) Position the insulator bushing (5) to the cover and heater element and secure by installing the screw (4), flat washer (2), lockwasher, and nut (3).

(4) Install the other insulator bushing in a similar manner.

(5) Position the thermostat (10) to the bracket (9) and secure by installing the two screws (11), lockwashers, and nuts (12).

(6) Install the thermostat (13) on the bracket in a similar manner.

(7) Position the bracket (9) to the cover (6) and secure by installing the two screws (11), lockwashers, and nuts (12).

(8) Reconnect the electrical leads with the terminals of the heater element (1) and the two thermostats (10 and 13).

(9) Install the battery box cover (TM 5–6115–232–10).

CHAPTER 4
SHIPMENT AND LIMITED STORAGE

Section I. SHIPMENT WITHIN ZONE OF INTERIOR

130. Preparation of Equipment for Shipment

a. Drain the fuel tank. Empty and clean the fuel sediment bowls. Operate the generator set until the fuel is used from the fuel pump, fuel line, and carburetor (TM 5–6115–232–10).

b. Remove, drain, clean, and reinstall the air cleaner cup.

c. Disconnect the battery cables from the batteries and wrap the battery cable connections with tape.

d. Check items listed in the Basic Issue Items List (Appendix II, TM 5–6115–232–10). Make up any shortages. Store these items in the toolbox or in a crate.

e. Install the necessary protective materials and devices, following TM 9–200 as a guide.

f. Secure the doors with the fasteners.

131. Loading Equipment for Shipment

Load the generator set onto the carrier by means of the U-bolt at the top of the unit and a hoist of sufficient capacity. Secure the generator set to the carrier bed with suitable lashing.

Section II. LIMITED STORAGE

132. Preparation of Equipment for Storage

a. Inspection. Inspect the generator set as outlined in paragraph 9. Correct any deficiencies.

b. Preservation.

(1) Clean the generator set. Exercise care not to damage the electrical components by the cleaning operation. Inspect the generator set after cleaning to be sure it is not wet. Dry any wet portions of the generator set.

(2) Remove all loose paint and rust and repaint where necessary as directed in TM 9–2851.

(3) Inspect the liquid level in the cooling system. Refill with an approved antifreeze so that it will be protected to 10° below the lowest expected temperature.

(4) *Batteries.* Storage batteries will be fully charged and the electrolyte will be brought up to the proper level. Remove the battery cables from the terminals of the batteries and wrap the battery cable connectors with tape.

(5) *Weatherproofing.* If the generator set is to be stored outside or subjected to ambient weather conditions. it should be protected with a suitable cover.

c. Lubrication. Completely lubricate the generator set as directed in the current lubrication order.

133. Inspection and Maintenance of Equipment in Storage

a. Inspection. When equipment has been placed in storage, all scheduled preventive maintenance services including inspection will be suspended and preventive maintenance inspection will be performed as specified herein. Refer to AR 743–505.

b. Worksheet and Preventive Maintenance. DA Form 464 will be executed on each major item of equipment when equipment is initially placed in limited storage and every 30 days thereafter. Required maintenance will be performed promptly to insure that the equipment is mechanically sound and ready for immediate use.

c. Operation. Equipment in limited storage must be operated long enough to bring it up to operating temperature and for complete lubrication of all bearings, gears, and so on at least every 30 days. Equipment must be serviced and in satisfactory operating condition before it is operated.

APPENDIX I

REFERENCES

1. Dictionaries and Abbreviations

AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Codes.

2. Fire Protection

TM 5–687	Repairs and Utilities: Fire Protection Equipment and Appliances; Inspections, Operation, and Preventive Maintenance.
TM 9–1799	Ordnance Maintenance: Fire Extinguishers.

3. Lubrication

LO 5–6115–232–20	Generator Set, Gasoline Engine: 10 Kw, Ac, 120 V, 1 and 3 Phase, 120/240 V, Single Phase 120/208 V, 3 Phase 60 Cycle; Skid Mounted (Hol-Gar Model CE–105–Ac/WK8) With Hercules Engine Model 1XB3ER.

