

# TM 11-5895-463-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

---

OPERATOR, ORGANIZATIONAL, DS, GS,  
AND DEPOT MAINTENANCE MANUAL  
INCLUDING REPAIR PARTS AND  
SPECIAL TOOL LISTS

OPERATION CENTER  
COMMUNICATIONS

**AN/MSC-31A**

(NSN 5895-00-999-2629)

This copy is a reprint which includes current  
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OPERATOR'S, ORGANIZATIONAL, DIRECT  
SUPPORT, GENERAL SUPPORT, AND DEPOT  
MAINTENANCE MANUAL FOR  
OPERATION CENTER,  
COMMUNICATIONS AN/MSC-31A  
(NSN 5895-00-999-2629)

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HEADQUARTERS  
 DEPARTMENT OF THE ARMY  
 WASHINGTON, D.C. April 1968

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT,  
 AND DEPOT MAINTENANCE MANUAL FOR  
 OPERATION CENTER, COMMUNICATIONS AN/MSC-31A  
 (NSN 5895-00-999-2629)

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F S N	QTY	Nomenclature Part NO. And Mfg. Code	Fig No.
2540-892-6243	1	Ladder, Vehicle, Boarding MS-3391/G	1-9
6230-729-9614	1	Lantern, electric: SC-D-539491; 80063	
6230-239-3518	1	Light, extension SC-C-539496; 80063	1-12
7510-240-1526	1 (b x)	Pencil grease; black	
7510-436-5210	1 (b x)	Pencil grease; blue	
7510-324-2086	1 (b x)	Pencil grease, green	
7510-174-4612	1 (b x)	Pencil grease; red	
7510-264-4612	1 (b x)	Pencil grease; yellow	
7110-782-2819	1	Sale, single drawer: Class 3. Size VII; 81349	1-8
7520-162-6178	1	Sharpener Pencil: SC-C-539503; 80063	
5410-305-5533	2	Sling, Multiple lia: SC-D-36423; 80063	
5410-792-6336	6	Strap assembly; 666144-649; 58189	
7430-254-4319	1	Typewriter 47-14-2; 90686	
5805-257-3602	1	Switchboard telephone manual SB-22/FT (less cover installed)	1-7
5805-543-0012	4	Telephone set TA-312/PT: (2 ea less cover installed 2 ea complete, stowed)	1-7
6130-985-7899	1	Power supply	1-8

**1-6 Technical Characteristics**

*a. Power- Requirements.*

Type ..... 115±11.5 volts ac,  
50 to 60 cps, 3-  
wire, single phase.

Consumption:

Fluorescent lights (10) ..... 200 watts.  
Incandescent light .....50 watts.  
Power distribution panel  
and neon light .....4 watts.  
Exhaust Blowers (2) .....500 watts.  
Air conditioner .....480 watts.  
Heaters (2) ..... 3,000 watts.  
LS-47C/F1 ..... 40 watts.  
AN/VRC-47 ..... 255 watts.  
AN/GRR-5 ..... 110 watts.  
Total ..... 4,639 watts.

*b. Physical Characteristics.*

Dimensions:

Length .....147 inches.  
Width ..... .87 inches.  
Height ..... 83 inches.  
Weight .....3.080 pounds(ap-  
proximately).  
Volume ..... .614 cubic feet.

*c. Radio Signal Characteristics.*

(1) *Radio Receiving Set AN/GRR-5.*  
Type of signals ..... Voice, cw, and mcw.  
Frequency range ..... 1.5-18.0mc.  
Power source .....115 volts ac, 50-60  
cycles.  
Antenna .....Whip.  
Weight (with  
accessories) ..... 76 pounds.

(2) *Radio Set AN/VRC-47.*

(a) *Receiver-Transmitter, Radio RT-524/VRC.*

Frequency range ..... .30.00-75 .95 mc.  
Type of sigals .....  
Preset frequencies ..... None.  
Range ..... .15 to 20 miles.  
Operation ..... Push-to-talk.  
Control ..... Local or remote.  
Antenna ... ..... Center-fed whip.  
Number of channels. .... 920.  
Squelch ..... Noise and tone oper-  
ated.

(b) *Receiver, Radio R-442/VRC.*

Frequency range ..... .70.00-75.95 mc.  
Type of signals ..... Voice.  
Preset frequencies ..... None.  
Antenna ..... Noise and tone oper-  
ated.  
Number of channels. .... 920.

*d. Local Communication Facilities.*

Intercommunication Station ..... LS-147C/F1.  
Telephone Set ..... TA-312/PT.

**1-7. General Description**

Shelter, Electrical Equipment S-371/MS31A is the shelter facility for the AN/MS31A in which all other components (para 1-8 and 1-9) are installed. The shelter is fully insulated and weatherproofed and can be transported by an air or ground vehicle. The AN/MS31A operating components are mounted on shelves and brackets that are secured to the floor and walls of the shelter. Storage areas are provided for running

spares and accessory items. Mountings are provided for storing the antenna accessory kit bags, cable reels, and spare parts.

#### **1-8. Description of Power, Signal, and Communications Components of AN/MSC-31A**

*a. Power and Signal Connections.* Watertight receptacles are provided in the power entrance box (fig. 1-4), on the AN/MSC-31A rear wall (fig. 1-1), for connection to an external power source. Alternating current (ac) power may be provided by a motor-generator set or from a central power source.

(1) *Lighting.* Ten fluorescent light fixtures, installed in the ceiling (fig. 4-2), provide lighting for the shelter. One incandescent



# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1-1. Scope

a. This manual describes Operations Center, Communications AN/MSC-31A (fig. 1-1 and 1-2). The manual includes instructions for installing, operating, and maintaining the AN/MSC-31A.

b. Throughout the manual, where applicable, references are made to other publications that cover the installation, operation, and maintenance of the equipment installed in the AN/MSC-31A.

c. Appendix C is current as of 28 August 1979. Appendix B is current as of 12 November 1973.

#### 1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

#### 1-3. Maintenance Forms, Records and Reports

a. *Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those described by TM 38-750, The Army Maintenance Management System (TAMMS).

b. *Report of Packaging and Handling Deficiencies.* Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2 DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

c. *Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

##### 1-3.1. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, or DA Form 2028 (Recommended Changes to Publications and Blank Forms),

direct to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MP, Fort Monmouth, NJ 07703. In either case, a reply will be furnished direct to you.

##### 1-3.2. Reporting Equipment Improvement Recommendations (EIR)

If your AN/MSC-31A needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

##### 1-3.3. Administrative Storage

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1.

##### 1-3.4. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

### Section II. DESCRIPTION AND DATA

#### 1-4. Purpose and Use

a. Operations Center, Communications AN/MSC-31A (fig. 1-1, 1-2, and 1-3) is an air-or land-transportable field communication operations office assemblage. It contains telephone switchboard, local telephone circuits, and provisions for the optional installation of radio equipment (para 4-6). Display board facilities are provided for a Signal Operations Officer to plan, engineer, and control an area-type communication system.

b. The AN/MSC-31A is normally used with Operations Central, Communications AN/MSC-32A at corps and army signal centers.

1-5. Items Comprising an Operable Equipment

NSN	QTY	Nomenclature, Part No. and Mfg. Code	Fig. No.
		NOTE	
		The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, ect.	
5895-00-999-2629		Operations Center Communications AN/MSC 31A	
		Consisting of:	
5965-00-876-2375	1	Loudspeaker, Permanent Magne LS-454/U	1-7
5965-00-682-2769	1	Handset-Headset H-1-144/U	
		NOTE	
		An asterisk (*) indicates that the item may be requisitioned "as required".	
5820-00-503-1250	*	Radio Set R-392/URR	1-7
5820-00-892-0864	*	Radio Set AN/VRC-47	1-7
5410-00-930-0664	1	Shelter electrical equipment S-371/MSC-31A	
		Consisting of	
4120-00-542-4014	1	Air Conditioner: F 9000-2, 9483	
		Basket, waste paper: RR-B-181, type II, style B, 81349	
5995-00-823-2715	1	Cable assembly and reel	1-11
		Consisting of:	
		Cable CX-4566A/U (250 fl lg)	
		Reel RC-435/U	
		NOTE	
		Dry batteries shown are used with the equipment but are not considered part of the equipment. They will not be preshipped automatically but are to be requisitioned in quantities necessary for the particular organization in accordance with SB 11-6	
6135-00-120-1020		Battery dry BA-30	
7920-00-178-8315	1	Brush dusting, Bench: SC-C-539469, 80063	
5410-00-752-2435	1	Cable assembly and reel. SM-D-352732, 80063	1-11
5995-00-752-2548	1	Cable assembly power electrical CX7705/U; 15 ft lg 80063	1-12
5995-00-935-2704	1	Cable assembly power electrical SC-D-543403; 80063	1-10
4940-00-752-2474	1	Cable assembly power electrical SM-D-350987, 80063	1-12
5995-00-823-2620		Cable assembly special purpose F/handset 8 ft lg SM-C 382135,80063	
4140-00-012-1085	1	Kit installation blower SC-DL-543454, 80063 (To be installed in lieu of air conditioner as required)	
5895-00-935-5959	*	Kit installation, radio set AN/VRC-47 or R-392/URR: SC-DL-543399; 80063	
		Which includes.	
5995-00-935-2656	1	Cable assembly, power electrical CX-4524/(3 ft fg)	4-7
		Cable assembly, power electrical CX-4721/U (5 ft fg)	4-7
5995-00-935-2652	1	Cable assembly antenna radio frequency RT-524/VRC-GPII: SC-D-543315-GPII; 80063	4-6
5995-00-089-9281	1	Cable assembly radio frequency R442/URC-GPI:	4-7
		SC-D-543315-GPI; 80063	
5995-00-935-2651	1	Cable assembly control radio frequency RT-524/VRC; SC-D-543462; 80063	4-7
5995-00-889-0803	1	Cable assembly, telephone CX4760A/U; 15H signal stub	1-12
5995-00-889-0923	1	Cable assembly, telephone F/SB-22/PT SM-C-353715; 80063	
5995-00-752-2566	5	Cable assembly telephone 4 ft fg SM-D-383873-Gr III, 80063	1-12
7105-00-943-3868	1	Chair folding SC-D 539471; 80063	
7110-00-273-8798	3	Chair rotary AA-C293A, type 2 class 2 style B;81349	1-8
6645-00-800-7094	1	Clock Air craft Mechanical: SC-C-539475; 80063	1-8
7210-00-753-3043	1	Cushion, chair SM-C-350214; 80063	
5120-00-776-9917	13	Grip, cable JAW: EQA-6-8P; 95344	1-12
5120-00-776-9918	12	Grip, cable JAW EQA-26S; 95344	1-12
4720-00-224-7909	2	Heater space, electrical AAT-15A; 72143	1-8
5830-00-752-5357	1	Intercommunication station LS-147C/FI	1-8

light is provided for use when cold weather prevents instant starting of the fluorescent fixtures.

(2) *Entrance boxes.* The power and signal entrance boxes (fig. 1-1) are mounted in the exterior wall of the shelter. Each entrance box is equipped with folding side panels for weather protection and is secured with captive screw fasteners.

(a) The power entrance box (fig. 1-4) contains receptacles for connecting ac power to the shelter components. It also contains a duplex convenience outlet receptacle (115 volts ac) equipped with a spring-loaded watertight cover. Entrance to the rear of the power entrance box is provided on the interior rear wall when the power entrance panel is removed.

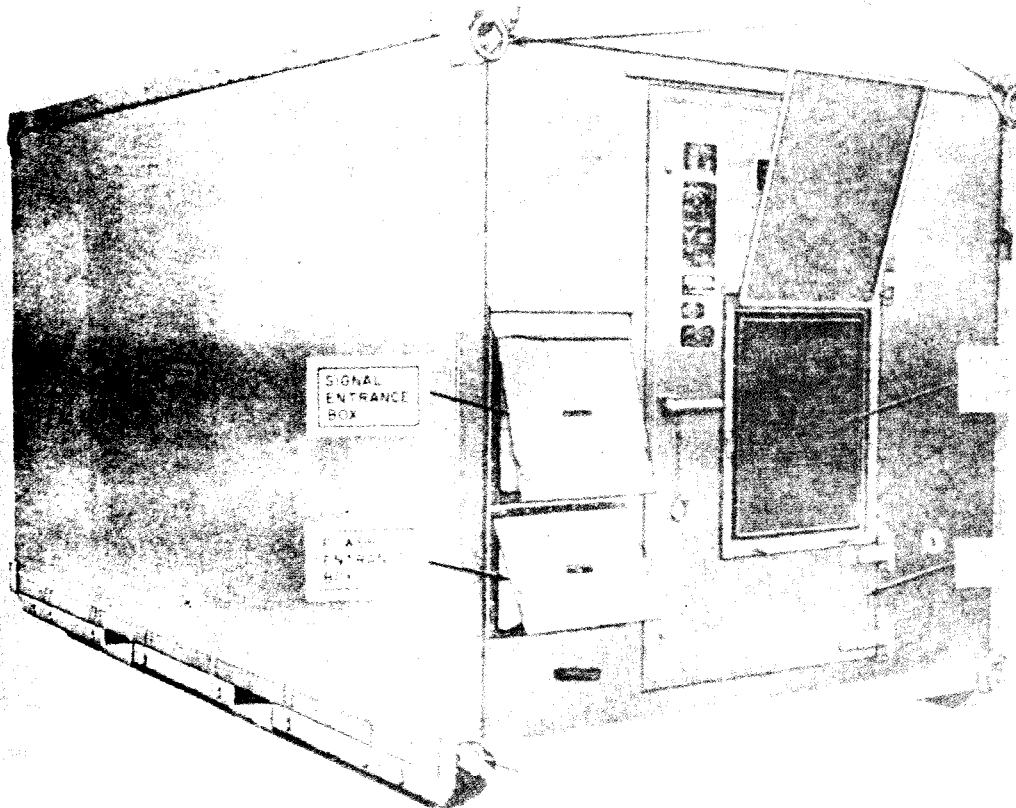


Figure 1-1. Operation Center, Communication AN M50-11A, rear, roadside view.

(b) The signal entrance box (fig. 1-5) contains the 26-pair cable receptacle and 26 pairs of binding posts for optional use in connecting signal circuits to the shelter components. Entrance to the rear of the signal entrance box is provided on the shelter interior rear wall when the signal entrance panel is removed.

(3) *Power distribution panel (fig. 1-6).* The power distribution panel contains metering and control circuits for the ac distribution circuits.

(4) *Power and signal wiring.* Ac power wiring is routed through power ducts to the various ac power outlets. Signal wiring is

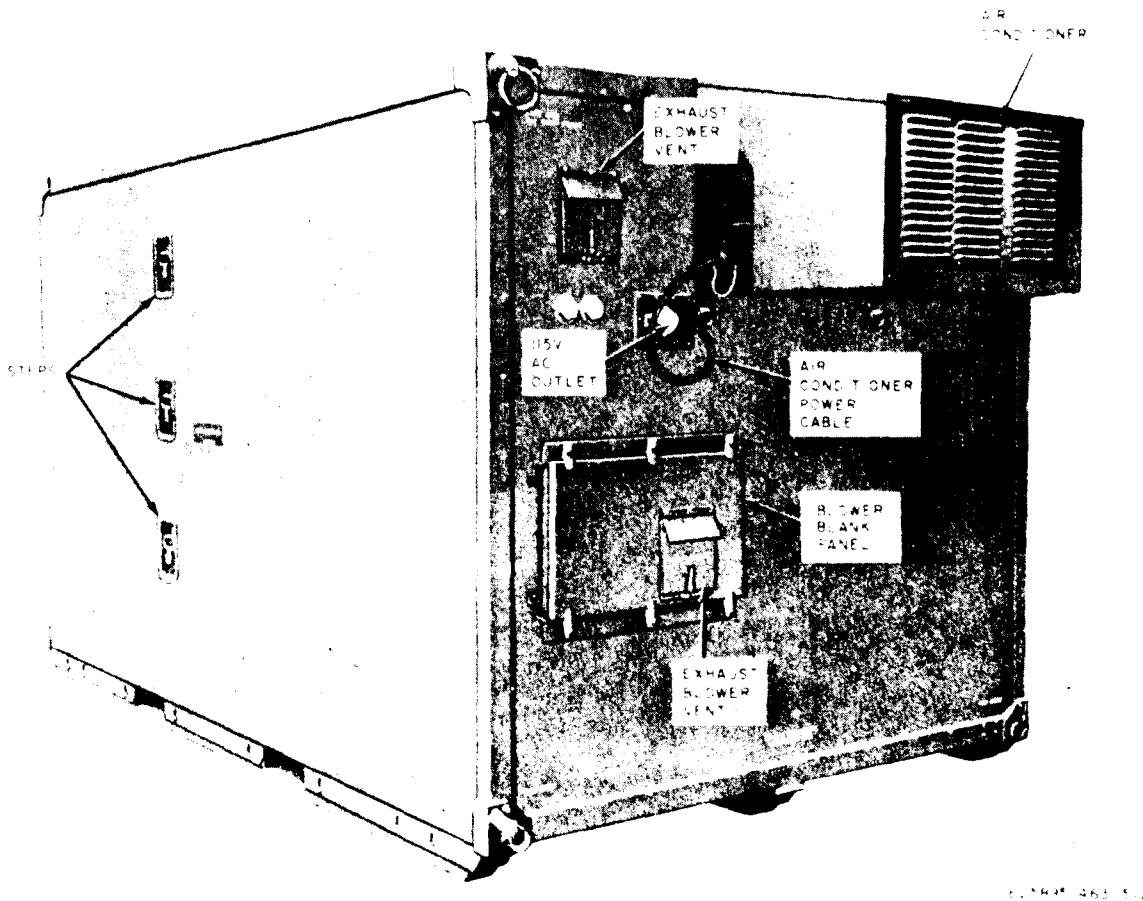


Figure 1-2. Operation center, Communication AN/MS-31A, front curbside view.

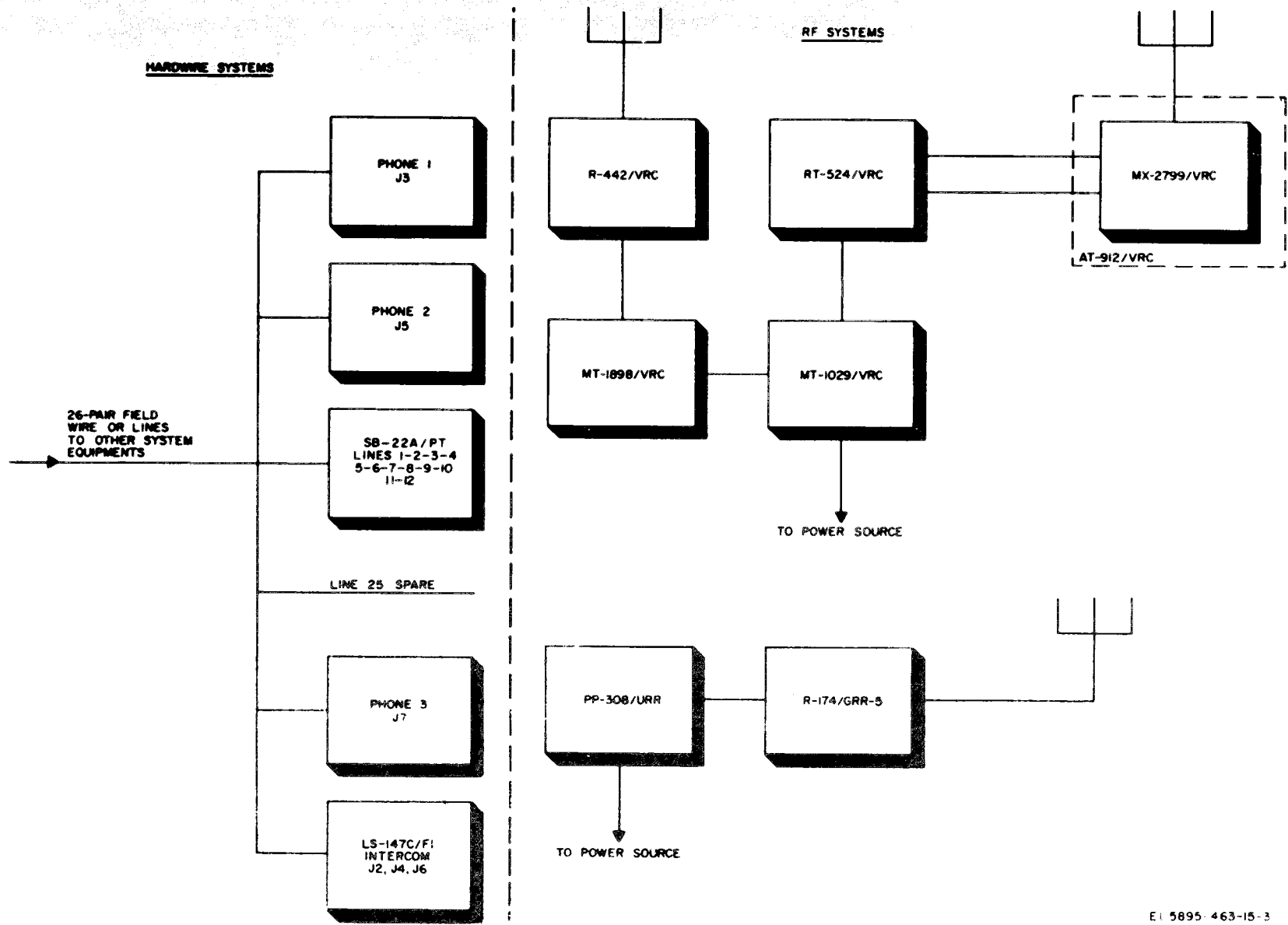


Figure 1-3. Operations Center, Communications AN/MS(-)A signal circuits, block diagram.

EL 5895-463-15-3

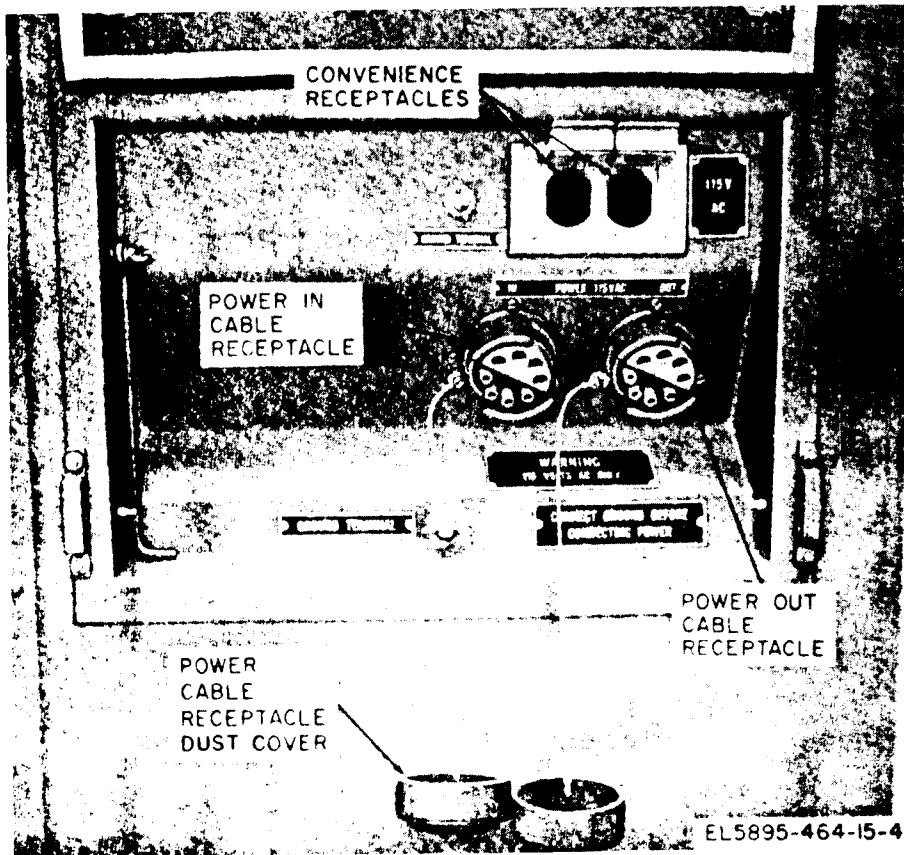


Figure 1-4. Power entrance box, exterior front view.

routed through signal ducts to the various components.

*b. Communications Components.*

(1) *Switchboard, Telephone, Manual SB-22A/PT* (fig. 1-7). The SB22A/PT (TM 11-5805-262-12) is a local, battery-powered telephone switchboard used to swith 12 telephone circuits.

(2) *Telephone Set TA-312/PT* (fig. 1-7). The TA-312/PTs (TM 11-5805-201-12) are used for local telephone communication. One TA-312/PT (less carrying case) is mounted on the curbside wall. Two TA-312/PTs are stored in a storage cabinet; when required for use, they are placed on the tabletop adjacent to a PHONE jack.

(3) *Intercommunication Station LS-147C/F1* (fig. 1-8). The LS-147C/F1 (TM 11-5830-221-12) provides two-way, non-

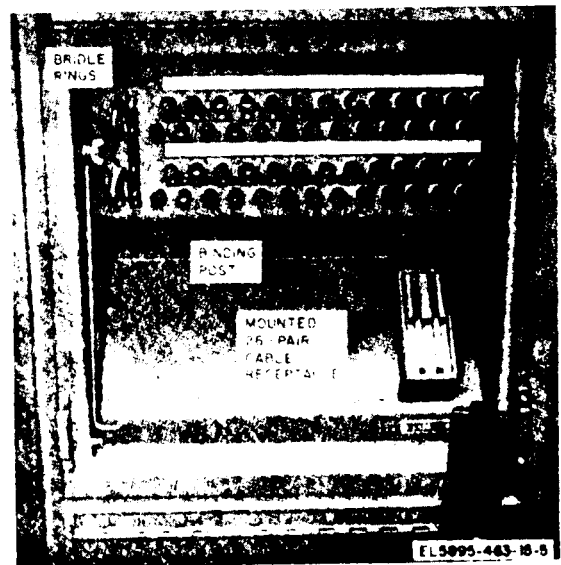


Figure 1-5. Signal entrance box, exterior front view.

private communication in a system that consists of other LS-147C/F1's or equivalent equipment.

(4) Radio Set AN/VRC-47. The AX VRC-47 (TM 11-5820-401-10) provides short range, two-way, frequency-modulated (FM) radiotelephone communications between vehicles or crew-served weapons. The AN VRC-47 radio set consists of Receiver-Transmitter, Radio RT-524/VRC (fig. 1-7) and Receiver, Radio R-112 VRC (fig. 1-7), and Loudspeaker, Permanent Magnet LS-154/U (fig. 1-7).

(5) Radio Receiving Set AN/GRR-5 (fig. 1-7). The AN GRR-5 (TM 11-5820-284-15) is a mobile amplitude modulated (am.) receiver used primarily to monitor warning broadcast nets. The AN GRR-5 consists of Receiver R-174/GRR-5, Power Supply PP-308/URR, and accessories.

