TM 5-6115-449-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

GENERATOR SET, SELF-POWERED, DIESEL ENGINE DRIVEN, 30 KW AC, 3 PHASE 120/208V, 240/416V, 60 HERTZ CONVERTIBLE TO 25 KW, 50 HERTZ, SKID MOUNTED (MILITARY DESIGN MODEL SF-30-MD/CIED) FSN 6115-935-5111

This copy is a reprint which includes current pages from Changes 2,3 and4.

HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 1969

SAFETY PRECAUTIONS

BEFORE OPERATION

Do not use a lifting device of less than 5,000 pounds capacity. Do not allow the generator set to swing back and forth when it is suspended. Failure to observe this warning can result in severe injury or death to personnel.

Exercise care in the use of bars, hammers, and similar tools while uncrating the unit to avoid damaging the equipment.

Do not smoke or use an open flame in the vicinity when servicing batteries. Batteries generate hydrogen, a highly explosive gas.

Battery connection is negative ground only.

When the generator set is installed in an enclosed area, the exhaust gases must be piped to the outside. Exhaust fumes contain carbon monoxide, which is a colorless, odorless, and poisonous gas. Continuous breathing of carbon monoxide will cause death.

Never operate the generator set at an angle of more than 15° from the level position.

Do not operate the generator set without a suitable ground connection. Electrical faults in the generator set, load lines, or bad equipment can cause death by electrocution when contact is made with an ungrounded system.

Before making connections for parallel operation, be sure the generator sets are not operating and that all switches are in the OFF position. Electrical faults in the generator set, load lines, and load equipment can cause injury or electrocution from contact with an ungrounded system.

Do not use starter continuously for more than 30 seconds of cranking, pause two minutes to allow motor to cool.

When installing battery cables always install the negative cable last.

Brushes must be centered on the collector rings.

DURING OPERATION

Do not attempt to make or break load connections while the generator set is operating or when it is connected to an energized line. The voltage produced by this generator set can cause severe electrical shock or death by electrocution.

Do not attempt to perform voltage conversion while the generator set is operating or when it is connected to an energized line. The voltage produced by the generator set can cause severe electrical shock or death by electrocution. Make sure that each nut is tight before operating the generator set or damage to the reconnection panel may result.

Do not operate the generator set unless the ground terminal has been connected to a suitable ground (para 2-4*d*). Electrical faults in the generator set, load lines, or load equipment can cause injury or electrocution from contact with an ungrounded system.

If the engine knocks or is noisy when the crankcase is filled with oil to the proper level, stop the engine immediately (para 2-12) as continued operation can cause serious damage. Report the condition to organizational maintenance.

Unusual noises from the generator generally indicate a part failure. Stop the generator set immediately (fig. 2-5) as continued operation may result in additional damage to the generator.

Do not perform any maintenance on the generator set controls or instruments when the unit is operating or when the unit is connected to an external lines. Also disconnect the batteries when performing maintenance on the engine electrical components.

AFTER OPERATION

Do not smoke or use an open flame in the vicinity of the generator set during fuel tank service. Do not remove radiator cap when coolant is hot because heated coolant may escape and cause serious injury.

It is important that the fuel system be kept free of contaminants, especially abrasive material. Do not remove any part of the fuel system until surfaces of the item to be removed and adjacent components are thoroughly clean. Also cap disconnected tubes or lines and openings in components. Flush lines and tubes with clean fuel before installation.

Do not damage fuel line on the injector nozzle.

When removing battery cables always remove the negative cable first.

Do not smoke, use an open flame or subject the fuel tank assembly to sparks during periods when the fuel tank assembly is not sealed.

*TM 5-6115-449-15
C 2

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *24 March 1972*

Operator, Organizational, Direct and General Support And Depot Maintenance Manual

GENERATOR SET, SELF-POWERED; DIESEL ENGINE DRIVEN; 30 KW AC, 3-PHASE 120/208 V, 240/416 V, 60 HERTZ; CONVERTIBLE TO 25 KW, 50 HERTZ; SKID MOUNTED (MILITARY DESIGN, MODEL SF-30-MD/CIED) FSN 6115-935-5111

TM 5-6115-449-15, 21 January 1969, is changed as follows:

Page 1-8, paragraph 1-4b(2). On line 7 "98 gal/10 KR" is changed to read "0.98 gal/10 KW".

Paragraph 1-4b(4). Subparagraph (a.1) is added after (*a*).

(a.1) Hydraulic oil filters

Manufacturer	Bendix
Model	MS-28720-6
Type	Element AN6235-2A

Paragraph 1-4b(4) (*h*) in line 3, "D298ER" is changed to read "DBGVCC-631-1HW".

Paragraph 1-4b(4). Subparagraphs (i) and (j) are added after (*h*).

(*i*) *Breather-engine.*

Manufacturer	Air Maze #201941
Type	Cartridge #201941-07

(*j*) *Pump fuel transfer MS51321-2.*

Manufacturer	Bendix P/N 480517
Type	Cartridge P/N 479135

Paragraph 1-4b(6). In line 6, "8 pints" is changed to read "13 pints".

Page 2-13. Figure 2-4 (2). Under *fuel, diesel,* -65°F to -25°F, change "VV-F-800 Grade DSA" to "VV-F-800 Grade DFA", and under Hydraulic oil for -25°F to 0°F change "MIL-H-3605" to "MIL-H-5606".

Page 3-6. Figure 3-4 (sheet 1 of 2) is superseded as follows:

Page 3-7. Figure 3-4 (sheet 2 of 2) is superseded as follows:

Page 3-8. Figure 3-5 (sheet 1 of 2) is superseded as follows:

Page 3-9. Figure 3-5 (sheet 2 of 2) is superseded as follows:

Page 3-12. Figure 3-7 is superseded as follows:

Page 3-15. Paragraph 3-13.1 is added after 3-13.

3-13.1 Breather, Engine.

a. Removal. Refer to figure 1-2 (sheet 2 of 2) and remove breather cover and element.

b. Cleaning and Inspection.

(1) Clean element in an approved cleaning solvent.

(2) Clean element for damage to wire mesh.

(3) Replace if damaged.

c. Installation. Installation is the reverse of removal. Refer to figure 1-2 (sheet 2 of 2).

Page 3-17. Figure 3-11, add the following to step 1. "Refer to figure 3-12A".

Page 3-23, paragraph 3-23. At end of paragraph add the following:

Under *Probable Cause* "Throttle closed". Under *Possible Remedy* "Move throttle linkage toward fuel injection pump (fig. 3-36)".

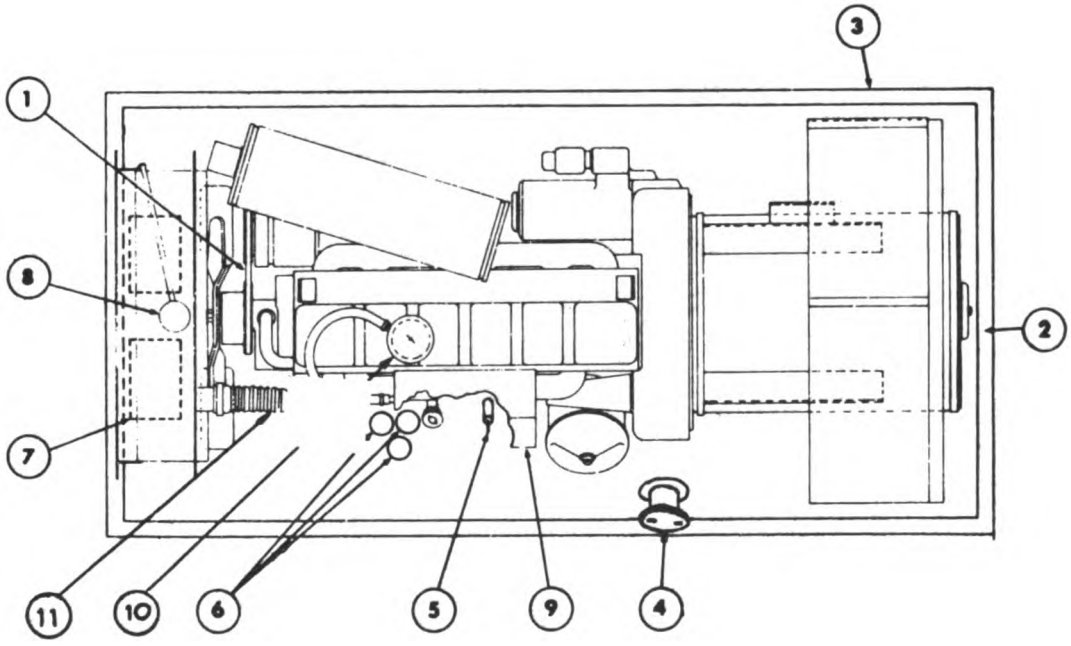
Paragraph 3-24. At end of paragraph add the following: Under *Probable Cause* "Electric-governor out of adjustment". Under *Possible Remedy* "Adjust electric governor control unit."

Page 3-24, paragraph 3-31. In line 4 change "breather tube" to "breather element or tube".

*This change supersedes C1, 31 July 1969.

PREVENTIVE MAINTENANCE SERVICES
DAILY

TM5-6115-449-15 **MILITARY STANDARD MODEL** **GENERATOR SET**



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	V-BELTS. Proper adjustment for fan belts is a deflection of 9/32 inch with application of 3 lbs to 5.2 lbs pressure midway between accessory drive pulley and fan pulley. Replace worn, frayed, or cracked belts in matched sets.	3-16 3-18
2	CONTROLS AND INSTRUMENTS. Inspect for damage and loose mounting. With unit operating, check for proper operation. Normal operating readings for instruments are as follows: Battery charging ammeter — Green portion of scale Coolant temperature gage — 160° to 200° F Oil pressure gage — 30 to 55 psi Voltmeter — 120/208, 240/416 volts Ac ammeter — Indicates percentage of applied load current not to exceed 100 percent maximum. Wattmeter — Indicates applied load not to exceed 25/30 kw maximum. Frequency meter — 50/60 cycles Fault indicator panel — All lights out	2-8 2-9
3	GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4 inch diameter hollow or 5/8 inch dia. solid rod 9 feet long. The cable will be No. 6 AWG copper wire bolted or clamped to the rod and attached to the ground terminal of the generator set.	2-4

ME 6115-449-15/3-4 ① C2

Figure 3-4. Daily preventive maintenance services. (Sheet 1 of 2).

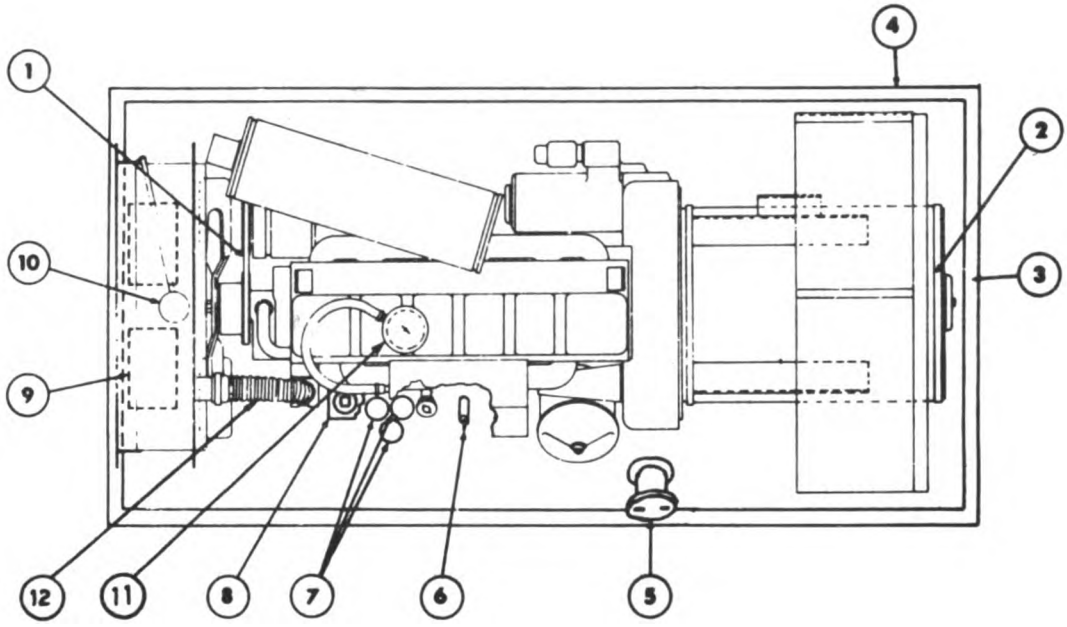
ITEM		PAR REF
4	FUEL TANK. Add fuel as required.	3-9 3-10
5	OIL LEVEL GAGE. (Dipstick) Add oil as indicated by level gage. Reference current L.O.	—
6	FUEL FILTERS. Drain water and sediment from fuel filters.	3-12
7	BATTERIES. Tighten loose cables and mountings. Remove corrosion. Inspect for cracks and leaks. Fill to 3/8 inch above the plates. Clean vent hole in filler cap before installing. In freezing weather, run engine a minimum of 1 hour after adding water. (Weekly)	3-14
8	RADIATOR. Proper coolant level is 2 inches below filler neck.	3-11
9	AIR CLEANER. Check restriction indicator. NOTE 1. OPERATION. During operation, observe for any unusual noise or vibration.	3-15
10	ENGINE BREATHER. Check - clean element when breather element is dirty.	3-13.1
11	HYDRAULIC OIL FILTER. Check - replace if element is dirty.	3-13.2

ME 6115-449-15/3-4 ② C2

Figure 3-4. Daily preventive maintenance services. (Sheet 2 of 2).

PREVENTIVE MAINTENANCE SERVICES
QUARTERLY

TM5-6115-449-15 **MILITARY STANDARD MODEL** **GENERATOR SET**



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	V-BELT. Proper adjustment for fan drive belt is a deflection of 9/32 inch with application of 3 lbs to 5.2 lbs pressure midway between fan pulley and accessory drive pulley. (Weekly)	3-16 3-18
2	GENERATOR BRUSHES. Check for worn or frayed wiring. Lift spring and remove brush from holder. If less than 5/8" long or if surface of brush is chipped or cracked replace with new brush.	3-21
3	CONTROLS AND INSTRUMENTS. Replace damaged instruments. Tighten loose mounting. With the unit operating, check for proper operation. Normal operating readings for instruments are as follows: Battery charging ammeter — Green portion of scale Coolant temperature gage — 160° to 200° F Oil pressure gage — 30 to 55 psi Voltmeter — 120/208, 240/416 volts Ac ammeter — Indicates percentage of applied load current not to exceed 100 percent, maximum. Wattmeter — Indicates applied load not to exceed 25/30 kw maximum. Frequency meter — 50/60 cycles Fault indicator panel — All lights out	2-8 2-9

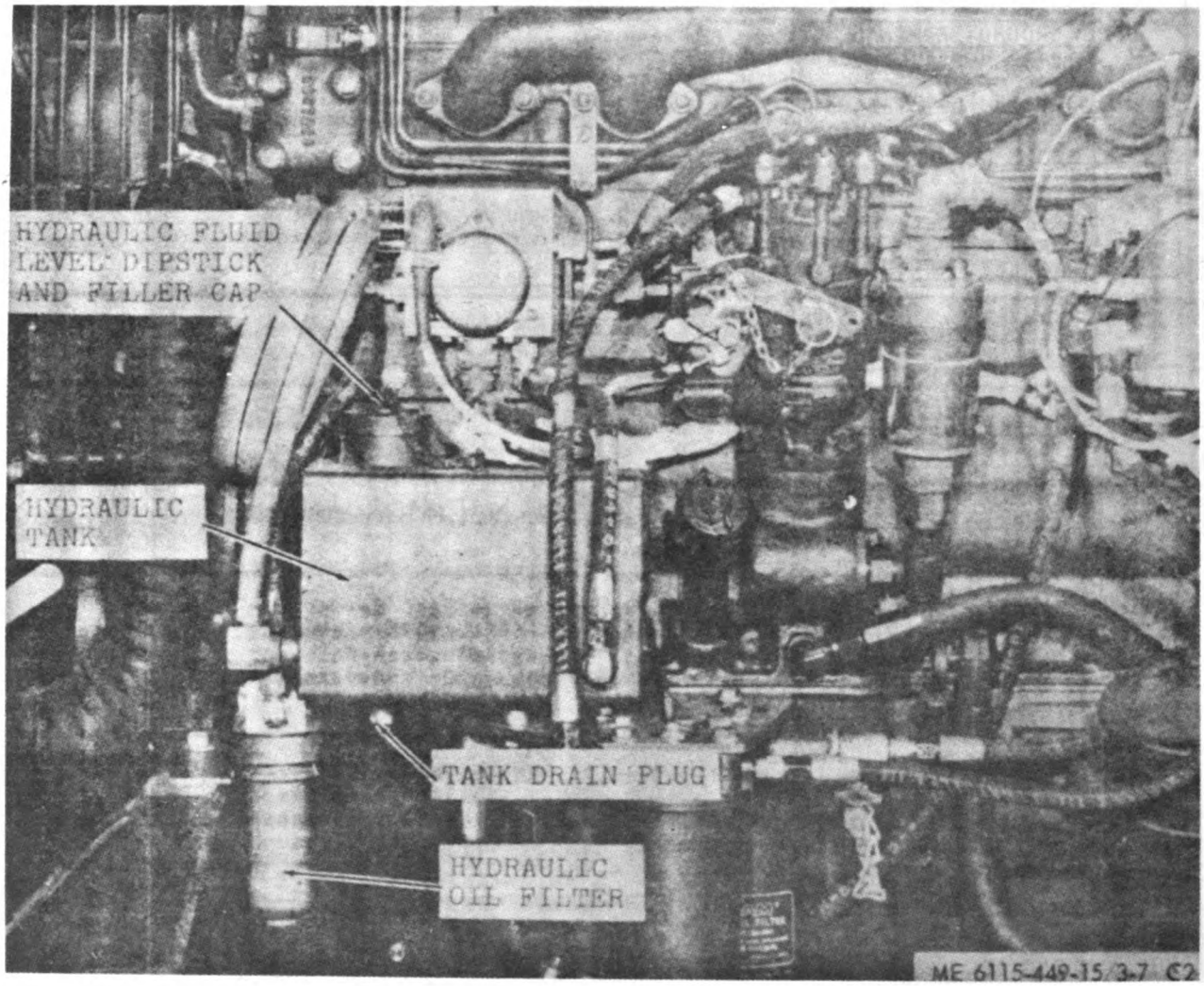
ME 6115-449-15/3-5 ① C2

Figure 3-5. Quarterly preventive maintenance services (Sheet 1 of 2).

ITEM		PAR REF
4	GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4-inch-dia. hollow or 5/8-inch-dia. solid rod 9 feet long. The cable will be No. 6 AWG copper wire, bolted or clamped to the rod and attached to the ground terminal of the generator set.	2-4
5	FUEL TANK. Add fuel as required. Tighten loose mounting. Replace defective cap gasket. Clean cap vent. Drain water and sediment.	3-9 3-10
6	OIL LEVEL GAGE. (Dipstick) Add oil as indicated by level gage. Reference current L.O.	—
7	FUEL FILTERS. Drain water and sediment. Replace or clean a damaged or dirty element.	3-12
8	HYDRAULIC TANK. Check fluid level. Add hyd. oil as required. Replace defective tank.	3-10
9	BATTERIES. Tighten loose cables and mountings. Remove corrosion. Fill to 3/8 inch above the plates. Clean venthole in filler cap before installing. In freezing weather, run engine a minimum of 1 hour after adding water. Replace a cracked or leaking battery.	3-14
10	RADIATOR. Proper coolant level is 2 inches below filler neck. Replace cracked or frayed hose. Replace defective radiator. Remove obstructions in the air passages. Tighten all mounting and leaking connections. Correct cap pressure rating is 7 lbs.	3-11
11	ENGINE BREATHER. Check - clean element when breather element is dirty - replace if damaged.	3-13.1
12	HYDRAULIC OIL FILTER. Check - replace if element is dirty.	3-13.2
	NOTE 1. OPERATIONAL TEST. During operation, observe for any unusual noise. NOTE 2. ADJUSTMENTS. Make all necessary adjustments during operational tests.	

ME 6115-449-15/3-5 ② C2

Figure 3-5. Quarterly preventive maintenance services (Sheet 2 of 2).



STEP 1. Check hydraulic fluid level by removing filler cap and inspecting dipstick.

STEP 2. Add fluid if required and put filler cap back in place.

STEP 3. Inspect hydraulic oil filter element, replace element if dirty.

Figure 3-7. Hydraulic fluid tank service.

Under *Probable Cause* and *Possible Remedy* (fig. 3-32) is changed to read (para 3-13.1).

Page 3-24, paragraph 3-34. At end of paragraph add the following: Under *Probable Cause* "Alternator out of adjustment". Under *Possible Remedy* "Adjust alternator output (para 3-18*b*)".

Paragraph 3-34. At end of paragraph add the following: Under *Probable Cause* "Alternator fuse defective". Under *Possible Remedy* "Replace fuse figure 7-3".

Page 3-27. Paragraph 3-64 is superseded as follows:

3-64. Interference Suppression Components
The primary suppression components are those whose primary function is to suppress radio interference. These components are located on the fuel transfer pump, load terminals, and the convenience receptacle. Figure 3-14.1(1) and 3-14.1(2) are added as follows.

Page 3-30. Figure 3-17 (sheet 1 of 2), add the following at the end of step 1. "Drain coolant from radiator and engine block".

Page 3-32, paragraph 3-70. Add subparagraph *d.*

d. Adjustment. With the set at operating temperature, manually open the shutter control and tighten the setscrews at the thermostat.

Page 3-33, paragraph 3-73. Add the following:

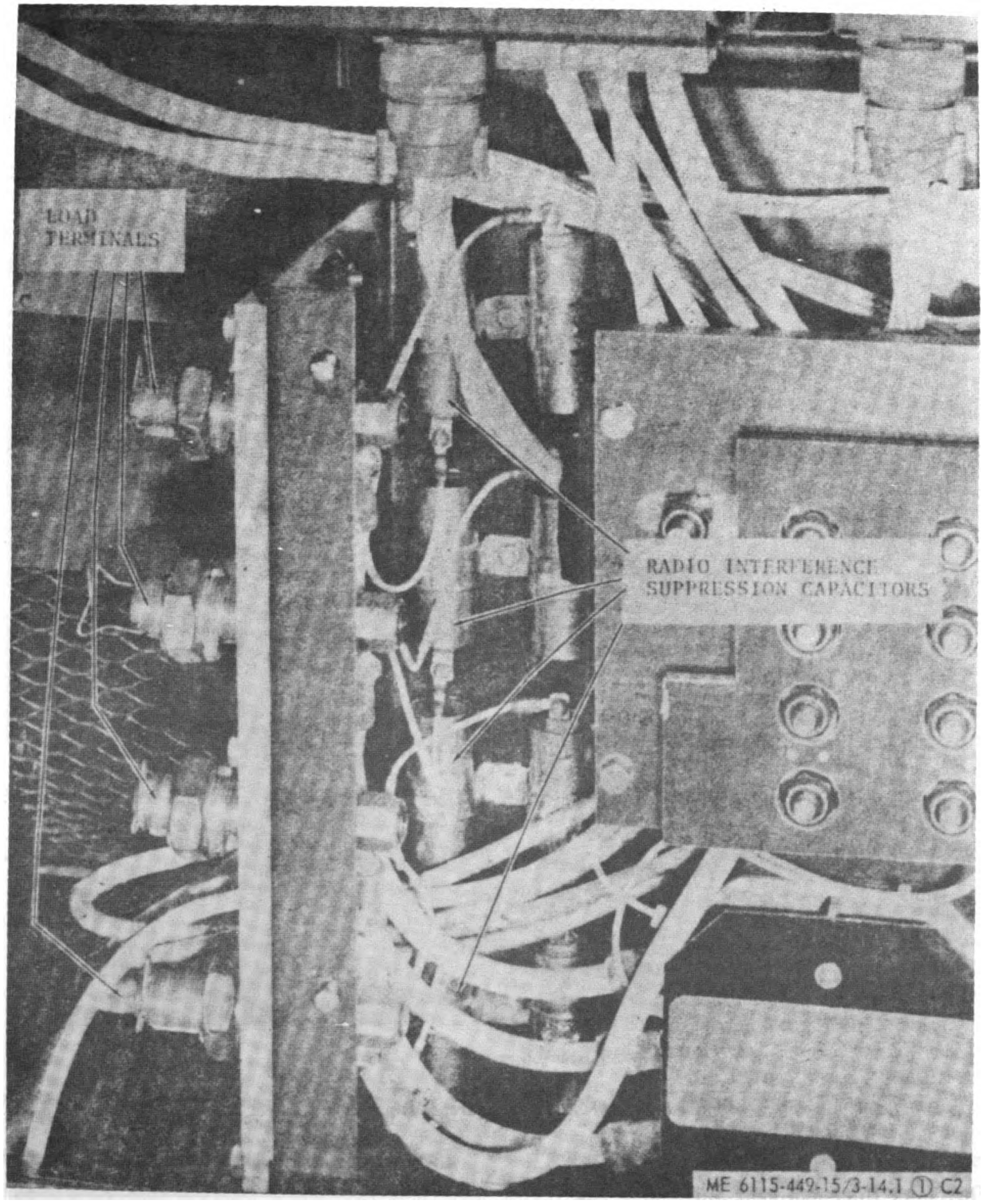


Figure 3-14.1(1) Radio interference suppression.

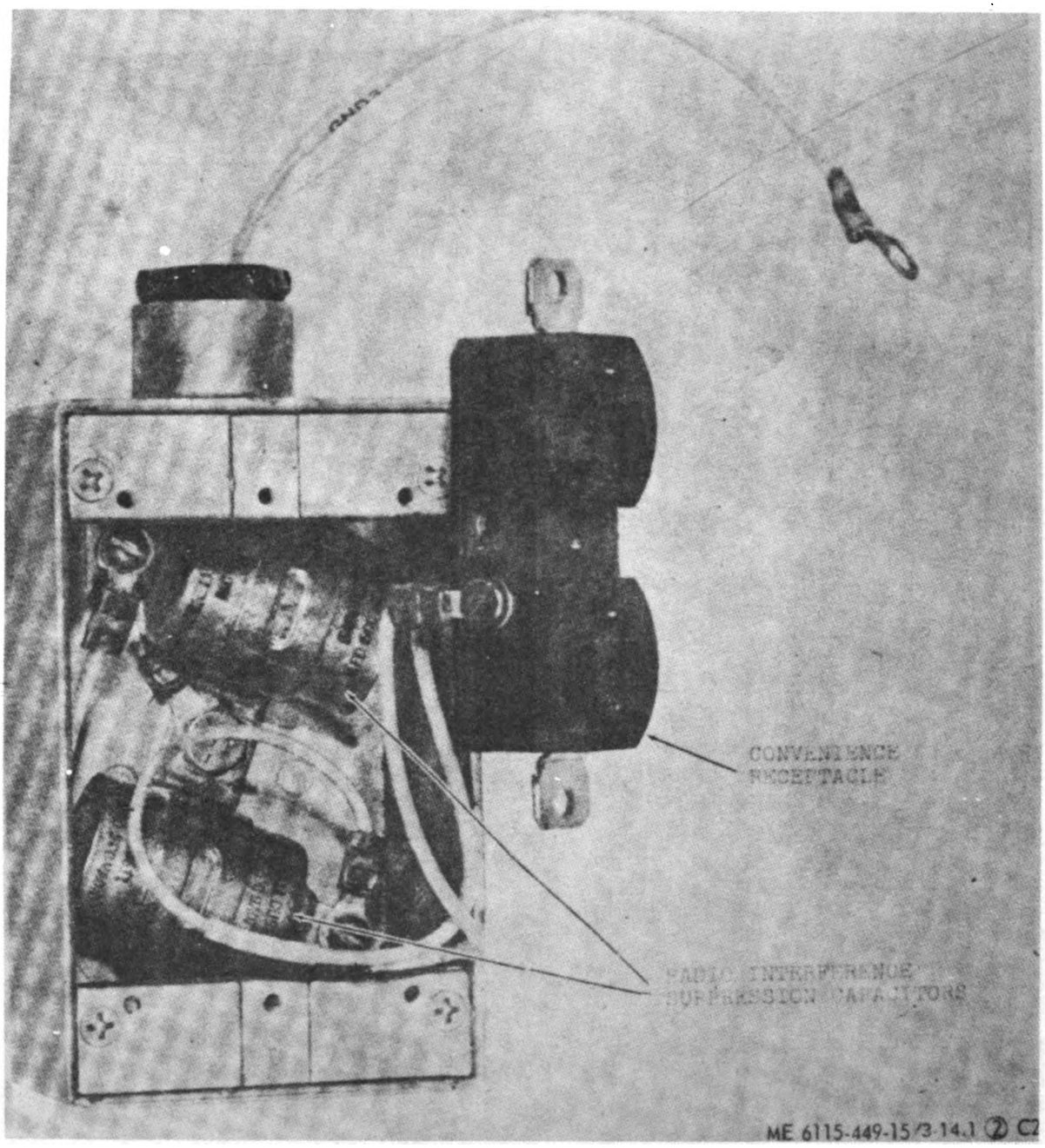


Figure 3-14.1(2) Radio interference suppression.

CAUTION

Day tank filler cap vent must be in the open position when set is operating on day tank.

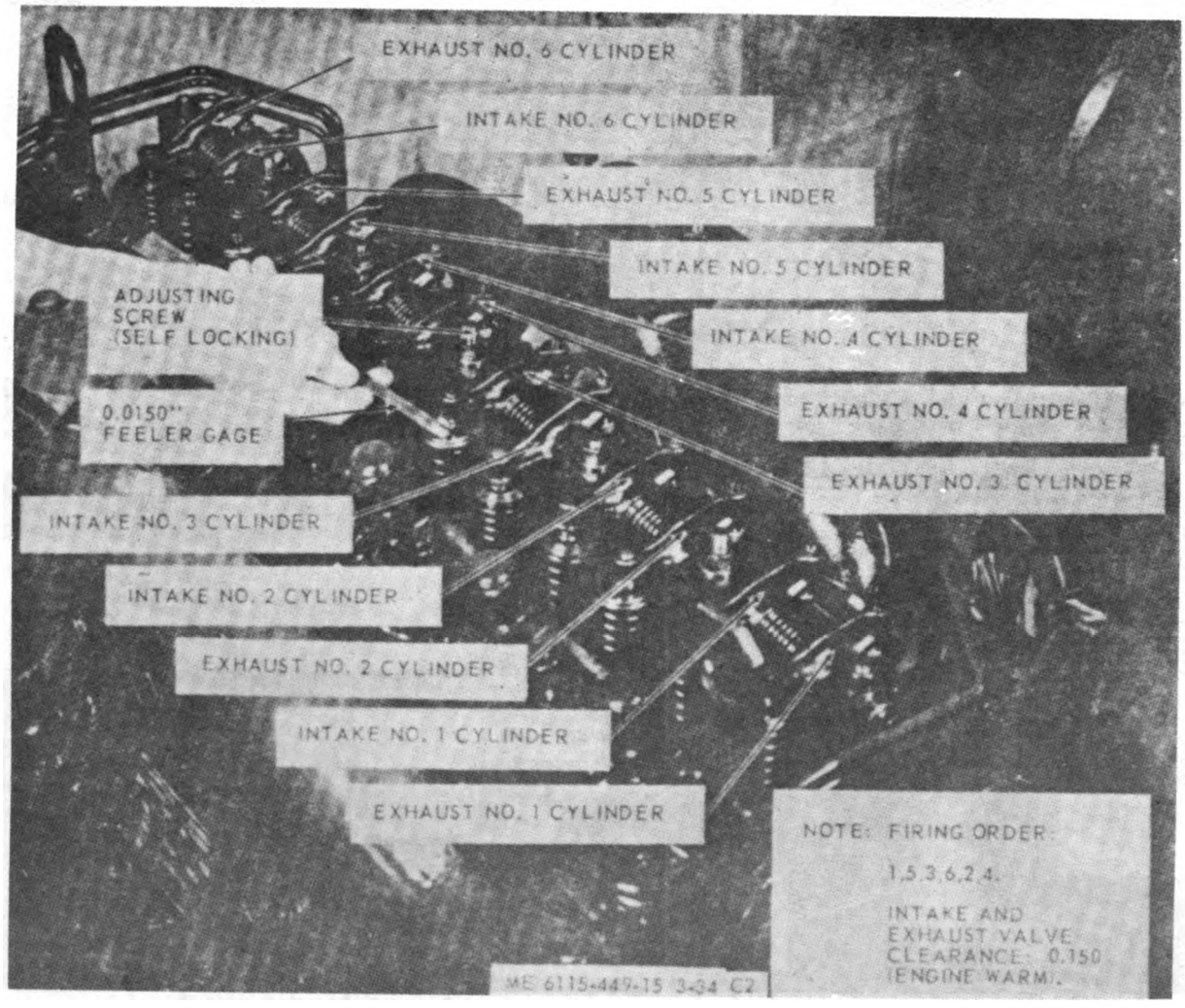
Page 3-54, paragraph 3-92c(1). In line 2; "13" is changed to read "11".

Paragraph 3-92c(2). In line 5, "217°F ±3°F" is changed to read: "230°F ±10°F".

Page 3-58. Figure 3-34 is superseded as follows:

Page 3-59. Figure 3-35 is superseded as follows:

Page 5-1. Paragraph 5-4*a*, line 5, figure 5-1, (sheet 1 of 2) is superseded as follows:



STEP 1. CRANK ENGINE OVER UNTIL INTAKE VALVE OF NO. 1 CYLINDER JUST STARTS TO OPEN.

STEP 2. USING FEELER GAGE, TURN ADJUSTING SCREW TO ADJUST ROCKER ARMS ON NO. 6 CYLINDER.

STEP 3. CRANK ENGINE OVER UNTIL EXHAUST VALVE OF NO. 5 CYLINDER JUST CLOSES AND INTAKE VALVE OF NO. 5 CYLINDER JUST STARTS TO OPEN. ADJUST ROCKER ARMS ON NO. 2 CYLINDER.

STEP 4. COMPLETE ADJUSTMENT, FOLLOWING FIRING ORDER AS FOLLOWS: POSITION VALVES OF NO. 3 CYLINDER AND ADJUST NO. 4 ARMS. POSITION VALVES OF NO. 2 CYLINDER AND ADJUST NO. 5 ARMS. POSITION VALVES OF NO. 4 CYLINDER AND ADJUST NO. 3 ARMS. POSITION VALVES OF NO. 6 CYLINDER AND ADJUST NO. 1 ARMS.

Figure 3-34. Rocker arm adjustment.

Figure 5-1. Schematic wiring diagram (sheet 1 of 2)
(Located in back of manual)

Paragraph 5-4a. Figure 5-1, line 6, (sheet 2 of 2) is superseded as follows:

Figure 5-1. Schematic wiring diagram (sheet 2 of 2)
(Located in back of manual)

Page 5-2. Paragraph 5-4h, line 1, figure 5-2 (sheet 1 of 2) is superseded as follows:

Figure 5-2. AC Troubleshooting (sheet 1 of 2)
(Located in back of manual)

Paragraph 5-4h. Line 3, figure 5-2 (sheet 2 of 2) is superseded as follows:

Figure 5-2. DC Troubleshooting (sheet 2 of 2)
(Located in back of manual)

Page 6-2, paragraph 6-16. In line 3 under Possible Remedy, "adjust or" is changed to read, "adjust (para 3-18) or".

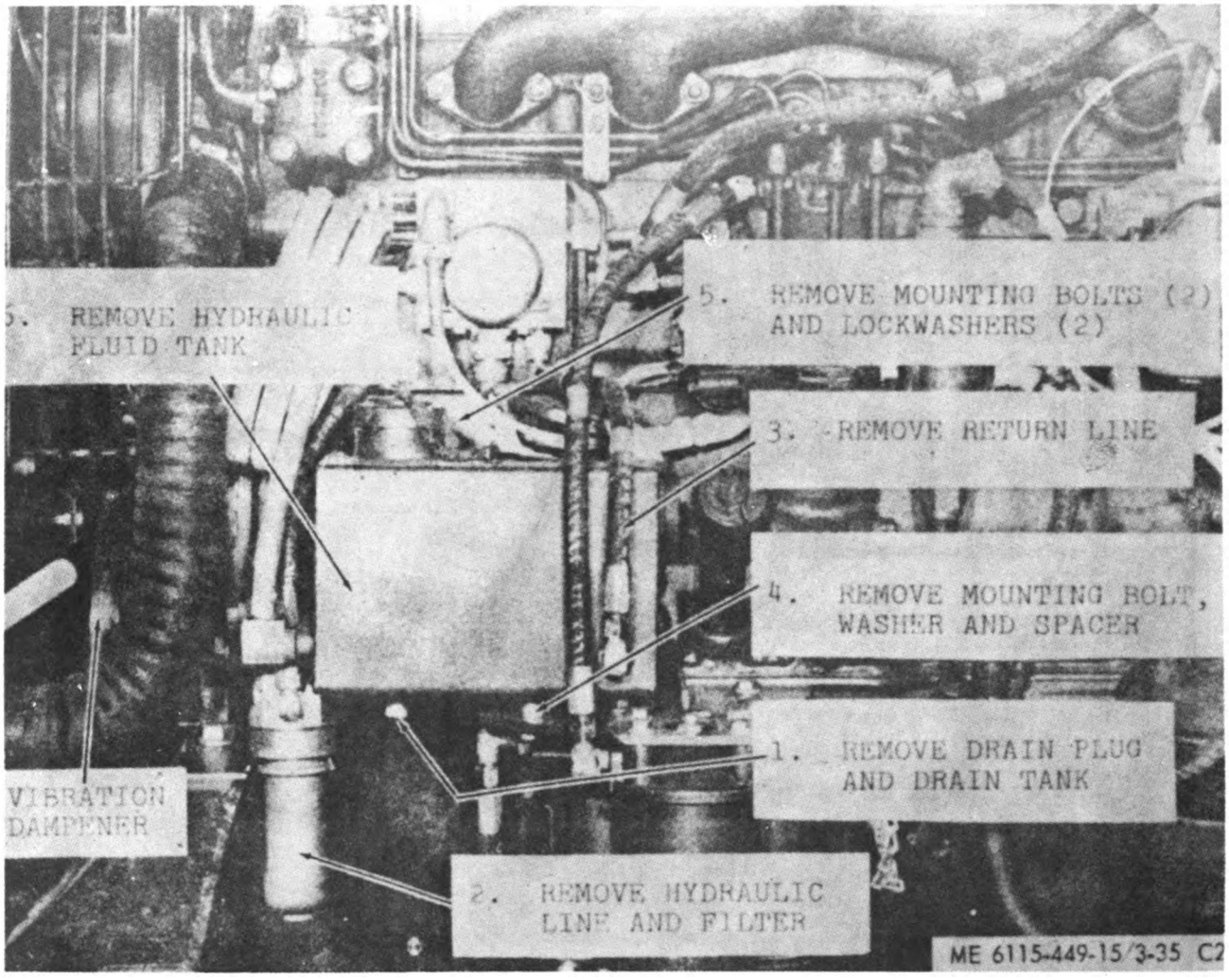


Figure 3-35. Hydraulic fluid tank removal and installation.

Paragraph 6-17. In line 1, "adjust or" is changed to read "adjust (para 3-18) or".

Page 7-2. Delete line 76.

Page 7-2. In line 31, "Pulley, drive" is changed to read "Pulley, drive and vibration damper".

Page 7-3. Figure 7-1. Delete item 76 from the face of illustration.

Page 7-13. In line 97, "weight (2)" is changed to read "weight (6)".

Page 8-1. Paragraph 8-2*c*(3), the following is deleted: V_L equals 20 VDC and I_L equals 21.5 ADC.

Paragraph 8-2c(4) is superseded as follows:

(4) Decrease I_L to zero and observe that V_L equals 20 VDC and I_L equals 21.5 ADC.

Page 8-3. Figure 8-1 (sheet 2 of 4) is superseded as follows:

Figure 8-1. Static exciter (sheet 2 of 4)
(Located in back of manual)

Page 8-10. Figure 8-3(2), lead K15-4 is added to TB4 terminal 6.

Figure 8-3(2). TB3 terminal 7, "K2-5" is changed to read "K2-3".

Page 8-11. Figure 8-3(3) (sheet 3 of 8) is superseded as follows:

Page 8-14. Figure 8-3(6), line 5. In second column, change wire marking "P57D16" to read "P71C16".

Page 8-15. Figure 8-3(7), in line 25 column 3, "R28-M" is changed to read "R30-R".

Page 9-3. Figure 9-1 (sheet 2 of 2) is superseded as follows:

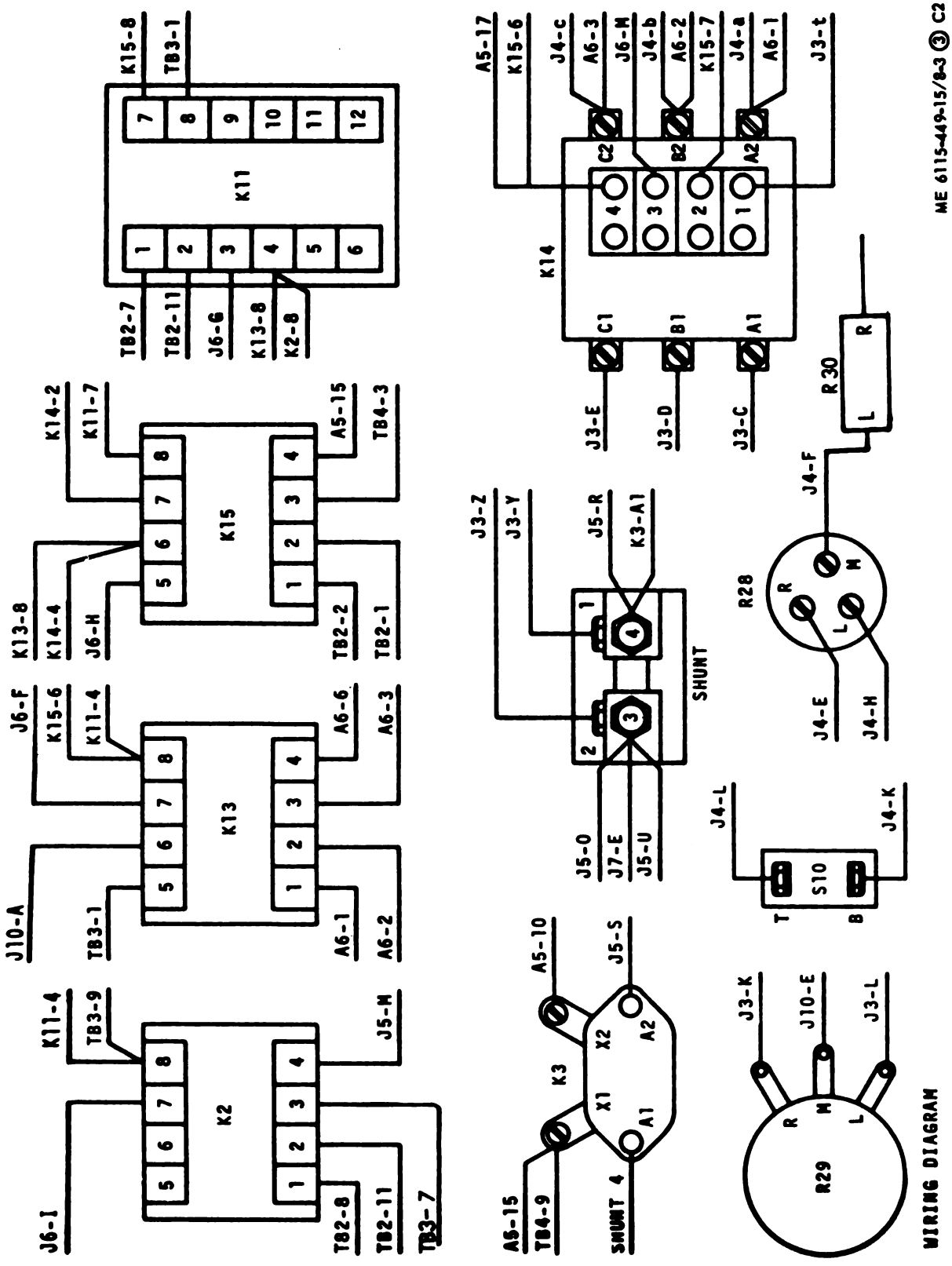


Figure 8-3(2). Relay box, disassembly and reassembly (sheet 3 of 3)

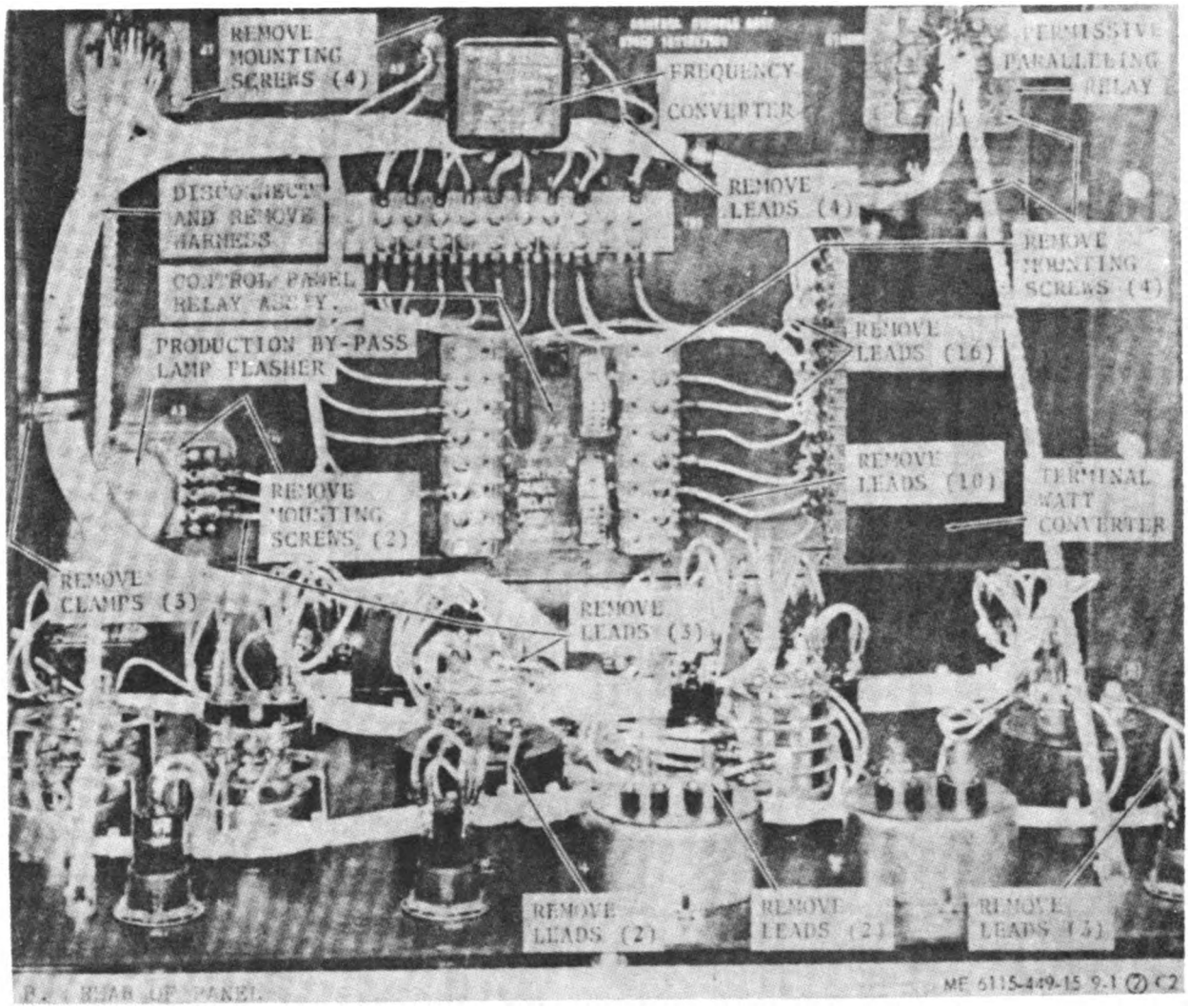


Figure 9–1. Control cubicle controls, removal and installation. (Sheet 2 of 2)

Page 9–26. Figure 9–14(2) in line 9, column 1; "P57C16" is changed to read "P71B16".

Page B–1. Appendix B. Section I, paragraph B–1, B–2, B–3, and Section II are rescinded.

Page C2. Section II, Maintenance Allocation Chart; 0106 Engine Lubrication System; Pan, oil, in column 3c "O" is changed to read "C".

Page I–1. Index, add: alternator, output: page 3–19, para 3–18 after line 2, Adjustment.

Index. Add Alternator, page 3–19, para 3–18 after line 8, Air Cleaner.

Page I–2. Index, in line 45, column 2 "Overvoltage reset switch" is changed to "Overspeed reset switch".

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25D, (qty rqr block No. 784) Organizational maintenance requirements for Generator Sets, Engine Driven, 30 KW, 60 HZ.

Changes in force: C 2 and C 3

TM 5-6115-449-15
C 3

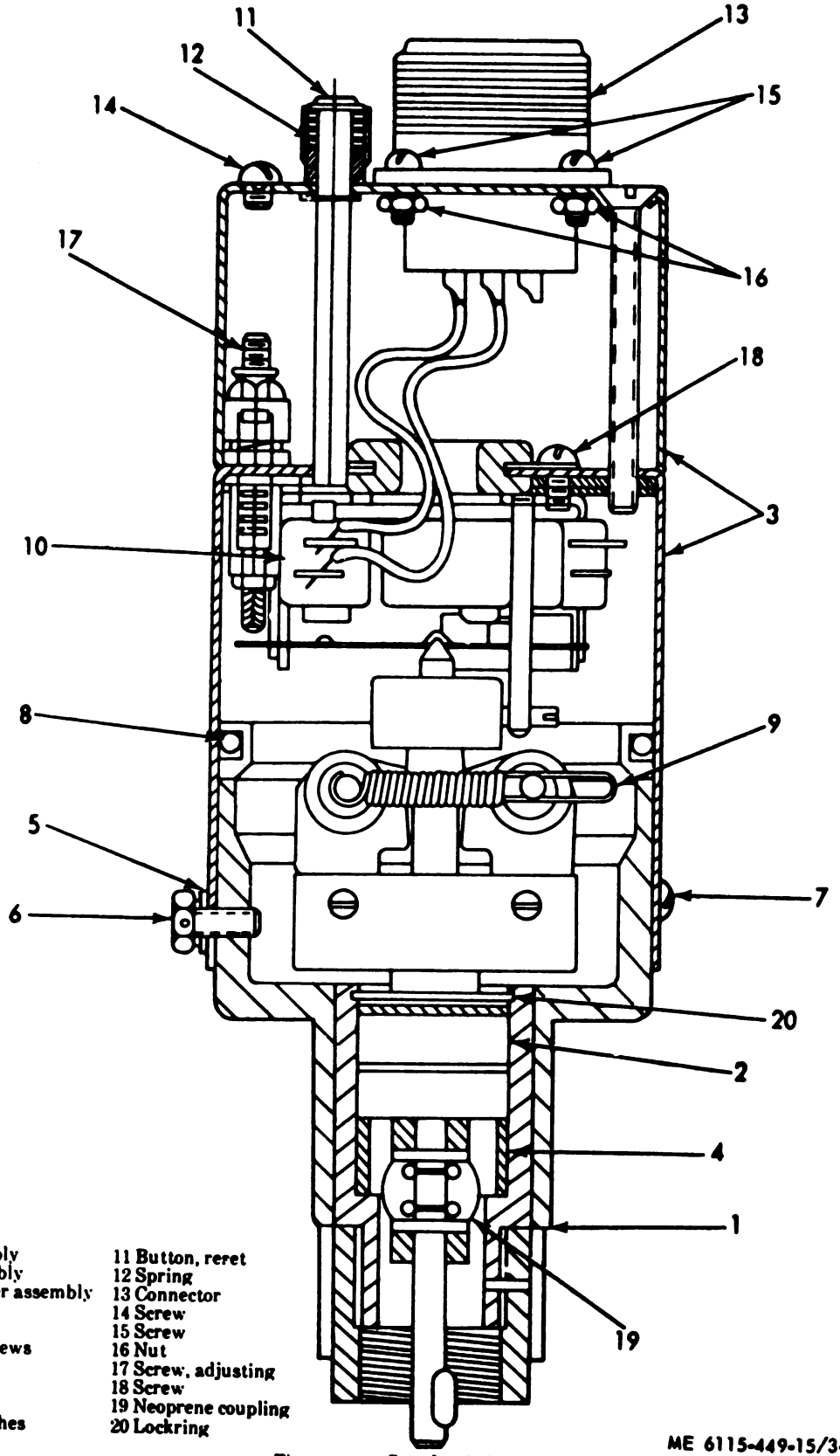
Change No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. *18 June 1973*

Operator, Organizational, Direct and General Support and Depot Maintenance Manual GENERATOR SET, SELF-POWERED; DIESEL ENGINE DRIVEN; 30 KW, AC, 3 PHASE, 120/208V 60 HERTZ; CONVERTIBLE TO 25 KW, 50 HERTZ; SKID MOUNTED (MILITARY DESIGN MODEL SF-30-MD/CIED) FSN 6115-935-5111

TM 5-6115-449-15, 21 January 1969, is changed as follows:

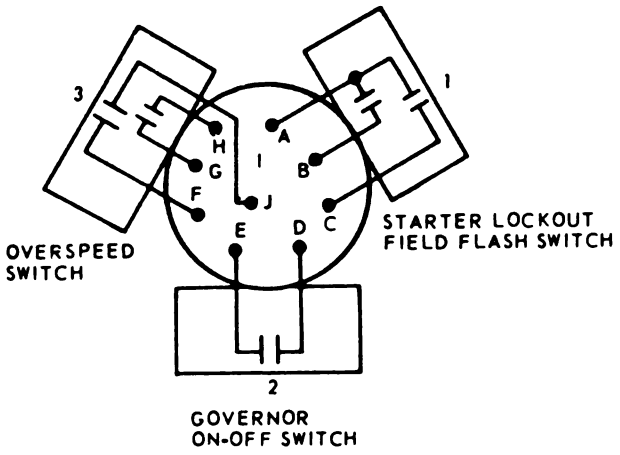
Page 3-53. Figures 3-31.1 and Figure 3-31.2 are added after Figure 3-31.



1 Body assembly
2 Rotor assembly
3 Cap and cover assembly
4 Spacer
5 Flat washer
6 Hex head screws
7 Safety wire
8 "O" ring
9 Spring
10 Micro switches
11 Button, reret
12 Spring
13 Connector
14 Screw
15 Screw
16 Nut
17 Screw, adjusting
18 Screw
19 Neoprene coupling
20 Lockring

ME 6115-449-15/3-31.1 C3

Figure 3-31.1 Speed switch assembly.



ME 6115-449-15/3-31.2 C3

Figure 3-31.2 Wiring of speed switch with 10 pin connector.

Page 9-4. Paragraph 9-3 is superseded as follows:

9-3. Speed Switch

a. General. These units contain three separate snap action switches with single pole, double-throw contacts, which operate at three different speeds. The speeds are pre-set at the factory to trip at the speeds shown on the nameplate. Trip points are on increasing speed. Each switch trip point may be adjusted in the field through the use of the adjusting screws.

b. Removal. Refer to paragraph 3-91 and remove the speed switch.

c. Disassembly and Reassembly.

(1) *Replacement of snap action switches.*

NOTE

Switches must be replaced as an assembly. Part Number SB-1014M. (Serial No. of old switch must be submitted with requisition).

(a) Remove old cap and cover assembly (3, Fig. 3-31.1, Part No. SB-1014M) by removing three screws and washers (5 and 6).

(b) Install new cap and cover assembly and reinstall screws.

(c) Calibrate. ((5) Major Speed Adjustment). ment).

(d) Lockwire.

(2) *Replacement of Rotor Assembly.*

(a) Scribe position of cap and cover assembly (3) with relation to body assembly (1).

(b) Remove cap and cover assembly as in (1) (a) above.

(c) Remove "Tru Arc" snap ring (20) from underside of rotor assembly with Waldes Pliers, #1 or #21.

(d) Push rotor out from bottom of body.

(e) Replace rotor and reassemble in reverse order.

(f) Calibrate speed. (See speed adjustment paragraph (4) below).

(g) Lockwire.

(3) *Replacement of Body Assembly.*

(a) Remove cap and cover assembly as outlined in paragraph (1) above.

(b) Remove rotor as outlined in paragraph (2) above.

(c) Reassemble in reverse order.

(d) Calibrate as required in paragraph (5) below.

(e) Lockwire.

(4) *Speed Adjustment.* All switches may be individually adjusted. Round head screw on top of cap provides access to adjusting screw. (1, fig. 3-31.2.) is lowest trip speed, (2) is intermediate, (3) is highest trip speed (overspeed).

(a) Remove appropriate screw.

(b) Insert 1/16" hex Allen Wrench into adjusting screw.

(c) Turn clockwise to increase trip point; counter-clockwise to decrease trip point.

CAUTION

Too many counterclockwise turns will remove set screw from locknut assembly.

(d) Test.

(e) Replace cap screws.

NOTE

Under certain conditions, the adjustment of one switch may slightly affect the speed setting of the other two switches. Compensating adjustments may be required.

(5) Major Speed Adjustment.

(a) Material Required.

1. Variable speed motor test stand Tachometer ± 1% accuracy.

2. Multimeter to check continuity of switches.

3. 1/16" hex Allen wrench.

(b) Procedure.

1. Install switch on motor test stand and connect multimeter to proper terminals.

2. Turn (1) switch adjusting screw out (CCW) for minimum speed.

3. Turn (2) switch adjusting screw halfway.

4. Turn (3) switch adjusting screw in (CW) for maximum speed.

5. Rotate cap and cover assembly CCW to maximum extended position.

6. Set test stand speed at approximately 200 RPM above actuation point of (1) switch.

7. Rotate cap and cover assembly CW until (1) switch actuates. Scribe this position on body and cap and cover assembly.

8. Further rotate cap and cover assembly CW 1/16" and lock screws (6 Fig. 3-31.1).

9. Minor adjust all three speed points per instructions in paragraph (4) above.

(c) Installation. Refer to paragraph 3-91 and install switch.

NOTE

Mechanically attach unit to drive access point making certain shafts align properly to prevent damaging vibrations and torsions.

Page B-1. Appendix B is superseded.

APPENDIX B
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists items required by the operator for operation of the generator set.

B-2. General

This list is divided into the following sections:

a. Basic Issue Items List — Section II. Not applicable.

b. Items Troop Installed or Authorized List — Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the generator set. These items are NOT SUBJECT TO TURN-IN with the generator set when evacuated.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance and Recoverability Code (SMR). Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A two character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished with Equipment (BIIL). Not applicable.

f. Quantity Authorized (Items Troop Installed or Authorized). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock No.	(3) Description Ref. No. & Mfr code / Usable on code	(4) Unit of meas	(5) Qty auth
	2S10-066-1235	ADAPTER, Drum	EA	1
	7520-559-9618	CASE, Maintenance and Operation Manuals	EA	1
	5935-258-9156	CONNECTOR, Plug	EA	1
	4210-555-8837	EXTINGUISHER, Fire	EA	1
	5975-878-3791	ROD ASSEMBLY, Ground	EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25D (qty rqr block No. 734) organizational maintenance requirements for Generator Sets; Engine Driven 30 KW, 60 HZ Precise Power.

CHANGE
No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *12 February 1975*

Operator, Organizational, Direct and General Support and Depot Maintenance Manual GENERATOR SET, SELF-POWERED; DIESEL ENGINE DRIVEN; 30 KW AC, 3-PHASE, 120/208V, 240/416V, 60 HERTZ; CONVERTIBLE TO 25 KW, 50 HERTZ; SKID MOUNTED (MILITARY DESIGN, MODEL SF-30-MD/CED) NSN 6115-00-935-5111

TM 5-6115-449-15, 21 January 1969, is changed as follows:

The title is changed as reflected above.

NOTE

Convert all Federal stock numbers (FSN) to National stock numbers (NSN) by adding a hyphen and two zeros between the FSC and the FIIN of each Federal stock number.

Example: Convert Federal stock number 2350-873-5408 to National stock number 2350-00-873-5408.

Wherever the words "Federal stock number" appear in the publication, change to read "National stock number."

Page 2 of Cover. Add the following safety precaution under heading "BEFORE OPERATION":

Do not rely on grounding or safety devices to prevent accidents. Electrical circuits and equipment are potentially hazardous. Personnel should always exercise caution to prevent injury or possible death due to electrical shock. Add the following safety precaution under heading "DURING OPERATION":

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

Add the following safety precaution under heading "AFTER OPERATION":

Drycleaning solvent, Fed Spec P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C) - 138°F (59°C).

Page 1-1. Paragraph 1-1*c* is superseded as follows:

c. Reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished direct to you.

Page A-1. Paragraph A-1 is superseded as follows:

A-1. Fire Protection and Safety

TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users
TB MED 251	Noise and Conservation of Hearing

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25D (qty rqr block No. 734), organizational maintenance requirements for Generator Set, Engine Driven, 30 KW, 60 HZ.

TECHNICAL MANUAL
No. 5-6115-449-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *21 January 1969*

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

GENERATOR SET, SELF-POWERED, DIESEL ENGINE DRIVEN, 30 KW AC, 3 PHASE 120/208V, 240/416V, 60 HERTZ CONVERTIBLE TO 25 KW, 50 HERTZ, SKID MOUNTED (MILITARY DESIGN MODEL SF-30-MD/CIED) FSN 6115-935-5111

INTRODUCTION

CHAPTER 1

Section I. GENERAL

1-1. Scope

a. These instructions are published for use by personnel to whom the Model SF-30-MD/CIED Generator Set is issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and overpack. Chapter 4 provides demolition and shipping instructions. Chapters 5 through 10 provide information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Numbers in parentheses following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

c. Report of errors, ommissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on a DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organizational maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag and placed in the manual compartment located on equipment.

Section II. DESCRIPTION AND TABULATED DATA

1-3. Description

a. General. The portable generator set, model SF-30-MD/CIED (fig. 1-1), hereafter called the generator set, is a self-contained, skid-mounted unit which may be operated as a single unit or in parallel with other electrical power generating sets. The equipment can deliver 3-phase, 60 Hertz, 120/208-volt, 240/416-volt or 3-phase, 50 Hertz, 120/208, 240/416-volt alternating current. Power source for the generator set is a six-cylinder diesel engine with an electric governing system to regulate the engine speed. The complete generator set, including operating controls and major components, is enclosed by hinged doors mounted on the panel assembly frame. An eye for lifting is mounted at the top of the frame. Eyes for towing are located at the front and rear of the skid frame. An auxiliary fuel hose and a parallel cable are strapped on top of the static exciter behind the left rear panel of the generator set.

b. Engine. The six-cylinder diesel engine, model D-298-ER (fig. 1-2), is a liquid cooled, four-stroke cycle engine rated at 56 horsepower at 1800 revolutions per minute, and 48 horsepower at 1500 revolutions per minute. When operating under maximum load, the engine speed is controlled by a governor set at 1800 rpm—60 Hertz or set at 1500 rpm—50 Hertz. The engine electrical system contains two 12-volt batteries in series, and a battery charging system consisting of alternator, rectifier and voltage regulator the output of which is 24 volts. The engine is also equipped with a primary fuel strainer and filter, a secondary fuel filter, a lubricating oil filter and an air cleaner. A water pump circulates cooling water through the engine. Safety devices automatically stop the engine during conditions of high coolant temperature, low oil pressure, no fuel, overspeed or overvoltage.

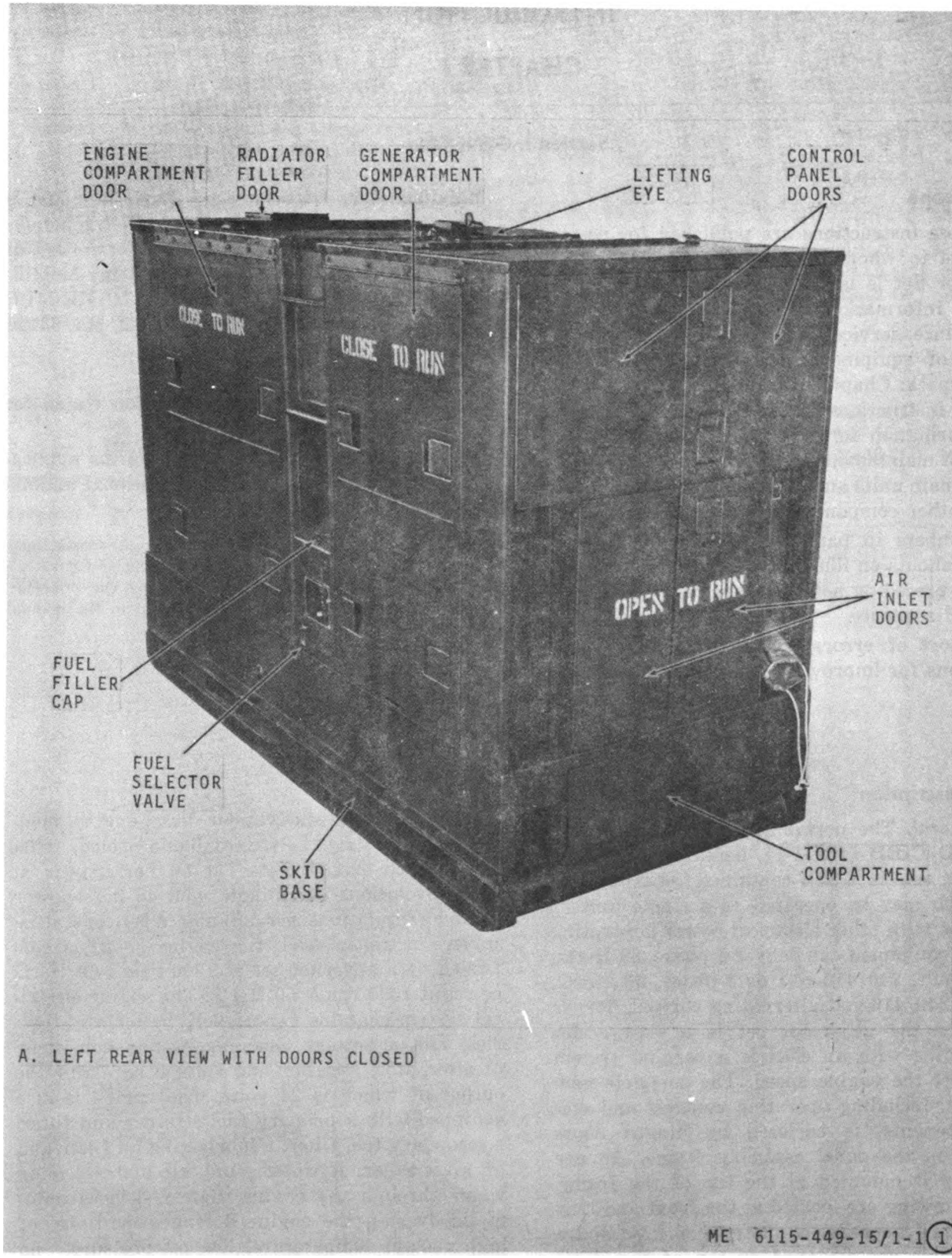


Figure 1-1. *Generator set* (*Sheet* 1 *of* 4).

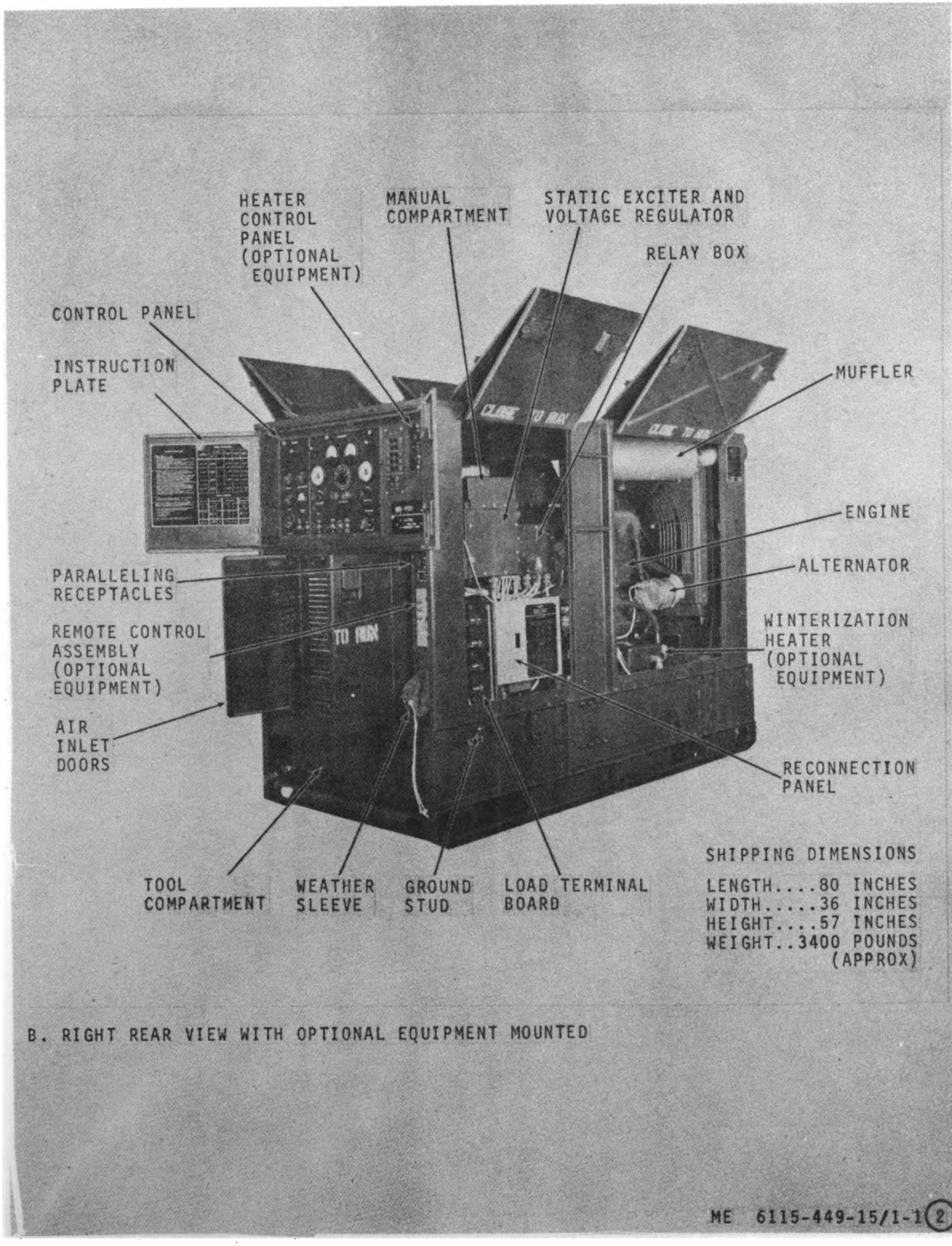


Figure 1-1. *Generator set (Sheet 2 of 4).*

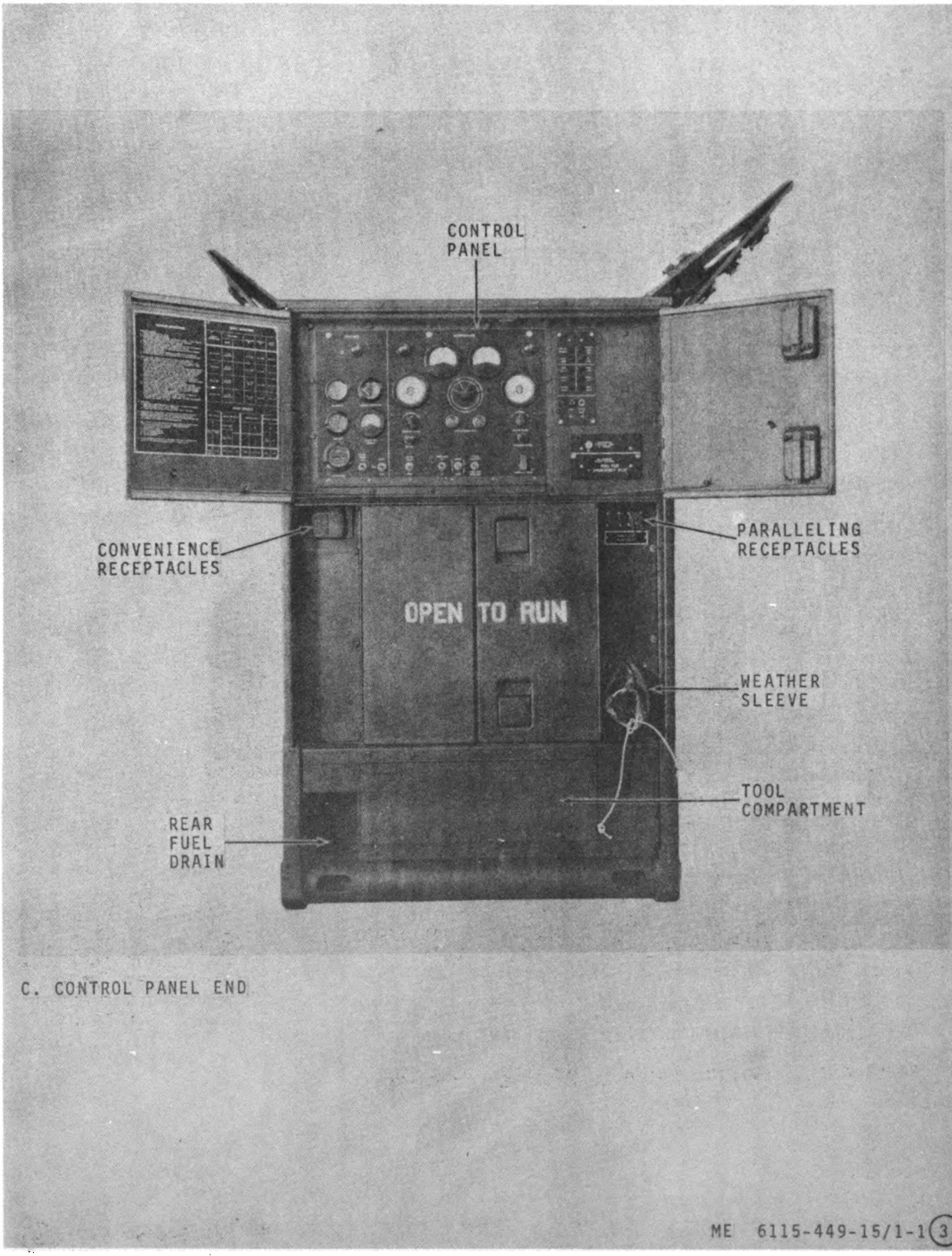
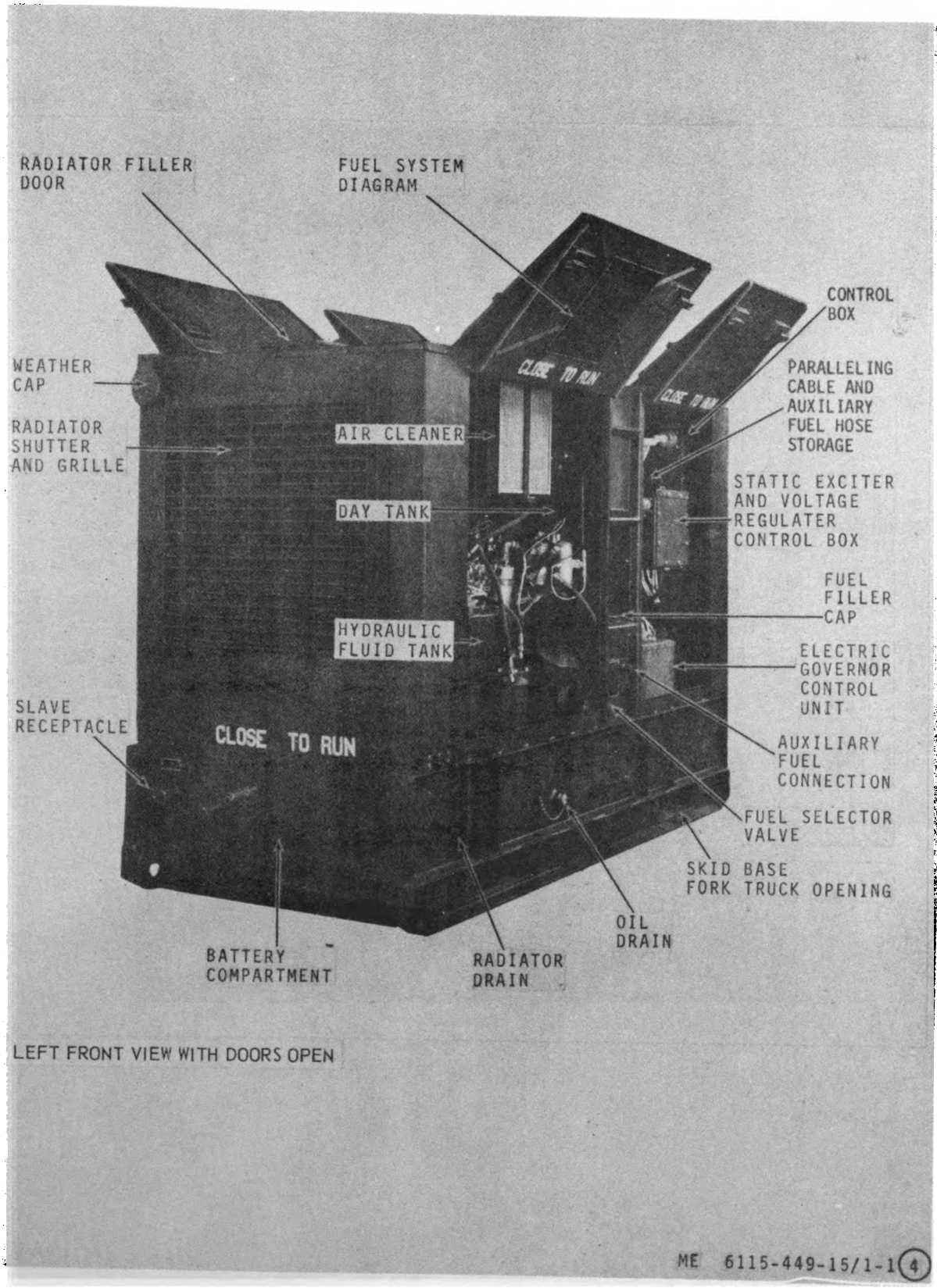


Figure 1-1. *Generator set* (*Sheet* 3 *of* 4).