4. Operating Instructions

TM 5–6115–232–10	Operators Manual: Generator Set, Gasoline Engine: 10 Kw, Ac, 120 V, 1 and 3 Phase 120/240 V, Single Phase, 120/208 V, 3 Phase, 60 Cycle; Skid Mounted, (Hol-Gar Model CE–105 Ac/WK8) (FSN 6115–361–6811).

5. Painting

TM 9–2851	Painting Instructions for Field Use.

6. Preventive Maintenance

AR 700–38	Unsatisfactory Equipment Report.
AR 750–5	Maintenance Responsibilities and Shop Operation.
TB ENG 347	Winterization Techniques for Engineer Equipment.
TM 5–505	Maintenance of Engineer Equipment.
TM 9–207	Operation and Maintenance of Ordnance Material in Extreme Cold Weather (0° to −65° F).
TM 9–6140–200–15	Storage Batteries, Lead-Acid Type.

7. Publication Indexes

DA Pam 108–1	Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings.
DA Pam 310–1	Index of Administrative Publications.
DA Pam 310–2	Index of Blank Forms.
DA Pam 310–3	Index of Training Publications.
DA Pam 310–4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
DA Pam 310–5	Index of Graphic Training Aids and Devices.
DA Pam 310–25	Index of Supply Manuals—Corps of Engineers.

8. Radio Interference Suppression

TM 11–483	Radio Interference Suppression.

9. Shipment and Limited Storage

AR 743–505	Limited Storage of Engineers Mechanical Equipment.
TM 9–200	General Packaging Instructions for Ordnance General Supplies.

10. Supply Publications

SM 10–1–C4–1	Petroleum, Petroleum-Base Products, and Related Material.
TM 5–6115–232–20P	Organizational Maintenance and Repair Parts and Special Tool Lists: Generator Set, Gasoline Engine: 10 Kw, Ac, 120 V, 1 and 3 Phase, 120/240 V, Single Phase, 120/208 V, 3 Phase, 60 Cycle; Skid Mounted, (Hol-Gar Model CE–105–Ac/WK8) FSN 6115–631–6811.

11. Training Aids

FM 5–25	Explosives and Demolition.
FM 21–5	Military Training.
FM 21–6	Techniques of Military Instruction.
FM 21–30	Military Symbols.

APPENDIX II
MAINTENANCE ALLOCATION

1. General

This Appendix contains a Maintenance Allocation Chart listing all maintenance and repair operations authorized for the various echelons.

2. Maintenance

Maintenance is any action taken to keep materiel in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of materiel includes the following:

a. Service. To clean, to preserve, and to replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and to detect incipient mechanical failure by scrutiny.

d. Test. To verify serviceability and to detect incipient mechanical failure by use of special equipment such as gages, meters, and so on.

e. Replace. To substitute serviceable assemblies, sub-assemblies, and parts for unserviceable components.

f. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

g. Overhaul. To restore an item to *completely serviceable* condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only As Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

3. Explanation of Columns

a. Functional Group. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes are taken from the Corps of Engineers Functional Grouping Indexes, and appear in the Maintenance Allocation Chart in their correct numerical sequence. These indexes are normally set up according to their proximity to each other and their function.

b. Components and Related Operation. This column contains the functional index grouping heading, subgroup headings, and a brief description of the part starting with the noun name. It also designates the operation to be performed such as service, adjust, inspect, test, replace, repair, and overhaul.

c. Echelon Maintenance.

Column 1. First Echelon: First echelon maintenance is that maintenance performed by the user or operator of the equipment, such as servicing, cleaning, lubricating, and limited adjustments. It also includes removal and replacement of items to accomplish servicing and lubrication.

Column 2. Second Echelon: Second echelon maintenance is that maintenance performed by trained personnel provided for that purpose in the using organization, such as replacement of all items in column 2, limited parts fabrication from bulk material, adjustments, and repair of assemblies, components, and end items that can be accomplished without extensive disassembly.