#### 1-9. Description of Miscellaneous Components

a. *Electric Heaters (fig. 1-9).* The heaters are secured in their mounting bases on the shelter floor (fig. 5-1). Each heater contains a 1.5-kilowatt heating element and a fan for air circulation. Horizontal louvers on the front of each heater are adjustable to deflect the airstream. Operating controls are located on the top of each heater.

b. *Blowers.* The blowers, one store and one installed, are equipped with removable covers which muffle the sound when the blower is in operation. The installed blower (fig. 1-7) is an exhaust blower to the outside of the shelter.

c. *Clock.* An 8-day, luminous-dial, 24-hour clock is mounted on the front wall (fig. 5-1) of the shelter. A knob on the left-hand side is used for winding and setting the clock.

d. *Air Conditioner, Model F-9000-2, (FSN 4120-679-2669 ) (fig. 1-10).* The Model F-

9000-2 air conditioner is air cooled, self-contained, base mounted, and requires an external power source of 115 volts, 60 cps, single phase, ac electrical power for operation. The Model F-9000-2 has a cooling capacity of 8,400 British thermal units per hour (Btu hr) at 125 °F surrounding air temperature.

#### e. Ancillary Components.

(1) *Power cable assembly and reel (fig. 1-11).* The Cable Assembly, Power, Electrical CX-7453A/U is wound on Reel Assembly RC-435/U which, during transport, is secured to the floor at the front of the shelter (fig. 1-9). It is a 100-foot, 3-conductor cable with a watertight power connector on each end.

(2) *Power cable stub.* Power Cable Stub CX-7705A/U is a 15-foot, three-conductor cable with a watertight power connector on one end, and green, white, and black prepared leads on the other end. It is wound on the same reel used for the CX-7453A/U.

(3) *Cable Assembly, Telephone CX-4566A/U and Reel Assembly RC-435/U (fig. 1-11).* The CX-4566A/U is 250 feet long and is equipped with a 26-pair cable connector on each end.

(4) *Cable Assembly, Telephone CX-4760A/U (fig. 1-12).* The CX-4760A/U is a 26-pair cable stub that is 15 feet long and is equipped with a 26-pair cable connector on one end and prepared leads on the other end.

(5) *SB-22A/PT cable stub.* The SB-22A/PT cable stub is equipped with a 26-pin connector on one end and prepared leads on the other end.

(6) *Telephone connecting cords (fig. 1-12).* The telephone (4 feet) connecting cords are two-conductor cords equipped with telephone plugs on one end and prepared leads on the other end.

(7) *Running spares.* The running spares are shown in figure 1-13.

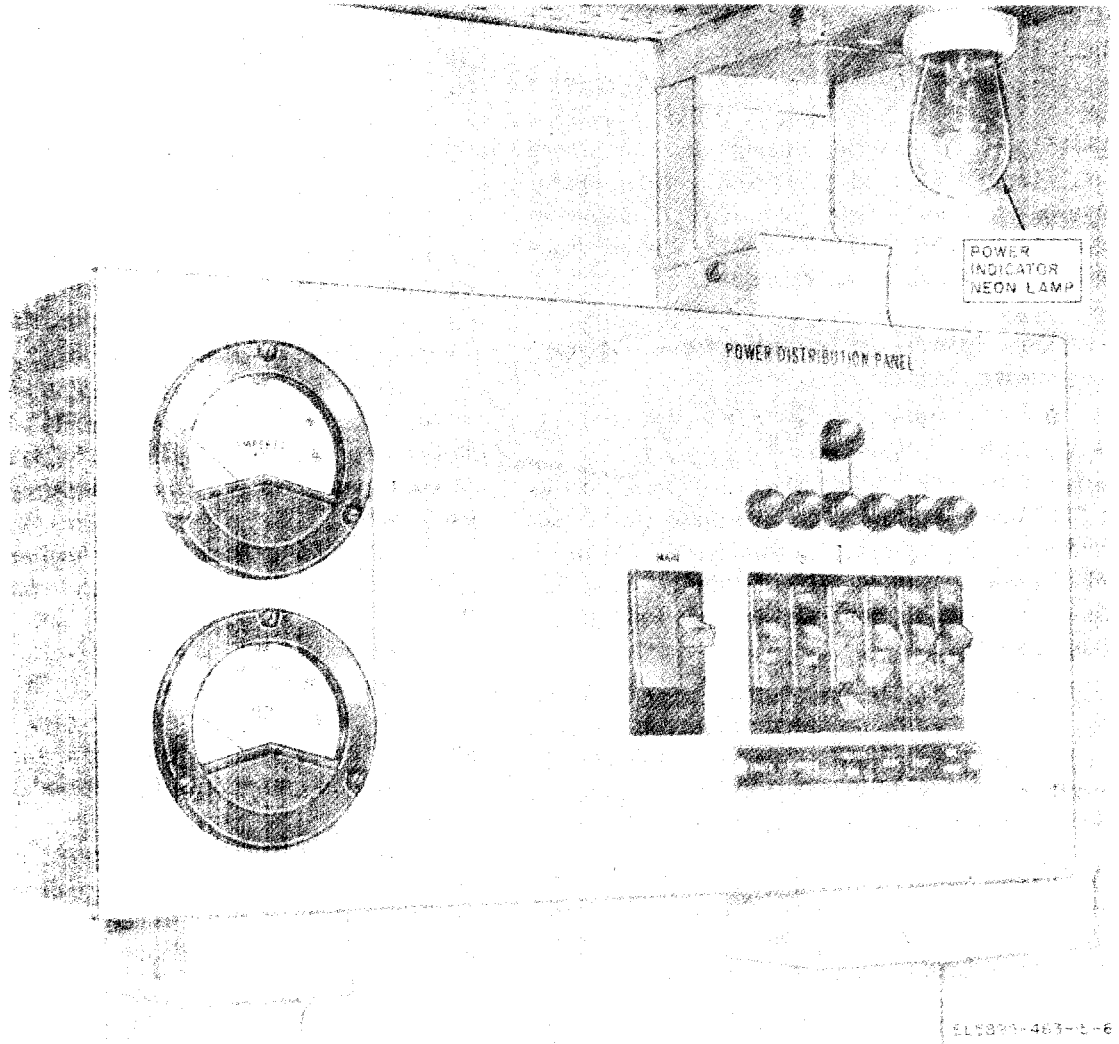


Figure 1-6. Power distribution panel, front view.



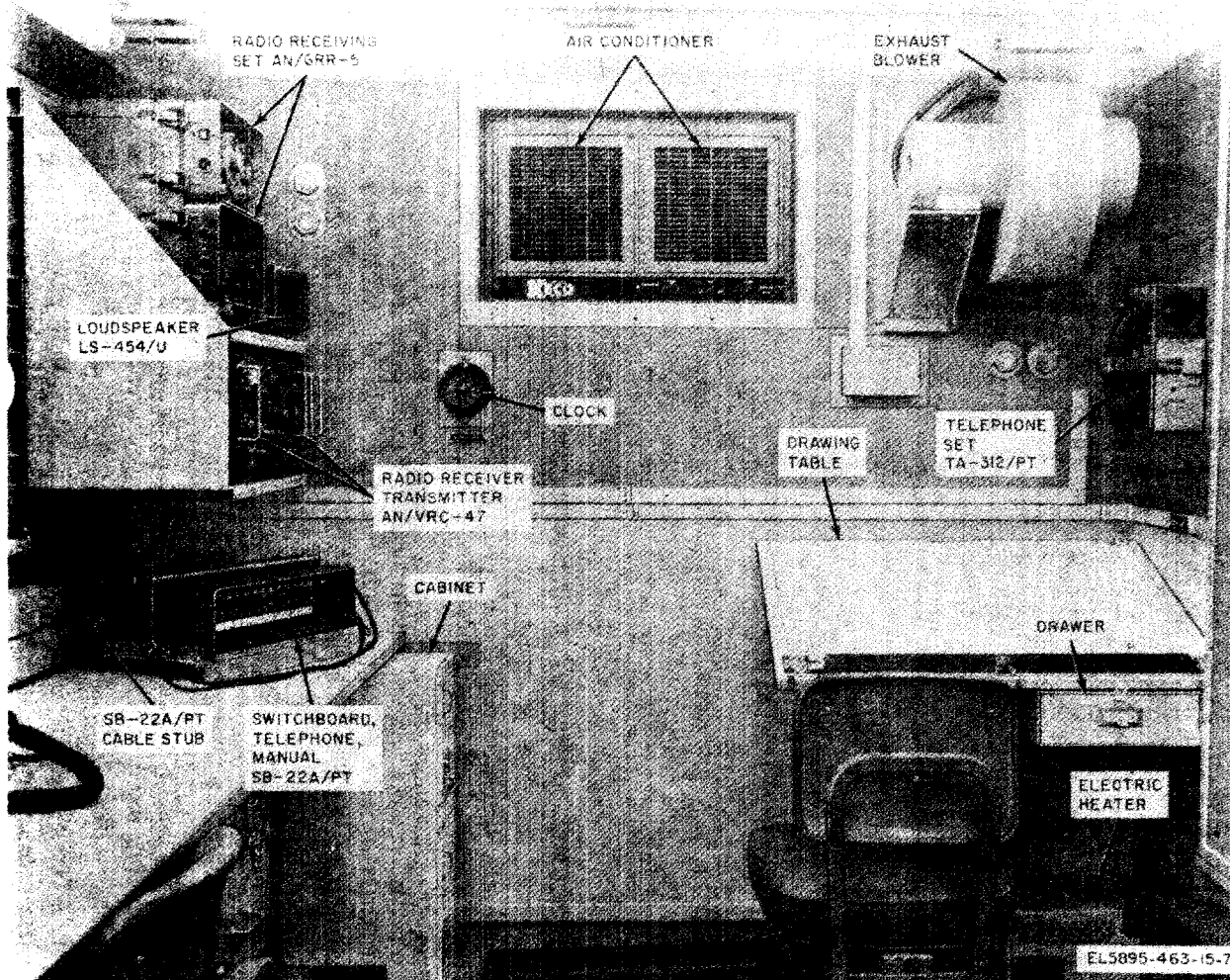


Figure 1-7. Operations Center, Communications AN/MS-31A, interior front view.

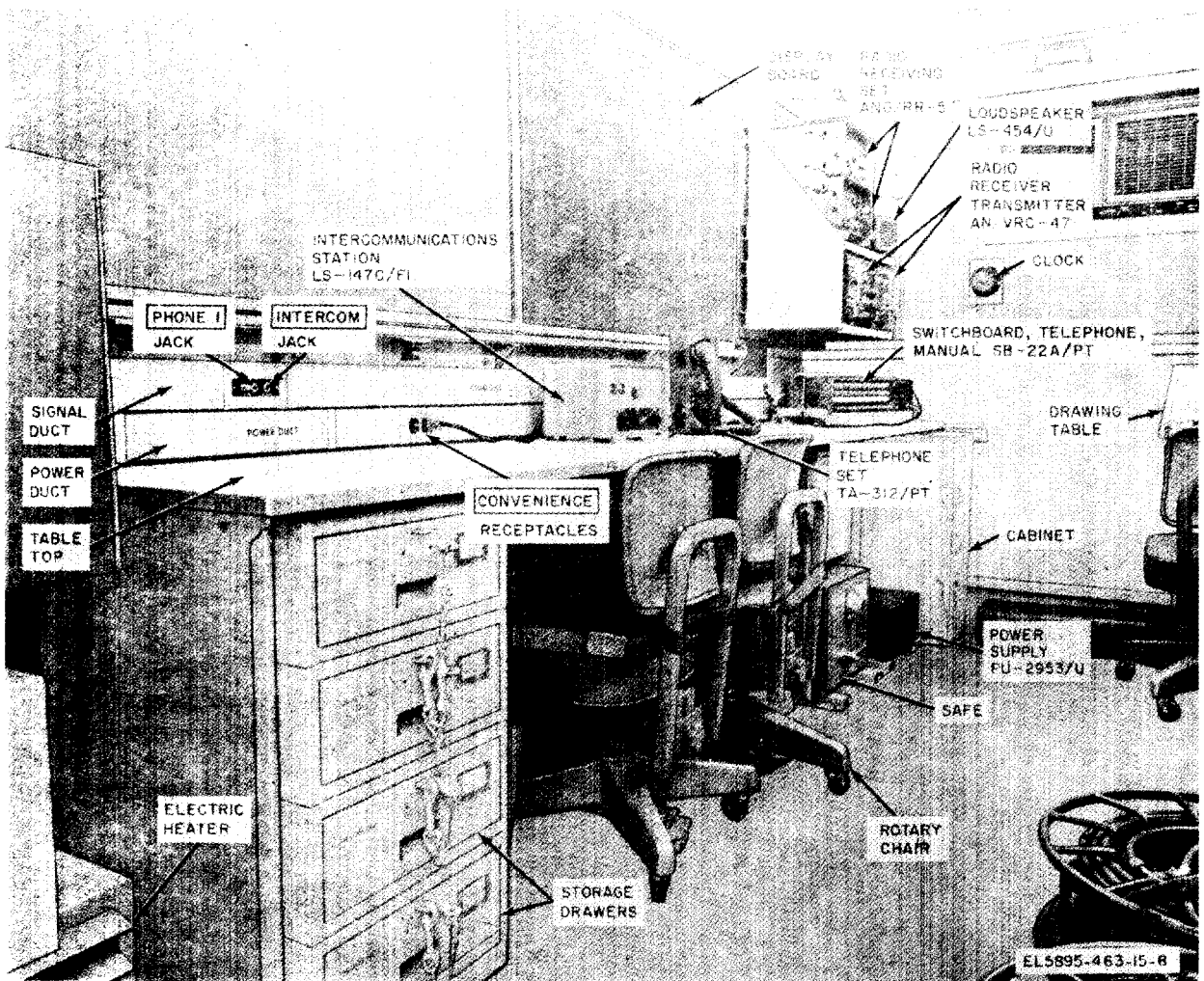


Figure 1-8. Operations Center, Communications AN/MS-13A, interior roadside view.

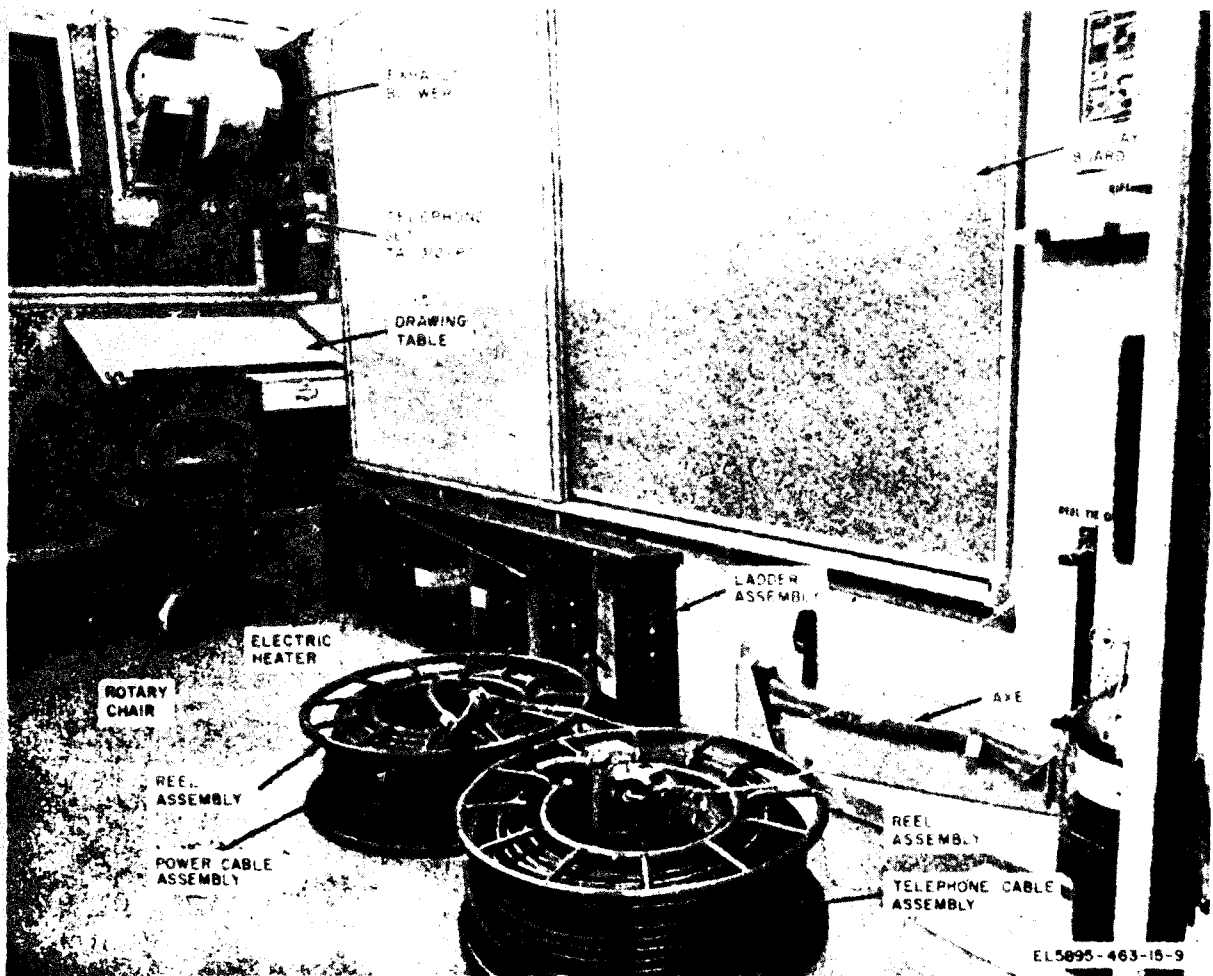
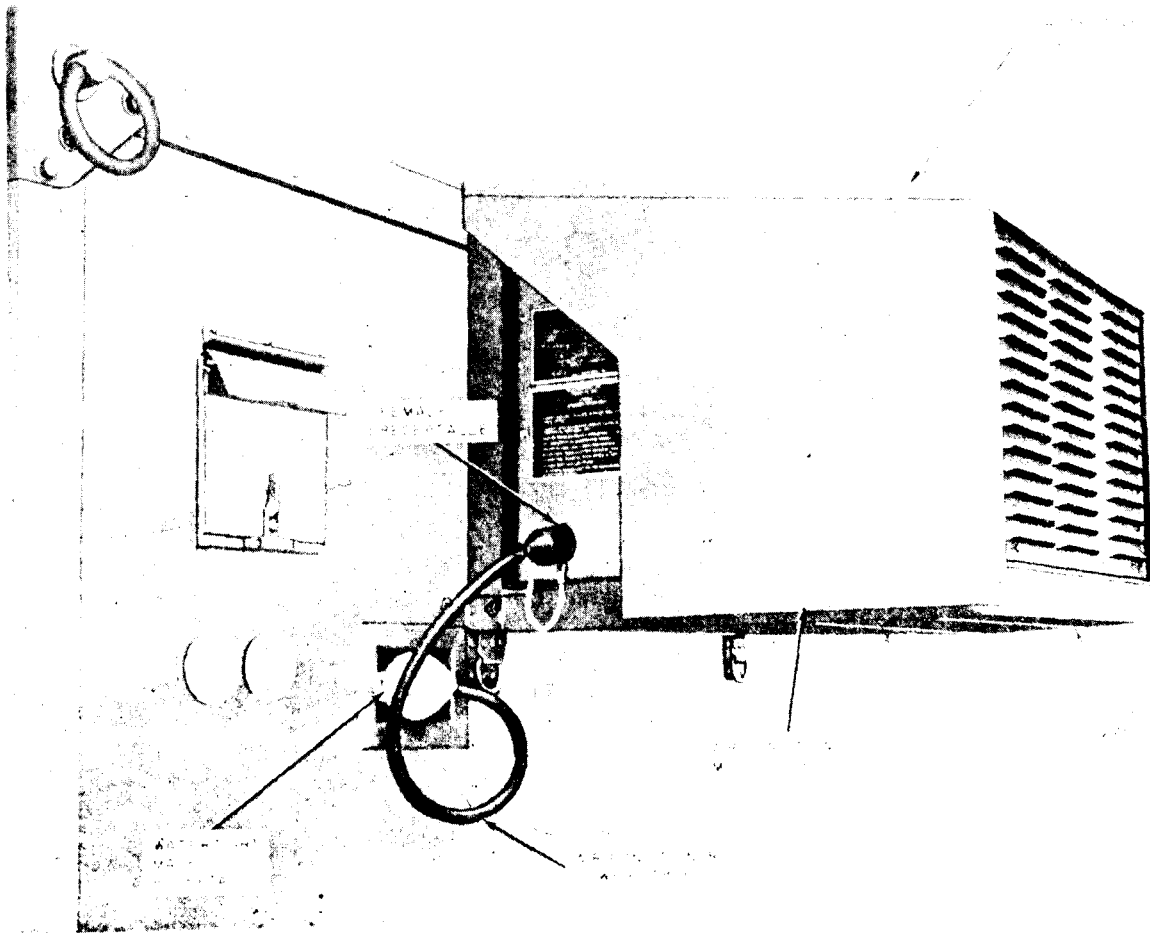


Figure 1-9. Operations Center, Communications AN MSC-11A, interior curbside view.



*Figure 1-10. Airconditioner, model F-9000-2.*

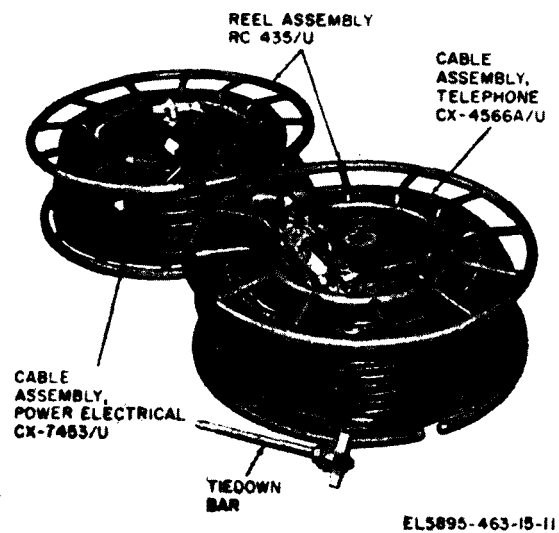
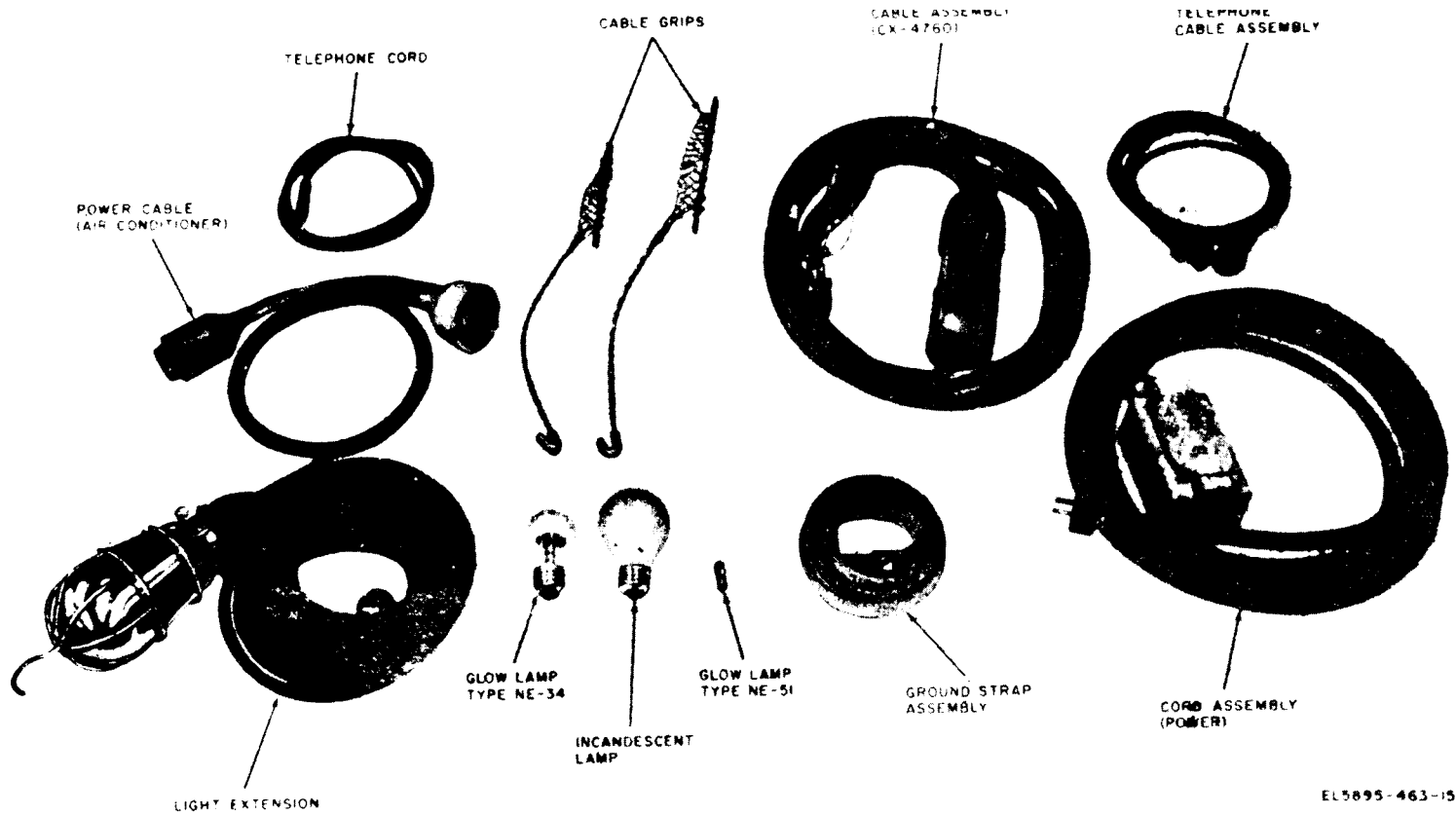


Figure 1-11. Shelter, Electrical Equipment S-371/  
MSC-31A, cable assemblies, and reels.



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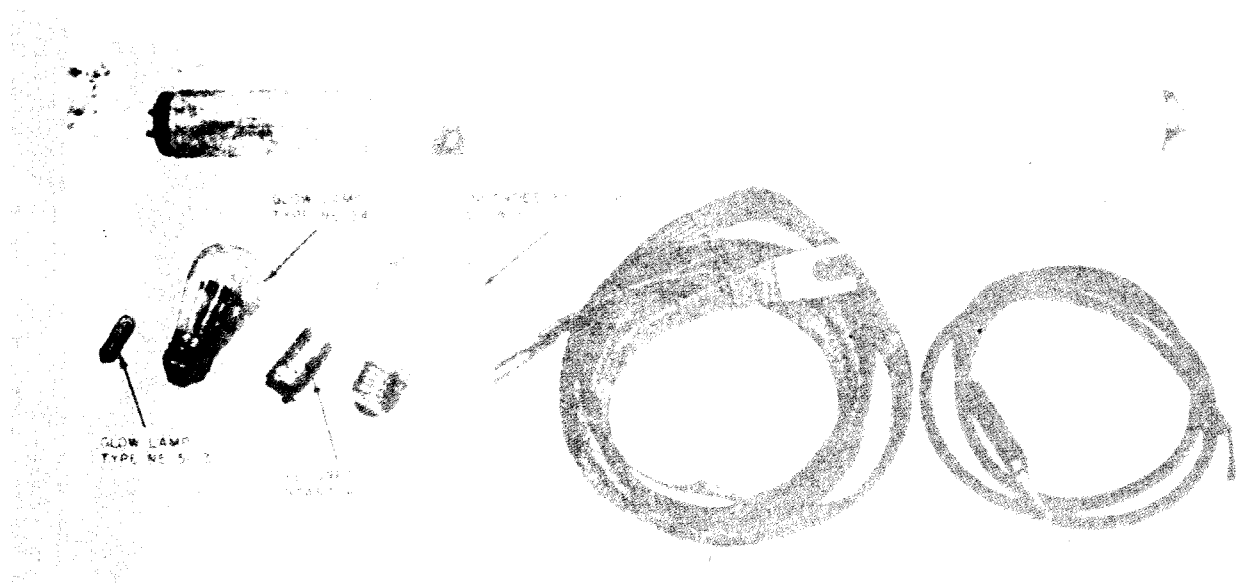


Figure 1-13. Shelter, Electrical Equipment S-371/MS-31A, running spares.