D. LEFT FRONT VIEW WITH DOORS OPEN

Figure 1-1. *Generator set* (*Sheet* 4 *of* 4).

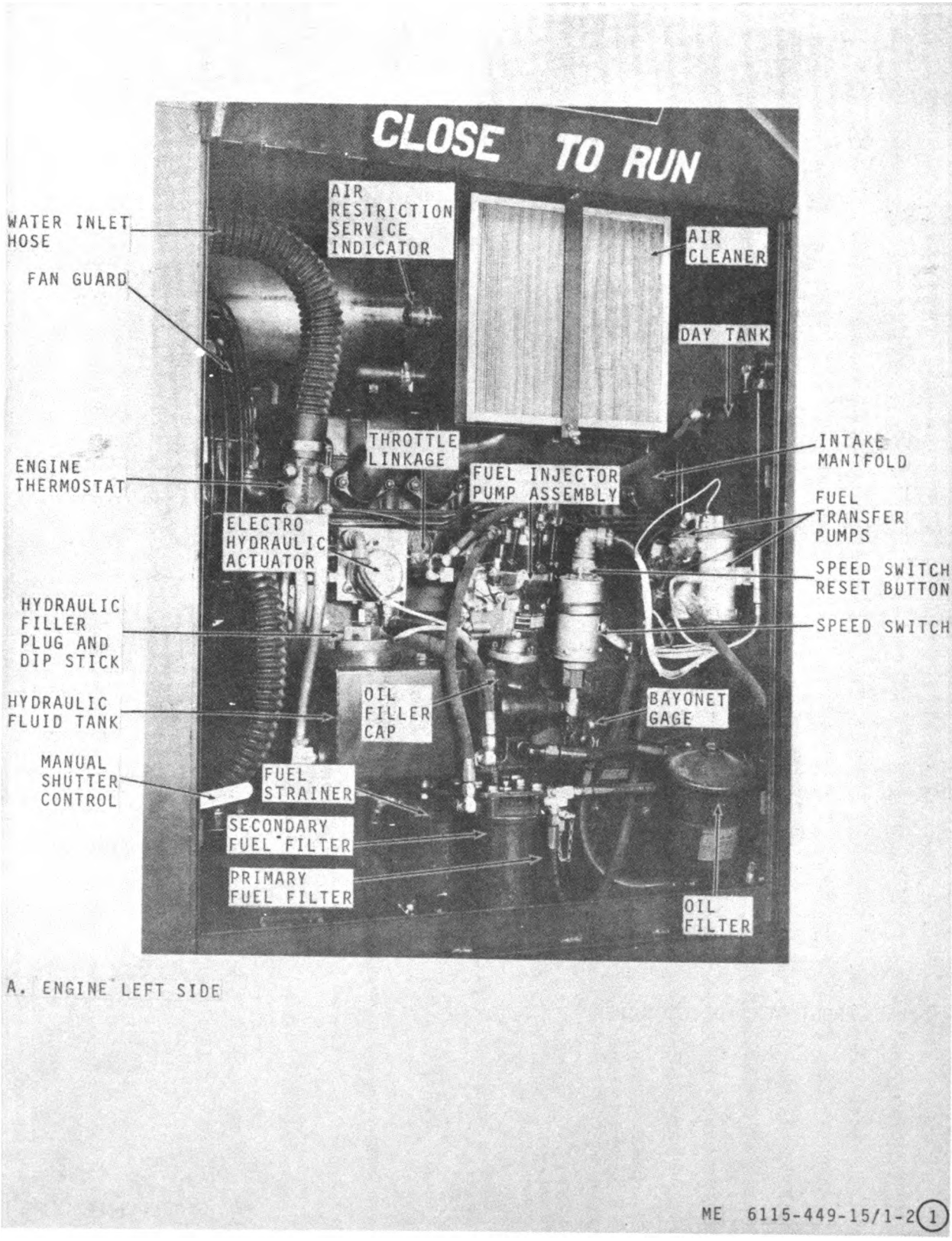
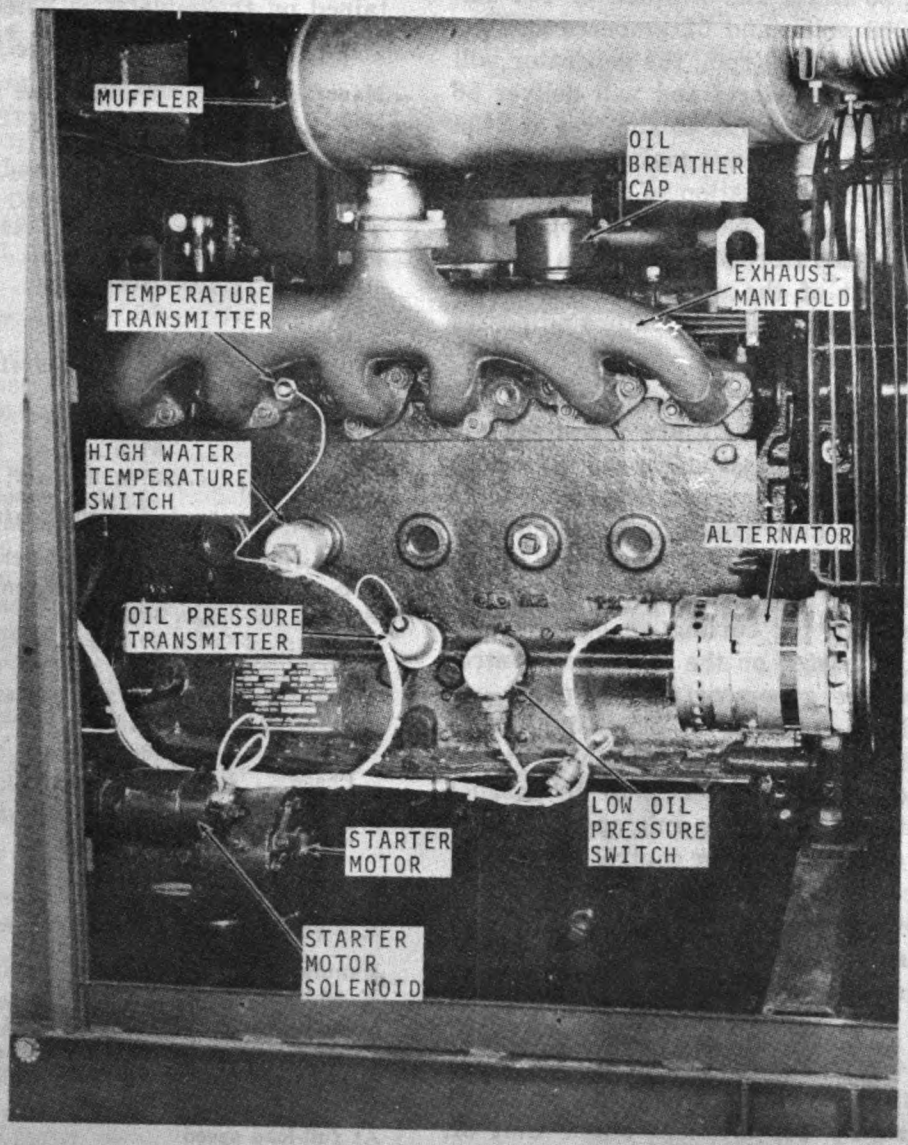


Figure 1-2. Engine compartment (Sheet 1 of 2).



B. ENGINE RIGHT SIDE

ME 6115-449-15/1-2 (2)

Figure 1-2. Engine compartment (Sheet 2 of 2).

c. Generator. The alternating current generator is a three-phase, fan-cooled generator. Operating at 1800 rpm, the generator will produce 30 KW (kilowatts) at 60 Hertz and will deliver 104 amperes at 120/208 volts, and 52 amperes at 240/416 volts. Driven at 1500 rpm, the generator will produce 25 KW at 50 Hertz and will deliver 86 amperes at 120/208 volts and 43 amperes at 240/416 volts. Rated voltages are maintained by 28-volt (direct current) excitation of the generator field by a static exciter, mounted on top of the generator. The generator is cooled by a fan located at the front of the unit. The fan impels cooling air which enters the generator and passes over the generator windings.

d. Control Panels. Both the engine and generator control panels (fig. 2-3) are placed at the rear top of the generator set and contain the controls and instruments for operating the engine and the generator. Both panels are grounded to protect the operator from electrical shock in the event of a short in the equipment. A main circuit breaker switch for cutting all output from the generator is located on the generator control panel. Also on the generator control panel are meters and adjusting knobs for increasing or decreasing frequency and voltage. A panel light and a switch for operating the generator in parallel with other sets or for single unit operation are also provided on the generator control panel. The engine panel contains switches for priming, starting and stopping the engine and also meters for reading engine fuel, oil pressure and coolant temperature. There is also an ammeter for the battery charger.

e. Electric Governing System. An electrical governing system provides the controls and load responses necessary for efficient single unit or parallel operation. Frequency is controlled by the electric governor, which signals a hydraulic actuator connected to the fuel metering valve. The electric governing system contains three current transformers, a rheostat for adjusting frequency, a load measuring unit for fast response and an actuator for control of the fuel metering valve. Speed and load are sensed electrically. If the electric governing system fails, the generator set may be operated with the mechanical governor by resetting the stop, located on the manual control arm of the fuel injection pump, to approximately 1800/1500 rpm of the generator (for 60/50 Hertz).

1-4. Identification and Tabulated Data

a. Identification. The generator set has three major identification plates. The information contained on these plates is listed below.

(1) *Generator set identification plate.*

Manufacturer	Westinghouse Electric Corp.
Model	SF-30-MD/CIED
FSN	6115-935-5111
Type	Portable, skid-mounted, diesel-driven, 30 KW, AC
TMS	TM 5-6115-449-15
Rating	50—50 Hertz
RPM	1800—1500
PF	0.8
Amperes	104—52
Volts	120/208-240/416, 3 phase, 4 wire, wye
Length	80 in.
Width	36 in.
Height	57 in.
Weight	3740 lbs. wet; 3400 lbs. dry

(2) *Generator identification plate.*

Serial Nos.	LA70300001 through LA70300200	
Type	Engine Driven Drip Proof	
Frame	365SP	
Ratings:	60 *Hertz*	50 *Hertz*
KVA	37.5	31.3
Volts	120/208, 240/416	120/208, 240/416
Amperes	104/52	86/43
RPMS	1800	1500
Phase	3	3
PF	0.8	0.8
DC Excitation:		
Rated volts	28	..
Rated amps	26.5	..

(3) *Engine identification plate.*

Manufacturer	Hercules Engine Div., White Corp.
Model	D-298-ER
Spec. No.	D-298-ER-X18
Serial No.	No assigned series
Type of engine	4 cycle full diesel
Rated horsepower	56
At full-load speed (rpm)	1800
Date of manufacture	Date shipped from engine manufacturer
Bore	3 3/4 in.
Stroke	4 1/2 in.
Displacement	298 cu. in.
Lube oil pressure	20 lbs.
Tappet clearance	0.015 in.
Military spec.	MIL-E-11276

b. Tabulated data.

(1) *Generator set.*

Manufacturer	Westinghouse Electric Corp.
Model	SF-30-MD/CIED
Type	Portable, skid-mounted, diesel-driven, 30 KW, AC
Serial Nos.	LA670001 through LA670200

(2) *Engine.*

Manufacturer ....Hercules Engine Div., White Corp.
Model D-298-ER
Specification D-298-ER-X18
Type .....Full diesel, 4-stroke cycle
Cylinder 6
Rated hp (horse) power) .....56 @ 1800 rpm
Fuel consumption rate .....98 gal/10 KW hour
Cooling .....Liquid
Bore .....3 3/4 in.
Stroke .....4 1/2 in.
Firing order .....1, 5, 3, 6, 2, 4 clockwise rotation facing radiator end.

(3) *Generator.*

Manufacturer ....Westinghouse Electric Corp.
Frame .....365 Special (NEMA Standard)
Type .....Engine Driven Drip Proof
Phase 3
Cooling .....Fan
Lubrication .....Sealed bearings
Type of excitation .Static

Cycles:	60 *Hertz*	50 *Hertz*
Rating	30 KW	25 KW
Voltage	120/208, 240/416	120/208, 240/416
Amperes	104/52	86/43

(4) *Accessory Items.*

(a) Oil filters.

Manufacturer ....Fram
Model FH6-PLMIL
Type .....Cartridge (CH-6PLMIL)

(b) Primary fuel strainer and filter.

Manufacturer ....Fram 227031-F2000-ON
Type .....Cartridge C-1126-PL Strainer C-1824

(c) Secondary fuel filter.

Manufacturer ....Fram 227025-F1126-ON
Type .....Cartridge C-1126-PL

(d) Engine primer.

Manufacturer ....Turner Corp.
Model .....LP 2405-1
Type .....Ether

(e) Batteries (2).

Manufacturer ....Military Standard MS35000-3
Volts .....12 V each

(f) Alternator (battery charging).

Manufacturer ....Motorola
Model .....RA24/35; MIL
Volts 28.4
Amps 15
RPM 2600
Amb. Temp. .....75° F

(g) Starter.

Manufacturer ....Delco Remy
Model D198ER
Mfg. No. 1113186

(h) Fuel injection pump.

Manufacturer ....Roosa Master
Model D298ER

(5) *Optional items.*

(a) Winterization kit.

Manufacturer ....Test Institute Corporation
Belmar Heater Div.
Cleveland, Ohio
Model CP3050
Type .....Vapor-Pot Combustion
Fuel .....Diesel Fuel Oil
Operating voltage .24 volts

Current consumption:	*above* +30 *F*	*below* +30 *F*
Start	14.5 amps	17.0 amps
Run (continuous)	5.0 amps	7.0 amps

Fuel consumption rate:
Heating .....0.35 GPII
Heat output:
To coolant .....30,000 BTU/hour
Usable exhaust ..10,000 BTU/hour
Heat input:
Maximum .....45,000 BTU/hour
Dimensions:
Length .....19 13/16 in.
Diameter .....6 7/32 in.
Weight .....22 pounds

(b) Remote Control Panel. Refer to part. No. 13216E3195

(6) *Capacities.*

Engine crankcase ..7 qts.
Oil filters .....1.5 qts.
Cooling system ....27.5 qts.
Fuel tank .....26 gallons (24 gallons usable)
Hydraulic system ..8 pints

(7) *Nut and bolt torque data.*

Manifold stud nuts (intake and exhaust) .....35 ft-lb (foot-pound)
Cyl. head nuts 5/8" solid stud ..175
Cyl. head nuts 5/8" hollow stud .135
Cyl. head nuts 9/16" studs 135
Flywheel bolt 80
Fuel nozzle attaching nut 20
All other bolts and nuts to be securely but not excessively tightened.

(8) *Adjustment data.*

Valve Adjustment:
Valve clearance (intake—hot or cold) 0.0150
Valve clearance (exhaust—hot) .0.0150
Valve clearance (exhaust—cold) .0.0150

(9) *Dimensions and weights.*

Length .....80 in.
Width .....36 in.
Height .....57 in.
Weight .....3400 lbs. dry

(10) *Wiring Diagram.* Refer to figure 1-3.

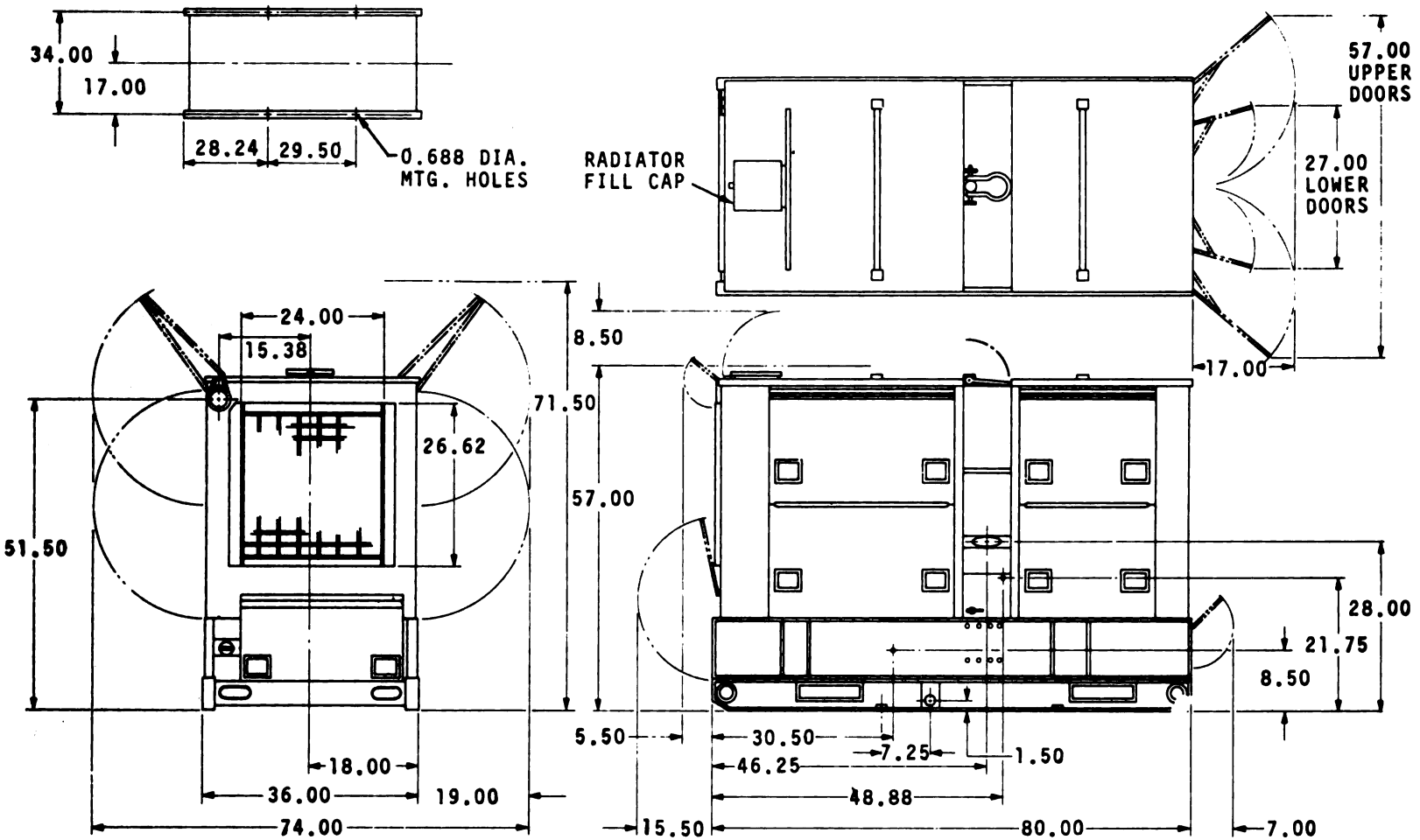
(11) *Installation Plan.* Refer to figure 1-4.

1-5. Difference in Models

This manual covers only the model SF-30-MD/CIED generator set. No. known unit differences exist for the model covered by this manual.

Figure 1-3. *Wiring diagram.*

(Located in back of manual)



NOTE: ALL DIMENSIONS GIVEN IN INCHES

ME 6115-449-15/1-4

Figure 1-4. Installation outline.

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unloading Equipment

The total crated weight of the generator set is approximately 3500 pounds. Use a forklift or crane to unload the unit. When lifting an uncrated generator set with a crane, utilize the lifting eye provided on the top of the generator set. Remove all tiedown straps and keep the equipment in the UP position while unloading.

Warning: **Do not use a lifting device of less than 5,000 pounds capacity. Do not allow the generator set to swing back and forth when it is suspended. Failure to observe this warning can result in severe injury or death to personnel.**

2-2. Unpacking Equipment

a. Before unpacking, move the unit as near as possible to the location where it will be operated.

b. Remove the top and then the sides of the crate.

Caution. **Exercise care in the use of bars, hammers, and similar tools while uncrating the unit to avoid damaging the equipment.**

c. If the unit is to be mounted as a permanent installation, either inside or outside, remove the unit from the wood skid base.

d. If the unit is to be set up as a temporary installation, do not remove the wood skid base. The wood skid base will serve as a foundation on soft ground, mud, or snow.

2-3. Inspecting and Servicing Equipment

a. Depreservation. Prepare the generator set for inspection and operation as outlined on DA Form 2258, "Depreservation Guide of Engineer Equipment", attached on or near the operator's controls.

b. Perform the daily preventative maintenance services (para 3-6).

c. Make a thorough visual inspection of the entire generator set for loose or missing mounting hardware, damaged, or missing parts. Inspect the fuel lines for cracks and leaks.

d. The two 12-volt batteries are located below the radiator. Batteries are shipped in dry state and the electrolyte is shipped in a separate container. Fill and connect the batteries as described below.

Caution: **Do not smoke or use an open flame in the vicinity when servicing batteries. Batteries generate hydrogen, a highly explosive gas.**

(1) Open access door.

(2) Remove cell caps and fill battery cells with electrolyte.

(3) Make sure vent holes in cell caps are open and install caps.

(4) Positive (+) and negative (—) cables are disconnected from the batteries when the generator set is shipped. Connect the cables illustrated in figure 3-10. Connect negative ground last.

Warning: **Battery connection is negative ground only.**

(5) Tighten all post connectors securely to the posts.

e. Arctic antifreeze solution is standard coolant for this generator set. In case of emergency, water with rust inhibitor can be used.

2-4. Installation Instructions (fig. 1-4)

a. Outdoor Installation. Select a clean, level, dry, well-drained, and well-ventilated location for the generator set if possible. Select a site where there will be enough space on all sides for servicing and operation of the unit. Avoid dusty or sandy areas and humid conditions whenever possible. Dirt and moisture will shorten the life of engine and generator parts and will affect the operating efficiency of the unit. If installation on soft ground is necessary, arrange a platform of planks or logs to prevent the generator set from sinking or request that a concrete base be constructed. Refer to figure 1-4 for dimensions of the base.

b. Indoor Installation. When the generator is installed indoors, allow at least four feet of space on all sides of the unit for operation and servicing. Make certain the inclosure is well ventilated so that the generator will receive an adequate supply of fresh air during operation. Install a gastight exhaust extension from the engine exhaust outlet to the outdoors. This extension should be as large in diameter as the engine exhaust stack and contain as few bends as possible. Wrap the extension with insulation if there is a danger of anyone's touching it and provide an insulating shield where the extension passes through a flammable wall If the engine heater is to be operated, provide a gastight exhaust extension to the outdoors.

Warning: **When the generator set is installed in an inclosed area, the exhaust gases must be piped to the outside. Exhaust fumes contain carbon monoxide, which is a colorless, odorless, and poisonous gas. Continuous breathing of carbon monoxide will cause death.**

c. Leveling. Level the generator set during installation. Keep unit as level as possible during operation.

Caution: **Never operate the generator set at an angle of more than 15° from the level position.**

d. Grounding. Ground the generator set prior to operation. The ground can be, in order of preference, an underground water piping system, a metal rod driven into the ground, or a metal plate buried in the ground. A ground rod must have a minimum diameter of 3/4-inch if hollow or 5/8-inch if solid, and it must be driven to a depth of at least 8 feet. A ground plate must have a minimum area of 9 square feet and must be buried to a depth of at least four feet. The ground lead must be a No. 6 AWG (American Wire Gage) copper wire. Bolt or clamp one end of the ground lead to the ground rod, ground plate or piping system. Connect the other end of the ground lead to the generator set ground terminal (fig. 2-1).

Warning: **Do not operate the generator set without a suitable ground connection. Electrical faults in the generator set, load lines, or bad equipment can cause death by electrocution when contact is made with an ungrounded system.**

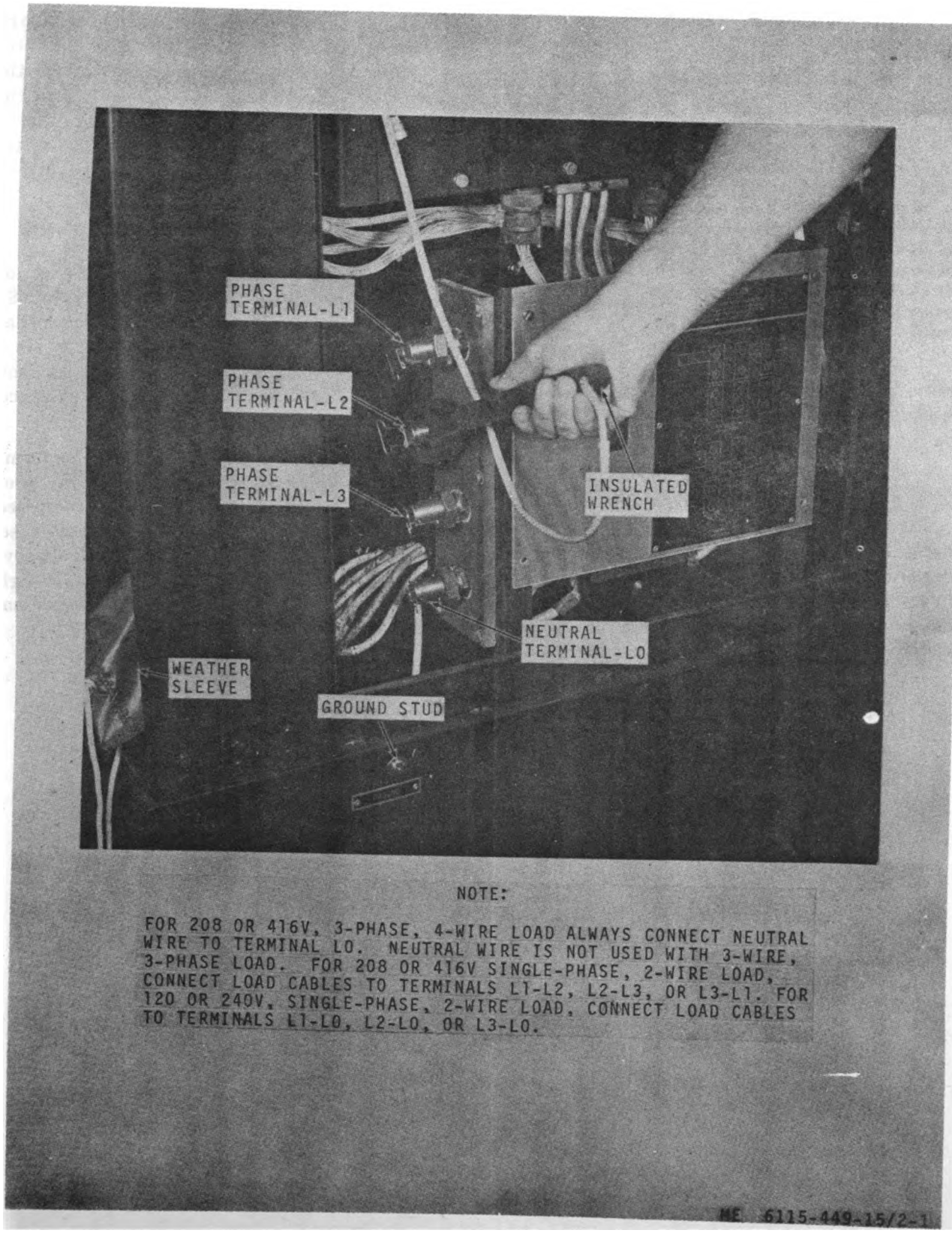


Figure 2-1. Load terminal connection instructions.

e. Load Connections.

(1) The generator set has four load terminals. The four load terminals will accommodate 2-wire, 3-wire, and 4-wire connection arrangements for single-phase and 3-phase loads.

Note. The load terminals will accommodate 2-wire, single-phase, and 4-wire, 3-phase loads. One or more single-phase loads can be served alone or in combination with 3-phase loads, but the current on any one phase must not exceed rated current and the difference between the phase currents must not exceed 25 per cent of rated current. With 25 per cent load unbalance, the phase voltage unbalance will be less than 5 per cent of rated voltage.

(2) Before making load connections, determine the phase and voltage requirements of the load and perform voltage conversion as instructed in paragraph 2-5 as necessary.

(3) Connect load cables to the load terminals as shown in figure 2-1.

Warning: **Do not attempt to make or break load connections while the generator set is operating or when it is connected to an energized line. The voltage produced by this generator set can cause severe electrical shock or death by electrocution.**

f. Auxiliary Fuel Lines. If an auxiliary fuel source is to be used, be sure the auxiliary fuel source is not more than 12 feet below the fuel pumps. Connect one end of the auxiliary fuel line to the external fuel source and the other end to the auxiliary fuel connection (fig. 1-1) of the generator set. Turn the fuel selector valve to the auxiliary position.

2-5. Equipment Conversion

The generator set has a voltage reconnection panel which permits the selection of 120/208 volts, 4-wire or 240/416 volts, 4-wire. When a change in the voltage output of the generator set is required, perform voltage conversion as shown on figure 2-2 and instructions on voltage reconnection nameplate.

Warning: **Do not attempt to perform voltage conversion while the generator set is operating or when it is connected to an energized line. The voltage produced by the generator set can cause severe electrical shock or death by electrocution. Make sure that each nut is tight before operating the generator set or damage to the reconnection panel may result.**

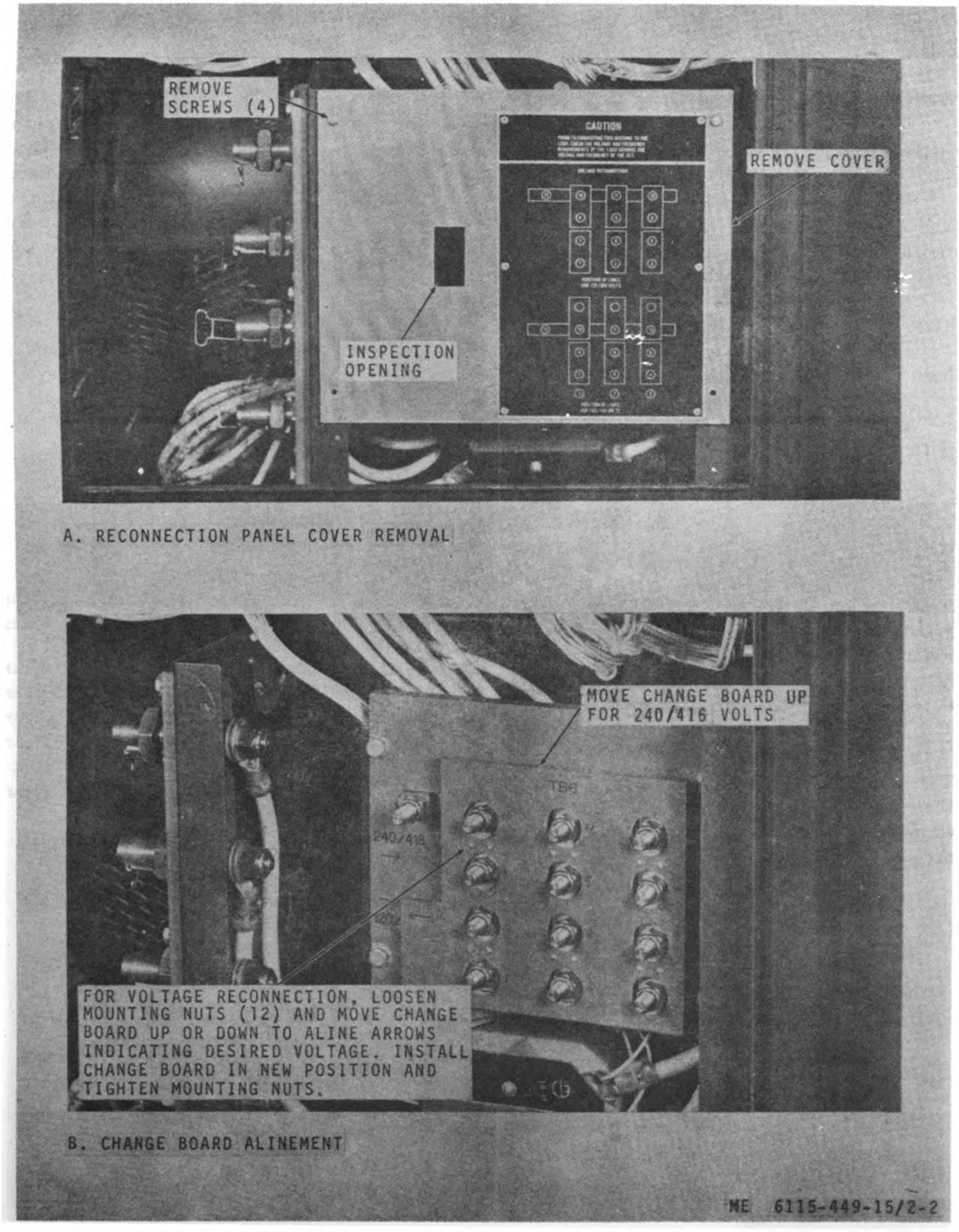


Figure 2-2. Reconnection panel instructions.

Section II. MOVEMENT TO NEW WORKSITE

2-6. Dismantling for Movement

a. Preparation for Movement.

(1) Stop the generator set (para 2-12) and make certain it is not connected to an energized line.

(2) Disconnect the load cables, ground lead, and all other electrical cables or leads that may be connected to the generator set.

(3) Remove the exhaust extension if used.

(4) Drain the fuel tank (fig. 3-6) if necessary.

(5) Disconnect and store the auxiliary fuel hose if used.

(6) Refer to the basic issue items list (app. B) to make sure all required items are on or with the generator set.

(7) Close all doors on the generator set.

b. Movement. The generator set may be towed for short distances, where the terrain permits, by attaching a suitable chain or cable to the towing openings on the skid frame. If the generator set is to be moved any significant distance, or over rough terrain, it should be loaded onto a carrier by a forklift. For shipment to a new work site refer to paragraph 4-6.

2-7. Reinstallation After Movement

Refer to paragraph 2-4 for installation instructions.

Section III. CONTROLS AND INSTRUMENTS

2-8. General

This section describes, locates, illustrates, and furnishes the operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for proper operation of the generator set.

2-9. Controls and Instruments

The purpose of controls and instruments and their normal and maximum reading are illustrated in the figures. These controls and instruments are:

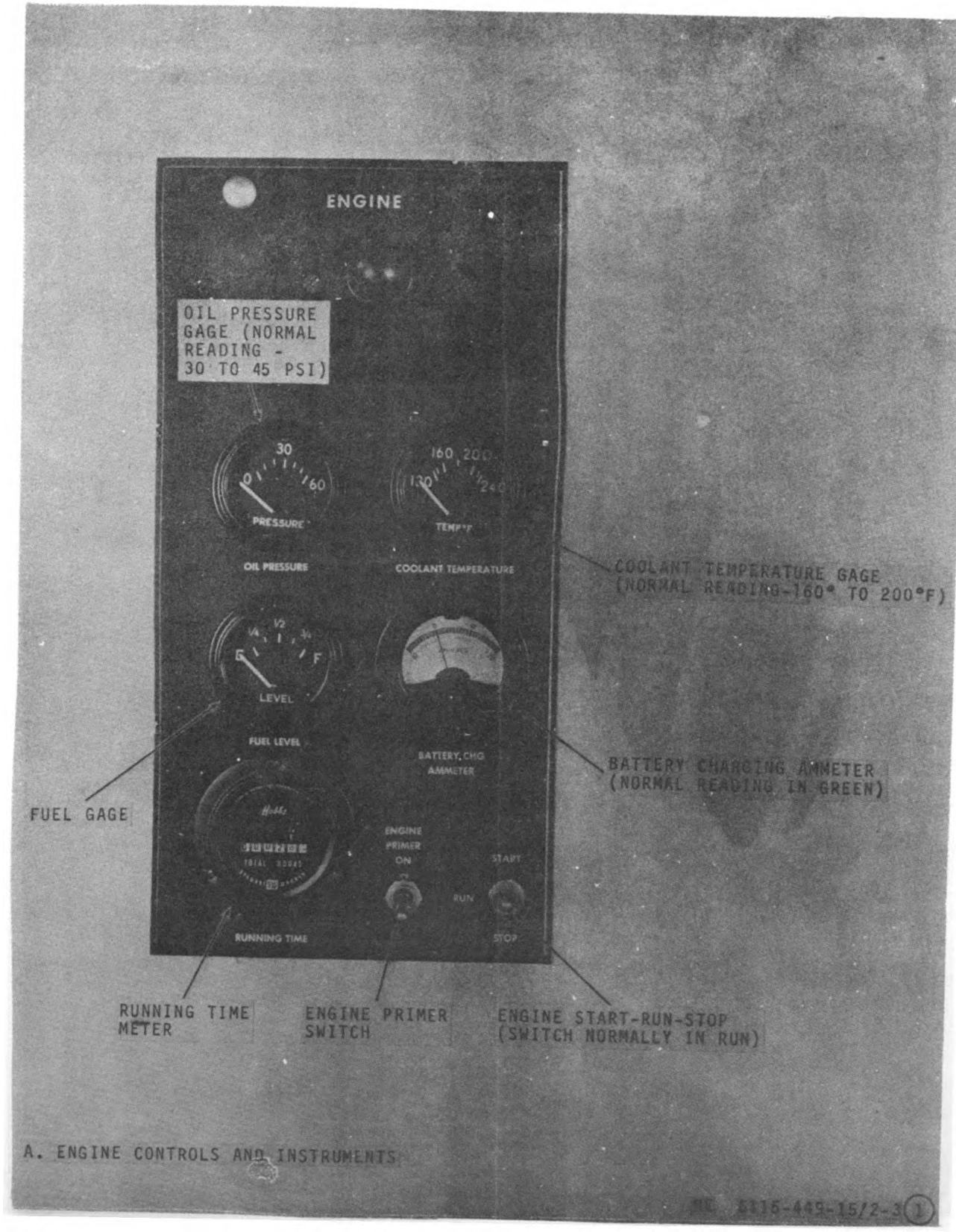


Figure 2-3. Controls and instruments (Sheet 1 of 4).

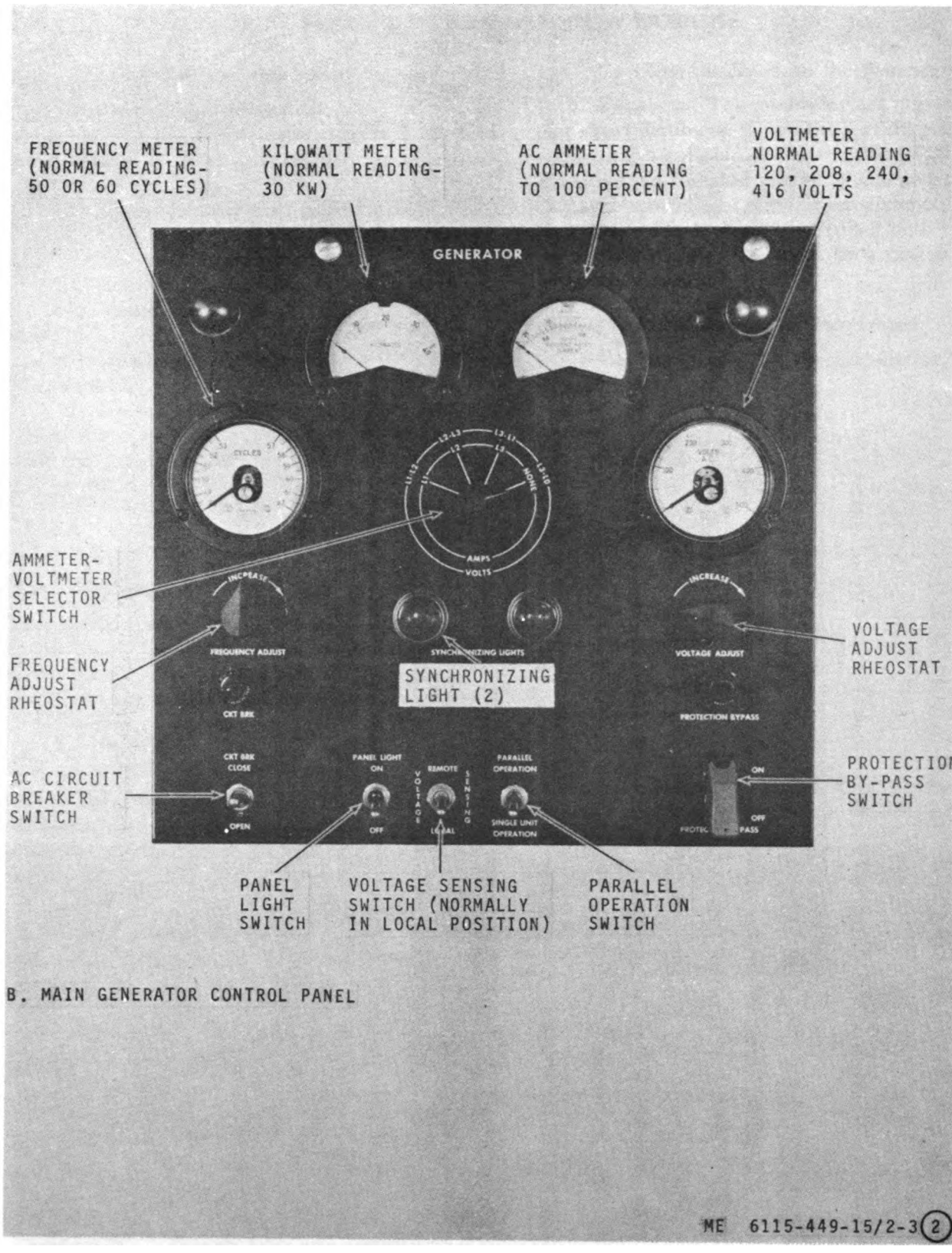


Figure 2-3. Controls and instruments (Sheet 2 of 4).

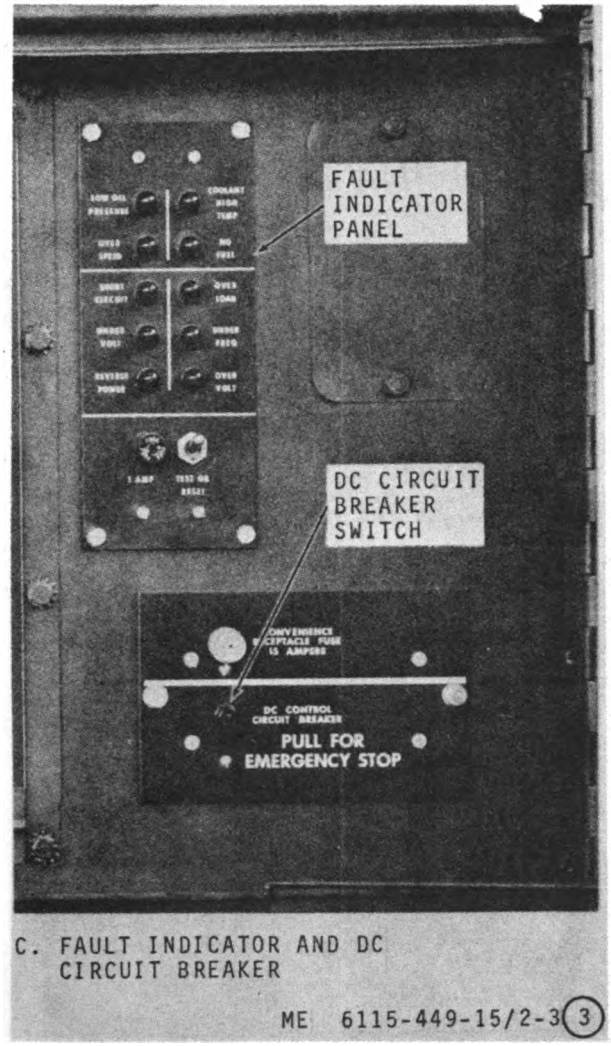
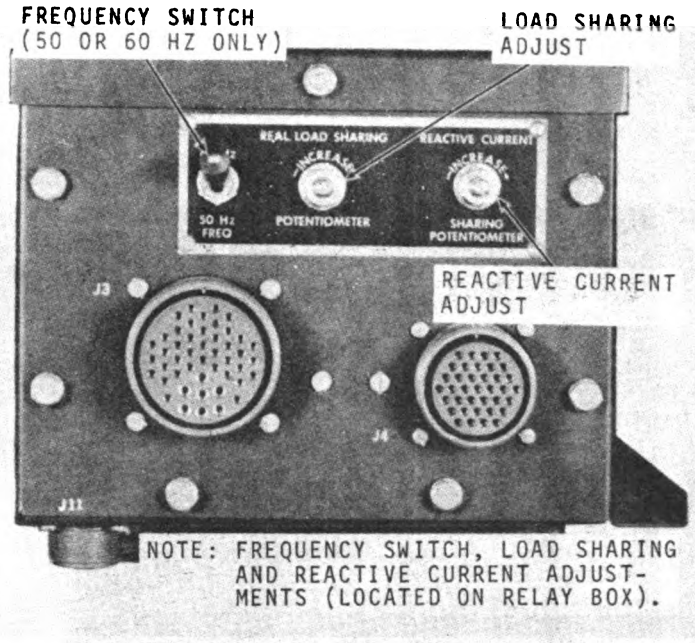
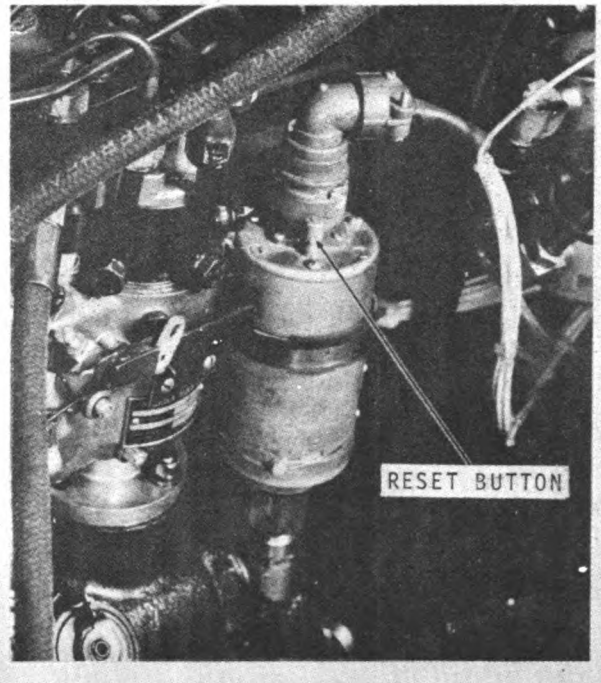


Figure 2-3. Controls and instruments (Sheet 3 of 4).



D. RELAY BOX CONTROLS



E. SPEED SWITCH RESET BUTTON

ME 6115-449-15/2-3 (4)

Figure 2-3. Controls and instruments (Sheet 4 of 4).

Section IV. OPERATION OF EQUIPMENT

2-10. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the generator set.

b. The operator must know how to perform every operation of which the generator set is capable. This section gives instructions on starting, stopping, single and parallel operation of the generator set. Since every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

2-11. Starting

a. Preparation for Starting.

(1) Open the control panel doors and air inlet doors (fig. 1-1).

(2) Perform the daily preventive maintenance services (para 3-6).

(3) Make the necessary load connections to the generator set (fig. 2-1).

b. Normal Starting. Refer to figure 2-4 and figure 2-11 and start the unit.

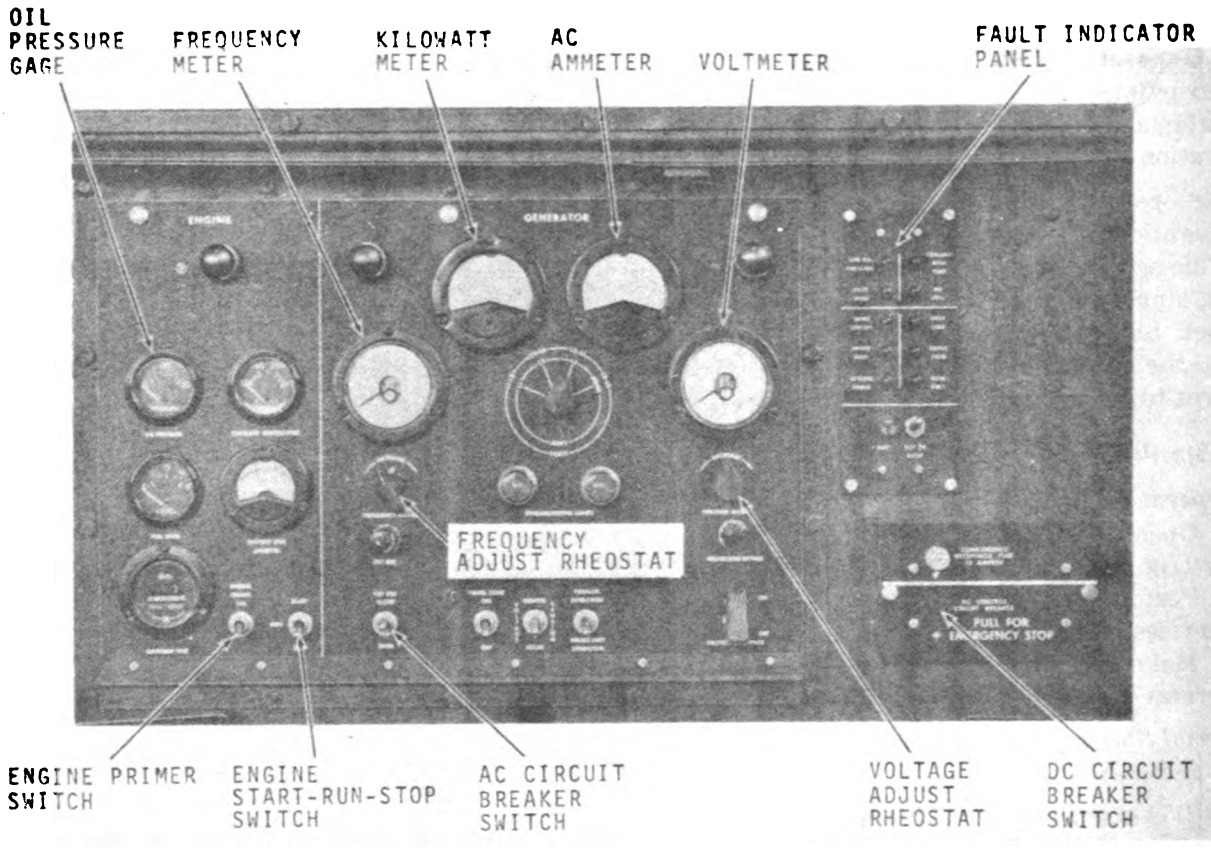
c. Cold Weather Starting. For temperatures below —25°F, refer to the winterization equipment (fig. 2-10) and engine priming instructions (fig. 2-11).

2-12. Stopping

a. Normal Stopping. Refer to figure 2-5 and stop the generator set.

b. Stopping by Safety Devices. The generator set is equipped with safety devices that will automatically stop the engine in case of high coolant temperature, low oil pressure, engine overspeed, overvoltage, or no fuel. When one of these abnormal conditions occurs, an electrical circuit is broken by the applicable safety device causing the engine to shut down. Short circuit, overload, under volt and reverse power protective relays will automatically open the AC power contactor but will not stop the engine.

Note. If an emergency situation requires continued operation of the generator set, the protection by-pass switch (fig. 2-3) can be used to over-ride all safety devices except the over-speed and short circuit. Hold engine switch in START position and start engine. Then lift cover and push protection by-pass switch to ON position. Release engine switch from START position. Push the protection by-pass switch to OFF position as soon as possible after the emergency has passed.



STEP 1. PUSH DC CIRCUIT BREAKER SWITCH TO CLOSED POSITION.

STEP 2. PLACE ENGINE START-RUN-STOP SWITCH IN RUN POSITION.

STEP 3. PRESS FAULT INDICATOR TEST SWITCH ON FAULT INDICATOR PANEL - ALL LIGHTS SHOULD GLOW.

STEP 4. PLACE FREQUENCY SELECTOR SWITCH (LOCATED ON RELAY BOX) IN DESIRED OPERATING FREQUENCY (50 OR 60 CYCLES).

STEP 5. PLACE ENGINE START-RUN-STOP SWITCH IN START POSITION AND HOLD IN START POSITION UNTIL ENGINE BUILDS UP SPEED. ENGINE OIL PRESSURE MUST NOT BE LESS THAN 20 PSI AND VOLTAGE AND FREQUENCY MUST BE NORMAL BEFORE RELEASING ENGINE SWITCH.

MODERATE COLD WEATHER (+20° TO -20°F)

1. TO START ENGINE, PUSH ENGINE START-RUN-STOP SWITCH TO START POSITION AND ALTERNATELY CLOSE AND OPEN ENGINE PRIMER SWITCH. IT MAY BE NECESSARY TO CONTINUE ENGINE PRIMING UNTIL ENGINE MAINTAINS OPERATING FREQUENCY.

   CAUTION: NEVER DISCHARGE ETHER INTO HOT ENGINE.

2. FROM THIS POINT, FOLLOW NORMAL STARTING INSTRUCTIONS.

NOTE: FOR DIAL DETAILS, REFER TO FIGURE 2-3.

CONTROL PANEL

ME 6115-449-15/2-4 (1)

Figure 2-4. Starting instructions (Sheet 1 of 2).

OPERATING INSTRUCTIONS

I PRESTART CHECKS
- A CHECK LUBRICATING OIL LEVEL
- B CHECK ENGINE COOLANT LEVEL
- C CHECK FUEL LEVEL BY PLACING "START-RUN" SWITCH IN "RUN" POSITION AND THE PROTECTION BYPASS SWITCH IN THE "ON" POSITION.
- D RETURN BOTH SWITCHES TO THE "OFF" POSITION.
- E CHECK VOLTAGE AND FREQUENCY REQUIREMENTS OF THE LOAD AGAINST THE VOLTAGE AND FREQUENCY CONNECTION OF THE SET.
- F MAKE SURE THE SHUTTERS ON THE RADIATOR END OF THE SET ARE NOT MANUALLY LOCKED OPEN.
- G CLOSE ALL DOORS EXCEPT THOSE ON CONTROL PANEL END OF SET.
- H FASTEN THE DOORS BELOW THE CONTROL PANEL IN THE OPEN POSITION.

II STARTING WHEN AMBIENT AIR TEMPERATURE IS ABOVE MINUS 25°F.
- A CRANK THE ENGINE BY PLACING THE STOP-RUN-START SWITCH IN THE "START" POSITION. DO NOT CRANK MORE THAN 15 SECONDS AT A TIME. ALLOW AT LEAST 15 SECONDS BETWEEN CRANKINGS.
- B WHEN THE TEMPERATURE IS BELOW PLUS 40°F, THE ENGINE ETHER PRIMER MAY BE REQUIRED. TO USE THE ETHER PRIMER PUSH THE PRIMER SWITCH TO THE "ON" POSITION WHILE CRANKING THE ENGINE. EACH TIME THE SWITCH IS ACTUATED TO THE "ON" POSITION ONE METERED SHOT OF ETHER WILL BE INJECTED INTO THE ENGINE AIR INTAKE SYSTEM.
- C AFTER THE ENGINE STARTS CONTINUE TO HOLD THE STOP-RUN-START SWITCH IN THE "START" POSITION UNTIL THE LUBE OIL PRESSURE IS ABOVE 20 PSI AND THE MAIN GENERATOR VOLTAGE IS NORMAL.
- D ADJUST THE FREQUENCY AND VOLTAGE TO THE DESIRED VALUES.
- E PRIOR TO CLOSING THE CIRCUIT BREAKER RESET THE FAULT INDICATOR LIGHTS. IF NONE OF THE LIGHTS COME BACK ON AFTER BEING RESET, PROCEED WITH THE NEXT STEP. IF A LIGHT DOES COME ON, CORRECT THE INDICATED FAULT BEFORE PROCEEDING.
- F CLOSE THE MAIN CIRCUIT BREAKER BY MOMENTARILY PLACING THE CIRCUIT BREAKER SWITCH IN THE "CLOSE" POSITION.
- G THE BREAKER CAN BE OPENED BY MOMENTARILY PLACING THE BREAKER SWITCH IN THE "OPEN" POSITION.

III STOPPING
- A OPEN THE CIRCUIT BREAKER BY MOMENTARILY PLACING THE CIRCUIT BREAKER SWITCH IN THE "OPEN" POSITION.
- B PLACE THE STOP-RUN-START SWITCH IN THE "STOP" POSITION.

IV STARTING WHEN THE AMBIENT AIR TEMPERATURE IS BELOW MINUS 25°F REQUIRES THAT A WINTERIZATION KIT BE INSTALLED ON THE SET. INSTRUCTIONS FOR STARTING THE SET WITH THE WINTERIZATION KIT ARE INCLUDED IN THE WINTERIZATION SYSTEM DIAGRAM.

V TM5-6115 449-15 CONTAINS EXPLANATIONS AND INSTRUCTIONS FOR USE OF THE FOLLOWING CONTROLS AND THEIR ASSOCIATED CIRCUITS:
- A LOCAL-REMOTE VOLTAGE SENSING
- B PROTECTION BYPASS
- C UNIT-PARALLEL SWITCH
- D FAULT INDICATOR SWITCH
- E REMOTE CONTROL

VI IF THE SET DOES NOT START BY FOLLOWING THE ABOVE INSTRUCTIONS, REFER TO THE TROUBLE SHOOTING GUIDE IN TM5-6115 449-15.

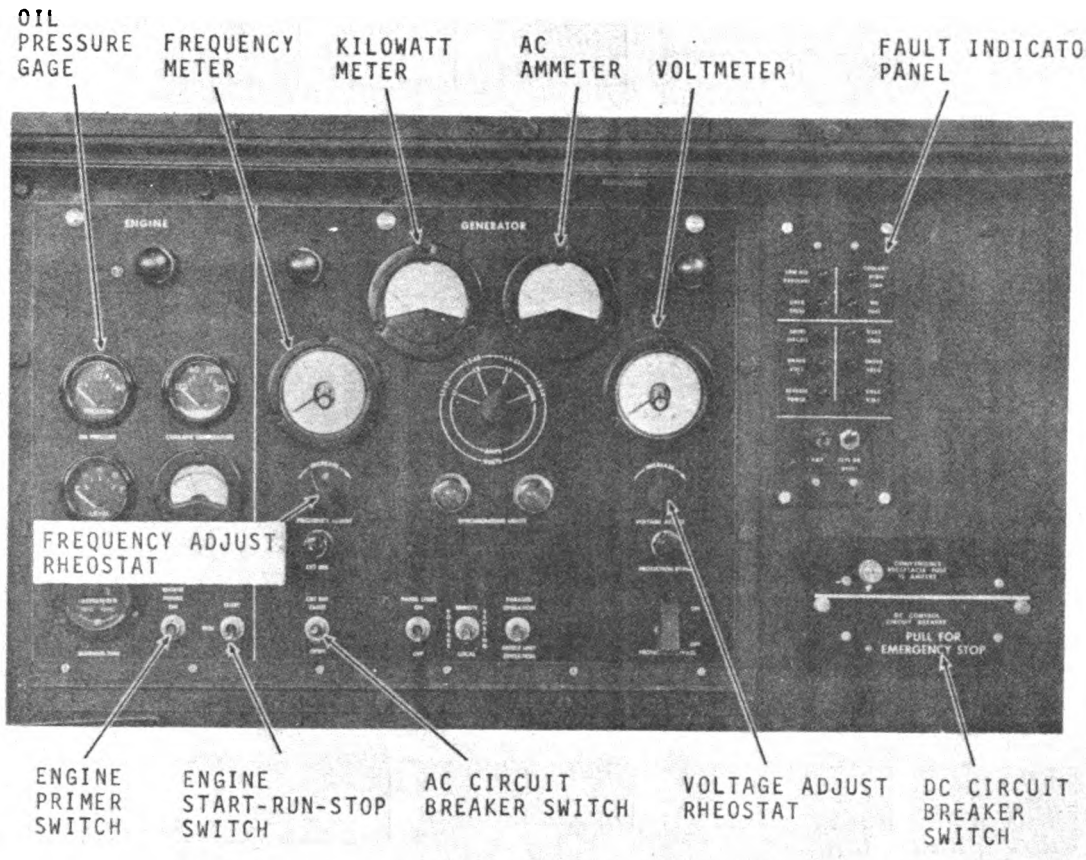
SERVICE INSTRUCTIONS

AMBIENT TEMPERATURE	FUEL, DIESEL	LUBRICATING OIL	HYDRAULIC OIL	ENGINE COOLANT
-65°F TO -25°F	VV-F-800 GRADE DSA	MIL-L-10295	MIL-H-5606	MIL-C-11
-25°F TO 0°F	VV-F-800 GRADE DF-1	MIL-L-10295	MIL-H-3605	MIL-C-11
0°F TO +20°F	VV-F-800 GRADE DF-1	MIL-L-2104 OE-10	MIL-H-5606	MIL-C-11
+20°F TO +125°F	VV-F-800 GRADE DF-2	MIL-L-2104 OE-30	MIL-H-5606	MIL-C-11

SYSTEM CAPACITIES

FUEL SYSTEM		LUBRICATING SYSTEM			COOLING SYSTEM			HYDRAULIC SYSTEM	
EMPTY TANK	USEABLE FUEL	CRANK CASE		FILTERS	RADIATOR	BLOCK	HEATER	SUMP	
		FULL MARK	LOW					FULL MARK	LOW
26 GAL	24 GAL	7 QTS	5 QTS	1.5 QTS	13 QTS	14.5 QTS	2 QTS	4 QTS	3.5 QTS

Figure 2-4. Starting instructions (Sheet 2 of 2).



STEP 1. REMOVE LOAD BY PUSHING AC CIRCUIT BREAKER SWITCH TO OPEN POSITION.

STEP 2. ALLOW ENGINE TO OPERATE FIVE (5) MINUTES AT NO LOAD.

STEP 3. STOP ENGINE BY PLACING ENGINE SWITCH IN STOP POSITION.

STEP 4. AFTER ENGINE HAS STOPPED, PULL DC CIRCUIT BREAKER SWITCH TO OPEN POSITION.

NOTE: FOR DIAL DETAILS, REFER TO FIGURE 2-3.

ME 6115-449-15/2-5

Figure 2-5. Stopping instructions.

2-13. Operation Under Usual Conditions

a. General. The generator set can be operated as a single unit or in parallel with other generator sets of the same model.

Warning: **Do not operate the generator set unless the ground terminal has been connected to a suitable ground (para 2-4*d*). Electrical faults in the generator set, load lines, or load equipment can cause injury or electrocutions from contact with an ungrounded system.**

b. Single-Unit Operation.

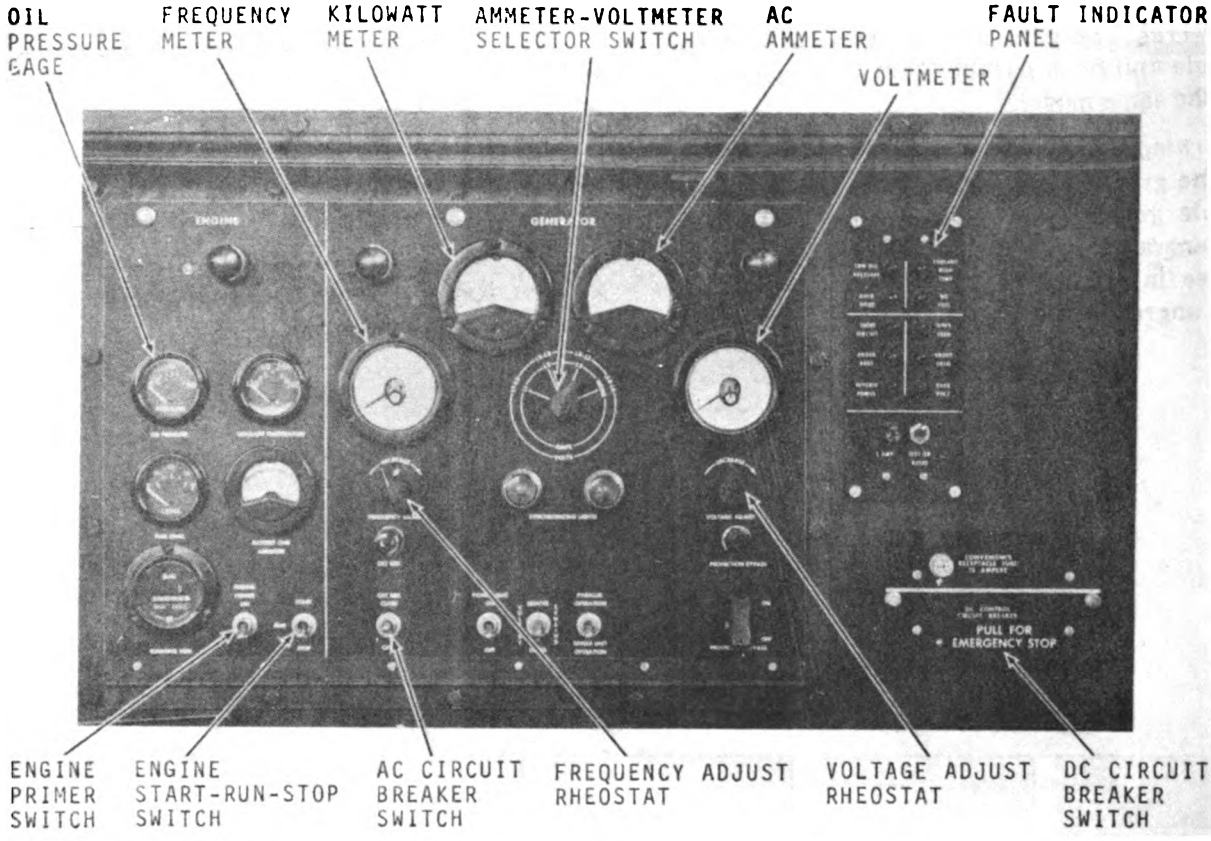
(1) Determine the load voltage requirements and position the voltage reconnection board for the required voltage (para 2-5).

(2) Attach the load cables (para 2-4*e*).

(3) Set the 50/60 cycle frequency switch (fig. 2-3) for the desired frequency.

(4) Start the engine (para 2-11).

(5) Refer to figure 2-6 and operate the generator set as a single unit.



STEP 1. START AND RUN THE GENERATOR SET.

STEP 2. ADJUST THE VOLTAGE ADJUST RHEOSTAT FOR THE DESIRED VOLTMETER READING.

STEP 3. ADJUST THE FREQUENCY ADJUST RHEOSTAT FOR THE DESIRED FREQUENCY METER READING.

CAUTION. DO NOT CLOSE THE AC CIRCUIT BREAKER SWITCH UNTIL IT HAS BEEN DETERMINED THAT THE LOAD IS EQUAL TO OR UNDER THE RATED CAPACITY OF THE GENERATOR SET.

STEP 4. APPLY LOAD TO UNIT BY SETTING AC CIRCUIT BREAKER IN THE CLOSE POSITION.

STEP 5. OBSERVE VOLTMETER. READJUST THE VOLTAGE ADJUST RHEOSTAT TO THE DESIRED OPERATING VOLTAGE.

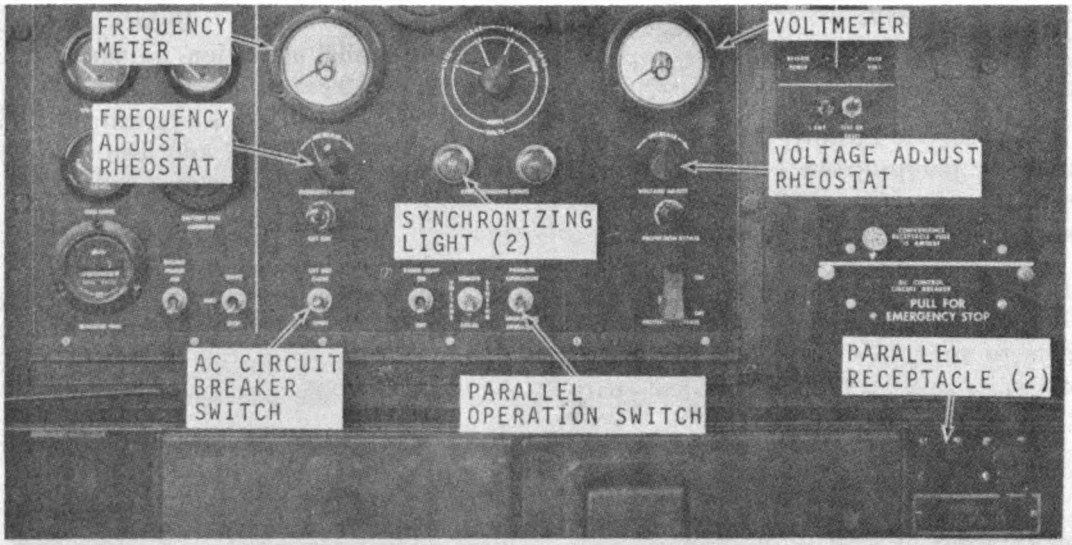
STEP 6. PLACE AMMETER-VOLTMETER SELECTOR SWITCH SEQUENTIALLY IN EACH PHASE POSITION WHILE OBSERVING AC AMMETER. IF MORE THAN RATED LOAD IS INDICATED FOR ANY PHASE POSITION, REDUCE LOAD OR REPORT THE CONDITION TO ORGANIZATIONAL MAINTENANCE.

STEP 7. OBSERVE KILOWATT METER READING. IF MORE THAN RATED KW IS INDICATED, REDUCE LOAD OR REPORT THE CONDITION TO ORGANIZATIONAL MAINTENANCE.

NOTE: FOR DIAL DETAILS, REFER TO FIGURE 2-3.

ME 6115-449-15/2-6

Figure 2-6. Single unit operating instructions.



STEP 1. PLACE OPERATING SET IN SINGLE-UNIT OPERATION (FIGURE 2-6).

STEP 2. START INCOMING SET.

CAUTION. DO NOT CLOSE THE CIRCUIT ON THE INCOMING SET AT THIS TIME.

STEP 3. PLACE PARALLEL OPERATION SWITCH OF EACH SET IN THE PARALLEL POSITION.

NOTE. SYNCHRONIZING LIGHTS OF THE INCOMING SET SHOULD LIGHT. SYNCHRONIZING LIGHTS ON OPERATING SET SHOULD REMAIN OFF.

STEP 4. OBSERVE VOLTMETER AND FREQUENCY METER OF EACH SET FOR PROPER READINGS.

STEP 5. OBSERVE SYNCHRONIZING LIGHTS OF INCOMING SET. LIGHTS SHOULD GO ON AND OFF SIMULTANEOUSLY. IF LIGHTS GO ON AND OFF ALTERNATELY, SETS ARE OUT OF PHASE. STOP BOTH SETS AND REVERSE ANY TWO INTERCONNECTING JUMPER CABLE LEADS AT TERMINALS L1, L2, OR L3 OF THE INCOMING SET. DO NOT INTERCHANGE THE LEAD AT THE L0 TERMINAL. REPEAT STEPS 1 THROUGH 4.

STEP 6. ADJUST FREQUENCY ADJUST RHEOSTAT OF THE INCOMING SET UNTIL SYNCHRONIZING LIGHTS GO ON AND OFF SLOWLY AT 2- TO 3-SECOND INTERVALS.

STEP 7. CAREFULLY OBSERVE FLUCTUATING SYNCHRONIZING LIGHTS AND AT THE INSTANT BOTH LIGHTS OF THE INCOMING SET ARE DARK, CLOSE THE CIRCUIT BREAKER OF THE INCOMING SET. THE GENERATOR SETS ARE NOW OPERATING IN PARALLEL.

CAUTION. DO NOT CLOSE THE CONTACTOR OF THE INCOMING SET WHILE THE SYNCHRONIZING LIGHTS ARE ON. DAMAGE TO ONE OR BOTH SETS MAY RESULT.

NOTE: WITH NO EXTERNAL LOAD ON THE PARALLEL SETS, DIVIDE KW BETWEEN SETS USING THE FREQUENCY ADJUST RHEOSTATS AND DIVIDE CURRENT (AMPS) BETWEEN THE SETS USING THE VOLTAGE ADJUST RHEOSTATS. WITH EXTERNAL LOAD APPLIED TO THE PARALLELED SETS, DIVIDE KW BY USING THE LOAD SHARING ADJUST RHEOSTATS AND DIVIDE CURRENT (AMPS) BETWEEN SETS USING THE REACTIVE CURRENT ADJUST RHEOSTATS.

FOR DIAL DETAILS, REFER TO FIGURE 2-3.

ME 6115-449-15/2-7

Figure 2-7. Generator set parallel operation.

c. Parallel Operation.

Note. Generator sets to be operated in parallel must have the same voltage and frequency rating.