Column 3. Third Echelon: Third echelon maintenance is that maintenance performed by specially trained units in direct support of the using organization, such as replacement of all items in columns 2 and 3, repair assemblies, components, and end items, and fabricate parts from bulk material.

Column 4. Fourth Echelon: Fourth echelon maintenance is that maintenance performed by units organized as semifixed or perma-

nent shops to serve lower echelon maintenance within a geographical area, such as replacement of items in columns 2, 3, and 4, repair end items, overhaul assemblies, components, and fabricate general use common hardware and parts.

Column 5. Fifth Echelon: Fifth echelon maintenance is that maintenance authorized to overhaul assemblies, components, end items, and replacement of all parts in columns 2, 3, 4, and 5.

d. Symbol "X". The symbol "X" in the appropriate column indicates the lowest echelon responsible for performing that particular maintenance operation, but does not necessarily indicate repair parts will be stocked at that level.

e. Remarks. The remarks column is used to explain why maintenance, that would normally be done at a lower echelon, is moved to a higher echelon because of some peculiarity in the construction of the end item.

Maintenance Allocation Chart

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
01	ENGINE						
0100	ENGINE ASSEMBLY						
	Engine Assembly						
	Service	X					
	Inspect	X					
	Test		X				Compression
	Replace			X			
	Repair			X			
	Overhaul				X		
0101	CRANKCASE, BLOCK, CYLINDER HEAD						
	Block Assembly						
	Repair				X		
	Head, Cylinder						
	Replace		X				
0102	CRANKSHAFT						
	Bearing, Main						
	Replace				X		
	Crankshaft						
	Replace				X		
	Repair					X	Metalizing, resizing
	Seal, Oil						
	Replace			X			
0103	FLYWHEEL ASSEMBLY						
	Gear, Spur						
	Replace				X		
0104	PISTONS, CONNECTING RODS						
	Piston Assembly						
	Replace				X		
	Repair				X		
	Rod Assembly, Connecting						
	Replace				X		
	Repair				X		
0105.1	VALVES						
	Guides, Springs						
	Replace			X			
	Valves and Inserts						
	Replace			X			
	Repair			X			Reface
0105.2	ROCKER ARMS, TAPPETS						
	Lifter Valve						
	Adjust		X				
	Replace				X		

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0105.3	CAMSHAFTS						
	Bearing, Sleeve, Camshaft						
	Replace				X		
	Camshaft						
	Replace				X		
0105.5	TIMING GEARS						
	Gears, Helical, Timing						
	Replace				X		
0106.1	OIL PUMP						
	Pump Assembly, Oil						
	Replace			X			
	Repair			X			
0106.2	OIL FILTERS						
	Filter, Oil						
	Service	X					
0106.4	PRESSURE REGULATOR OR RELIEF VALVES						
	Regulator, Pressure						
	Adjust		X				
	Replace		X				
0106.5	CRANKCASE VENTILATION						
	Cap, Breather						
	Service	X					
0106.6	OIL PAN, LINES, LEVEL GAGE						
	Pipe, Oil Drain						
	Replace		X				
	Line Assembly, Oil (External)						
	Replace		X				Fabricate
	Hose, Drain						
	Replace		X				
0108	MANIFOLDS						
	Gasket, Manifold						
	Replace		X				
0111.1	HAND CRANKING DEVICES						
	Crank, Starting						
	Replace	X					
03	FUEL SYSTEM						
0301	CARBURETOR						
	Carburetor Assembly						
	Adjust		X				
	Replace		X				
0302.4	FUEL PUMP, GASOLINE						
	Pump, Fuel						
	Service	X					
	Replace		X				
0304	AIR CLEANER						
	Cleaner Assembly, Air						
	Service	X					
0306	TANKS, LINES, FITTINGS						
	Cap, Fuel Tank						
	Replace		X				
	Line Assembly, Fuel						
	Replace		X				Fabricate
	Tank, Fuel						
	Service	X					
	Repair			X			