## CHAPTER 2

### INSTALLATION

---

#### 2-1. Unpacking and Checking

*a. Packaging Data.* The AN/MSC-31A (fig. 2-1) is packed in a reusable wooden crate. The shelter, which houses the equipment, is anchored to eyebolts in the skid base of the crate. The skid base has entries for handling with a forklift. The dimensions of the crate are 155 by 93 by 94 inches. The volume is 874 cubic feet, and the weight of the crated AN/MSC-31A is approximately 3,600 pounds.

*b. Removal of contents.*

**Caution: Do not thrust any tools into the interior of any pack or package.**

(1) Unfasten the lag bolts with wrenches and remove the top, front, rear, and side panels from the crate base (fig. 2-1).

(2) Detach the *tiedowns* from the eyebolts in the base of the crate turnbuckles.

(3) Remove the wooden blocking from the sides and ends of the shelter.

**Caution: Be careful when handling tools, because the aluminum skin of the shelter can be easily damaged.**

(4) Remove the shelter from the crate base. Use an overhead lifting device whenever available; if it is not available, remove the headers from the crate base, lift the shelter from either side with a forklift, or drag it from the base by the towing eyes.

**Warning: The overhead lifting device or other lifting equipment should be capable of lifting or handling 3,600 pounds.**

(5) Send the crate to a local *storage area* for reuse.

*c. Checking AN/MSC-31A Contents.* Check the contents of the AN/MSC-31A against the packing list. If the packing list is not available, use the basic issue items list (appx B).

*Note.* For unpacking, and checking the major components, refer to the applicable technical manual (appx A).

#### 2-2. Siting

The location of the AN/MSC-31A will depend on the tactical situation, standard operating procedure (SOP), and the location and arrangement of other equipment in the area communications network. The AN/MSC-31A may be either mobile (mounted on an M35 truck) or at a fixed ground location. It can be powered by a mobile power source or can use commercial or military powerlines. Consideration should be given to available power sources and telephone trunkline terminations.

*a. Ground Installation.* Position the AN/ MSC-31A in such manner as to make both power and telephone connections as convenient as possible. Orientation of the AN/ MSC-31A should take into consideration access to the shelter entrance and general topographic features of the terrain. Such factors as drainage and accessibility to the shelter by prime movers and loading equipment should also be considered in the placement of the shelter:

*b. Truck Installation.*

*Note.* Remove personnel carriers from the truck bed before installing the AN/ MSC-31A on the truck.

(1) Use the sling hooks (nearest turnbuckle) to connect the sling assemblies to the lifting and tiedown eyes of the shelter (fig. 2-2). Connect the sling hooks, at the opposite ends of the cables, to the lifting ring, and place the lifting ring over the lifting hook of the lifting device.

**Warning: To avoid injury to personnel, or damage to equipment, only personnel engaged in the actual loading operation should be permitted near the truck, lifting device,**

and shelter. To eliminate confusion, all instructions must come from the loading crew supervisor.

(2) Loop a 1/2-inch rope (at least 15 feet long) to each rear towing eye.

(3) Lower the tailgate of the truck; make sure that all tools and equipment have been removed from the bed of the truck. Slowly lift the shelter high enough to clear the bed of the truck.

*Note.* The entrance door of the shelter must be at the rear of the truck, and the front end of the shelter must be flush against the front of the truck bed.

(4) Position a man at the free end of each of the 1/2-inch ropes to guide the shelter. Back the truck slowly into position under the shelter and slowly lower the shelter into the truck.

**Warning: All personnel must remain clear of the truck while the shelter is being lowered into the truck.**

(5) Remove the lifting ring from the lifting hook and disassemble the ring and the sling hooks. Remove the sling hooks from the lifting and tiedown eyes and the 1/2-inch ropes from the rear towing eyes. Raise and secure the truck tailgate.

(6) Install a tiedown ring assembly (part of the sling assembly) in the center support of each cargo bed - side rail of the truck (fig. 2-3 )

(7) At each side of the shelter, use the hook at the end farthest from the turnbuckle to hook each sling assembly to a lifting and tiedown eye of the shelter, secure the sling hooks at the opposite end of the cables to the tiedown ring (fig. 2-3).

(8) Tighten all turnbuckles evenly by hand, and then turn each turnbuckle an additional one-half turn with a bar or rod inserted into the slot of the turnbuckle.

**Caution: Do not overtighten the turnbuckles. Overtightening the turnbuckles will damage the shelter.**

(9) After the truck is driven to the operating site, lower the tailgate to the horizontal position; then remove the ladder from the shelter and secure it to the left side of the tailgate.

*c. Unloading Shelter.* To unload the shelter from the truck, reverse the procedures given in b above.

## 2-3. Grounding

**Warning: The AN/MS-31A must be properly grounded before input power is connected.**

Select a grounding site (within 6 feet of the power and signal entrance boxes) that is low and damp, if possible, and that will not interfere with the entrance door, field tires, power, or signal cables.

*a.* Loosen and lift the cover of the power entrance box (fig. 1-1).

*b.* Use the cover support to secure the cover in the open position.

*c.* Remove a ground rod and the sledge hammer from their mountings in the shelter (fig. 5-1 ),

*d.* Remove any dirt or grease from the ground rod.

*e.* Scoop out a small hole, about 6 inches deep, at the selected grounding site.

*f.* Drive the grounding rod into the hole until the top of the grounding rod is approximately 3 inches above the bottom of the hole.

*g.* Remove a 10-foot ground strap from the storage area in the shelter.

*h.* Connect one end of the ground strap to the ground rod and the other end of the lower GROUND TERMINAL in the power entrance box.

*i.* Saturate the ground around the rod with water to keep it moist.

*j.* If a motor-generator set is used to supply ac power, ground it the same way as the AN/MS-31A.

## 2-4. Power Connections

**Caution: Grounding connections (para 2-3 must be completed" before power is connected to the AN/MS-31A.**

*a. Preliminary Procedures.*

(1) Make sure that all circuit breakers and equipment power switches in the shelter are off.

(2) Remove the power cable assembly and cable reel (fig. 5-1) from the shelter.

(3) Unwind the power cable assembly and power cable stub from the cable reel.

**Caution: Power for the AN/MSC-31A is normally supplied through the IN POWER 115V AC connector. The POWER 115V AC OUT connector is provided to supply power to another shelter or to supply power to the AN/MSC-31A if the IN POWER 115V AC connector is damaged. When the POWER 115V AC OUT connector is used to supply power to another shelter, do not allow the total current drain to exceed 60 amperes) current rating of power cable assembly between the AN/MSC-31A and power source).**

*b. Connection to Motor-Generator Set.* If a motor-generator set is used to provide power to the AN/MSC-31A, connect power to the shelter as described in (1) and (2) below; otherwise, connect power as described in *c* below.

(1) Remove the cover from the IX POWER 115V AC receptacle in the power entrance box (fig. 1-4) and from the connector on one end of the power cable assembly. Connect the power cable assembly to the IN POWER 115V AC receptacle.

(2) If the motor generator set includes an output connector that is compatible with the connector on the power cable assembly, connect the power cable assembly to the generator set; otherwise, refer to the motor-generator set manual and connect the leads (white lead neutral) of the power cable stub to the appropriate output terminals of the motor-generator set. Connect the power cable stub to the power cable assembly.

*c. Connection to Central Power Source.*

(1) Turn off or disconnect the central power source before making any connections.

(2) If the power source is a 120-volt, 50- to 60-cycle per second (cps), single-phase, two-wire source, connect the green and white wires

of the power cable stub to the neutral terminal and the black wire of the power cable stub to the other terminal.

(3) If the power source is a 110/220 volt, 50- to 60-cps, single-phase or two-phase, three-wire distribution system, connect the green and white wires of the power cable stub to the neutral terminal and the black wire to either of two other terminals.

(4) If the power source is a 110/220-volt, 50- to 60-cps, three-phase, four-wire distribution system, connect the green and white wires of the power cable stub to the neutral bus bar and the black wire of the power cable stub to the phase 1, phase 2, or phase 3 bus bar.

(5) Connect the power cable stub to one end of the power cable assembly. Connect the other end of the power cable assembly to the IN POWER 115V AC receptacle in the power entrance box (fig. 1-4) on the AN/MSC-31A.

## 2-5. Signal Connections

(fig. 4-1)

All telephone and intercommunication connections are made through the signal entrance box on the AN/MSC-31A.

*a. Twenty-Six Pair Cable Connection Procedure.*

(1) Unlock and remove the covers from the 26-pair cable assembly (A and B, fig. 2-4) and on the 26-pair receptacle (A, B, C, and D, fig. 2-5) in the signal entrance box (fig. 1-5).

(2) Insert the connector into the receptacle and secure it by closing the locking collar (E, F, and G, fig. 2-5).

(3) If the required cable distance exceeds 250 feet, couple two 26-pair cable assemblies together.

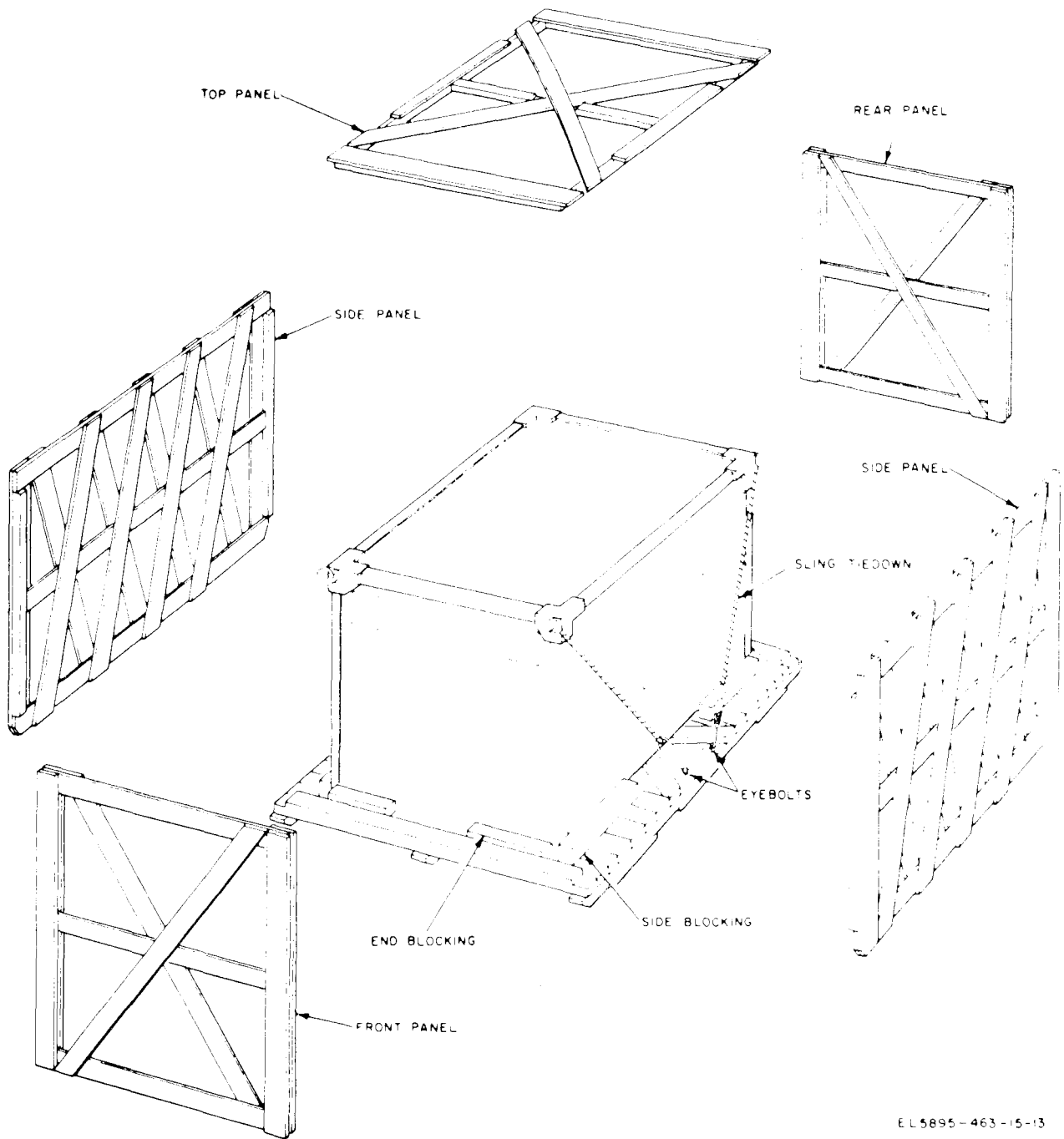
*Note.* To avoid poor quality signals, do not connect more than six 26-pair cable assemblies together.

*b. Field Wire Connection Procedure.*

(1) Connect the field wires to the PHONE and INTERCOM binding posts in the signal entrance box (fig. 1-5).

(2) Loosen the captive screws and lift the cover of the signal entrance box.

(3) Depress the binding post to open the wire slots. Place the field wires in the appropriate slots, and release the binding posts.



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Figure 2-1. Typical packaging diagram.

(4) Distribute and retain the wires in the bridle rings associated with each row of binding posts.

(c) Installation of Kits and Option *Rac* Equipment. If the equipment kits and optional radio equipment are to be installed in the field, refer to paragraph 4-6.

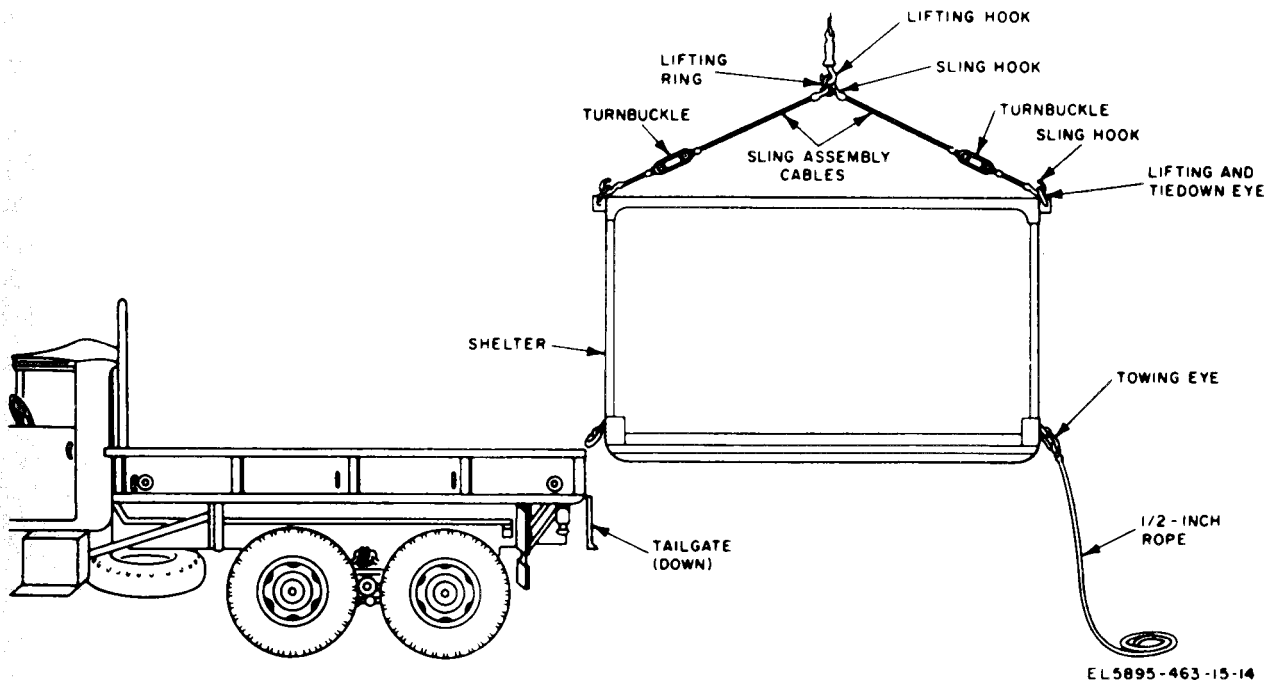
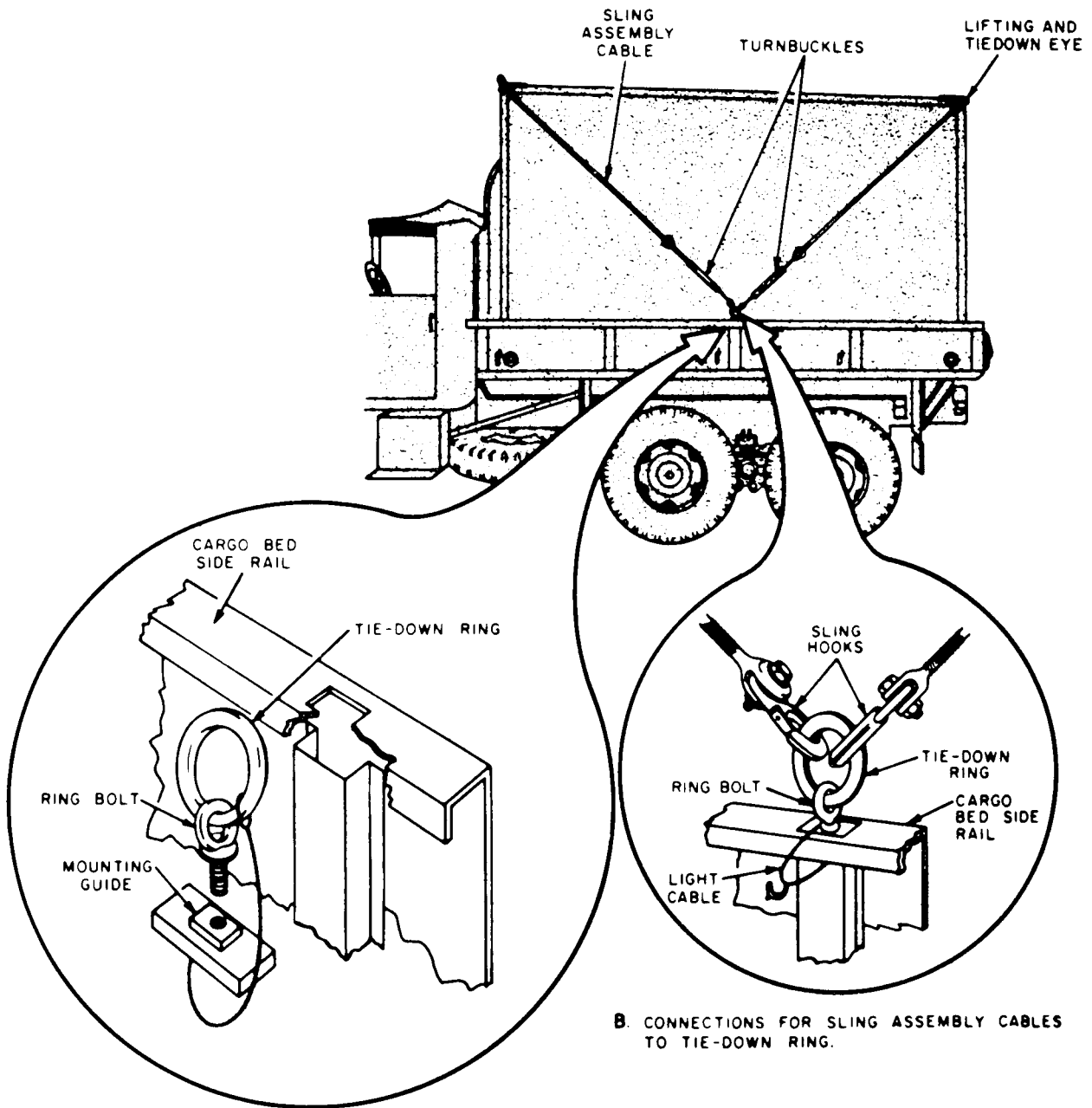


Figure 2-2. Lifting and loading AN/MS-31A on truck.



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Figure 2-3. Securing AN/MS-31A on truck.

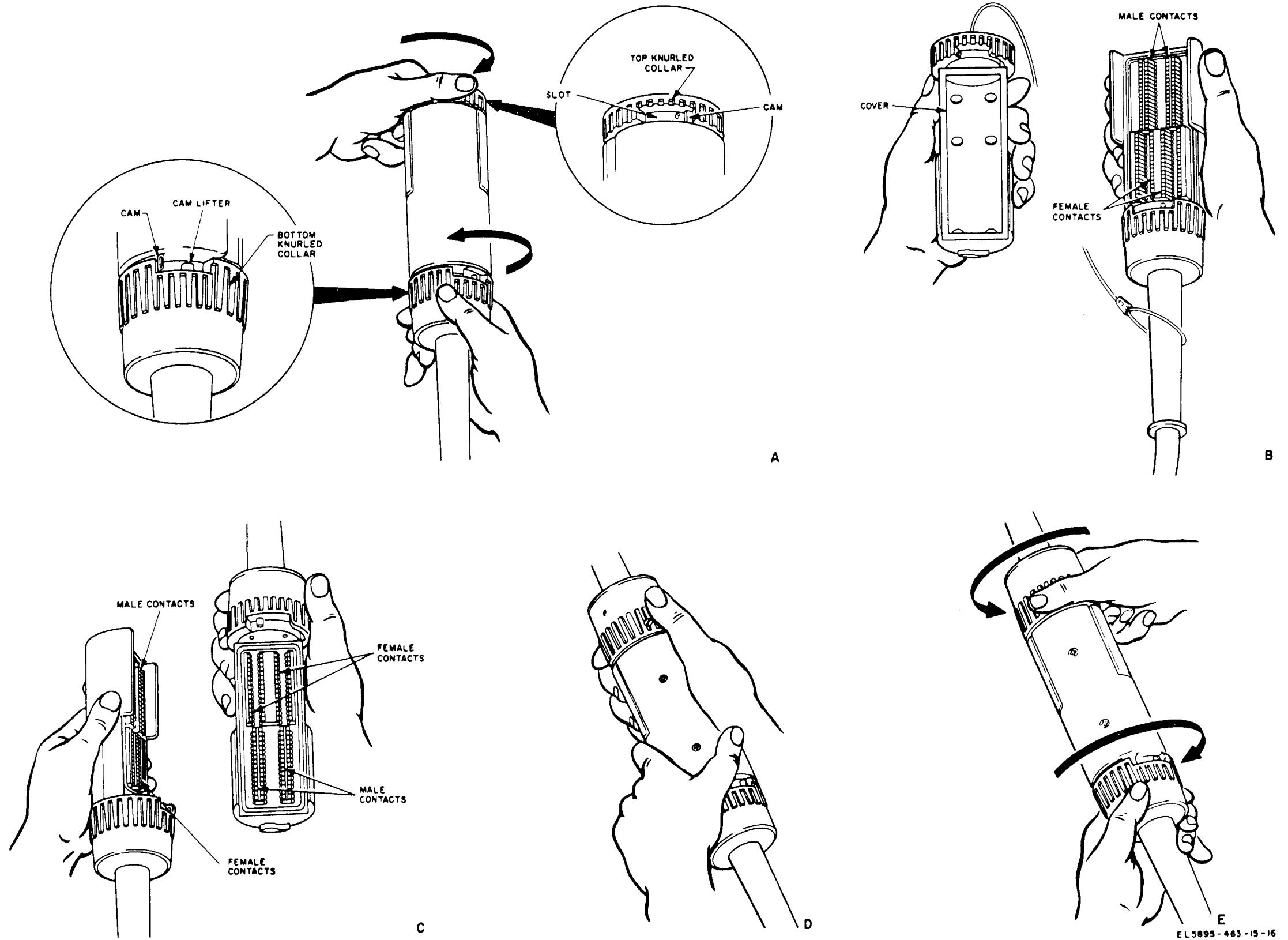


Figure 2-4. Coupling 26-pair connectors.

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Figure 2-4

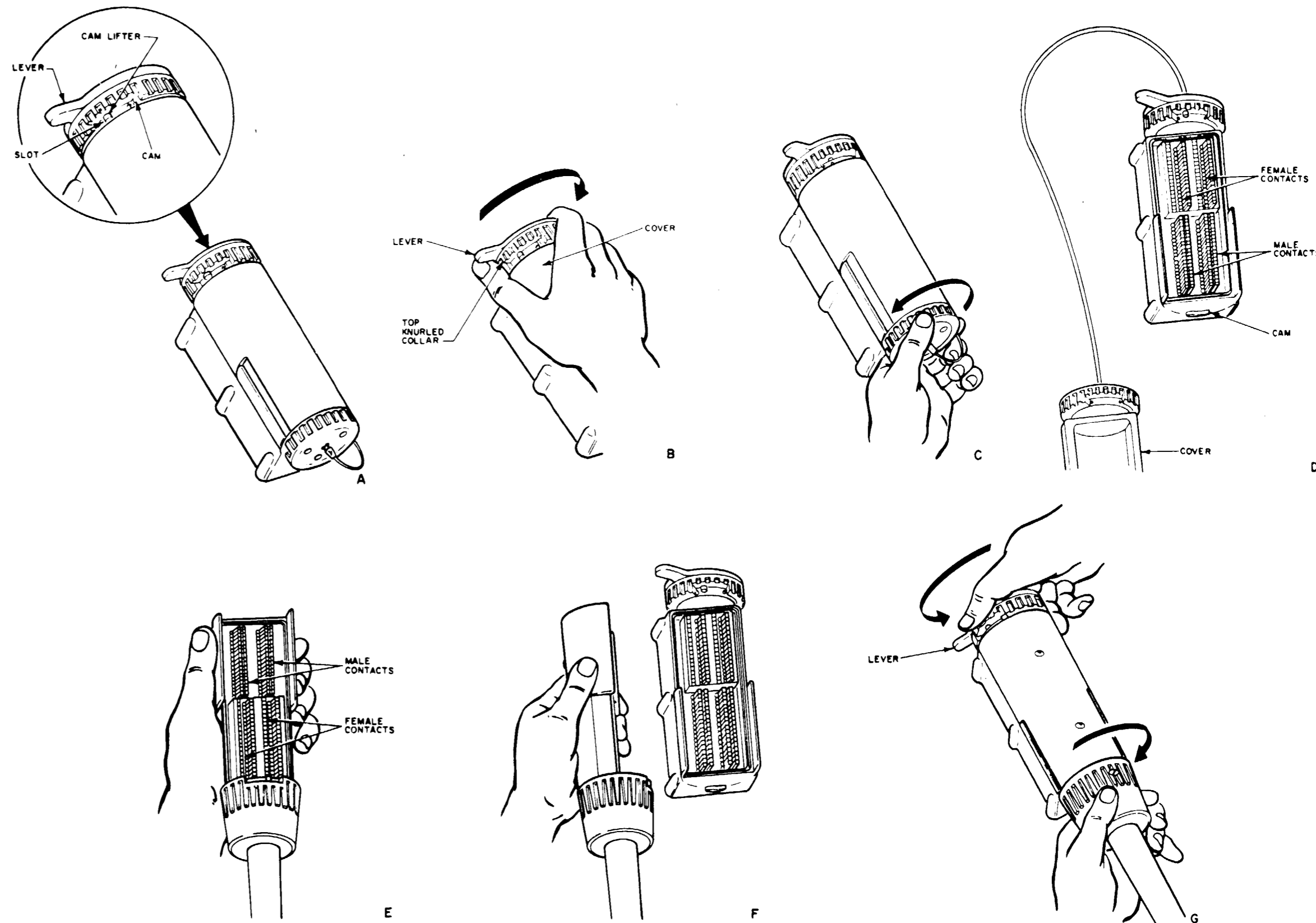


Figure 2-5. Connecting 26-pair connector to 26-pair receptacle.