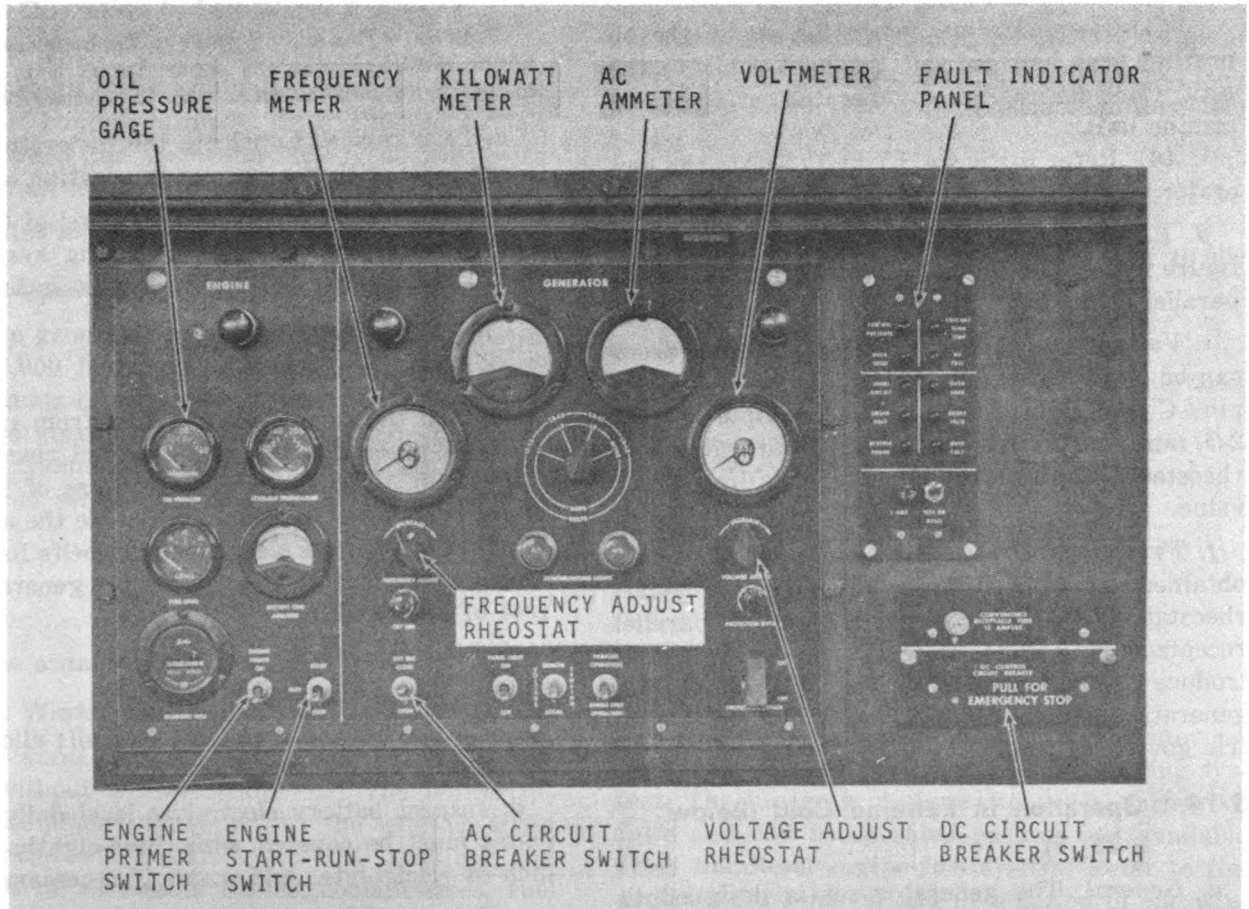
(1) Connect the parallel cable (fig. 1-1) between units by plugging the cable into the parallel receptacles (fig. 2-7) of both units (either receptacle may be used).

(2) Connect a suitable copper wire (No. 6 AWG) between the ground terminals of both generator sets to provide a common ground. Check that both units are properly grounded (para 2-4*d*).

Warning: **Before making connections for parallel operation, be sure the generator sets are not operating and that all switches are in the OFF position. Electrical faults in the generator set, load lines, and load equipment can cause injury or electrocution from contact with an ungrounded system.**

(3) Connect jumper cables between like load terminals of each generator set (L1 to L1, L2 to L2, etc. (para 2-4*e*)).

(4) Position voltage change boards of both units for the selected operating voltage (para 2-5).



CAUTION. BEFORE REMOVING A GENERATOR SET FROM PARALLEL OPERATION, CHECK THAT THE LOAD DOES NOT EXCEED THE FULL RATING OF THE REMAINING SET.

STEP 1. REMOVE LOAD BY PLACING AC CIRCUIT BREAKER SWITCH IN OFF POSITION.

STEP 2. ALLOW ENGINE TO OPERATE FIVE (5) MINUTES AT NO LOAD.

STEP 3. STOP ENGINE BY PLACING ENGINE START-RUN-STOP SWITCH IN STOP POSITION.

WARNING. IF NECESSARY TO MOVE GENERATOR SET, STOP REMAINING SET BEFORE DETACHING LOAD TERMINAL WIRES OR GROUND WIRES.

NOTE: FOR DIAL DETAILS, REFER TO FIGURE 2-3.

ME 6115-449-15/2-8

Figure 2-8. *Removal from parallel operation.*

(5) Designate one generator set as the operating unit and connect the load cable to this unit. Consider the other generator set as the incoming unit.

(6) Refer to figure 2-7 and operate the generator sets in parallel.

d. Removal from Parallel Operation. Refer to figure 2-8 and remove the generator sets from parallel operation.

e. Voltage Droop. A conventional voltage droop can be obtained by connecting a jumper between pins C and D of either parallel receptacle (fig. 2-7) and then using the reactive current adjust rheostat (fig. 2-3) to adjust the desired droop value.

f. Frequency Droop. Frequency droop can be obtained by connecting a 100,000-ohm, 2-watt rheostat between pins A and B of either parallel receptacle (fig. 2-7). It will be necessary to introduce droop when paralleling this set with a generating set not equipped with the same electric governing system.

2-14. Operation in Extreme Cold (Below —25° F)

a. General. The generator set is designed to operate in temperatures down to —25°F without winterization equipment. To operate successfully at temperatures below —25°F the engine must be heated by integrally mounted winterization heating equipment (para 2-20). Allow engine to reach normal operation temperature before applying load.

b. Fuel System. Keep the fuel tank as full as possible to prevent condensation of moisture. Be sure to use the proper grade of fuel for existing temperatures. Refer to figure 2-4 for proper fuel grade selection. Service the fuel filters and strainers more frequently than usual. Remove ice, snow, and moisture from the fuel filler cap and filler neck.

c. Engine Electrical System. Clean the batteries and cables and inspect for cracked or damaged cases. Be sure the battery terminals are tight, clean and lightly greased. Check that the battery cap ventholes are open. The electrolyte level must be three-eighths (3/8) inch above the plates. To prevent the batteries from freezing, keep them fully charged. Inspect all electrical wiring for cracks, breaks, and fraying. Tighten loose connections.

Note. After adding water to the batteries in freezing temperatures, run the engine for at least one hour to thoroughly mix the water with the electrolyte.

d. Lubrication. Lubricate the generator set in accordance with the current lubrication order.

e. Cooling System. Inspect the level of the coolant in the radiator. Inspect cooling system for leaks, paying particular attention to gaskets and hose connections.

2-15. Operation in Extreme Heat

a. Keep the cooling system free from rust and scale. If necessary, add an approved rust inhibitor. Avoid, if at all possible, the use of alkaline water or salt water, which will cause the accumulation of rust and scale. Inspect all belts for proper adjustment (fig. 3-11). Keep the generator set free of dust and dirt.

b. Lubricate the engine in accordance with the current lubrication order (fig. 3-1).

c. Do not fill the fuel tank too full; allow sufficient room for fuel expansion.

d. Inspect battery electrolyte level daily. The plates must be covered with three-eighths (3/8) inch of electrolyte. Add water if necessary.

e. Be sure the generator set is free of airflow restrictions. When operating indoors, make provisions for adequate ventilation and the venting of exhaust fumes to the outside.

2-16. Operation in Dusty or Sandy Areas

a. Where water is available, keep the immediate area wetted down. Keep the generator set as clean as possible, paying special attention to the screens and grilles.

b. Clean filters and strainers more frequently than under normal conditions. Be sure that all lubricant containers are tightly sealed and stored in an area free from dust and sand.

c. Take all necessary precautions to keep dirt and grit out of the fuel tank.

2-17. Operation Under Rainy or Humid Conditions

Keep the fuel tank full to prevent forming of condensation. During dry periods when the set is not operating, open the doors and allow the set to dry out.

2-18. Operation In Salt Water Areas

a. Salt water causes corrosive action on metal. Take care to avoid equipment contact with salt water. If contact is made, or if exposed to salt spray, wash the generator set frequently with clean, fresh water.

b. Paint all damaged prepainted surfaces.

2-19. Operation at High Altitudes

a. The generator set will operate at elevations up to 8,000 feet above sea level without special adjustments or reduction in load. Above this altitude the generator output is reduced. To maintain maximum performance, follow all maintenance and service instructions carefully.

b. The generator set is rated at 30 KW up to 8,000 feet. To calculate specific generator set output above 8,000 feet use the following formula:

$$\frac{5\% \times (\text{actual altitude} - 5{,}000) \times 5{,}000 \text{ ft. rating}}{1{,}000} = \text{derating factor}$$

Example of solution for derating factor at 10,000 feet:

$$\frac{0.05 \times (10{,}000 - 5{,}000) \times 30\text{KW}}{1{,}000} = 7.5 \text{ KW derating factor}$$

30 KW — 7.5KW = 22.5 KW specific output at 10,000 ft. altitude

Section V. OPERATION OF OPTIONAL EQUIPMENT USED IN CONJUNCTION WITH THE GENERATOR SET

2-20. Winterizing Equipment

a. General. Standard generator sets are supplied without winterization kits. The winterization equipment for starting the engine when temperatures are below —25°F is required and consists of an engine heater, coolant lines, fuel line, electrical controls, wiring harness, and mounting hardware installed in the generator set for preheating the engine oil pan and cooling system. The heater is designed to use a variety of fuels and can be operated on any fuel available from the diesel engine fuel system. Refer to figure 10-3 for removal and installation of the winterization kit.

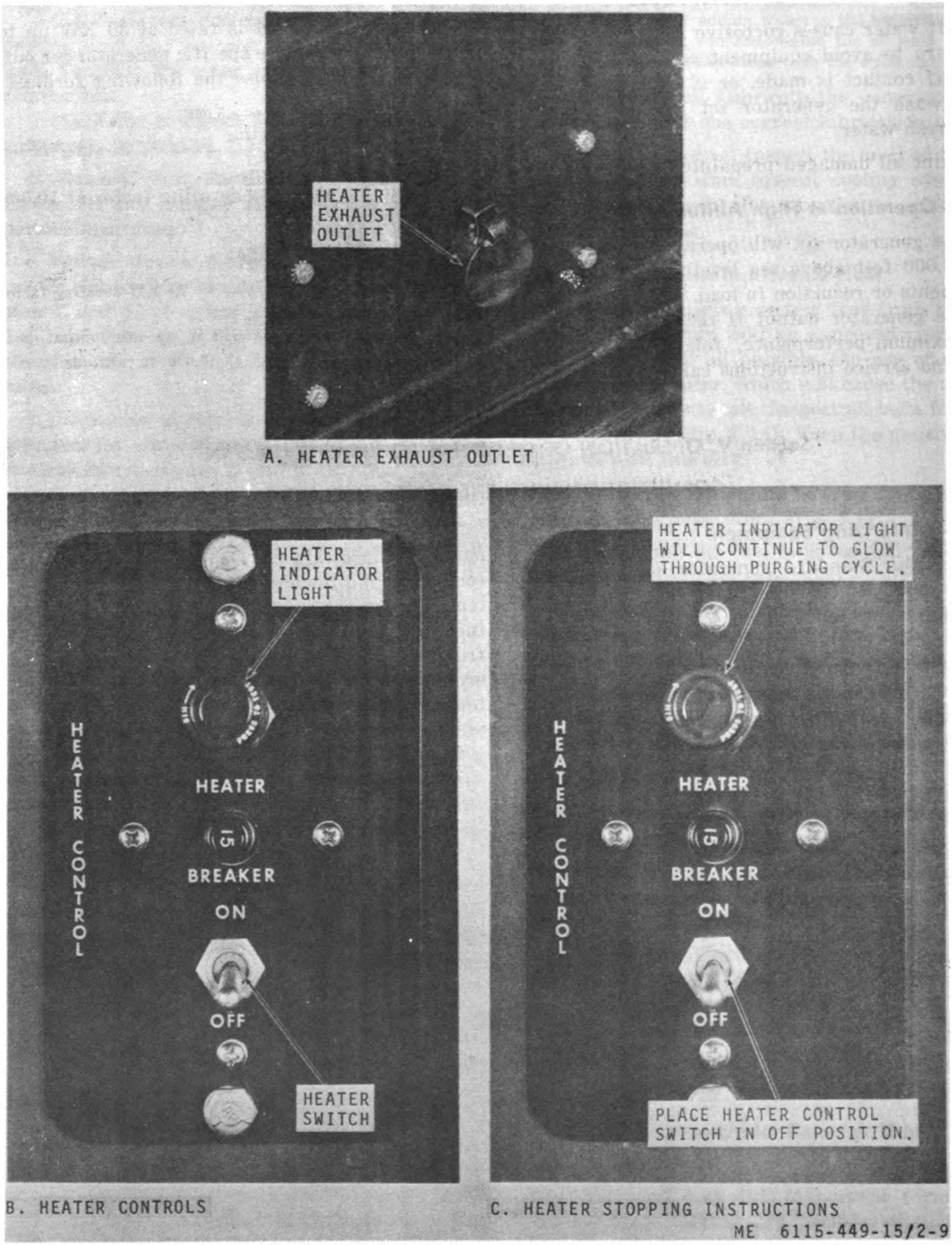


Figure 2-9. Engine heater operating instructions.

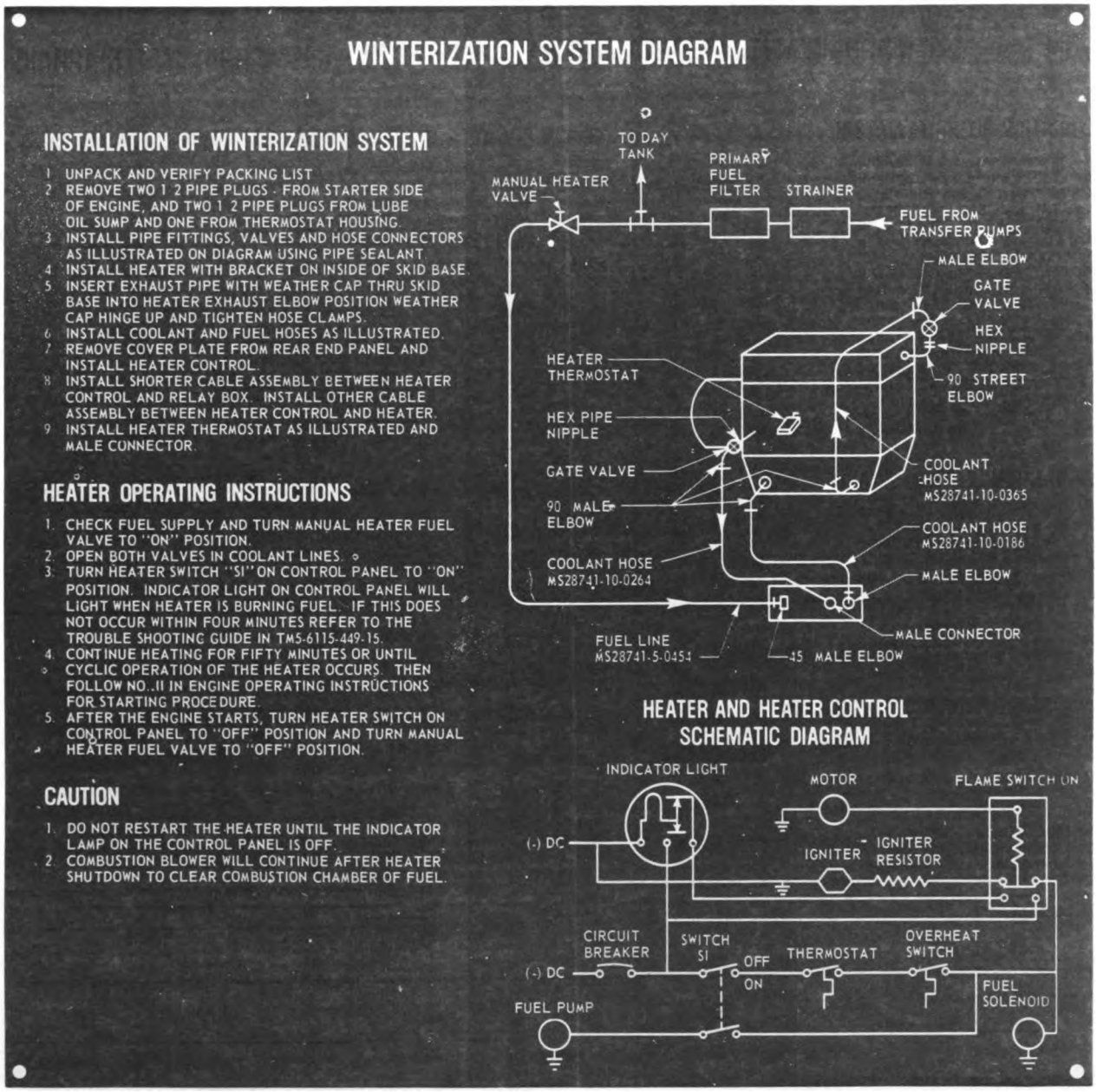
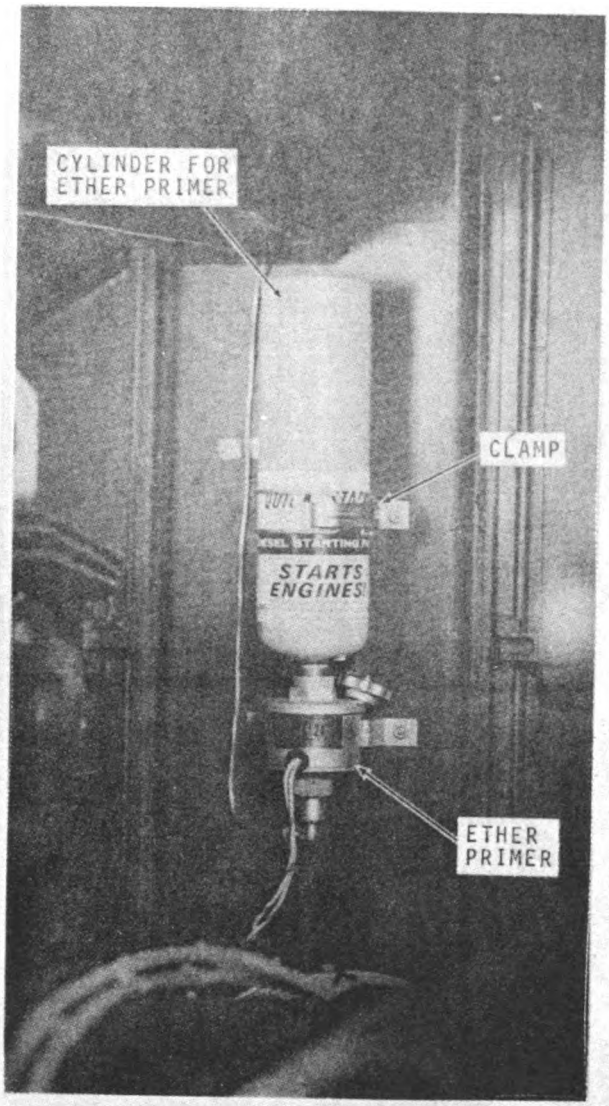
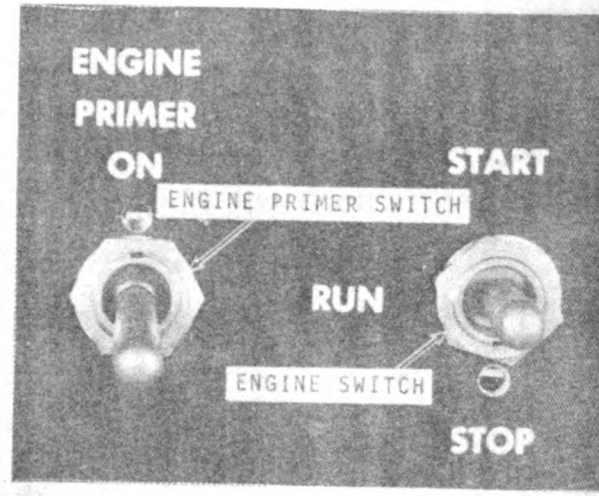


Figure 2-10. Engine heater stopping instructions.



A. ETHER PRIMER ASSEMBLY



B. CONTROLS

STEP 1. REMOVE THE ETHER PRIMER CAP FROM ETHER CYLINDER.

STEP 2. ATTACH THE ETHER CYLINDER TO THE ETHER PRIMER AND SECURE WITH THE CLAMP.

STEP 3. TO START ENGINE, PUSH ENGINE START-RUN-STOP SWITCH TO START POSITION AND ALTERNATELY CLOSE AND OPEN THE ENGINE PRIMER SWITCH. IT MAY BE NECESSARY TO CONTINUE ETHER PRIMING UNTIL ENGINE MAINTAINS OPERATING FREQUENCY.

CAUTION. NEVER DISCHARGE ETHER INTO HOT ENGINE.

ME 6115-449-15/2-11

Figure 2-11. Engine primer operating instructions.

b. Operation.

(1) Refer to figures 2-9 and 2-10 to start and operate the engine heater.

(2) Refer to figures 2-9 and 2-10 to stop the engine heater.

2-21. Remote Control Kit

a. General. If provisions to start the generator set from a remote location are required, a remote control kit is available. Refer to figure 1-1 and table 2-1.

b. Installation. Refer to figure 10-12 for installation and disassembly of remote control box.

2-22. Receptacle Kits

Standard generator sets are supplied with blank receptacle panels. Wiring connections are supplied with each kit. Refer to table 2-1 for optional receptacles and stock numbers.

Table 2-1. Remote Control

Use	Title	ERDL Drawing No.
Hawk	Receptacle box assembly, output AC	13216E3156
Nike Hercules	Receptacle box assembly, output AC	13216E3413
Remote Control Kit	Remote control and panel assembly	13216E3195
Winterization Kit	Winterization Kit	13216E6922

CHAPTER 3

OPERATION AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

No special tools or equipment are required by operator or organizational maintenance personnel for maintenance of the generator set.

3-2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for use with the generator set are listed on the Basic Issue Items List, appendix B of this manual.

Section II. LUBRICATION

3-3. General Lubrication Information

a. This section contains lubrication instructions which are supplemental to, and not specifically covered in the lubrication order.

b. For the current lubrication order, refer to DA Pam 310-4.

3-4. Detailed Lubrication Information

a. General. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Points of Lubrication. Service the lubrication points at proper intervals as illustrated on the lubrication order.

d. OES Oil.

(1) Check crankcase oil level frequently, as oil consumption may increase.

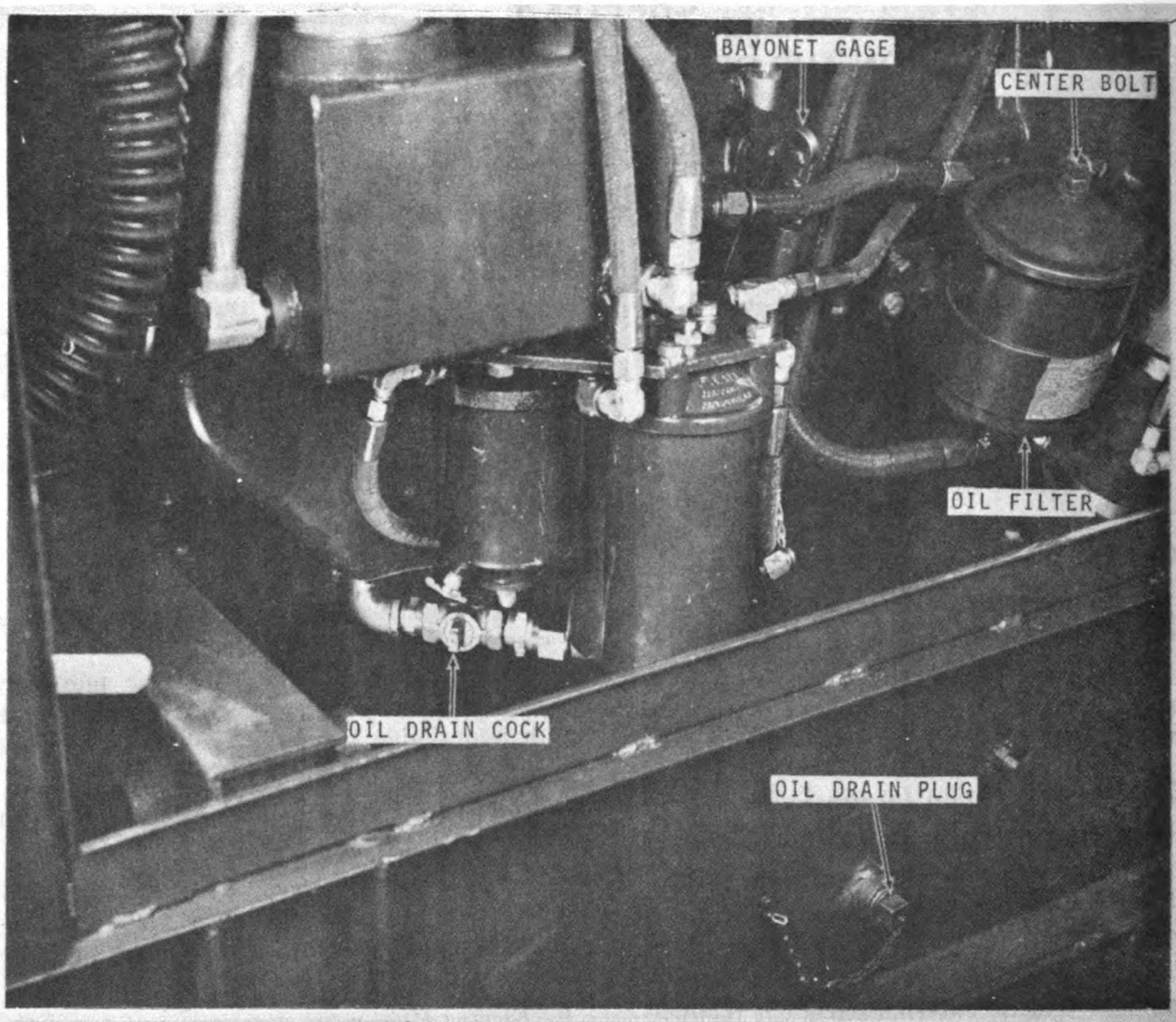
(2) Oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

e. Oil Filter Service. Refer to figure 3-2 and service the oil filter.

f. Air Cleaner Service. Check air restriction indicator daily. If red signal is visible, service and clean the air cleaner as described in figure 3-3.

g. Electro-Hydraulic Actuator Service. Refer to figure 3-3 and inspect actuator. Report any damage or malfunction to direct support maintenance.

Figure 3-1. Lubrication order (Not Used).



STEP 1. POSITION SUITABLE CONTAINER UNDER OIL DRAIN PLUG AND REMOVE PLUG.

STEP 2. DRAIN OIL BY OPENING OIL DRAIN COCK.

STEP 3. LOOSEN CENTER BOLT, REMOVE OIL FILTER COVER AND LIFT OUT FILTER ELEMENT.

STEP 4. CLEAN OIL FILTER COVER AND HOUSING.

STEP 5. INSTALL NEW OIL FILTER ELEMENT AND GASKET.

STEP 6. REPLACE COVER, INSTALL AND TIGHTEN CENTER BOLT.

STEP 7. CLOSE OIL DRAIN COCK.

STEP 8. INSTALL OIL DRAIN PLUG.

STEP 9. FILL WITH APPROVED OIL.

STEP 10. CHECK OIL LEVEL BY CHECKING BAYONET GAGE.

A. SERVICE

ME 6115-449-15/3-2 (1)

Figure 3-2. Oil filter assembly (Sheet 1 of 2).

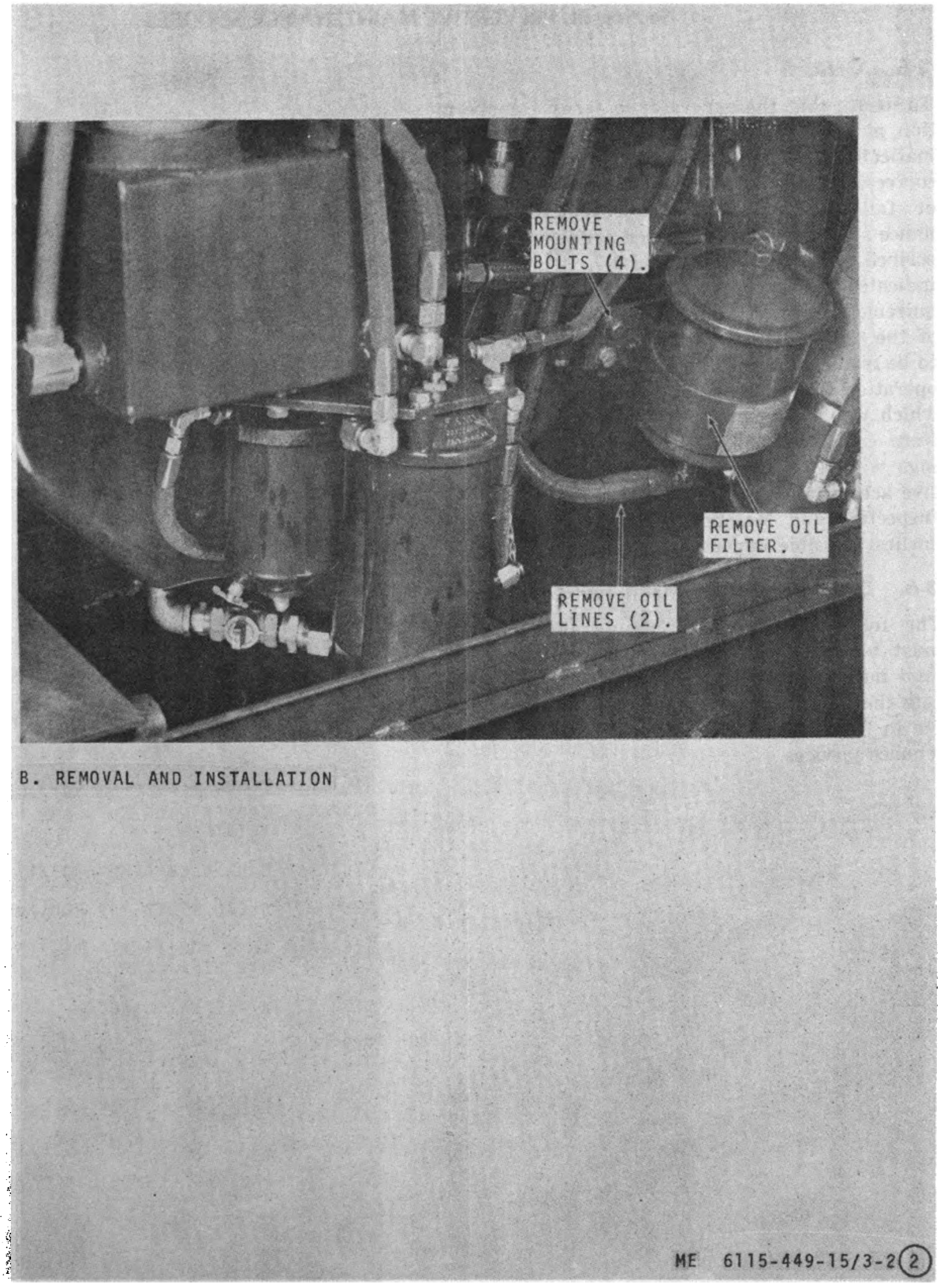


Figure 3-2. Oil filter assembly (Sheet 2 of 2).

3-5. General

To insure that the generator is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-6 and 3-7. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

3-6. Daily Preventive Maintenance Services

The following preventive maintenance services must be performed by the operator daily. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-4 for the daily preventive maintenance services.

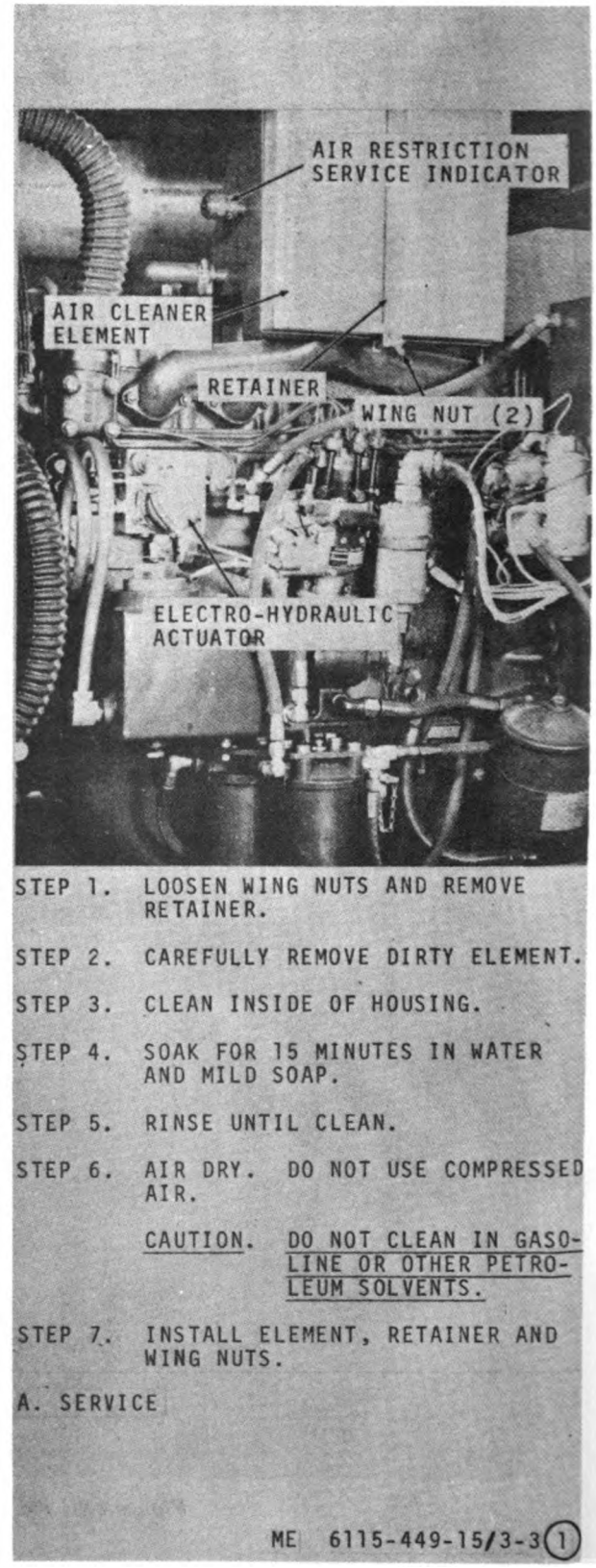
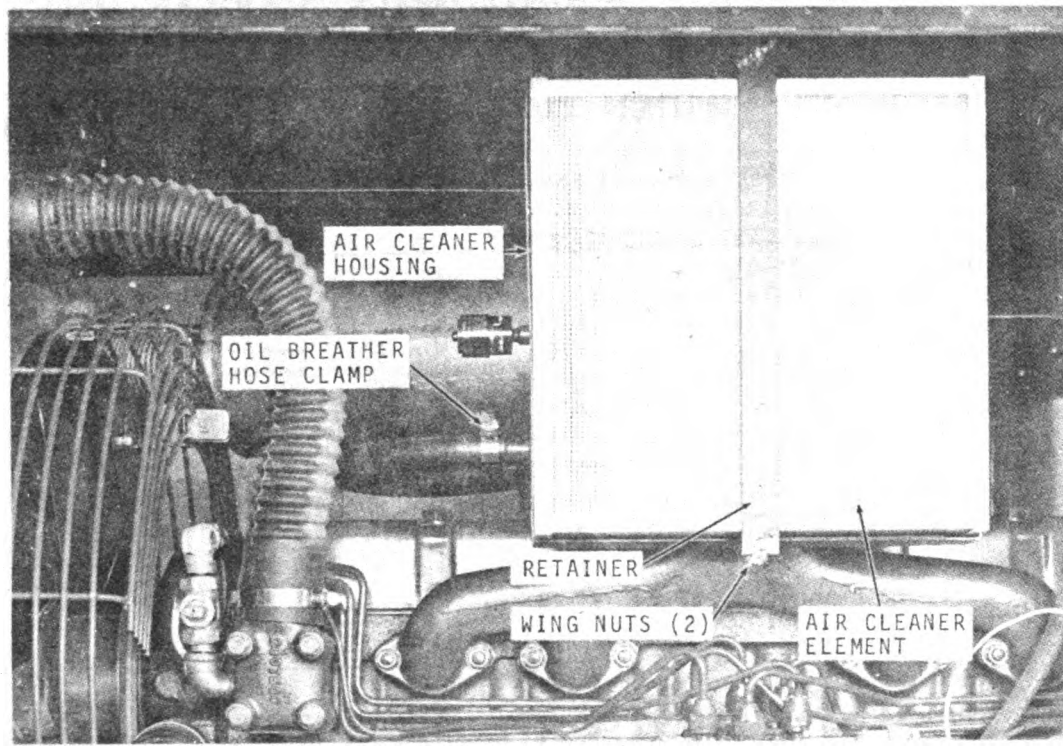


Figure 3-3. Air cleaner assembly (Sheet 1 of 2).



STEP 1. REMOVE WING NUTS AND RETAINER.

STEP 2. REMOVE AIR CLEANER ELEMENT.

STEP 3. LOOSEN OIL BREATHER HOSE CLAMP AND REMOVE HOSE.

STEP 4. REMOVE ETHER PRIMER LINE, LOCATED BEHIND HOUSING.

STEP 5. REMOVE HOUSING MOUNTING BOLTS (2) LOCATED ON THE BASE OF THE HOUSING ABOVE MANIFOLD INTAKE.

STEP 6. REMOVE HOUSING AND GASKET.

STEP 7. INSTALL A NEW GASKET OVER MANIFOLD.

STEP 8. INSTALL HOUSING AND MOUNTING BOLTS (2).

STEP 9. INSTALL ETHER PRIMER LINE.

STEP 10. INSTALL OIL BREATHER HOSE AND TIGHTEN CLAMP.

STEP 11. REFER TO FIGURE 3-3 AND SERVICE AIR CLEANER.

STEP 12. INSTALL ELEMENT RETAINER AND WING NUTS.

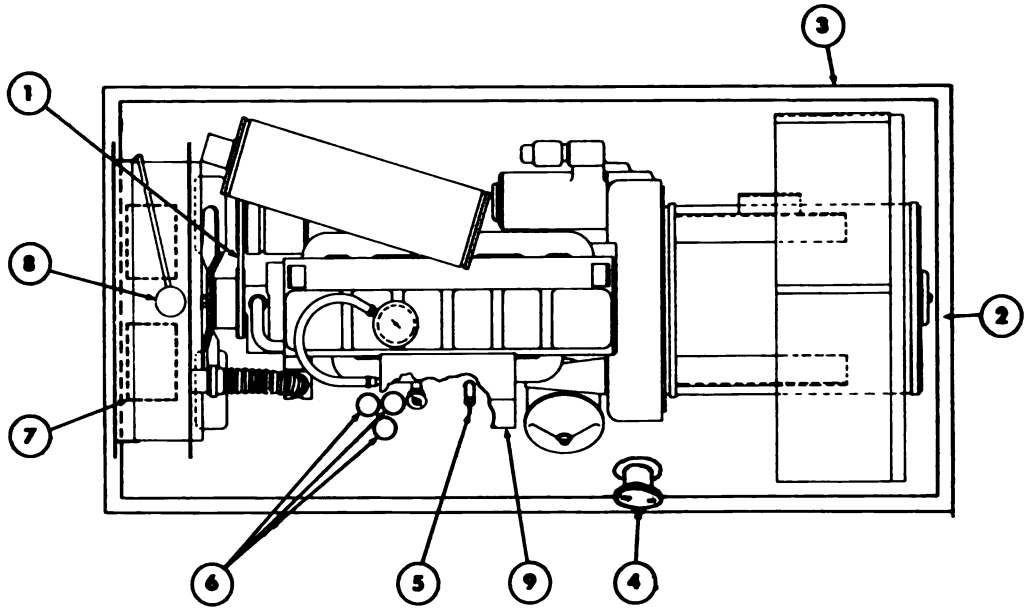
B. REMOVAL AND INSTALLATION

ME 6115-449-15/3-3 (2)

Figure 3-3. Air cleaner assembly (Sheet 2 of 2).

PREVENTIVE MAINTENANCE SERVICES
DAILY

TM5-6115-449-15 **MILITARY STANDARD MODEL** **GENERATOR SET**



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	V-BELTS. Proper adjustment for fan belts is a deflection of 9/32 inch with application of 3 lbs to 5.2 lbs pressure midway between accessory drive pulley and fan pulley. Replace worn, frayed, or cracked belts in matched sets.	3-16 3-18
2	CONTROLS AND INSTRUMENTS. Inspect for damage and loose mounting. With unit operating, check for proper operation. Normal operating readings for instruments are as follows: Battery charging ammeter — Green portion of scale Coolant temperature gage — 160° to 200° F Oil pressure gage — 30 to 55 psi Voltmeter — 120/208, 240/416 volts Ac ammeter — Indicates percentage of applied load current not to exceed 100 percent maximum. Wattmeter — Indicates applied load not to exceed 25/30 kw maximum. Frequency meter — 50/60 cycles Fault indicator panel — All lights out	2-8 2-9
3	GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4 inch diameter hollow or 5/8 inch dia. solid rod 9 feet long. The cable will be No. 6 AWG copper wire bolted or clamped to the rod and attached to the ground terminal of the generator set.	2-4

ME 6115-449-15/3-4 (1)

Figure 3-4. Daily preventive maintenance services (Sheet 1 of 2).

ITEM		PAR REF
4	FUEL TANK. Add fuel as required.	3-9 3-10
5	OIL LEVEL GAGE. (Dipstick) Add oil as indicated by level gage. Reference current L.O.	—
6	FUEL FILTERS. Drain water and sediment from fuel filters.	3-12
7	BATTERIES. Tighten loose cables and mountings. Remove corrosion. Inspect for cracks and leaks. Fill to 3/8 inch above the plates. Clean vent hole in filler cap before installing. In freezing weather, run engine a minimum of 1 hour after adding water. (Weekly)	3-14
8	RADIATOR. Proper coolant level is 2 inches below filler neck.	3-11
9	AIR CLEANER. Check restriction indicator. NOTE 1. OPERATION. During operation, observe for any unusual noise or vibration.	3-15

ME 6115-449-15/3-4 (2)

Figure 3-4. Daily preventive maintenance services (Sheet 2 of 2).

3-7. Quarterly Preventive Maintenance Services

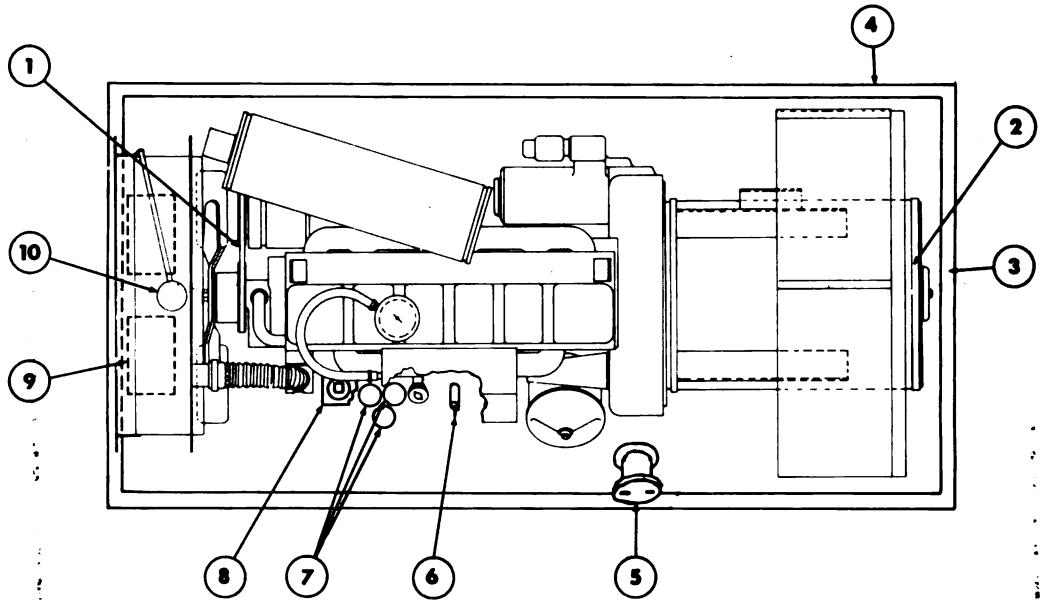
a. This paragraph contains an illustrated tabulating listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quar-

terly interval is equal to three calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-5 for the quarterly preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES
QUARTERLY

TM5-6115-449-15 **MILITARY STANDARD MODEL** **GENERATOR SET**



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	V-BELT. Proper adjustment for fan drive belt is a deflection of 9/32 inch with application of 3 lbs to 5.2 lbs pressure midway between fan pulley and accessory drive pulley. (Weekly)	3-16 3-18
2	GENERATOR BRUSHES. Check for worn or frayed wiring. Lift spring and remove brush from holder. If less than 5/8" long or if surface of brush is chipped or cracked replace with new brush.	3-21
3	CONTROLS AND INSTRUMENTS. Replace damaged instruments. Tighten loose mounting. With the unit operating, check for proper operation. Normal operating readings for instruments are as follows: Battery charging ammeter — Green portion of scale Coolant temperature gage — 160° to 200° F Oil pressure gage — 30 to 55 psi Voltmeter — 120/208, 240/416 volts Ac ammeter — Indicates percentage of applied load current not to exceed 100 percent, maximum. Wattmeter — Indicates applied load not to exceed 25/30 kw maximum. Frequency meter — 50/60 cycles Fault indicator panel — All lights out	2-8 2-9

ME 6115-449-15/3-5 (1)

Figure 3-5. *Quarterly preventive maintenance services*

ITEM		PAR REF
4	GROUND TERMINAL. Check for proper ground. A proper ground will consist of a 3/4-inch-dia. hollow or 5/8-inch-dia. solid rod 9 feet long. The cable will be No. 6 AWG copper wire, bolted or clamped to the rod and attached to the ground terminal of the generator set.	2-4
5	FUEL TANK. Add fuel as required. Tighten loose mounting. Replace defective cap gasket. Clean cap vent. Drain water and sediment.	3-9 3-10
6	OIL LEVEL GAGE. (Dipstick) Add oil as indicated by level gage. Reference current L.O.	—
7	FUEL FILTERS. Drain water and sediment. Replace or clean a damaged or dirty element.	3-12
8	HYDRAULIC TANK. Check fluid level. Add fuel as required. Replace defective tank.	3-10
9	BATTERIES. Tighten loose cables and mountings. Remove corrosion. Fill to 3/8 inch above the plates. Clean venthole in filler cap before installing. In freezing weather, run engine a minimum of 1 hour after adding water. Replace a cracked or leaking battery.	3-14
10	RADIATOR. Proper coolant level is 2 inches below filler neck. Replace cracked or frayed hose. Replace defective radiator. Remove obstructions in the air passages. Tighten all mounting and leaking connections. Correct cap pressure rating is 7 lbs.	3-11
	NOTE 1. OPERATIONAL TEST. During operation, observe for any unusual noise. NOTE 2. ADJUSTMENTS. Make all necessary adjustments during operational test.	

ME 6115-449-15/3-5(2)

Figure 3-5. Quarterly preventive maintenance services

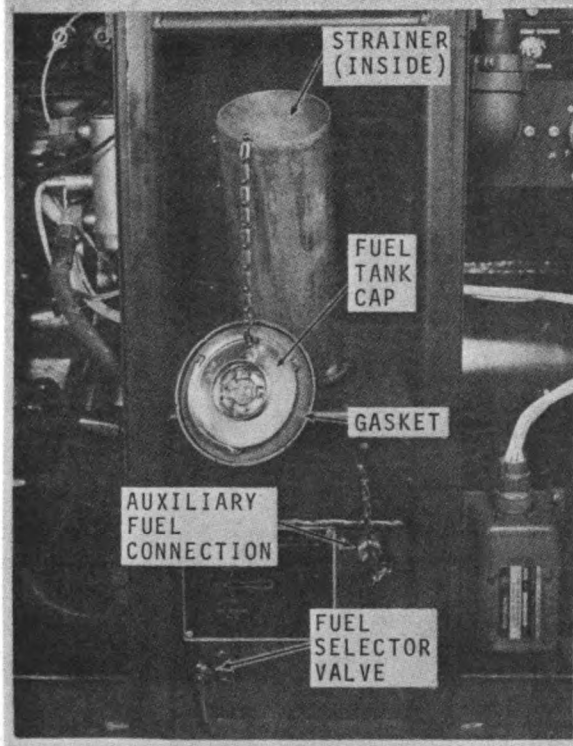
3-8. General

Instructions in this section are published for the information and guidance of the operator to maintain the generator set.

3-9. Fuel Tank Service

Refer to figure 3-6 and service fuel tank.

Warning: **Do not smoke or use an open flame in the vicinity of the generator set during fuel tank service. When filling fuel tank, always provide metal-to-metal contact between container and fuel tank to prevent sparks from static electricity.**



STEP 1. OPEN FUEL DRAIN COCKS AND ALLOW WATER AND SEDIMENT TO COMPLETELY DRAIN OFF. CLOSE DRAIN COCKS WHEN CLEAN DIESEL FUEL RUNS OUT.

STEP 2. REMOVE FUEL TANK CAP AND STRAINER.

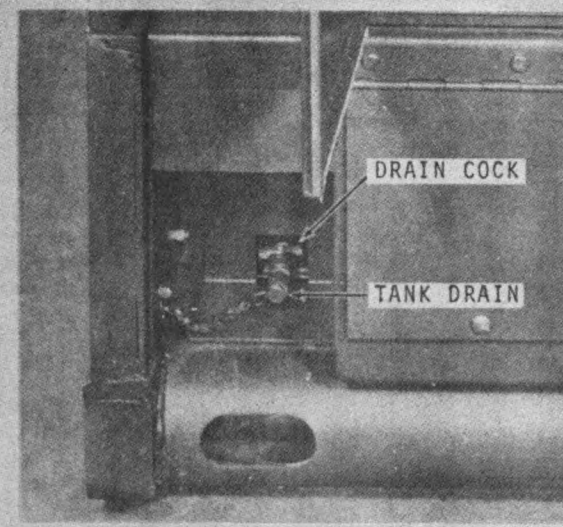
STEP 3. CLEAN AND INSPECT FUEL TANK CAP, GASKET AND STRAINER.

STEP 4. REPLACE ALL DEFECTIVE PARTS.

STEP 5. RE-INSTALL FUEL TANK STRAINER, GASKET AND CAP.

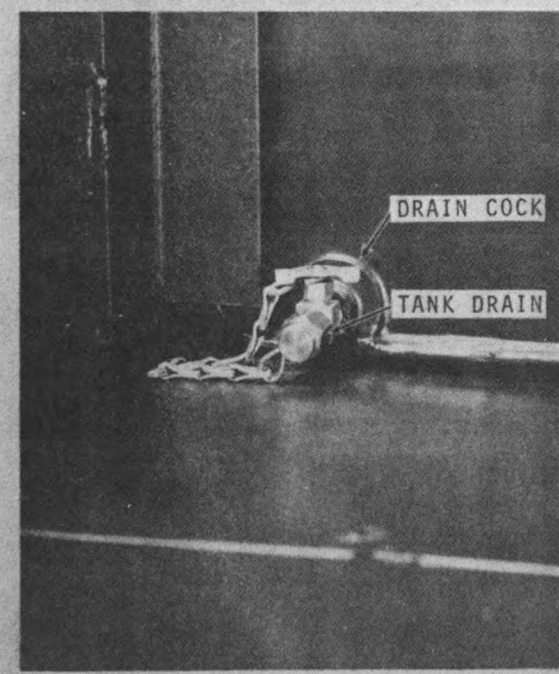
STEP 6. FILL FUEL TANK.

A. FUEL FILLER NECK ASSEMBLY



NOTE. LOCATED LOWER LEFT HAND CORNER BELOW CONVENIENCE RECEPTACLES.

B. REAR FUEL DRAIN



C. FRONT FUEL DRAIN

ME 6115-449-15/3-6

Figure 3-6. Fuel tank service.

3-10. Hydraulic Fluid Tank Service

Refer to figure 3-7 and service hydraulic fluidtank.

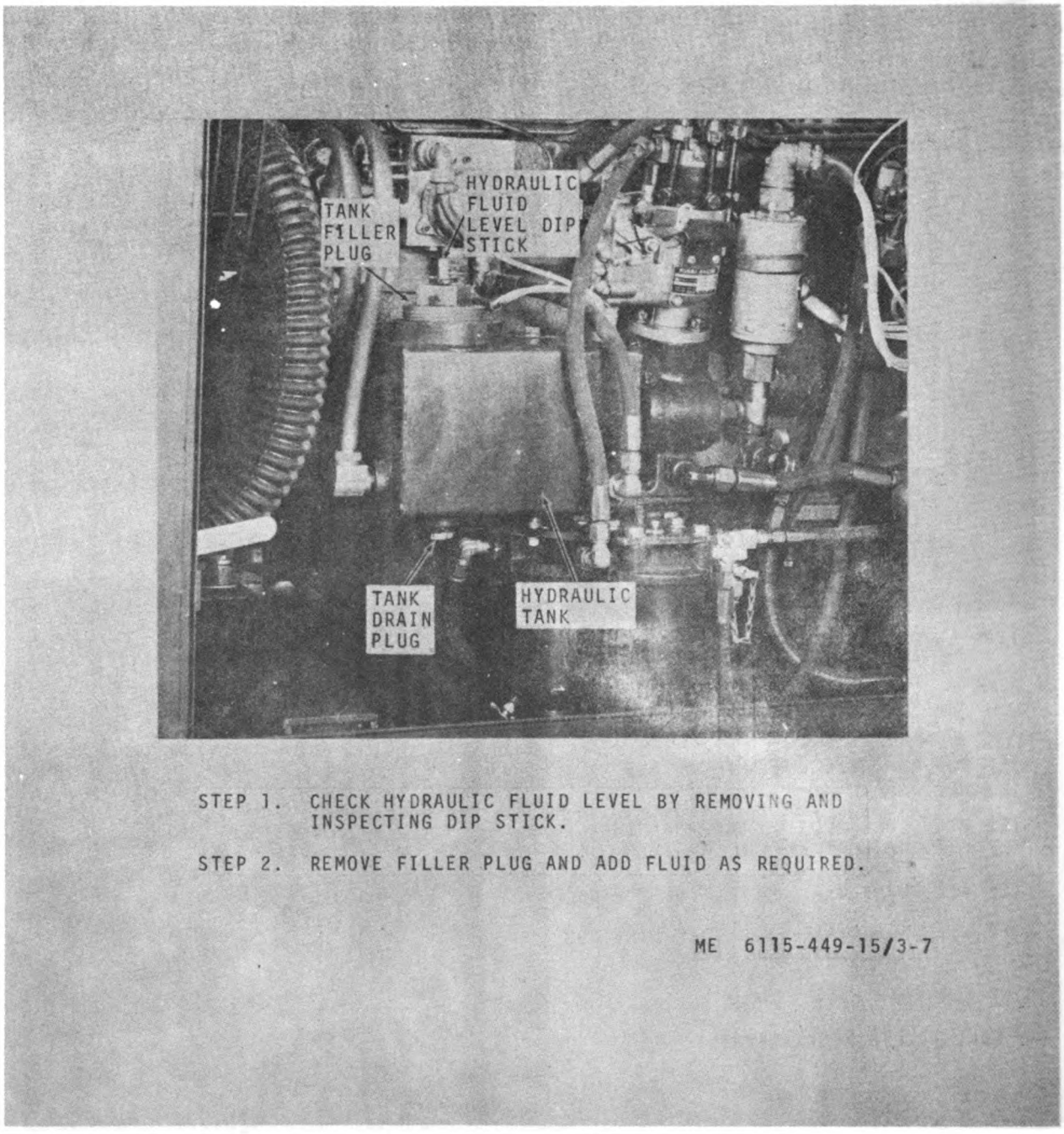
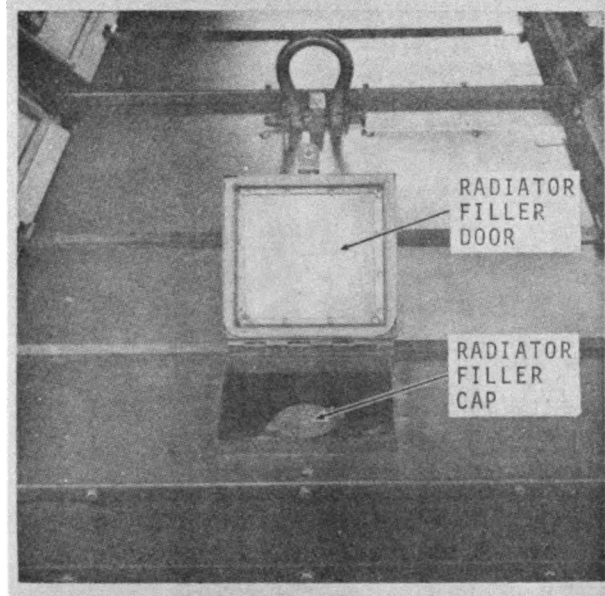


Figure 3-7. Hydraulic fluid tank service.

3-11. Radiator Assembly Service

Refer to figure 3-8 and service radiator assembly.



STEP 1. OPEN RADIATOR FILLER DOOR.

STEP 2. SLOWLY LOOSEN AND REMOVE RADIATOR FILLER CAP.

STEP 3. FILL RADIATOR WITH COOLANT, AS REQUIRED.

STEP 4. INSTALL RADIATOR CAP.

STEP 5. CLOSE RADIATOR FILLER DOOR.

A. ADDING COOLANT.

STEP 1. OPEN RADIATOR FILLER DOOR.

STEP 2. SLOWLY LOOSEN AND REMOVE RADIATOR FILLER CAP.

STEP 3. OPEN RADIATOR DRAIN COCK AND DRAIN RADIATOR.

STEP 4. CLOSE DRAIN COCK.

STEP 5. FLUSH AND INSTALL RADIATOR COOLANT AS REQUIRED.

STEP 6. INSTALL FILLER CAP AND SECURE FILLER DOOR.

B. RADIATOR DRAINAGE

ME 6115-449-15/3-8

Figure 3-8. Radiator assembly service.

3-12. Fuel Filter and Strainer Service

Refer to figure 3-9 and service fuel filter andstrainer assembly.

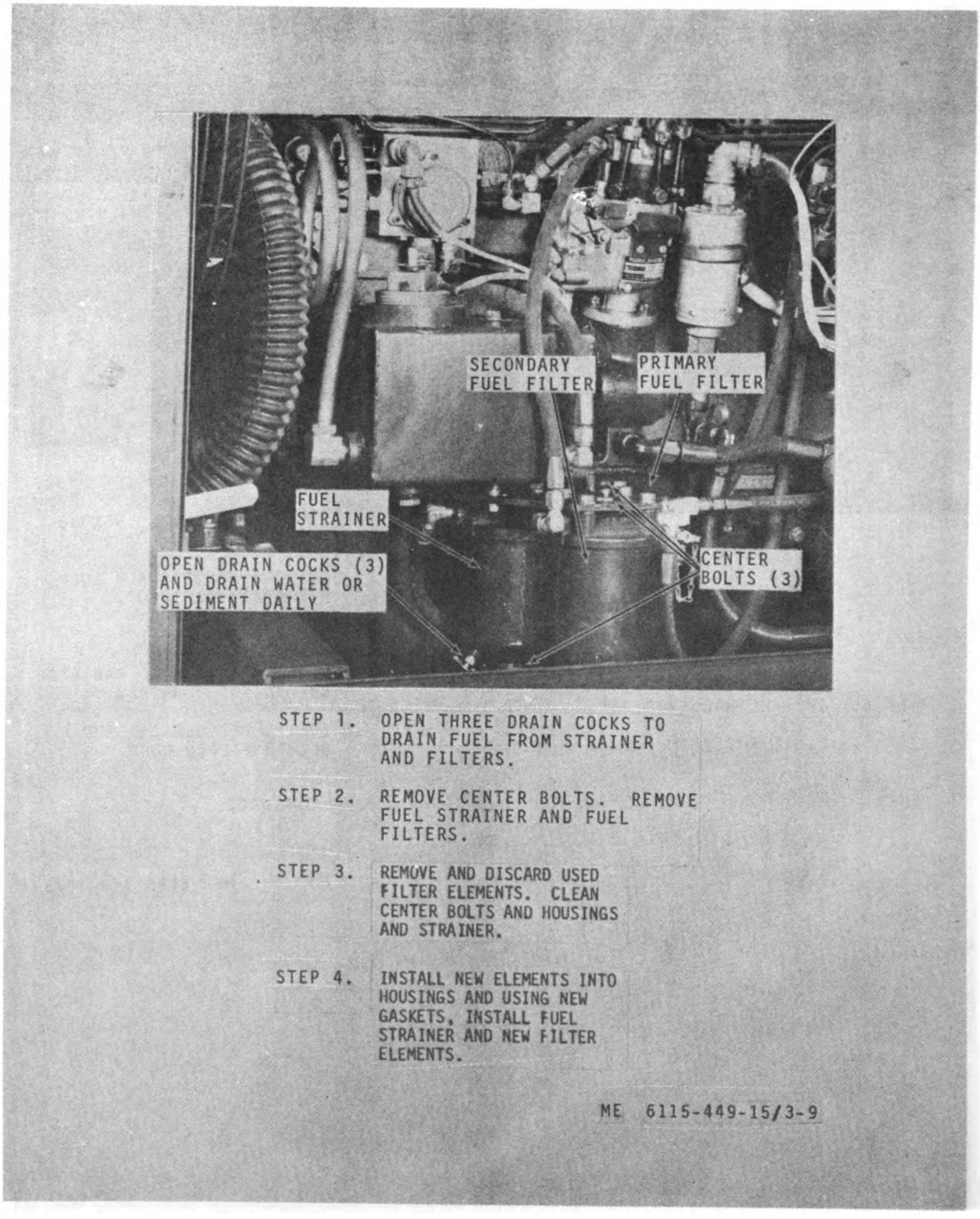


Figure 3-9. Fuel filter and strainer service.

3-13. Oil Filter Assembly Service

a. Removal. Refer to figure 3-2 and remove oil filter assembly.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or wear.

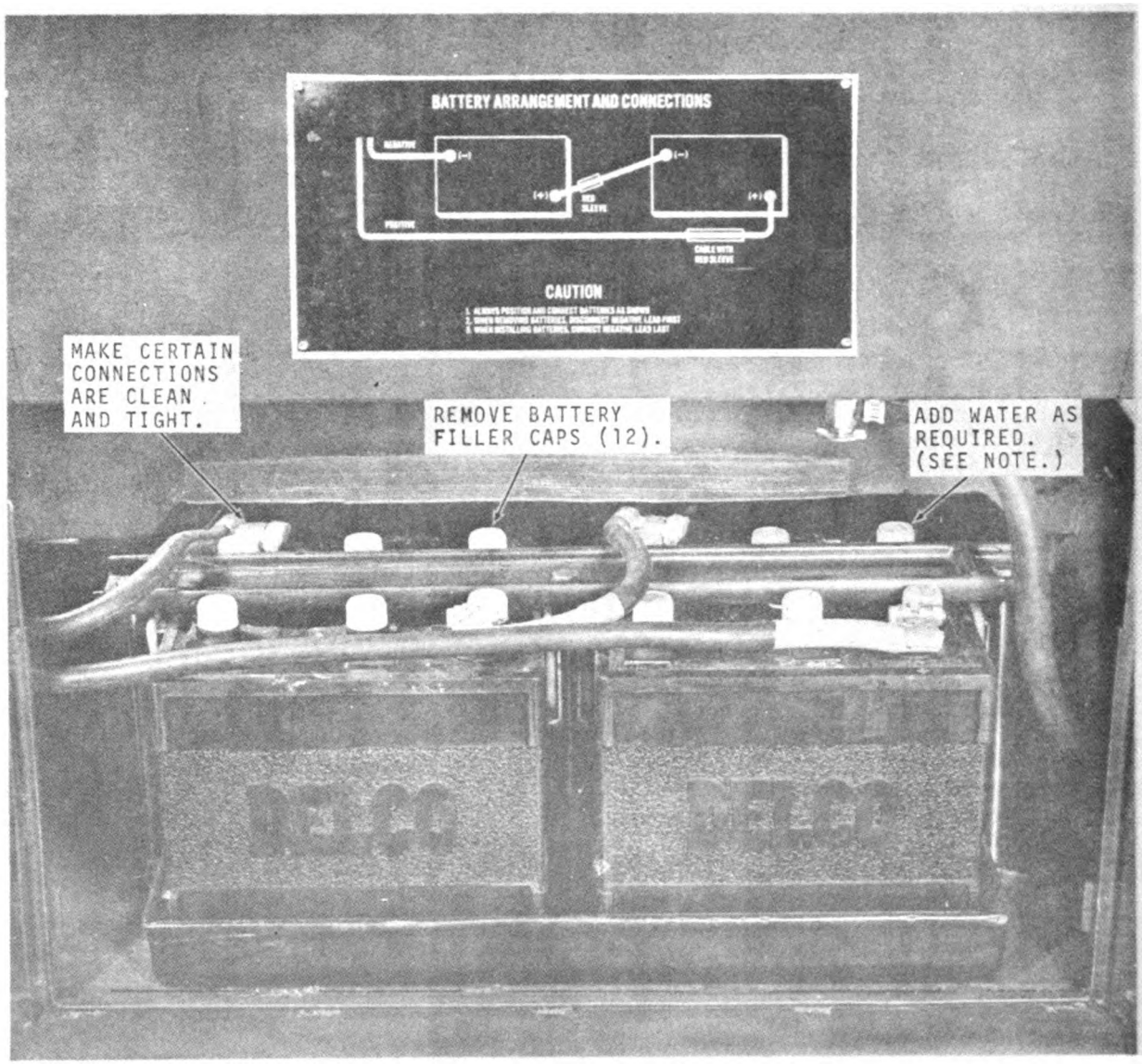
(3) Replace all damaged, worn, or defective parts.

c. Installation. Refer to figure 3-2 and install oil filter assembly.

d. Service. Refer to paragraph 3-4 and service oil filter.

3-14. Battery Service

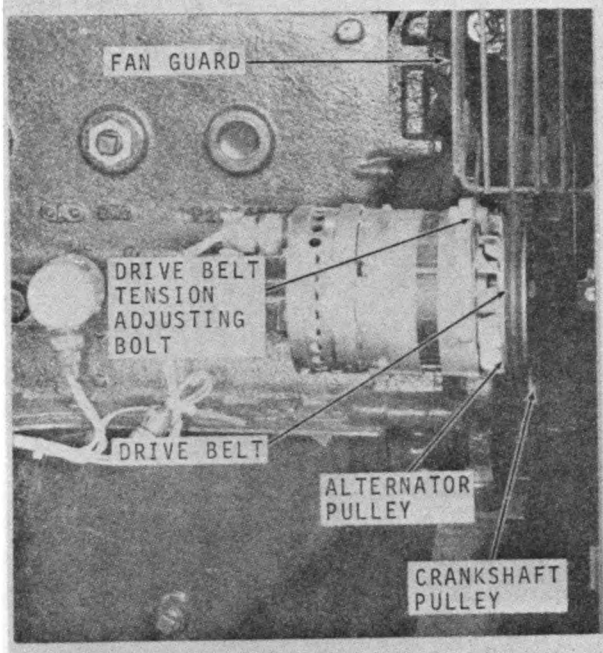
Refer to figure 3-10 and service battery.



NOTE: THE ELECTROLYTE LEVEL SHOULD BE MAINTAINED 3/8 INCH ABOVE THE SEPARATORS OR INSULATORS BY ADDITION OF DISTILLED WATER OR "APPROVED WATER" (WATER FREE FROM IMPURITIES BY ANALYSIS). DO NOT OVERFILL THE CELLS OF THE BATTERY AS EITHER HAS A DETRIMENTAL EFFECT ON BATTERY LIFE.

ME 6115-449-15/3-10

Figure 3-10. *Battery service.*



STEP 1. REMOVE FAN GUARD.

STEP 2. LOOSEN DRIVE BELT TENSION ADJUSTING BOLT.

STEP 3. REMOVE DRIVE BELT FROM ALTERNATOR AND CRANKSHAFT PULLEY.

STEP 4. LIFT DRIVE BELT OVER FAN AND REMOVE FROM GENERATOR SET.

STEP 5. SLIDE NEW DRIVE BELT OVER FAN AND POSITION ON ALTERNATOR AND CRANKSHAFT PULLEYS.

STEP 6. ATTACH SPRING SCALE TO DRIVE BELT, MIDWAY BETWEEN ALTERNATOR PULLEY AND CRANKSHAFT PULLEY.

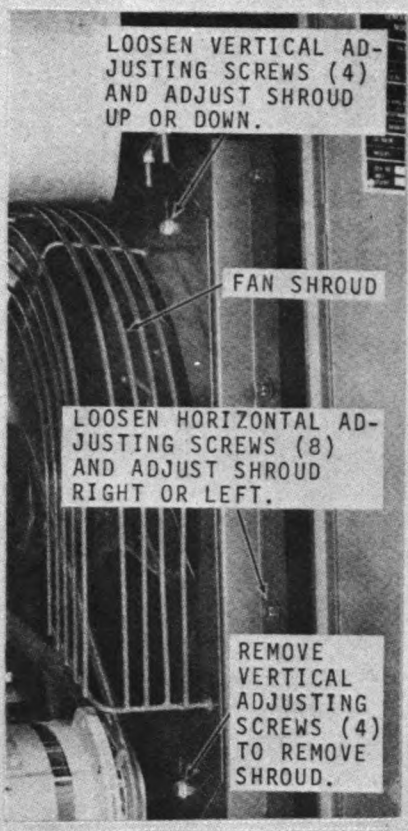
STEP 7. SHIFT ALTERNATOR POSITION TO OBTAIN BELT TENSION BETWEEN 3 LBS. MINIMUM AND 5-1/4 LBS. MAXIMUM.

STEP 8. TIGHTEN DRIVE BELT ADJUSTING BOLT.

STEP 9. INSTALL FAN GUARD.

ME 6115-449-15/3-11

Figure 3-11. *Drive belt removal, installation and adjustment.*



A. FAN SHROUD REMOVAL AND ADJUSTMENT

NOTE: PORTIONS OF FRAME ASSEMBLY HAVE BEEN REMOVED TO FACILITATE COMPONENT IDENTIFICATION ONLY.

STEP 1. REMOVE FAN SHROUD AND MOUNTING HARDWARE.

STEP 2. REMOVE FRONT PANEL ASSEMBLY.

STEP 3. REMOVE FAN MOUNTING BOLTS AND FAN.

STEP 4. INSTALL FAN AND MOUNTING BOLTS.

STEP 5. INSTALL FRONT PANEL ASSEMBLY.

STEP 6. INSTALL FAN SHROUD AND MOUNTING HARDWARE.

B. FAN REMOVAL

ME 6115-449-15/3-12

Figure 3-12. *Fan assembly, removal and installation.*

3-15. Air Cleaner

Check air restriction indicator dailv. If red signal is visible, service air cleaner as described in figure 3-3. Clean every 100 hours following the instructions on element and figure 3-3.

3-16. Radiator Shroud

Refer to figure 3-12 and adjust radiator shroud. This is necessary whenever the fan belt is adjusted (para 3-18.)

3-17. Drive Belt

a. Removal. Refer to figure 3-11 and remove drive belt.

b. Cleaning and Inspection.

(1) Clean drive belt with approved (non-petroleum) cleaning solvent and dry thoroughly.

(2) Inspect drive belt for cracks, breaks or other damage.

(3) Replace damaged or defective drive belt.

c. Installation and Adjustment.

(1) Refer to figure 3-11 and install drive belt.

(2) Refer to figure 3-11 and adjust drive belt.

3-18. Fan and Alternator

a. Fan and Alternator Belt Adjustment.

(1) Refer to figure 3-11 and adjust fan belt tension.

(2) Clean and inspect fan and hub assembly. Repair or replace broken, worn or damaged parts as required.

b. Alternator Output Adjustment.

(1) Adjust alternator output by rotating output adjusting screw.

(2) To increase alternator output, rotate output adjusting screw clockwise. To decrease output, rotate screw counterclockwise.

Note. Alternator output should be adjusted to obtain a reading of approximately 1/2 ampere on the battery charging ammeter. Make sure batteries are fully charged before adjusting alternator output.

3-19. Lamps and Fuses

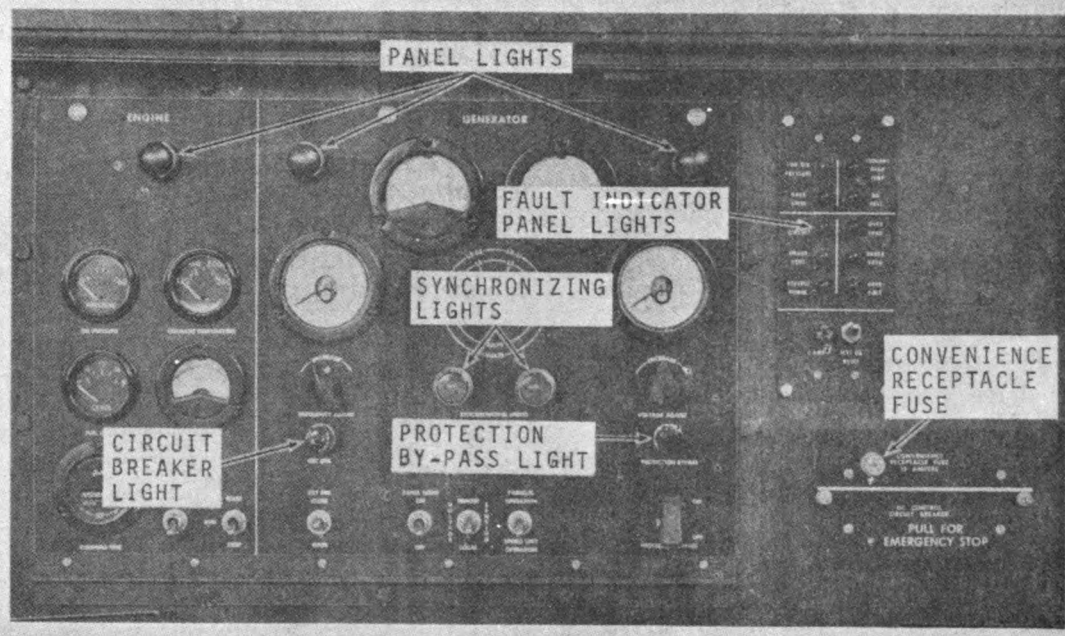
a. Removal. Refer to figure 3-13 and remove the incandescent lamps.

b. Cleaning and Inspection.

(1) Clean lamps and fuses with a clean dry cloth.

(2) Inspect lamps and fuses for damage.

c. Installation. Refer to figure 3-13 and replace lamps and fuses.



STEP 1. REMOVE LENS.

STEP 2. REMOVE BAYONET TYPE LAMPS BY PRESSING IN AND TURNING COUNTERCLOCKWISE. UNSCREW OTHER TYPE LAMPS.

STEP 3. INSTALL NEW LAMP AND INSTALL LENS.

NOTE: FOR DIAL DETAILS, REFER TO FIGURE 2-3.

ME 6115-449-15/3-13

Figure 3-13. *Panel lamps and fuses, removal and installation.*

3-20. Generator Service

Use low pressure air to blow dust and dirt from the internal parts of the generator. Report any abnormalities to direct support maintenance.

3-21. Main Generator Brushes

a. Removal.

(1) Remove louver door from rear panel housing (fig. 3-14).

(2) Refer to figure 3-14 and remove the main generator brushes.

b. Cleaning and Inspection.