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0308	ENGINE SPEED GOVERNOR						
	Governor Assembly						
	Adjust		X				
	Replace		X				
	Repair				X		
	Rod Connecting, Governor						
	Adjust		X				
	Replace		X				
0309	FUEL FILTERS						
	Strainer, Fuel						
	Service	X					
0311	PRIMING SYSTEM						
	Pump, Primer						
	Service		X				
0312	ACCELERATOR, THROTTLE OR CHOKE CONTROLS						
	Control, Throttle and Choke						
	Adjust		X				
04	EXHAUST SYSTEM						
0401	MUFFLER AND PIPES						
	Extension, Exhaust						
	Replace		X				
	Muffler Assembly						
	Replace		X				
05	COOLING SYSTEM						
0501	RADIATOR						
	Cap, Radiator						
	Replace	X					
	Radiator Assembly						
	Service	X					
	Repair			X			
0503	LINES AND FITTINGS, HOSES, PIPES, CLAMPS						
	Hoses, Clamps						
	Replace		X				
	Line Assemblies						
	Replace		X				Fabricate
0504	WATER PUMP						
	Pump, Water						
	Replace			X			
	Repair			X			Install Kit
0505	FAN ASSEMBLY						
	Belt, V, Drive						
	Adjust		X				
	Replace		X				
	Blade Assembly Engine Coolant						
	Replace		X				
0506	WATER MANIFOLDS, HEADERS, THERMOSTATS AND HOUSING, GASKETS.						
	Thermostat, Flow Control						
	Test		X				
	Replace		X				
06	ELECTRICAL SYSTEM (ENGINE AND VEHICULAR)						
0601	GENERATOR						
	Generator						
	Test		X				
	Replace		X				
	Repair			X			Install Kit

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0602	GENERATOR REGULATOR						
	Regulator Assembly						
	Adjust		X				
	Test		X				
	Replace		X				
0603	STARTER						
	Starter Engine						
	Service	X					
	Test		X				
	Replace		X				
	Repair			X			Install Kit
0604.2	MAGNETO						
	Magneto, Ignition						
	Service		X				
	Adjust		X				
	Replace		X				
	Repair			X			Install Kit
0604.6	IGNITION COIL: WIRING, SPARK PLUGS						
	Spark Plugs						
	Service		X				
	Adjust		X				
	Replace		X				
	Lead, Spark Plug						
	Replace		X				
0606	ENGINE CONTROLS						
	Switch, Safety, Pressure, Temperature						
	Replace		X				
0607	INSTRUMENT OR ENGINE CONTROL PANEL						
	Instruments and Switches						
	Replace		X				
0612	BATTERIES						
	Battery, Storage						
	Service	X					
	Test		X				
	Replace	X					
0615	RADIO SUPPRESSION						
	Capacitor						
	Replace		X				
	Strap, Bonding						
	Replace		X				
15	FRAME						
1501	FRAME ASSEMBLY						
	Frame						
	Replace			X			
17	BODY; CAB; HOOD; HULL						
1708	STORAGE RACKS, BOXES, STRAPS						
	Box, Tool						
	Replace		X				
22	MISCELLANEOUS BODY, CHASSIS OR HULL, AND ACCESSORY ITEMS.						
2207	WINTERIZATION EQUIPMENT						
	Control, Overheat						
	Replace		X				
	Heater Assembly						
	Service		X				
	Test				X		Bench Test
	Replace		X				