**CHAPTER 3**  
**OPERATING INSTRUCTIONS**

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**3-1. General**

The following are the descriptions of the controls and indicators of the shelter components. For information concerning the controls and

indicators of the major communications components, refer to the applicable technical manuals listed in appendix A.

*a. Power Distribution Panel (fig. 1-6).*

<i>Control, indicator, or instrument</i>	<i>Description and function</i>																
MAIN circuit breaker switch CBS.	Sixty-ampere circuit breaker. Provides overload protection for 115-volt, ac input source and ON-OFF control of ac power to individual circuit breaker switches.																
Individual circuit breaker. Switches:	Provides ON-OFF control and overload protection for individual circuits as follows:																
	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><i>Rating (amp)</i></th> <th style="text-align: left;"><i>Circuit</i></th> </tr> </thead> <tbody> <tr> <td>1 LIGHTS.....</td> <td>15 Fluorescent lights.</td> </tr> <tr> <td>2 BLOWERS. . . . .</td> <td>15 Blower No. 1 and No. 2 receptacles</td> </tr> <tr> <td>3 HEATER 1. . . . .</td> <td>20 Electric heater power receptacle HEATER 1 (fig. 1-6).</td> </tr> <tr> <td>4 HEATER 2.....</td> <td>20 Electric heater power receptacle HEATER 2 (fig. 1-6).</td> </tr> <tr> <td>5 CONV. . . . .</td> <td>20 Convenience receptacles.</td> </tr> <tr> <td>6 EQUIP.....</td> <td>20 Major communication equipment receptacles.</td> </tr> <tr> <td>7 AIR COND.....</td> <td>20 Air conditioner receptacle.</td> </tr> </tbody> </table>	<i>Rating (amp)</i>	<i>Circuit</i>	1 LIGHTS.....	15 Fluorescent lights.	2 BLOWERS. . . . .	15 Blower No. 1 and No. 2 receptacles	3 HEATER 1. . . . .	20 Electric heater power receptacle HEATER 1 (fig. 1-6).	4 HEATER 2.....	20 Electric heater power receptacle HEATER 2 (fig. 1-6).	5 CONV. . . . .	20 Convenience receptacles.	6 EQUIP.....	20 Major communication equipment receptacles.	7 AIR COND.....	20 Air conditioner receptacle.
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5 CONV. . . . .	20 Convenience receptacles.																
6 EQUIP.....	20 Major communication equipment receptacles.																
7 AIR COND.....	20 Air conditioner receptacle.																
Voltmeter.....	Ac voltmeter with 0- to 150-volt scale. Indicates ac input voltage from external power source.																
Ammeter. . . . .	Ac ammeter with 0- to 100-ampere scale. Indicates total current drain from external power source by AN/MS-31A components in use.																
Glowlamp (8)-----	Neon lamp. Glows when associated circuit breaker switch is on.																

*b. Lighting (fig. 5-1).*

<i>Control, indicator, or instrument</i>	<i>Description and function</i>						
BLACKOUT-BY-PASS switch (fig. 5-1).	Two-position on-off switch. Controls lighting in the AN/MS-31A for blackout operation as follows:						
	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><i>Sw pos</i></th> <th style="text-align: left;"><i>Function</i></th> </tr> </thead> <tbody> <tr> <td>ON</td> <td>Permits fluorescent lights to be controlled by individual light switches.</td> </tr> <tr> <td>OFF</td> <td>Permits fluorescent lights to be controlled by door microswitch.</td> </tr> </tbody> </table>	<i>Sw pos</i>	<i>Function</i>	ON	Permits fluorescent lights to be controlled by individual light switches.	OFF	Permits fluorescent lights to be controlled by door microswitch.
<i>Sw pos</i>	<i>Function</i>						
ON	Permits fluorescent lights to be controlled by individual light switches.						
OFF	Permits fluorescent lights to be controlled by door microswitch.						
POWER INDICATOR NEON LAMP.	Lights when ac power is connected to the AN/MS-31A.						
Door microswitch.....	Extinguishes fluorescent lights when shelter door is opened. (BLACKOUT-BY-PASS switch at OFF.)						
LIGHT 1 switch.....	Two-position on-off switch. Controls four fluorescent lights in each row and one fluorescent light in front area (fig. 5-1).						
LIGHT 2 switch.....	Two-position on-off switch. Controls four fluorescent lights in each row and one fluorescent light in front area (fig. 5-1).						
Incandescent light switch (fig. 5-1).	Two-position light switch. Controls cold start incandescent light.						

c. Blowers (fig. 5-1).

*Control, indicator, or instrument*  
 BLOWER 1 switch  
 BLOWER 2 switch

*Description and function*  
 Two-position on-off switch. Controls operation of BLOWER 1.  
 Two-position on-off switch. Controls operation of BLOWER 2.

d. Electric Heaters (fig. 5-1).

*Control, indicator, or instrument*  
 HEAT-OFF-FAN switch

*Description and function*  
 Three-position toggle switch.

	<i>Sw pos</i>	<i>Function</i>
	HEAT	Applies ac power to heater element and fan motor.
	OFF	Disconnects ac power from heater element and fan motor.
	FAN	Applies ac power to fan motor.
TEMPERATURE CONTROL		Thermostat control. Regulates temperature provided by heating element.
RESET pushbutton		Pushbutton which resets protective circuit breaker within heater.

e. Phone and Intercommunication Jacks (fig. 5-1).

*Jack*  
 PHONE 1, PHONE 2,  
 and PHONE 3.  
 INTERCOM

*Function*  
 Terminating jacks. Used to connect LINE circuit of TA-312 PT (fig. 1-7) to similarly marked jacks at the patch panel and to line circuits.  
 Terminating jacks connected in parallel. Used to connect LS-47C/F1 to intercom line between shelthers.

f. Air Conditioner (fig. 3-1).

*Control, indicator, or instrument*  
 ON-FAN-COOL selector switch.

*Description and function*  
*Function*  
 SW POS  
 COOL Applies ac power to compressor motor.  
 OFF Disconnects ac power from compressor motor and fan.  
 FAN Applies ac power to fan motor.  
 THERMOSTAT Thermostate control, Regulates temperature provided By SELECTOR switch setting.  
 FRESH AIR control Controls intake of fresh air to interior of shelter.

3-2. Energizing AC Circuits

**Warning: To prevent asphyxiation, the AN/ MSC-31A must be ventilated at all times when occupied.**

Prepare the AN/MSC-31A for full operation as follows:

a. Connect the AN/MSC-31A to the available power source (para 2-3 and 2-4); the POWER INDICATOR NEON LAMP (fig. 5-1) will light.

b. Operate the MAIN circuit breaker switch on the power distribution panel (fig. 1-6) to ON.

c. Operate the BLACKOUT-BY-PASS switch (fig. 5-1) to ON. When blackout conditions are required, operate the switch to OFF.

d. Operate circuit breaker switch No. 1 (LIGHTS) to ON.

e. Operate LIGHT 1 and LIGHT 2 switches (fig. 5-1) to ON. Operate the incandescent light switch (fig. 5-1) to ON as required.

f. Check to see that the voltmeter (fig. 1-6) indicates 105 to 125 volts ac.

g. Check to see that the ammeter indicates approximately 0 ampere.

h. Operate circuit breakers No. 2 through 7 to ON.

3-3. Operating Procedures

Note. Refer to the applicable technical manuals (appx A) for operating procedures of major communications components. Refer to paragraph 3-1 for (Inscriptions and functions of controls and indicators of the AN/MSC-31A components.

**Warning:** To prevent asphyxiation, the AN/ MSC-31A must be ventilated at all times when occupied.

a. *Electric Heater (fig. 5-1).* Insert the power connector cord plug into the appropriate HEATER receptacle (fig. 5-1) and operate the HEAT-OFF-FAN switch to the desired position.

*Note.* If the HEAT-OFF-FAN switch is operated to HEAT, set the TEMPERATURE CONTROL to the desired setting.

b. *Exhaust Blower.* Insert the power cord connector plug into the appropriate blower receptacle (fig. 5-1) and operate the blower switch to ON.

**Caution:** Open the air vent cover on the shelter door (fig.1-1) and the exhaust blower vent cover on the front of the shelter (fig. 1-2) before operating the blower.

c. *Air Conditioner.*

(1) *Service Valve Operation.* Operates refrigerant service valves to proper position (TM 5-4120-265-15) .

**Caution:** Both refrigerant service valves must be operated before operating air conditioning unit.

(2) *Connecting power cable.* Remove the power cable from the storage cabinet. Connect the female receptacle to the mating twist-lock receptacle on the unit, Twist to lock to place. Connect the male connector to the exterior, and

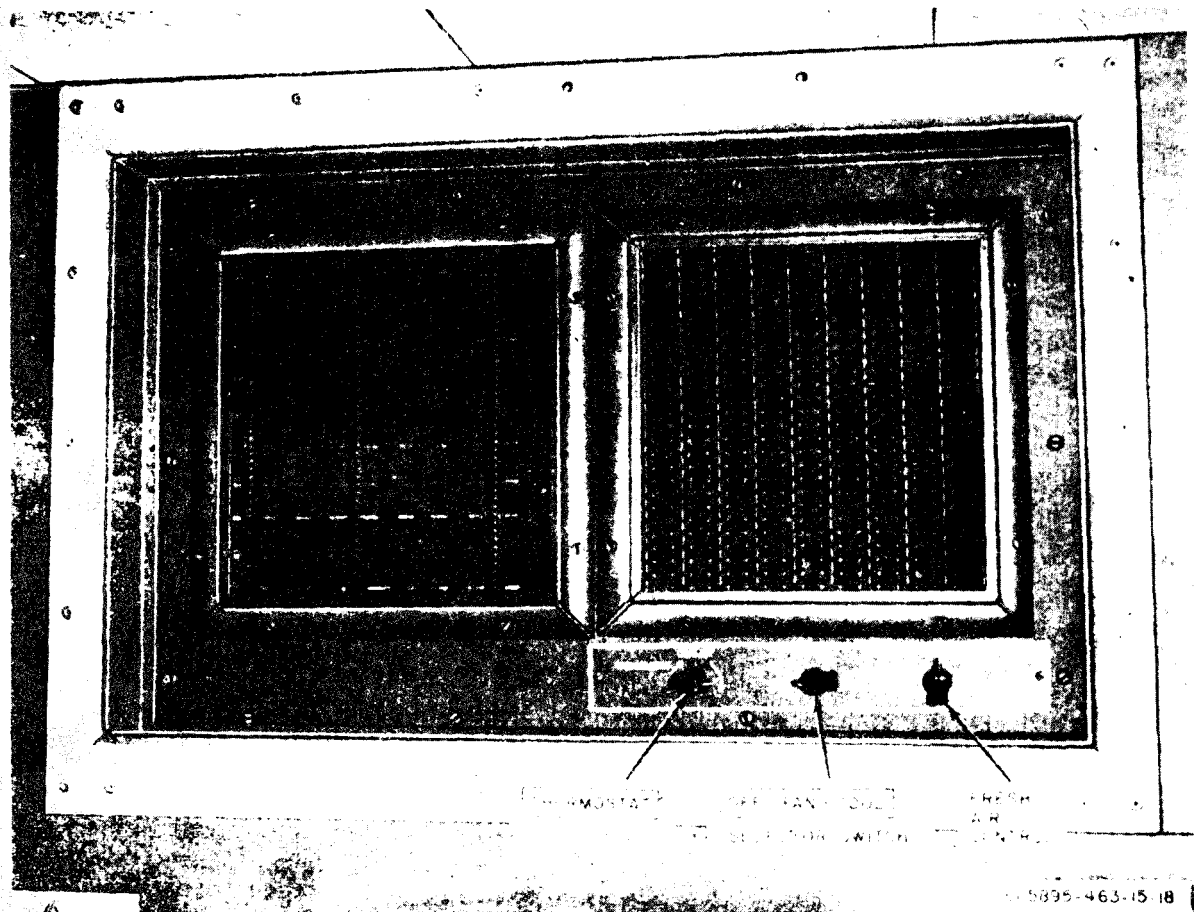


Figure 3-1. Air conditioner control panel.

weatherproof the receptacle mounted on the upper front roadside of the shelter (fig. 1-10).

(3) Turn the OFF-FAN-COOL selector switch to COOL.

(4) Turn the thermostat knob to extreme right (in the direction of the arrow) until the compressor starts. Readjust the thermostat as required to satisfy cooling requirements.

(5) Turn the fresh air control to OPEN if outside air is desired.

### 3-4. Operating Under Adverse Climatic Conditions

The AN/MSC-31A can be operated in extremely cold or hot climates. The shelter offers protection from the elements for personnel and equipment. However, when the entrance boxes are exposed to adverse conditions, the following precautions are necessary.

*a. Cold Climates.* Extreme cold causes the cables and wires to become hard, brittle, and difficult to handle. Be careful when handling the cables and when connecting them to the AN/MSC-31A so that kinks and unnecessary loops will not result in permanent damage. Make sure that the binding posts and cable receptacles on the outside of the AN/MSC-31A are free of frost, snow, and ice by replacing the covers on the receptacles and closing the covers on the entrance boxes when they are not in use. Lower and secure the folding side panels when the entrance box covers are open. Replace the connector covers as soon as the connectors are disconnected from the equipment; never drag or place an open connector in snow or on the ground.

*b. Hot, Dry Climates.* In hot, dry climates, the connectors, receptacles, and binding posts are subject to damage from dirt and dust. Lower and secure the folding side panels when the entrance box covers are open. Close the covers on the entrance boxes when they are not

in use, and replace the covers on the cable connectors.

*c. Warm, Damp Climates.* In warm, damp climates, the equipment is subject to damage from moisture and fungi. Wipe moisture and fungi from the exterior of the equipment with a lint-free cloth.

### 3-5. Stopping Procedures

Note. To turn off the power in an emergency, operate the MAIN circuit breaker switch to OFF.

*a. Stopping Procedures.* Stopping procedures are not required for the SB-22A/PT or the TA-312/PT. Refer to the applicable technical manuals (appx A) for stripping procedures on the major communications components. Refer to paragraphs 5-1 through 5-4 for procedures to be performed for storage or transit of the AN/MSC-31A.

*b. AN/MSC-31A Components.*

(1) *Electric Heaters.* Operate the TEMPERATURE CONTROL to its lowest setting and the HEAT-OFF-FAN switch to OFF.

Note. After the other AN/MSC-31A components have been turned off, allow the exhaust blower to remain in operation for at least 10 minutes to evacuate all smoke and fumes before completing the stopping procedures and closing the shelter door.

(2) *Blowers.* Operate the BLOWER switches to OFF. Secure the vents.

(3) *Air conditioner (fig. 3-1).*

(a) Operate the OFF-FAN-COOL selector switch to the OFF position.

(b) Operate the fresh air control to the CLOSED position.

*c. Circuit Breaker and Light Switches.* Operate all circuit breaker and light switches to OFF.

*d. Door and Entrance Box Covers.* Secure the door and entrance box covers.

## CHAPTER 4

## MAINTENANCE

## Section I. OPERATOR/CREW AND ORGANIZATIONAL PREVENTIVE

## MAINTENANCE CHECKS AND SERVICES

## 4-1. General

## NOTE

Refer to TM 750-244-2 for proper procedures for destruction of this equipment to prevent enemy use.

a. Operator/crew preventive maintenance is the systematic care, servicing and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to maintain equipment in serviceable condition. To be sure that your equipment is always ready for your mission, you must do scheduled preventive maintenance checks and services (PMCS).

(1) BEFORE OPERATION, perform your B PMCS to be sure that your equipment is ready to go.

(2) WEEKLY PMCS are important checks to keep serious problems from suddenly happening. Perform WEEKLY as well as BEFORE OPERATION PMCS if:

(a) You are the assigned operator and have not operated the item since the last WEEKLY.

(b) You are operating the item for the first time.

(3) When an item of equipment is reinstalled after removal, for any reason, perform the necessary B PMCS (para 4-3) to be sure the item meets the readiness reporting criteria.

(4) Use the ITEM NO. column in the PMCS table to get the number to be used in the TM ITEM NO. column on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) when you fill out the form.

b. Organizational preventive maintenance procedures are designed to help maintain equipment in serviceable condition. They include items to be checked and how to check them. These checks and services, described in paragraph 4-4, outline inspections that are to be made at specific monthly (M), quarterly (Q), and annual (A) intervals.

c. Routine checks like CLEANING, PRESERVATION, DUSTING, WASHING, CHECK-

ING FOR FRAYED CABLES, STOWING ITEMS NOT IN USE, COVERING UNUSED RECEPTACLES, CHECKING FOR LOOSE NUTS AND BOLTS AND COMPLETENESS are not listed as PMCS checks. They are things that you should do any time you see they must be done. If you find a routine check like one of those listed in your PMCS it is because other operators reported problems with this item.

## NOTE

When you are doing any PMCS or routine check, keep in mind the warnings and cautions.

## WARNING

Never operate the generator or shelter until it has been properly grounded. Electrical defects in the load lines or equipment can cause death by electrocution when contact is made with an ungrounded system.

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent a chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel. Goggles must be worn at all times while cleaning with compressed air. Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch gage (psig) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when trichlorotrifluoroethane has been used.

**NOTE**

The PROCEDURES column in your PMCS charts instruct how to perform the required checks and services. Carefully follow these instructions and, if tools are needed or the chart so instructs, get organizational maintenance to do the necessary work.

It your equipment must be in operation all the time, check those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

**d.** Deficiencies that cannot be corrected must be reported to higher category maintenance personnel. Records and reports of preventive maintenance must be made in accordance with

procedures given in TM 38-750.

**4-2. Operator/Crew Preventive Maintenance Checks and Services**

Perform weekly as well as before operation PMCS if:

**a.** You are the assigned operator and have not operated the item since the last weekly.

**b.** You are operating the item for the first time.

**NOTE**

The checks in the interval column are to be performed in the order listed.

**4-3. Operator/Crew Preventive Maintenance Checks and Services Chart**

B – Before

W – Weekly

Item No.	Interval		Item to be Inspected	Procedures - Check for and have repaired or adjusted as necessary	Equipment is not Ready/Available If:
	B	W			
1	*		Mission Essential Equipment	Check for completeness and satisfactory condition of the equipment. Report missing items.	Available equipment is insufficient to support the combat mission.
2	•		Grounding System	Inspect ground rods and grounding connections to ensure clean tight connections.	Personnel experiences shock from bodily contact with shelter frame or equipment.
3		•	Air Filter	Check that air filter on shelter door is clean and not clogged or obstructed.	
4	*		AN/MSC-31A	Perform all operational checks as described in paragraph 3-2 and 3-3.	Equipment is not operational.
5	*		Manual Telephone Switchboard SB-22A/PT	Perform operational checks as described in TM 11-5805-262-12.	See subsystem TM for readiness criteria.
6	*		Telephone Set TA-312/PT	Perform operational checks as described in TM 11-5805-201-12.	See subsystem TM for readiness criteria.
7	*		Intercommunication Station LS-147C/FI	Perform operational checks as described in TM 11-5830-221-12.	See subsystem TM for readiness criteria.
8	*		Radio Set AN/VRC-47	Perform operational checks as described in TM 11-5820-401-12.	See subsystem TM for readiness criteria.
9	*		Radio Receiving Set R-392/URR	Perform operational checks as described in TM 11-5820-334-20.	See subsystem TM for readiness criteria.

\*Do this check before each deployment to a mission location. This will permit any existing problems to be corrected before the mission starts. The check does not need to be done again until redeployment.

**4-4. Organizational Preventive Maintenance Checks and Services Chart**

Q – Quarterly

A – Annually

Item No.	Interval			Item to be Inspected	Procedures
	M	Q	A		
1	•			Ground System	a. Clean grounding rod and ground terminal connections. b. Replace ground rod if ground lead cannot be securely tightened. Replace ground lead if it is cut, corroded, or broken.
2		•		Air Filter	Clean air filter.
3	•			TA-312/PT	Check batteries and replace if necessary.
4		•		Exhaust Blower	Lubricate with PL Special or OE 10 and clean motor and fan housing.
5		•		Manual Telephone Switchboard SB-22A/PT	Perform organizational checks as described in TM 11-5805-262-12.
6		•		Telephone Set TA-312/PT	Perform organizational checks as described in TM 11-5805-201-12.
7		•		Intercommunication Station LS-147C/FI	Perform organizational checks as described in TM 11-5830-221-12.
8		•		Radio Set AN/VRC- 47	Perform organizational checks as described in TM 11-5820-401-12.
9		•		Radio Receiving Set R-392/URR	Perform organizational checks as described in TM 11-5820-334-20.
10		I •		Fire Extinguisher	Inspect the tag on fire extinguisher to insure that inspection is current. Call assigned fire inspector if extinguisher seal is missing or tag is not up to date.
11			•	Sledge Hammer and Ax	Replace if handle is broken, split, or not tight in head. Sharpen ax as required.
12			•	First Aid Kit	Replace if case is broken or damaged. Replace parts that have been used. (See parts list sheet inside first aid kit).





#### 4-5. Shelter Facility Troubleshooting

*a. General.* Replacement and repair of components and parts for the AN/MS-31A are authorized for the various categories of maintenance personnel as indicated in the maintenance allocation chart (appx C). The tools and test equipment required are listed in the maintenance allocation chart. Troubleshooting information in the troubleshooting chart (b below) is based on symptoms that could be obtained while performing the operator's preventive maintenance checks and services (para 4-3) and organizational preventive main-

tenance checks and services (para 4-4). For signal line and power line troubleshooting information, refer to the signal schematic-wiring diagram (fig. 4-1) and the power schematic-wiring diagram (fig. 4-2). When an abnormal symptom is obtained, locate the symptom in the troubleshooting chart and perform the corrective measure indicated, as authorized in the maintenance allocation chart. If the corrective measure does not correct the problem, refer to higher category maintenance. For troubleshooting procedures for the major components, refer to the applicable technical manual listed in appendix A.

*b. Troubleshooting.*

Item No.	Symptom	Probable trouble	Corrective measure
1	POWER INDICATOR NEON LAMP fails to glow when power is applied to AN/ MSC-31A.	<p>a. Defective lamp.</p> <p>b. Defective power cable.</p> <p>c. Defective IN POWER 115V AC receptacle.</p> <p>Note. If immediate operation is required, and POWER 115V OUT receptacle is not used to power another assemblage, use POWER 115V AC OUT receptacle for input power.</p>	<p>a. Replace lam P.</p> <p>b. Check and repair or replace as required.</p> <p>c. Check and replace or repair receptacle as required.</p>
2	VOLTS AC meter indicates 0 volt when power is applied and MAIN circuit breaker is operated to ON	<p>a. Defective MAIN circuit breaker</p> <p>b. Defective VOLTS AC meter.</p> <p>c. Defective power cable.</p>	<p>a. Replace circuit breaker.</p> <p>b. Replace meter,</p> <p>c. Repair or replace cable.</p>
3	Neon lamp fails to glow when associated circuit, breaker is operated to ON.	<p>a. Defective neon lamp.</p> <p>b. Defective circuit breaker on power distribution panel.</p>	<p>a. Replace neon lamp.</p> <p>b. Replace circuit breaker.</p>
4	Fluorescent ceiling lights do not operate when fluorescent light switch is operated to ON.	<p>a. Defective BLACKOUT BY-PASS switch.</p> <p>b. Defective LIGHTS circuit breakers on power distribution panel.</p> <p>c. Defective light.</p>	<p>a. Replace switch.</p> <p>b. Replace circuit breaker.</p> <p>c. Replace light..</p>
5	Incandescent ceiling lamp does not light when incandescent COLD START light switch is operated to ON.	<p>a. Defective incandescent cold light switch.</p> <p>b. Defective fixture or wiring.</p> <p>c. Defective lamp.</p>	<p>a. Replace defective light switch.</p> <p>b. Check and repair or replace as required.</p> <p>c. Replace lamp.</p>
6	Ceiling lights are not extinguished when door is opened BLAKOUT BY-PASS switch is at OFF.	<p>a. Defective door microswitch.</p> <p>b. Defective BLACKOUT BY-PASS switch.</p>	<p>a. Replace switch.</p> <p>b. Replace switch,</p>
7	Exhaust blower fails to operate when BLOWER switch is operated to ON.	<p>c. Defective exhaust blower.</p> <p>b. Defective BLOWER switch or receptacle.</p>	<p>a. Check and repair or replace as required.</p> <p>b. Check and replace as required.</p>
8	Heater fails to operate properly.	<p>a. Defective heater receptacle.</p> <p>b. Defective heater.</p> <p>c. Defective heater circuit breaker on power distribution panel.</p> <p>d. Defective ac wiring,</p>	<p>a. Check and replace as required.</p> <p>b. Check and replace as required.</p> <p>c. Check and replace as required.</p> <p>d. Check and repair as required.</p>
9	No ac power available from any CONVENIENCE receptacle.	Defective CONV circuit breaker on POWER DISTRIBUTION PANEL,	Replace circuit breaker.
10	No ac power to air conditioner.	<p>a. Defective air conditioner power receptacle.</p> <p>b. Defective AIR COND. circuit breaker on power distribution panel.</p> <p>c. Defective ac wiring.</p>	<p>a. Check and replace as required.</p> <p>b. Check and replace as required.</p> <p>c. Check and repair as required.</p>
11	No ac power to equipment.	<p>a. Defective equipment receptacle.</p> <p>b. Defective EQUIP. circuit breaker on power distribution panel.</p> <p>c. Defective ac wiring.</p>	<p>a. Check and replace as required.</p> <p>b. Check and replace as required</p> <p>c. Check and repair as require</p>
12	Local communications not available with LS-147C/F1.	a. Defective LS-147C/F1.	a. Check and repair or replace as required.