(1) Clean brushes with a clean, dry, lint-free cloth.

(2) Inspect brushes for chips, cracks, wear and other damage.

(3) Replace a brush that is damaged or worn to 5/8-inch or less.

c. Installation.

(1) Refer to figure 3-14 and install the main generator brushes.

(2) Refer to figure 3-14 and install louver door on rear panel housing.

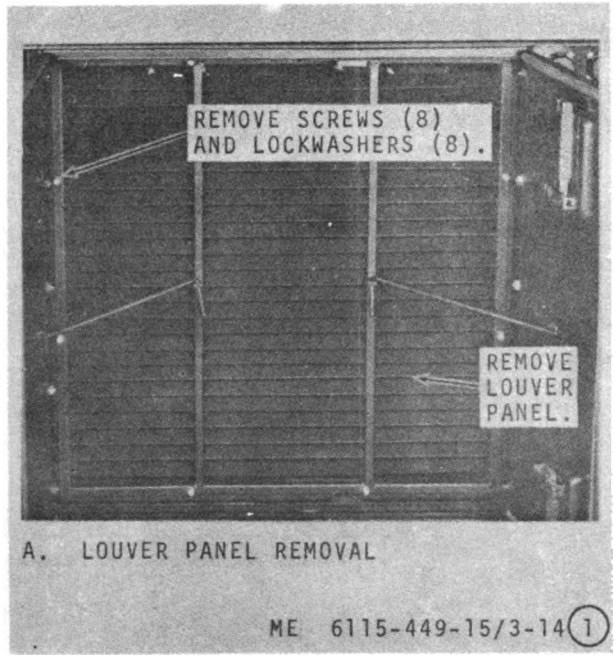
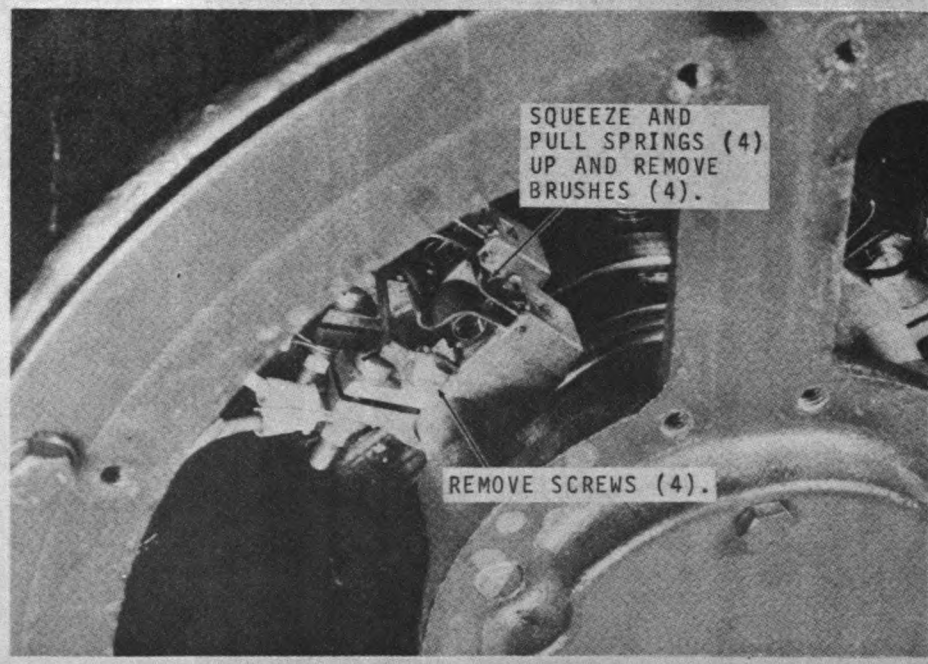


Figure 3-14. Generator covers and brushes, removal and installation (Sheet 1 of 2).

B. COVER REMOVAL AND INSTALLATION



C. BRUSH REMOVAL AND INSTALLATION

ME 6115-449-15/3-14 (2)

Figure 3-14. *Generator covers and brushes, removal and installation* (*Sheet* 2 *of* 2)

Section V. TROUBLESHOOTING

3-22. General

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

3-23. Engine Hard to Start or Fails to Start

Probable cause	*Possible remedy*
Day tank switch defective	Repair or replace day tank switch (para 3-75)
Speed switch tripped	Reset speed switch (fig. 3-31)
Fuel selector valve in wrong position	Place fuel selector valve in SET or AUXILIARY position depending on source of fuel.
Engine starting procedure improper	Repeat the engine starting procedure (fig. 2-4).
Air in fuel system	Inspect all fuel lines for loose connections (fig. 3-21) and bleed the fuel system (para 3-78*e*)
Fuel filter clogged	Service the fuel filters (para 3-12)
Water in fuel system	Drain the primary fuel filter or service the fuel filters (para 3-12)
Incorrect grade of fuel or water and dirt in fuel	Drain the fuel tank (para 3-9) and fill with clean fuel of correct grade
Speed switch defective	Replace speed switch (fig. 3-31)
Air Cleaner clogged	Service the air cleaner (fig. 3-3)

3-24. Engine Misses or Runs Erratically

Probable cause	*Possible remedy*
Primary or secondary fuel filters clogged or damaged	Clean or repair faulty filter (fig. 3-9)
Rocker arm adjustment incorrect	Adjust rocker arm (fig. 3-34)
Fuel injector nozzle holder defective	Replace defective fuel injector holder (para 3-80)
Fuel injection pump defective or out of time	Inform direct support maintenance.
Air cleaner clogged or damaged	Clean or replace air cleaner (fig. 3-3)
Air in fuel system	Bleed the air from fuel system (para 3-78*e*)
Water in fuel system	Drain the primary fuel filter or service the fuel filters (para 3-12)
Incorrect grade of fuel or water and dirt in fuel	Drain the fuel tank (para 3-9) and fill with clean fuel of correct grade.

3-25. Engine Stops Suddenly

Probable cause	*Possible remedy*
Fuel lines or fuel system components contaminated or damaged	Clean or replace fuel lines and fuel system components as necessary (para 3-77)
Fuel transfer pump defective	Replace fuel transfer pump (para 3-79)
Fuel injection pump defective or out of adjustment	Inform direct support maintenance
Speed switch defective	Replace speed switch (para 3-91)
Low oil pressure switch defective	Replace low oil pressure switch (para 3-92)
Fuel tank empty	Fill the fuel tank (para 3-9) and prime the fuel system
Day tank switch defective	Replace day tank switch (fig. 3-19)

Note. The generator set is equipped with safety devices to automatically stop the engine in case of low fuel level, low oil pressure, high coolant temperature, overspeed or overvoltage.

3-26. Engine Overheats

Probable cause	*Possible remedy*
Engine thermostat defective	Replace engine thermostat (fig. 3-17)
Shutter or shutter control defective	Repair or replace shutter or control (para 3-70)
Drive belt defective	Replace drive belt (fig. 3-11)
Radiator hoses collapsed or defective	Replace radiator hoses (para 3-70)
Coolant level low	Fill the cooling system to the proper level (para 3-11)
Cooling system dirty or clogged	Service the cooling system (fig. 3-8)
Drive belt slipping	Adjust drive belt to proper tension (fig. 3-11)

3-27. Engine Runs Too Cold

Probable cause	*Possible remedy*
Engine thermostat not working	Test and replace defective engine thermostat (fig. 3-17)
Shutter or shutter control defective	Repair or replace shutter or replace shutter control (para 3-70)

3-28. Engine Lacks Power

Probable cause	*Possible remedy*
Fuel injection pump defective or out of time	Inform direct support maintenance
Fuel injector nozzles defective	Replace defective fuel injector nozzle (para 3-80)
Insufficient valve clearance	Adjust rocker arm (para 3-95)
Compression low	Inform direct support maintenance

3-29. Engine Knocks or Develops Excessive Noise

Probable cause	*Possible remedy*
Crankcase oil level low	Add oil to proper level in crankcase (fig. 3-2 and 1-2) refer to the current lubrication order (fig. 3-1)

Caution: **If the engine knocks or is noisy when the crankcase is filled with oil to the proper level, stop the engine immediately (para 2-12) as continued operation can cause serious damage. Report the condition to organizational maintenance.**

Valve clearance excessive	Adjust rocker arm clearance (para 3-95)
Fuel injection pump timed too early	Inform direct support maintenance.
Fuel injector nozzle holder sticking	Replace fuel injector nozzle holder (para 3-80)

3-30. Engine Oil Pressure Low

Probable cause	*Possible remedy*
Crankcase oil level low	Add oil to proper level (fig. 3-2 and 1-2) refer to the current lubrication (fig. 3-1)
Oil filters clogged	Service the oil filters (fig. 3-2)
Oil pressure relief valve defective, dirty or out of adjustment	Inform direct support maintenance

3-31. Engine Oil Consumption High

Probable cause	*Possible remedy*
Cylinder head cover or gasket defective	Replace cylinder head cover or gasket (fig. 7-8)
Cylinder head breather tube clogged	Clean breather tube (fig. 3-32)
Oil pressure relief valve defective	Inform direct support maintenance
Worn or broken piston rings	Inform direct support maintenance

3-32. Engine Exhaust Smoke Excessive

Probable cause	*Possible remedy*
Restriction in air supply	Service the air cleaner (fig. 3-3)
Incorrect grade of fuel	Drain the fuel tank (para 3-9) and fill with correct grade of fuel.
Crankcase oil level too high	Drain oil from crankcase until proper level is reached (fig. 3-2)
Worn piston rings and cylinders	Inform direct support maintenance

3-33. Engine Starter Fails to Crank Engine

Probable cause	*Possible remedy*
Battery cables corroded or defective	Clean or replace battery cables (para 3-87)
Engine start switch defective	Replace engine start switch (para 3-101)
Starter solenoid defective	Replace defective starter solenoid (para 3-89)
Engine starter defective	Replace engine starter (para 3-89)
Batteries discharged	Replace batteries (para 3-86)

3-34. Battery Charging (DC) Ammeter Shows No Charge When Batteries are Low

Probable cause	*Possible remedy*
Battery charging (dc) ammeter defective	Replace battery charging (dc) ammeter (para 3-99)
Alternator defective	Replace alternator (para 3-88)
Drive belt defective	Replace drive belt (para (3-17)

3-35. Battery Charging (DC) Ammeter Shows Charge When Batteries are Fully Charged

Probable cause	*Possible remedy*
Battery charging (dc) ammeter defective	Replace battery charging (dc) ammeter (para 3-99)
Alternator defective	Replace alternator (para 3-88)

3-36. Generator Fails to Build up Rated Voltage or Generator Output Voltage too Low

Probable cause	*Possible remedy*
Voltage not adjusted to the selected operating voltage	Adjust the voltage (fig. 2-6) to agree with position of voltage reconnection panel.
Improper generator operating procedure	Refer to figure 2-5 for applicable operating details.
Loose terminal connections on voltage reconnection panel	Stop the engine and tighten all connections at voltage reconnection panel. (fig. 2-2)
Brush holders improperly adjusted	Adjust brush holders (para 3-113)

3-37. Generator Voltage Drops Under Load

Inform direct support maintenance.

3-38. Generator Overheats

Probable cause	*Possible remedy*
Generator air inlet doors closed	Open generator air inlet doors (fig. 1-1)
Generator screens obstructed	Remove obstructions (fig. 2-2)
Operating area not adequately ventilated	Increase ventilation in the operating area (para 2-4).
Generator overloaded	Reduce the load

3-39. Generator Fails to Supply Power to Load

Probable cause	*Possible remedy*
Circuit breaker switch is in OFF position	Throw circuit breaker switch to ON position at proper time (fig. 2-6)
Load cables not connected correctly	Reconnect load cables correctly (para 2-4*e*)
Load cables defective	Replace load cables (fig. 2-1)
Load terminal studs defective or loose	Clean and tighten or replace load terminal studs (fig. 2-1)

3-40. Generator Fails to Maintain Kilowatt Load Division During Parallel Operation

Probable cause	*Possible remedy*
Generator frequency fluctuates or drifts	Check engine for miss or erratic operation (para 3-24)
Generator frequency drops under load	Check engine for lack of power (par. 3-28)
Frequency adjust rheostat improperly adjusted	Adjust frequency adjust rheostat (fig. 2-6)
Parallel operation switch not in PARALLEL position	Place parallel operation switch in PARALLEL position (fig. 2-7)
Paralleling cable not securely connected	Reconnect paralleling cable securely (fig. 2-7)

3-41. Generator Output Voltage too High

Probable cause	*Possible remedy*
Improper voltage adjustment	Refer to paragraph 2-13 for applicable operating details and adjust voltage to agree with position of voltage reconnection panel.
Voltage regulator harness is disconnected or loose	Connect voltage regulator harness (fig. 8-2)

3-42. Generator Fails to Maintain Reactive Load Division During Parallel Operation

Probable cause	*Possible remedy*
Parallel operation switch not in PARALLEL position	Place parallel operation switch in PARALLEL position (fig. 2-7)
Voltage adjust rheostat out of adjustment	Adjust the voltage adjust rheostat (fig. 2-6)

3-43. Generator Noisy

Probable cause	*Possible remedy*
Foreign object penetrating the generator ventilating louvers or screens	Remove object from louvers or screens

Caution: **Unusual noises from the generator generally indicate a part failure. Stop the generator set immediately (fig. 2-5) as continued operation may result in additional damage to the generator.**

3-44. Generator Frequency Drops Under Load

Probable cause	*Possible remedy*
Engine lacks power	Refer to paragraph 3-28.

3-45. Generator Fails to Parallel

Probable cause	*Possible remedy*
Parallel operation switch defective	Replace parallel operation switch (para 3-108)
Paralleling receptacle defective	Inform direct support maintenance.

3-46. Generator Voltage Erratic

Probable cause	*Possible remedy*
Brush holders loose	Adjust brush holders (para 3-113)
Reconnection panel terminals loose	Tighten reconnection panel terminals. (fig. 2-2)

3-47. Generator Frequency Fluctuates or Drifts

Probable cause	*Possible remedy*
Engine misses or runs erratically	Refer to paragraph 3-24.

3-48. Generator Sparks at Collector Rings

Probable cause	*Possible remedy*
Brushes defective	Replace brushes (para 3-113)
Brush holders improperly adjusted	Adjust brush holders (para 3-113)

3-49. Frequency Meter Fails to Register

Probable cause	*Possible remedy*
Frequency meter defective	Inform direct support maintenance.

3-50. Kilowatt Meter Fails to Register

Probable cause	*Possible remedy*
Kilowatt meter defective	Inform direct support maintenance.

3-51. AC Ammeter Fails to Register

Probable cause	*Possible remedy*
AC ammeter defective	Replace AC ammeter (para 3-102).
Ammeter-voltmeter selector switch defective	Replace ammeter-voltmeter selector switch (para 3-104).

3-52. Voltmeter Fails to Register

Probable cause	*Possible remedy*
Voltmeter defective	Replace voltmeter (para 3-103).
Ammeter-voltmeter selector switch defective	Replace ammeter-voltmeter selector switch (para 3-104).

3-53. Circuit Breakers Trips off or Fails to Close

Probable cause	*Possible remedy*
Short circuit in load	Check load connections and leads. (fig. 2-2)
Under voltage	Inform direct support maintenance.
Overload	Reduce load.
Breaker defective	Replace breaker. (fig. 2-3)
Switch defective	Replace switch. (fig. 9-7)

3-54. Circuit Breaker on One or Both Units Will not Remain Closed During Paralleling Procedure

Probable cause	*Possible remedy*
Jumper cables not connected for correct phase sequence	Interchange jumper cables at phase terminals of one unit (para 2-13*c*).
Jumper cable not connected from neutral terminal of one unit to neutral terminal of other unit	Correct same jumper cable to neutral terminal of both units (para 2-13*c*).
Reverse power	Inform direct support maintenance.

3-55. Control Panel Indicator Light Fails to Operate

Probable cause	*Possible remedy*
Lamp defective	Replace lamp (para 3-106).

3-56. Convenience Receptacle Will Not Supply Current

Probable cause	*Possible remedy*
Fuse defective	Replace fuse.

3-57. Heater Overheats

Paragraph 3-57 through 3-61 apply to sets with optional winterization kit.

Probable cause	*Possible remedy*
Heater exhaust obstructed	Remove obstruction.
Limit switch defective	Inform direct support maintenance.

3-58. Heater Fails to Shut off

Probable cause	*Possible remedy*
Fuel regulator valve defective	Inform direct support maintenance.
Flame switch defective	Inform direct support maintenance.
Wiring connections shorted	Inform direct support maintenance.

3-59. Heater Blower will not Stop

Probable cause	*Possible remedy*
Limit switch defective	Inform direct support maintenance.
Broken quartz rod	Inform direct support maintenance.

3-60. Heater Smokes on Starting

Probable cause	*Possible remedy*
Igniter defective	Inform direct support maintenance.
Blower defective	Inform direct support maintenance.

3-61. Heater Fails to Ignite or Keep Burning

Probable cause	*Possible remedy*
Fuel selector valve in wrong position	Place fuel selector valve to SET or AUXILIARY position depending on source of fuel. (fig. 3-6).
Fuel tank empty	Fill the fuel tank. (fig. 3-6)
Heater circuit breaker open	Reset heater circuit breaker. (fig. 2-9)
Primary fuel filter clogged	Service the primary fuel filter (para 3-12).
Heater toggle switch defective	Replace heater toggle switch (para 3-108).
Flame sensitive switch defective	Inform direct support maintenance.
Limit switch defective	Inform direct support maintenance.
Igniter defective	Inform direct support maintenance.
Blower defective	Inform direct support maintenance.
Heater ducts obstructed	Remove obstructions. (fig. 2-9)
Heater exhaust obstructed	Remove obstructions. (fig. 10-4)

Section VI. RADIO INTERFERENCE SUPPRESSION

3-62. Definitions

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

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

3-63. General Methods Used to Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground stray currents. Methods used include shielding the high frequency wires, grounding the frame with bonding straps, and using capacitors and resistors.

3-64. Interference Suppression Components

The primary suppression components are those whose primary function is to suppress radio interference. These components are located on fuel transfer pump (fig. 3-23).

Note. No special suppression components are provided other than those that are an integral part of the various components.

3-65. Replacement of Suppression Components

Replace radio interference suppression components when defective. Tag and disconnect leads, replace component, and reassemble (fig. 3-23).

Note. Do not pull on cable or twist braided shielding.

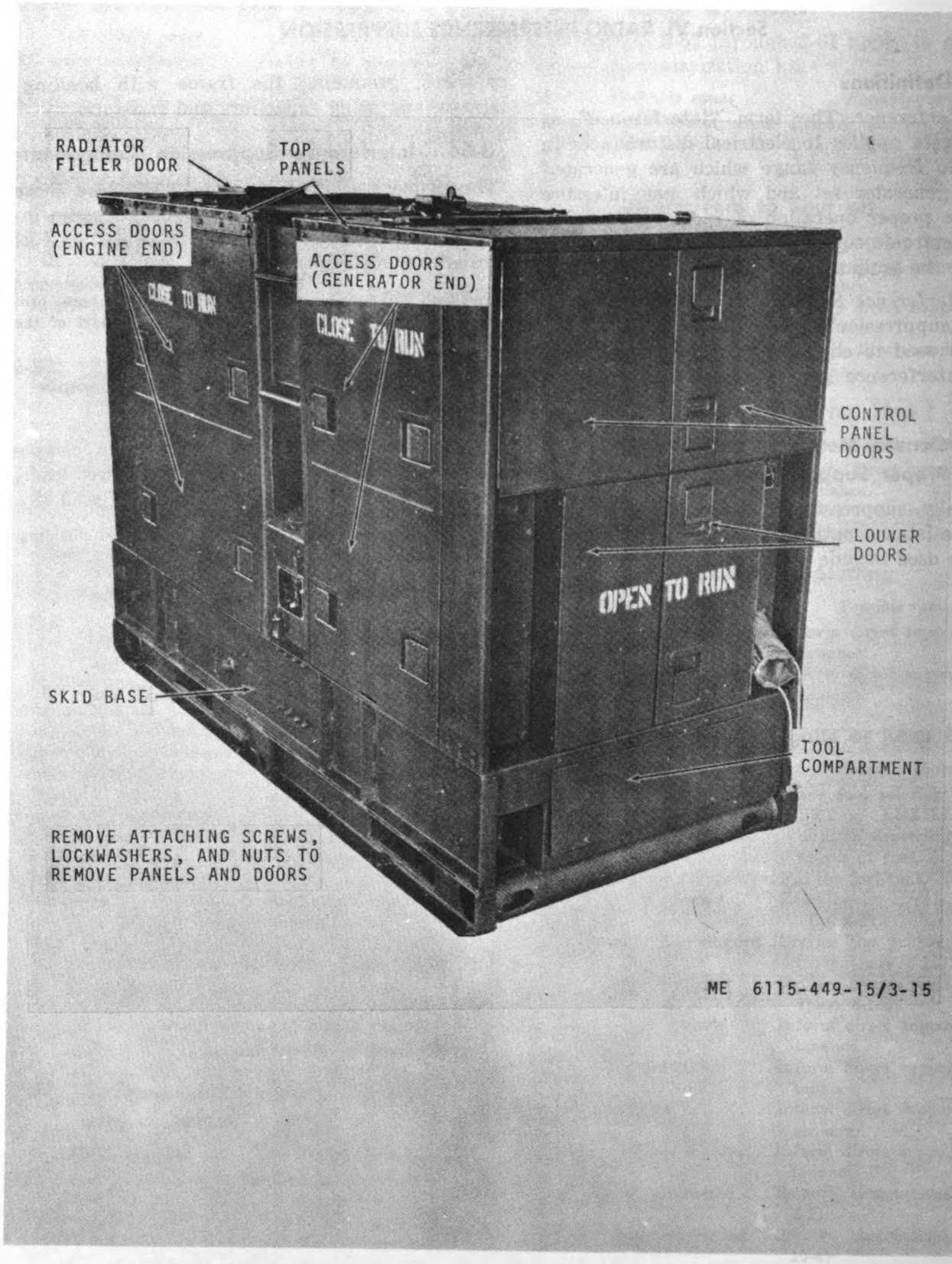
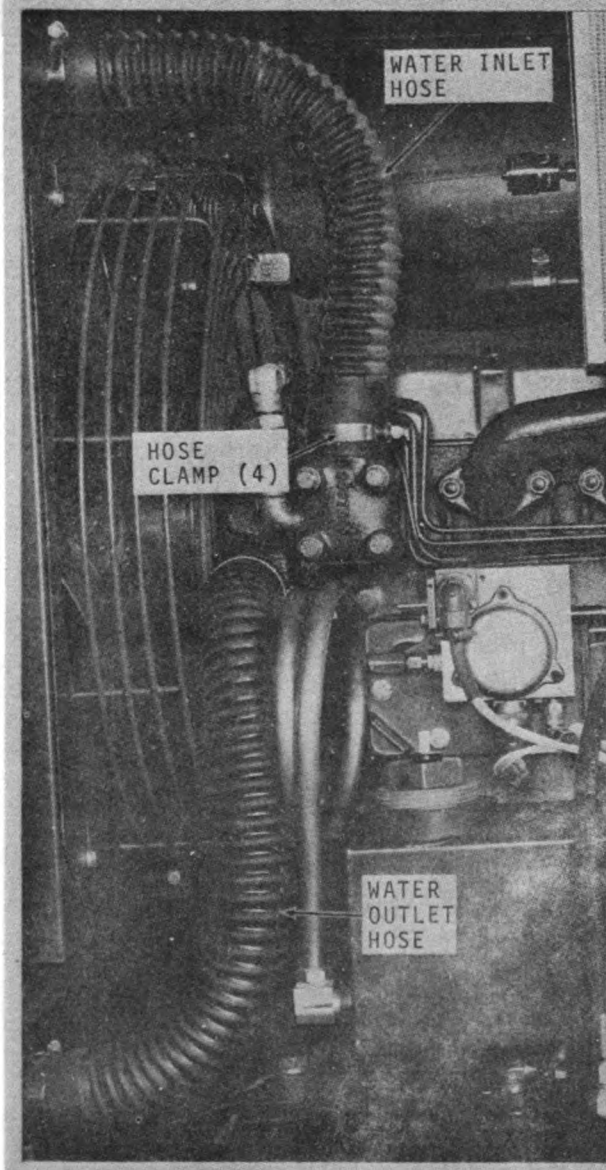


Figure 3-15. Housing panels and doors, removal and installation.



STEP 1. DRAIN RADIATOR (FIG. 3-8).

STEP 2. LOOSEN HOSE CLAMP SCREWS AND REMOVE WATER INLET, WATER OUTLET AND RADIATOR DRAIN HOSES.

STEP 3. REMOVE AUTOMATIC SHUTTER CONTROL BY REMOVING TWO MOUNTING BOLTS.

A. RADIATOR HOSES

STEP 4. REMOVE SHUTTER THERMOSTAT HOUSING BY REMOVING TWO MOUNTING BOLTS. REMOVE THERMOSTAT FROM HOUSING.

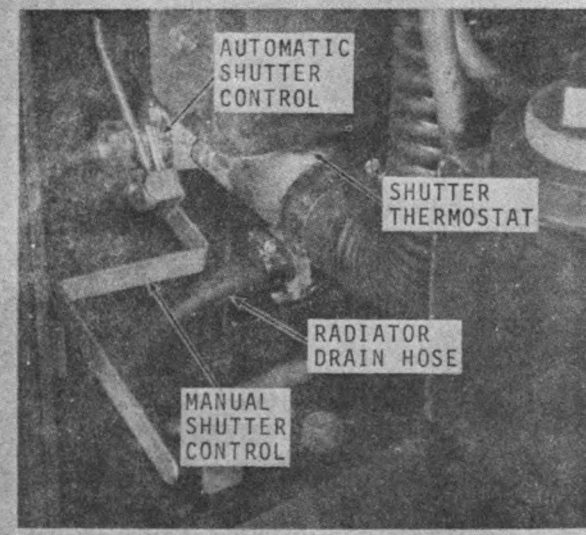
STEP 5. PLACE NEW SHUTTER THERMOSTAT INTO HOUSING AND INSTALL WITH MOUNTING BOLTS (2).

STEP 6. INSTALL AUTOMATIC SHUTTER CONTROL WITH MOUNTING BOLTS (2).

STEP 7. INSTALL WATER INLET, WATER OUTLET AND RADIATOR DRAIN HOSES WITH HOSE CLAMPS. TIGHTEN CLAMP SCREWS.

STEP 8. REFER TO (FIG. 3-8) AND SERVICE RADIATOR.

A. RADIATOR HOSES (cont)



B. SHUTTER CONTROLS

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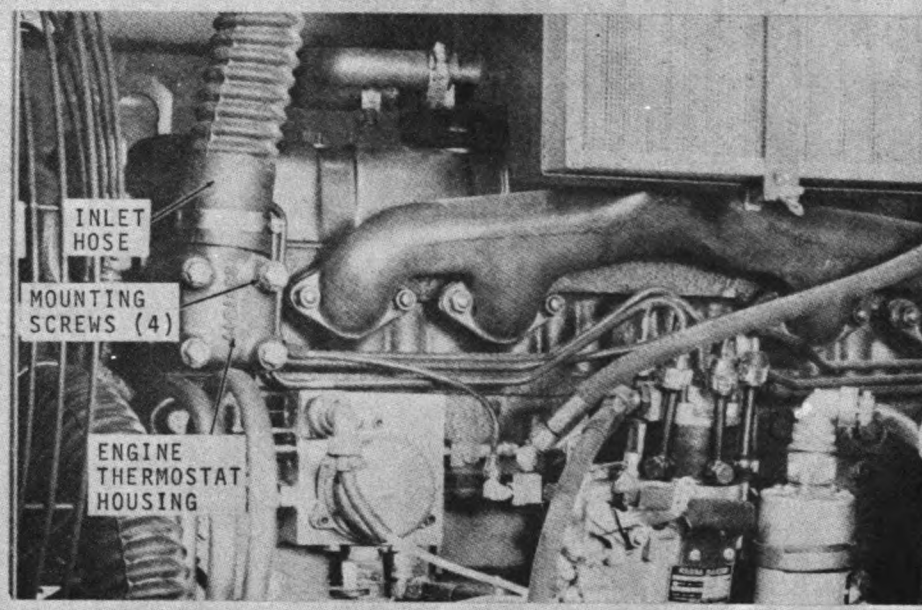
Figure 3-16. Shutter controls and radiator hoses, removal and installation.



STEP 1. RELIEVE COOLANT PRESSURE BY SLOWLY REMOVING RADIATOR FILLER CAP.

STEP 2. LOOSEN INLET HOSE CLAMP SCREW AND REMOVE INLET HOSE FROM THERMOSTAT HOUSING.

STEP 3. REMOVE FOUR THERMOSTAT HOUSING MOUNTING SCREWS; REMOVE HOUSING, THERMOSTAT AND GASKET.

STEP 4. INSTALL NEW THERMOSTAT IN HOUSING.

STEP 5. INSTALL THERMOSTAT HOUSING AND NEW GASKET WITH MOUNTING SCREWS.

STEP 6. INSTALL RADIATOR INLET HOSE AND CLAMP.

STEP 7. SERVICE RADIATOR (PAR. 3-11).

A. REMOVAL AND INSTALLATION

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Figure 3-17. Engine thermostat and thermostat housing (Sheet 1 of 2).

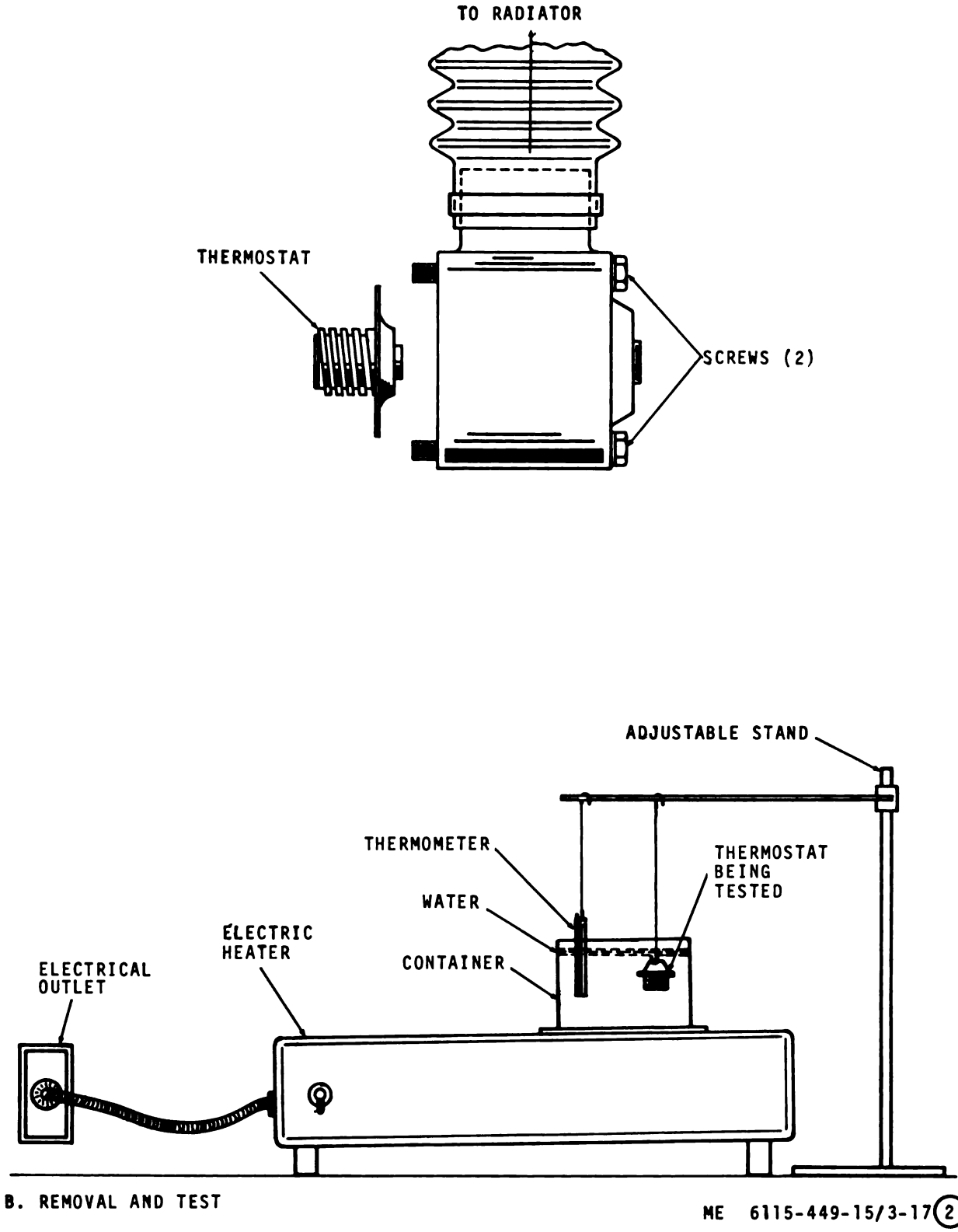

Figure 3-17. Engine thermostat and thermostat housing (Sheet 2 of 2).

Section VII. HOUSING ASSEMBLY

3-66. General

The engine and generator are enclosed in a sheet metal housing. Doors at both sides of the unit provide access to the generator set components. Sheet metal panels complete the housing assembly.

3-67. Instruction, Name, and Data Plates

a. Removal. All instruction, name, and data plates have been attached to the unit with rivets or self-tapping metal drive screws. To remove rivets or drive screws, drill out through mounting holes.

b. Installation. To install new, or replace damaged instruction, name, and data plates, position plate over mounting holes and install new rivets or self-tapping metal drive screws.

3-68. Housing Panels and Doors

a. Removal. Refer to figure 3-15, 7-4 and 10-2 and remove the housing components.

b. Cleaning, Inspection, and Repair.

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

(2) Inspect all parts for cracks, breaks, dents, broken welds, distortion and other damage.

(3) Pound out minor dents and reweld broken welds.

(4) Replace a damaged part.

c. Installation. Refer to figures 3-15 and install the housing components.

Section VIII. COOLING SYSTEM

3-69. General

The cooling system consists of a radiator, water pump, thermostats, fan, shutter, shutter controls, and the necessary lines, fittings, and linkage to connect these components. The engine thermostat regulates the flow of coolant pumped through the engine block by the water pump to cool the engine. The shutter is controlled by the shutter control thermostat, located at the base of the radiator, which can be operated manually. The shutter controls the amount of air pushed through the radiator by the fan. The fan guard protects personnel from the fan.

3-70. Shutter Controls and Radiator Hoses

a. Removal.

(1) Drain the cooling system (para 3-11).

(2) Refer to figure 3-16 and remove shutter controls and radiator hoses.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, leaks or other defects.

(3) Replace all damaged or defective parts.

c. Installation.

(1) Refer to figure 3-16 and install the shutter controls and radiator hoses.

(2) Fill the cooling system (fig. 3-8).

3.71. Engine Thermostat and Thermostat Housing

a. Removal. Refer to figure 3-17 and remove the thermostat housing and thermostat.

b. Thermostat Testing. Test thermostat for proper operation by suspending it and a thermometer in a container of water. Heat the water. When the thermometer indicates between 165°F and 175°F thermostat should start to open and should be completely open when the temperature reaches 202°F. Remove the thermostat from the water. The cooler surrounding air should cause a pronounced closing action and the thermostat should be completely closed within a short time. Replace a defective thermostat.

c. Installation. Refer to figure 3-17 and install thermostat housing and thermostat.

3-72. Fan Assembly

a. Removal. Refer to figure 3-12 and remove fan assembly.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or other damage.

(3) Replace all damaged or defective parts.

c. Installation.

(1) Refer to figure 3-12 and install fan assembly.

(2) Refer to figure 3-12 and adjust fan shroud.

3-73. General

Fuel for the generator set is drawn from either the fuel tank or an auxiliary fuel supply by two electrically operated fuel transfer pumps (fig. 3-18). The source of the fuel is determined by the setting of the fuel selector valve. Fuel is pumped from the fuel source through the strainer and primary filter into the day tank. The injection pump draws fuel from the day tank through the secondary filter. Under all conditions of operation it is assured that solid fuel without air bubbles is transmitted to the fuel injection pump.

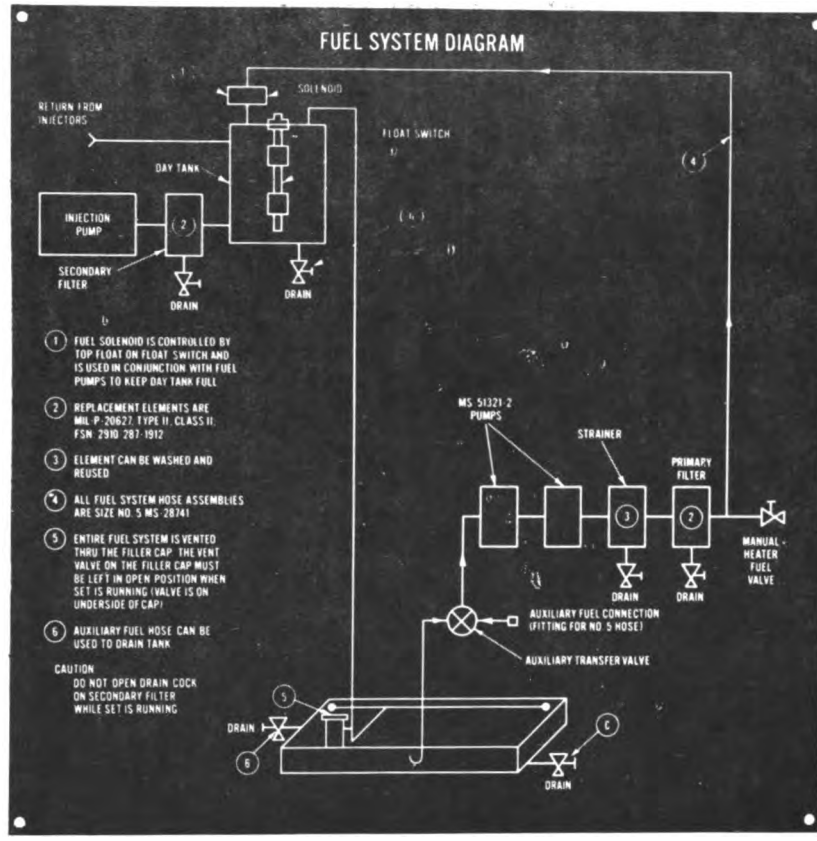

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Figure 3-18. *Fuel system.*

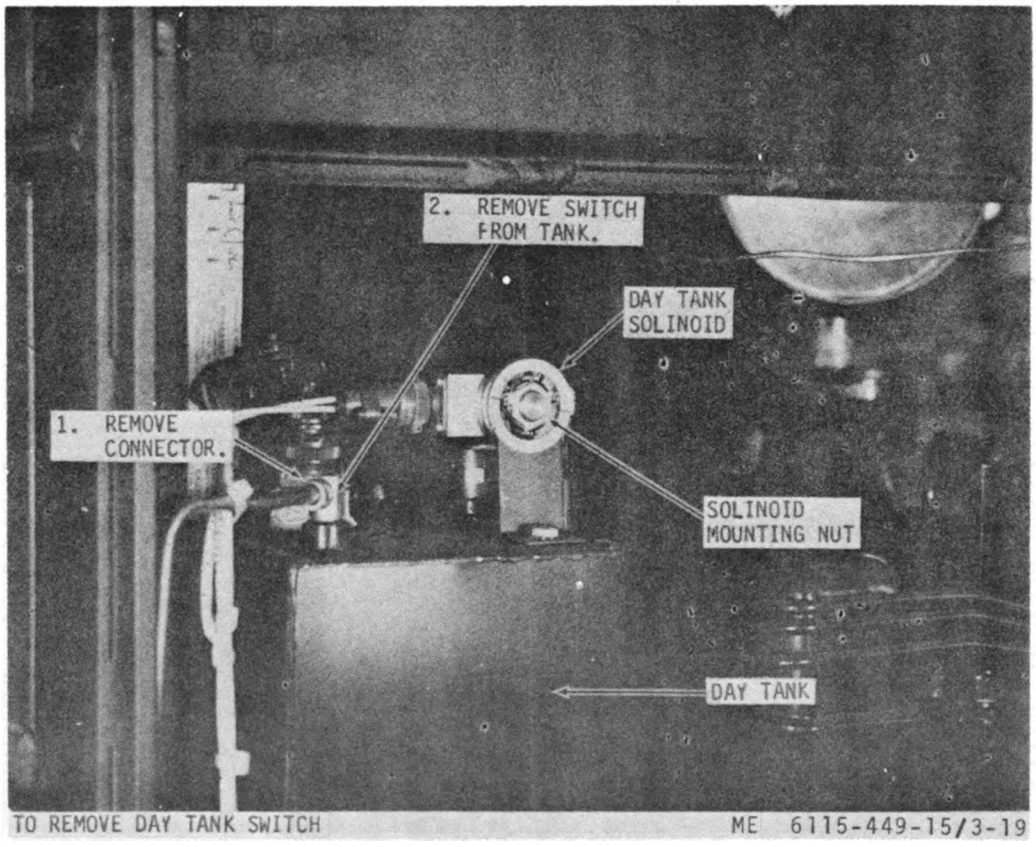
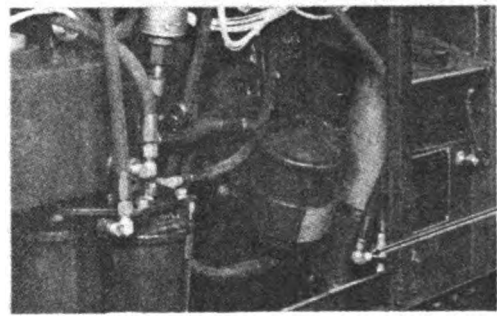
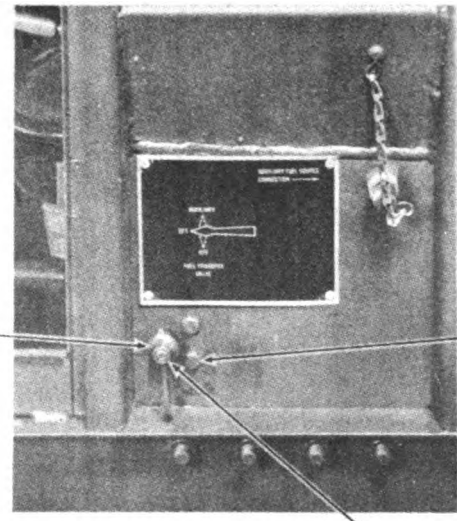


Figure 3-19. Day tank switch, removal and installation.



TAG AND
DISCONNECT
FUEL LINES (3).

A. LINE REMOVAL



3. REMOVE
VALVE.

2. REMOVE MOUNTING
BOLTS (2).

1. REMOVE PHILLIPS SCREW AND
HANDLE.

B. VALVE REMOVAL

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Figure 3-20. ***Fuel selector valve, removal and installation.***

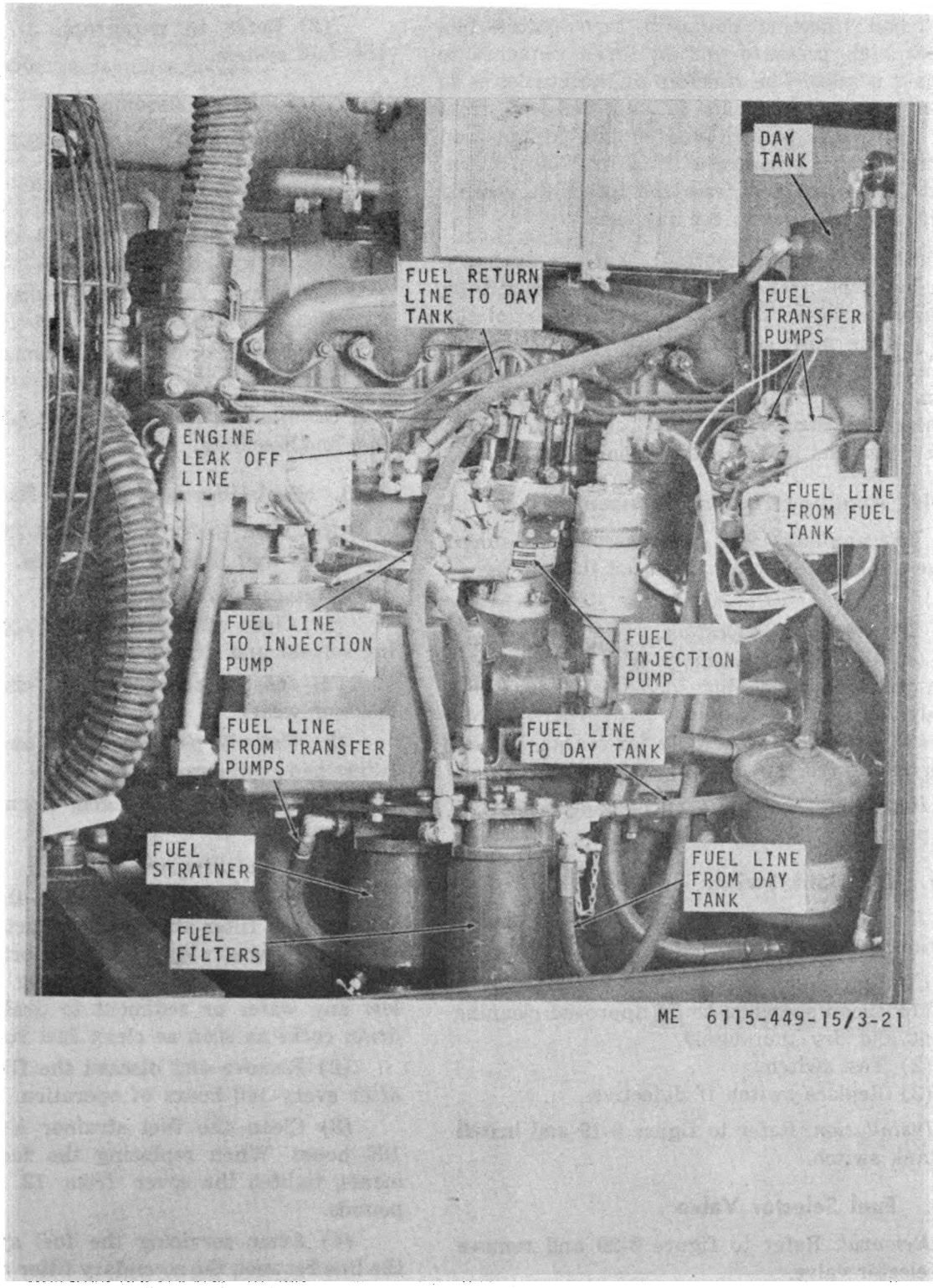

Figure 3-21. Fuel line assembly, removal and installation.

The fuel injection pump in turn forces fuel under high pressure and in timed sequence to the six nozzles. The function of the nozzles is to inject metered amounts of fuel received from the injection pump into engine combustion chambers at a pressure of 2500 to 2750 psi. Unused fuel is drained from the injectors, cooling them, and returned to the day tank.

Caution: **It is important that the fuel system be kept free of contaminants, especially abrasive material. Do not remove any part of the fuel system until surfaces of the item to be removed and adjacent components are thoroughly clean. Also cap disconnected tubes or lines and openings in components. Flush lines and tubes with clean fuel before installation.**

3-74. Auxiliary Fuel Hose Assembly

a. The auxiliary fuel hose assembly is stored above the engine exciter when not in use (fig. 1-1).

b. Cleaning and Inspection.

(1) Clean the assembly with an approved (non-petroleum) cleaning solvent and dry thoroughly.

(2) Inspect the assembly for cracks, breaks, leaks and obstructions.

c. Replacement. Replace all damaged or defective parts.

3-75. Day Tank Switch

a. Removal. Refer to figure 3-19 and remove day tank switch.

b. Cleaning and Testing.

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

(2) Test switch.

(3) Replace switch if defective.

c. Installation. Refer to figure 3-19 and install day tank switch.

3-76. Fuel Selector Valve

a. Removal. Refer to figure 3-20 and remove fuel selector valve.

b. Cleaning and Inspection.

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

(2) Inspect the valve, replace if defective.

c. Installation.

(1) Refer to figure 3-20 and install fuel selector valve.

(2) Refer to paragraph 3-78*e* and bleed the fuel system.

3-77. Fuel Line Assembly

a. Removal. Refer to figure 3-21 and remove fuel lines.

b. Cleaning and Inspection.

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

(2) Inspect for cracks, breaks, leaks and obstructions.

(3) Repair or replace all damaged or defective parts.

c. Installation. Refer to figure 3-21 and install fuel line assembly.

3-78. Fuel Filter and Strainer Assemblies

a. Removal. Refer to figure 3-22 and remove fuel filter and strainer assemblies.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, leaks or wear.

(3) Refer to paragraph 3-12 and service fuel filters and strainer.

(4) Replace all damaged, worn or defective parts.

c. Filter and Strainer Service.

(1) Open the drain cock in the bottom of the primary filter shell before start of daily operations in warm weather or shortly after the end of daily operations in freezing weather. Allow any water or sediment to drain. Close the drain cocks as soon as clean fuel runs out.

(2) Remove and discard the filter elements after every 100 hours of operation.

(3) Clean the fuel strainer element every 100 hours. When replacing the fuel filter elements, tighten the cover from 12 to 14 foot-pounds.

(4) After servicing the fuel system break the line between the secondary filter and injection pump and remove vent plug from the secondary filter.

(5) Start pumps and leave running until fuel flows from open secondary fuel vent.

(6) Replace plug and line and leave pumps running until day tank is full which is indicated by the pumps slowing down.

d. Installation.

(1) Refer to figure 3-22 and install fuel filter and strainer assemblies.

(2) Refer to paragraph 3-78*e* and bleed fuel system.

e. Bleeding Air from Fuel System.

(1) *Day tank to fuel injection pump.*

(a) Close DC control circuit breaker.

(b) Place engine switch in RUN position.

(c) Place protection bypass switch in ON position.

(d) Loosen second stage fuel filter vent screw.

(e) Wait until fuel flows from the filter vent.

(f) Tighten vent screw of second stage fuel filter.

(2) *Bleeding high pressure system.*

(a) The high pressure fuel system is usually self-bleeding due to the fact that any air trapped by the fuel injection pump plungers is forced out through the fuel injection nozzles and into the engine combustion chambers. However, in the event the fuel lines have been removed, the engine has run out of fuel, or the engine has not been operated for some time, bleeding of the high pressure system may be necessary to facilitate engine starting.

(b) Bleed the high pressure fuel system as follows:

1. Loosen connector nut attaching the upper end of each fuel injection line to the cylinder head.

2. Crank engine with the starter until fuel flows from the ends of all injection lines. Tighten all fuel line connector nuts.

Caution: **Do not use starter continuously for more than 30 seconds of cranking, pause two minutes to allow motor to cool.**

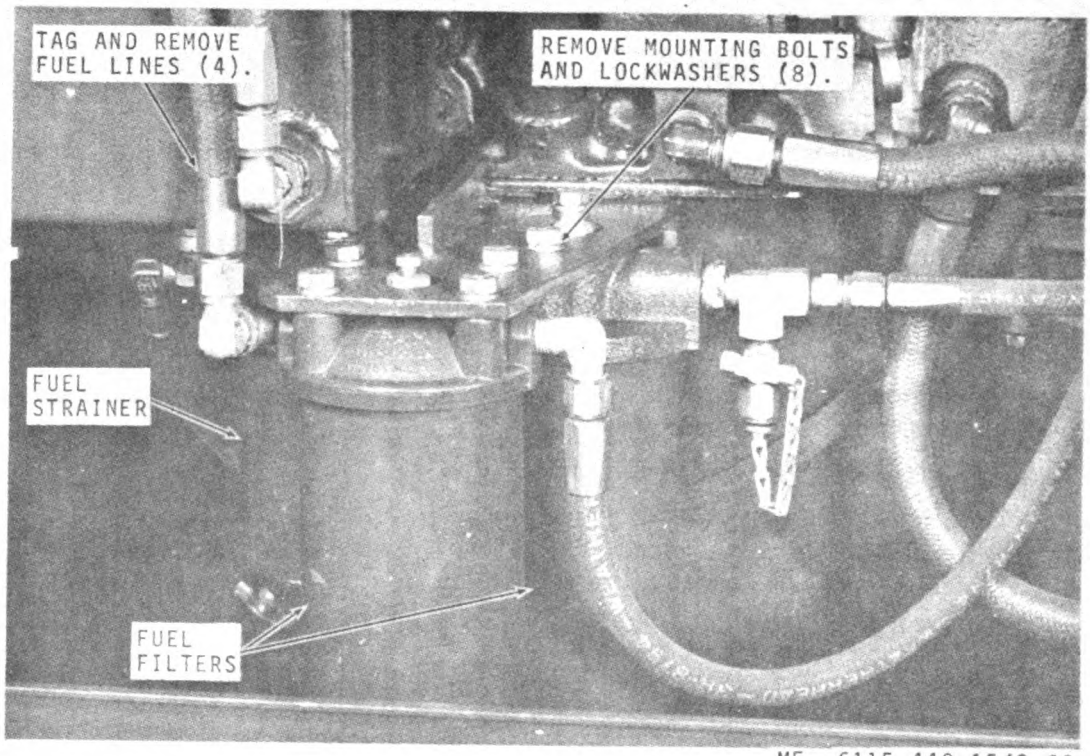

Figure 3-22. Fuel filter and strainer assemblies, removal and installation.

3-79. Fuel Transfer Pumps

a. Removal. Refer to figure 3-23 and remove fuel transfer pumps.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks and wear.

(3) Replace all damaged, worn or defective parts.

c. Installation. Refer to figure 3-23 and install fuel transfer pumps.

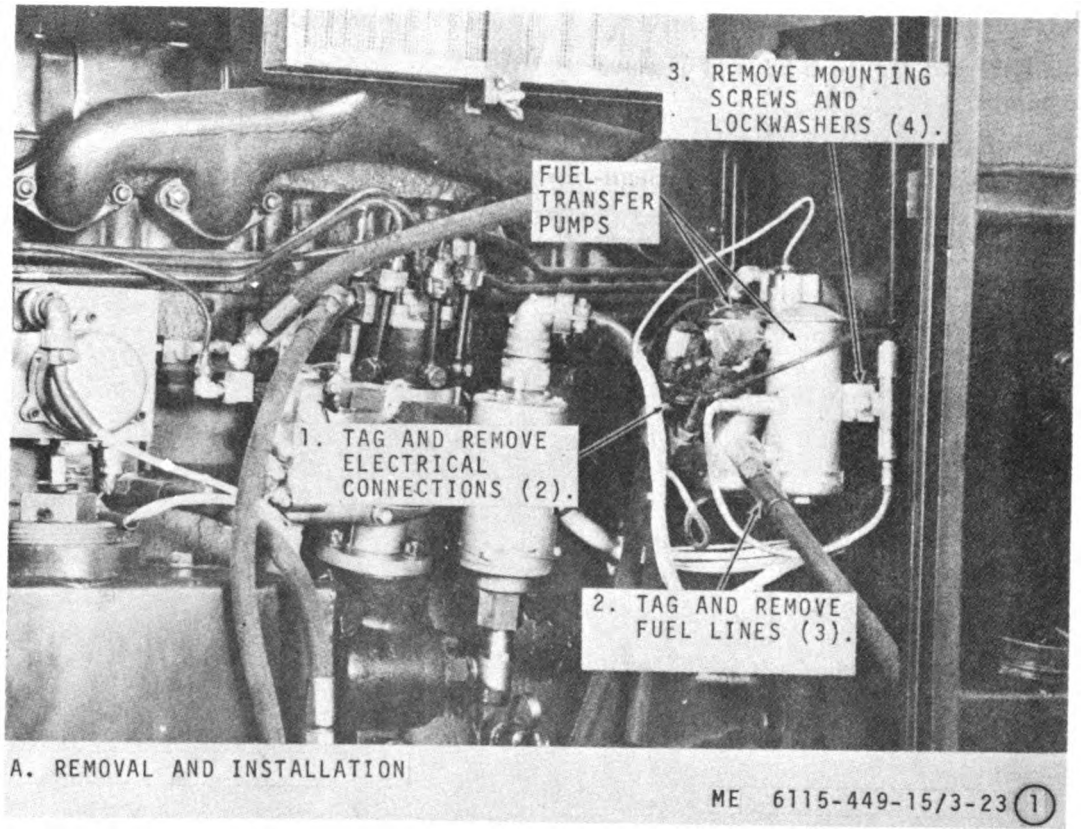

Figure 3-23. Fuel transfer pumps (Sheet 1 of 2).

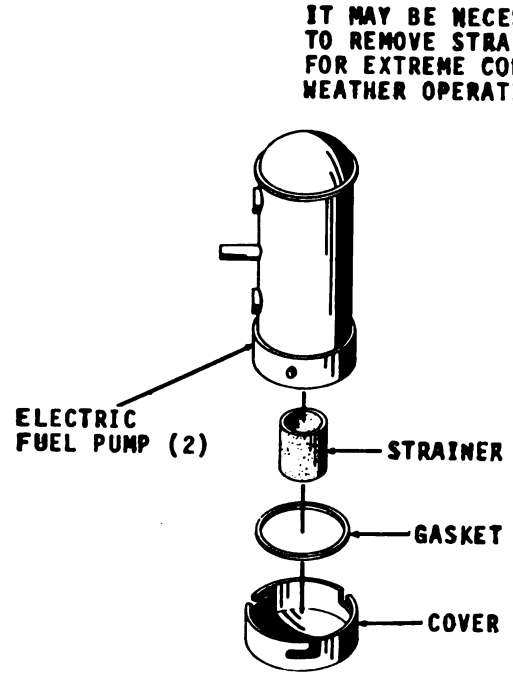

Figure 3-23. Fuel transfer pumps (Sheet 2 of 2).

3-80. Fuel Injector Nozzle

a. Removal. Refer to figures 3-24 and 7-6 and remove fuel injector nozzle.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or wear.

(3) Replace all damaged, worn or defective parts.

c. Installation. Refer to figure 3-24 and install fuel injector nozzle.

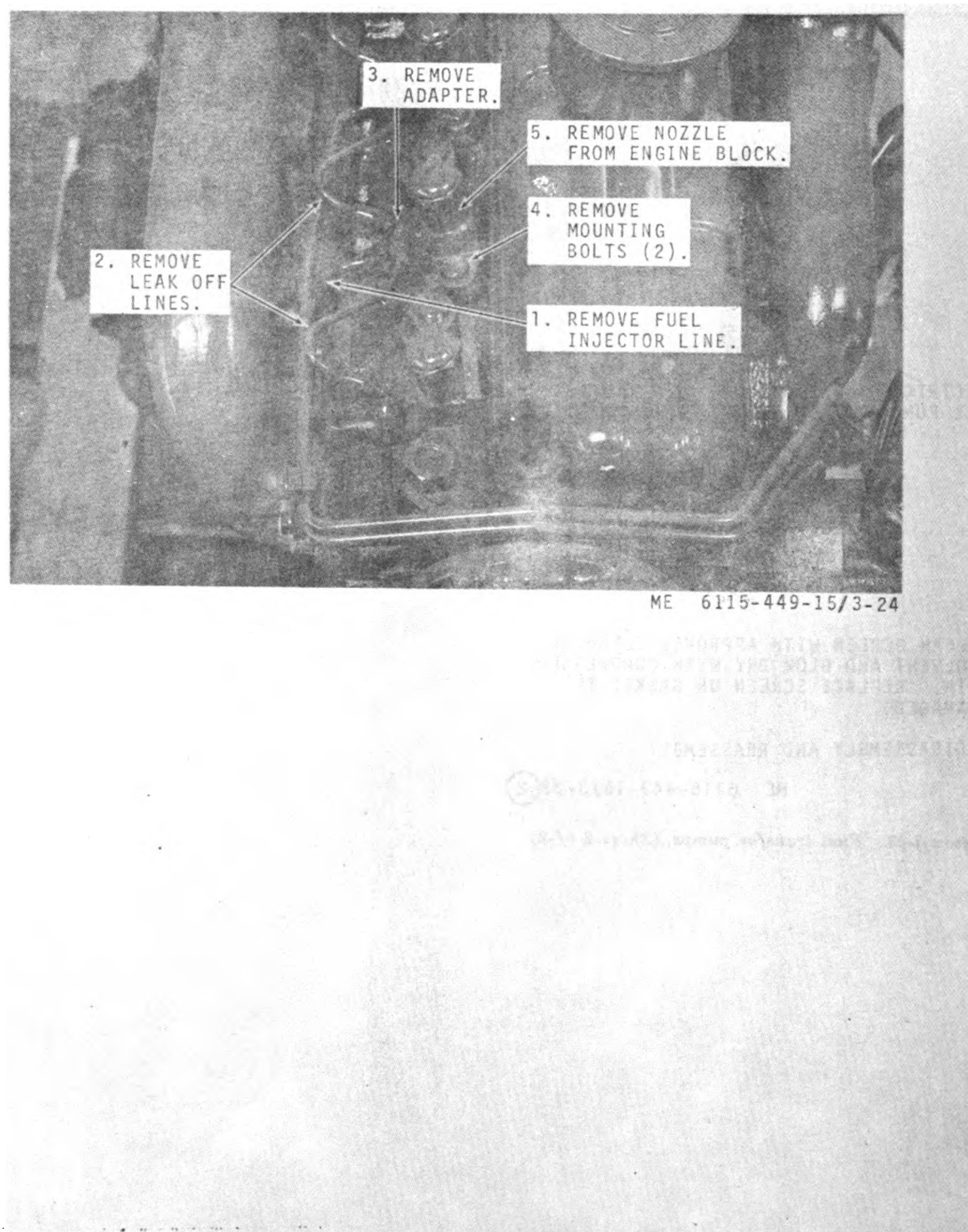

Figure 3-24. Fuel injector nozzle, removal and installation.

3-81. Intake Manifold

a. Removal. Refer to figure 3-25 and remove intake manifold.

Caution: **Do not damage fuel line on the injector nozzle.**

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, leaks or wear.

(3) Replace all damaged, worn or defective parts using new gaskets.

c. Installation. Refer to figure 3-25 and install intake manifold.

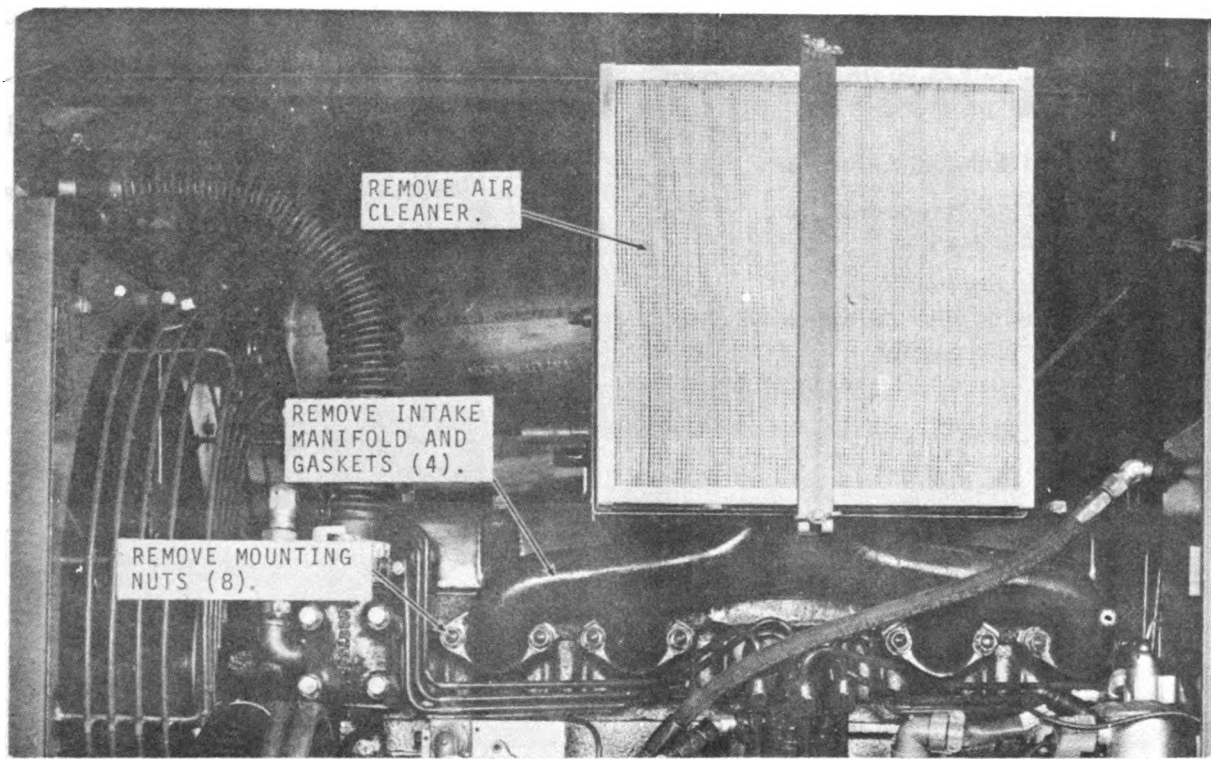

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Figure 3-25. Intake manifold, removal and installation.

3-82. General

The exhaust system consists of the exhaust manifold, exhaust stack, and rain cap. Engine combustion products are discharged through the muffler and into the exhaust stack and out through the rain cap. For indoor installation, the rain cap can be removed and an exhaust stack can be extended with suitable ducting to the open air. The rain cap is a flap valve which opens readily under exhaust gas pressure.

3-83. Muffler and Exhaust Extension

a. Removal. Refer to figure 3-26 and remove muffler and exhaust extension.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, leaks or wear.

(3) Replace all damaged, worn, or defective parts.

c. Installation. Refer to figure 3-26 and install muffler and exhaust extension.

3-84. Exhaust Manifold

a. Removal. Refer to figure 3-26 and remove exhaust manifold.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or wear.

(3) Replace all damaged, worn, or defective parts.

c. Installation. Refer to figure 3-26 and install exhaust manifold.

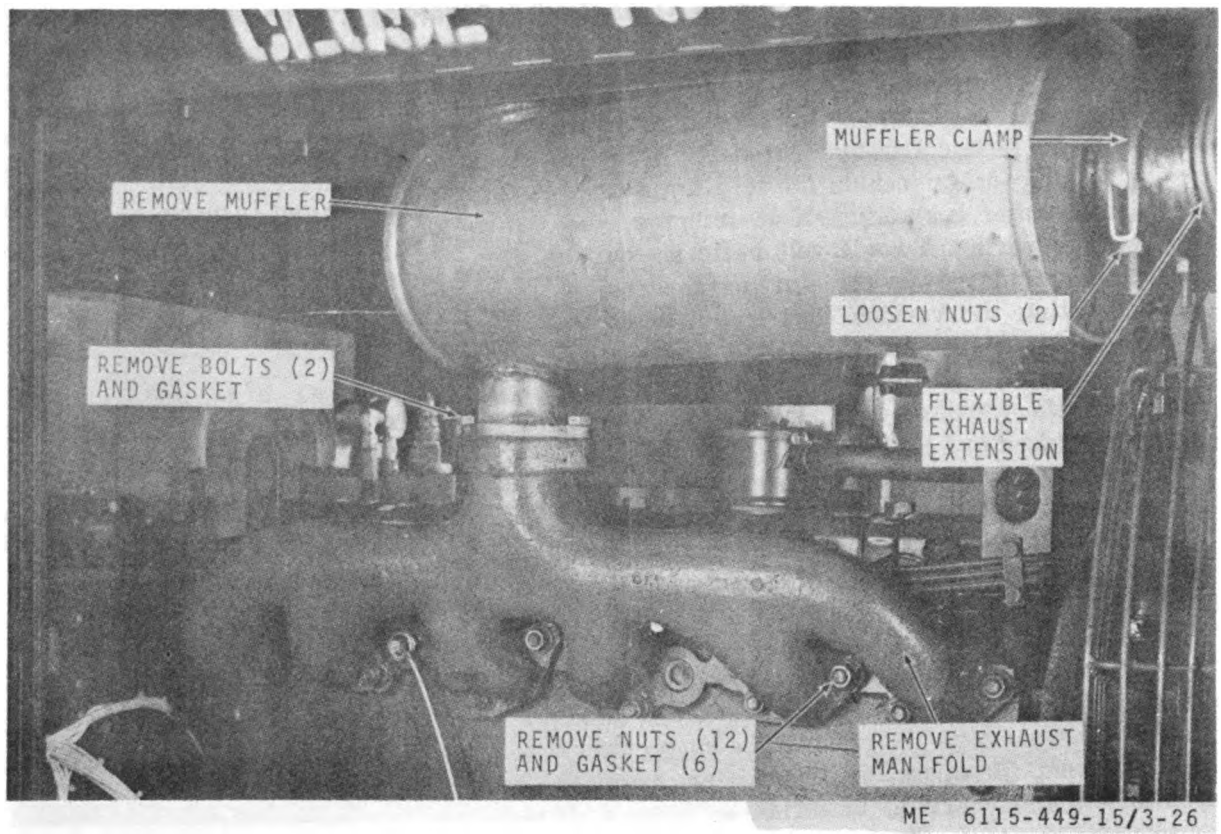


Figure 3-26. *Muffler and exhaust manifold, removal and installation.*

3-85. General

The engine of the generator set is equipped with a 24-volt, dc electrical system wired for negative ground. Components include an ac alternator, a voltage regulator, a rectifier, a dc ammeter, and appropriate wiring. Two 12-volt batteries wired in series provide power for starting the engine and operating the various electrical accessories and controls. The starting switch energizes the starter solenoid, causing the starter drive gear to engage the flywheel gear. The starter motor is also energized and cranks the engine. When the engine starts, a contact in the overspeed switch opens, breaking the starter solenoid circuit and preventing damage to the starter motor and gearing. The alternator, rectifier, and regulator serve to keep the batteries fully charged and to provide up to 30 amperes of 24-volt dc to an outside load through a two-pole receptacle. The regulator controls the voltage output of the alternator, and the rectifier converts its alternating current to direct current for operating the starter, engine accessories, and charging batteries.

3-86. Storage Batteries

a. Removal. Refer to figure 3-27 and remove batteries.

b. Cleaning and Inspection.

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

(2) Inspect batteries for cracks, breaks, leaks or wear.

c. Testing.

(1) Test batteries using an appropriate hydrometer or test equipment.

Note. Accurate battery voltage can only be tested with an appropriate load on the battery during the test.

(2) Charge batteries as required.

d. Battery Service. Refer to figure 3-10 and service batteries.

e. Replacement. Replace defective batteries.

f. Installation. Refer to figure 3-27 and install batteries.

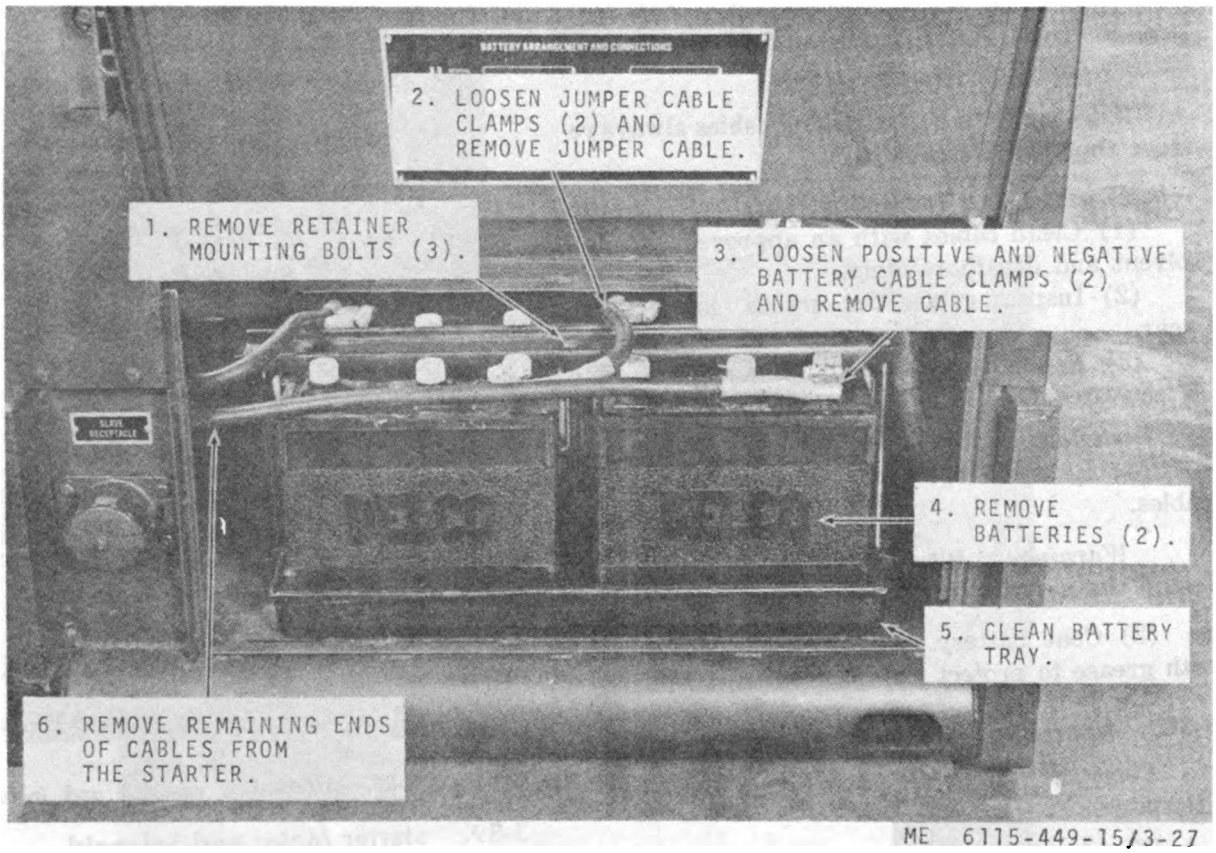


Figure 3-27. Storage batteries and cables, removal and installation.

3-87. Battery Cables

a. Removal. Refer to figure 3-27 and remove battery cables.

Warning: **When removing cables always remove the negative cable first.**

b. Cleaning and Inspection.

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

(2) Inspect cables for cracks, breaks, or wear.

(3) Repair or replace all damaged, worn, or defective cables.

c. Installation.

(1) Refer to figure 3-27 and install battery cables.

Warning: **When installing cables always install the negative cable last.**

(2) Coat battery cable clamps, at battery, with grease to protect clamps from corrosion.

3-88. Alternator

a. Removal. Refer to figure 3-28 and remove alternator.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or wear.

(3) Replace damaged, worn or defective parts.

c. Installation. Refer to figure 3-28 and install alternator.

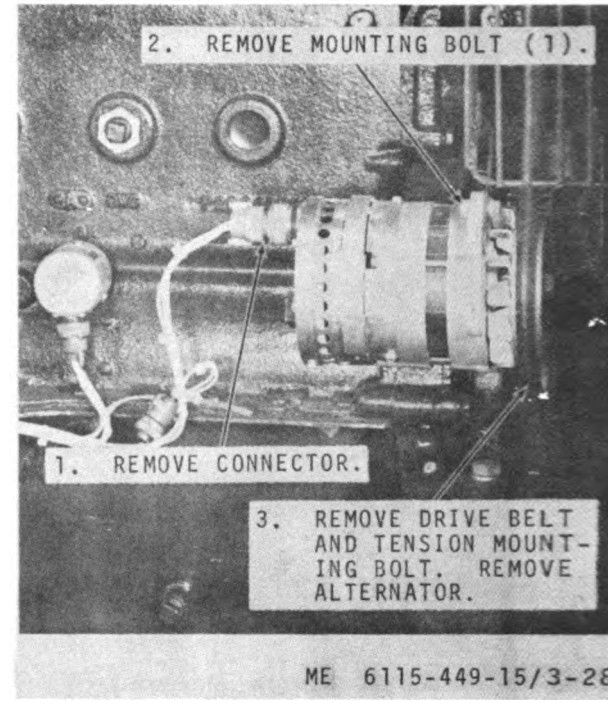


Figure 3-28. Alternator, removal and installation.