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
	Repair		X				
	Overhaul				X		
	Hoses, Lines, and Valves						
	Replace		X				
2210	DATA PLATES AND INSTRUCTION HOLDERS						
	Plate, Identification (C.O.E.)						
	Replace			X			
	Plate, Instruction						
	Replace		X				
41	ELECTRIC GENERATOR						
4100	GENERATOR ASSEMBLY						
	Inspect	X					
	Test			X			
	Replace			X			
	Repair			X			
	Overhaul				X		
4100.1	ROTOR ASSEMBLIES						
	Rotor Assembly						
	Test				X		
	Replace				X		
	Repair				X		
	Overhaul					X	
4100.2	STATOR ASSEMBLIES						
	Stator Assembly						
	Test				X		
	Replace				X		
	Repair				X		
	Overhaul					X	
4100.3	BRUSH HOLDERS						
	Brush, Electrical Contact						
	Replace		X				
	Holder, Erush						
	Replace			X			
4100.4	VENTILATING SYSTEM						
	Baffle, Air Shield						
	Service	X					
4100.5	FRAME SUPPORTS AND HOUSINGS						
	Bearing, Shaft						
	Replace			X			
4100.6	DRIVE COMPONENTS						
	Coupling Assembly, Disc						
	Replace			X			
4100.7	CONTROL PANEL, HOUSING, CUBICLES						
	Instruments						
	Replace		X				
	Wiring Harness						
	Replace			X			
	Receptacle, Duplex 3 Service						
	Replace		X				
	Light, Panel						
	Replace		X				
4100.9	CIRCUIT BREAKER ASSEMBLY						
	Contactor Magnetic						
	Replace			X			
	Repair			X			

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
4100.10	SWITCHES						
	Switch						
	Replace		X				
4100.11	REGULATOR; VOLTAGE OR CURRENT						
	Voltage Regulator						
	Adjust			X			
	Replace			X			
	Repair			X			
4100.12	RESISTORS						
	Resistor, Fixed and Variable						
	Replace			X			
4100.13	RELAY OR ASSEMBLY						
	Relay Assembly, Overload						
	Replace			X			
4100.16	TRANSFORMER; RECTIFIERS						
	Transformer, Current						
	Replace			X			
4100.17	TERMINAL BLOCKS; JUNCTION BOXES						
	Mounting Board Assembly						
	Replace			X			
	Change Board, Molded						
	Replace	X					
	Board Assembly, Load Terminal						
	Replace		X				
4100.18	HOUSING OR HULL PANELS AND ATTACHING PARTS						
	Roof Assembly						
	Replace		X				
	Door						
	Replace		X				
	Panel						
	Replace		X				
	Grill, Radiator						
	Replace		X				
4100.19	RADIO INTERFERENCE SUPPRESSION						
	Capacitor, Fixed						
	Replace		X				
	Lead Assembly						
	Replace		X				
	Lead Assembly: Control Box to Frame						
	Replace			X			
4106	EXCITER ASSEMBLIES, ROTATING						
4106.1	ROTOR ASSEMBLIES						
	Armature and Shaft Assembly						
	Test				X		
	Replace				X		
	Repair				X		
	Overhaul					X	
4106.2	STATOR ASSEMBLIES						
	Field Coil						
	Test				X		
	Replace				X		
	Repair				X		
	Overhaul					X	
4106.3	BRUSH HOLDERS						
	Brush, Electrical Contact						
	Replace		X				

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
	Holder, Brush						
	Replace			X			
42	ELECTRICAL EQUIPMENT, TRANSMISSION AND DISTRIBUTION.						
4214	MISCELLANEOUS WIRING; FITTINGS						
	Terminal Block Assembly, Remote Control						
	Replace		X				
	Cable Assembly, Remote Control						
	Replace	X					
	Repair		X				
47	GAGE (NON-ELECTRICAL); WEIGHING AND MEASURING DEVICES.						
4703.1	OIL PRESSURE GAGE						
	Gage, Oil Pressure						
	Replace		X				
	Hose Assembly, Oil						
	Replace		X				Fabricate
4705	FUEL GAGE (QUANTITY)						
	Gage, Fuel						
	Replace		X				
4708	TEMPERATURE GAGES						
	Gage, Water Temperature						
	Replace		X				
76	FIRE FIGHTING EQUIPMENT						
7603	FIRE EXTINGUISHERS						
	Extinguisher, Fire						
	Replace	X					

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By Order of the Secretary of the Army:

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

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DCSLOG (1)
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USAABELCTBD (2)
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USAES (100)
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NG: State AG (3).
USAR: Same as Active Army except allowance is one copy to each unit.
For explanation of abbreviations used, see AR 320–50.

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