	<i>Symptom</i>	<i>Probable trouble</i>	<i>Corrective measure</i>
13	Local communications not available with TA-312/PT.	<p><i>b.</i> Defective wiring in signal duct.</p> <p><i>c.</i> Defective connector.</p> <p><i>a.</i> Defective TA-312/PT.</p> <p><i>b.</i> Defective wiring in signal duct.</p> <p><i>c.</i> Defective connector.</p> <p><i>Note.</i> For troubleshooting procedures of major components, refer to applicable technical manual (appx A).</p>	<p><i>b.</i> Check and repair or replace as required.</p> <p><i>c.</i> Repair or replace as required.</p> <p><i>a.</i> Check and repair or replace as required.</p> <p><i>b.</i> Check and repair or replace as required.</p> <p><i>c.</i> Repair and replace as required.</p>
14	Ammeter indicates current flow when circuit breakers No. 2 through 7 are at OFF.	<p><i>a.</i> Defective circuit breakers (fig. 4-10).</p> <p><i>b.</i> Defective ac wiring.</p> <p><i>c.</i> Defective ammeter.</p>	<p><i>a.</i> Repair or replace as required.</p> <p><i>b.</i> Disconnect all ac input power and check for grounded or shorted wiring.</p> <p><i>c.</i> Repair or replace as required.</p>



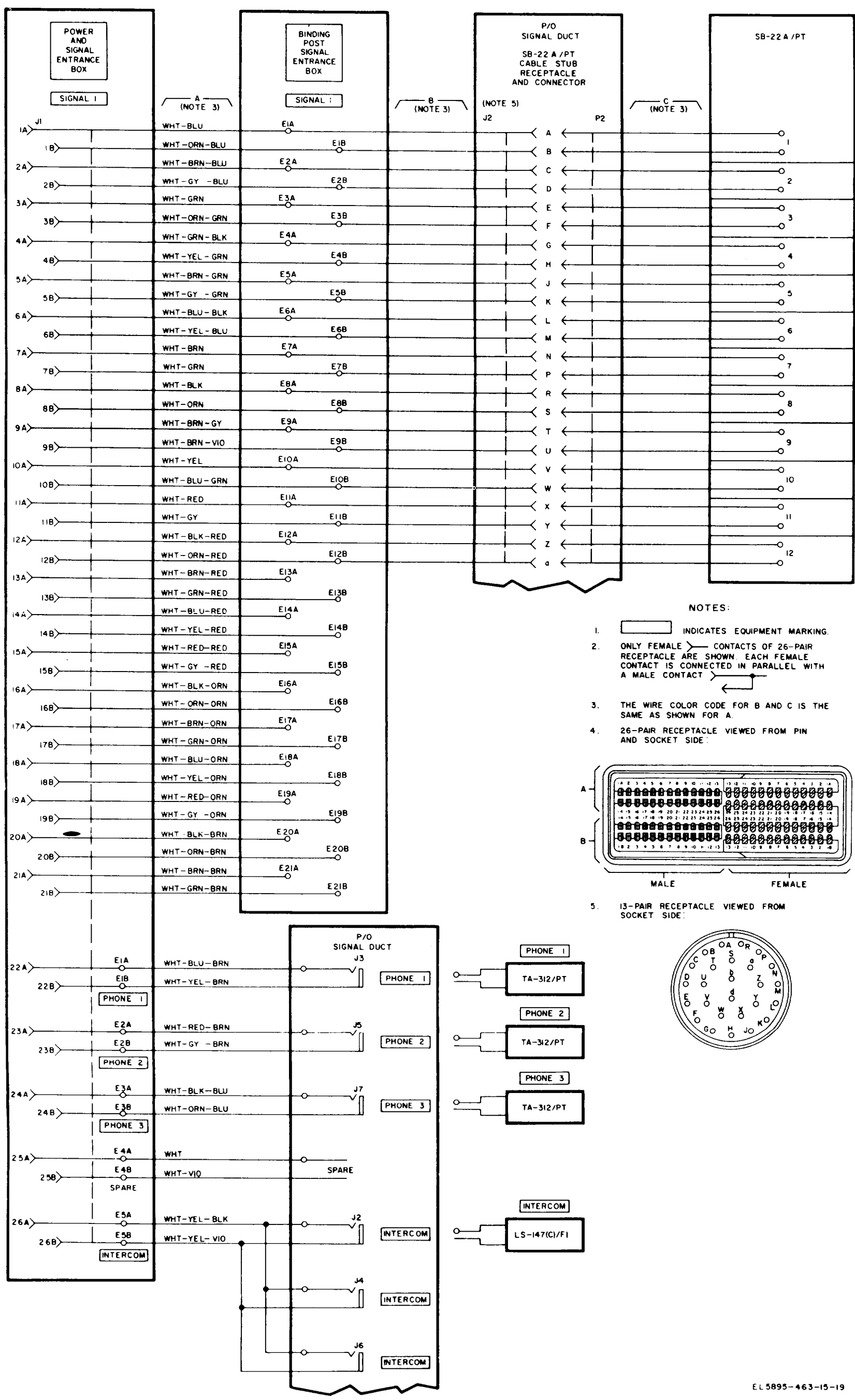
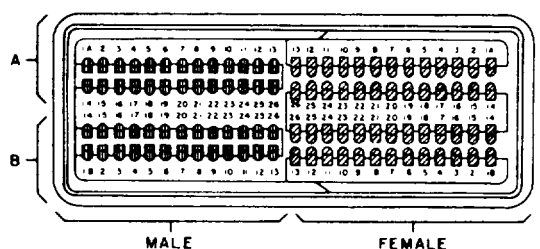


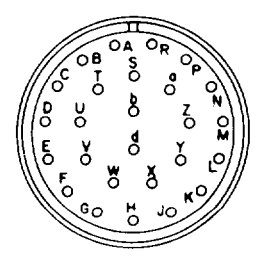
Figure 4-1. Signal schematic-wiring diagram.

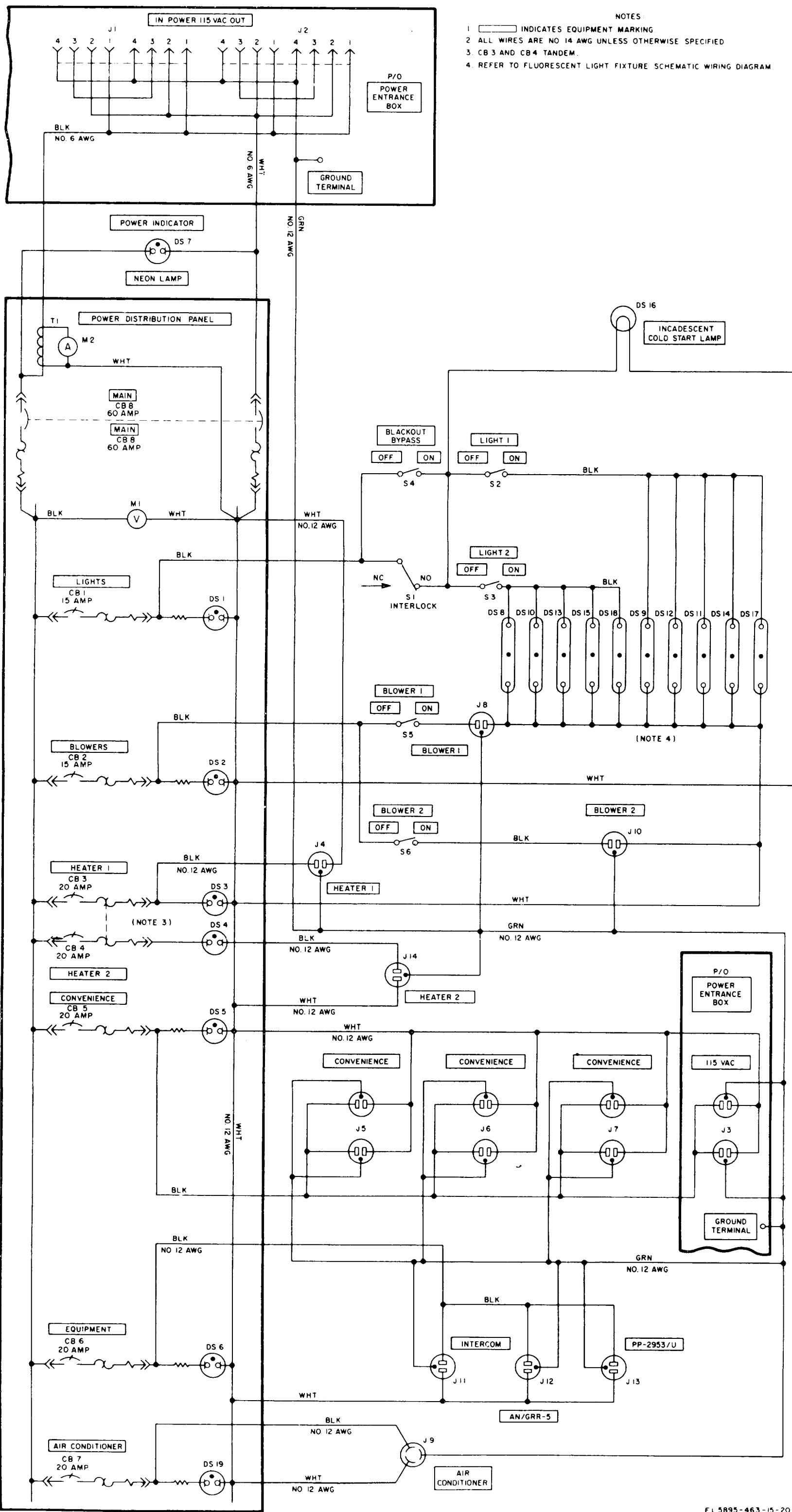
Figure 4-1.

- NOTES:
- INDICATES EQUIPMENT MARKING.
  - ONLY FEMALE CONTACTS OF 26-PAIR RECEPTACLE ARE SHOWN EACH FEMALE CONTACT IS CONNECTED IN PARALLEL WITH A MALE CONTACT
  - THE WIRE COLOR CODE FOR B AND C IS THE SAME AS SHOWN FOR A.
  - 26-PAIR RECEPTACLE VIEWED FROM PIN AND SOCKET SIDE:



- 13-PAIR RECEPTACLE VIEWED FROM SOCKET SIDE:





- NOTES:
- 1 [Symbol] INDICATES EQUIPMENT MARKING
  - 2 ALL WIRES ARE NO 14 AWG UNLESS OTHERWISE SPECIFIED
  - 3 CB 3 AND CB 4 TANDEM
  - 4 REFER TO FLUORESCENT LIGHT FIXTURE SCHEMATIC WIRING DIAGRAM

Figure 4-2. Power schematic-wiring diagram.

Figure 4-2.

## Section II. ORGANIZATIONAL REPAIR PROCEDURES

## 4-6. Kit and Optional Radio Equipment Installation and Removal

**a. Blower Kit Installation.**

(1) Removal of air conditioner (fig. 4-3).

(a) Turn the AIR COND. circuit breaker to OFF (fig. 1-6).

(b) Turn the air conditioner OFF-FAN-COOL selector switch to OFF.

(c) Disconnect the air conditioner power cable (fig. 1-10).

(d) Remove the 14 sheet metal screws that secure the air conditioner protective cover. Remove the protective cover.

(e) Remove the four hexagonal head studs that secure the air conditioner to the mounting bracket.

(f) Lift and slide the air conditioner forward, and remove it from the mounting bracket.

**Warning: The weight of the air conditioner is approximately 200 pounds. Sufficient personnel must be available to remove the air conditioner.**

(g) Remove the 17 hexagonal-head studs that secure the air conditioner mounting bracket to the shelter. Remove the mounting bracket.

(2) **Installation of blower blank panel (fig. 4-3).**

(a) Remove the six slot-head, captive screws that secure the blower blank panel to the exterior front curbside of the shelter. Remove the Mower blank panel.

(b) Place the Mower blank panel in the air conditioner opening.

(c) Align and secure the blower blank panel using the six slot-head, captive screws.

(d) Adjust and tighten the wing bracket on each side of the interior of the blower blank panel.

(3) **Removal of blower blank panel.** To remove the blower blank panel, reverse the procedure given in (2) above.

(4) **Installation of blower (fig. 4-4).**

(a) Unpack the blower kit and check the contents in accordance with the packaging list.

(b) Attach the support assembly to the shelter support bracket; use the hexagonal-head studs with the lockwashers and flat washers.

(c) Install the bracket assembly using the four hexagonal-head studs, lockwashers, and flat washers.

(d) Install the rubber sleeve on the blower assembly exhaust flange and secure with one blower sleeve clamp assembly.

(e) Position the blower shock mount on the bracket assembly and align with the blower mounting holes in the bracket assembly.

(f) Position the blower, motor base down, on top of the shock mount on the bracket assembly.

(g) Insert the blower shade in the sleeve and align the blower assembly mounting holes.

(h) Secure the Mower to the bracket assembly using the four hexagonal-head studs, lockwashers, and flat washers.

*Note.* The support assembly and bracket assembly mounting holes are slotted to permit proper alignment of the blower assembly.

(i) Secure the rubber sleeve to the blower vent using a second blower sleeve clamp assembly.

(j) Operate the BLOWER 2 switch to OFF (fig. 5-1).

(k) Connect the blower power plug to the BLOWER 2 receptacle.

(l) Open the exterior blower vent on front of the blower blank panel.

(m) Operate the BLOWER 2 switch on ON and check the blower for proper operation.

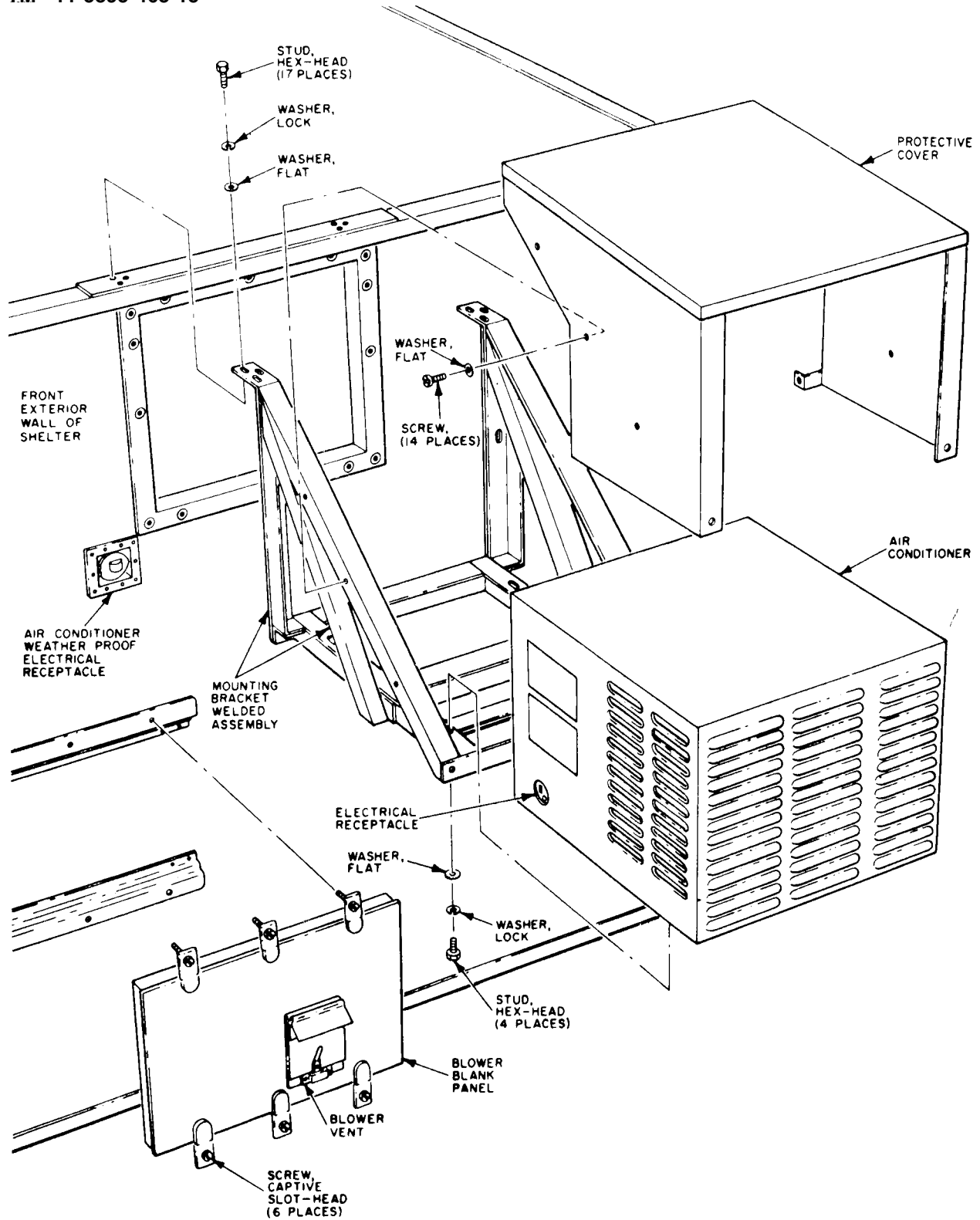
(5) **Removal of blower.** To remove the blower, reverse the procedure given in (4) above.

**b. Radio Kit Installation (fig. 4-5).**

(1) **Installation of mounting hardware.**

(a) Unpack the radio kit and check the contents in accordance with the packaging list.

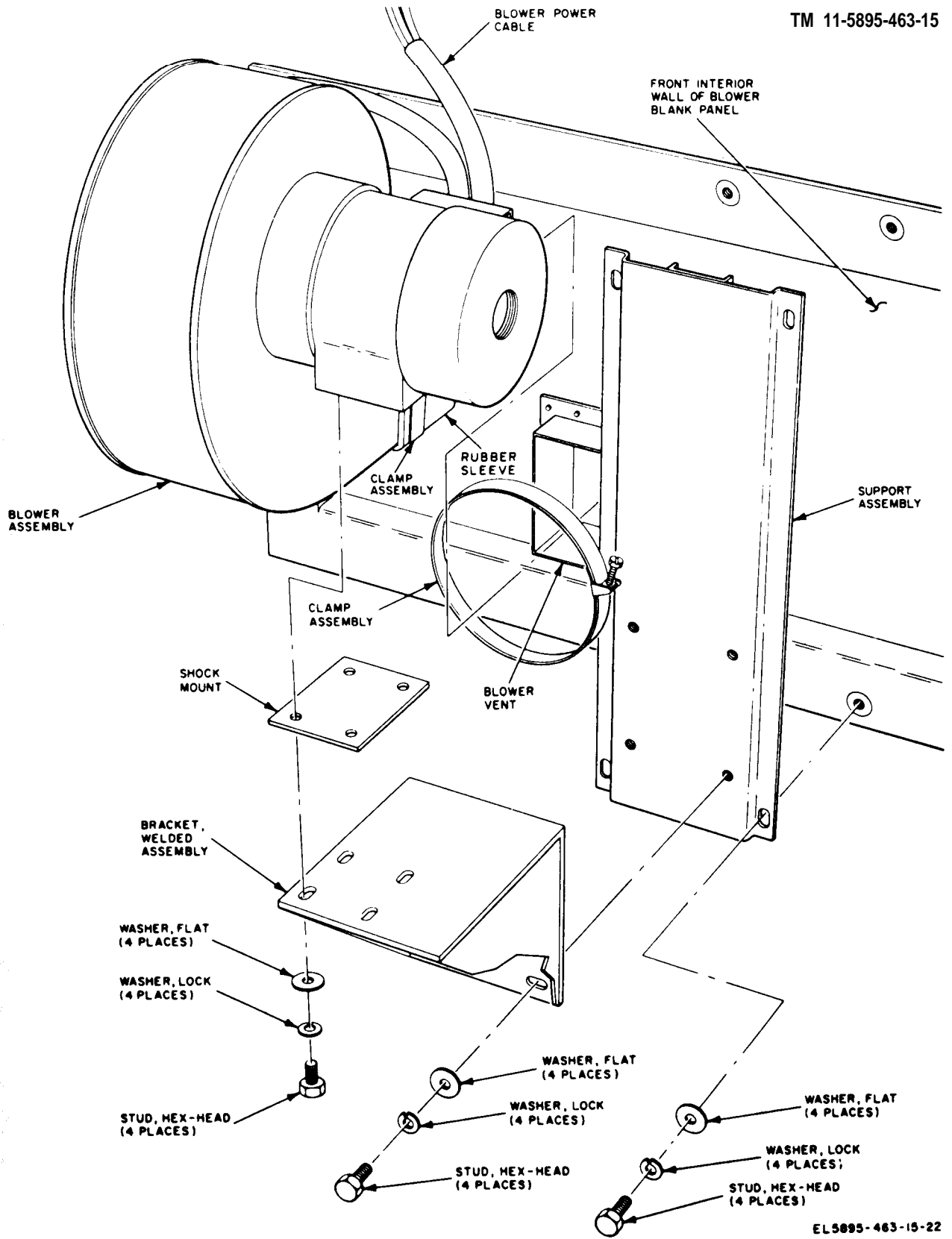
(b) Unpack the major radio equipment and check in accordance with the procedures given in applicable technical manuals (appx A).



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Figure 4-3. Removal of air conditioner and installation of blower blank panel.





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Figure 4-4. Installation blower.

(c) Remove the cable entrance blind plugs located below the top bracket on the shelter interior front wall (fig. 5-1).

(d) Install the upper feedthrough assembly with its length of W-128 antenna wire extending approximately 18 inches to the exterior of the shelter. Tighten the locknuts on the feedthrough assembly.

(e) Install the rubber grommet and compression nut on the exterior of the feedthrough assembly. Tighten the compression nut to insure an adequate water seal.

(f) Install the lower feedthrough assembly and antenna cable R-442/VRC GPI with the WHIP ANTENNA band identification to the exterior of the shelter. Tighten the locknuts and compression nut on the feedthrough assembly.

(g) Align the shelf assembly above the SB-22A/PT and with the horizontal support brackets.

(h) Place the installed antenna wire and cable through the two holes in back of the shelf assembly,

(i) Carefully slide the shelf assembly against the support brackets, align the mounting holes, and secure with the 16 hexagonal-head studs and lockwashers.

(2) *Removal of mounting hardware.* To remove radio mounting hardware, reverse the procedure given in (1) above.

(3) *Installation of radio equipment.*

(a) Mount the AN/GRR-5 Shock Mounting Base Plate MT-768/URR on the top shelf and secure from beneath using the mounting hardware provided.

(b) Install the LS-454/U loudspeaker on the rubber shock mount spacer adjacent to the AN/GRR-5.

(c) Position the antenna cable and wire to the left and move them forward to permit installation of the AN/GR-5 without binding or abraiding the antenna cables.

(d) Slide the AN/GRR-5 into position on the MT-768/URR and secure it using the two thumbscrews on the front of the mount.

(e) Mount the RT-524/VRC Shock Mounting Base Plate MT-1029/VRC on the

bottom shelf at the left side and secure from beneath using the mounting hardware provided.

(f) Mount the R-442/VRC Shock Mounting Ease Plate MR-1898/URC to the right of the MT-1029/VRC and secure from beneath using the mounting hardware provided.

(g) Slide the RT-524/VRC into position on the MT-1029/VRC using extreme care to engage the guide pins and connector. Seat the RT-524/VRC firmly and secure using the thumb fasteners on the front of the MT-1029/VRC.

(h) Slide the R-442/VRC into position on the MT-1898/VRC using extreme care to engage the guide pins and connector. Seat the R-442/VRC firmly and secure using the thumb fasteners on the front of the MT-1898/VRC.

(i) Install the right and left mounting brackets on the shelter floor beneath the SB-22A/PT. Secure with the hexagonal-head studs and lockwashers. (fig. 4-5).

(j) Install the PP-2953/U power supply on these brackets and secure with the hexagonal-head studs and lockwashers.

(k) Remove the cable entrance blind plugs located on the front curbside wall beneath blower No. 1.

(l) Install the feedthrough assembly and RT-524/VRC GPII antenna cable nearest the curbside wall with the WHIP ANTENNA band identification to the exterior of the shelter. Tighten the locknuts of the feedthrough assembly. Feed approximately 18 inches of the antenna cable to the shelter exterior and tighten the compression nut.

(m) Install the RT-524/VRC control cable assembly adjacent to the RT-524/VRC GPII antenna cable with the TR-524/VRC CONTROL identification band to the interior of the shelter. Tighten the locknuts of the feedthrough assembly. Feed approximately 18 inches of the cable to the shelter exterior and tighten the compression nut.

(4) *Removal of radio equipment.* To remove the radio equipment, reverse the procedure given in (3) above.

c. Antenna Kit Installation (fig. 4-6).

(1) *Installation of antenna mounting brackets.*

(a) Remove the assembled bracket assembly and antenna mounting bracket for Antenna Matching Unit-Base MX-6707/VRC from the radio kit packaging container.

(b) Mount the assembled bracket assembly and antenna mounting bracket on the exterior upper curbside wall of the shelter with the four hexagonal-head screws and lockwashers.

(c) Remove the two remaining antenna mounting brackets and bracket assemblies from the radio kit packaging container.

(d) Install the antenna mounting brackets on the bracket assemblies; use the four hexagonal-head screws, flat washers, lockwashers, and nuts for each assembly.

(e) Mount the two assembled bracket assemblies and antenna mounting brackets on the exterior upper front roadside wall of the shelter with the four hexagonal-head screws lockwashers provided for each.

(2) *Removal of antenna mounting brackets.* To remove the antenna mounting brackets, reverse the procedure given in (1) above.

(3) *Installation of antenna mast bases and antennas* (fig. 4-6).

(a) Remove Antenna Matching Unit-Base MX-6707 (VRC from the packaging container.

(b) Mount the MX-6707/VRC on the antenna mounting bracket assembly located on the exterior upper front curbside wall of the shelter with the four hexagonal-head screws and four hexagonal-head nuts with the four flatwashers and four lockwashers.

(c) Remove Antenna Elements AS-1730/VRC and AS-1095/VRC from the antenna bag assembly stored on the interior curbside wall of the shelter.

(d) Insert the AS-1095/VRC into the upper screw-fit slot in the AS-1730/VRC and tighten by turning the AS-1095/VRC element clockwise.

(e) Install the antenna assembly on the MX-6707/VRC antenna matching unit-base

and tighten by turning the antenna assembly clockwise.

(f) Remove two Mast Bases AB-15/CR from the packaging containers.

(g) Mount the AB-15/GR *with the binding post connector* on the antenna bracket assembly located on the right exterior upper front roadside wall of the shelter (fig. 4-6).

(h) Mount the AB-15/GR *with the UG-273/U Adapter* on the shelter left exterior upper front roadside wall (fig. 4-6).

(i) Remove whip antenna Mast Sections MS-116A, MS-117A, and MS-118A from the antenna bag assembly stored on the shelter interior curbside wall.

(j) Assemble the three antenna mast sections in numerical sequence.

(k) Install the two antenna mast section assemblies on the two AB-15/GR mast bases, and tighten by turning the mast sections clockwise.

(4) *Removal of antenna mast bases and antennas.* To remove antenna mast bases and antennas, reverse the procedure given in (3) above.

d. *Interconnection of Radio Kit Cable and Wire Assemblies* (fig. 4-7).

(1) *Power cable connections.*

(a) Connect Power Cable Assembly CX-1358/U to Power Supply PP-308/URR POWER INPUT receptacle J103.

(b) Connect the other end of Power Cable Assembly CX-1358/U to the AN/CRR-5 power receptacle located in the ceiling power duct directly above the radio set (fig. 5-1).