3-89. Starter Motor and Solenoid

a. Removal. Refer to figure 3-29 and remove starter motor and solenoid.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or wear.

(3) Replace all damaged, worn, or defective parts.

c. Brush Inspection and Replacement. (fig. 7-2)

(1) Loosen the two brush cover screws and slide cover away from motor frame.

(2) Lift brush tension spring and lift brush from holder for inspection. Disconnect brush leads when replacing brushes.

(3) Check brush face for deep surface pits, cracks or excessive chipping.

(4) Measure brush length. When brush is worn to a length shorter than 5/8 inch, replace the brush and adjoining brush.

(5) Make sure brush lead connections are securely fastened and that brushes move freely in their holders.

(6) Clean around brushes and commutator with dry, low-pressure compressed air.

(7) Reposition brush cover on motor frame and tighten cover screws securely.

d. Installation. Refer to figure 3-29 and install starter motor and solenoid.

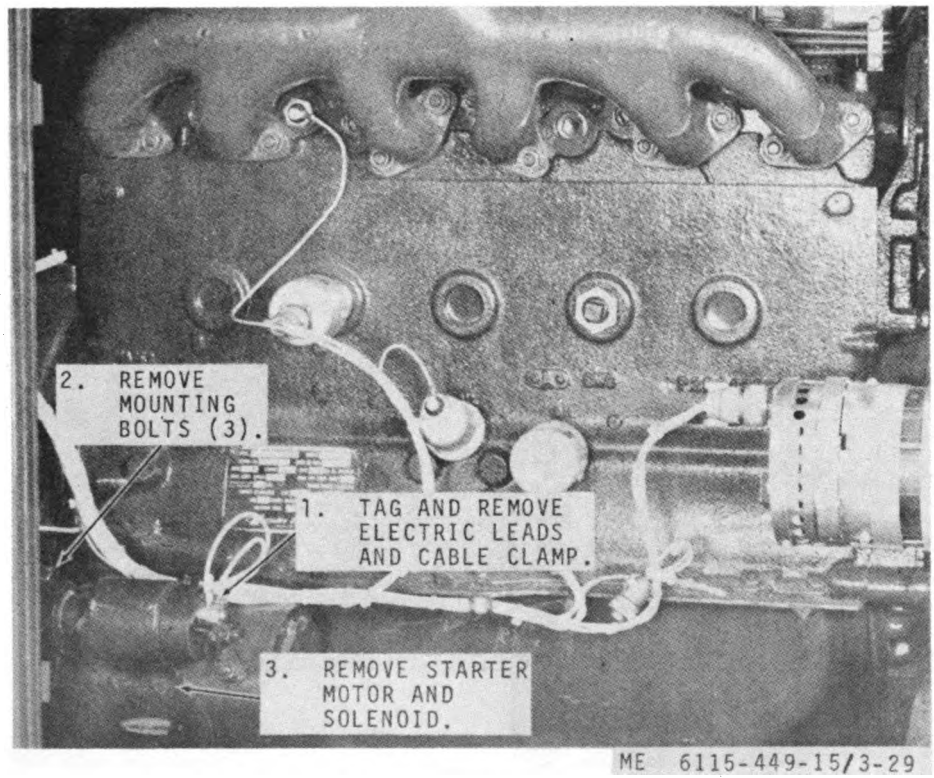


Figure 3-29. Starter motor and solenoid, removal and installation.

3-90. Slave Receptacle

a. Removal. Refer to figure 3-30 and remove the slave receptacle by removing mounting screws and lead wires from connector.

b. Cleaning and Inspection.

(1) Clean the receptacle and attached leads with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the connector for cracks, breaks, and other damage. Inspect the leads for broken or frayed insulation and other damage.

(3) Replace a damaged or defective slave receptacle.

c. Installation. Refer to figure 3-30 and install the slave receptacle by connecting lead wires to connector and installing mounting screws.

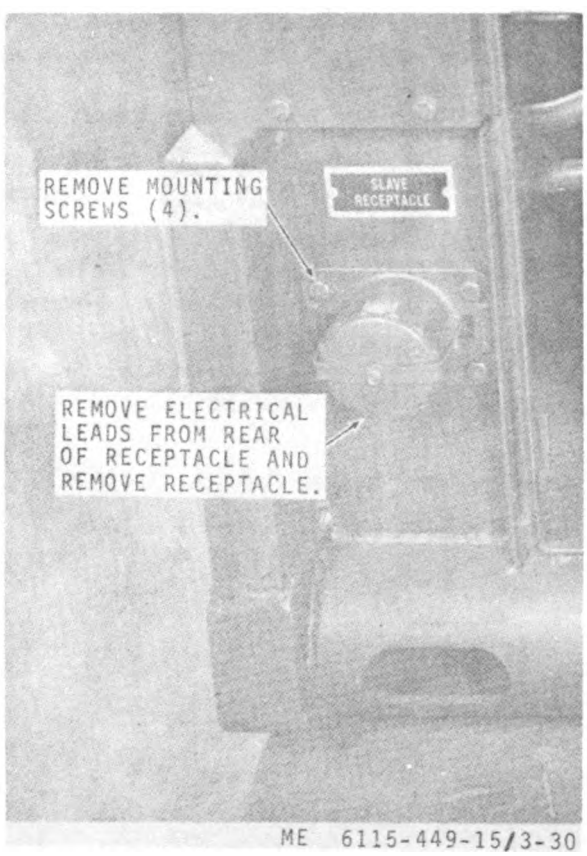


Figure 3-30. Slave receptacle, removal and installation.

3-91. Speed Switch

a. Removal. Refer to figure 3-31 and remove speed switch.

b. Cleaning and Inspection.

(1) Clean the assembly (outside only) with an approved solvent and dry thoroughly.

(2) Inspect for cracks, breaks, and other damage.

(3) Replace a damaged or defective speed switch.

c. Installation. Refer to figure 3-31 and replace speed switch.

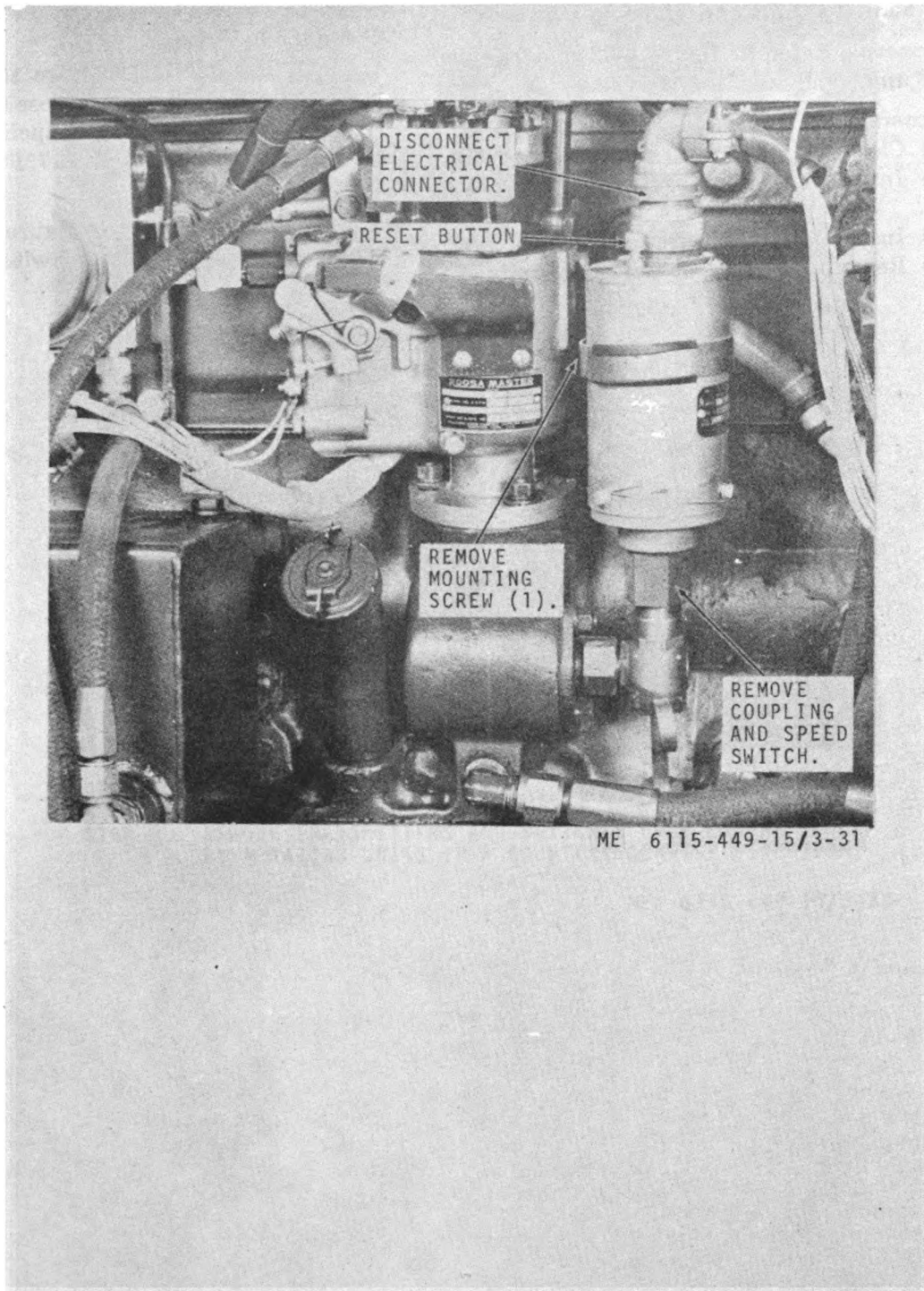


Figure 3-31. Speed switch, removal and installation.

3-92. Sending Units and Warning Switches

a. Removal. Refer to figure 3-32 and remove sending units and warning switches.

b. Cleaning and Inspection (outside only).

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

(2) Inspect for cracks, breaks, or other damage.

(3) Inspect electrical circuits.

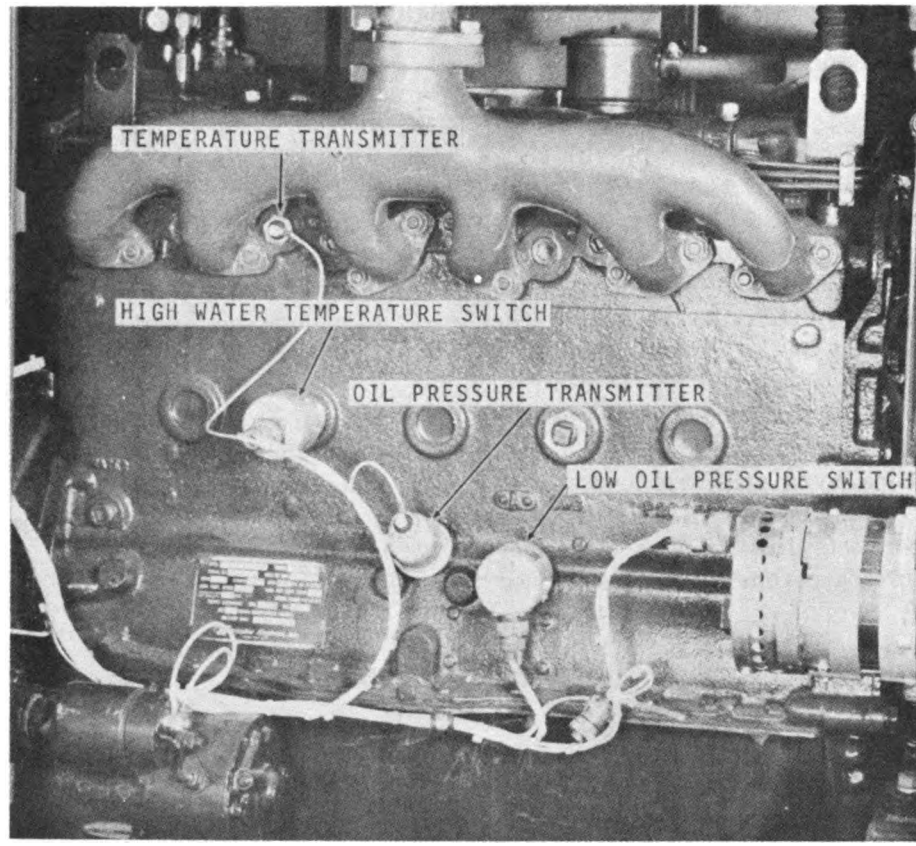
(4) Replace damaged or defective units.

c. Switch Settings.

(1) The low oil pressure shut-down switch is set to open at 13 psi and close at 19 psi.

(2) The high water temperature shut-down switch is set to open at 217°F ± 3°F and to close at 200°F ± 3°F.

d. Installation. Refer to figure 3-32 and install sending units and warning switches.



STEP 1. REMOVE ELECTRICAL LEADS.

STEP 2. REMOVE TRANSMITTERS AND SWITCHES FROM ENGINE BLOCK BY ROTATING UNITS IN A COUNTERCLOCKWISE DIRECTION.

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Figure 3-32. Sending units and warning switches removal and installation.

Section XII. LUBRICATING SYSTEM

3-93. General

The lubricating system is of the pressure type. It consists of a gear-type oil pump, with the suction end in the oil pan oil sump, which needs no priming. The oil pump is gear-driven through a gear arrangement at the center of the camshaft. The oil pump forces the oil under pressure through a full-flow oil filter to the main oil header on the cylinder block. This oil header is a drilled passage extending the length of the cylinder block on the side opposite the camshaft and is closed at both ends with plugs. Oil pressure is controlled by a pressure control mechanism assembled to a passage drilled in the cylinder block which connects directly with the oil header. A safety pressure relief valve, assembled to the oil pump, prevents excessive pressure buildup. From the main header the oil is distributed under controlled pressure, through drilled passages to all main bearings, camshaft bearings, and rocker arms. From the main bearings oil is delivered under pressure, through drilled passages in the crankshaft, to all connecting rod bearings. The cylinder walls, and valve tappets, are lubricated by means of oil drain-back and the mist of oil thrown off around the various pressure lubricated bearings. External openings provide for connection of an oil pressure gage, bypass type oil filter, or other accessories requiring pressure lubrication.

Section XIII. ENGINE

3-94. General

This section contains information on the maintenance of the engine which is the responsibility or organizational maintenance.

3-95. Rocker Arm Adjustment

a. Run engine until warm.

b. Stop engine.

c. Refer to figure 3-33 and remove rocker arm cover.

d. Refer to figure 3-34 and adjust rocker arm.

e. Refer to figure 3-33 and install rocker arm cover.

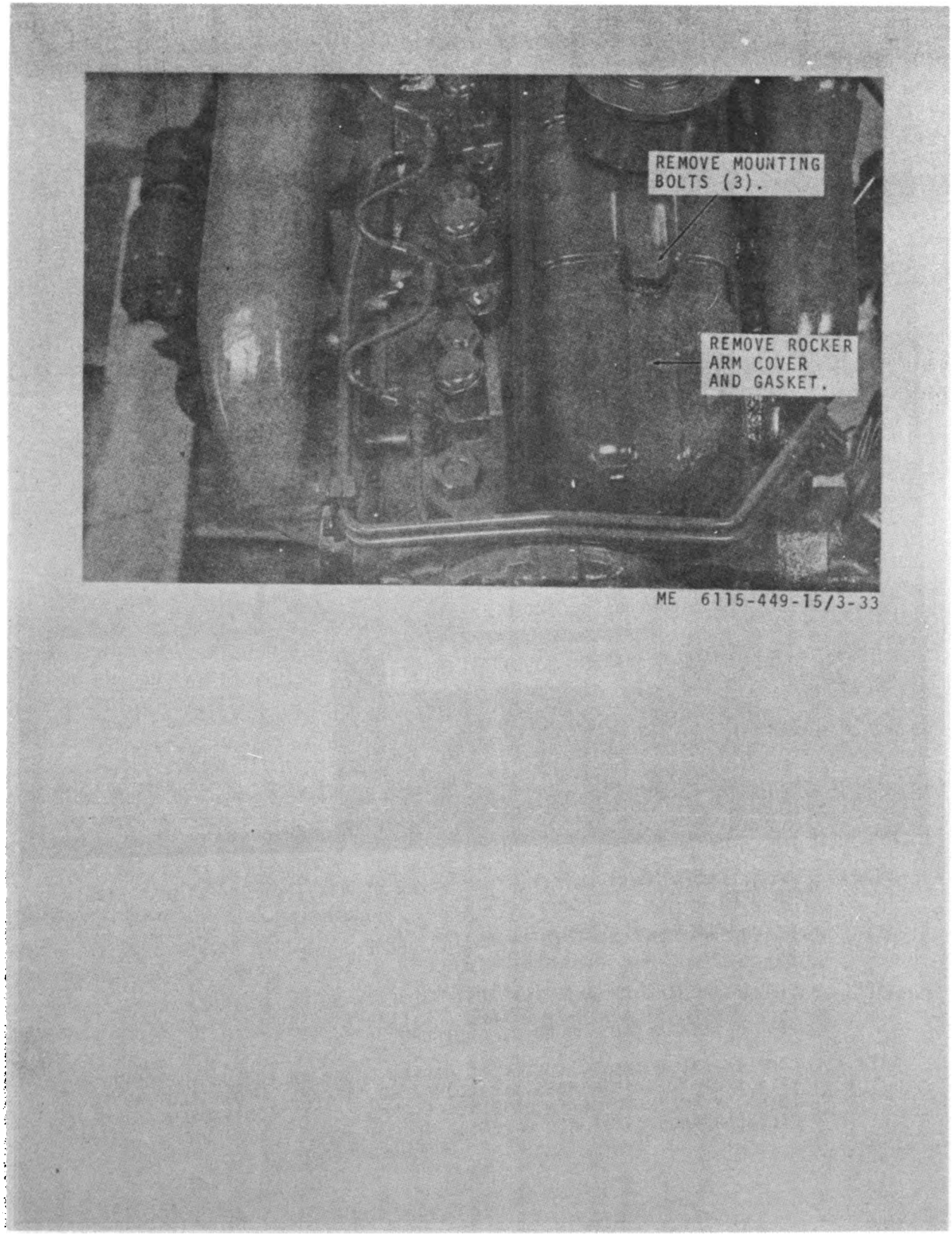
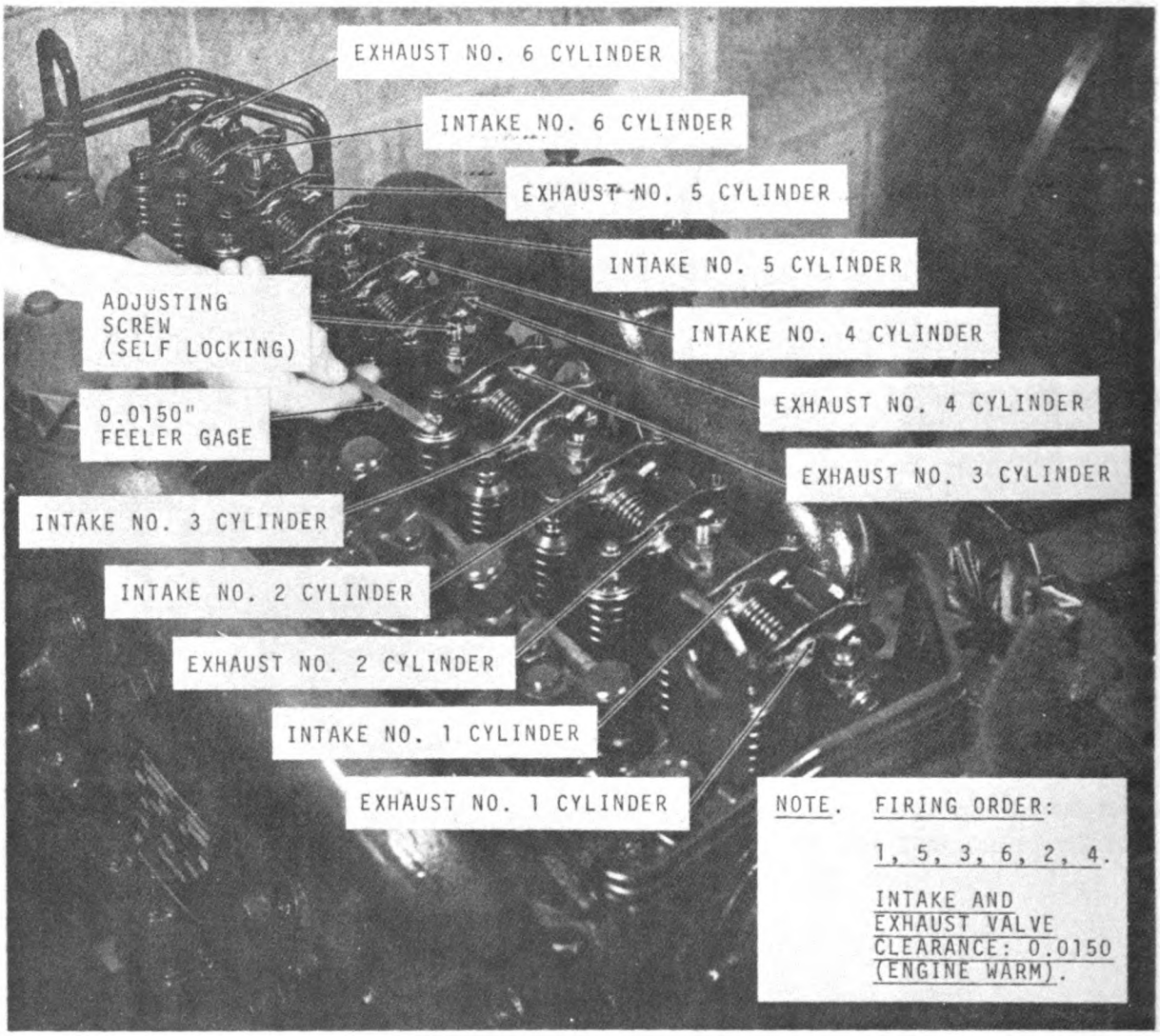


Figure 3-33. Rocker arm cover, removal and installation.



STEP 1. CRANK ENGINE OVER UNTIL INTAKE VALVE OF NO. 1 CYLINDER JUST STARTS TO OPEN.

STEP 2. USING FEELER GAGE, TURN ADJUSTING SCREW TO ADJUST ROCKER ARMS ON NO. 6 CYLINDER.

STEP 3. CRANK ENGINE OVER UNTIL EXHAUST VALVE OF NO. 5 CYLINDER JUST CLOSES AND INTAKE VALVE OF NO. 5 CYLINDER JUST STARTS TO OPEN. ADJUST ROCKER ARMS ON NO. 2 CYLINDER.

STEP 4. COMPLETE ADJUSTMENT, FOLLOWING FIRING ORDER AS FOLLOWS: POSITION VALVES OF NO. 3 CYLINDER AND ADJUST NO. 1 ARMS. POSITION VALVES OF NO. 2 CYLINDER AND ADJUST NO. 5 ARMS. POSITION VALVES OF NO. 4 CYLINDER AND ADJUST NO. 3 ARMS.

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Figure 3-34. Rocker arm adjustment.

3-96. Hydraulic Fluid Tank

a. Removal.

(1) Drain hydraulic fluid.

(2) Refer to figure 3-35 and remove tank.

b. Cleaning and Inspection.

(1) Clean tank in an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, leaks, or wear.

(3) Replace damaged, worn, or defective hydraulic fluid tank.

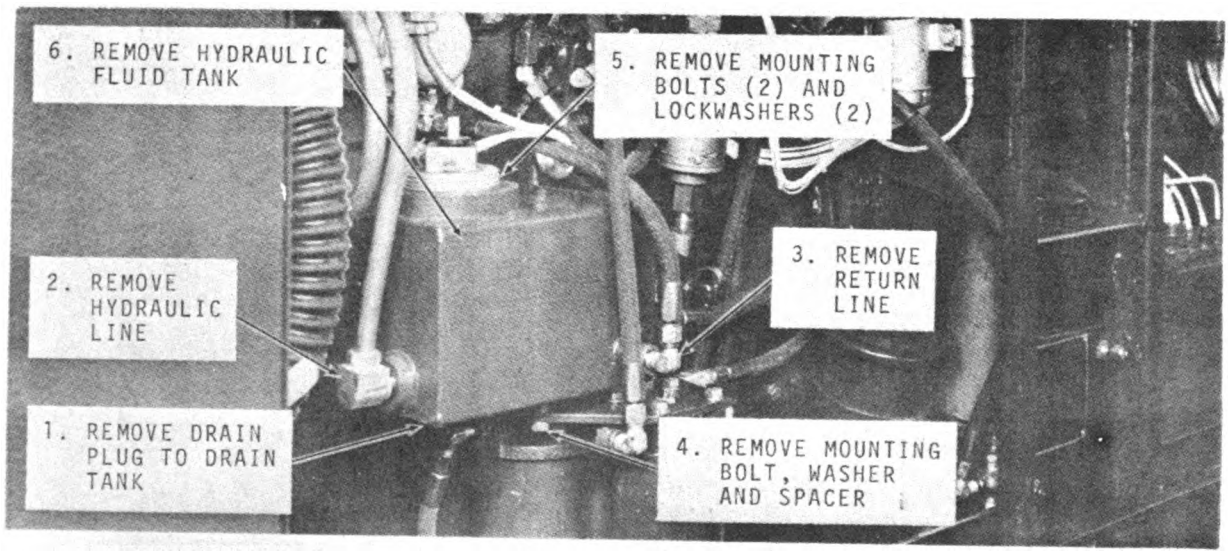


Figure 3-35. Hydraulic fluid tank, removal and installation.

c. Installation. Refer to figure 3-35 and install hydraulic fluid tank.

d. Service. Refer to paragraph 3-10 and service hydraulic fluid tank.

3-97. Throttle Control and Link Assembly

a. Removal. Refer to figure 3-36 and remove throttle control and link assembly.

b. Cleaning and Inspection.

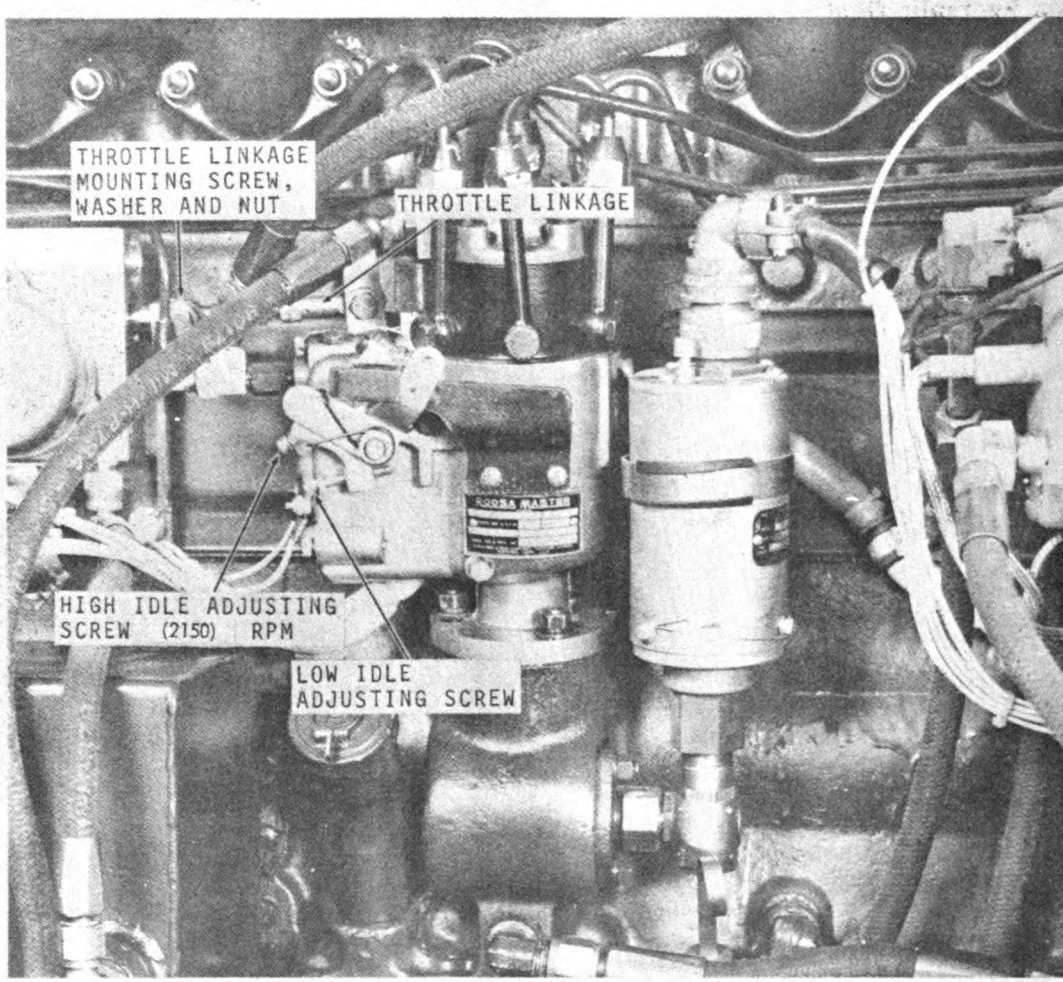
(1) Clean all parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, or wear.

(3) Replace all damaged, worn, or defective parts.

c. Installation. Refer to figure 3-36 and install throttle control and link assembly.

d. Adjustment. Refer to figure 3-36 and adjust throttle control and link assembly.



STEP 1. REMOVE SCREW, WASHER AND NUT FROM ACTUATOR SIDE OF LINKAGE.

STEP 2. REMOVE THROTTLE LINKAGE.

STEP 3. INSTALL SCREW, WASHER AND NUT ON LINKAGE.

STEP 4. ADJUST LOW AND HIGH IDLE ADJUSTING SCREWS FOR PROPER ENGINE SPEEDS.

ME 6115-449-15/3-36

Figure 3-36. Throttle control and link assembly, removal, installation and adjustment.

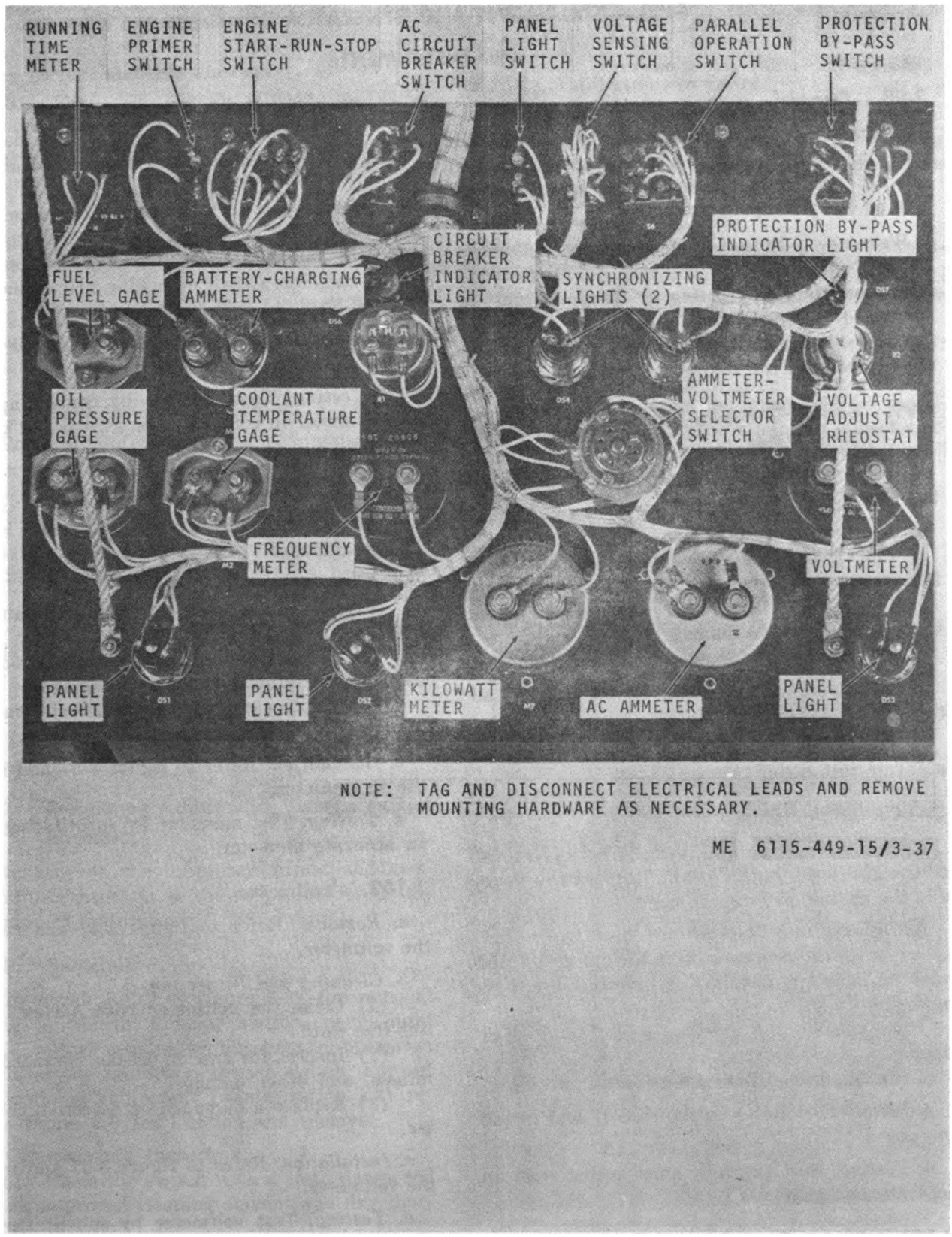


Figure 3-37. Controls and instruments, removal and installation.

Section XIV. ENGINE AND GENERATOR CONTROLS AND INSTRUMENTS

3-98. General

The system's control panels are located behind the upper doors at the rear of the generator set. Refer to chapter 2, section III for a description of these components.

Warning: **Do not perform any maintenance on the generator set controls or instruments when the unit is operating or when the unit is connected to any external lines. Also disconnect the batteries when performing maintenance on the engine electrical components.**

3-99. Battery-Charging Ammeter and Running Time Meter

a. Removal. Refer to figure 3-37 and remove the meter.

b. Cleaning and Inspection.

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

(2) Inspect for cracks, breaks, corroded terminals, and other damage.

(3) Replace a damaged or defective meter.

c. Installation. Refer to figure 3-37 and install meter.

d. Testing. Test meters by substituting with an accurate test meter.

3-100. Engine Gages

a. Removal. Refer to figure 3-37 for removal of the fuel level gage, coolant temperature gage, and the engine oil pressure gage.

b. Cleaning and Inspection.

(1) Clean the gages with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect for cracks, breaks, and other damage.

(3) Replace a damaged or defective gage.

c. Installation. Refer to figure 3-37 and install the gages.

d. Testing. Test gages by substituting with an accurate test gage.

3-101. Engine Control Switches

a. Removal. Refer to figure 3-37 for removal of the engine primer switch and the engine start-run-stop switch.

b. Cleaning and Inspection.

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

(2) Inspect for cracks, breaks, corroded terminals, and other damage.

(3) Replace a damaged or defective engine start-run-stop switch or engine primer switch.

c. Installation. Refer to figure 3-37 for installation of the engine primer switch and engine start-run-stop switch.

d. Testing. Test switches by connecting leads of ohmmeter in connectors on switch and test for continuity in each switch position.

3-102. AC Ammeter

a. Removal. Refer to figure 3-37 and remove the ac ammeter.

b. Cleaning and Inspection.

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

(2) Inspect for cracks, breaks, corroded or damaged terminals, and other damage.

(3) Replace a damaged or defective ac ammeter.

c. Installation. Refer to figure 3-37 and install the ac ammeter.

d. Testing. Test ammeter by substituting with an accurate ammeter.

3-103. Voltmeter

a. Removal. Refer to figure 3-37 and remove the voltmeter.

b. Cleaning and Inspection.

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

(2) Inspect for cracks, breaks, corroded terminals, and other damage.

(3) Replace a damaged or defective voltmeter.

c. Installation. Refer to figure 3-37 and install the voltmeter.

d. Testing. Test voltmeter by substituting an accurate voltmeter.

3-104. Ammeter-Voltmeter Selector Switch

a. Removal. Refer to figure 3-37 and remove the ammeter-voltmeter selector switch.

b. Cleaning and Inspection.

(1) Clean the switch with an approved cleaning solvent and dry thoroughly.

(2) Inspect for cracks, breaks, corroded terminals, and other damage.

c. Installation. Refer to figure 3-37 and install the ammeter-voltmeter selector switch.

d. Testing. Test switches by connecting leads of ohmmeter in connectors on switch and test for continuity in each switch position.

3-105. Frequency Meter and Kilowatt Meter

Maintenance on these instruments are the responsibility of direct support maintenance.

3-106. Panel and Indicator Lights

a. Removal. Refer to figure 3-37 and remove panel and indicator lights.

b. Cleaning and Inspection.

(1) Clean all lights in an approved cleaning solvent and dry thoroughly.

(2) Inspect all lights for cracks, breaks, or wear.

(3) Replace all damaged, worn, or defective lights.

c. Installation. Refer to figure 3-37 and install panel and indicator lights.

d. Testing. Test lights by substituting light with a good test light.

3-107. Frequency Adjust and Voltage Adjust Rheostats

Maintenance on the frequency adjust and voltage adjust rheostats is the responsibility of direct support maintenance.

3-108. Switches

a. Removal. Refer to figure 3-37 for removal of the ac circuit breaker switch, panel light switch, voltage sensing switch, parallel operation switch, or the protection bypass switch. For set with optional equipment (winterization kit) refer to figure 2-9 for location and removal.

b. Cleaning and Inspection.

(1) Clean the switch with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect for cracks, breaks, corroded terminals, and other damage.

(3) Replace a damaged or defective panel light switch.

c. Installation. Refer to figure 3-37 for installation of switches.

3-109. Fault Indicator Panel

a. Removal. Refer to figure 3-38 for removal of the fault indicator panel. Remove mounting screws and disconnect electrical connectors from rear of panel.

b. Cleaning and Inspection.

(1) Clean the fault indicator panel assembly with a clean, dry, lint-free cloth.

(2) Inspect for cracks, breaks, and other damage.

(3) Replace a damaged or defective fault indicator panel assembly.

c. Installation. Refer to figure 3-38 for installation of the fault indicator panel. Connect electrical connectors at rear of panel and install mounting screws.

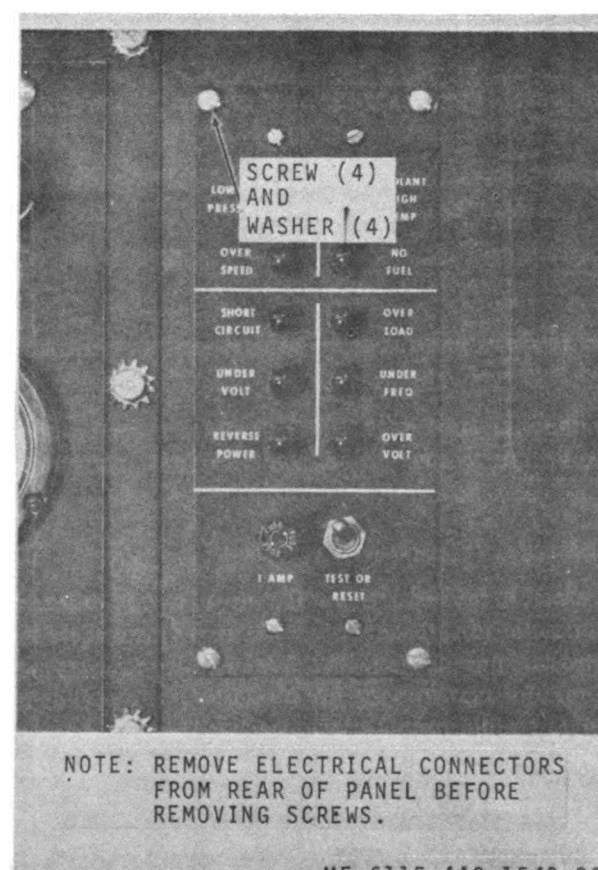


Figure 3-38. Fault indicator panel, removal and installation.

3-110. Electric Governor Control Unit

a. General. Refer to figure 3-39 and disconnect electrical connectors and mounting hardware and remove the electric governor control unit.

b. Cleaning and Inspection.

(1) Clean unit with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect for cracks, breaks, damaged connectors, damaged terminals and other damage.

(3) Replace a damaged or defective electric governor control unit.

c. Installation. Refer to figure 3-39 and install the electric governor control unit by connecting electrical connectors and mounting hardware.

d. Adjustment. Refer to paragraph 9-5*h* and adjust governor.

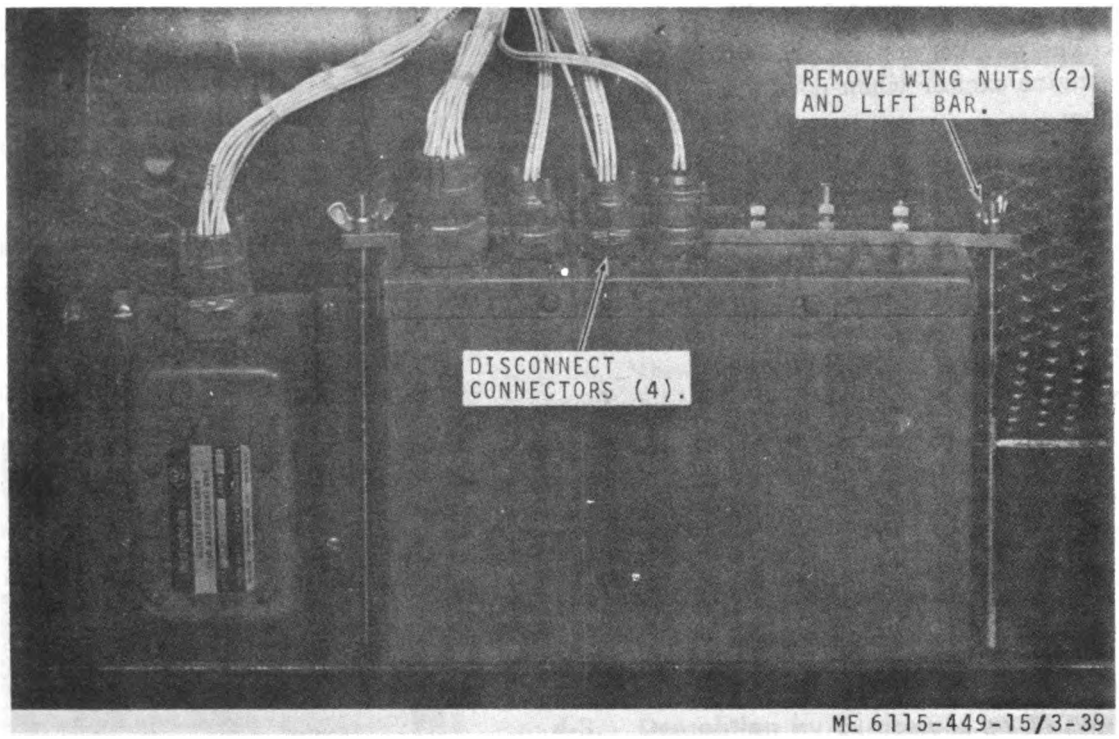


Figure 3-39. *Electrical governor control unit, removal and installation.*

3-111. Parallel Cable Assembly

a. The parallel cable assembly is stored above the engine exciter when not in use (fig. 1-1).

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, breaks, or wear.

c. Replacement. Replace all damaged, worn, or defective parts.

Section XV. GENERATOR

3-112. General

This section contains information on the maintenance of the main generator which is the responsibility of organizational maintenance. This includes the main generator covers, brushes, and load terminal board.

3-113. Main Generator Brushes

(Refer to paragraph 3-21.)

Warning: **Brushes must be centered on the collector rings.**

3-114. Load Terminal Board

a. Removal. Refer to figure 3-40 and remove load terminal board.

b. Cleaning and Inspection.

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

(2) Inspect split bolt terminals and all parts or cracks, breaks, or wear.

(3) Replace all damaged, worn, or defective parts.

c. Installation. Refer to figure 3-40 and install load terminal board.

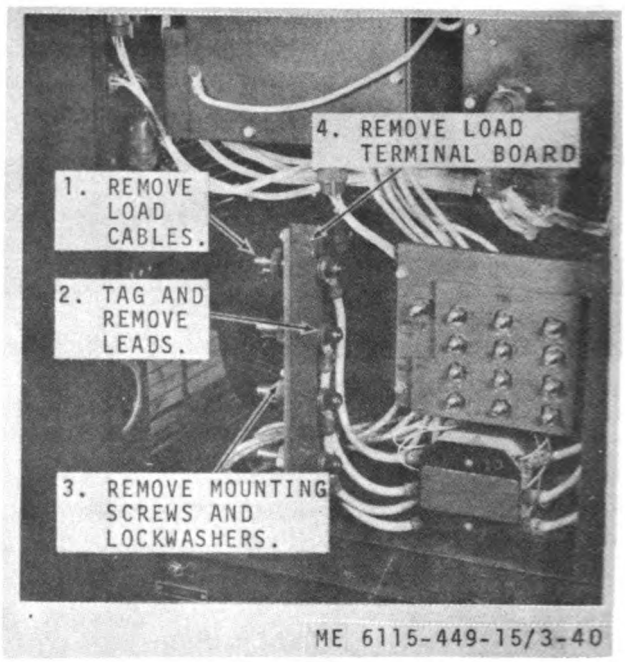


Figure 3-40. Load terminal board, removal and installation.

CHAPTER 4

DEMOLITION, SHIPMENT AND LIMITED STORAGE

Section I. DEMOLITION OF GENERATOR SET TO PREVENT ENEMY USE

4-1. General

When capture or abandonment of the generator set to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all generator sets and all corresponding repair parts.

4-2. Demolition by Mechanical Means

a. Use sledge hammers, crowbars, picks, axes, or other heavy tools which may be available to destroy the following:

(1) Engine control panel and generator control panel.

(2) Day tank and switch.

(3) Fuel injection pump.

Note. The above steps are minimum requirements for this method.

(4) Radiator and shutter.

(5) Battery-charging alternator and rectifier.

(6) Engine starting motor.

(7) Interior of static exciter.

b. Demolition by Misuse. Perform the following steps to render the generator set inoperative.

(1) Drain the radiator and engine crankcase. Place sand, gravel, nuts, bolts, screws, or broken glass into the radiator opening, oil filter tube, and fuel tank.

(2) Cut and remove the drive belts. Start the engine and block the emergency switch in the downward position. Run the engine at full throttle until failure occurs.

4-3. Demolition by Explosives or Weapons Fire

a. Explosives. Place demolition charges as shown in figure 4-1 and detonate them simultaneously. Use as many of the charges listed in figure 4-1 as time permits.

b. Weapons Fire. Fire on the generator set with the heaviest practical weapons available.

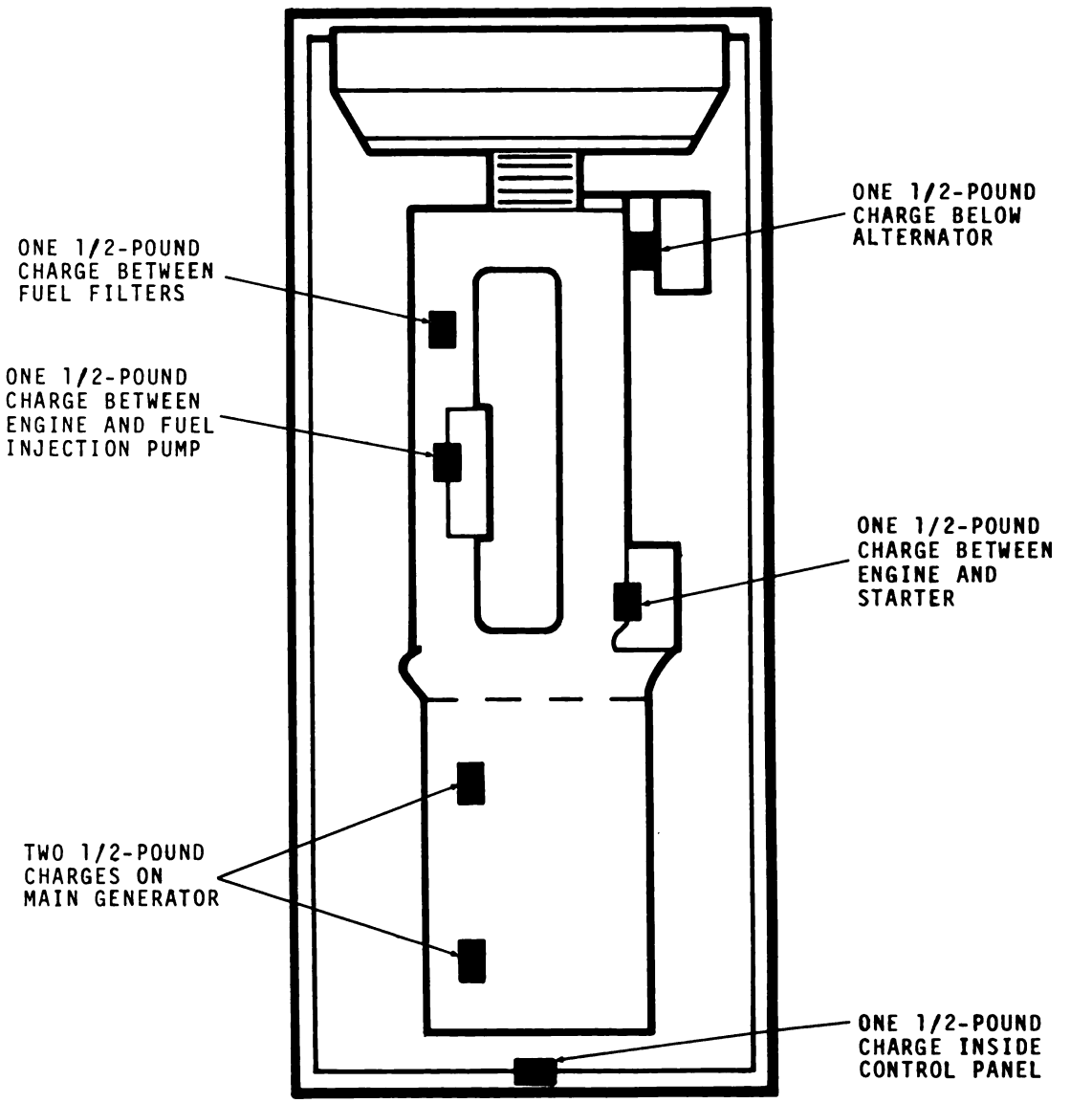


Figure 4-1. Placement of charges.

4-4. Other Demolition Methods

a. Scattering and Concealment. Remove all easily accessible parts such as the fuel injection pump, fuel injectors, starting motor, and battery-charging alternator and scatter them through dense foliage, bury them in dirt and sand, or throw them in a lake, stream, or other body of water.

b. Burning. Pack rags, clothing, or canvas under and around the unit and inside the generator set at the front and rear. Saturate this packing with gasoline, oil, or diesel fuel and ignite.

c. Submersion. Totally submerge the unit in a body of water to provide water damage and concealment. A body of salt water will do greater damage to metal parts than submersion in a body of fresh water.

4-5. Training

All operators should receive thorough training in the destruction of the generator set. Refer to FM 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training, that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.

Section II. SHIPMENT AND L...TED STORAGE

4-6. Preparation of Equipment for Shipment

a. General. Detailed instructions for the preparation of the generator set for domestic shipment are outlined within this paragraph. Preservation will be accomplished in a sequence that will not require the operation of previously preserved components.

b. Inspection. Inspect the generator set for any unusual conditions such as damage, rusting, accumulation of water, and pilferage. Inspect the individual components and assemblies as outlined in the quarterly preventive maintenance services in paragraph 3-7.

c. Cleaning and Drying. Remove all contamination from the generator set by an approved method. Approved methods of application are described in TM 38-230.

d. Painting. Repaint all surfaces where the paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instructions.

e. Depreservation Guide. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

(1) Complete a properly annotated depreservation guide concurrently with preservation for each item of mechanical equipment. Outline any peculiar requirements in the blank spaces on the form. Place the completed depreservation guide with the equipment in a waterproof envelope marked "Depreservation Guide", and fasten in a conspicuous location on or near the operator's controls.

(2) Prior to placing equipment in operation or to the extent necessary for inspection, perform depreservation of the item as outlined on the depreservation guide.

f. Cooling System. Completely drain the cooling system including radiator block and accessories through which the coolant has circulated. Flush with clean water. Leave draincocks open.

g. Lubrication System. Check level of lubricant. Operate the engine at fast idle until lubricant has been circulated throughout the system. The lubricant shall remain in the crankcase.

h. Sealing of Openings. Seal openings that will permit the direct entry of water into the interior of the engine, starting motor, generator, electrical enclosures and so on, with pressure-sensitive tape conforming to PPP-T-60, Type IV.

i. Fuel Tank. Drain fuel tank after engine preservation and fog interior with preservative oil, conforming to MIL-L-21260, Symbol PE-2.

j. Air Cleaner. Clean the air cleaner and seal all openings that permit the direct entry of water. Use pressure-sensitive tape conforming to specification PPP-T-60, Type IV.

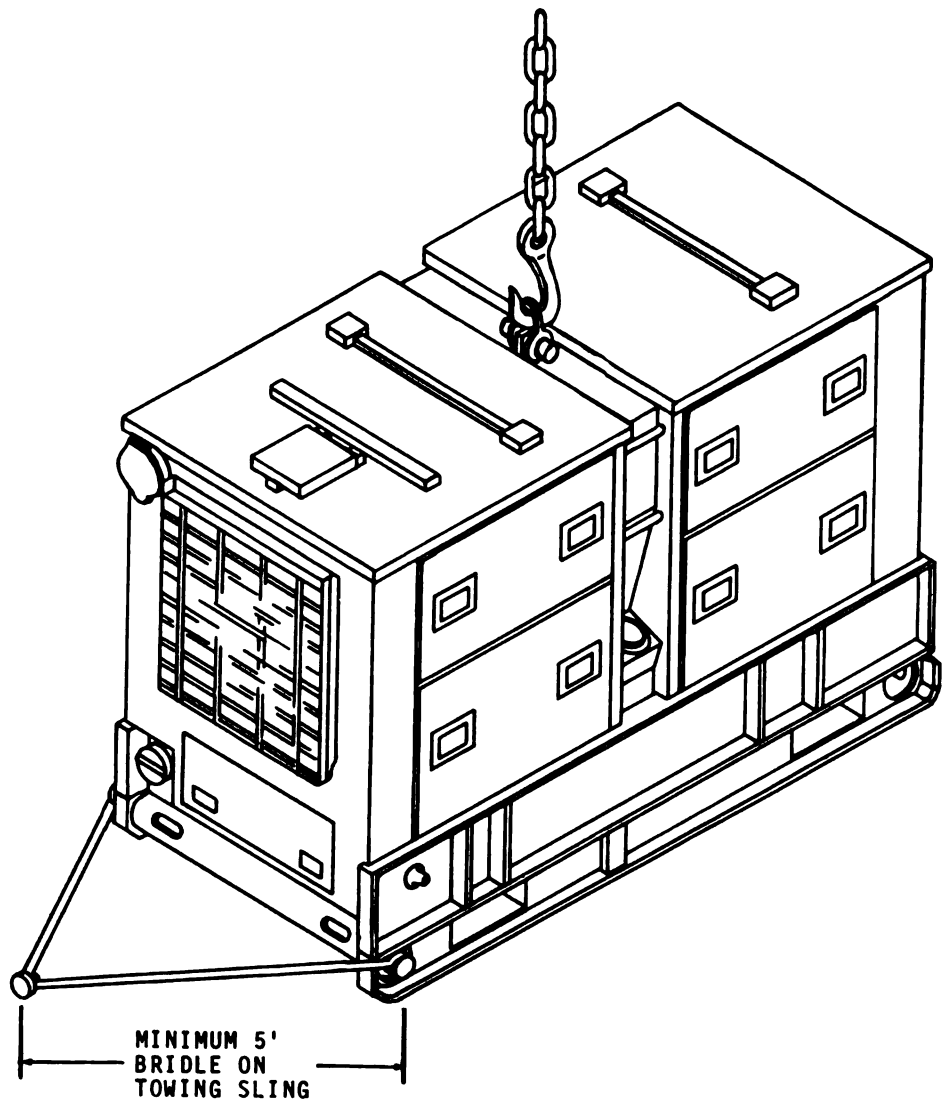
k. Exterior Surfaces. Coat exposed machined ferrous metal surfaces with type P-6 preservative conforming to MIL-C-11796, Class 3. If preservative is not available, cup grease may be used.

l. Marking. Markings must conform to MIL-STD-129.

m. Batteries and Cables. Fill batteries, check that they are fully charged and secured in the battery compartment. Disconnect cables, seal vent holes, wrap and secure all terminals with Type IV pressure-sensitive tape conforming to PPP-T-60.

4-7. Loading Equipment for Shipment (fig. 4-2)

Use appropriate materials handling equipment of sufficient capacity to lift the generator set onto the carrier. Block and tie the unit to the carrier to assure that it will not move during transit.



ME 6115-449-15/4-2

Figure 4-2. Generator set loading for shipment.

4-8. Preparation of Equipment for Storage

a. Detailed instructions for preparation of the generator set for limited storage are provided in paragraph 4-6.

b. Make every effort to provide covered storage for the generator set. If this is impossible, select a firm, level, well-drained storage location, protected from prevailing winds. Position the generator set on heavy planking. Cover the generator set with a tarpaulin or other suitable water-proof covering and secure in a manner that will provide the generator set maximum protection from the elements.

4-9. Inspection and Maintenance of Equipment in Storage

Inspect the generator set every 90 days, as outlined on the quarterly preventive maintenance services (fig. 3-5) and operate long enough to assure complete lubrication of bearings. After each inspection period, represerve the generator set as outlined in paragraph 4-6*e*.

CHAPTER 5

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

5-1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Model SF-30-MD/CIED generator set. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

5-2. Record and Report Forms

For record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in a canvas bag placed in the manual compartment mounted on equipment.

Section II. DESCRIPTION AND TABULATED DATA

5-3. Description

For complete description of the generator set, (para 1-3).

5-4. Tabulated Data

a. General. This paragraph contains all the overhaul data pertinent to direct and general support and depot maintenance personnel. A schematic wiring diagram (fig. 5-1) is also provided.

Figure 5-1. *Schematic wiring diagram* (*Sheet* 1 *of* 2). **(Located in back of manual)**

Figure 5-1. *Schematic wiring diagram* (*Sheet* 2 *of* 2). **(Located in back of manual)**

b. Generator Classification and Rating.

Rating	30 KW	
Power factor	0.8	
Degree of enclosure	Dripproof	
Type	Synchronous Salient-Pole AC	
Phase	3	
Cooling	Fan	
Lubrication	Sealed bearing	
Drive	Direct	
Temperature rise	167° F (75° C)	
Frequency	60 *Hertz*	50 *Hertz*
Voltage:	240/416 wye, 4 wire	240/416 wye, 4 wire
	120/208 wye, 4 wire	120/208 wye, 4 wire
Amperes:	52 amps @ 240/416 wye 4 wire	43 amps @ 240/416 wye 4 wire
	104 amps @ 120/208 wye 4 wire	86 amps @ 120/208 wye 4 wire
Duty classification	Continuous	

c. Exciter Classification and Rating.

Cooling	Convection
Mounting	Bolted to generator
Voltage	28
Amperes	26.5
Duty classification	Continuous
Field winding	Series
Degree of enclosure	Dripproof.

d. Generator Repair and Replacement Standards.

Stator:	
Number of slots	48
Number of coils per slot	2
Number of sections in winding mold	4
Number of turns per section	3 per sec. 1
Number of turns per section	4 per sec. 2 4 per sec. 3 3 per sec. 4
Number of strands per turn	6
Number of strands per slot	42
Pitch of coils	1 and 11
Type of winding	Series star
Number of leads out	12
Insulating materials	Slot insulators (48 req'd) Phase insulators (12 req'd) Lead insulators (AR)
Dipping compounds	Varnish, type II, grade CB, MIL-V-173. Varnish, MIL-I-24092.

Dipping and baking procedures ..... Dip completely wound stator in varnish grade CB for 50-70 seconds. Bake with bore vertical at 293° F (145° C) to 311° F (155° C) for 3.5 to 4.0 hours. Repeat this process. Cool to ambient temperature.
Apply one coat of grade CB varnish.

Rotor:
- Number of coils 4
- Number of turns per coil 117
- Number of turns per layer 9
- Wire size .....No. 10 AWG
- Type of wire .....CLI (MIL-W-7139)
- Coil connection .....Series
- Insulating materials ....Varnish, type M, grade CL155, treatment per MIL-I-24092. Lead insulators (AR), glass sleeve, 0.294 ID. Lead connection insulators (AR) type BCC-A, form 3 class C, glass sleeve, 1/18 ID. Shaft insulator.
- Dipping compounds .....Varnish, type M, grade CL155, MIL-I-24092. Varnish, fungus-resistant, MIL-V-173. After each layer of wire, brush on type M varnish. Heat in vertical position for 4 hours at 293° F (145° C) to 311° F (155° C). Dip rotor in varnish for 25 to 35 seconds. Repeat process. Cool to ambient temperature.

Generator brush rigging:
- No. of brushes 4
- Brush grade .....Carbon

e. Nut and Bolt Torque Data.

- Manifold stud nuts (intake and exhaust) .....35 ft-lb (foot-pound)
- Cyl. head nuts 5/8" solid stud ....175 ft-lb
- Cyl. head nuts 5/8" hollow stud ...135 ft-lb
- Cyl. head nuts 9/16" studs .....135 ft-lb
- Flywheel bolt .....80 ft-lb
- Fuel nozzle attaching nut .....20 ft-lb
- All other bolts and nuts to be securely but not excessively tightened.

f. Engine Repair and Replacement Standards. Table 5-1 lists manufacturer's sizes, maximum allowance wear, and maximum allowable clearance.

g. Schematic Wiring Diagram. Refer to figure 5-1.

h. Troubleshooting. Refer to figure 5-2.

Figure 5-2. *Troubleshooting schematic (Sheet 1 of 2).* **(Located in back of manual)**

Figure 5-2. *Troubleshooting schematic (Sheet 2 of 2).* **(Located in back of manual)**

Table 5-1. *Engine Repair and Replacement Standards*

Component	Manufacturer's dimension and tolerance in inches		Desired clearance		Maximum allowable wear in inches	Maximum allowable clearance in inches
	Minimum	Maximum	Minimum	Maximum		
CYLINDER BLOCK:						
Cyl. bore dia. 3 3/4" bore	3.7490	3.7510			0.0050	
Cyl. bore dia. 4" bore	3.9990	4.0010			0.0050	
Cyl. bore out of round		0.0005			0.0030	
Cyl. bore taper		0.0005			0.0020	
Main brg. bore—less brgs.	3.0665	3.0670				
Camshaft brg. bore—less brgs.	2.1870	2.1880				
Oil pump bore	2.0000	2.0005				
Valve tappet bore	0.7494	0.7500				
Main brg. cap bolt torque ft. lbs.	78	82	80			
CYLINDER SLEEVE:						
Cyl. sleeve length 3 3/4" bore		8 7/8				
Cyl. sleeve o.d.	3.9990	4.0000				
Cyl. sleeve to block	Selective		Hand push fit			
Cyl. sleeve above block deck	0.0020	0.0040				

Table 5-1. Engine Repair and Replacement Standards—Continued

Component	Manufacturer's dimension and tolerance in inches		Desired clearance		Maximum allowable wear in inches	Maximum allowable clearance in inches
	Minimum	Maximum	Minimum	Maximum		
CRANKSHAFT:						
Main brg. journal dia.	2.8734	2.8744			0.0030	
Main brg. journal out of round		0.0003			0.0020	
Main brg. journal taper		0.0003			0.0015	
Main brg. run-out of center		0.0020			0.0030	
Conn. rod journal dia.	2.3730	2.3740			0.0020	
Conn. rod journal out of round		0.0003			0.0020	
Conn. rod journal taper		0.0003			0.0015	
Fillet radii	0.1400	0.1700				
Crankshaft main brg. clearance			0.0009	0.0034		0.0070
Crankshaft thrust clearance			0.0050	0.0100		0.0150
Seal surface dia.—rear	4.3100	4.3150			0.0150	
Seal surface dia.—front	1.8740	1.8750			0.0150	
CONNECTING ROD:						
Length—c/1 to c/1	7.9980	8.0020				
Bearing bore—less bearings	2.5260	2.5270				
Brg. to crankshaft clearance			0.0010	0.0030		0.0050
Conn. rod side clearance			0.0050	0.0120		0.0200
Piston pin bushing bore—less bushing	1.4370	1.4380				
Piston pin bushing bore	1.2503	1.2508			0.0015	
Cap bolt torque ft. lbs.	68	72	70			
CAMSHAFT:						
Bearing journal dia.—all	2.0530	2.0540			0.0020	
Lobe diameter—base to tip	1.7200	1.7250			0.0100	
Journal run-out in vee blocks		0.0010			0.0040	
Bearing clearance			0.0015	0.0035		0.0060
End thrust			0.0015	0.0055		0.0120
Back lash camshaft to crank gear			0.0010	0.0030		
Gear retaining nut torque ft.-lbs.	125	135	130			
PISTON: (with newly honed bores and new pistons)						
Clearance in cyl. bore—all	5 lb.	5 lb.	Pull on 1/2 × 0.0050 ribbon			
Piston pin bore	1.2500	1.2502			0.0010	
Width of ring groove—top—Keystone	1/8 nom.					
Width of ring groove—2nd and 3rd comp.	0.0975	0.0990			0.0050	
Width of ring groove—top—oil control	0.1880	0.1895			0.0050	
Width of ring groove—lower oil control	0.1880	0.1890			0.0050	
PISTON PIN:						
Length 3 3/4 dia. piston	3.0350	3.0400				
Diameter	1.2498	1.2499			0.0020	
Clearance in piston			0.0000	0.0005		0.0020
Clearance in connecting rod			0.0005	0.0012		0.0050
PISTON RING:						
Clearance in groove—top	Keystone taper					
Clearance in groove—2nd and 3rd comp.	0.0040	0.0060				0.0080
Clearance in groove—oil control	0.0015	0.0030				0.0080
Gap	0.0100	0.0200				0.0400
VALVE, INTAKE:						
Head diameter	1.6825	1.6925				
Stem diameter	0.3725	0.3735			0.0025	
Stem to guide clearance			0.0005	0.0025		0.0050
Stem to rocker arm clearance—hot			0.0150			
Seat diameter in head	1.6470	1.6530			1/8	
Seat width in head		7/64				
Top of valve recessed below cyl. head deck	0.0210					
Valve seat angle	30°					

Table 5-1. Engine Repair and Replacement Standards —Continued

Component	Manufacturer's dimension and tolerance in inches		Desired clearance		Maximum allowable wear in inches	Maximum allowable clearance in inches
	Minimum	Maximum	Minimum	Maximum		
VALVE, EXHAUST:						
Head diameter	1.4950	1.5050				
Stem diameter	0.3740	0.3750			0.0025	
Stem to guide clearance			0.0015	0.0035		0.0060
Stem to rocker arm clearance—hot			0.0150			
Seat diameter to head	1.4510	1.4560				
Seat width in head		7/64			1/8	
Top of valve recessed below cyl. head deck	0.0210					
Valve seat angle	45°					
VALVE GUIDE:						
Length	2.9325	2.9425				
Outside diameter	0.6265	0.6270				
Bore dia.—intake—ream	0.3740	0.3750			0.0030	
Bore dia.—exhaust—ream	0.3750	0.3760			0.0030	
Depth below cyl. head deck—all	1.3700	1.3800				
TAPPET, VALVE LIFTER (PUSH ROD):						
Body diameter	0.7482	.7490			0.0030	
Overall length	2.2450	2.2550				
Clearance in bore (block)			0.0005	0.0015		0.0050
VALVE SPRINGS—INTAKE AND EXHAUST:						
Free length	1.7960	1.8360				
Total coils	6 1/4					
Diameter wire	0.1770					
Outside diameter	1.2920	1.3020				
Test load at 1.4920 inches lbs.	72	82				
Test load at 1.0820 inches lbs.	163	180				
VALVE SPRING—INTAKE AND EXHAUST: (Note. This spring is used in some engines and is not interchangeable.)						
Free length	1.8630	1.9030				
Total coils	7 1/2					
Diameter wire	0.1420					
Outside diameter	1.2300	1.2500				
Test load at 1.5225 inches lbs.	38	45				
Test load at 1.1725 inches lbs.	80	86				
OIL PUMP BODY:						
Shaft bore dia.—main	0.6255	0.6265			0.0030	
Shaft bore dia.—idler	0.6255	0.6265			0.0030	
Pump gear bore dia.	1.5005	1.5015			0.0050	
Pump gear bore depth	1.5640	1.5650			0.0040	
SHAFTS:						
Length—main	9.2400	9.2500				
Length—idler	2.7450	2.7550				
Diameter—main	0.6240	0.6245			0.0020	
Shaft clearance in body			0.0010	0.0025	0.0030	0.0060
GEARS:						
Outside dia.—both	1.4975	1.4985			0.0020	
Length—both	1.5610	1.5620				
Clearance in body bore			0.0020	0.0040		0.0070
End clearance to body			0.0020	0.0040		0.0080
Backlash, drive gear to camshaft			0.0060	0.0120		0.0200
FLYWHEEL:						
Clutch face run out at 6 in. rad.		0.0080				
Pilot bore eccentricity		0.0050				
FLYWHEEL HOUSING:						
Clutch attaching face deviation		0.0080				
Clutch housing bore eccentricity		0.0050				

Table 5-1. Engine Repair and Replacement Standards—Continued

Component	Manufacturer's dimension and tolerance in inches		Desired clearance		Maximum allowable wear in inches	Maximum allowable clearance in inches
	Minimum	Maximum	Minimum	Maximum		
ROCKER ARM MECHANISM:						
Rocker shaft length—6 cyl.	13.7400	13.7600				
Rocker shaft diameter	0.8590	0.8600			0.0030	
Rocker arm bore diameter	0.8625	0.8635			0.0030	
Rocker arm clearance on shaft			0.0025	0.0045		0.0120
Tappet adjusting screw torque ft.-lbs.	3	10				
TORQUE VALVES—MISC. FT.-LBS.						
Cyl. head nuts 5/8" solid stud	170	180	175			
Cyl. head nuts 5/8" hollow stud	130	140	135			
Cyl. head nuts 9/16" studs	130	140	135			
Flywheel bolt	77	83	80			
Manifold—intake and exhaust	30	40	35			
Fuel nozzle attaching nut	18	22	20			
All other bolts and nuts to be securely but not excessively tightened.						

CHAPTER 6

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

6-1. Special Tools

No special tools are required to perform direct and general support and depot maintenance on the generator set.

6-2. Special Equipment

No special equipment is required by direct and general support and depot maintenance personnel for performing maintenance on the generator set.

Section II. TROUBLESHOOTING

6-3. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the generator set or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause (fig. 5-2).

6-4. Engine Hard to Start or Fails to Start

Probable cause	*Possible remedy*
Electric starter fails to crank engine	Refer to paragraph 6-15.
Cylinder head gasket defective	Replace cylinder head gasket (para 7-11).
Valves burned, sticking, or have defective valve springs	Repair or replace valves and/or springs (para 7-11).
Piston rings worn or broken	Replace piston rings (para 7-17).
Pistons and/or cylinder sleeves worn	Replace pistons and/or cylinder sleeves (para 7-17).

6-5. Engine Misses or Runs Erratically

Probable cause	*Possible remedy*
Valves burned, sticking, or have defective valve springs	Repair or replace valves and/or valve springs (para 7-11).
Fuel injection nozzles defective	Repair defective fuel injection nozzles (para 7-8).
Fuel injection pump out of time or defective	Test, repair or replace fuel injection pump (para 7-7).

6-6. Engine Stops Suddenly

Probable cause	*Possible remedy*
Fuel injection pump defective	Repair fuel injection pump (para 7-7).
Oil pressure low	Inspect lubrication system to determine cause of low oil pressure.
Speed switch defective	Replace speed switch (para 8-91).

6-7. Engine Lacks Power

Probable cause	*Possible remedy*
Valves burned or have defective valve springs	Repair or replace valves and/or valve springs (para 7-11).
Piston rings worn or broken	Replace piston rings (para 7-17.
Cylinder sleeves worn	Replace cylinder sleeves (para 7-17).
Fuel injection nozzles out of adjustment or defective	Adjust, repair, or replace fuel injection nozzles (para 7-8).
Fuel injection pump defective	Overhaul fuel injection pump (para 7-7).

6-8. Engine Will not Idle Smoothly

Probable cause	*Possible remedy*
Fuel injection pump defective	Repair fuel injection pump (para 7-7).
Valves burned or have defective valve springs	Repair or replace valve and/or valve springs (para 7-11).
Fuel injection nozzles out of adjustment, dirty, or defective	Adjust, clean or repair fuel injection nozzles (para 7-8).
Piston or piston rings worn or broken	Replace piston and piston rings (para 7-17).
Camshaft defective	Replace camshaft (para 7-13).

6-9. Engine Overheats

Probable cause	*Possible remedy*
Fuel injection pump out of time	Retime fuel injection pump (para 7-7).
Radiator clogged or defective	Clean, repair or replace radiator (para 7-4).
Water pump defective	Repair or replace water pump (para 7-6).
Crankshaft defective	Inspect, repair or replace crankshaft (para 7-16).

6-10. Engine Exhaust White

Probable cause	*Possible remedy*
Fuel injection nozzles out of adjustment, dirty or defective	Adjust, clean or repair fuel injection nozzles (para 7-8).

6-11. Engine Exhaust Blue

Probable cause	*Possible remedy*
Piston rings worn or stuck	Replace piston rings (para 7-17).
Valve guides and/or seals worn	Replace valve guides and/or seals (para 7-11).

6-12. Engine Noisy

Probable cause	*Possible remedy*
Oil pump defective	Repair or replace oil pump (para 7-18).
Fuel injection pump improperly adjusted	Adjust fuel injection pump (para 7-7).
Main bearings worn	Replace main bearings (para 7-16).
Piston, connecting rod bearing and/or pin worn	Replace piston, connecting rod bearing and/or pin as necessary (para 7-17).

6-13. Engine Oil Consumption Excessive

Probable cause	*Possible remedy*
Piston rings worn, sticking or defective	Replace piston rings (para 7-17).
External oil leaks	Repair and replace oil pan, oil pan gasket, front oil seal, rear jute packing and/or front and rear filler block, as necessary (para 7-15).

6-14. Engine Oil Pressure Low

Probable cause	*Possible remedy*
Oil pump defective	Repair or replace oil pump (para 7-18).
Main bearings worn	Replace main bearings (para 7-16).

6-15. Electric Starter Fails to Crank Engine

Probable cause	*Possible remedy*
Commutator defective	Repair or replace armature (para 7-2).
Field circuit defective	Test field circuit (para 7-2). Repair or replace field circuit (para 7-2).
Armature defective	Test the armature (para 7-2). Repair or replace armature (para 7-2).
Armature shaft bent	Replace armature (para 7-2).
Brushholder defective	Replace brushholder (para 7-2).
Brushes defective	Replace brushes (para 7-2).
Flywheel ring gear stripped	Replace flywheel ring gear (para 7-14).
Starter drive assembly faulty	Replace starter drive assembly (para 7-2).

6-16. Dc Ammeter Shows Charge when Batteries are Fully Charged

Probable cause	*Possible remedy*
Alternator rotor grounded	Replace alternator rotor (para 7-3).
Alternator regulator out of adjustment or defective	Adjust or repair alternator regulator (para 7-3).
Alternator stator field grounded	Replace alternator stator (para 7-3).