(c) Connect one Electrical Power Cable Assembly CX-4721/U to Receiver-Transmitter, Radio RT-524/VRC power receptacle J23.

(d) Connect the other end of Electrical Power Cable Assembly CX-4721/U to Receiver, Radio R-442/VRC power receptacle J11.

(e) Connect another Electrical Power Supply Cable CX-4721/VRC to Receiver-Transmitter, Radio RT-524/VRC power receptacle J21 (fig. 4-7).

(f) Connect the other end of Electrical Power Cable Assembly CX-4721/VRC to Power Supply PP-2953/U POWER OUT receptacle J3.

(g) Connect Electrical Power Cable Assembly CX-4524/U to Power Supply PP-2953/U AC POWER receptacle J1.

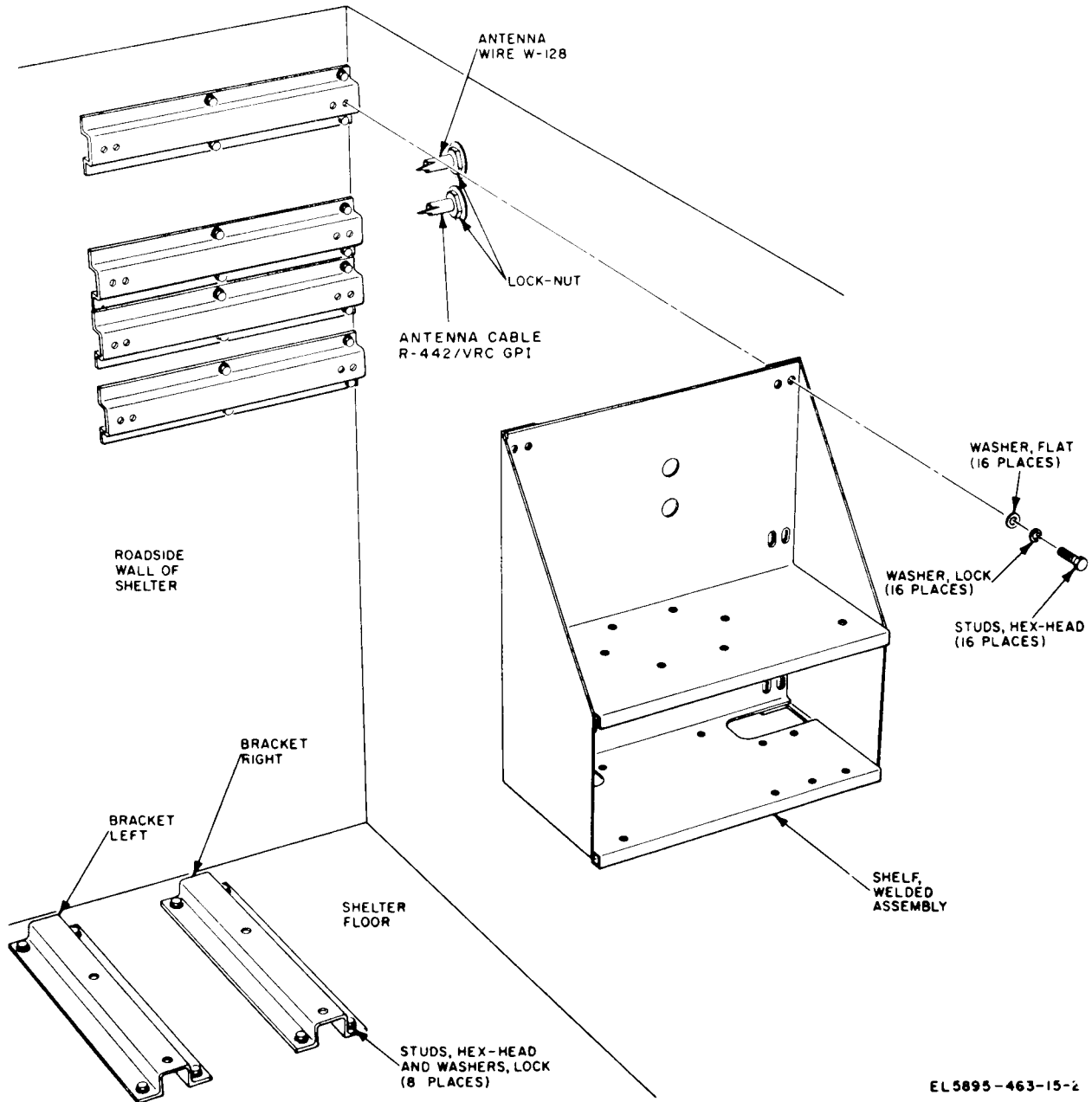
(h) Connect the other end of Electrical Power Cable Assembly CX-4524/U to the PP-

2953/U power receptacle located in the power duct on the lower front wall of the shelter (fig 5-1).

(2) **Antenna and loudspeaker connections (fig. 4-7).**

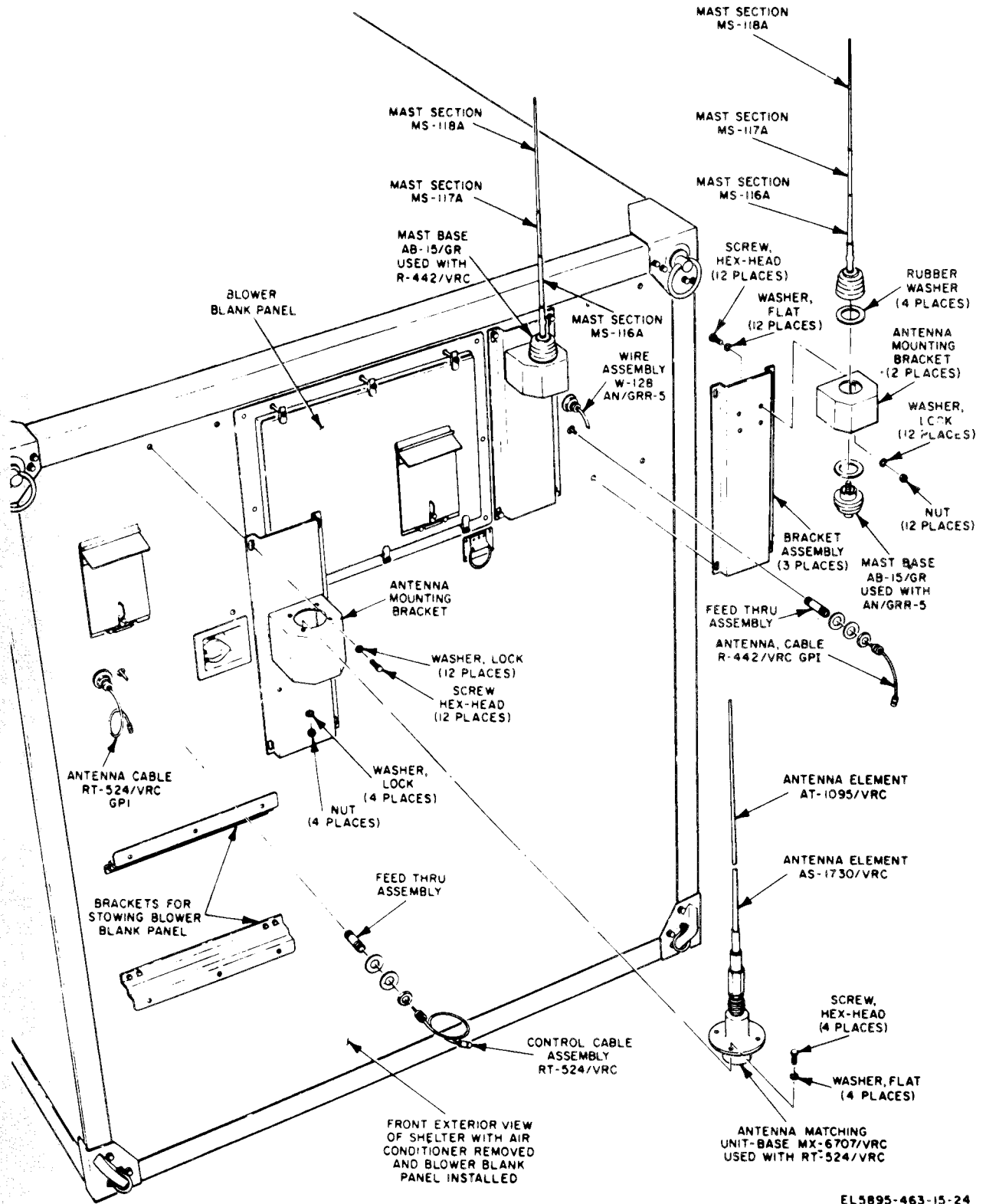
(a) Connect Wire Assembly W-128 to binding post terminal A on Receiving Set, Radio AN/GRR-5.

(b) Connect the other end of the W-128



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Figure 4-5. Radio kit installation.



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Figure 4-6. Antenna kit installation.

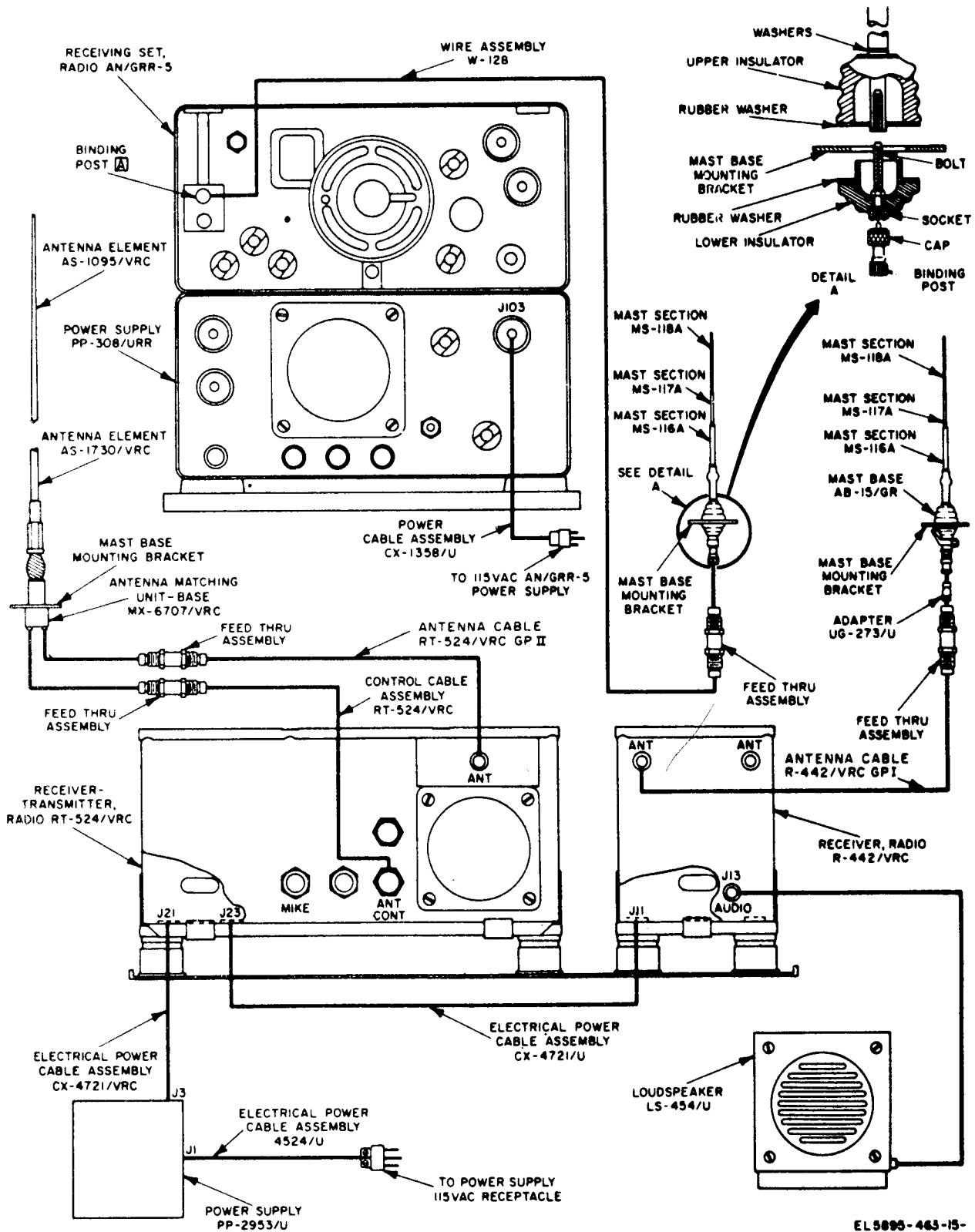


Figure 4-7. Interconnection of radio kit cable and wire assemblies.

a the binding post in Antenna Base AB-15/GR mounted on the right exterior upper front roadside wall of the shelter (fig. 4-7).

(c) Connect Antenna Cable R442/VRC GPI connector to the ANT receptacle on Receiver, Radio R-442/VRC.

(d) Connect the other end of Antenna Cable R-442/VRC GPI to Antenna Base AB-15/GR (with the UG279/U Adapter) located on the left exterior upper front roadside wall of the shelter (fig. 4-7).

(e) Connect Antenna Cable RT-524/VRC GPH connector to the ANT receptacle on Receiver-Transmitter, Radio RT-524/VRC.

(f) Connect the other end of Antenna Cable RT-524/VRC GPII to J1 on Antenna Matching Unit-Base MX-6707/VRC that is located on the exterior upper front curbside wall of the shelter.

(g) Connect Control Cable Assembly RT-524/VRC to ANT CONT receptacle on Receiver-Transmitter, Radio RT-524/VRC.

(h) Connect the other end of control Cable Assembly RT-524/VRC to Matching Unit-Base MX-6707/VRC connector J2.

(i) Connect Loudspeaker LS-454/U able to Receiver, Radio R-442/VRC AUDIO receptacle. J13.

(3) *Disconnection of radio kit cables and wire assemblies.* To disconnect the radio kit cables and wire assemblies, reverse the procedure given in *d* above.

(4) *Preoperational checks.* Perform preoperational checks on the radio equipment in accordance with the applicable technical manuals (appx A ).

#### 4-7. Repair of fluorescent Fixtures and wiring

*Note.* The fluorescent light fixtures are fabricated as part of the power duct. The radiofrequency filters are sealed units; they are not repairable and are replaced as a complete unit.

a. Operate the associated LIGHT switch to OFF; remove the light shield and the fluorescent lamp.

b. Carefully pry off the associated power duct cover.

c. Tag and disconnect the wires from the defective component and remove the defective component from the power duct (fig. 4-8).

d. Secure the replacement component in the power duct.

e. Connect the wires to the replacement component.

f. Replace the *cover* on the power duct.

g. Replace the fluorescent lamp and light shield.

h. Operate the associated LIGHT switch to ON.

#### 4-8. Removal and Replacement of Electric Heater

##### a. *Removal.*

(1) Operate the HEATER-OFF-FAN switch to OFF.

(2) Remove the heater power cord connector plug from the twistlock HEATER receptacle (fig. 5-1).

(3) Loosen the four turnlock fasteners that secure the heater to the mounting base.

(4) Lift out the heater.

##### b. *Replacement.*

(1) Place the heater on the mounting base so that the turnlock fasteners are aligned with the holes in the mounting base.

(2) Tighten the four turnlock fasteners.

(3) Align the power cord connector plug contacts with the HEATER receptacle (fig. 5-1). Insert the connector plug contacts in the receptacle and twist clockwise until the contacts are seated.

#### 4-9. Exhaust Blower Repairs (fig. 4-9).

Organizational repair of blowers is restricted to replacement of ac power cords and the blower motor and impeller.

a. Operate the BLOWER switch to OFF.

b. Remove the defective power cord, blower motor, or impeller.

c. Refer to figure 4-9 to determine the correct connections for the required motor rota-

tion and the required position of the impeller. Be sure that the concave portion of the impeller faces the air exhaust outlet as indicated.

*Note.* If the replacement motor is provided with two mounting sides, install the motor so that the capacitor side is facing the front wall of the shelter.

#### 4-10. Power Distribution Panel Repairs (fig. 4-10)

**Warning:** Before performing any power distribution panel repairs, disconnect the power cable from the IN POWER 115V AC receptacle in the power entrance box.

*a. Preliminary Procedures.* Remove the screws that secure the cover to the power distribution panel and remove the cover.

*b. Removal and Replacement of Circuit Breaker.*

(1) Grasp the defective circuit breaker and pull it straight out from the panel (fig. 4-10).

(2) Disconnect the wires connected to the circuit breaker.

(3) Connect the wires to the appropriate terminals of the replacement circuit breaker.

(4) Position the circuit breaker in the power distribution panel and firmly press it in place.

*c. Removal and Replacement of Current Transformer.*

(1) Tag and disconnect the black and white ammeter leads from the transformer terminals.

(2) Remove the nuts and washers that secure the current transformer inside the panel, and remove the current transformer (fig. 4-10)

*Note.* Count the number of turns of heavy black wire through the center hole of the current transformer before proceeding to the next step.

(3) Disconnect the black wire wound around the current transformer from the

MAIN circuit breaker and carefully unwind the wire.

**Caution:** Be sure that the number of turns around the replacement transformer is the same as that on the original transformer.

(4) Wind the black wire around the replacement current transformer.

(5) Reconnect the black wire to the MAIN circuit breaker.

(6) Position the current transformer inside the panel and secure it with the original nuts and washer.

(7) Connect the black and white ammeter leads to the appropriate terminals of the transformer.

*d. Removal and Replacement of Meters.*

(1) Tag the color connections and remove the leads from the meter terminals.

(2) Remove the bolts that secure the meter to the panel and lift out the meter (fig. 4-10).

(3) Position the replacement meter in the panel and secure it with the original bolts.

(4) Connect the leads to the appropriate terminals of the replacement meter.

#### 4-11. Removal and Replacement of Power Cable and Entrance Box Connectors

*a. Power Receptacles.*

(1) Disconnect the power cable from the IN POWER 115V AC receptacle in the power entrance box (fig. 1-4).

(2) Remove the interior cover of the power entrance box, disconnect the wires from the appropriate receptacle, and remove the receptacle (fig. 4-11).

(3) Install the replacement receptacle, connect the wires to the proper terminals of the receptacle, and replace the cover on the power entrance box.

*b. Power Cable Connectors.* Refer to figures 4-12 and 4-13 for details of construction necessary for disassembly and removal.



### Section III. DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE

#### 4-12. Scope of Direct Support and General Support Maintenance

a. *General.* Direct and general support maintenance consists entirely of corrective maintenance procedures as indicated in the maintenance allocation chart (appx C).

b. *Tools and Test Equipment Required.* The tools and test equipment required for direct and general support maintenance of the AN/MS-31A are listed in the maintenance allocation chart (appx C).

#### 4-13. Direct Support Repair Procedures

a. *Radiofrequency and Direct Line Communications Equipment Repair.* Refer to the applicable technical manual (appx A) for instructions in performing direct support maintenance of the TA-312/PT, SB-22A/PT, LS-147C FI, AN/VRC-47, AN/GRR-5, and Air Condition Model F-900-2.

b. *Shelter, Electrical Equipment S-371/ISC-31A Repairs.* Direct support repair of the S-371/MS-31A includes the following:

- (1) Emergency repairs of holes and minor structural damage to the shelter.

- (2) Removal and replacement of the door handle and latchbolt assemblies, entrance door filter, cover assemblies, and gaskets for the blower vent, door, and the entrance boxes.

*Note.* Refer to TB SIG 354 for additional information on direct support maintenance of the shelter.

#### 4-14. General Support Repair Procedures

a. *Radiofrequency and Direct Line Communications Equipment Repair.* Refer to the applicable technical manual (appx A) for instructions on performing general support maintenance on the communications equipment in the assemblage.

b. *Shelter, Electrical Equipment S-371/SC-31A Repair.* General support maintenance of the S-371/MS-31A includes replacement of doors and skids, and permanent repair of holes and major structural damage

to shelter. Refer to TB SIG 354 for further information on general support maintenance of the shelter facility.

c. *Removal of Signal Entrance Box 26-Pair Receptacle* (fig. 4-14).

- (1) Remove the screws that secure the cover to the rear of the signal entrance box (fig. 4-15).

- (2) Remove the cover from the defective 26-pair receptacle.

- (3) Remove the mounting screws that secure the insert clip to the housing.

- (4) Unfasten the cable clip that secures the cable form.

**Caution:** Be extremely careful when connecting and soldering wires to the receptacle insert. Excessive heat or pressure will damage the receptacle insert.

- (5) Lift the receptacle insert out of the housing; tag and unsolder the wires.

- (6) Remove the mounting screws and remove the housing.

d. *Replacement of Signal Entrance Box 26-Pair Receptacle* (fig. 4-15).

- (1) Position the housing and secure it to the signal entrance box.

**Caution:** Be extremely careful when connecting and soldering wires to the receptacle insert. Excessive heat or pressure will damage the receptacle insert.

- (2) Slide the end of the cable form out through the housing and connect the wires to the receptacle insert.

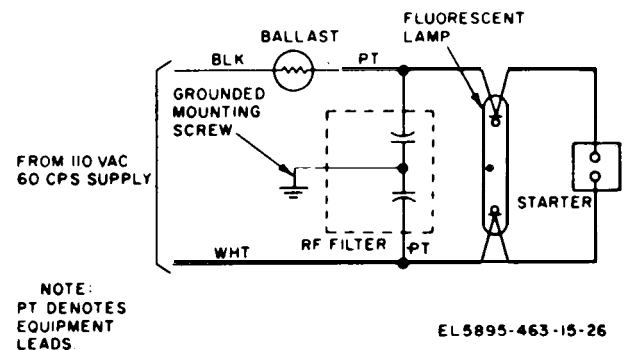
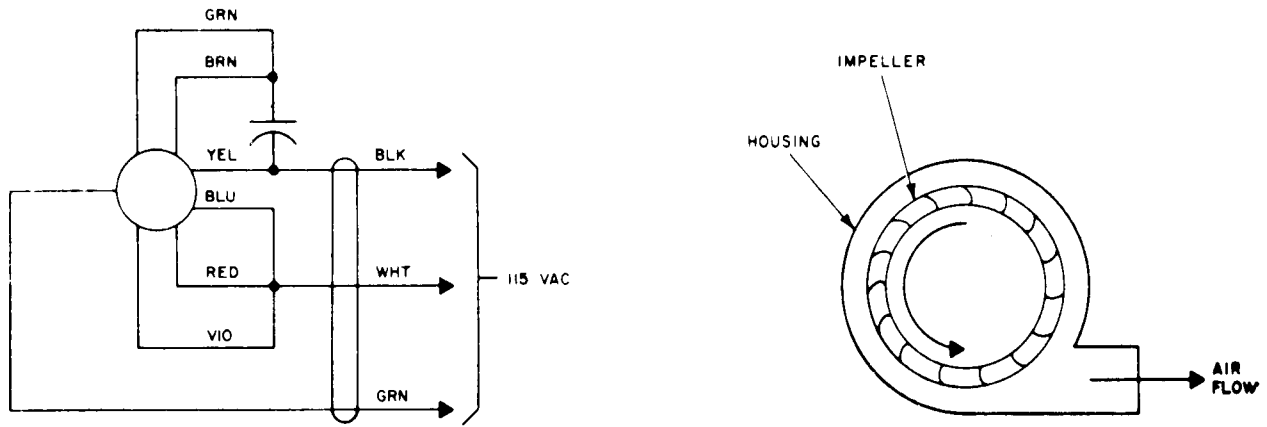
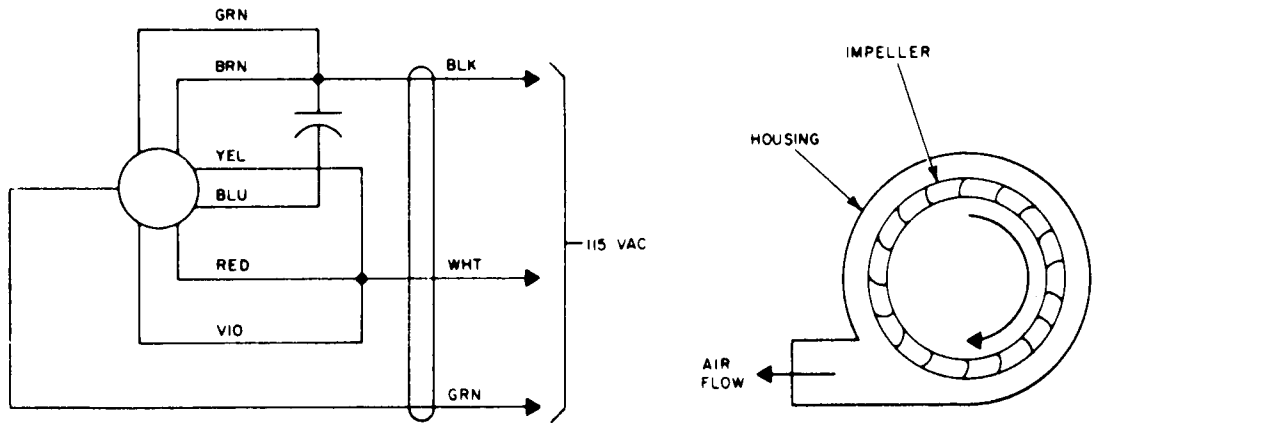


Figure 4-8. Fluorescent light fixture, schematic-wiring diagram.



A. ROADSIDE (COUNTERCLOCKWISE).



B. CURBSIDE (CLOCKWISE).

NOTE:  
DIRECTION OF ROTATION IS VIEWED  
FROM MOTOR END OPPOSITE SHAFT

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Figure 4-9. Blower motor connections and impeller installation diagram.

**Caution:** Be careful not to damage the wires when replacing the receptacle insert mounting screws.

(3) Secure the cable form by fastening the cable clip.

(4) Install the cover on the housing.

(5) Position and secure the rear cover on the signal entrance box.

c. Removal of 26-Pair Cable Connectors (fig. 4-16).

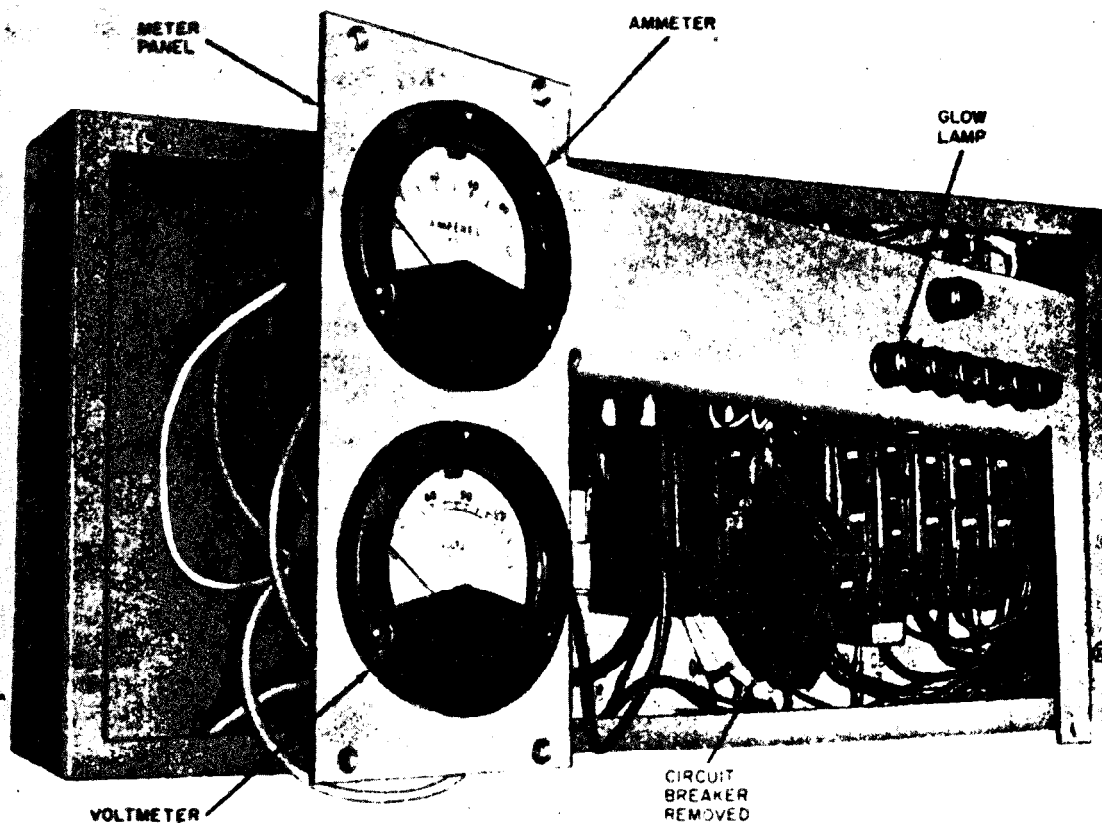
(1) Loosen the setscrews and slide the locking ring back on the cable.

(2) Remove the clamping bolts and clamp nuts from the cable clamp.

(3) Remove the retaining bolts and both sections of the cable clamp.

(4) Slide the enforcement and nylon insulator back on the cable.

(5) Remove the contact assembly retaining screws.



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Figure 4-10. Power distribution panel, meter panel, and circuit breaker switch removed.

(6) Work the cable into the housing and lift and contact assembly out of the housing.

(7) Slide the separator away from the contact assembly.

(8) Tag and disconnect the leads.

(9) Remove the separator and slide the housing off the cable.

(10) Slide the nylon insulator, enforcement, locking ring, and cover off the cable.

*f. Replacement of 26-Pair Cable Connectors (fig. 4-16).*

(1) Slide the cover, locking ring, enforcement, and nylon insulator on the cable. Be sure that the flange on the enforcement and nylon insulator is toward the cable end.

(2) Slide the housing on the cable.

(3) Install the separator with the leads properly positioned.

(4) Position the contact assembly near the housing and connect the leads.

(5) Replace the contact assembly in the housing. If necessary, work the cable out of the housing to provide clearance for the contact assembly.

(6) Be sure that the contact assembly is properly seated and secure it to the housing with the contact assembly retaining screws.

(7) Slide the nylon insulator forward until its flange is flush against the housing.

(8) Slide the enforcement forward until its flange is flush against the nylon insulator.

(9) Replace the sections of the cable clamp and secure them with the retaining bolts.

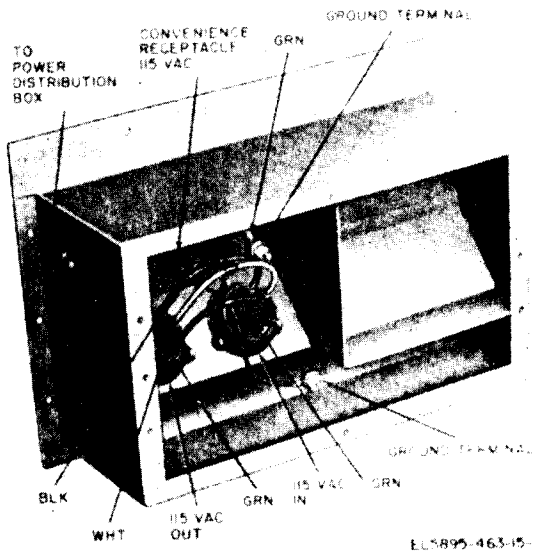


Figure 4-11. Power entrance box, rear view.

(10) Replace the clamping bolts and nuts, and tighten them securely.

(11) Slide the locking ring into position on the housing the secure it it with the setscrew.

(12) Replace the cover.

**4-15. Depot Maintenance**

Depot maintenance of the AN/MS-31A includes major repair and overhaul of the equipment components and the shelter facility. Refer to the applicable technical manual for the individual equipment components for depot overhaul standards and procedures.

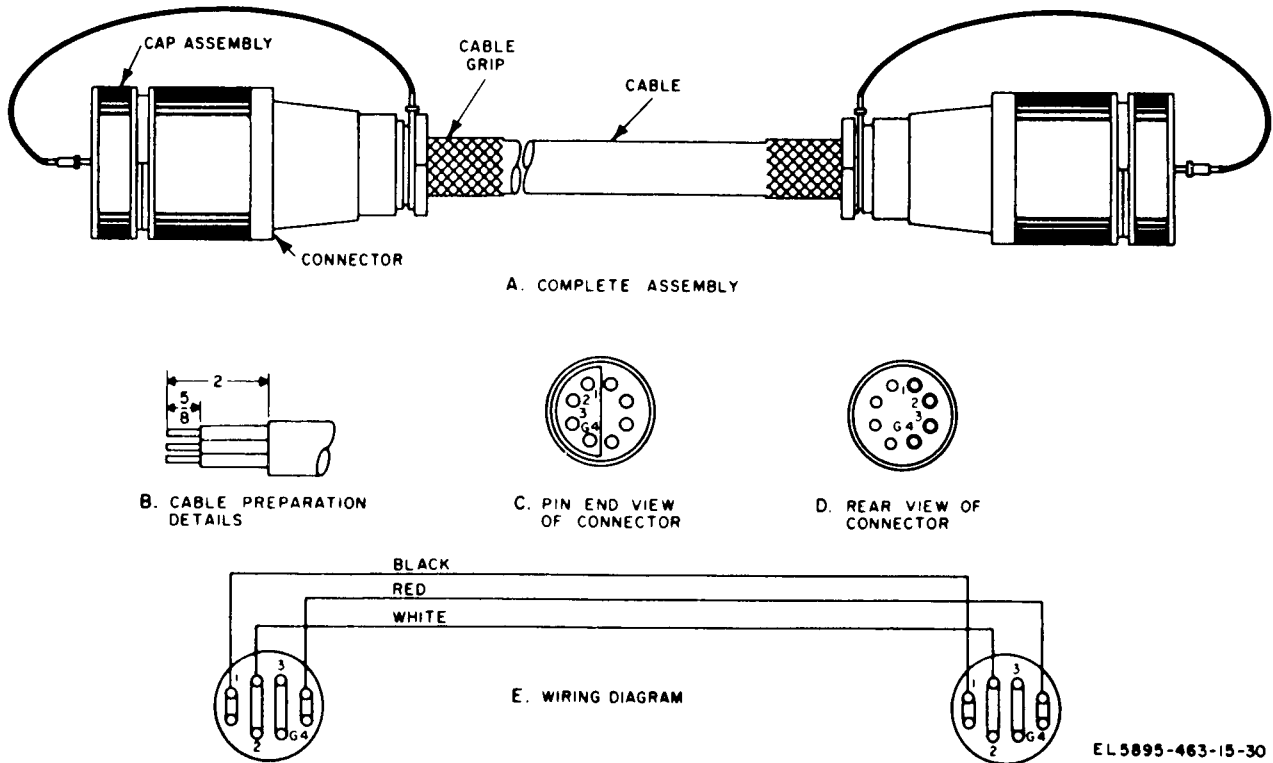
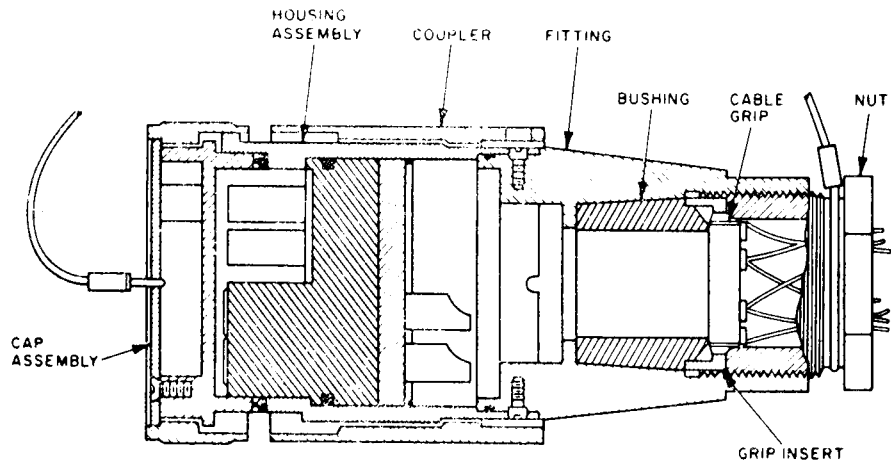
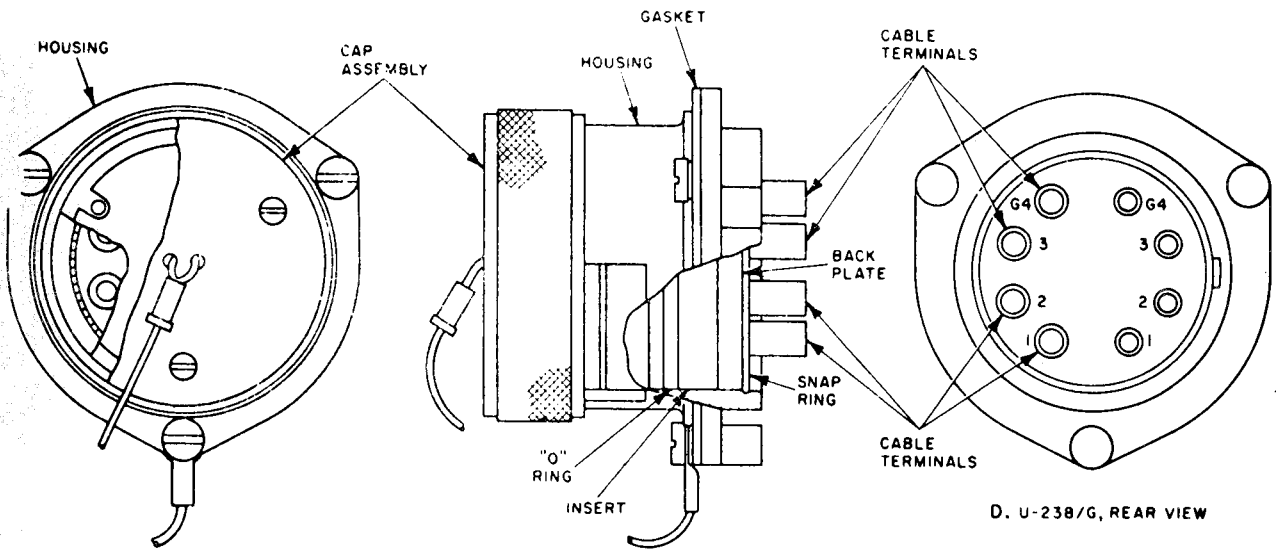


Figure 4-12. Power cable repair details.

REWORK & SQUARE MALFUNCTIONS



A. U-237/G, INTERIOR DETAILS



B. U-238/G, EXTERIOR VIEW

C. U-238/G, INTERIOR DETAILS

D. U-238/G, REAR VIEW

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Figure 4-13. Power cable connector and power receptacle assembly details.

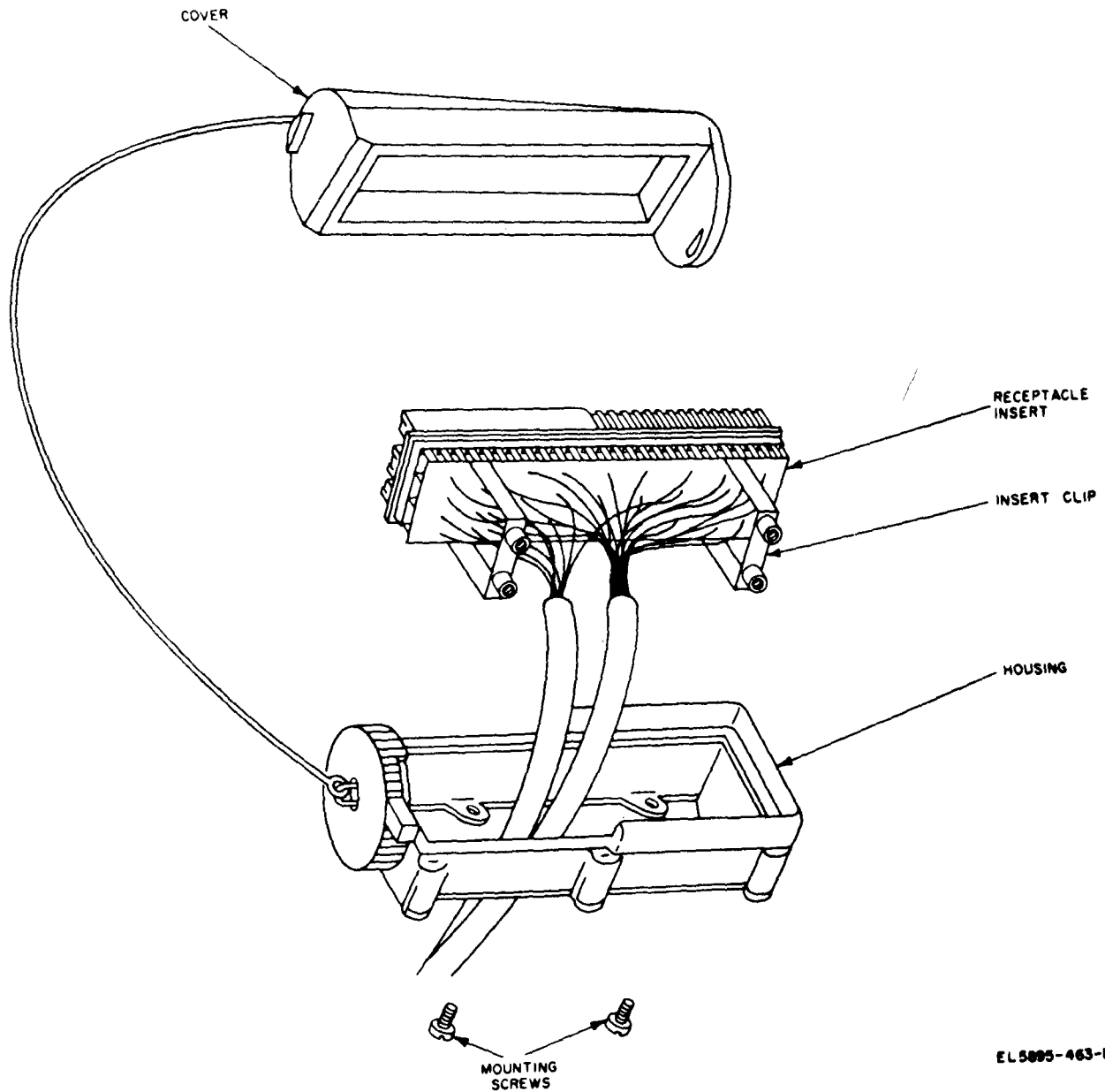


Figure 4-14. Signal entrance box 26-pair receptacle, exploded view.

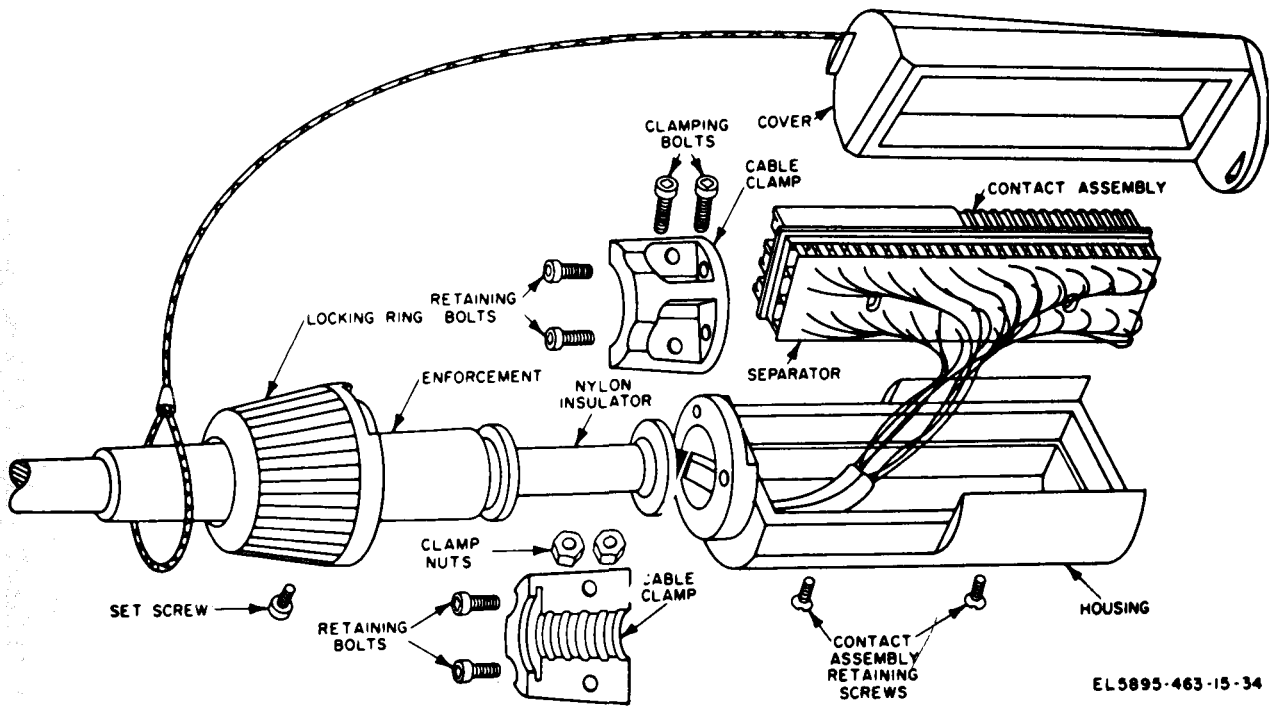
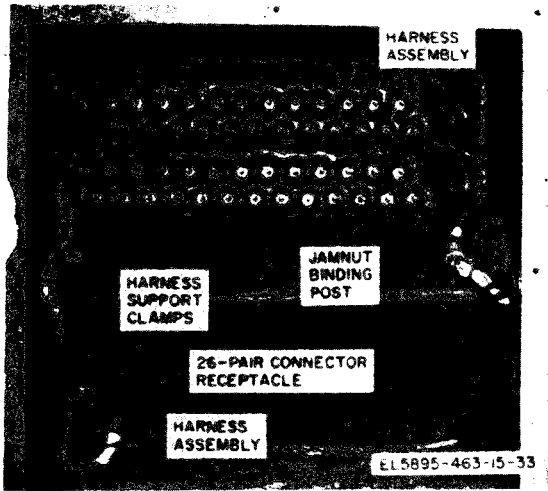


Figure 4-16. Twenty-six pair cable connector, exploded view.





## CHAPTER 5

# SHIPMENT AND LIMITED STORAGE

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### 5-1. Preliminary Procedures

*a.* Turn off all operating equipment according to the stopping procedures given in paragraph 3-5.

*b.* Turn all switches and circuit breakers to OFF.

*c.* Check to see that all equipments are secure in the proper storage racks (fig. 5-1).

*d.* For prolonged storage at long distance shipment, remove the batteries from the TA-312/PT and from the hand lantern.

*e.* Remove the mounting straps and fixtures from the storage cabinets for use in securing the equipment.

*f.* Secure all items on the common items panel with the clamps provided and mount the wastepaper baskets in their brackets.

*g.* Place all miscellaneous items in the storage cabinets.

*g.* Disconnect the ground strap from the ground rod and store it in a storage cabinet.

*h.* Remove the ground rod, clean and store it in the shelter (fig. 5-1).

*i.* Wind the power cable and the telephone cable on their respective reels, and secure the reels to the shelter floor (fig. 5-1).

*j.* Disconnect the air conditioner power cable and store it in a storage cabinet (fig. 1-10).

*k.* Remove the whip antennas and antenna wire, and store them in the storage bag inside the shelter (fig. 5-1).

*l.* Disconnect the radio cables and store them in the storage bag.

### 5-2. Disassembly of Equipment

*a.* Disconnect all field wires from the signal entrance box binding posts (fig. 1-5).

*b.* Disconnect the 26-pair cable at the signal entrance box and replace the covers on the receptacles and connectors (fig. 1-5).

*c.* When 115 volts ac power cable from the OUT POWER 115V AC receptacle at the adjacent shelter. Replace the receptacle and connector cover.

*d.* When 115 volts ac power is obtained from a commercial source, proceed as follows:

(1) Turn off or disconnect the power.

(2) Disconnect the power cable connector from the power cable stub connector. Replace both connector covers.

(3) Disconnect the power cable stub from the commercial source and store it in a storage cabinet.

*e.* Disconnect the power cable from the IN POWER 115V AC receptacle in the power entrance box, and replace the covers on the receptacle and connector.

*f.* Disconnect the ground strap from the GROUND TERMINAL in the power entrance box.

### 5-3. Checking and Securing AN/MSC-31A

- a. Close and secure the covers on the signal entrance box and the power entrance box.
- b. Close and secure the blower vent cover on the front of the shelter and the filter cover on the entrance door.
- c. Check the area to make sure that all components and parts have been recovered and stored (fig. 5-1).
- d. Check the interior of the AN/MSC-31A to make sure that all components and parts have been properly secured and that all compartment doors are closed and secured (fig. 5-1).
- e. If the AN/MSC-31A is truck-mounted, close and secure the tailgate and check to see that the sling assembly is secure.

### 5-4. Repackaging for Shipment or Limited Storage

Repackaging of the AN/MSC-31A for shipment or limited storage will normally be performed at a packaging facility or by a packaging team. If emergency packaging is required, select materials from those listed in SB 38-100. Package the AN/MSC-31A in accordance with the original packaging as far as possible with available materials (fig. 2-1).

*Note.* For repackaging of the major components, refer to the instructions given in the applicable technical manuals.

#### *CAUTION*

**When transporting the AN/MSC-31A by air, the outside vent covers of the shelter must be opened to equalize the atmospheric pressure in the shelter.**

| Section II. DELETED.