6-17. DC Ammeter Shows Low or no-Charging Rate when Batteries are Low

Probable cause	*Possible remedy*
Alternator regulator out of adjustment or defective	Adjust or repair alternator regulator (para 7-3).
Alternator rotor defective	Repair or replace alternator rotor (para 7-3).
Alternator brushes worn	Replace alternator brushes (para 7-3).

6-18. Alternator Overheats

Probable cause	*Possible remedy*
Alternator stator defective	Repair or replace alternator stator (para 7-3).
Alternator bearings defective	Replace alternator bearings (para 7-3).

6-19. No Generator Voltage Build-Up

Probable cause	*Possible remedy*
Shorted diode in circuit board	Replace diode (para 8-3).
Short in current voltage transformer	Replace transformer (para 8-2)
Defective Transistor Q1 or Q2	Replace transistor (para 8-3).
Shorted silicon controlled rectifier	Replace silicon controlled rectifier (para 8-3).

6-20. No-Load Generator Terminal Voltage too Low or too High

Probable cause	*Possible remedy*
Transformer T1, T2 or T3 defective	Replace transformer (para 8-2).
Shorted diode in circuit board	Replace diode (para 8-3).
Circuit board transformer T1 defective	Replace transformer (para 8-3).
Transistor Q1 or Q2 will not absorb normal maximum voltages	Replace transistor (para 8-3).

6-21. No Generator Field Excitation

Probable cause	*Possible remedy*
Static exciter defective	Repair exciter (para 8-2).

6-22. Generator Terminal Voltage Drops when Load is Applied

Probable cause	*Possible remedy*
Windings of transformers T1, T2 or T3 improperly polarized	Check connections. Correct as necessary (para 8-2).

6-23. Poor Voltage Regulation

Probable cause	*Possible remedy*
Unit parallel switch open	Reset switch.

6-24. Ineffective Cross Current Compensation Control

(Generator terminal voltage should drop with application of zero power factor load)

Probable cause	*Possible remedy*
Current transformer T1, T2 or T3 improperly polarized.	Check connections. Correct as necessary.

6-25. Generator Terminal Voltage Unstable

Probable cause	*Possible remedy*
Loose leadwire connection	Check all connections. Correct as necessary.
Primary winding in transformer T1, T2 or T3 open	Replace transformer (para 8-2).
Capacitor C2 shorted	Replace capacitor (para 8-3).
Adjustable slide on resistor R18 not making contact	Check and correct as necessary.

6-26. Circuit Breaker Trips off or Fails to Close

Probable cause	*Possible remedy*
AC contactor defective	Replace contactor (para 9-9).
Under volt relay defective	Replace under volt relay (para 8-4).
Short circuit relay defective	Replace short circuit relay (para 8-4).
Overload relay defective	Replace overload relay (para 8-4).

6-27. Generator Fails to Supply Power to Load

Probable cause	*Possible remedy*
AC contactor defective	Replace contactor (para 9-9).
Voltage reconnection board defective	Replace voltage reconnection board (para 9-10).

6-28. Frequency Meter Fails to Register

Probable cause	*Possible remedy*
Frequency converter defective	Replace frequency converter (para 9-2).

6-29. AC Ammeter Fails to Register

Probable cause	*Possible remedy*
Ammeter-voltmeter selector switch defective	Replace switch (para 3-104).
Electrical harness defective	Repair or replace electrical harness (para 9-2).

6-30. Wattmeter Fails to Register

Probable cause	*Possible remedy*
Terminal watt converter defective	Replace terminal watt converter (para 9-2).
Electrical harness defective	Repair or replace electrical harness (para 9-2).

6-31. Frequency Drifts

Probable cause	*Possible remedy*
Governor control unit out of alinement	Aline control unit (para 9-5).

6-32. Generators do not Parallel Properly

Probable cause	*Possible remedy*
Paralleling connecting cable circuit open or improperly polarized	Close circuit. Check polarity.
Governor control unit defective or out of alinement	Test control unit and realine (para 9-5).

6-33. Heater Overheats

(For Generator Sets Equipped With Optional Winterization Kit)

Probable cause	*Possible remedy*
Fuel flow excessive	Adjust, repair or replace parts as necessary (fig. 10-8).
Heater passages dirty	Clean heater (para 10-16).

6-34. Heater Leaks

Probable cause	*Possible remedy*
Heater chamber defective	Repair or replace heater chamber (para 10-16).

6-35. General

The engine and generator are rigidly coupled together at the flywheel housing. The assembly is mounted by the front engine mount and the two generator feet, making a three point suspension. The engine drives the generator through a direct coupling. The engine or generator may be removed from the set independently of each other. An engine supporting bracket is provided with the generator set to support the engine during generator removal. It is necessary to remove the panel assembly housing, containing the radiator and shutter assembly, to remove the engine. The engine accessories may remain on the engine during engine removal. Remove the rear panel assembly, containing the control cubical assembly, the load terminal and reconnection box assembly, the static exciter and voltage regulator assembly and the relay box assembly prior to generator removal.

6-36. Housing Panels and Doors

a. Removal. Refer to paragraph 3-68 and remove housing panels and doors.

b. Installation. Refer to paragraph 3-68 and install housing panels and doors.

6-37. Front Panel Assembly

a. Removal.

(1) Remove housing door supports and doors (para 3-68).

(2) Drain engine coolant (fig. 3-8).

(3) Disconnect muffler (para 3-83).

(4) Disconnect radiator hoses (para 3-70).

(5) Refer to figure 6-1 and remove front panel assembly from the skid base.

b. Installation.

(1) Refer to figure 6-1 and install front panel assembly onto the skid base.

(2) Connect radiator hoses (para 3-70).

(3) Connect muffler (para 3-83).

(4) Install panels and doors (para 3-68).

(5) Add engine coolant (fig. 3-8).

6-38. Rear Panel Assembly

a. Removal.

(1) Remove panels and doors (para 3-68).

(2) Refer to figure 6-2 and remove wiring harness connections to the rear panel assembly.

(3) Refer to figure 6-1 and remove rear panel assembly from the skid base.

b. Installation.

(1) Refer to figure 6-1 and install the rear panel assembly onto the skid base.

(2) Refer to figure 6-2 and install wiring harness connectors to the rear panel assembly.

(3) Install panels and doors (par. 3-68).

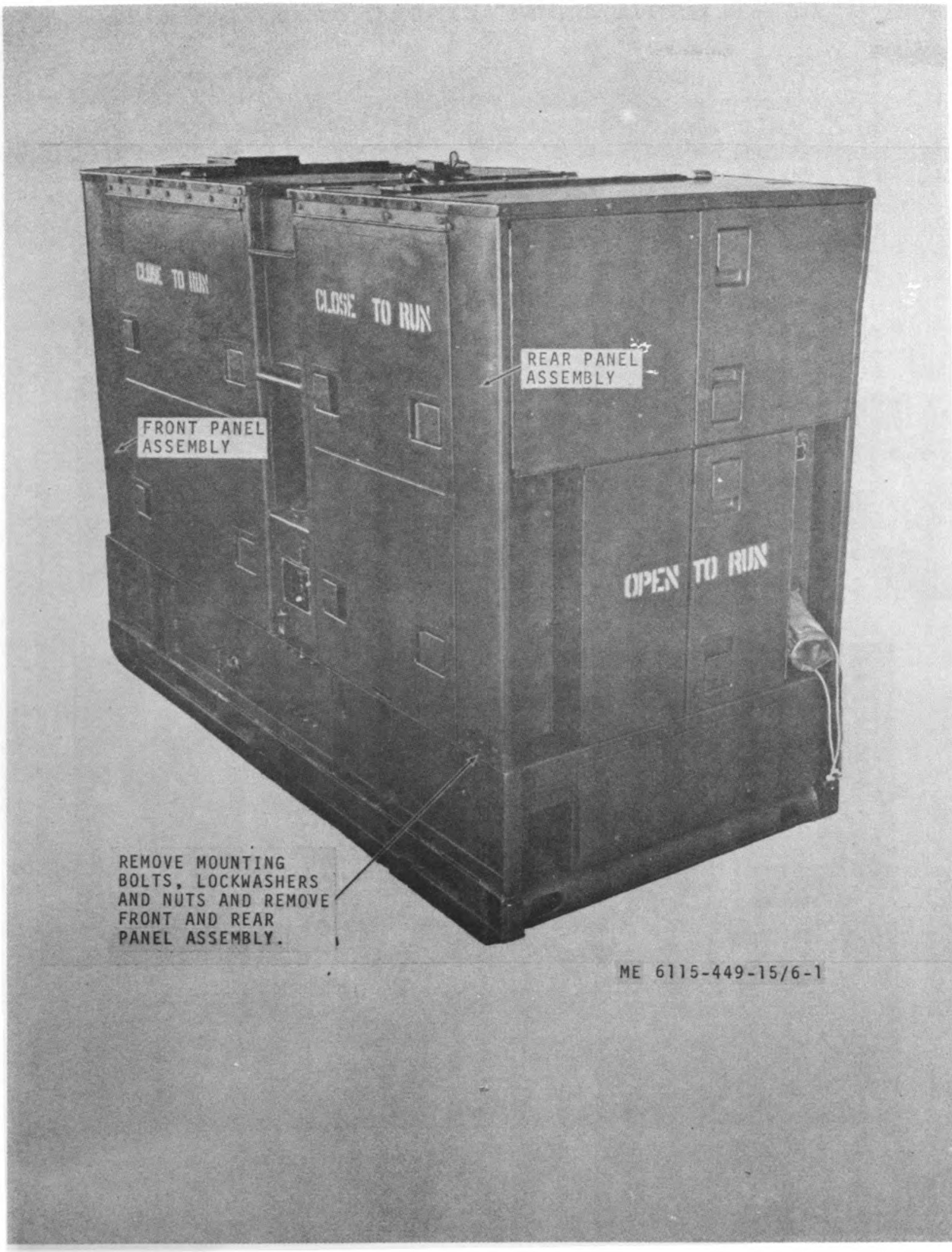
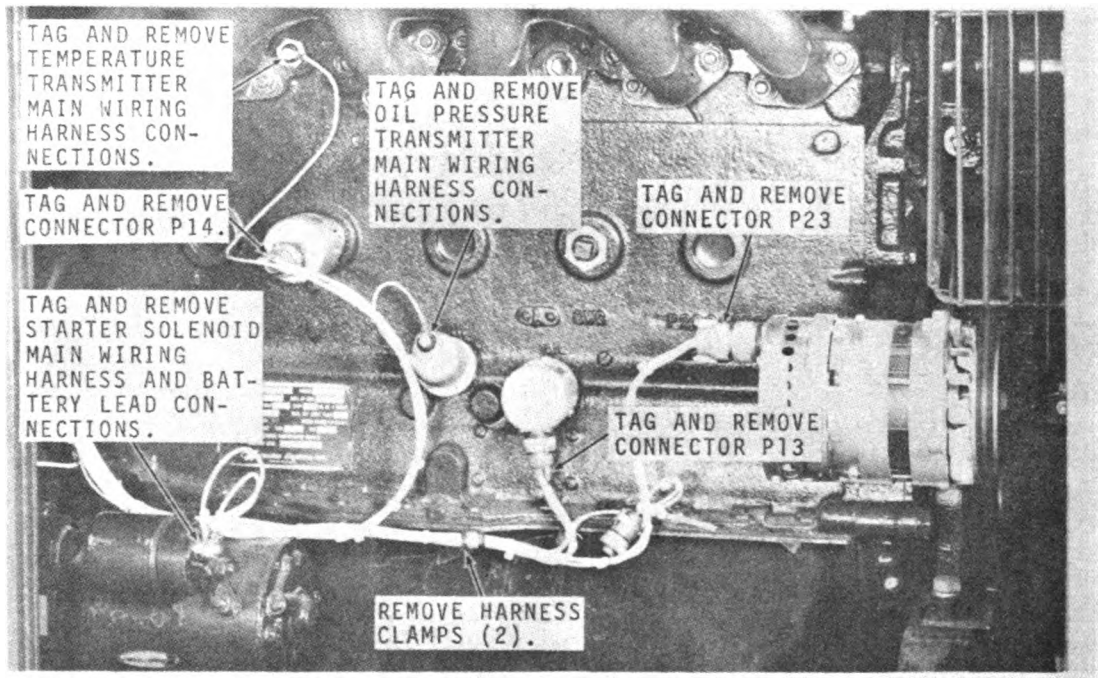
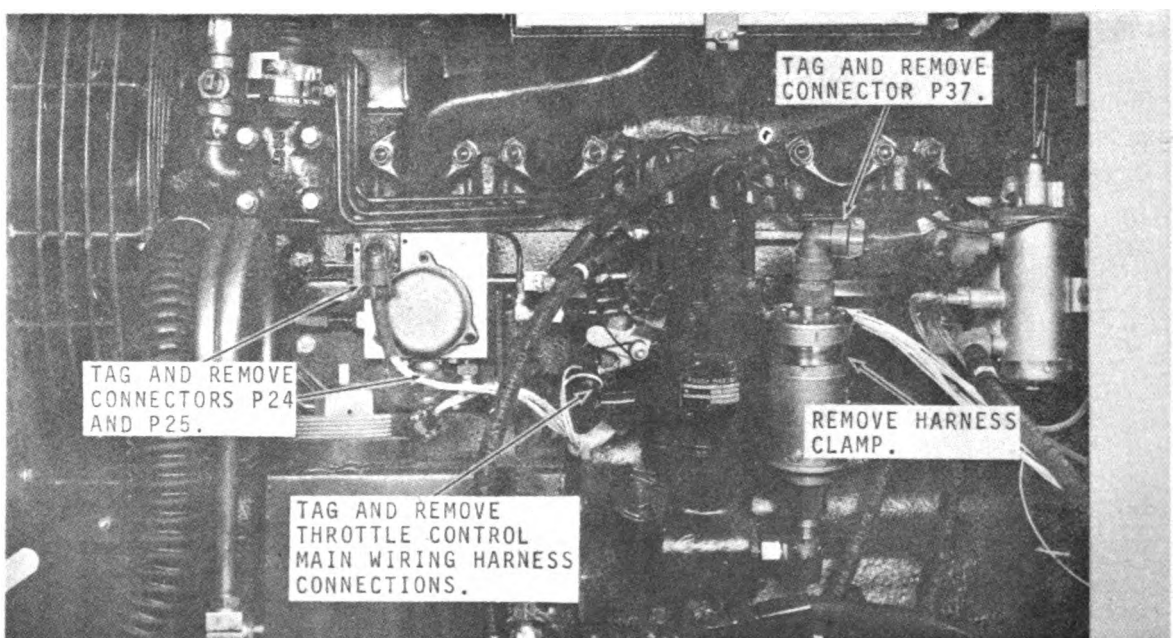


Figure 6-1. Front and rear panel assemblies, removal and installation.



A. ENGINE COMPARTMENT LEFT SIDE



B. ENGINE COMPARTMENT RIGHT SIDE

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Figure 6-2. Wiring harness connections (Sheet 1 of 2).

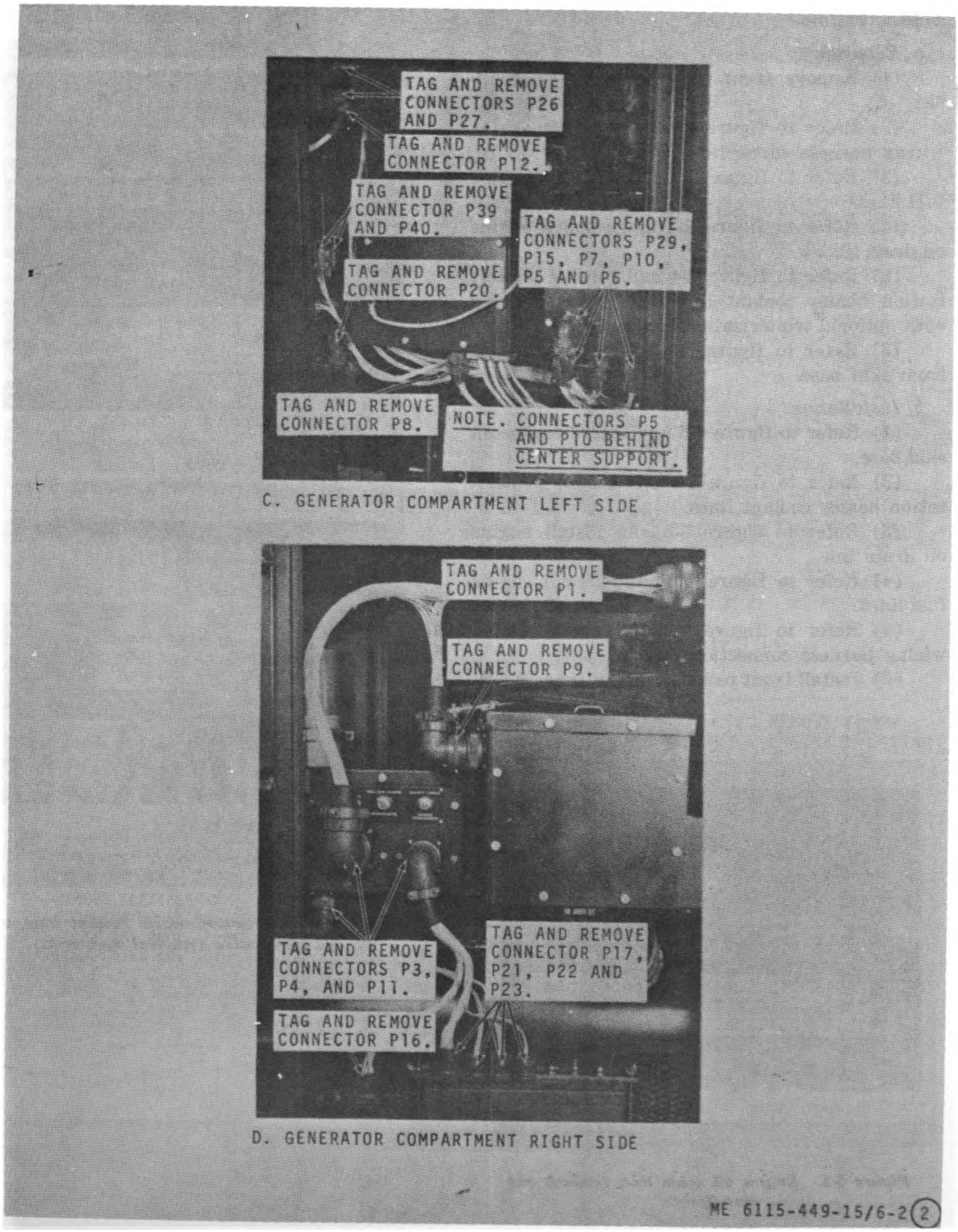


Figure 6-2. Wiring harness connections (Sheet 2 of 2).

6-39. Engine

a. Removal.

(1) Remove front panel assembly (para 3-68).

(2) Refer to figure 6-2 and remove engine wiring harness connections.

(3) Refer to figure 3-21 and remove engine fuel lines.

(4) Refer to figure 6-3 and remove engine oil drain line.

(5) Refer to figure 6-4 and remove winterization heater coolant lines (for sets equipped with optional winterization kits.)

(6) Refer to figure 6-5 and remove engine from skid base.

b. Installation.

(1) Refer to figure 6-5 and install engine on skid base.

(2) Refer to figure 6-4 and install winterization heater coolant lines.

(3) Refer to figure 6-3 and install engine oil drain line.

(4) Refer to figure 3-21 and install engine fuel lines.

(5) Refer to figure 6-2 and install engine wiring harness connections.

(6) Install front panel assembly (para 3-68).

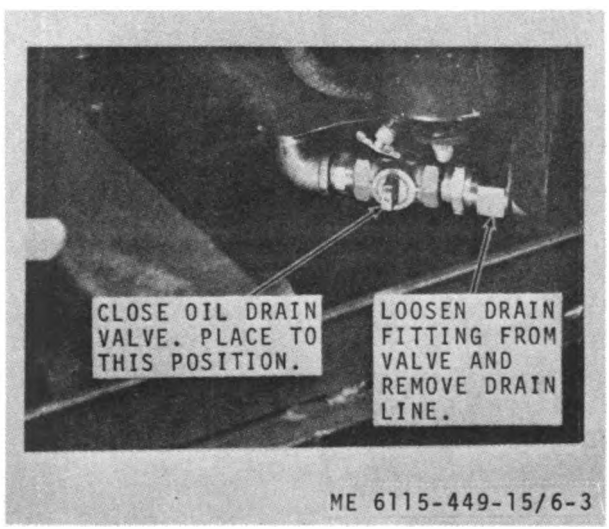


Figure 6-3. Engine oil drain line, removal and installation.

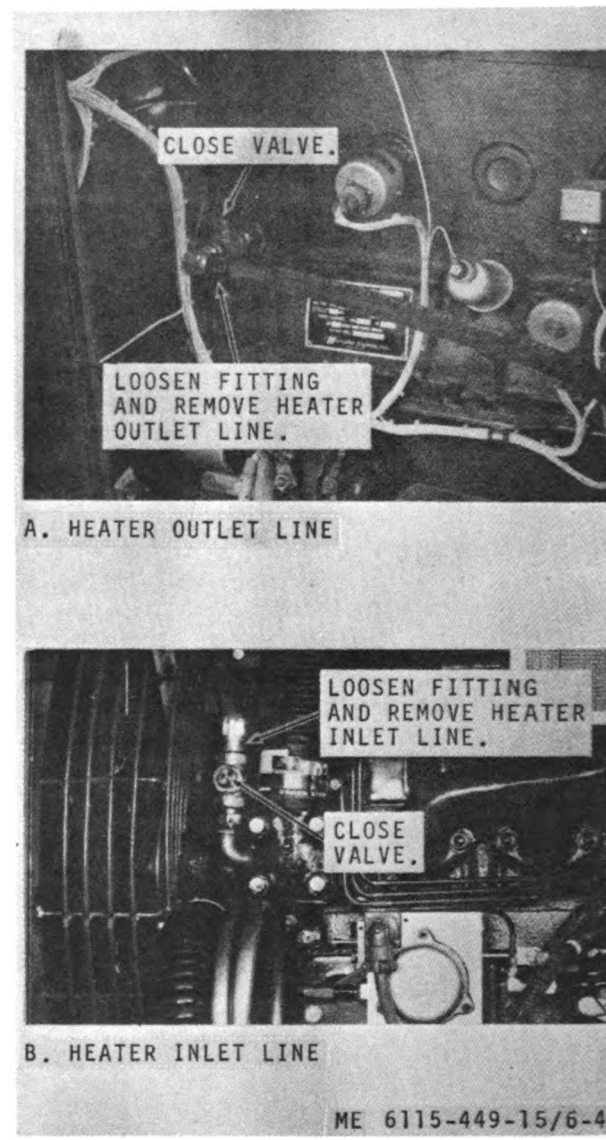


Figure 6-4. Winterization heater coolant lines, removal and installation (optional equipment).

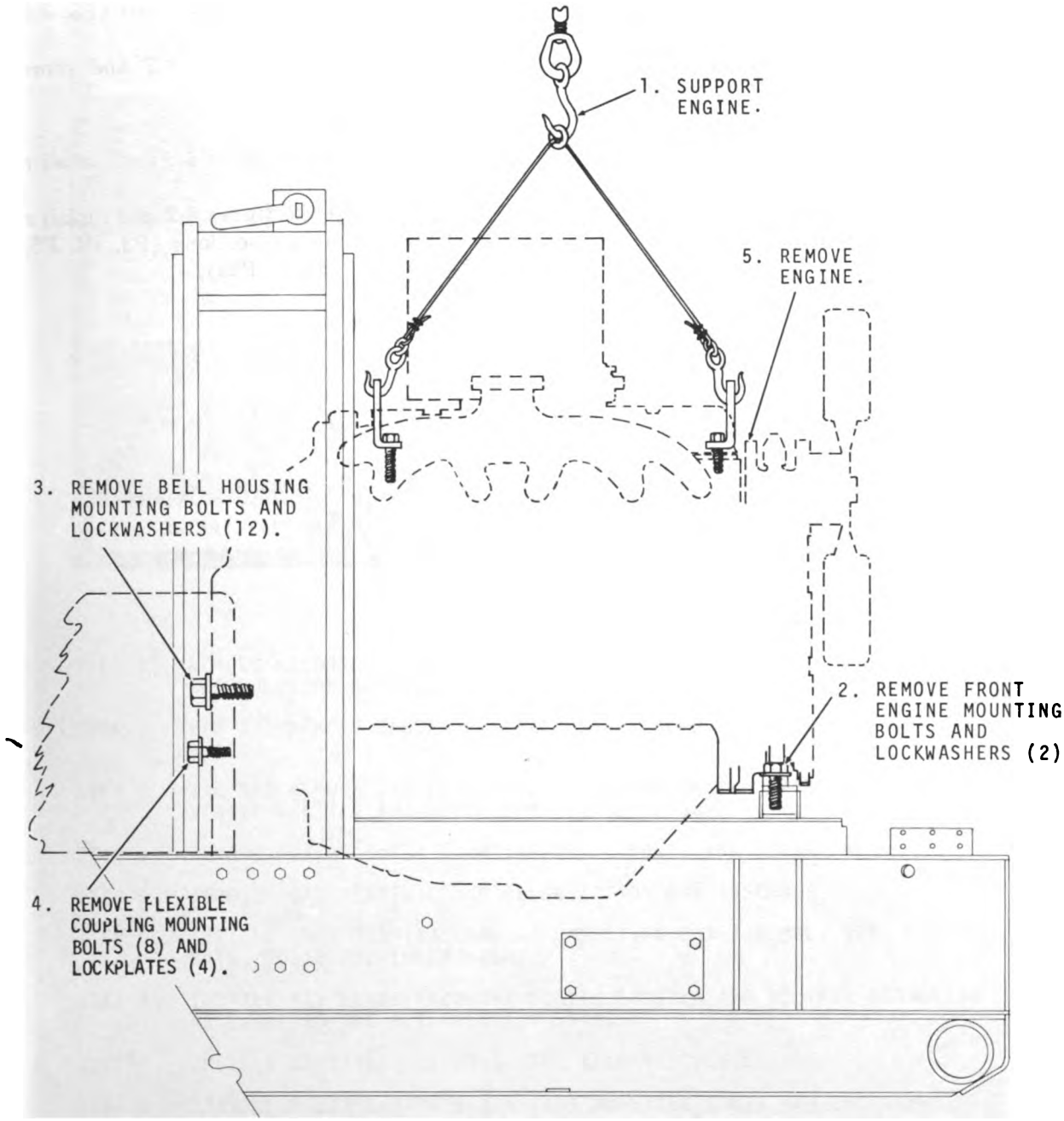


Figure 6-5. Engine removal and installation.

6-40. Load Terminal and Reconnection Box Assembly

a. Removal.

(1) Remove load terminal board (para 3-114).

(2) Refer to figure 6-6 and remove load terminal and reconnection box assembly.

b. Installation.

(1) Refer to figure 6-6 and install load terminal and reconnection box assembly.

(2) Install load terminal board (para 3-114).

6-41. Relay Box Assembly

a. Removal.

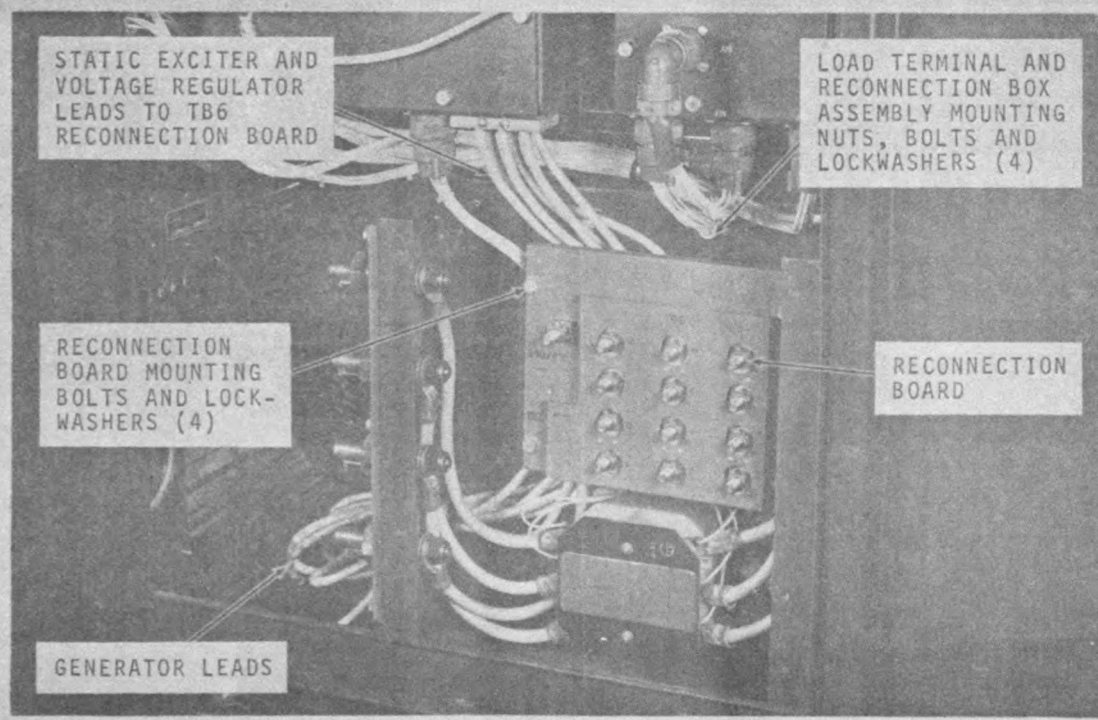
(1) Refer to figure 6-2 and remove relay box wiring harness connections (P3, P4, P5, P6, P7, P10, P11, P15 and P29).

(2) Refer to figure 6-7 and remove relay box assembly.

b. Installation.

(1) Refer to figure 6-7 and install relay box assembly.

(2) Refer to figure 6-2 and install relay box wiring harness connections (P3, P4, P5, P6, P7, P10, P11, P15 and P29).



STEP 1. REMOVE RECONNECTION BOARD MOUNTING BOLTS AND PARTIALLY REMOVE RECONNECTION BOARD.

STEP 2. TAG AND REMOVE GENERATOR LEADS FROM THE REAR OF THE RECONNECTION BOARD.

STEP 3. TAG AND REMOVE SIX LEAD WIRES FROM THE RECONNECTION BOARD TO THE STATIC EXCITER AND VOLTAGE REGULATOR ASSEMBLY.

STEP 4. REMOVE BOX ASSEMBLY MOUNTING NUTS, BOLTS AND LOCKWASHERS.

STEP 5. REMOVE LOAD TERMINAL AND RECONNECTION BOX ASSEMBLY.

STEP 6. INSTALL LOAD TERMINAL AND RECONNECTION BOX ASSEMBLY WITH MOUNTING NUTS, BOLTS AND LOCKWASHERS.

STEP 7. INSTALL SIX LEADS FROM THE STATIC EXCITER AND VOLTAGE REGULATOR ASSEMBLY TO THE RECONNECTION BOARD.

STEP 8. INSTALL GENERATOR LEADS TO THE RECONNECTION BOARD.

STEP 9. INSTALL RECONNECTION BOARD WITH MOUNTING BOLTS AND LOCKWASHERS.

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Figure 6-6. Load terminal and reconnection box assembly, removal and installation.

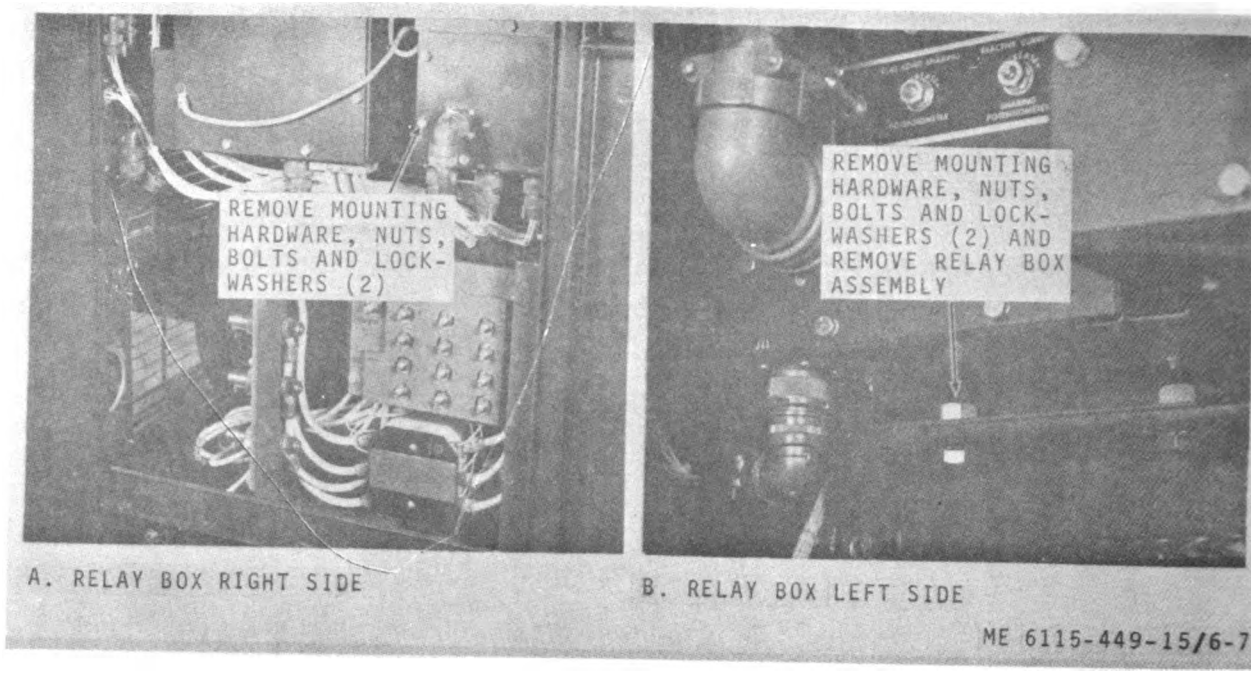

Figure 6-7. Relay box assembly, removal and installation.

6-42. Static Exciter and Voltage Regulator Assembly

a. Removal.

(1) Remove load terminal and reconnection box assembly (para 6-40).

(2) Refer to figure 6-2 and remove wiring harness connections to the static exciter and voltage regulator (P8 and P9).

(3) Refer to figure 6-8 and remove static exciter and voltage regulator.

b. Installation.

(1) Refer to figure 6-8 and install static exciter and voltage regulator assembly.

(2) Refer to figure 6-2 and install wiring harness connections to the static exciter and voltage regulator (P8 and P9).

(3) Install load terminal and reconnection box assembly (para 6-40.)

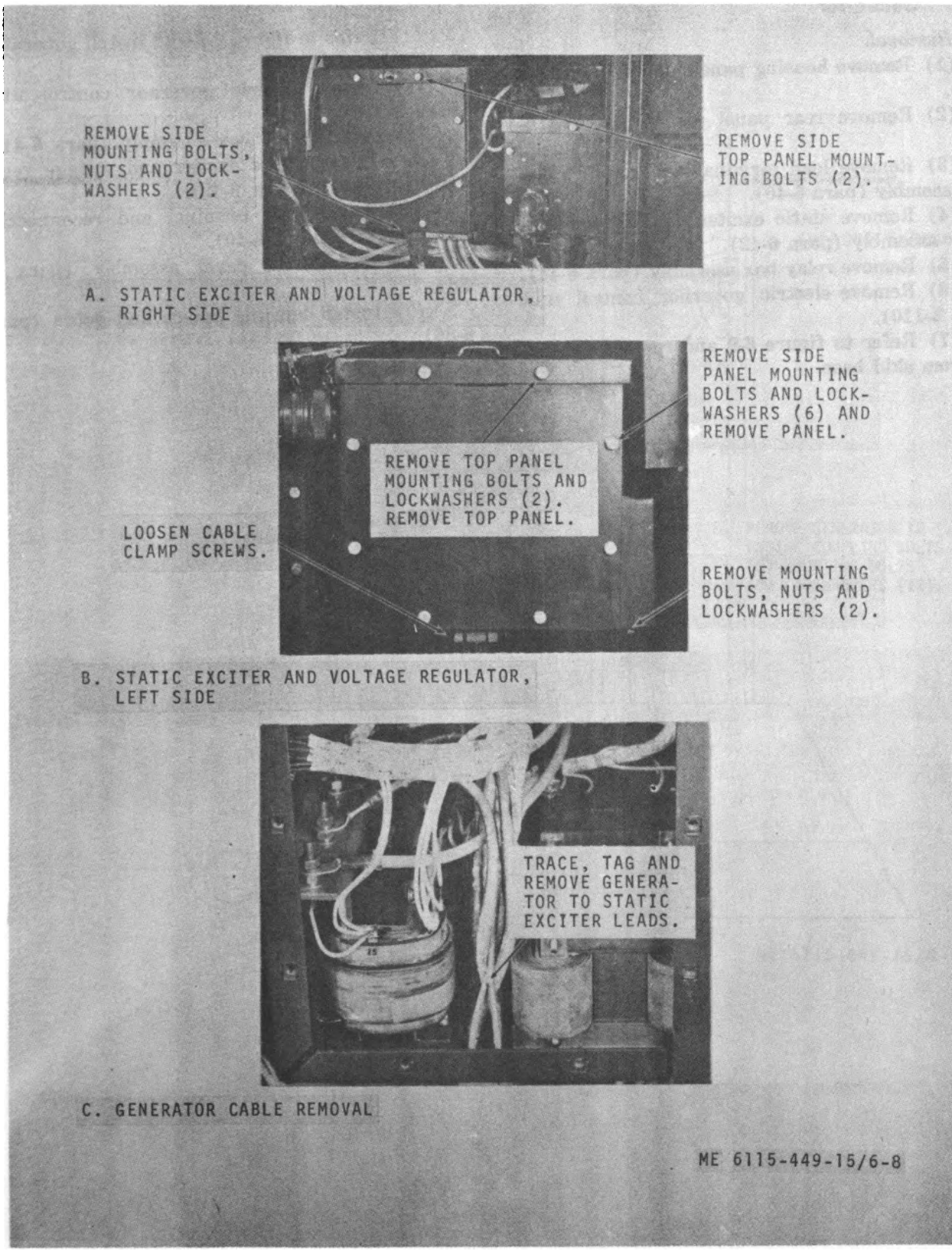

Figure 6-8. Static exciter and voltage regulator assembly, removal and installation.

6-43. Generator

a. Removal.

(1) Remove housing panels and doors (para 6-36).

(2) Remove rear panel assembly (para 6-38).

(3) Remove load terminal and reconnection box assembly (para 6-40).

(4) Remove static exciter and voltage regulator assembly (para 6-42).

(5) Remove relay box assembly (para 6-41).

(6) Remove electric governor control unit (para 3-110).

(7) Refer to figure 6-9 and remove generator from skid base.

b. Installation.

(1) Refer to figure 6-9 and install generator on skid base.

(2) Install electric governor control unit (para 3-110).

(3) Install relay box assembly (para 6-41).

(4) Install static exciter and voltage regulator assembly (para 6-42).

(5) Install load terminal and reconnection box assembly (para 6-40).

(6) Install rear panel assembly (para 6-38).

(7) Install housing panels and doors (para 6-36).

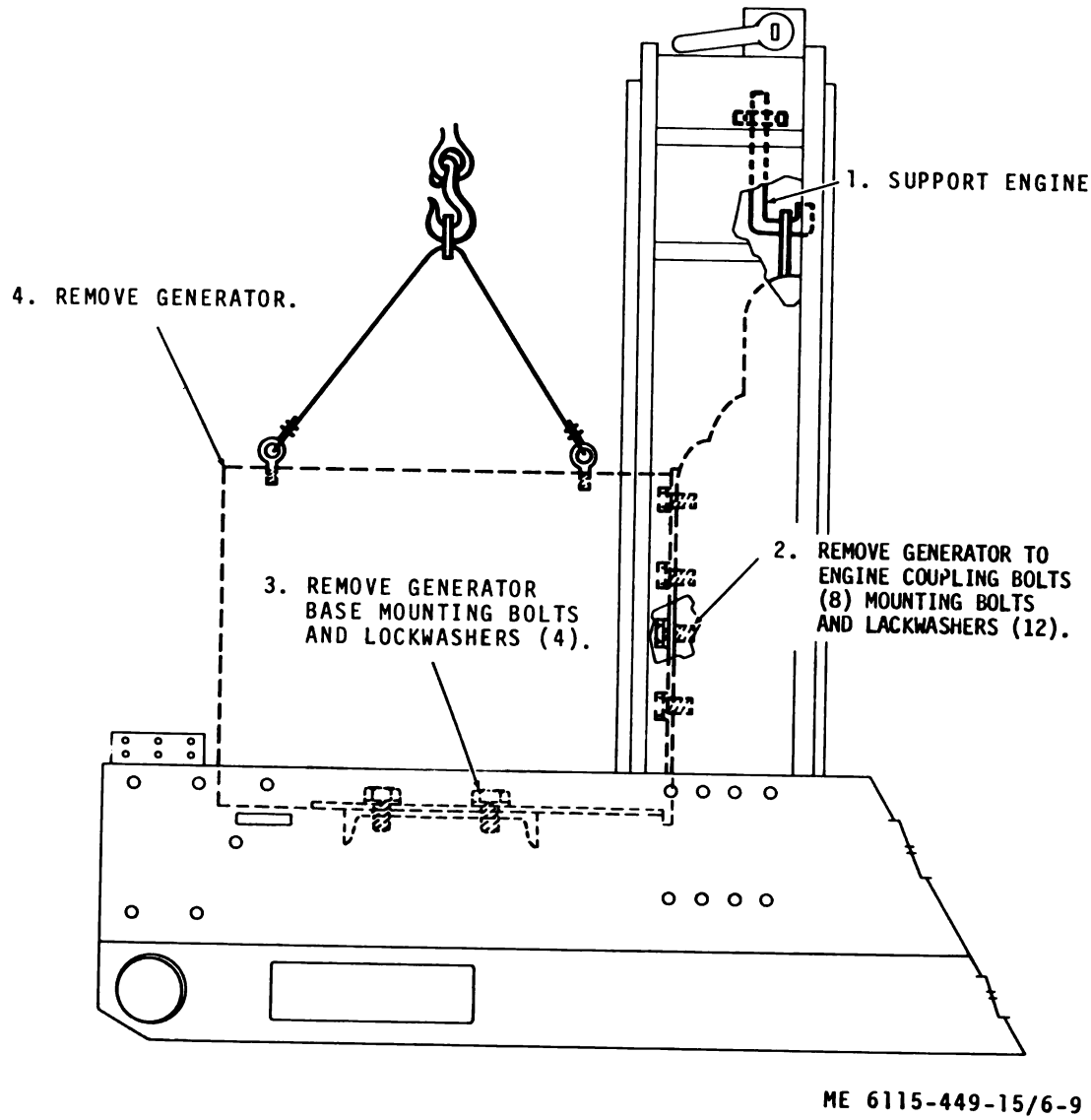

Figure 6-9. Generator removal.

CHAPTER 7

ENGINE REPAIR INSTRUCTIONS

Section I. ENGINE ACCESSORIES

7-1. General

This section contains those items which are considered accessories to the engine. Among these items are the starter, alternator, water pump, fuel injection pump and lines, hydraulic system and governor.

7-2. Starter

a. General. The starter is a 24 volt dc motor actuated by a solenoid. When the starter is actuated the solenoid is energized engaging the gear. The pinion gear meshes with the ring gear on the engine flywheel. This mechanically cranks the engine to a speed sufficient to start the engine. The starter is mounted to the engine bell housing on the flywheel end.

b. Removal. Refer to paragraph 3-89 and remove starter.

c. Bench Testing.

(1) *Motoring test.* Connect a 24 volt dc power supply in series with a load rheostat and an ammeter shunt of a 100 amp capacity. Connect an ammeter to the shunt and a dc voltmeter to the starter terminals. With voltage adjusted to 22.5 volts, current should be 58 amps maximum at 9300 rpm. If current and speed are low, inspect for high resistance in internal connections. If current is high and speed is low, inspect bearings and armature for wear or misalinement.

(2) *Stall Torque Test.* With starter connected as in (1) above, fasten a torque arm and spring scale to the armature drive end. Adjust rheostat to 14 volts. The current should be 540 amps maximum at 26 ft-lb minimum. If the current and torque are both low, inspect for high resistance in internal connections and improper brush contact. High current and low torque may be caused by defective armature or field coil.

d. Disassembly. Refer to figure 7-2 and disassemble the starter by following numerical sequence.

e. Cleaning, Inspection and Repair

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

(2) Wipe armature and stator with a clean, dry cloth.

(3) Inspect stator for cracks and faulty insulation.

(4) Inspect commutator for cracks, breaks, damaged brush holders and worn or defective brushes.

(5) Replace all damaged or defective parts.

1 Screw (3)
2 Washer (3)
3 Starter motor and solenoid
4 Screw (3)
5 Washer (3)
6 Pump, water
7 Gasket
8 Screw (3)
9 Washer (3)
10 Pump, fuel injection
11 Screw (4)
12 Washer (4)
13 Pump, hydraulic
14 Pin, cotter
15 Nut
16 Gear, pump
17 Key, woodruff
18 Insert, bearing
19 Gasket
20 Cap, breather
21 Screw, cover (3)
22 Cover, valve
23 Gasket, cover
24 Nut (20)
25 Washer (20)
26 Head, cylinder
27 Stud
28 Gasket, head
29 Nut
30 Washer
31 Pulley, drive
32 Screw, cover (12)
33 Washer (12)
34 Cover, gear housing
35 Gasket, cover
36 Gear, crankshaft
37 Gear, camshaft timing
38 Retainer, bearing
39 Bearing, camshaft (2)
40 Camshaft
41 Housing, gear
42 Gasket, housing
43 Screw, mounting
44 Lockwasher
45 Screw (7)
46 Lockwasher (7)
47 Gear, ring
48 Flywheel
49 Bell housing
50 Gasket
51 Screw, oil pan (28)
52 Lockwasher (28)
53 Bracket (2)
54 Oil pan
55 Gasket, oil pan
56 Screw
57 Washer (4)
58 Adapter, oil pan
59 Gasket, adapter
60 Screw, main bearing cap (16)
61 Washer (16)
62 Cap, main bearing (7)
63 Screw, connecting rod bearing cap (12)
64 Washer (12)
65 Cap, connecting rod bearing (6)
66 Oil Pump assembly
67 Crankshaft
68 Screw, cover (2)
69 Washer (2)
70 Plate, cover
71 Gasket, cover
72 Screw (12)
73 Washer (12)
74 Plate, side cover (2)
75 Gasket, cover
76 Sleeve, cylinder
77 Block, cylinder

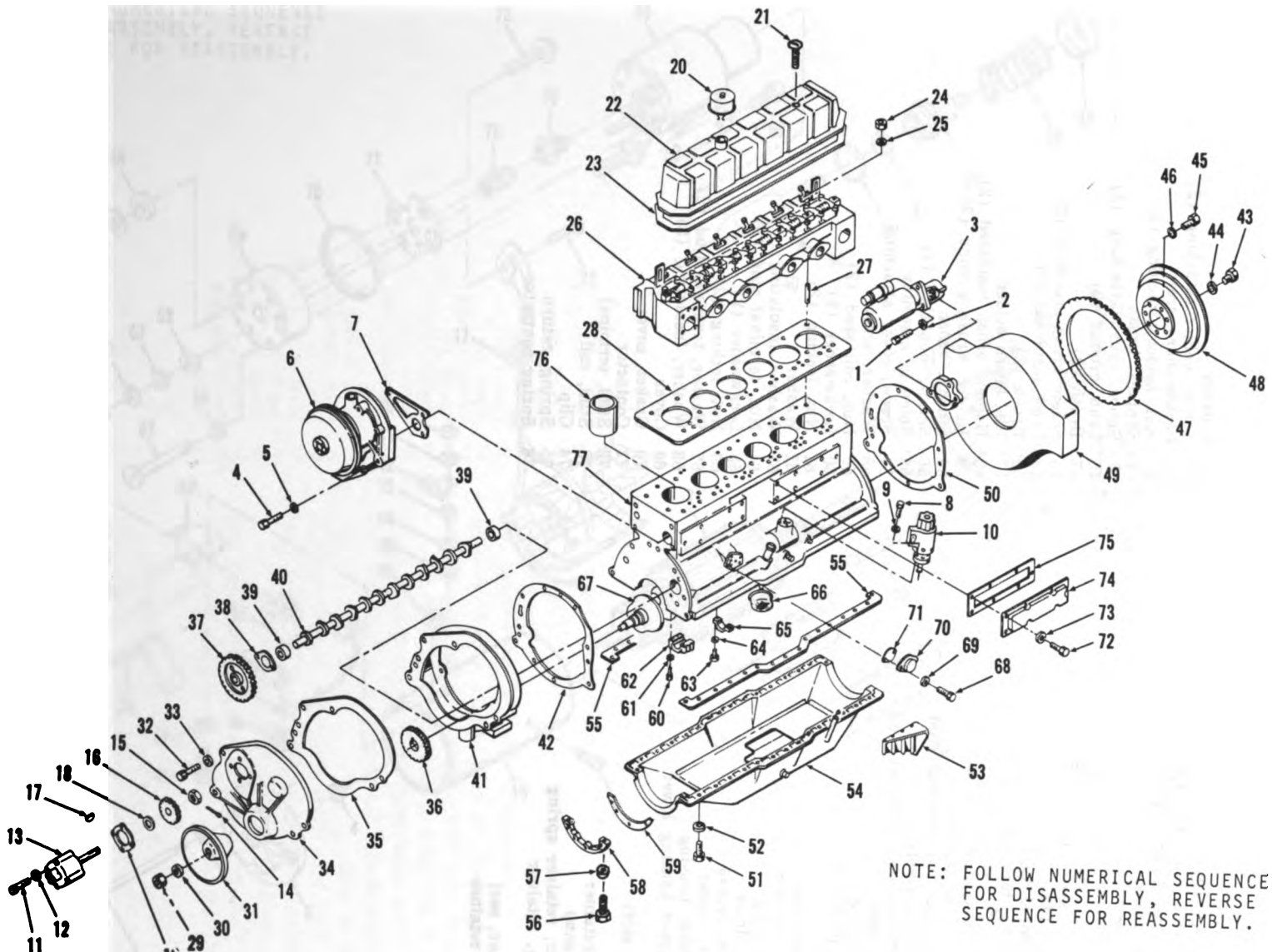

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Figure 7-1. Engine, disassembly and reassembly.

1 Screw, cover (2)
2 Lockwasher, cover screw (2)
3 Frame, commutator end
4 Bushing, bronze
5 Housing, lever
6 Washer, spacer
7 Armature
8 Screw, pole shoe (4)
9 Pole shoe (4)
10 Nut, terminal stud
11 Lockwasher, terminal stud
12 Terminal
13 Nut, terminal stud
14 Washer, terminal stud
15 Washer, insulated terminal stud
16 Field coil assembly
17 Bushing, insulated terminal stud
18 Frame, field
19 Pin, locating
20 Screw, mounting
21 Washer
22 Housing, clutch
23 Washer, spacer
24 Gasket, cover
25 Clutch, drive
26 Bushing, bronze
27 Washer, spacer
28 Plug, lever housing
29 Plug, lever housing lower
30 Pin
31 Lever, shift
32 Pin
33 Ring, retainer
34 Ring, snap
35 Washer, retainer spring
36 Spring, retainer
37 Seal
38 Retainer, seal
39 Ring, retainer
40 Linkage
41 Screw, holder attaching (2)
42 Lockwasher, screw
43 Nut, holder attaching (2)
44 Support, brush
45 Screw, brush attaching (2)
46 Lead, ground (2)
47 Brush (2)
48 Screw, brush attaching (2)
49 Lead, insulated (2)
50 Brush (2)
51 Pin, brush holder
52 Holder, brush insulated (2)
53 Holder, brush ground (2)
54 Spring, brush
55 Screw, mounting (4)
56 Solenoid assembly
57 Screw, cover attaching
58 Washer, screw
59 Nut, coil stud (2)
60 Lockwasher (2)
61 Nut, locking (2)
62 Washer
63 Washer, insulating
64 Nut, terminal stud (2)
65 Lockwasher (2)
66 Nut, locking (2)
67 Washer, terminal stud (2)
68 Washer, insulating (2)
69 Cover
70 Gasket, cover
71 Contactor
72 Stud, terminal
73 Stud, coil
74 Clip
75 Spring, return
76 Spring contactor

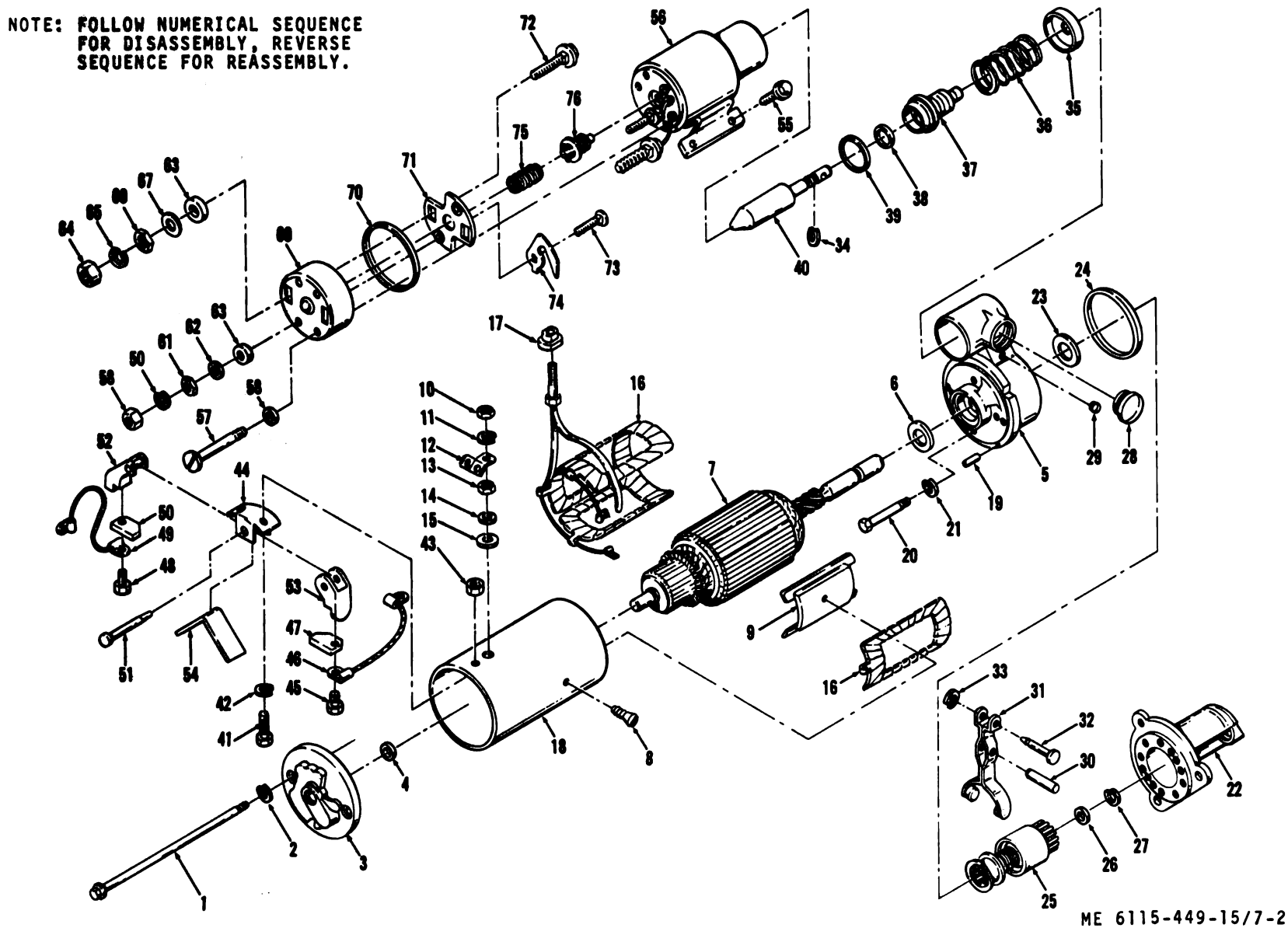


Figure 7-2. Starter, disassembly and reassembly.

f. Testing.

(1) Use a multimeter and test for continuity between each brush holder and frame.

(2) Test armature for open circuits, shorts and grounding as instructed in TM 5-764.

(3) Test starter stator coils for continuity and grounding as instructed in TM 5-764.

g. Reassembly. Refer to figure 7-2 and reassemble starter by reversing numerical sequence.

h. Installation. Refer to paragraph 3-89 and install starter.

7-3. Alternator

a. General. The alternator supplies sufficient current to charge the storage batteries when the stored charge of the batteries is below rated values. The output is controlled by a regulator and transient voltage suppressor which are integral with the alternator. These regulated voltages are adjustable so that when the batteries are fully charged a charge rate between 0 to 2 amperes can be obtained at all times. The alternator is mounted on the engine and is belt driven.

b. Removal. Refer to paragraph 3-88 and remove alternator.

c. Bench Testing.

(1) Test stator for grounding, shorting or open circuits as instructed in TM 5-764.

(2) Test rotor for resistance, insulation breakdown, and continuity as instructed in TM 5-764.

(3) Test alternator for output ranges. At 75°F, output will be between 27 and 28.5 volts. At 10 amp load the output voltage will be between 27.9 and 28.5 at 2660 rpm at 75°F.

(4) Test alternator transient voltage. Transient voltage should not exceed 50 volts under any condition or load.

(5) Test rms ripple voltage. Ripple voltage on the output terminals should not exceed 5 percent for any load from 0 to 20 amps.

(6) Test rectifier for proper operation and for deterioration.

d. Disassembly. Refer to figure 7-3 and disassemble the alternator by following numerical sequence.

e. Cleaning, Inspection and Repair.

(1) Clean all metal parts with an approved solution.

(2) Clean all electrical components with an approved solvent.

(3) Inspect housing and mounting bracket for cracks and breaks.

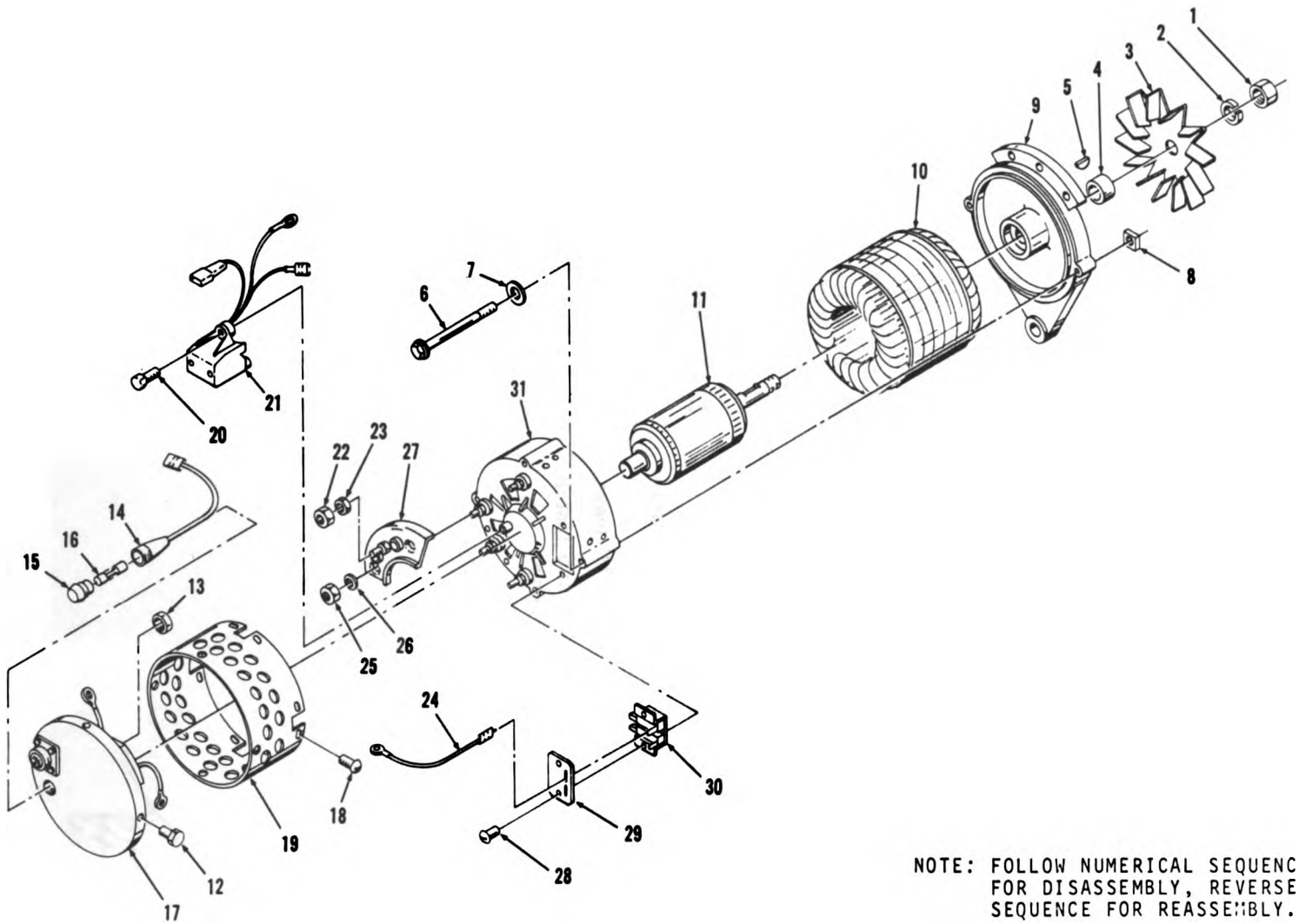
(4) Inspect all threaded parts for worn or damaged threads. Replace all defective parts.

(5) Inspect brushes for wear or damage. Repair brushes if defective.

(6) Inspect regulator for damage and insufficient operation. Repair if defective.

(7) Repair or replace all defective parts.

1 Nut
2 Lockwasher
3 Fan
4 Spacer
5 Key, woodruff
6 Screw (4)
7 Washer (4)
8 Nut (4)
9 Housing, end
10 Stator assembly
11 Rotor assembly
12 Screw (4)
13 Nut
14 Fuseholder
15 Cap, fuse
16 Fuse
17 Cover, shroud
18 Screw (4)
19 Shroud, air
20 Screw (2)
21 Regulator, voltage
22 Nut
23 Nut, locking
24 Lead assembly
25 Nut
26 Washer
27 Rectifier
28 Screw (2)
29 Insulator, brush holder
30 Brush assembly
31 Housing



NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.

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Figure 7-8. Alternator, disassembly and reassembly.

f. Reassembly. Refer to figure 7-3 and reassemble alternator by reversing numerical sequence.

g. Installation. Refer to paragraph 3-88 and install alternator.

7-4. Radiator

a. General. The radiator is a multiple finned type used for cooling liquid returning to the engine. A fan located behind the radiator forces air through the fins and lowers the temperature of the coolant. The radiator is located in front of the engine.

b. Removal. Refer to figure 7-4 and remove radiator by following numerical sequence.

c. Testing.

(1) Seal inlet and outlet tube on radiator.

(2) Fill radiator with water and apply low pressure through filler neck.

(3) Check for leaks.

d. Cleaning, Inspection and Repair.

(1) Clean all metal parts with an approved solvent.

(2) Use low pressure air to clean dirt between fins.

(3) Flush radiator with water.

(4) Inspect radiator fins and lines for cracks, breaks, and other damage.

(5) Repair all damage and solder all leaks.

e. Installation. Refer to figure 7-4 and install radiator by reversing numerical sequence.

1 Bolt, hex head (10)
2 Lockwasher (10)
3 Grill
4 Screw (4)
5 Lockwasher
6 Shutter
7 Screw (8)
8 Lockwasher
9 Shroud
10 Screw (2)
11 Lockwasher
12 Gasket
13 Screw
14 Lockwasher
15 Gasket
16 Screw, set (2)
17 Nut, hex
18 Spring
19 Ring, retainer
20 Control, shutter
21 Ring, retainer
22 Thermostat
23 Housing, control
24 Housing, thermostat
25 Radiator
26 Cap, radiator

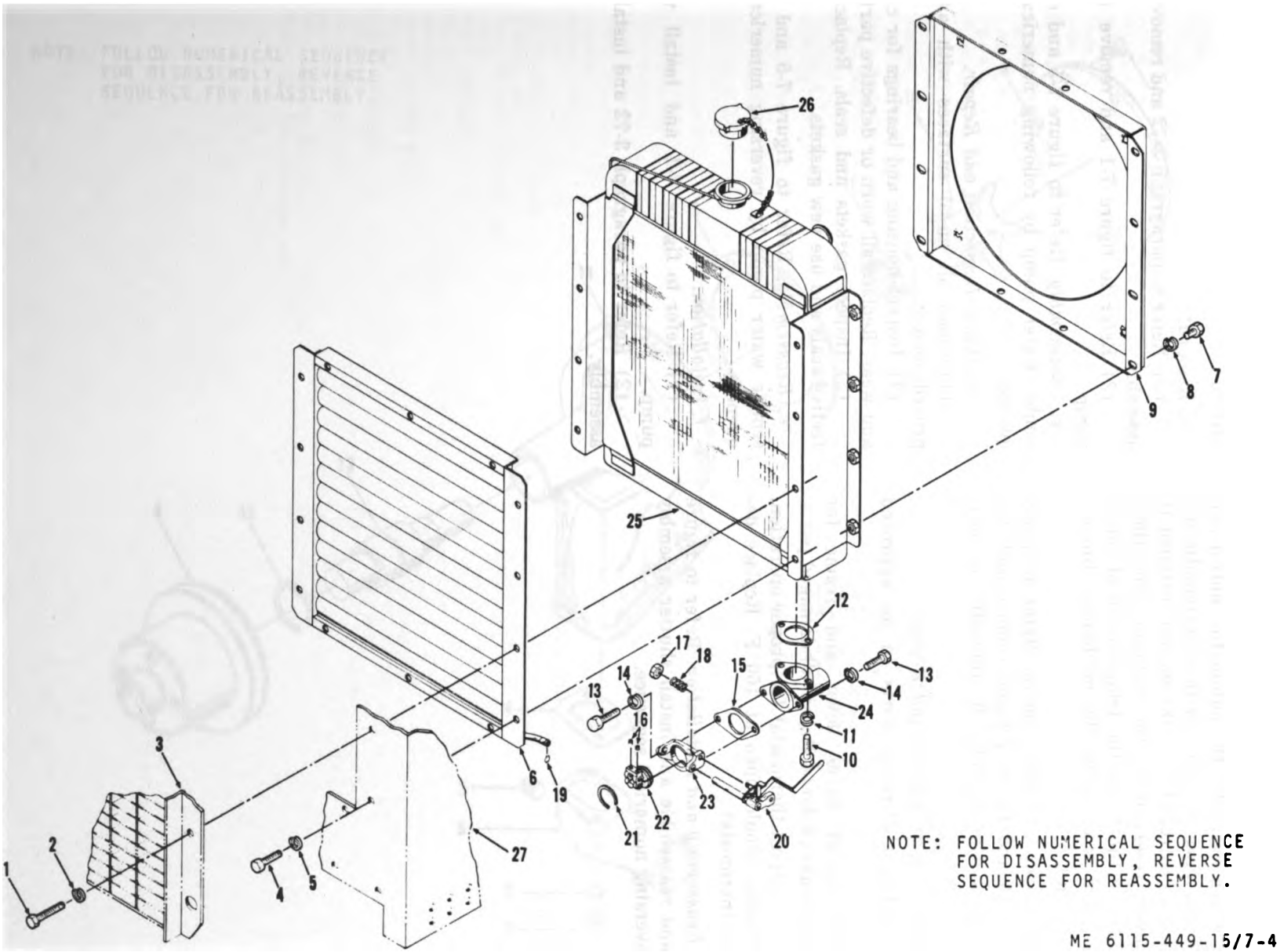

Figure 7-4. Radiator and shutter, removal and installation.

7-5. Shutter Assembly

a. General. The shutter assembly assists in maintaining correct engine coolant temperature. Operation of the shutter vanes can be manual or automatic. Manual operation is controlled by a lever which overrides the automatic control and holds the vanes in open position. Automatic operation is controlled by a thermostat installed in the lower reservoir of the radiator. The thermostat is actuated by the temperature of liquid coolant and is connected by mechanical linkage to the vanes.

b. Removal and Disassembly. Refer to paragraph 7-4*b* and figure 7-4 and remove and disassemble shutter assembly by following numerical sequence.

c. Cleaning, Inspection and Repair.

(1) Clean all metal parts in an approved solvent.

(2) Inspect vanes, lever and frame for cracks, breaks or dents. Repair all damaged parts.

(3) Inspect thermostat for proper operation. Thermostat should open at 160°F. Replace defective thermostat.

d. Reassembly and Installation. Refer to figure 7-4 and reassemble and install shutter assembly by reversing numerical sequence.

7-6. Water Pump

a. General. The water pump is a centrifugal type pump used to circulate the liquid coolant through the radiator and engine block. It is mounted on the front of the engine and is belt driven.

b. Removal.

(1) Refer to paragraph 3-72 and remove fan assembly.

(2) Refer to figure 7-1 and remove water pump.

c. Disassembly. Refer to figure 7-5 and disassemble water pump by following numerical sequence.

d. Cleaning, Inspection and Repair.

(1) Clean all metal surfaces with an approved solvent.

(2) Inspect housing and bearings for cracks and wear. Replace all worn or defective parts.

(3) Inspect gaskets and seals. Replace defective seals and use new gaskets.

e. Reassembly. Refer to figure 7-5 and reassemble water pump by reversing numerical sequence.

f. Installation.

(1) Refer to figure 7-1 and install water pump.

(2) Refer to paragraph 3-72 and install fan assembly.

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.

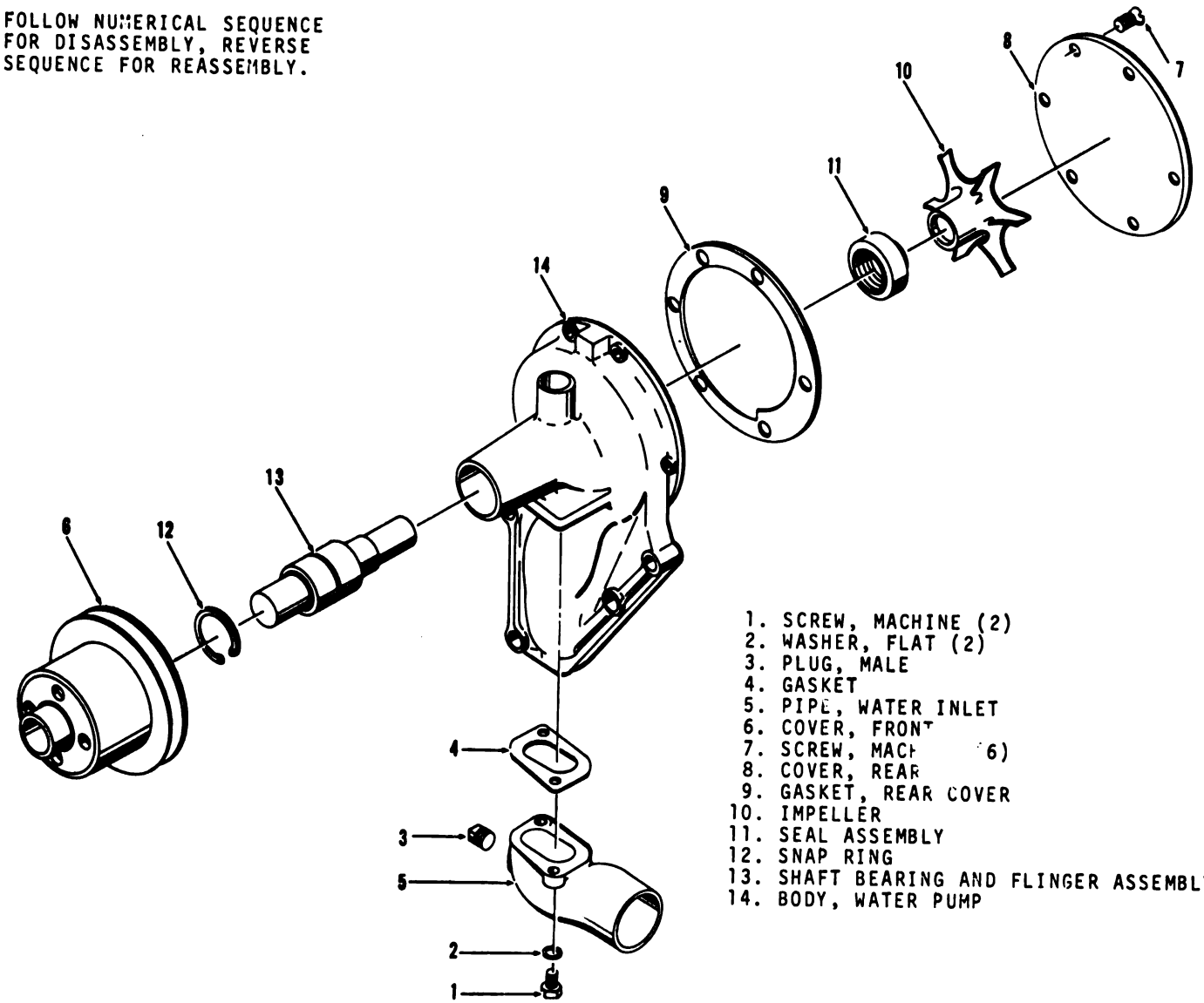

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Figure 7-5. Water pump disassembly and reassembly.

7-7. Fuel Injection Pump Assembly

a. General. The fuel injection pump is a single cylinder, opposed plunger, inlet metering, distributor type pump. This pump meters and sprays fuel through nozzles into the engine cylinders. Located on the left side of the engine, the pump is driven by the oil pump drive gear. A portion of fuel is used to lubricate and cool the pump.

b. Removal.

(1) Disconnect fuel lines and tubes to injector nozzles.

(2) Rotate engine using barring tool.

(3) Aline trimming marks on fuel injection pump.

(4) Refer to figure 7 'd remove fuel injection pump.

c. Bench Testing.

(1) Install the fuel injection pump on a test stand equipped for a direct drive to fuel pump.

(2) Drive fuel pump at 200 rpm and test pump transfer pressure (18 to 25 psi).

(3) Increase drive to 923 rpm and test pump transfer pressure (40 to 45 psi).

(4) Reduce drive speed to 900 rpm and measure fuel delivery (54 to 57 cmm per stroke).

(5) If correct pressure and delivery are not obtained, clean and inspect the piston (fig. 7-6), regulator spring and end plate sleeve.

(6) Test pressure and delivery (steps 2, 3, 4 above). Replace a pump that will not meet these specifications.

d. Disassembly. Refer to figure 7-6 and disassemble fuel injection pump by following numerical sequence.

e. Cleaning, Inspection and Repair.

(1) Clean all metal parts in an approved solvent.

(2) Inspect all parts for damage. Replace all damaged parts.

(3) Inspect all threaded parts for worn or broken threads. Repair threaded parts.

f. Reassembly. Refer to figure 7-6 and reassemble the fuel injection pump by reversing numerical sequence.

g. Installation. Refer to figure 7-1 and install the fuel injection pump.

7-8. Fuel Injection Nozzle and Sleeve

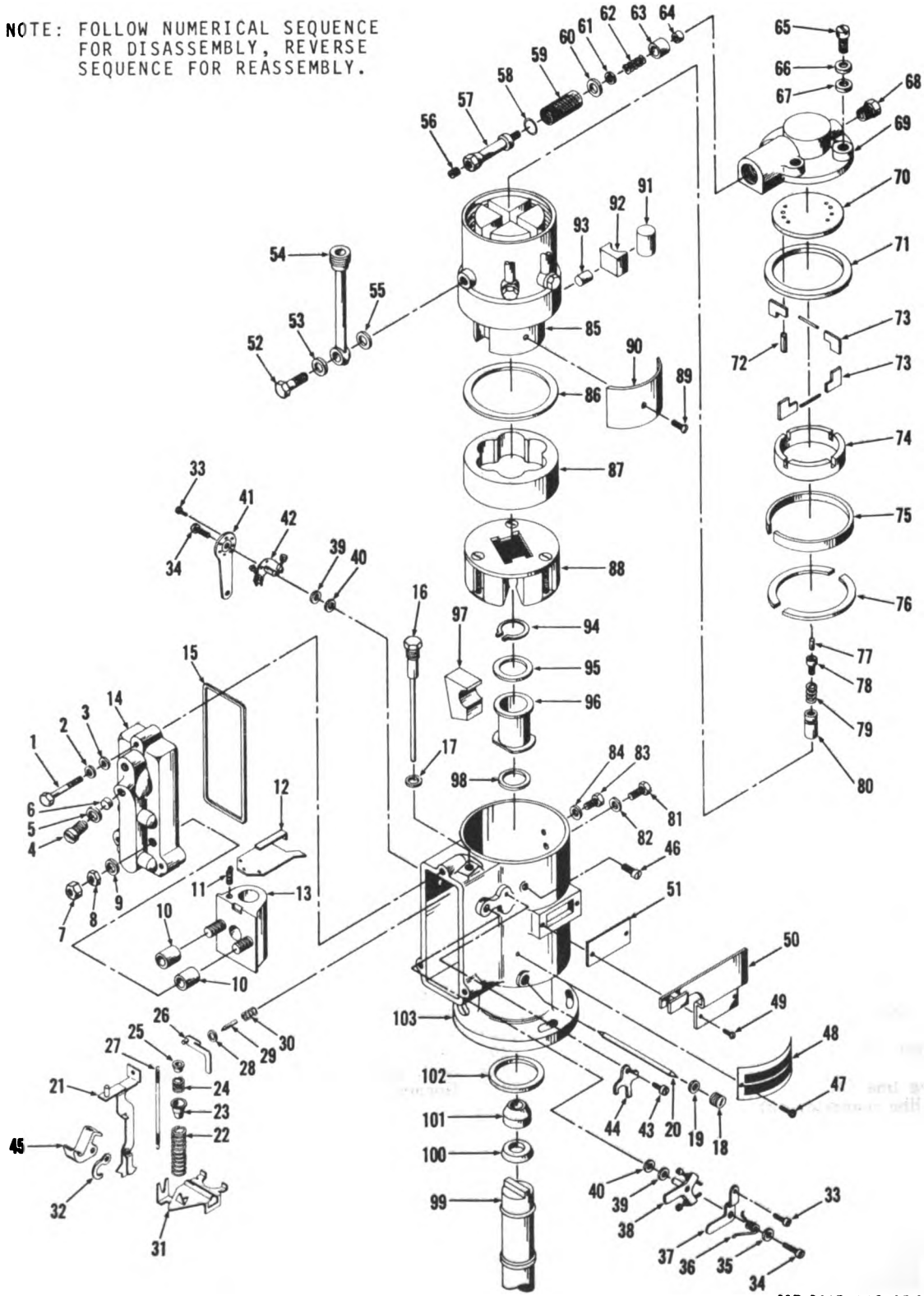
a. General. The fuel injector nozzle has four small openings through which fuel is sprayed into the cylinder at proper injection periods. The nozzle fits into a sleeve and both are mounted to the cylinder head and secured by screws.

b. Removal. Refer to paragraph 3-80 and remove fuel injector nozzle and sleeve.

c. Disassembly. Refer to figure 7-6 and disassemble fuel injector nozzle.

1 Screw, cover holddown (3)
2 Lockwasher, cover screw (3)
3 Washer, cover screw (3)
4 Screw, low idle hole plug
5 Washer, low idle screw
6 Seal, low idle screw
7 Locknut, terminal contact (2)
8 Nut, terminal contact (2)
9 Washer, insulating (2)
10 Tube, insulating (2)
11 Spring, shutdown arm
12 Arm assembly
13 Frame assembly, solenoid
14 Cover, governor control
15 Gasket, cover
16 Stud, guide
17 Washer, guide stud
18 Nut, pivot shaft retainer (2)
19 Seal, pivot shaft (2)
20 Shaft, governor arm
21 Hook assembly
22 Spring, governor control
23 Retainer, spring
24 Spring, idling
25 Guide, idling spring
26 Arm assembly, metering valve
27 Spring, governor linkage
28 Shim, metering valve
29 Valve, metering
30 Spring, metering valve
31 Arm, governor
32 Cam assembly
33 Screw (2)
34 Screw, retainer (2)
35 Washer
36 Spring, return
37 Lever
38 Shaft assembly, throttle
39 Washer, seal (2)
40 Seal, throttle assembly (2)
41 Lever
42 Shaft assembly
43 Screw
44 Bracket
45 Lever, throttle shaft
46 Screw
47 Screw, nameplate (2)
48 Nameplate
49 Screw, bracket (4)
50 Bracket
51 Cover, timing line (2)
52 Screw, fuel line connector (6)
53 Washer, fuel line (6)
54 Connector, fuel line
55 Washer (6)
56 Plug, end plate
57 Sleeve, end plate
58 Seal, end plate sleeve
59 Element, filter
60 Seal, element
61 Ring, sleeve seal
62 Spring, regulating
63 Piston, regulating
64 Seal, regulating piston
65 Screw, end plate (4)
66 Lockwasher, screw (4)
67 Washer (4)
68 Plug, end plate
69 Plate, end
70 Plate, thrust
71 Rollpin, locating
72 Seal, transfer pump
73 Blade assembly (2)
74 Liner, transfer pump
75 Ring, rotor retainer
76 Retainer, rotor (2)
77 Screw, delivery valve
78 Stop, delivery valve
79 Spring, delivery valve
80 Valve, delivery
81 Screw, cam locating
82 Washer
83 Screw, head locating
84 Washer
85 Head and rotor assembly
86 Seal, hydraulic head
87 Cam, ring
88 Retainer assembly
89 Screw, leaf spring adj.
90 Spring, leaf
91 Roller, cam (2)
92 Shoe, cam roller (2)
93 Plunger, rotor (2)
94 Ring, retainer
95 Spacer
96 Roller
97 Shoe, roller (2)
98 Washer, thrust
99 Shaft, drive
100 Seal, drive shaft
101 Seal
102 Seal, pilot tube
103 Housing

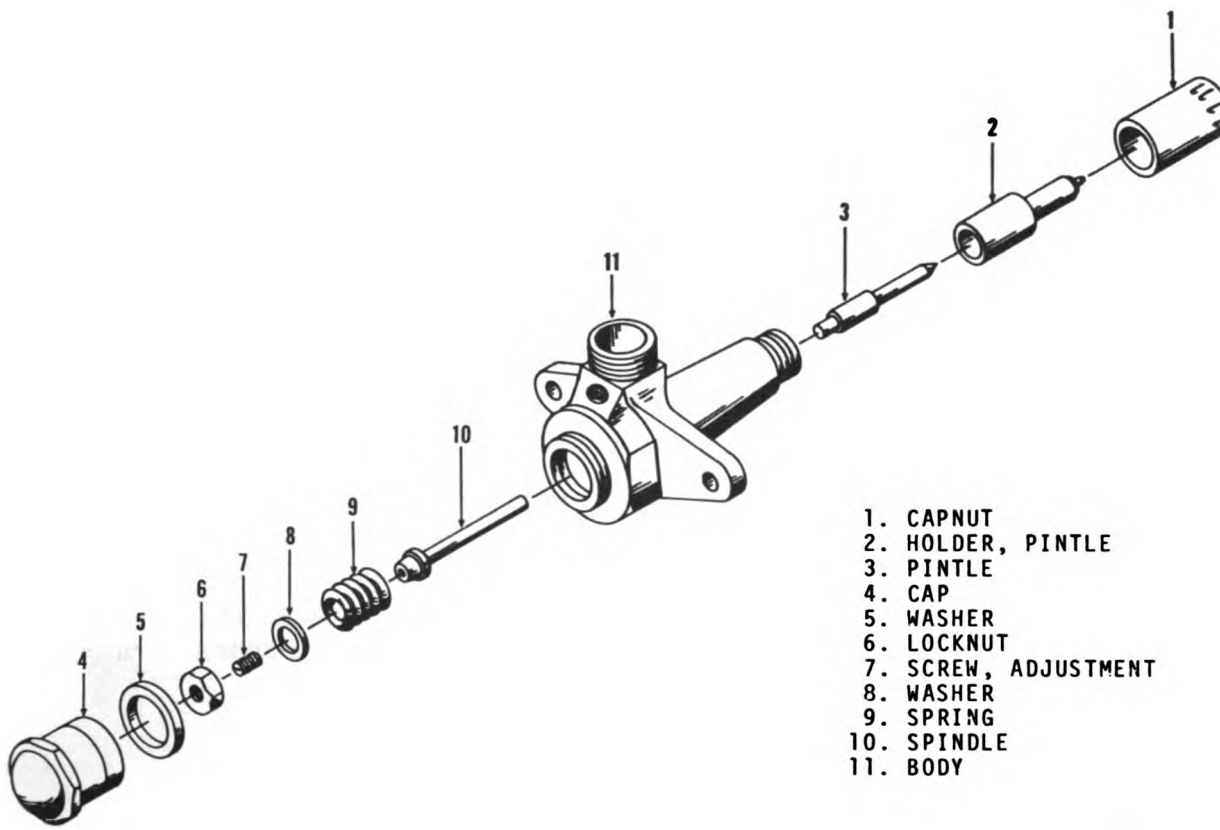
NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.



A. FUEL INJECTION ASSEMBLY

ME 6115-449-15/7-6 (1)

Figure 7-6. Fuel injection assembly, disassembly and reassembly (Sheet 1 of 2).



B. Fuel nozzle assembly.

ME 6115-449-15/7-6 (2)

Figure 7-6. Fuel injection assembly, disassembly and reassembly (Sheet 2 of 2).

d. Cleaning, Inspection and Repair.

(1) Soak nozzle in kerosene or clean fuel oil and wipe dry with a soft cloth.

(2) Inspect body and pintle for damage, deterioration from fuel and breaks. Replace defective parts.

(3) Wash and rinse all parts and coat with an approved lubricating oil.

e. Reassembly. Refer to figure 7-6 and reassemble fuel injector nozzle by reversing numerical sequence.

f. Testing.

(1) Install nozzle on fuel injection line or hand operated testing unit.

(2) Run engine and observe spray and examine for possible leakage. Spray should be even and smooth, free from uneven branches or streams. The oil spray cone should be same thickness around nozzle when observed two to five inches away. Unevenness or roughness indicates a dirty or defective nozzle.

(3) Using a test fixture, test fuel nozzle pressure. Proper pressure should be 2750 pounds per square inch.

Note. No adjustment is necessary unless pressure drops to 2500 pounds.

(4) Adjust pressure by removing cap and turning screw clockwise to increase pressure or counterclockwise to decrease pressure.

g. Installation. Refer to paragraph 3-80 and install fuel injection nozzle and sleeve.

7-9. Engine Speed Governor Assembly

a. General. The governor is a speed regulating device comprised of an electro-hydraulic actuator and power supply. The electro-hydraulic actuator receives its input signals from the electric control unit and converts these signals to an actuator motion that properly positions the engine throttle. The hydraulic supply consists of a hydraulic pump, tank, filter, relief valve and necessary line connections. The pump is gear driven and develops 310 pounds per square inch pressure at a flow rate of 2 gallons per minute.

b. Removal.

(1) Refer to figure 7-1 and remove the hydraulic pump.

(2) Refer to paragraph 3-96 and remove hydraulic fluid tank.

(3) Refer to figure 7-7 and remove electro-hydraulic actuator.

c. Testing.

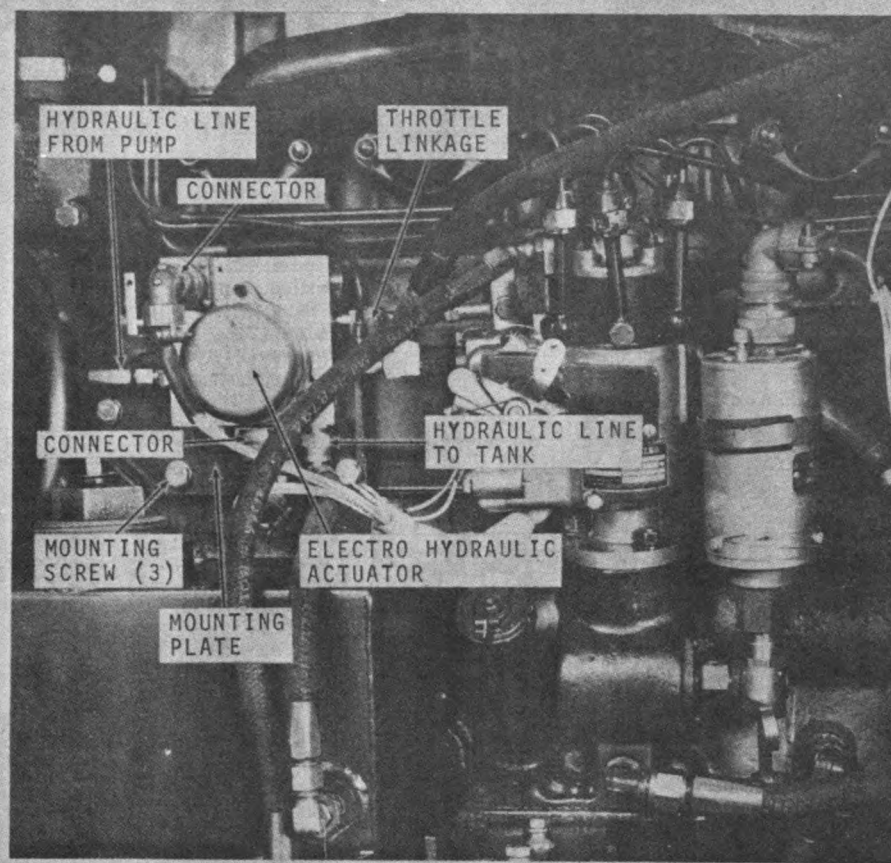
(1) Energize terminals C and D of connector J4 with a 120 volt, 60 cycle AC voltage.

(2) Measure voltage at terminals A and B of connection J4 with a 0 to 50 volt AC voltmeter. Voltage should be maximum at full closed position and minimum at full open position of the actuator. The voltage should not pass through a maximum or minimum as the piston position is moved between the two extremes. If readjustment is necessary loosen transducer lock screw located in block. Move transducer body relative to slug to obtain voltages as indicated above. After adjustment lock set screw.

(3) Test hydraulic pump for flow rate with a flow meter and pressure with suitable pressure gage. The pump flow rate should be two gallons per minute and the pressure should be within 10 pounds of 310 pounds per square inch.

(4) Fill hydraulic tank and test for leaks.

d. Disassembly. Refer to figure 7-7 and disassemble the electro-hydraulic actuator by following numerical sequence.



STEP 1. REMOVE THROTTLE LINKAGE (PAR. 3-97).

STEP 2. REMOVE ELECTRICAL CONNECTOR (2).

STEP 3. REMOVE HYDRAULIC LINE FROM PUMP.

STEP 4. REMOVE HYDRAULIC LINE TO TANK.

STEP 5. REMOVE MOUNTING SCREW (2).

STEP 6. REMOVE MOUNTING PLATE WITH ACTUATOR.

STEP 7. REMOVE FOUR MOUNTING SCREWS FROM REAR OF MOUNTING PLATE TO RELEASE ACTUATOR.

A. REMOVAL AND INSTALLATION

ME 6115-449-15/7-7 (1)

Figure 7-7. Electro-hydraulic actuator (Sheet 1 of 3).

1 Bolt
2 Lockwasher
3 Setscrew
4 Link
5 Ring, retaining
6 Washer
7 O-Ring
8 Collar
9 Collar, quad-ring
10 Piston
11 Slug, transducer
12 Setscrew
13 Screw, machine (4)
14 Lockwasher (4)
15 Receptacle
16 Gasket
17 Core, transducer
18 Pin, roll
19 Plug assembly, filter
20 O-Ring
21 Plug, metal (2)
22 O-Ring (2)
23 Screw, machine (4)
24 Lockwasher (4)
25 Receptacle
26 Gasket
27 Screw, cap (3)
28 Lockwasher (3)
29 Cover
30 Gasket
31 Screw, machine (4)
32 Lockwasher (4)
33 Needle (2)
34 Orifice, top (2)
35 O-Ring (2)
36 Valve (2)
37 Spacer (2)
38 Orifice, bottom (2)
39 O-Ring (2)
40 Screw, machine (4)
41 Lockwasher (4)
42 Adapter (2)
43 Screw, machine (2)
44 Lockwasher (2)
45 Nut (2)
46 Plate, mounting
47 Screw, Machine (2)
48 Lockwasher (2)
49 Nut (2)
50 Setscrew (2)
51 Nut, lock (2)
52 Armature
53 Screw, machine (2)
54 Lockwasher (2)
55 Core (2)
56 Mounting, armature
57 Block, valve

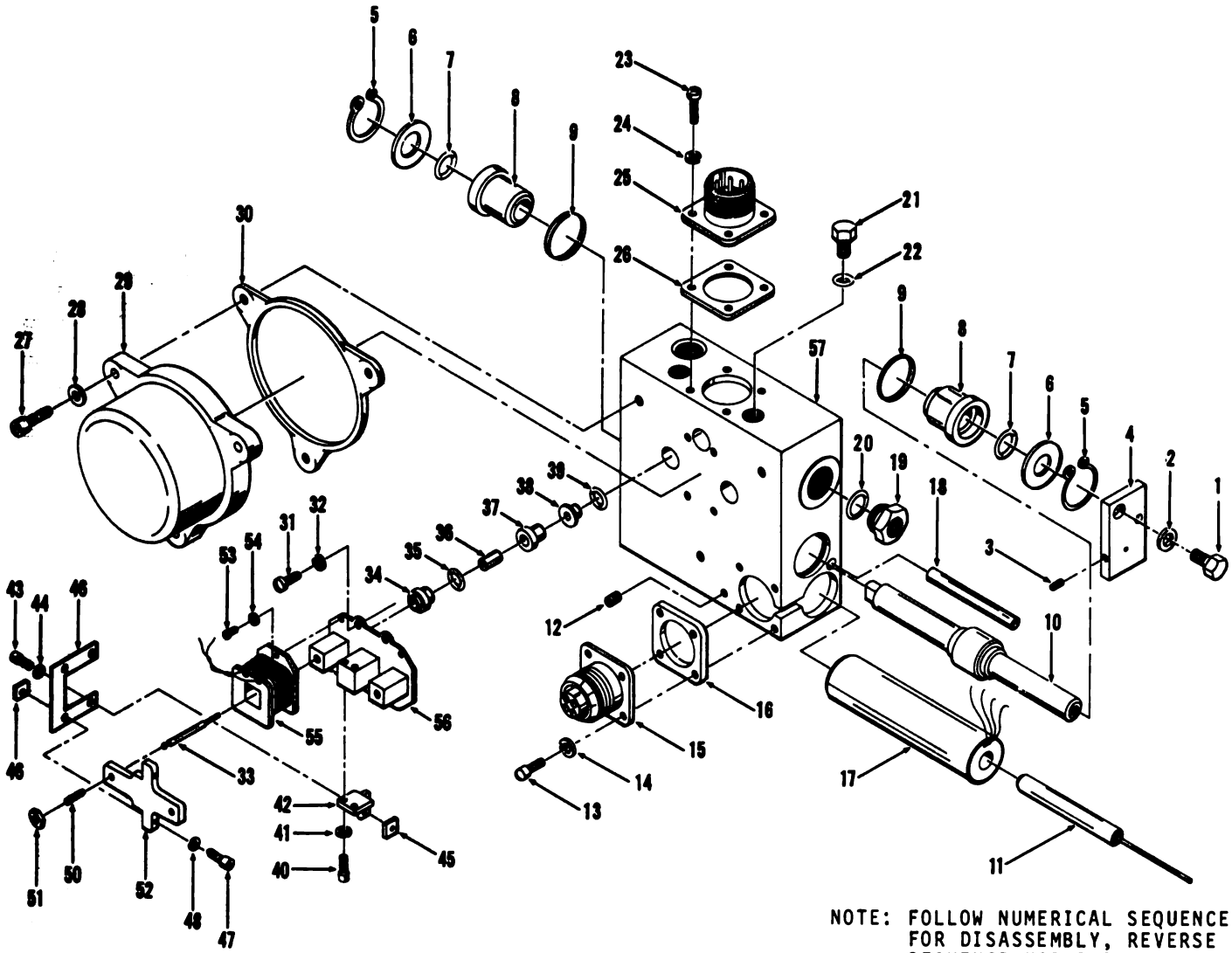


Figure 7-7. Electro-hydraulic actuator (Sheet 2 of 3).

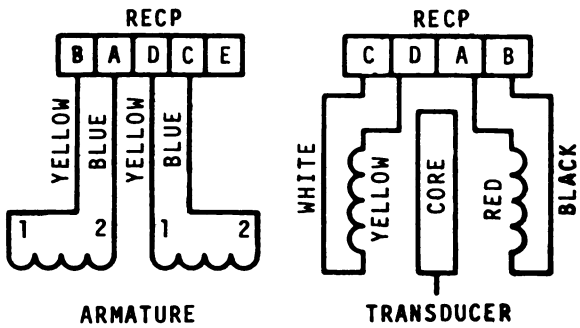


Figure 7-7. Electro-hydraulic actuator (Sheet 3 of 3).

e. Cleaning, Inspection and Repair

(1) Clean all metal parts in an approved solvent.

(2) Inspect housings, cases and tanks for cracks, dents and breaks. Repair defective parts.

(3) Inspect pump gears for worn or broken teeth. Replace defective gears.

(4) Inspect tubing for restrictions, cracks, and defective fittings. Replace defective tubing.

(5) Inspect actuator piston for scratches and wear. Repair or replace damaged piston.

(6) Inspect actuator electrical connectors and wires for broken or frayed wires. Replace defective wires.

(7) Inspect all threaded parts for worn or damaged threads. Rethread damaged parts.

f. Reassembly. Refer to figure 7-7, and reassemble actuator by reversing numerical sequence.

g. Installation.

(1) Refer to figure 7-7 and install electro-hydraulic actuator.

(2) Refer to paragraph 3-96 and install hydraulic tank.

(3) Refer to figure 7-1 and install hydraulic pump.

h. Testing. Test actuator and pump with engine running by performing steps 1 through 3, paragraph 7-9*c*.

Section II. MAIN ENGINE

7-10. General

The main engine components consist of the cylinder head, rocker arm assembly, gear housing and timing gears, camshaft, flywheel and bell housing, main bearings and crankshaft, oil pump, piston and connecting rod assembly, and cylinder block.

7-11. Cylinder Head

a. General. The cylinder head is a one piece casting fastened to the top of the cylinder block by studs and nuts. A gasket forms a seal between the block and cylinder head to prevent leaks.

b. Removal. Refer to figure 7-1 and remove cylinder head.

c. Disassembly. Refer to figure 7-8 and disassemble cylinder head by following numerical sequence.

d. Cleaning, Inspection and Repair.

(1) Clean cylinder head with an approved solvent.

(2) Refer to table 5-1, Engine Repair and Replacement Standards, and inspect intake and exhaust valves, valve seats, guides and springs for wear and clearance.

(3) Inspect cylinder head casting for cracks and breaks.

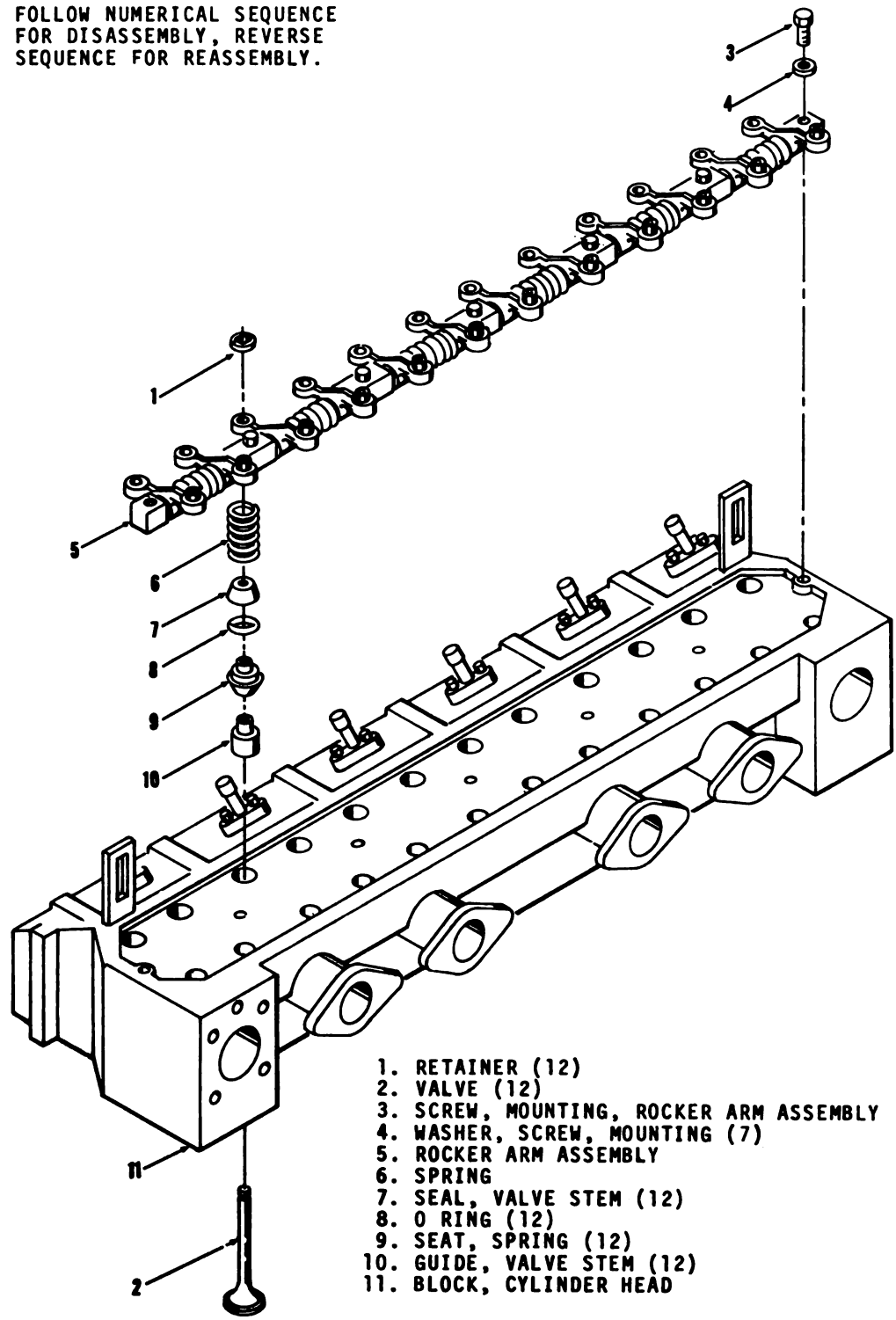
(4) Repair worn valves, valve seats and guides.

(5) Replace defective springs, bent or cracked valves and valve guides.

e. Reassembly. Refer to figure 7-8 and reassemble cylinder head by reversing numerical sequence.

f. Installation. Refer to figure 7-1 and install cylinder head.

NOTE: FOLLOW NUMERICAL SEQUENCE
FOR DISASSEMBLY, REVERSE
SEQUENCE FOR REASSEMBLY.

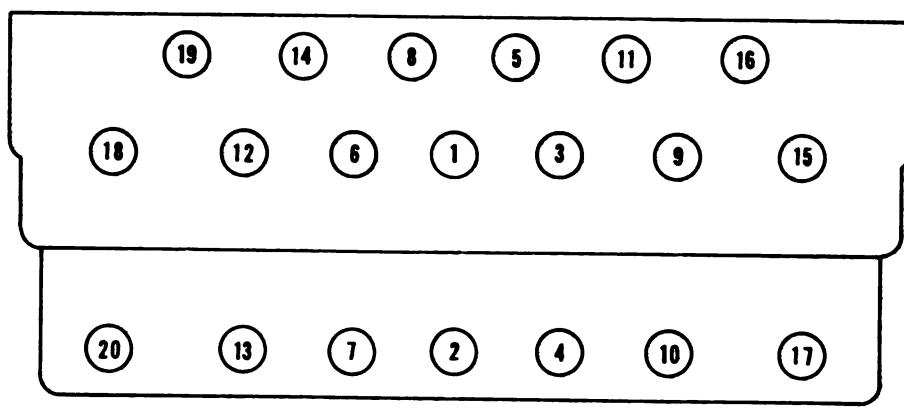


1. RETAINER (12)
2. VALVE (12)
3. SCREW, MOUNTING, ROCKER ARM ASSEMBLY (7)
4. WASHER, SCREW, MOUNTING (7)
5. ROCKER ARM ASSEMBLY
6. SPRING
7. SEAL, VALVE STEM (12)
8. O RING (12)
9. SEAT, SPRING (12)
10. GUIDE, VALVE STEM (12)
11. BLOCK, CYLINDER HEAD

A. DISASSEMBLY AND REASSEMBLY

ME 6115-449-15/7-8 (1)

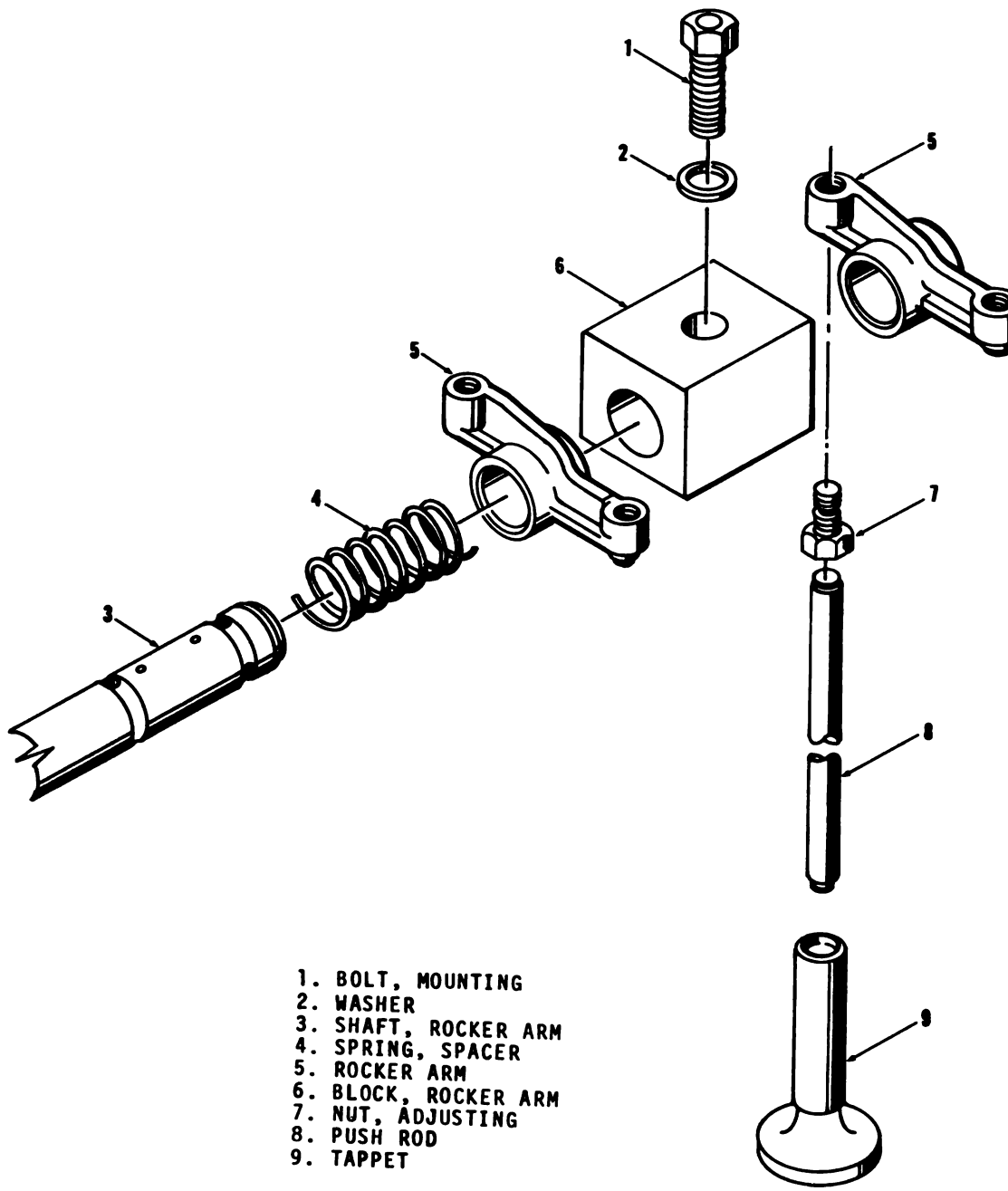
Figure 7-8. Cylinder head A



B. TORQUE SEQUENCE

ME 6115-449-15/7-8 (2)

Figure 7-8. Cylinder head B



1. BOLT, MOUNTING
2. WASHER
3. SHAFT, ROCKER ARM
4. SPRING, SPACER
5. ROCKER ARM
6. BLOCK, ROCKER ARM
7. NUT, ADJUSTING
8. PUSH ROD
9. TAPPET

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.

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Figure 7-9. Rocker arm assembly, disassembly and reassembly.

7-12. Rocker Arm Assembly

a. General. The rocker arms, push rods and valve lifters function as a unit in the cylinder head. This unit actuates the intake and exhaust valves. The rocker arms are assembled on the rocker arm shafts and are secured to the cylinder head by screws. The push rods actuate the individual rocker arms causing the appropriate valve to open at the correct time.

b. Removal. Refer to figure 7-8 and remove rocker arm assembly.

c. Disassembly. Refer to figure 7-9 and disassemble rocker arm assembly.

d. Cleaning, Inspection and Repair.

(1) Clean all parts in an approved solvent.

(2) Inspect all parts for wear and other evidence of damage.

(3) Repair or replace all damaged parts.

e. Reassembly. Refer to figure 7-9 and reassemble rocker arm assembly.

f. Installation. Refer to figure 7-8 and install the rocker arm assembly, valve tappets and push rods on the cylinder head.

7-13. Gear Housing, Timing Gears and Camshaft

a. General. The gear housing encases the timing gears and camshaft. The front oil seal for the crankshaft is also mounted on the gear housing. A cover plate provides access to the timing gears for inspecting and adjusting camshaft timing.

b. Disassembly. Refer to figure 7-1 and remove gear housing cover, camshaft, timing gears, hydraulic pump drive gear and gear housing by following numerical sequence.

c. Cleaning, Inspection and Repair.

(1) Clean all metal parts with an approved solvent.

(2) Inspect gear housing for cracks, dents or other damage. Replace damaged parts.

(3) Inspect gears for broken or worn teeth and excessive wear. Replace damaged or defective gears.

(4) Inspect camshaft for wear. Repair camshaft. If camshaft is excessively worn, broken or bent, replace camshaft.

d. Reassembly. Refer to figure 7-1 and reassemble gear housing, gears, camshaft and cover by reversing numerical sequence.

7-14. Flywheel and Bell Housing Assembly

a. General. The flywheel is bolted to the crankshaft and coupled to the generator drive coupling. A ring gear, mounted on the flywheel, engages with the pinion gear on the starter and cranks the engine for starting. The flywheel and ring gear are located in the bell housing.

b. Removal and Disassembly. Refer to figure 7-1 and remove and disassemble flywheel, ring gear and bell housing by following numerical sequence.

c. Cleaning, Inspection and Repair.

(1) Clean all parts in an approved solvent.

(2) Inspect ring gear for worn or damaged teeth. Repair damaged teeth.

(3) Inspect bell housing for cracks and breaks. Repair defective bell housing.

(4) Inspect flywheel for scratches, breaks or other damage. Repair defective flywheel.

(5) Inspect threaded parts for worn or damaged threads. Repair or replace defective parts.

d. Reassembly and Installation. Refer to figure 7-1 and reassemble and install bell housing, ring gear and flywheel by reversing numerical sequence.

e. Testing.

(1) Turn crankshaft to top dead center (DC) position.

(2) Attach a dial indicator to the bell housing and check the concentricity of the pilot bore. The concentricity should not exceed 0.005 inches at total reading.

(3) Place indicator on face of flywheel and check alinement of flywheel. The flywheel should not be out of alinement more than 0.005 inches of total reading.

7-15. Oil Pan

a. General. The oil pan serves as a cover for the crankcase and as an oil reservoir. A bayonet gage is used to check oil level without removing oil pan. Drain plugs are located on the bottom of the pan.

b. Removal. Refer to figure 7-1 and remove oil pan, oil pan adapters and gaskets by following numerical sequence.

c. Cleaning, Inspection and Repair.

(1) Clean oil pan with an approved solvent.

(2) Inspect oil pan for dents, breaks or cracks. Repair all damage.

(3) Inspect oil pan adapters for damage. Replace or repair damaged adapters and replace gaskets.

d. Installation. Refer to figure 7-1 and install oil pan by reversing numerical sequence.

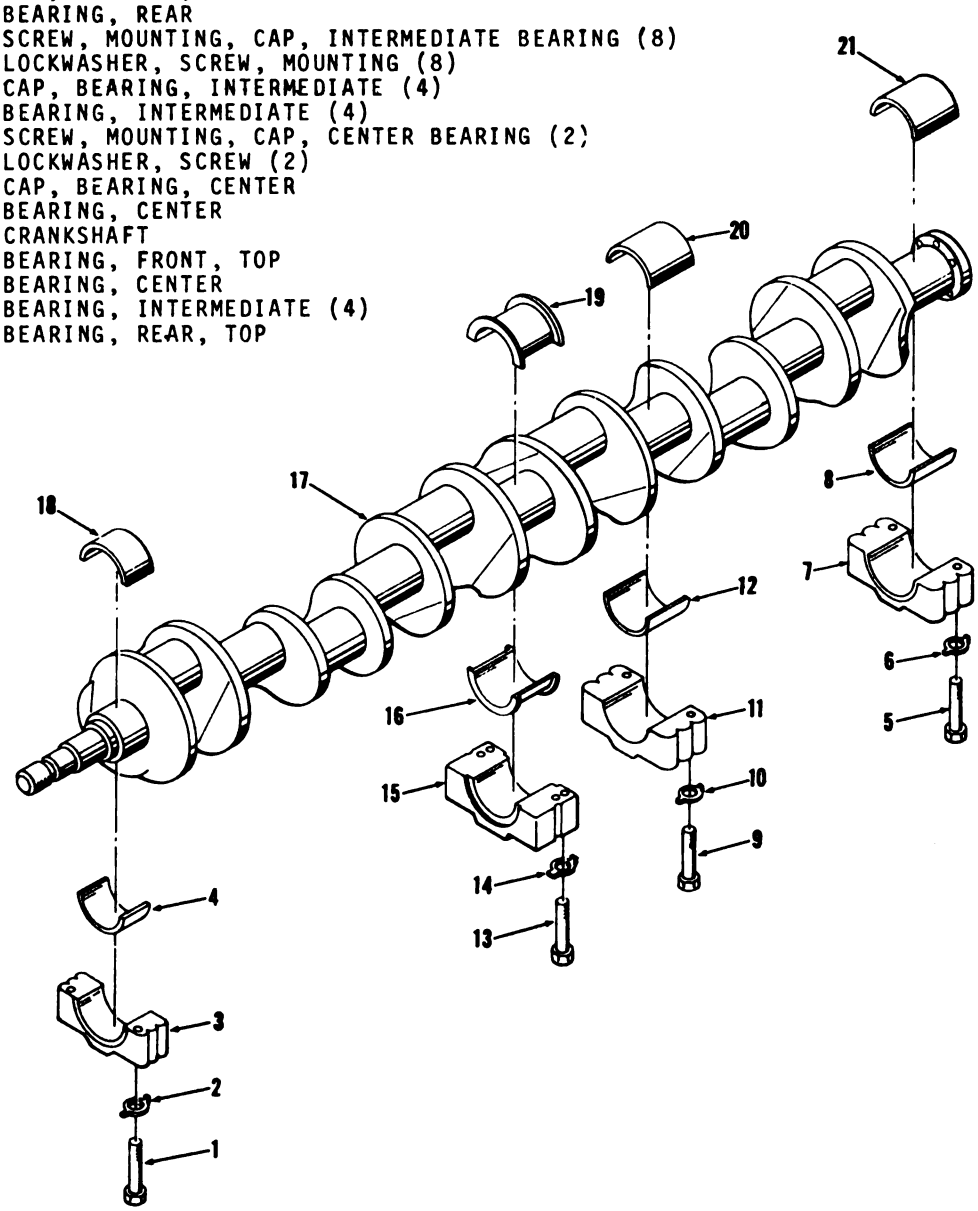
7-16. Crankshaft

a. General. The crankshaft is a machined forging with surface hardened bearing journals. The shaft has drilled passages to carry oil for lubricating the bearings. Seven main bearing caps secure the crankshaft to the block.

b. Removal. Refer to figure 7-1 and remove crankshaft.

c. Disassembly. Refer to figure 7-10 and disassemble crankshaft by following numerical sequence.

1. SCREW, MOUNTING, CAP, FRONT BEARING (2)
2. LOCKNUT, SCREW, MOUNTING (2)
3. CAP, BEARING, FRONT
4. BEARING, MAIN, FRONT
5. SCREW, MOUNTING, CAP, REAR BEARING (2)
6. LOCKWASHER, SCREW, MOUNTING (2)
7. CAP, BEARING, REAR
8. BEARING, REAR
9. SCREW, MOUNTING, CAP, INTERMEDIATE BEARING (8)
10. LOCKWASHER, SCREW, MOUNTING (8)
11. CAP, BEARING, INTERMEDIATE (4)
12. BEARING, INTERMEDIATE (4)
13. SCREW, MOUNTING, CAP, CENTER BEARING (2)
14. LOCKWASHER, SCREW (2)
15. CAP, BEARING, CENTER
16. BEARING, CENTER
17. CRANKSHAFT
18. BEARING, FRONT, TOP
19. BEARING, CENTER
20. BEARING, INTERMEDIATE (4)
21. BEARING, REAR, TOP



NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.

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Figure 7-10. Crankshaft disassembly and reassembly.

d. Cleaning, Inspection and Repair.

(1) Clean crankshaft in an approved solvent and clean oil passages with a small wire brush.

(2) Inspect journals for scratches and scoring. Carefully polish journals to remove scratches and score marks.

(3) Inspect journal dimensions with a micrometer. Regrind journals if necessary.

e. Reassembly. Refer to figure 7-10 and reassemble crankshaft by reversing numerical sequence.

f. Installation. Refer to figure 7-1 and install crankshaft.

7-17. Piston and Connecting Rod Assembly

a. General. The piston is made of an aluminum alloy. There are five piston rings located on the piston. The first three are compression rings and the bottom two are oil rings. The piston pin is a large diameter floating pin which rotates in the bushing of the connecting rod. This pin attaches the connecting rod to the piston. The connecting rods transfer power from the piston to the crankshaft.

b. Removal. Refer to figure 7-1 and remove piston and connecting rod assembly.

c. Disassembly. Refer to figure 7-11 and disassemble the piston and connecting rod assembly by following numerical sequence.

d. Cleaning, Inspection and Repair.

(1) Clean all parts in an approved solvent.

(2) Inspect rings for wear, scratches, and deterioration. Replace defective piston rings.

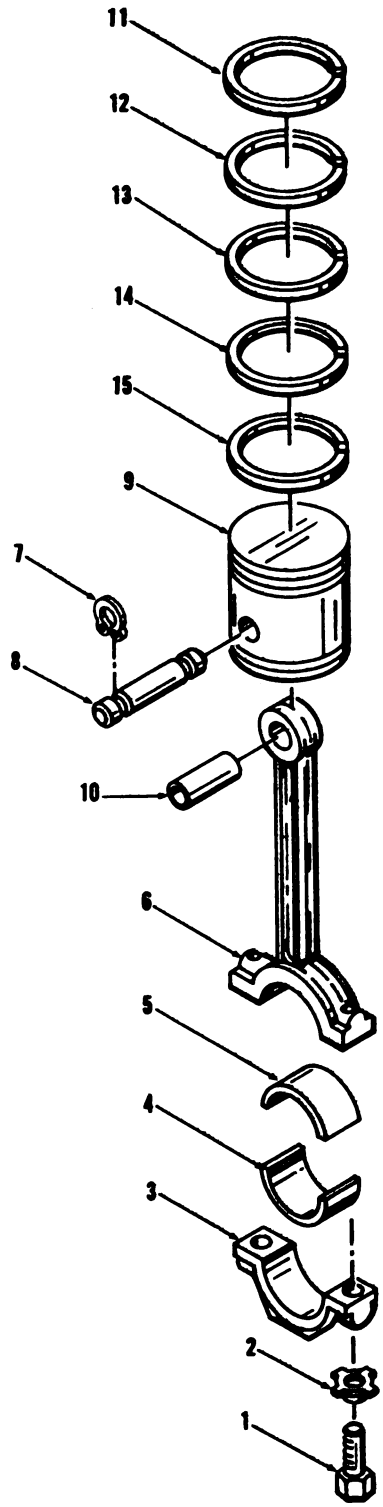
(3) Inspect bearings and bushings for wear, scratches and scoring. Replace defective bearings and bushings.

(4) Inspect piston, connecting rod and bearing cap for breaks, bends and cracks. Repair or replace defective parts.

(5) Inspect threaded parts for worn or damaged threads. Replace damaged parts.

e. Reassembly. Refer to figure 7-11 and reassemble piston and connecting rod assembly by reversing numerical sequence.

f. Installation. Refer to figure 7-1 and install piston and connecting rod assembly.



1. SCREW (2)
2. LOCKWASHER (2)
3. BEARING CAP
4. BEARING
5. BEARING
6. CONNECTING ROD
7. RING, RETAINING (2)
8. PIN, PISTON
9. BODY, PISTON
10. BUSHING, PIN, PISTON
11. PISTON RING NO. 1
12. PISTON RING NO. 2
13. PISTON RING NO. 3
14. PISTON RING NO. 4
15. PISTON RING NO. 5

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.

ME 6115-449-15/7-11

Figure 7-11. Piston and connecting rod disassembly and reassembly.

7-18. Oil Pump Assembly

a. General. The oil pump is gear driven from the camshaft. The body of the pump extends into the oil pan and strainer is mounted on the end of a pipe. Two gears inside the pump draw oil from the oil pan. A pressure adjustment relief valve is attached to the oil pump body and relieves pressure build-up. Another relief valve is mounted on the engine block and controls oil pressure throughout the system.

b. Removal. Refer to figure 7-1 and remove the oil pump.

c. Disassembly. Refer to figure 7-12 and disassemble the oil pump by following numerical sequence.

d. Cleaning, Inspection and Repair

(1) Clean all metal parts in an approved solvent.

(2) Inspect drive shaft and idler shaft for wear and bends. Replace worn or bent shafts.

(3) Inspect all gears for worn or broken teeth. Replace defective gears.

(4) Inspect threaded parts for worn or damaged threads. Repair damaged threads.

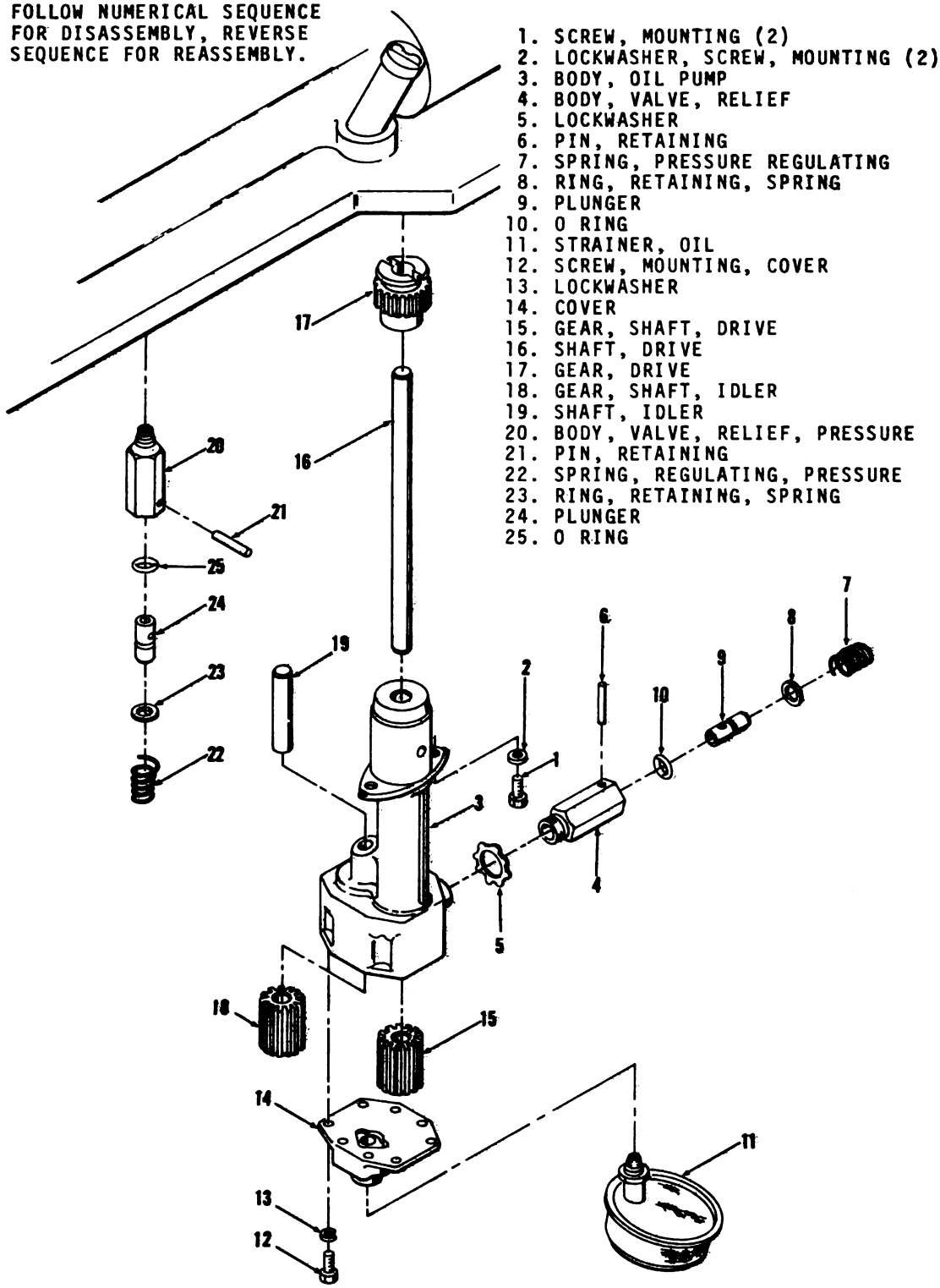
(5) Inspect strainer for breaks. Repair strainer.

e. Reassembly. Refer to figure 7-12 and reassemble oil pump by reversing numerical sequence.

f. Installation. Refer to figure 7-1 and install oil pump.

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR REASSEMBLY.

1. SCREW, MOUNTING (2)
2. LOCKWASHER, SCREW, MOUNTING (2)
3. BODY, OIL PUMP
4. BODY, VALVE, RELIEF
5. LOCKWASHER
6. PIN, RETAINING
7. SPRING, PRESSURE REGULATING
8. RING, RETAINING, SPRING
9. PLUNGER
10. O RING
11. STRAINER, OIL
12. SCREW, MOUNTING, COVER
13. LOCKWASHER
14. COVER
15. GEAR, SHAFT, DRIVE
16. SHAFT, DRIVE
17. GEAR, DRIVE
18. GEAR, SHAFT, IDLER
19. SHAFT, IDLER
20. BODY, VALVE, RELIEF, PRESSURE
21. PIN, RETAINING
22. SPRING, REGULATING, PRESSURE
23. RING, RETAINING, SPRING
24. PLUNGER
25. O RING



ME 6115-449-15/7-12

Figure 7-12. Oil pump and relief valves disassembly and reassembly.

7-19. Cylinder Block

a. General. The cylinder block is a single piece machined casting which provides a suitable means for mounting engine accessories and components. The engine cylinders are water jacketed to permit more efficient cooling. Cylinder sleeves are press fit into the block.

b. Disassembly. Refer to figure 7-1 and disassemble in cylinder block.

c. Cleaning, Inspection and Repair.

(1) Clean cylinder block with an approved solvent.

(2) Clean all oil passages with an approved solvent.

(3) Inspect tapped holes for worn or damaged threads. Repair tapped holes.

(4) Inspect cylinder sleeves for scratches, wear and scoring. Repair cylinder sleeves.

d. Reassembly. Refer to figure 7-1 and reassemble the cylinder block.

CHAPTER 8

MAIN GENERATOR AND ACCESSORIES REPAIR INSTRUCTIONS

Section I. STATIC EXCITER AND VOLTAGE REGULATOR

8-1. General

The main generator excitation system consists of a static exciter and voltage regulator. This system controls the generator voltage under all conditions of load and speed. It contains similar connections for both 50 and 60 cycle operation. Both the static exciter and voltage regulator are mounted in a box attached to the top of the generator. They are controlled by the voltage adjusting rheostat which controls and stabilizes the output of the generator.

8-2. Static Exciter

a. General. The exciter consists of a system of transformers, reactors, semiconductors and other static devices which feed back part of the generator output power to the generator field. The exciter supplies the correct field excitation to retain constant generator output voltage at any load current up to 104 amps and at any power factor between unity and zero. The output leads from the exciter are electrically isolated and are not grounded. The exciter is mounted in a box with the voltage regulator and is removable as a unit.

b. Removal. Remove static exciter (para 6-42), to run test.

c. Bench Testing.

(1) Test Equipment.

(a) Multimeter, Simpson 260, or equivalent.

(b) Voltmeter, 0-300 VAC, Weston 433, or equivalent.

(c) Voltmeter, 0-75 VDC, Weston 931, or equivalent.

(d) Shunt, 3 amps—50 mv, Weston, or equivalent.

(e) Shunt, 50 amps—50 mv, Weston, or equivalent.

(f) Millivoltmeter, 0-50 mv, Weston 931, or equivalent.

(g) Power Supply, 24 VDC.

(h) Variac, 240 VAC, 3 Phase.

(i) Load Resistor, .97 ohms, 1000 W.

(j) Load Resistor, 1.17 ohms, 1000 W.

(2) Refer to figure 8-1 and set up test equipment.

(3) With I_C equal 500 madc, apply 208 VAC, 3 phase, input voltage to the exciter. V_L equal 20 VDC and I_L equal 21.5 ADC.

(4) Decrease I_C to zero and observe that

(5) Increase I_C to 500 madc and observe that V_L equal 12 VDC and I_L equal 12.4 ADC.

(6) Increase I_C to 750 madc and observe that V_L equal 8.6 VDC and I_L equal 8.9 amps DC.

(7) Increase I_C to 1500 madc and observe that V_L equal 4.2 VDC and I_L equal 4.3 amps DC.

(8) Decrease I_C to 500 madc and remove the 208 VAC input power.

(9) Disconnect the .97 load resistor and replace it with 1.17 ohms.

(10) With I_C equal 500 madc, apply 240 VAC, 3 phase, input voltage to the exciter.

(11) Decrease I_C to zero and observe that V_L equal 27 VDC and I_L equal 21.5 amps DC.

(12) Increase I_C to 500 ma and observe that V_L equal 16.2 VDC and I_L equal 14 amps DC.

(13) Increase I_C to 750 ma and observe that V_L equal 11.6 VDC and I_L equal 10 amps DC.

(14) Increase I_C to 1500 ma and observe that V_L equal 5.4 VDC and I_L equal 4.6 amps DC.

(15) Decrease I_C to 500 madc and remove the 240 VDC input power. Decreases I_C to zero and remove the power supply.

d. Disassembly. Refer to figure 8-1 and disassemble the static exciter.

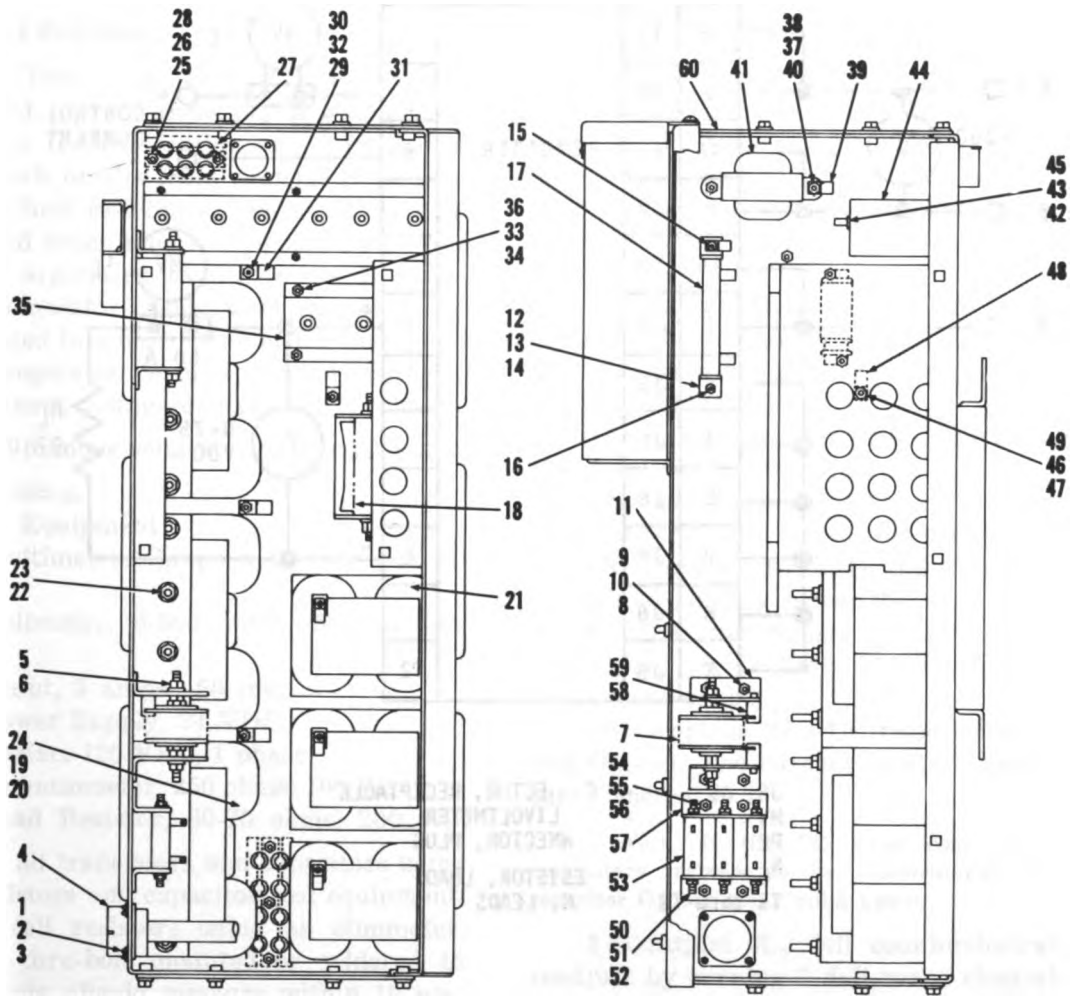
e. Cleaning, Inspection and Repair.

(1) Clean all parts with a clean, dry cloth and compressed air.

(2) Inspect all components for deterioration and damage.

(3) Inspect all threaded parts for worn or damaged threads.

1 Screws (4)
2 Washers (4)
3 Nuts (4)
4 Connector
5 Nuts (2)
6 Washers (2)
7 Suppressor, surge
8 Nuts (4)
9 Screws (4)
10 Washers (4)
11 Bracket
12 Screws (2)
13 Nuts (2)
14 Washers (2)
15 Clamp
16 Bracket, resistor mounting
17 Resistor
18 Rectifier assy.
19 Nuts (12)
20 Screws (12)
21 Reactor, linear (3)
22 Screws (12)
23 Washers (6)
24 Transformer, saturable (3)
25 Nuts (2)
26 Washers (2)
27 Clamps (2)
28 Screws (2)
29 Nut
30 Angle, mounting
31 Clamp
32 Rod
33 Nuts (2)
34 Washers (2)
35 Transformer, current
36 Screws (2)
37 Nuts (2)
38 Washers (2)
39 Clamp
40 Screws (2)
41 Transformer, isolation
42 Nuts (12)
43 Washers (12)
44 Transformer, current metering
45 Screws (6)
46 Nut
47 Washer
48 Clamp
49 Screw
50 Nuts (6)
51 Washers (6)
52 Rods (3)
53 Resistors (3)
54 Nuts (4)
55 Washers (4)
56 Screws (4)
57 Bracket
58 Screw
59 Grommet
60 Housing



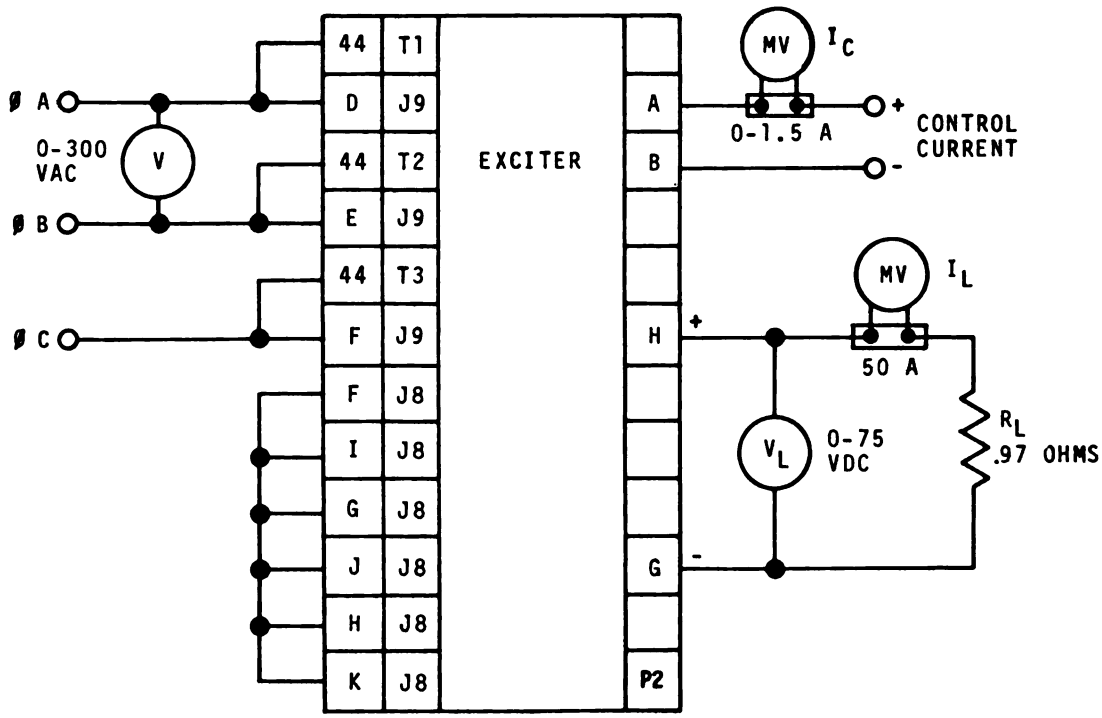
DISASSEMBLY AND REASSEMBLY

ME 6115-449-15/8-1(1)

Figure 8-1. *Static Exciter* (*Sheet* 1 *of* 4).

Figure 8-1. *Static exciter* (*Sheet* 2 *of* 4).
(Located in back of manual)

Figure 8-1. *Static exciter* (*Sheet* 3 *of* 4).
(Located in back of manual)



J8, J9 - C ECTOR, RECEPTACLE
MV - LIVOLTMETER
P2 - NNECTOR, PLUG
R_L ESISTOR, LOAD
T1 thru T3 N. LEADS

TEST SETUP - EXCITER

ME 6115-449-15/8-1 (4)

Figure 8-1. Static exciter (Sheet 4 of 4).

(4) Inspect all wires for breaks or faulty insulation.

(5) Repair or replace all defective or damaged parts.

f. Reassembly. Refer to figure 8-1 and reassemble the static exciter.

g. Installation. Install static exciter (para 6-42).

8-3. Voltage Regulator

a. General. The voltage regulator controls the generator field current through the exciter. It acts as a trim for the exciter and corrects the excitation which results from changes in generator speed and field resistance. The reference voltage is obtained from generator windings T9 and T12 and the associated exciter series winding. The voltage regulator, along with the static exciter, is mounted in a box on top of the main generator. This regulator permits parallel operation of the set without voltage droop.

b. Removal. Remove voltage regulator (fig. 8-2)

c. Bench Testing.

(1) Test Equipment

(a) Multimeter, Simpson 260, or equivalent.

(b) Voltmeter, 0-300 VAC, Weston 433, or equivalent.

(c) Shunt, 3 amps—50 mv.

(d) Power Supply, 24 VDC.

(e) Variac, 120 VAC, 1 phase.

(f) Potentiometer, 250 ohms, 100 W.

(g) Load Resistor, 60-70 ohms, 200 W.

(2) Test all transistors and capacitors using suitable transistors and capacitor test equipment.

(3) Test all resistors using an ohmmeter. All resistors, thru-bolt mounted or soldered to the panel boards, should measure within 10 percent of their rated values.

(4) Test chokes and transformers for continuity using an ohmmeter. Test the chokes and transformers for grounds by testing between one lead of each winding and the core with a multimeter. Test each transformer for shorted windings by testing between one lead of the secondary winding and one lead of the primary winding. Test the diodes for shorts or opens using an ohmmeter. When testing the diodes, connect the leads of the ohmmeter in such a way as to isolate the diode from other diodes and surrounding circuitry. A normal diode will indicate very low resistance in one direction and extremely high in the other. If the diode is shorted, very low resistance will be indicated in both directions. An open diode will read infinite in both directions.

(5) Refer to figure 8-2 and set up test equipment.

(6) Adjust R_1 to mid range value and increase input voltage to 120 VAC. The current in R_L will be either zero or nearly 1.5 amps (maximum). Figure 8-2 (4).

(7) Adjust R_{18} on printed circuit board to the point where the current in R_L changes abruptly to maximum value or from maximum value to zero. Lock R_{18} in this position.

(8) Slowly adjust the input voltage slightly above and slightly below the nominal value and observe that the change in the current in R_L takes place very rapidly. Reset the input voltage to nominal value.

(9) Apply a 24 VDC pulse between H (+) and G (—). The current in R_L should momentarily increase.

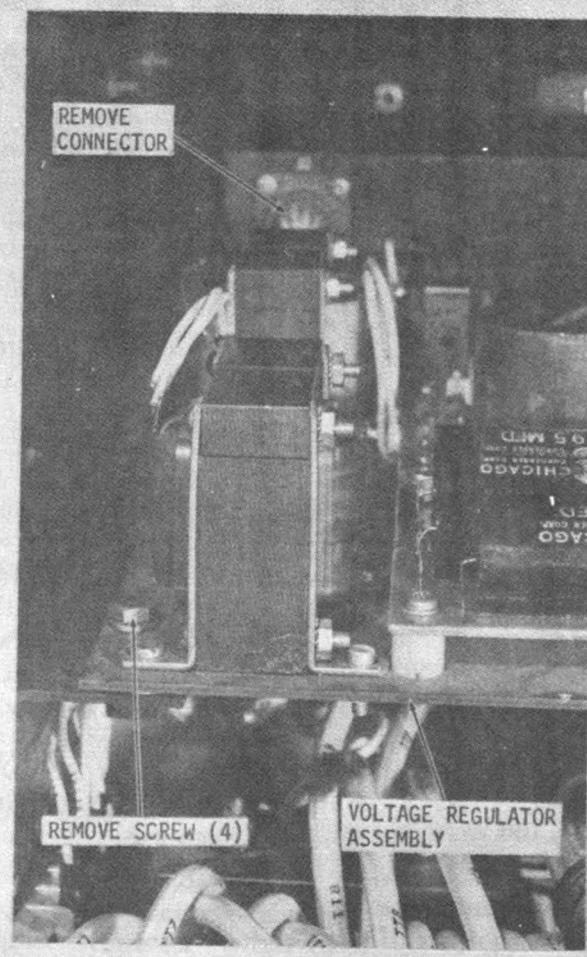
Note. If the DC pulse does not produce a momentary increase in R_L momentarily short circuit capacitor C_8 and apply pulse again.

(10) Adjust R_{16} full counterclockwise, then readjust by turning 5 full turns clockwise. Lock R_{16} in this position.

d. Disassembly. Refer to figure 8-2 and disassemble voltage regulator.

e. Cleaning, Inspection and Repair.

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



REMOVAL AND INSTALLATION

ME 6115-449-15/8-2 (1)

Figure 8-2. *Voltage regulator* (*Sheet* 1 *of* 4).

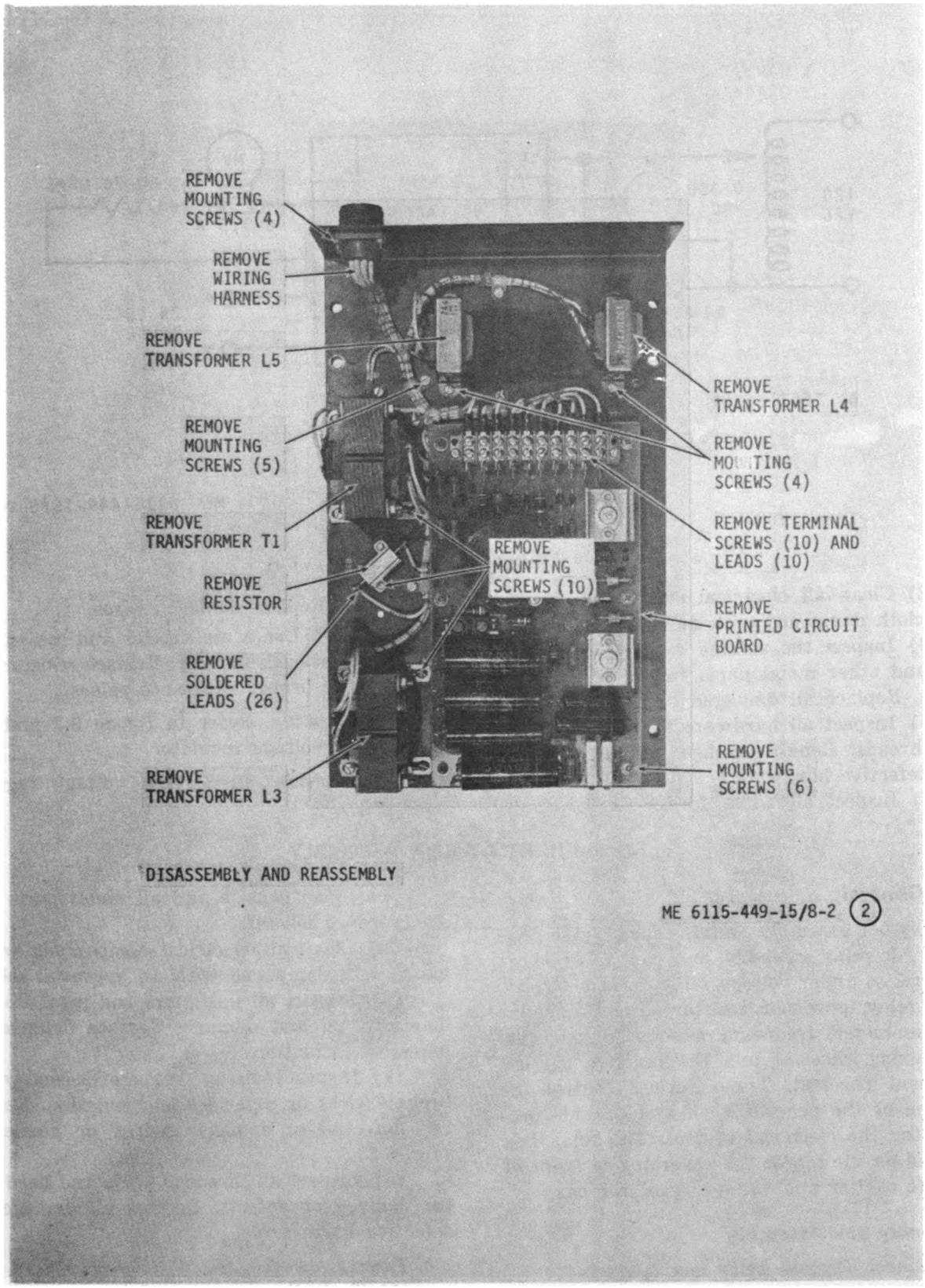
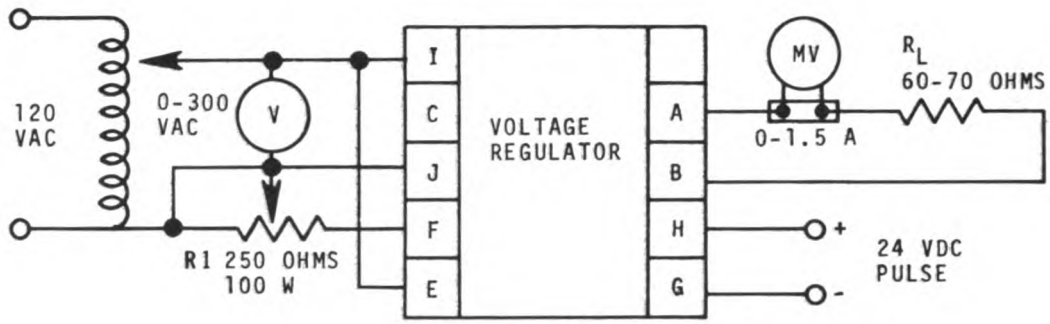


Figure 8-2. Voltage regulator (Sheet 2 of 4).



D. TEST SETUP

ME 6115-449-15/8-2 (4)

Figure 8-2. Voltage regulator (Sheet 4 of 4).

(2) Clean all electrical components with a clean cloth dampened with an approved solvent.

(3) Inspect the voltage regulator mounting plate and other metal parts for cracks or other defects. Replace all damaged or defective parts.

(4) Inspect all hardware for worn or damaged threads. Repair damaged threads and replace defective hardware.

(5) Inspect all wires for breaks or faulty insulation. Replace damaged wires.

f. Testing. Use a multimeter and measure the resistance at each resistor. Replace resistors that do not have proper resistance values.

g. Reassembly. Refer to figure 8-2 and reassemble the voltage regulator.

h. Installation. Install the voltage regulator (fig. 8-2).

Section II. RELAY BOX ASSEMBLY

8-4. General

The relay box assembly contains the reverse power relay, dc relay assembly, over volt relay, short circuit relay, under voltage relay, overload relay, starter relay, governor resistor assembly, shunt for dc ammeter, frequency selector switch, real load sharing rheostat and the reactive current adjustment rheostat. These devices control the operation of the generator set and provide protection for the electrical system. The relay box is located on the top of the generator in front of the static exciter and voltage regulator box.

8-5. Relay Box Assembly

a. Removal. Remove relay box (para 6-41).

b. Cleaning, Inspection and Repair.

(1) Clean chassis and all metal parts with an approved solvent.

(2) Clean all electrical components with a clean cloth dampened with an approved solvent.

(3) Inspect all insulators and insulation for deterioration and damage. Replace damaged or defective insulation.