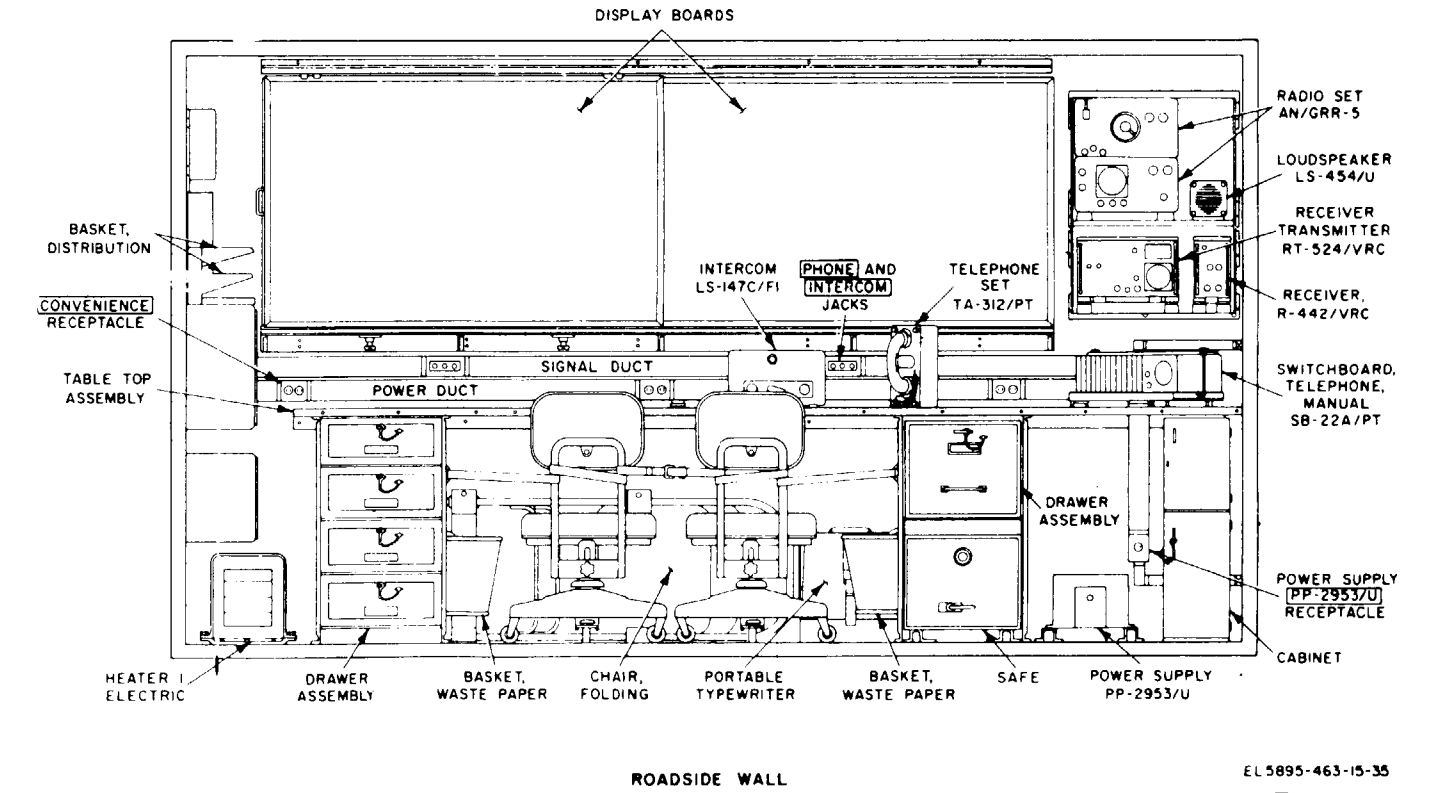
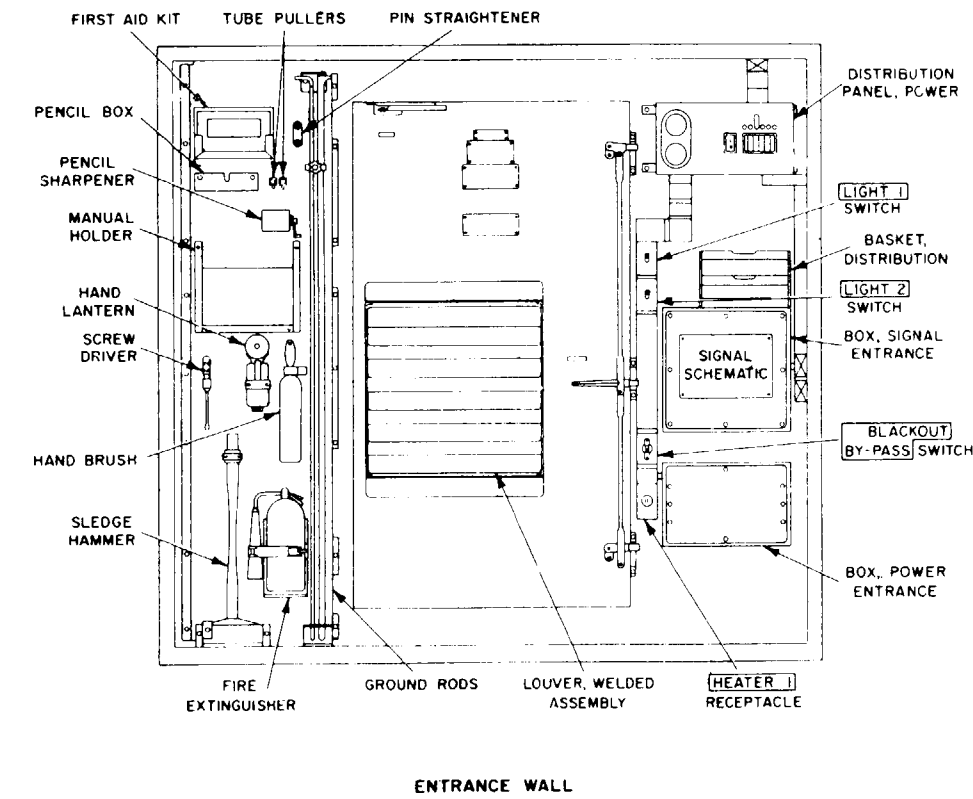
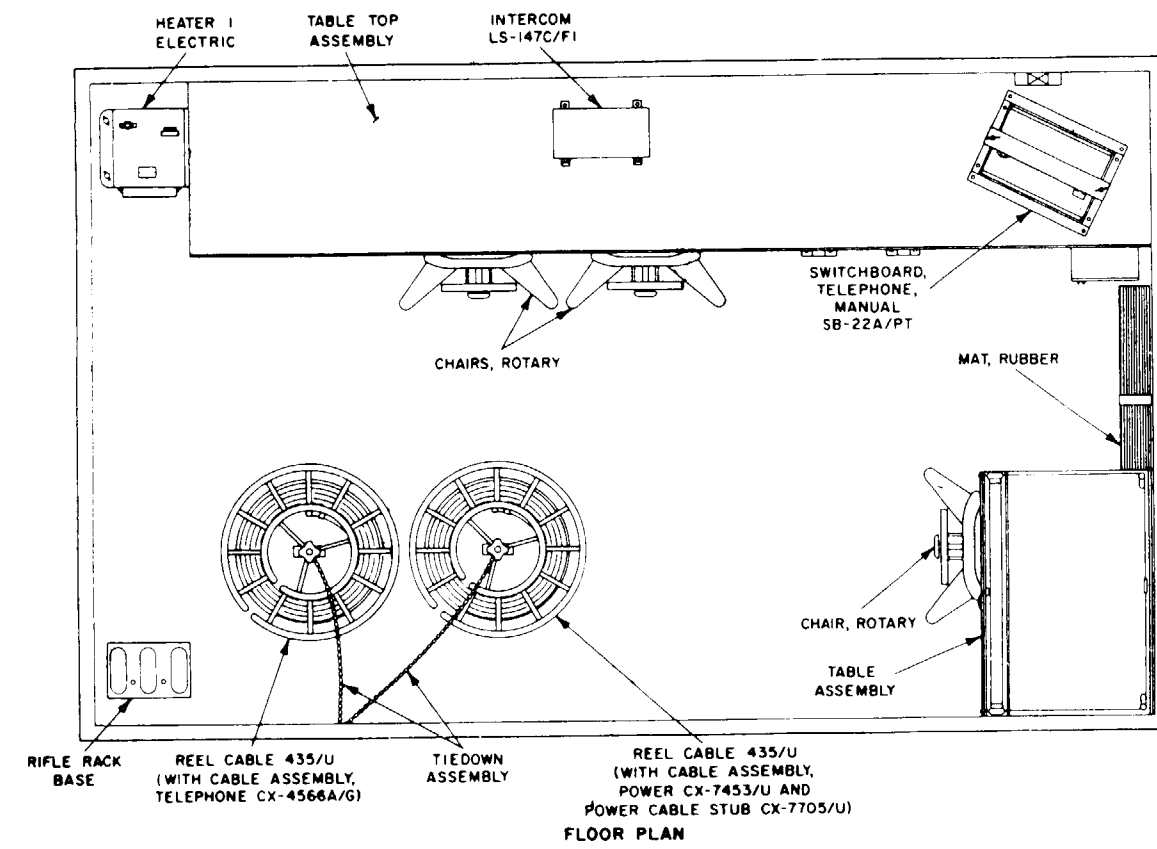
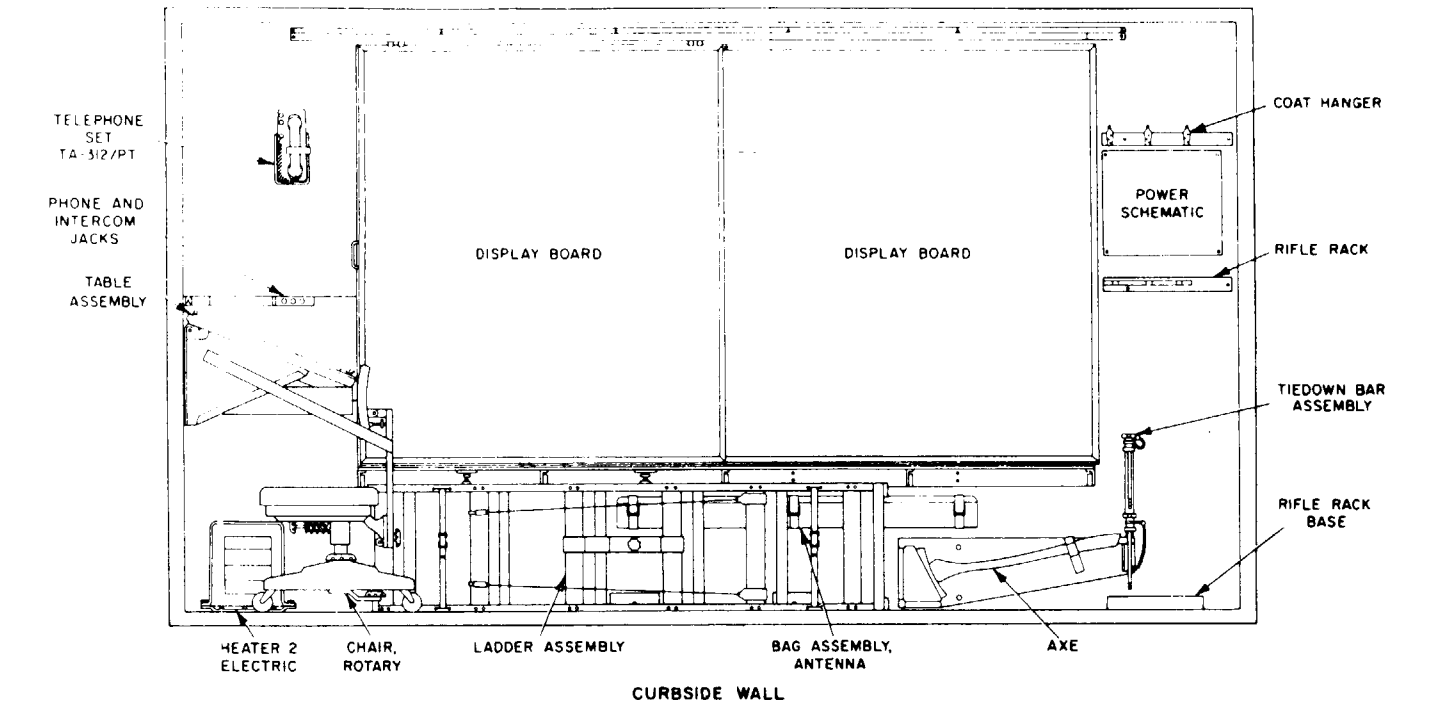
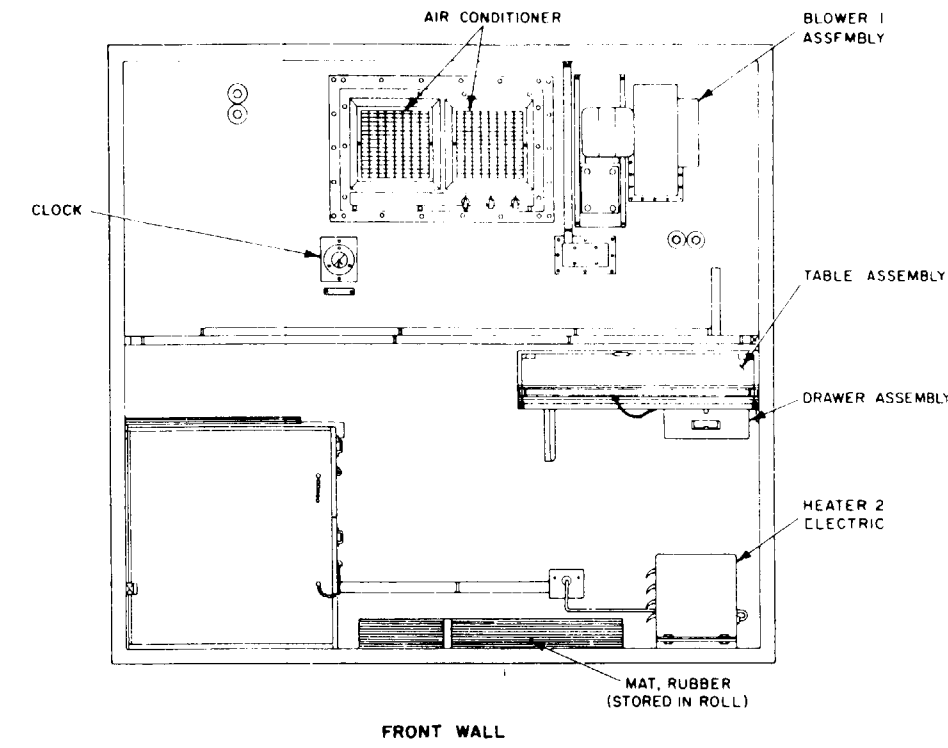
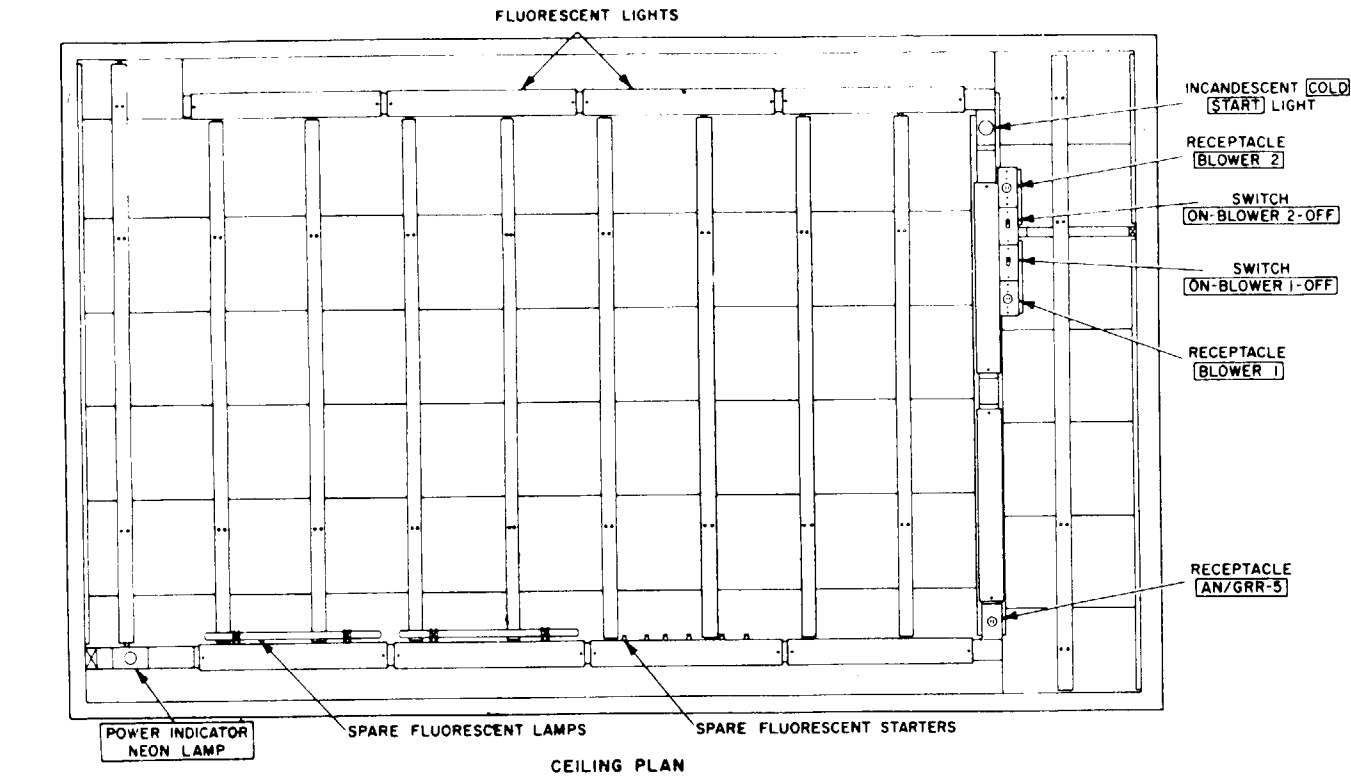


Figure 5-1. Operations Center, Communications AN/MS-31A floor plan and elevation diagram.

## APPENDIX A

### REFERENCES

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DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
SB 11-6	Primary Battery Supply Data.
SB 11-30	Primary Battery Management Data.
SB 38-100	Preservation, Packaging, Packing, and Marking Materials, Supplies and Equipment Used by The Army.
TB SIG 291	Safety Measures to be Observed When Installing and Using Whip Antennas, Field-Type Masts, Towers and Antennas and Metal Poles that are Used with Communications, Radar and Direction Finder Equipment.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern painting of Electrical Equipment Shelters.
TB 43-0125	Installation of Communications-Electronic Equipment; Hookup of Electrical Cables to Mobile Generator Sets on Fielded Equipment to Meet Electrical Safety Standards.
TB 750-240	Maintenance and Repair Procedures for S-141/G, S-144/G, S-250/G, S-280/G and S-318/G Type Shelters.
TM 11-5805-201-12	Operator's and Organizational Maintenance Manual: Telephone Set TA-312/PT (NSN 5805-00-543-0012).
TM 11-5805-201-35	Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts and Special Tools List): Telephone Set TA-312/PT (NSN 5805-00-543-0012).
TM 11-5805-262-12	Operator's and Organizational Maintenance Manual: Switchboards, Telephone Manual, SB-22/PT (NSN 5805-00-257-3602) and SB-22A/PT (5805-00-715-6171) and Adapter, Tone Signaling, TA-977/PT (5805-00-040-9653).
TM 11-5805-262-20P	Organizational Maintenance Repair Parts and Special Tools List For Switchboard, Telephone, Manual, SB-22/PT (NSN 5805-00-257-3602) and SB-22A/PT (5805-00-715-6171).
TM 11-5805-262-34P	Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists: (Including Depot Maintenance Repair Parts and Special Tools) for Switchboards, Telephone, Manual SB-22/PT (NSN 5805-00-257-3602) and SB-22A/PT (5805-00-715-6171).
TM 11-5805-262-35	Direct Support, General Support, and Depot Maintenance Manual: Switchboards, Telephone, Manual SB-22/PT (NSN 5805-00-257-3602) and SB-22A/PT (5805-00-715-6171).
TM 11-5820-334-10	Operator's Manual: Radio Receiver R-392/URR (NSN 5820-00-503-1250).
TM 11-5820-334-20	Organizational Maintenance Manual: Radio Receiver R-392/URR (NSN 5820-00-503-1250).
TM 11-5820-401-12	Operator's and Organizational Maintenance Manual for Radio Sets, AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), AN/VRC-49 (5820-00-

223-7437), AN/VRC-54 (5820-00-223-7567); Mounting Kit, MT-1029/VRC (5820-00-893-1323) and MT-1898/VRC (5820-00-893-1324); Antenna Kit, AT-912/VRC (5820-00-897-6357); Control, Frequency Selector, C-2742/VRC (5820-00-892-3343) and Control, Radio Set C-2299/VRC (5820-00-892-3340).

- TM 11-5830-221-12 Operator's and Organizational Maintenance Manual: Intercommunication Stations LS-147A/FI, LS-147B/FI, LS-147C/FI, and LS-147D/FI (NSN 5830-00-752-5357).
- TM 11-5830-221-24P Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools Lists for Telecommunication Station LS-147C/FI (NSN 5830-00-752-5357).
- TM 11-5830-221-35 Field and Depot Maintenance Manual: Intercommunication Stations LS-147A/FI, LS-147B/FI, LS-147C/FI and LS-147D/FI.
- TM 11-5935-212-13P Operator's, Organizational, and Direct Support Maintenance Repair Parts and Special Tools Lists for Connectors, Plug, Electrical U-185A/G (NSN 5935-00-577-8846) and U-185B/G (NSN 5935-00-045-9830).
- TM 11-5965-206-14P Operator's, Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools); Headset-Microphone H-91A/U (FSN 5965-669-6871); Handset-Headset H-144/U, H-144A/U, H-144B/U and H-144C/U (FSN 5965-682-2769) and Headset-Microphone H-210/G (FSN 5965-892-1068).
- TM 11-5965-224-14P Operator's, Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools): Handsets H-60PT ( FSN 5965-669-9145) and H-165/U (5965-543-1837).
- TM 11-5965-231-14P Operator's, Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Headset, Electrical H-113/U (FSN 5965-504-6370).
- TM 11-5965-255-14P Operator's, Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Loudspeaker, Permanent Magnet LS-454/U (FSN 5965-892-3538).
- TM 11-5985-230-14P Operator's, Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools): Mast Base AB-15/GR (FSN 5985-221-5544).
- TM 11-6130-233-12 Operator's and Organizational Maintenance Manual: Power Supplies PP-2953/U, PP-2953A/U, and PP-2953B/U and PP-2953C/U (NSN 6130-00-985-7899).
- TM 38-750 The Army Maintenance Management System (TAMMS).
- TM 740-90-1 Administrative Storage of Equipment.
- TM 750-244-2 Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

## APPENDIX B

### BASIC ISSUE ITEMS LIST (BIIL) AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST (ITIAL)

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#### Section I. INTRODUCTION

##### **B-1 Scope**

This appendix lists basic issue items and items troop installed or authorized required by the crew/operator for installation, operation, and maintenance of Communication Operation Center AN/MSC-31A.

##### **B-2 General**

This Basic Issue Items and Items Troop Installed or Authorized List is divided into the following sections:

*a. Basic Issue Items List-Section II.* A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with the end item.

*b. Items Troop Installed or Authorized List-Section III.* A list, in alphabetical sequence of items which, at the discretion of the unit commander, may accompany the end item, but are not subject to be turned in with the end item.

##### **B-3. Explanation of Columns**

The following provides an explanation of columns found in the tabular listings:

*a. Illustration.* This column is divided as follows

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Not applicable.

*b. Federal Stock Number.* Indicates the Federal

stock number assigned to the item and will be used for requisitioning purposes.

*c. Part Number.* Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items

*d. Federal Supply Code for Manufacturer (FSCM).* The FSCM is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., and is identified in SB 708-42.

*e. Description.* Indicates the Federal item name and a minimum description required to identify the item.

*f. Unit of Measure (U/M).* Indicates the standard of basic quantity of the listed item as, used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, (eg., ea, in., pr, etc). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

*g. Quantity Furnished with Equipment (Basic Issue Items Only).* Indicates the quantity of the basic issue item furnished with the equipment

*h. Quantity Authorized (Items Troop Installed or Authorized Only).* Indicates the quantity of the item authorized to be used with the equipment.

**SECTION II. BASIC ISSUE ITEMS LIST**

Illustration		(2) Federal Stock Number	(3) Part Number	(4) F S C M	(6) Description  Usable on code	(6) Unit of meas	(7) Qty furn with equip
(A) Fig. No.	(B) Item No.						
19		5110-293-2339	SC-C-539541	80063	AXE	EA	1
		5985-089-7089	SC-D-543385	80063	BAG, ASSEMBLY, ANTENNA	EA	1
		4210-268-9729	RB-1	33525	BRACKET: F/5 LB FIRE EXTINGUISHER	EA	1
19		4210-270-4512	SC-D-539482	80063	EXTINGUISHER, FIRE: 5 LB SIZE	EA	1
		6545-922-1200	SC-D-539483	80063	FIRST AID KIT	EA	1
		5120-251-4489	GGG-H-86	81349	HAMMER HAND: TYPE X1, CLASS 2, STYLE A	EA	1
1-12		5975-224-5260			ROD, GROUND MX-148/G	EA	2
		5410-752-2525	SM-B-352166	80063	LEAD ELECTRICAL GROUNDING	EA	2

**SECTION III ITEMS TROOP INSTALLED OR AUTHORIZED LIST**

(1) Federal stock number	(2) P a r t number	(3) FSCM	(4) Description  Usable on code	(5) U n i t of meas	(6) Q t y a u t h
5120-293-2696	7113	95344	EXTRACTOR, ELECTRON TUBE, F/7 PIN MINIATURE	EA	1
5120-293-2692	9113	95344	EXTRACTOR, ELECTRON TUBE, F/9 PIN MINIATURE	EA	1
5120-293-0255	8655	72653	PIN STRAIGHTENER, ELECTRON TUBE	EA	1
5120-752-9675	2143-6	08600	SCREWDRIVER	EA	1





# APPENDIX C

## MAINTENANCE ALLOCATION

---

### Section I. INTRODUCTION

#### C-1. General

This appendix provides a summary of the maintenance operations for AN/MS-31A. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

#### C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

*a. Inspect.* To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

*b. Test.* To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

*c. Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

*d. Adjust.* To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

*e. Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

*f. Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

*g. Install.* The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow

the proper functioning of the equipment or system.

*h. Replace.* The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

*i. Repair.* The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

*j. Overhaul.* That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

*k. Rebuild.* Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

#### C-3. Column Entries

*a. Column 1, Group Number.* Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

*b. Column 2, Component/Assembly.* Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

*c. Column 3, Maintenance Functions.* Column 3 lists the functions to be performed on the

item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

*d. Column 4, Maintenance Category.* column 4 specifies, by the listing of a “work time” figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate “work time” figures will be shown for each category. The number of task-hours specified by the “work time” figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

- C - Operator/Crew
- O - Organizational
- F - Direct Support
- H - General Support
- D - Depot

*e. Column 5, Tools and Equipment.* Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

*f. Column 6, Remarks.* Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular- code.

#### **C-4. Tool and Test Equipment Requirements (See III)**

*a. Tool or Test Equipment Reference Code.* The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

*b. Maintenance Category.* The codes in this column indicate the maintenance category allocated the tool or test equipment.

*c. Nomenclature.* This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

*d. National/NATO Stock Number.* This column lists the National/NATO stock number of the specific tool or test equipment.

*e. Tool Number.* This column lists the manufacturer’s part number of the tool followed by the Federal Supply Code for manufacturers (5-digit ) in parentheses.

#### **C-5. Remarks (See IV)**

*a. Reference Code.* This code refers to the appropriate item in section H, column 6.

*b. Remarks.* This column provides the required explanatory information necessary to clarify items appearing in section II.

SECTION II MAINTENANCE ALLOCATION CHART  
FOR

OPERATION CENTER, COMMUNICATIONS AN/MSC-31A

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	OPERATION CENTER, COMMUNICATIONS AN/MSC-31A	Inspect Test Test Service Replace Repair Repair Repair Overhaul	0.3 0.2	0.4 1.0 2.0 0.5	0.5 1.0	5.0	00.0	,2,3 ,2,4 ,2,3 ,2,4 ,2,4,5	A B
01	SHELTER, ELECTRICAL EQUIPMENT S-371 /MSC-31A	Test Repair Repair Repair		0.2 0.3 0.5	1.0	5.0		,2,3 ,2,3 ,2,4	
0101	AIR CONDITIONER (See TM 5-4120-282-13)	Replace		0.5				,3	
0102	BLOWER, EXHAUST (SCD 539899)	Inspect Test Replace Repair		0.2 0.3 0.4 0.5				,3 ,3	
0103	HEATER (SCD 539485)	Inspect Test Replace Repair		0.2 0.3 0.4 0.5				,3 ,3	
02	INTERCOMMUNICATION STATION LS-147C/FI (See TM 11-5830-221-12)	Replace Repair		0.2					C
03	SWITCHBOARD, TELEPHONE, MANUAL SB-22/PT (See TM 11-5805-262-12)	Replace Repair		0.4					C
04	TELEPHONE SET TA-312/PT (See TM 11-5805-201-12)	Replace Repair		0.2					C
05	LOUDSPEAKER, PERMANENT MAGNET LS-454/U (See TM 11-5965-255-14P)	Replace Repair		0.2					C
06	HEADSET-HANDSET H-144/U (See TM 11-5965-205-14P)	Install Replace Repair	0.1	0.1					C
07	RECEIVER, RADIO R-392 /URR (See TM 11-5820-334-20)	Replace Repair		0.2					C
08	RADIO SET AM/VRC-47 (See TM 11-5820-401-12)	Replace Repair		0.2					C
09	POWER SUPPLY PP-2953/U (See TM 11-6130-233-12)	Replace		0.2					C

**SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR**

OPERATION CENTER, COMMUNICATIONS AN/MS-31A

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATC STOCK NUMBER	TOOL NUMBER
3	O, F, H, D O, F, H, D O	MULTIMETER AN/USM-223 OHMMETER ZM-21A/U TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	525-00-999-7465 525-00-643-1030 180-00-064-5178	
5	F, H, D H, D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G TOOL KIT, ELECTRONIC EQUIPMENT SHELTER TK-144/G	180-00-610-8177 180-00-973-4369	

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	VISUAL
B	OPERATIONAL
C	SEE TECHNICAL MANUAL FOR REPAIR PROCEDURES



By Order of the Secretary of the Army:

**HAROLD K. JOHNSON,**  
*General, United States Army*  
*Chief of Staff.*

**Official:**

**KENNETH G. WICKHAM,**  
*Major General, United States Army,*  
*The Adjutant General.*

Distribution:

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CofSpts (1)	LBAD (14)
USAARENBD (2)	SAAD (30)
USACDCEC (10)	TOAD (14)
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USAESC (70)	USAERDAA (2)
MDW (1)	USAERDAW (13)
Armies (2) except	USACRREL (2)
Seventh USA (10)	Sig FLDMS (2)
corps (2)	Units org under fol
USAC (3)	TOE:-2 ea.
Div (2)	6-615 11-116
Instl (2) except	6-617 11-122
Ft Gordon (10)	7 11-167
Ft Huachuca (10)	11-5 11-158
WSMR (5)	11-6 11-247
Ft Carson (20)	11-15 11-347
Ft Knox (12)	11-16 11-377
Svc Colleges (2)	11-32 11-500
USAADS (2)	11-35 (AA-AC) (GT)
USAAMS (2)	11-36 11-587
USAARMS (2)	11-66 11-692
USAIS (2)	11-67 11-597
USAES (2)	11-66 17
USATC Armor (2)	11-66 31-106
USATC Inf (2)	11-97 31-106
	11-98 37

NG: None.

USAR: None.

For explanation of abbreviations used, see AR S20-50.