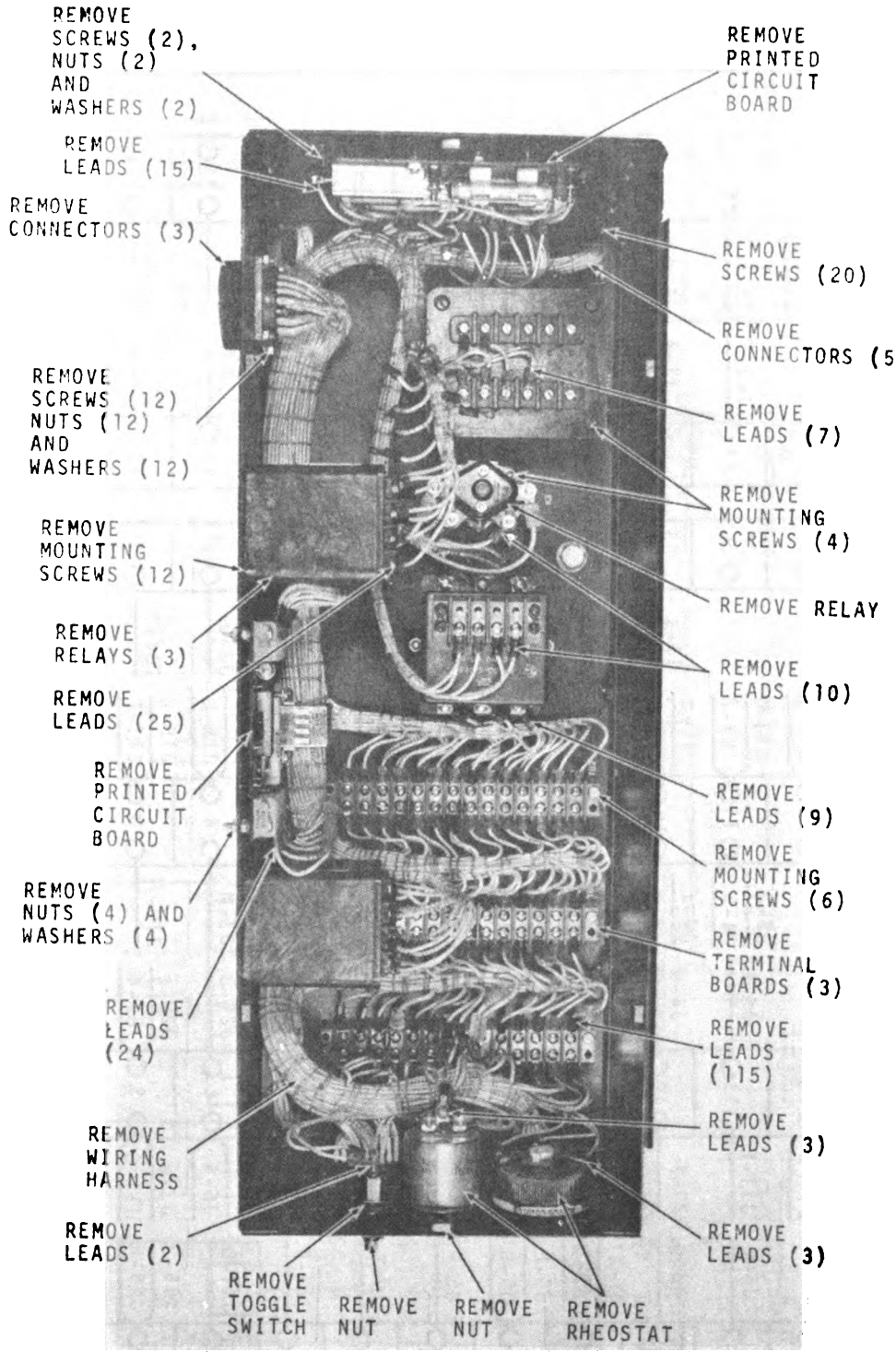
(4) Inspect wiring harness assembly for broken wires or deteriorated insulation. Replace any defective or damaged wires or connectors (fig. 8-3).

(5) Inspect all threaded parts and hardware for damage or defects. Replace all damaged or defective hardware.

c. Testing.

(1) Test all components for proper connections and continuity.

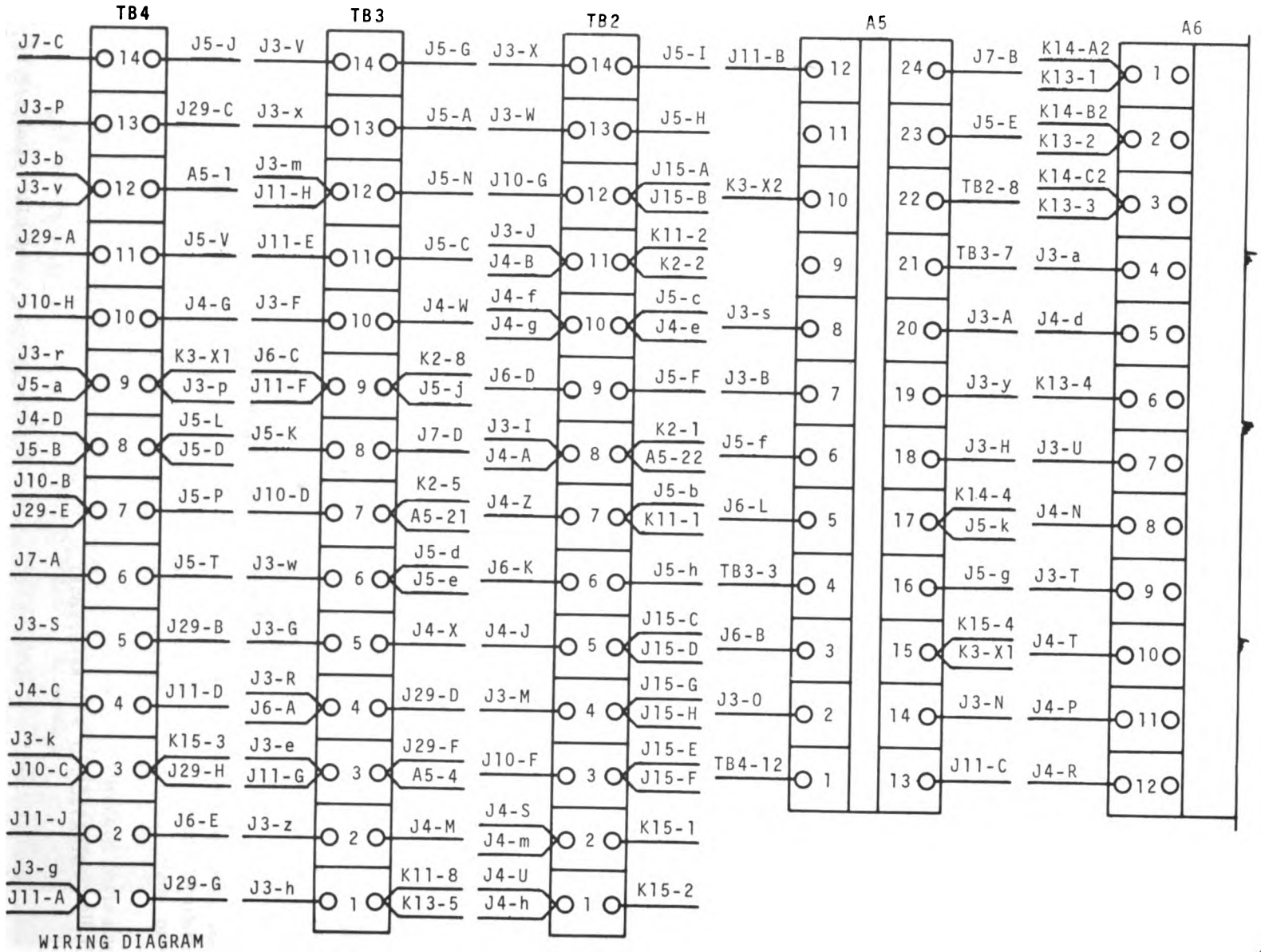
(2) Test components for proper operation.



DISASSEMBLY AND REASSEMBLY

ME 6115-449-15/8-3(1)

Figure 8-3. Relay box, disassembly and reassembly (Sheet 1 of 8).



ME 6115-449-15/8-3 (2)

Figure 8-3. Relay box, disassembly and reassembly (Sheet 2 of 8).

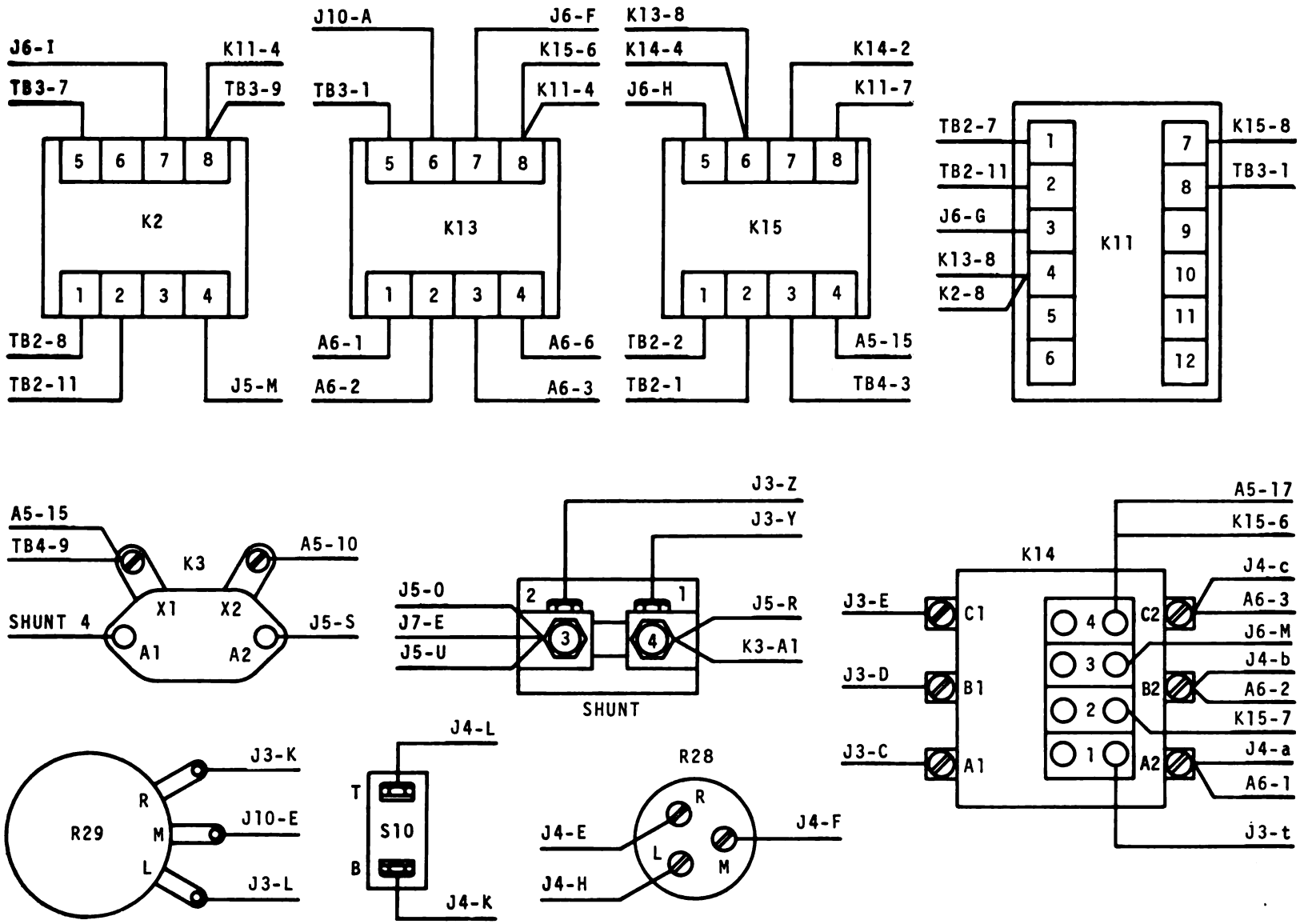
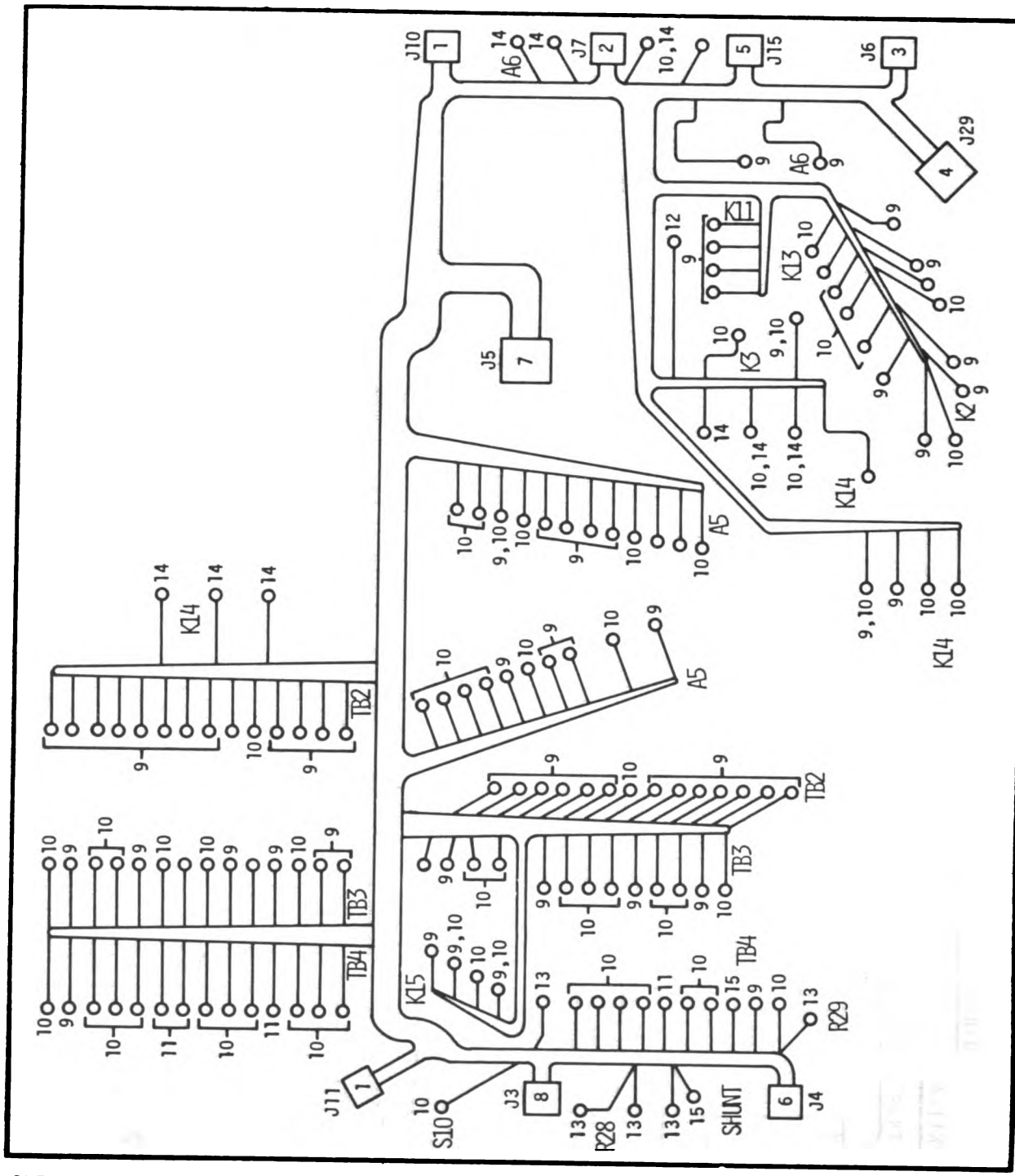


Figure 8-3. Relay box, disassembly and reassembly (Sheet 3 of 8).



ME 6115-449-15/8-3 (4)

Figure 8-3. ***Relay box, disassembly and reassembly*** (*Sheet* 4 *of* 8).

INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3272-2	CONNECTOR	MIL-W-5086
2	13216E3272-5	CONNECTOR	---
3	13214E3272-7	CONNECTOR	---
4	13216E7187-1	CONNECTOR	---
5	13216E7187-2	CONNECTOR	---
6	13216E7187-4	CONNECTOR	---
7	13216E7187-6	CONNECTOR	---
8	13216E7187-7	CONNECTOR	---
9	MS25036-2	TERMINAL LUG	---
10	MS25036-6	TERMINAL LUG	---
11	MS17143-6	TERMINAL LUG	---
12	MS25036-12	TERMINAL LUG	---
13	MS25036-49	TERMINAL LUG	---
14	MS25036-53	TERMINAL LUG	---
15	MS25036-57	CONNECTOR	---

* WIRE MARKING NO.	FROM STATION NO.	TO STATION NO	* WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
X12BB16	J5-c	TB2-10	X12P16	J3-J	TB2-11
P50M16	J5-d	TB3-6	X94B18	J3-K	R29-R
P50K16	J5-e	TB3-6	X95B18	J3-L	R29-L
P68A16	J5-f	A5-6	X96B18	J3-M	TB2-4
P53B16	J5-g	A5-16	P42A16	J3-N	A5-14
P207D18	J5-h	TB2-6	P67A16	J3-O	A5-2
P200G18	J5-j	TB3-9	P46E18	J5-A	TB3-13
P200E18	J5-k	A5-17	P55Z16	J5-B	TB4-8
L27A18	J3-A	A5-20	P80M16	J5-C	TB3-11
L28A18	J3-B	A5-7	P55T16	J5-D	TB4-8
X17B16	J3-C	K14-A1	P51D16	J5-E	A5-23
X18B16	J3-D	K14-B1	P201D18	J5-F	TB2-9
X19B16	J3-E	K14-C1	E39E18	J5-G	TB3-14
X7F18	J3-F	TB3-10	E38E18	J5-H	TB2-13
X8F18	J3-G	TB3-5	E37E18	J5-I	TB2-14
X6D18	J3-H	A5-18	V64D16	J5-J	TB4-14
X9K16	J3-I	TB2-8	V65D16	J5-K	TB3-8

INTERNAL WIRING HARNESS

ME 6115-449-15/8-3 (5)

Figure 8-3. Relay box, disassembly and reassembly (Sheet 5 of 8).

WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.	WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.
P55LL16	J5-L	TB4-8	P80C16	J3-m	TB3-12
P58A16	J5-M	K2-4	P55G16	J3-p	TB4-9
P80K16	J5-N	TB3-12	P55K16	J3-r	TB4-9
P140D12	J5-O	SHUNT-3	L26C18	J3-s	A5-8
P55V12	J5-P	TB4-7	P57D16	J3-t	K14-1
P140B12	J5-R	SHUNT-4	P40J16	J3-v	TB4-12
P41A12	J5-S	K3-A2	P50J16	J3-w	TB3-6
P55B12	J5-T	TB4-6	P46C18	J3-x	TB3-13
P140H12	J5-U	SHUNT-3	L25C18	J3-y	A5-19
P40B12	J5-V	TB4-11	K32C18	J3-z	TB3-2
P55RR16	J5-a	TB4-9	K112D18	J15-A	TB2-12
X9T16	J5-b	TB2-7	J112C18	J15-B	TB2-12
X31C16	J3-P	TB4-13	K111D18	J15-C	TB2-5
P45G16	J3-R	TB3-4	K111C18	J15-D	TB2-5
X29C16	J3-S	TB4-5	X98C18	J15-E	TB2-3
K34C18	J3-T	A6-9	X98D18	J15-F	TB2-3
K33C18	J3-U	A6-7	X96C18	J15-G	TB2-4
E39C18	J3-V	TB3-14	X96D18	J15-H	TB2-4
E38C18	J3-W	TB2-13	P44E16	J11-A	TB4-1
E37C18	J3-X	TB2-14	P48B18	J11-B	A5-12
E35C18	J3-Y	SHUNT-1	P54B16	J11-C	A5-13
E36C18	J3-Z	SHUNT-2	P81B16	J11-D	TB4-4
D24D16	J3-a	A6-4	P80H18	J11-E	TB3-11
P40K16	J3-b	TB4-12	P200C18	J11-F	TB3-9
P47D16	J3-e	TB3-3	P47F16	J11-G	TB3-3
P44D16	J3-g	TB4-1	P80B16	J11-H	TB3-12
P62B16	J3-h	TB3-1	P202D18	J11-J	TB4-2
P56D16	J3-k	TB4-3	P40D16	J29-A	TB4-11

INTERNAL WIRING HARNESS

ME 6115-449-15/8-3 (6)

Figure 8-3. Relay box, disassembly and reassembly (Sheet 6 of 8).

WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.	WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.
X29E16	J29-B	TB4-5	K114B18	J4-K	S10-B
X31E16	J29-C	TB4-13	K115B18	J4-L	S10-T
P45H16	J29-D	TB3-4	K32E18	J4-M	TB3-2
P55P16	J29-E	TB4-7	K103A18	J4-N	A6-8
P47H16	J29-F	TB3-3	K108B18	J4-P	A6-11
P44G16	J29-G	TB4-1	K109B18	J4-R	A6-12
P56E16	J29-H	TB4-3	K102C18	J4-S	TB2-2
P45J16	J6-A	TB3-4	K104A18	J4-T	A6-10
P66A16	J6-B	A5-3	K101C18	J4-U	TB2-1
P200B18	J6-C	TB3-9	X7J18	J4-W	TB3-10
P201B18	J6-D	TB2-9	X8J18	J4-X	TB3-5
P202B18	J6-E	TB4-2	X9M18	J4-Z	TB2-7
P203B18	J6-F	K13-7	X115A16	J4-a	K14-A2
P204B18	J6-G	K11-3	X116A16	J4-b	K14-B2
P205B18	J6-H	K15-5	X117A16	J4-c	K14-C2
P206B18	J6-I	K2-7	D24E16	J4-d	A6-5
P207B18	J6-K	TB2-6	X12V18	J4-e	TB2-10
P208B18	J6-L	A5-5	X12W18	J4-f	TB2-10
P209B18	J6-M	K14-3	X12X18	J4-g	TB2-10
X9P16	J4-A	TB2-8	K101B18	J4-h	TB2-1
X12U16	J4-B	TB2-11	K102B18	J4-m	TB2-2
P81D16	J4-C	TB4-4	P63A16	J10-A	K13-6
P55R16	J4-D	TB4-8	P55M16	J10-B	TB4-7
K105B18	J4-E	R28-R	P56H16	J10-C	TB4-3
K107B18	J4-F	R28-M	P50N16	J10-D	TB3-7
K110D16	J4-G	TB4-10	X138A18	J10-E	R29-M
K106B18	J4-H	R28-L	X98B18	J10-F	TB2-3
K111B18	J4-J	TB2-5	K112B18	J10-G	TB2-12

INTERNAL WIRING HARNESS

6115-449-15/8-3 (7)

Figure 8-3. Relay box, disassembly and reassembly (Sheet 7 of 8).

WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.	WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.
K110B16	J10-H	TB4-10	P62A16	K11-8	TB3-1
P55D12	J7-A	TB4-6	P62E16	K13-5	TB3-1
P51A16	J7-B	A5-24	P140C12	K3-A1	SHUNT-4
V64B16	J7-C	TB4-14	P200J18	A5-17	K14-4
V65B16	J7-D	TB3-8	P200K18	K2-8	TB3-9
P140F12	J7-E	SHUNT-3	P200L18	K11-4	K2-8
D24F16	K13-4	A6-6	P200M18	K13-8	K11-4
K101E18	K15-2	TB2-1	P200N18	K15-6	K13-8
K102E18	K15-1	TB2-2	P200P18	K14-4	K15-6
P40F16	A5-1	TB4-12	X9L18	K11-1	TB2-7
P47E16	A5-4	TB3-3	X9R18	K2-1	TB2-8
P49A16	K3-X2	A5-10	X9V18	A5-22	TB2-8
P50L16	TB3-7	A5-21	X12F18	K2-2	TB2-11
P50P16	K2-5	TB3-7	X12R18	K11-2	TB2-11
P55C16	A5-15	K3-X1	X115B16	K14-A2	A6-1
P55F18	K3-X1	TB4-9	X115C16	K13-1	A6-1
P55J18	K15-4	A5-15	X116B16	K14-B2	A6-2
P56G16	TB4-3	K15-3	X116C16	K13-2	A6-2
P59A16	K14-2	K15-7	X117B16	K14-C2	A6-3
P60A16	K15-8	K11-7	X117C16	K13-3	A6-3

*NOTE: LAST TWO DIGITS INDICATE WIRE SIZE.

INTERNAL WIRING HARNESS

ME 6115-449-15/8-3 (8)

Figure 8-3. Relay box, disassembly and reassembly (Sheet 8 of 8).

d. Disassembly. Refer to figure 8-3 and disassemble the relay box.

e. Reassembly. Refer to figure 8-3 and reassemble the relay box.

f. Installation. Install the relay box (para 6-41).

Section III. MAIN GENERATOR ASSEMBLY

8-6. General

The main generator is a synchronous rotating field generator direct-coupled to a diesel engine. The four pole rotor is supported on one end by a single ball bearing mounted in a bracket secured to the frame by bolts. The brushes are mounted in brush holder assemblies attached to the bracket and are accessible by removing the bracket cover plate. The opposite end of the rotor contains a fan and is bolted to the engine flywheel. The stator assembly is attached to the frame and spaces between the windings provide ventilation.

8-7. Main Generator

a. Removal. Remove generator (para 6-43).

b. Disassembly. Refer to figure 8-4 and disassemble generator.

c. Bench Testing.

(1) *Motor test equipment—(routine test) figure 8-5.*

(a) Current Transformer (3 req'd), Westinghouse EMR ratio 200/5, or equivalent.

(b) VM Selector Switch, Westinghouse Type W2 Style Number 505A702G04 or equivalent.

(c) AM Selector Switch, Westinghouse Type W2 Style Number 505A701G01 or equivalent.

(d) Wattmeter, Westinghouse—PY5—102/500 volts—5 amps, 500/2500 watts or equivalent.

(e) A. C. ammeter, Westinghouse, Type PA151—5 amp or equivalent.

(f) A. C. Voltmeter, Westinghouse, Type PA151—300/600 volts or equivalent.

(g) D.C. Voltmeter, Westinghouse, Type PX151—150 volt or equivalent.

(h) D.C. Ammeter, Westinghouse, Type PX151—30 amp or equivalent.

(i) Rheostat 125 volt—30 amp.

(j) Units tested per this test specification may be released for shipment provided all values are within the limits specified herein.

(k) Instruments used for these tests shall be of the portable Laboratory type having accuracies of 1/2% of Full Scale or better. Calibration dates shall be not more than 3 months prior to date of use. DC Instruments shall not be used on the lower 15% of the scale and AC Instruments (except watt meters) shall not be used on the lower 1/3 of the scale. Resistance readings to be made with unit at room temperature.

(2) *Motor Test.*

(a) Set up generator to run as a motor. Test shall be run in the sequence listed herein.

(b) Measure and record resistance between following pairs of stator leads: T1-T4, T2-T5, T3-T6, T7-T10, T8-T11, T9-T12. Each reading shall be within ± 2.5% of .0702 @ 25°C. If any reading is outside this limit but within ± 5%, proceed as per paragraph (1).

(c) Measure and record rotor resistance at the slip rings. This resistance shall be within ± 5%, of .741 @25°C.

(d) Perform remaining tests with the unit connected parallel wye.

(e) Measure and record insulation resistance at 500 VD.C. Minimum 100 megohms at 25° C.

(f) Operate unit as a motor at no load. With rated voltage applied to stator, adjust field current to obtain minimum line current. Record line amps, watts, and field amps and volts. Allowable variation from standard value—Average Line Amps 2.85 ± 10%, Watts 1000 ± 15%. Field Amps 9.4 ± 8%.

(g) With rated voltage applied, increase field amps to rated Full Load value. Record line amps and watts, and field amps and volts. At this condition the ratio of amps in highest phase to amps in lowest phase to be less than 1.05. Allowable variation from standard value:
Average line amps 104 ± 8%, watts 2450 ± 15%, field amps 22.2 ± 8%.

(h) During running conditions *f* and *g*, observe noise and vibration. There shall be no abnormal magnetic noise or evidence of defective or overheated bearing.

(j) Mechanical rotation to be counter clockwise from slip ring end when phase rotation of the voltage applied is 1-2-3.

(k) Dielectric Test—Apply following voltage to ground for 1 minute.

Stator—1832 volts
Rotor—1500 volts

1 Screw, machine (6)
2 Washer
3 Plate, coupling
4 Disc, coupling
5 Blower
6 Bolt, hex head (10)
7 Washer, flat (10)
8 Cover (2)
9 Brush, carbon, generator (4)
10 Rotor assembly
11 Bolt, hex head (6)
12 Lockwasher (6)
13 Screw
14 Nut
15 Lockwasher
16 Bracket
17 Bearing, sealed
18 Bearing plate
19 Bolt, hex head (4)
20 Nut, hex (4)
21 Lockwasher (4)
22 Bolt, hex head (4)
23 Rod, brush holder
24 Bracket, brush holder
25 Screw (4)
26 Screen, cover frame (4)
27 Housing, wound stator assembly

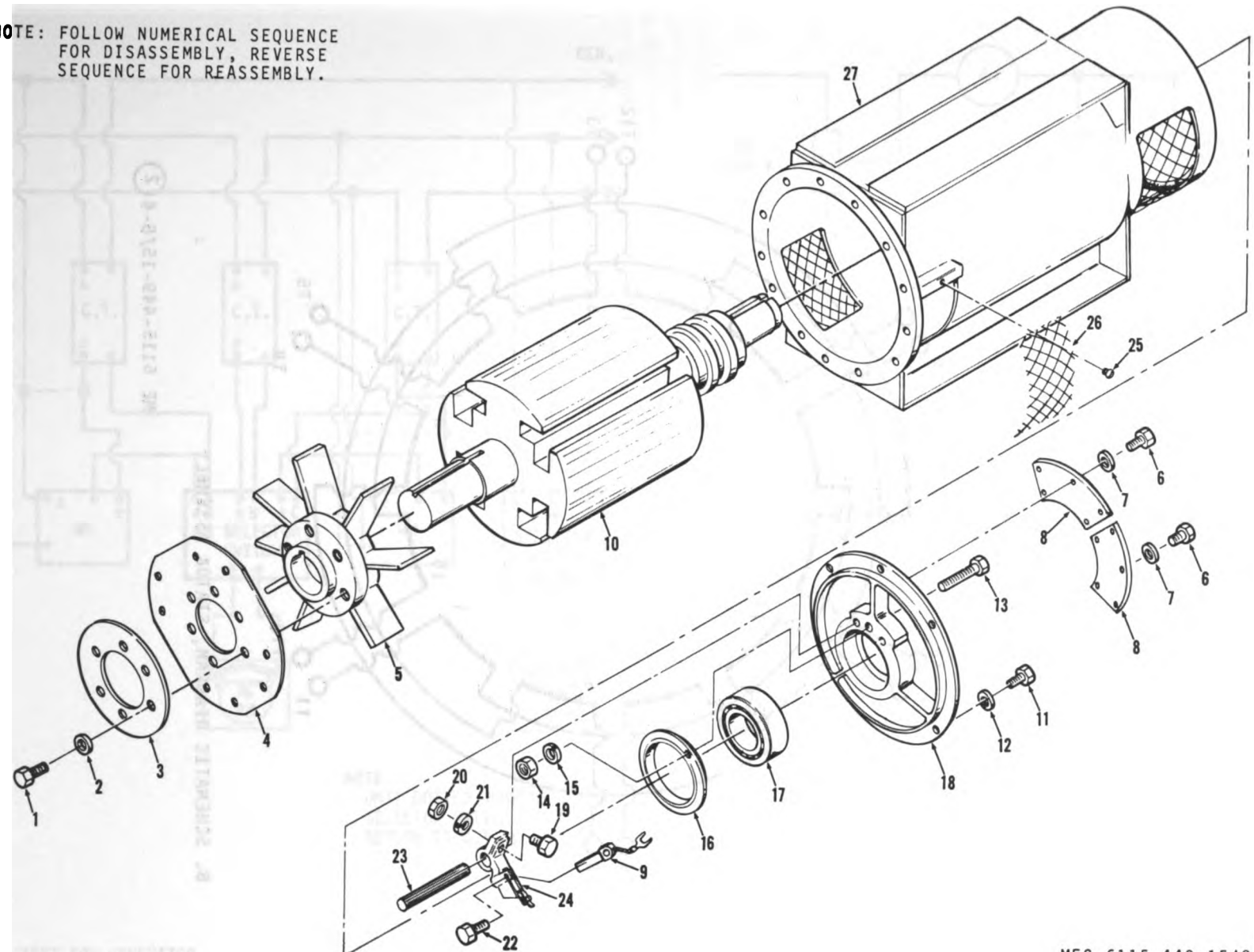
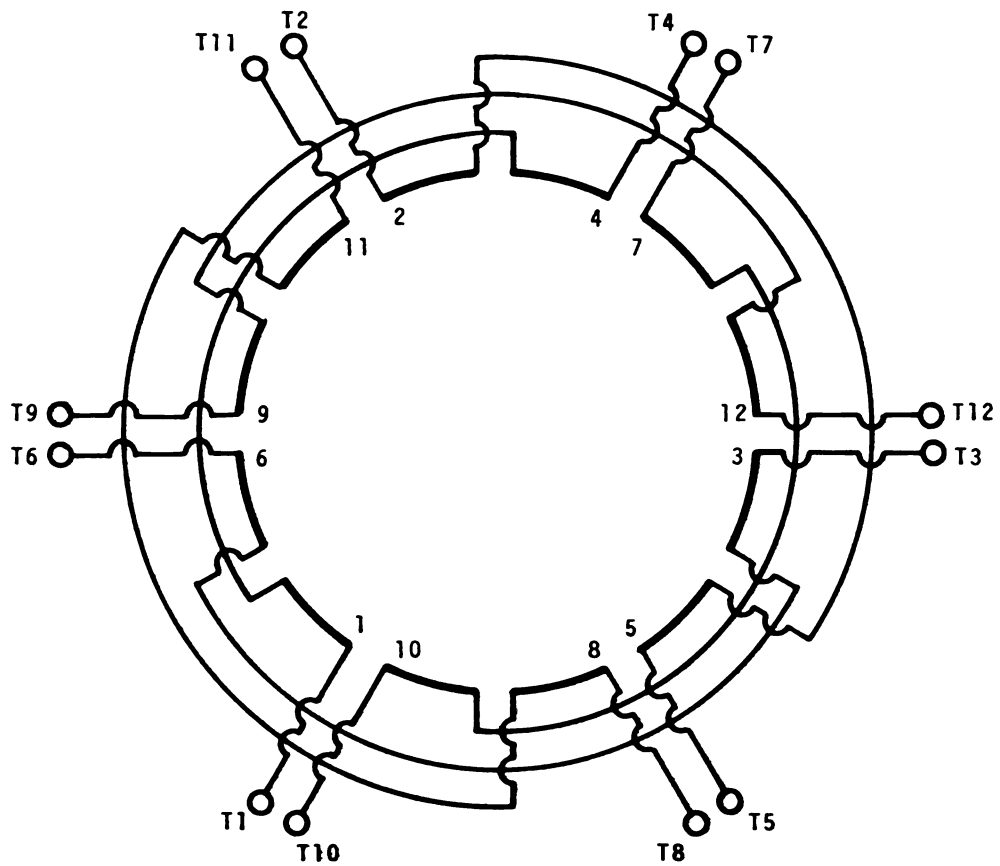


Figure 8-4. *Generator, disassembly and reassembly* (*Sheet* 1 *of* 2).

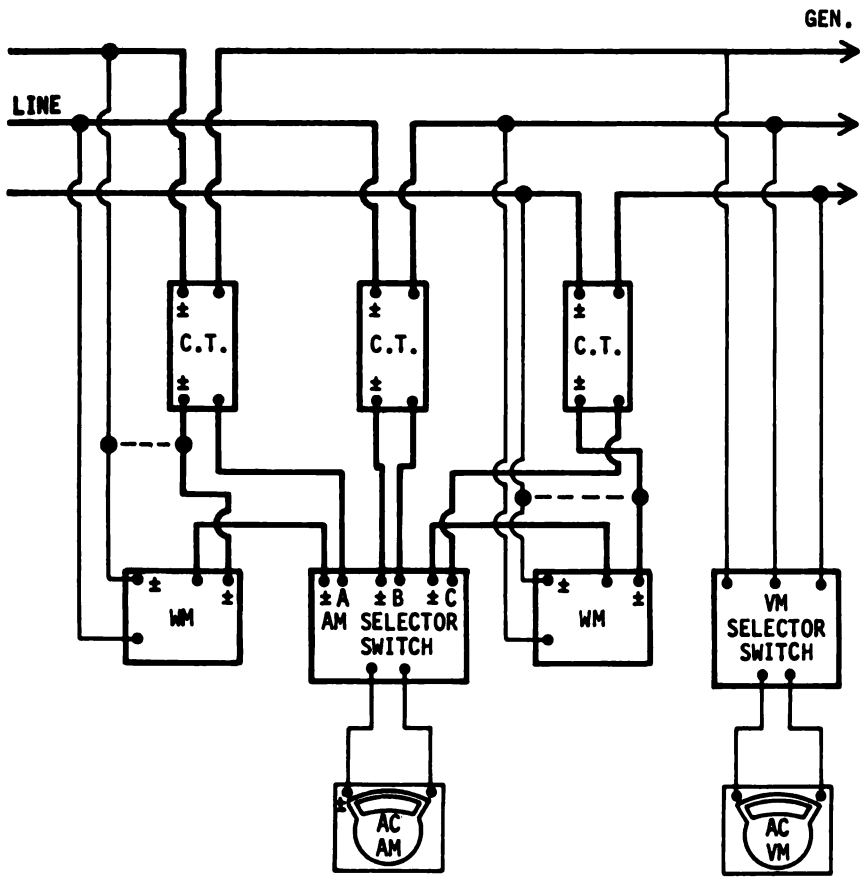
(l) Units not meeting the 5% limit shall be rejected. Units not meeting the 2.5% limit but within ± 5% shall be run as a generator at no load, rated N.L. excitation. The voltage between the pairs of leads (as in **paragraph** *b*) shall be measured and recorded. Units with a difference of more than 1 volt shall be rejected.



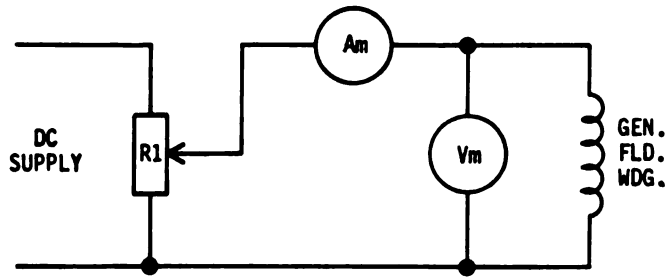
B. SCHEMATIC DIAGRAM, STATOR ASSEMBLY

ME 6115-449-15/8-4 (2)

Figure 8-4. *Generator, disassembly and reassembly (Sheet 2 of 2).*



NOTE:
OMIT DOTTED JUMPERS IF AM SELECTOR SWITCH HAS COMMON RETURN TO C.T.'s



C.T.	-	CURRENT TRANSFORMER	200/5 RATIO
WM	-	WATTMETER	0-500/2500 WATTS
ACVM	-	A.C. VOLTMETER	0-300/600 VOLTS
ACAM	-	A.C. AMETER	0-5 AMPS
Am	-	D.C. AMETER	0-30 AMPS
Vm	-	D.C. VOLTMETER	0-150 VOLTS
R1	-	RESISTOR, VARIABLE	5 OHMS, 500 WATTS
DC SUPPLY	-	125 VOLTS, 30 AMPS	

Figure 8-5. Routine test for generator.

d. Cleaning, Inspection and Repair.

(1) Clean stator, rotor and collector ring assembly with a clean dry cloth and brushes to loosen caked dirt and dust. Use low pressure air to blow away the loosened dirt.

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

(3) Inspect stator and frame for cracks, breaks, broken welds and other damage. Repair or replace frame if defective. Rewind stator coils if defective (refer to tabulated data, para 5-4).

e. Testing After Repair.

(1) After winding and connecting stator coils and before varnishing, test stator as follows:

(a) Apply 1,500 volts, 60 Hertz, for 1 minute to test dielectric.

(b) Connect T10, T11, and T12 together. Connect T6 to T9, T4 to T7 and T5 to T8 and apply surge comparison to T1, T2 and T3. Compare T1 - T3, T2 - T3, T2 - T1, T3 -T1, T1 - T2 and T1 - T3. The surge voltage should be 1832 volts for — 1 minute on each comparison.

(2) After winding and connecting rotor coils and before varnishing, test stator coil to core for 1 minute at 1832 volts.

(3) After assembly of rotor, test assembly and connector rings to shaft at 1,500 volts for one minute.

(4) Test spring tension on brush holder assembly. When extended to required length spring to have initia! tension of 2.15 pounds.

f. Reassembly. Refer to figure 8-4 and reassemble generator.

g. Testing after Reassembly.

(1) Perform bench test as instructed in paragraph 8-7*c* and make all following tests according to specifications in paragraph 8-7*c*.

(2) Test generator stator and rotor for continuity and insulation resistance as instructed in TM 5-764.

(3) Test rotor dielectric to ground for one minute at 1832 volts.

(4) Test rotor dielectric to ground for one minute at 1500 volts.

(5) Test generator stator for short circuits with an internal growler as instructed in TM 5-764.

(6) Test rotor field assembly as instructed in TM 5-764.

h. Installation. Install the generator (para 6-43).

i. Testing Under Load. Perform operational test on generator under load conditions when installed in unit by observing meter and gages. These meters will indicate if operation is normal.

CHAPTER 9

CONTROLS, INDICATORS AND WIRE HARNESSES REPAIR INSTRUCTIONS

Section I. CONTROLS

9-1. General

This section contains repair instructions required on the controls necessary for efficient generator set operation. The controls include those mounted in the control cubicle plus the governor and safety controls.

9-2. Control Cubicle Assembly

a. General. The control cubicle contains the controls and devices which are mounted on the control panel. These controls consist of the frequency meter and converter, wattmeter and terminal watt converter, frequency and voltage adjust rheostats, control panel relay assembly and the protection bypass lamp flasher.

b. Removal. Refer to figure 9-1 and remove control cubicle assembly. Remove the frequency meter and converter, wattmeter and terminal watt converter, frequency adjust and voltage adjust rheostats, control panel relay assembly, the protection bypass lamp flasher and the wiring harness.

Note. For removal of the gages and controls refer to paragraphs 3-98 through 3-108.

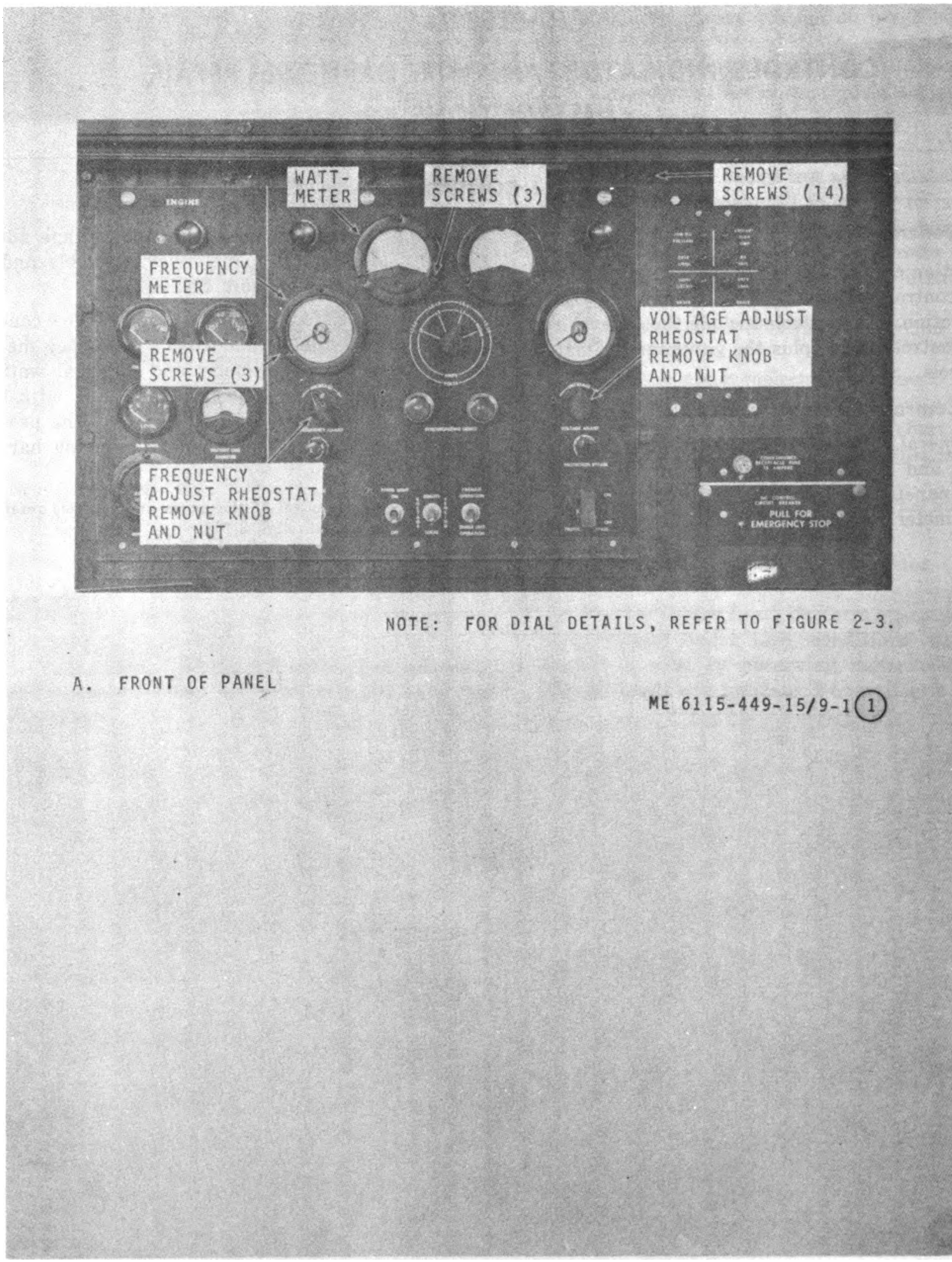
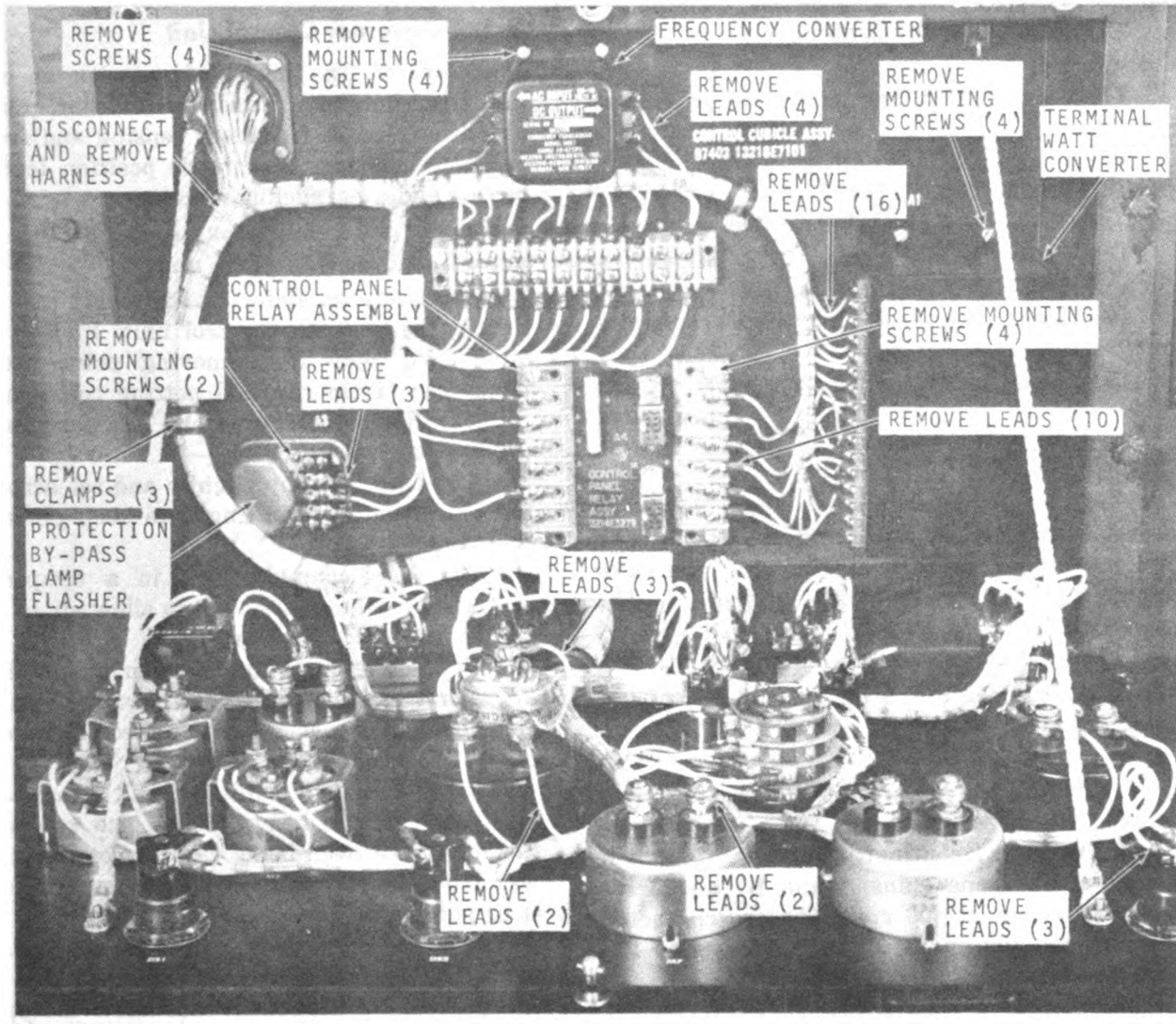


Figure 9-1. *Control cubicle controls, removal and installation (Sheet* 1 *of* 2).



B. REAR OF PANEL

ME 6115-449-15/9-1 (2)

Figure 9-1. Control cubicle controls, removal and installation (Sheet 2 of 2).

c. Testing.

(1) Test all components for proper operation.

(2) Test wires for continuity.

d. Control Box.

(1) Clean control box with an approved solvent.

(2) Inspect box for damage.

(3) Repair box.

e. Installation.

(1) Refer to paragraphs 3-98 through 3-108 and install all gages and controls.

(2) Refer to figure 9-1 and install remaining controls.

(3) Install control cubicle assembly (fig. 9-1).

9-3. Speed Switch

a. General. The speed switch shuts down the engine when engine speed exceeds 2250 rpm. This prevents damage to engine and generator which may result from excessive speed. The speed switch has a manual reset button which must be reset before the engine can be started.

b. Removal. Refer to paragraph 3-91 and remove the speed switch.

c. Bench Testing.

(1) Install the speed switch on a test stand equipped for direct drive.

(2) Connect a continuity tester across switch element number one (pins A and B) and drive the speed switch at 400 rpm. The switch should open between 390 and 410 rpm and reset at 100 rpm below trip speed.

(3) Connect the tester across switch element number two (pins D and E) and drive the speed switch at 1200 rpm. Switch should close between 1190 and 1210 rpm and reset at 100 rpm below trip speed.

(4) Connect tester across switch element number three (pins G and H) and drive the speed switch at 2225 rpm. Switch should open between 2215 and 2235 rpm. Switch element must be manually reset before switch will function.

(5) Replace switch if it does not operate within the ranges specified above.

d. Installation. Refer to paragraph 3-91 and install the speed switch.

9-4. Governor Controls

The governing controls consist of the governor control unit and the load measuring unit. These units control the operation of the governor system which is located on the engine. The governor control unit and load measuring unit are located on the left side of the generator compartment.

9-5. Governor Control Unit

a. General. The governor control is an electric unit that contains a transistor invertor, magnetic amplifier circuit, frequency sensing and frequency reference circuits, throttle position feed back circuit and a paralleling circuit.

b. Removal. Refer to paragraph 3-110 and remove the governor control unit.

c. Disassembly. Refer to figure 9-2 and disassemble the governor control unit. Follow procedure listed below for removing printed circuit panel assy. from can and potting compound.

(1) Remove 6 screws and lockwashers from cover of control unit.

(2) Lift cover up slightly and set across the top of can at a slight angle, to keep potentiometers out.

(3) Place complete unit in a temperature controlled oven large enough to allow air to circulate completely around unit.

(4) Set temperature of oven to 185°F and allow unit to soak at this temperature until potting compound is completely melted. This usually takes 12 hours.

(5) To remove printed circuit panel assembly from can, use heavy gloves, and remove entire unit from oven being careful not to spill the wax from the can or allow wax to get on the cover or potentiometers.

(6) Slowly lift the printed circuit panel assembly by the cable harness (between the cover and printed circuit board) and allow the potting compound to drain away from the printed circuit panel.

(7) Set the printed circuit panel assembly on a drain board and allow to cool to room temperature.

Note 1. Melting temperature of potting compound is 165° F.

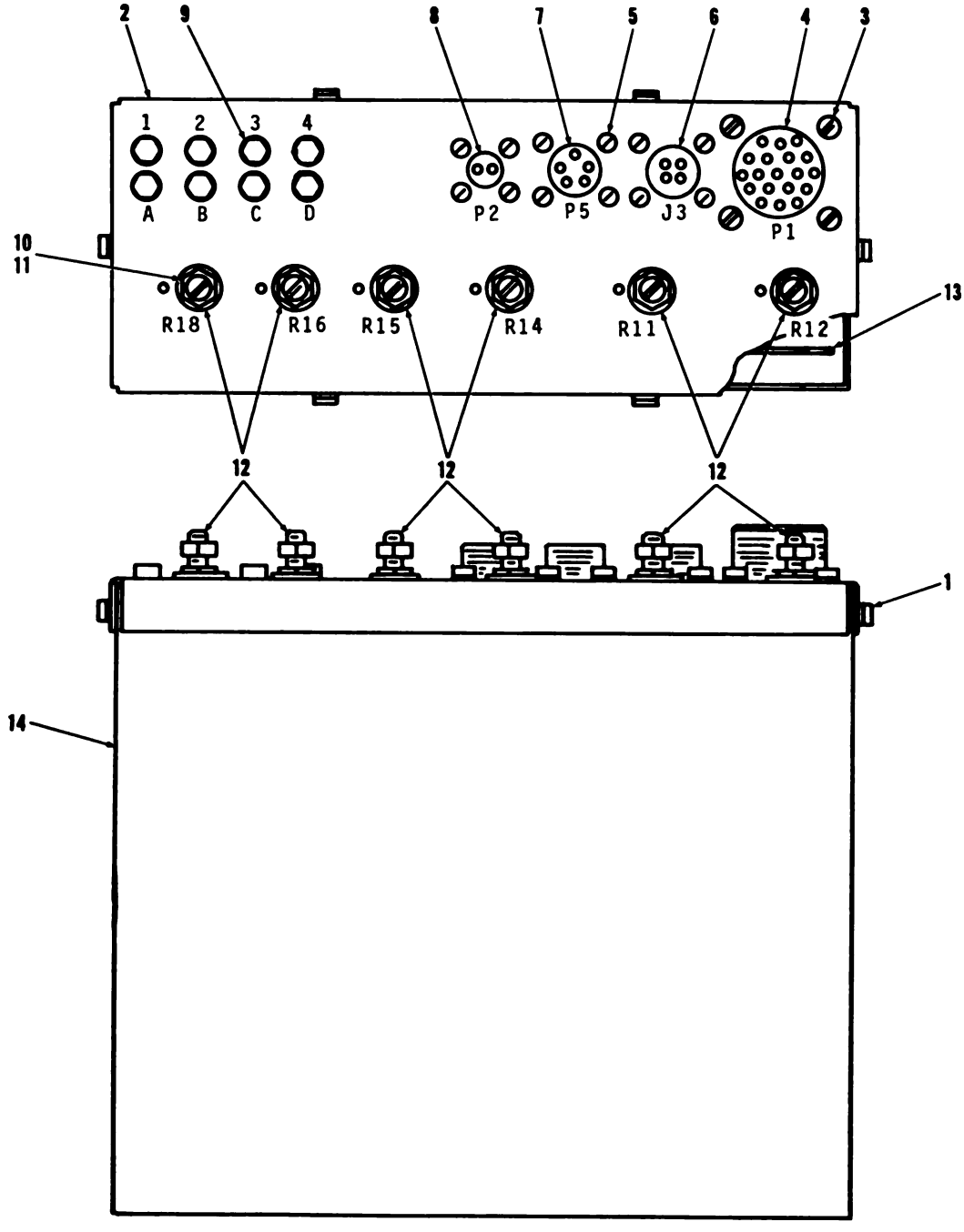
Note 2. Flash point of this compound is 515° F. It is not recommended to unpot by placing unit on a hot plate type surface where high temperatures can be obtained. It is much safer to use lower temperatures and extra time during this process. This would require constant observation of the oven and unit and using higher temperatures could cause damage to some of the governor components.

d. Bench Testing

(1) Test insulators for breakdown and deterioration.

(2) Test resistors for proper resistance value.

(3) Test capacitors for proper capacitanceand dielectric breakdown.



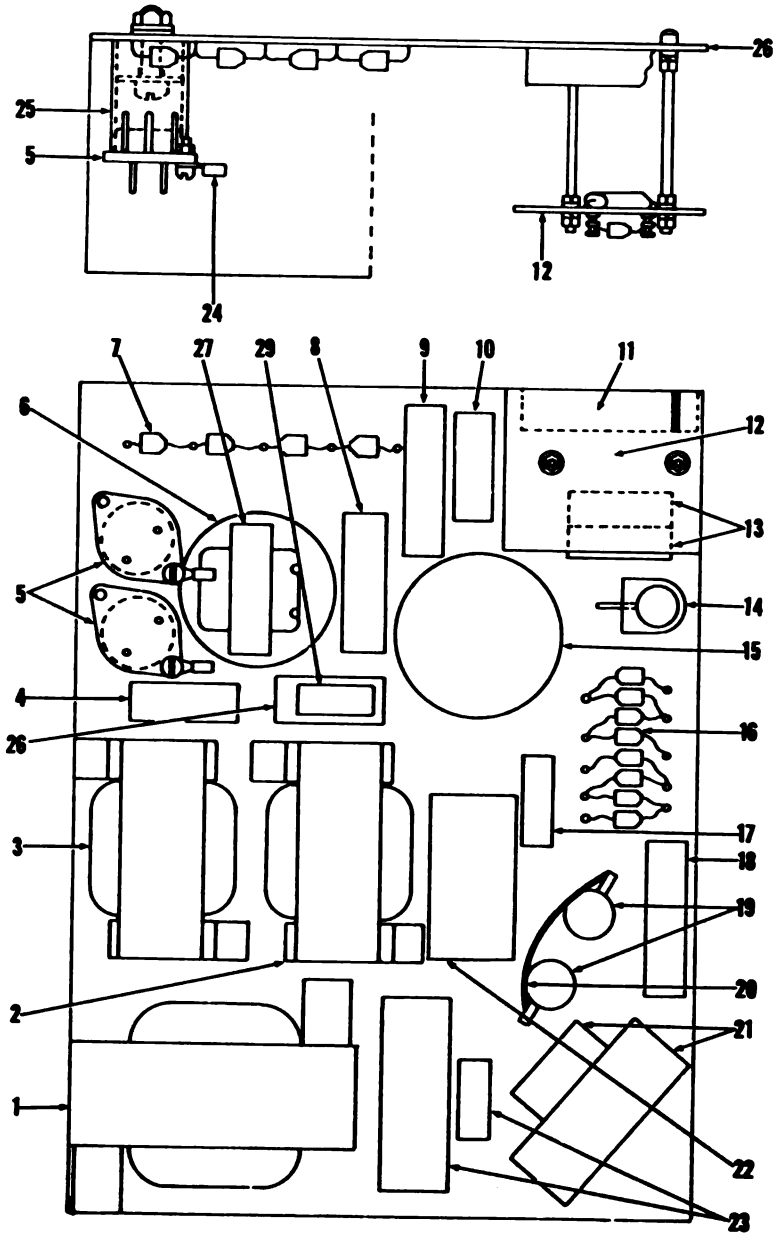
DISASSEMBLY AND REASSEMBLY

ME 6115-449-15/9-2(1)

1	Screws, cover mounting	5	Screws, mounting (12)	9	Test jacks	13	Board, printed circuit
2	Cover	6	Connector	10	Nuts (12)	14	Cabinet
3	Screws, mounting (4)	7	Connector	11	Washers (6)		
4	Connector	8	Connector	12	Potentiometers (6)		

Figure 9-2. Governor control unit (Sheet 1 of 3).

1 Transformer, T1
2 Reactor, L2
3 Reactor, L1
4 Resistor, R5
5 Transistor, silicon (2)
6 Reactor, Filter T2
7 Diodes (4)
8 Capacitor
9 Resistor, R20
10 Resistor, R22
11 Capacitor, C5
12 Rectifier assembly
13 Resistors, R4 and R8
14 Resistor, R10
15 Magamp, SL1
16 Diodes (12)
17 Capacitor, C6
18 Resistor, R2
19 Resistors, R1 and R1A
20 Wire, tinted copper
21 Capacitors, C4
22 Rectifier, CR2
23 Capacitors, C3
24 Terminal
25 Heat sink
26 Board, printed circuit
27 Filter reactor, L3
28 DC bypass capacitor, C7
29 Inverter starting resistor, R23
30 Wax



COMPONENT DIAGRAM

ME 6115-449-15/9-2 (2)

Figure 9-2. Governor control unit (Sheet 2 of 3).

Figure 9-2. Governor control unit (Sheet 3 of 3).

(Located in back of manual)

(4) Test transformers for dielectric breakdown between primary and secondary windings. Test for continuity within each winding.

(5) Test all rheostats for proper operation and correct resistance.

e. Repair. To repair the governor control unit, replace defective components.

f. Reassembly. Refer to figure 9-2 and reassemble the governor control unit.

g. Installation. Refer to paragraph 3-110 and install the governor control unit.

h. Initial Alinement Procedure After Repair.

(1) Set R11, R14, R16 and R18 rheostats at mid-point.

(2) Set R15 full counterclockwise.

(3) Set R12 approximately 3/4 turn counterclockwise.

(4) Start engine. If engine oscillates rapidly, adjust R16 and R18 until operation is stable.

(5) Once set has been stabilized, adjust R1 rheostat on control panel to obtain 60 Hz.

(6) Connect a dc voltmeter with 0-10 volt range across test points 3 and 4. Test point 4 is positive. Adjust R14 until voltage across test points 3 and 4 is zero at no load.

(7) Connect dc voltmeter across test points 1 and 2. Test point 1 is positive. Adjust R11 for zero volts at 60 Hz at no load. Repeat adjustment until voltage across test points 1 and 2 and 3 and 4 is zero and frequency is 60 Hz.

Note. **If test points 1 and 2 cannot be zeroed, they must be reduced to a minimum.**

(8) Adjust R12 to give approximately 5 volts across test points A and B.

(9) Adjust R15 for optimum transient performance. Fully clockwise position is maximum load measurement gain.

(10) Set R18 and R16 for stabilized performance at all load conditions.

9-6. Load Measuring Unit

a. General. The load measuring unit consists of a three phase transformer, diode rectifiers and a load resistor. This unit measures the total load on the generator set regardless of power factor or phase. This unit produces a dc voltage that is proportional to the load on the generator. The dc output of this unit is connected to the feedback and paralleling circuits of the control unit.

b. Removal. Refer to figure 9-3 and remove the load measuring unit.

c. Disassembly. Refer to figure 9-3 and disassemble the load measuring unit.

d. Testing.

(1) Test transformer for dielectric breakdown between windings and for continuity within windings.

(2) Test diode rectifier for proper functioning.

(3) Test load resistor for proper resistance value.

e. Repair. To repair the load measuring unit, replace defective components.

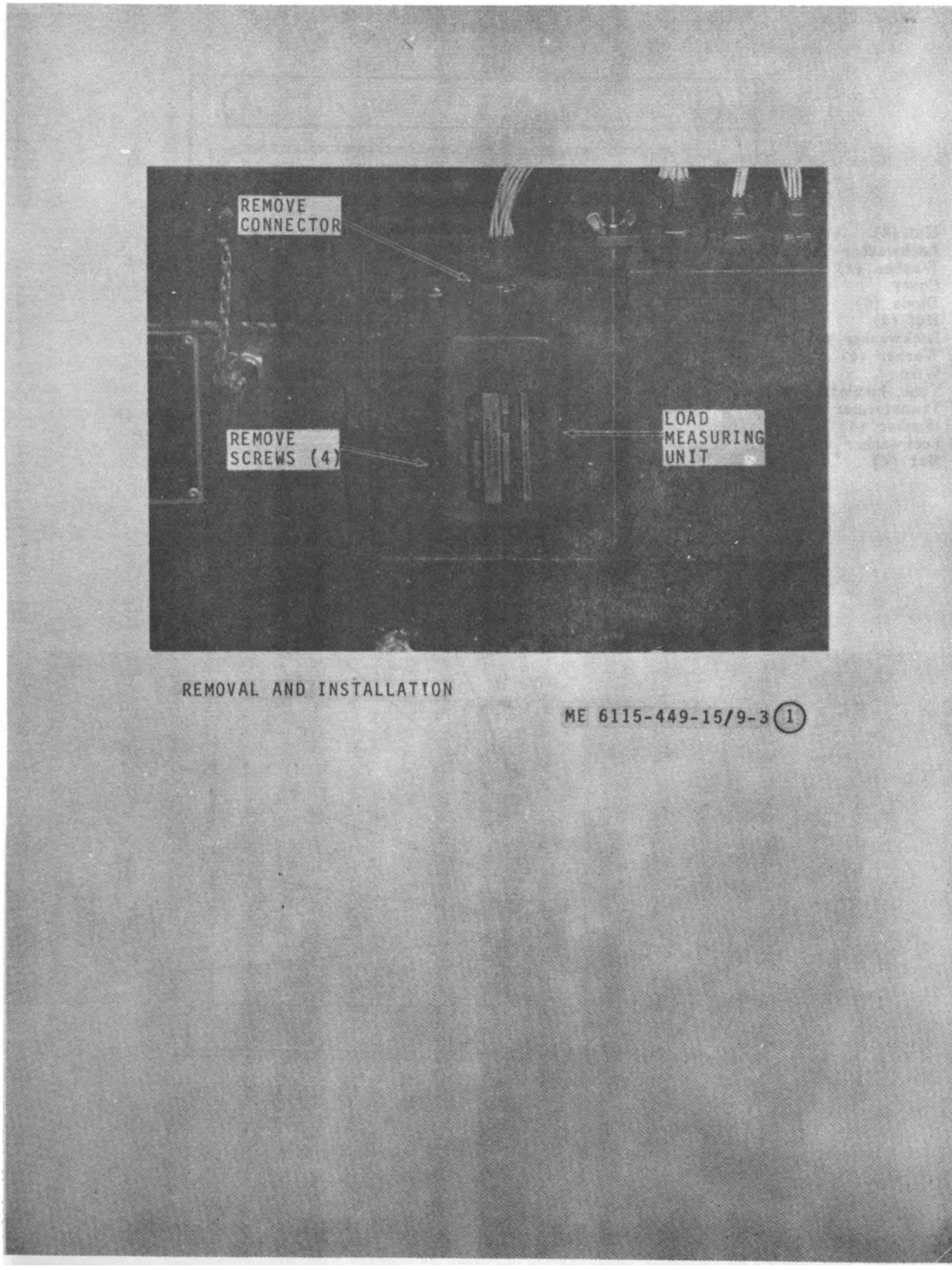
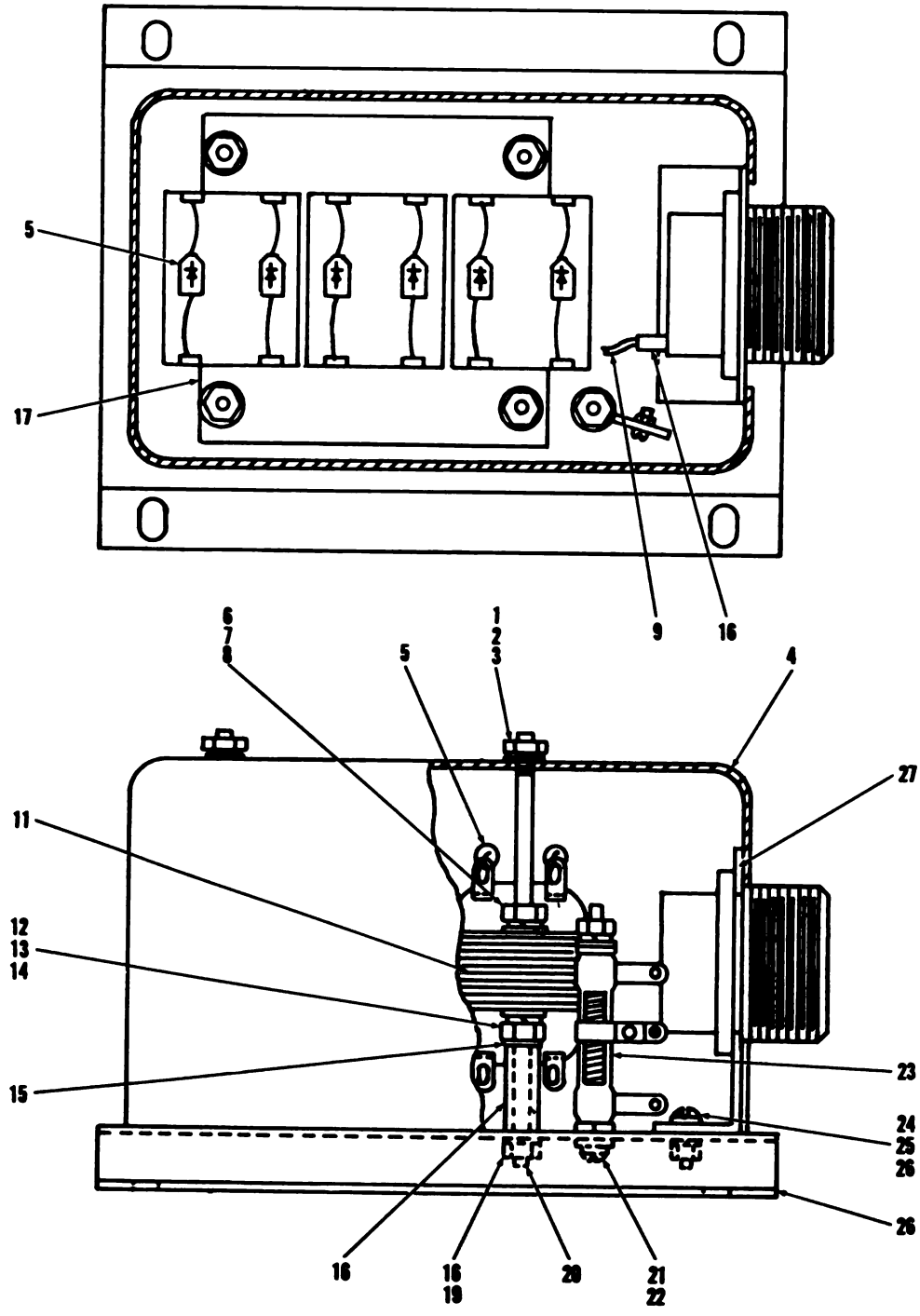


Figure 9-3. *Load measuring unit* (*Sheet* 1 *of* 3).

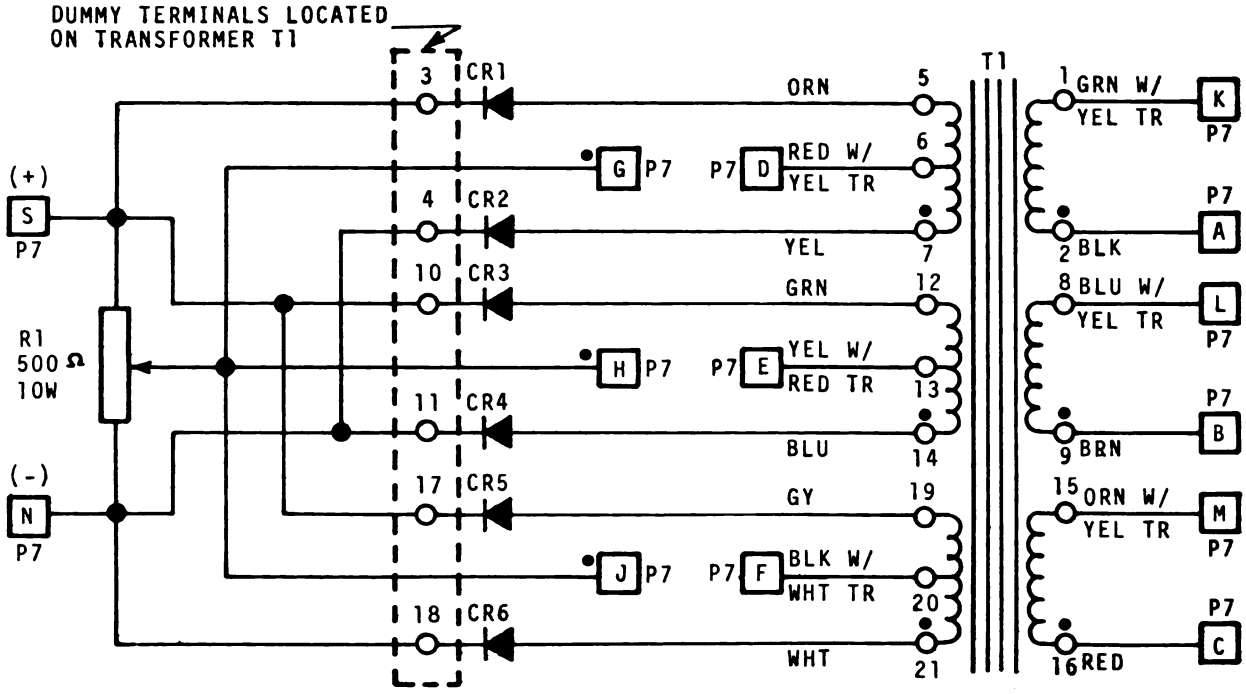
1 Nut (4)
2 Lockwasher (4)
3 Washer (4)
4 Cover
5 Diode (6)
6 Nut (4)
7 Lockwasher (4)
8 Washer (4)
9 Wire
10 Tube, insulating (14)
11 Transformer assembly
12 Washer (4)
13 Lockwasher (4)
14 Nut (4)
15 Washer (4)
16 Tube
17 Plate, mounting
18 Nut (4)
19 Lockwasher (4)
20 Screw, machine (4)
21 Screw, machine
22 Lockwasher
23 Resistor, adjustable
24 Screw (2)
25 Nut (2)
26 Lockwasher (2)
27 Bracket, receptacle
28 Bracket, mounting



DISASSEMBLY AND REASSEMBLY

ME 6115-449-15/9-3 (2)

Figure 9-3. Load measuring unit (Sheet 2 of 3).



CR1 Thru CR6 - DIODES
P7 - CONNECTOR, PLUG
R1 - RESISTOR
T1 - TRANSFORMER

SCHEMATIC DIAGRAM - LOAD MEASURING UNIT

ME 6115-449-15/9-3 (3)

Figure 9-3. Load measuring unit (Sheet 3 of 3).

f. Reassembly. Refer to figure 9-3 and reassemble the load measuring unit.

g. Installation. Refer to figure 9-3 and install load measuring unit.

Section II. FAULT LOCATING INDICATOR, AC CONTRACTOR AND RECONNECTION BOARD

9-7. General

This section contains the repair instructions for the fault locating indicator, ac contactor and reconnection board.

9-8. Fault Locating Indicator

a. General. This unit is designed to monitor ten independent circuits and indicate when any one or more circuits is open. The unit is completely self-contained and consists of neon indicating lamps, diodes, resistors, capacitors and silicon controlled rectifiers. The electric circuit is fuse-protected and has a reset and test switch. The fault indicator is panel mounted in the upper right rear section of the operator's panel.

b. Removal. Refer to paragraph 3-109 and remove the fault locating indicator.

c. Disassembly. Refer to figure 9-4 and disassemble the fault locating indicator.

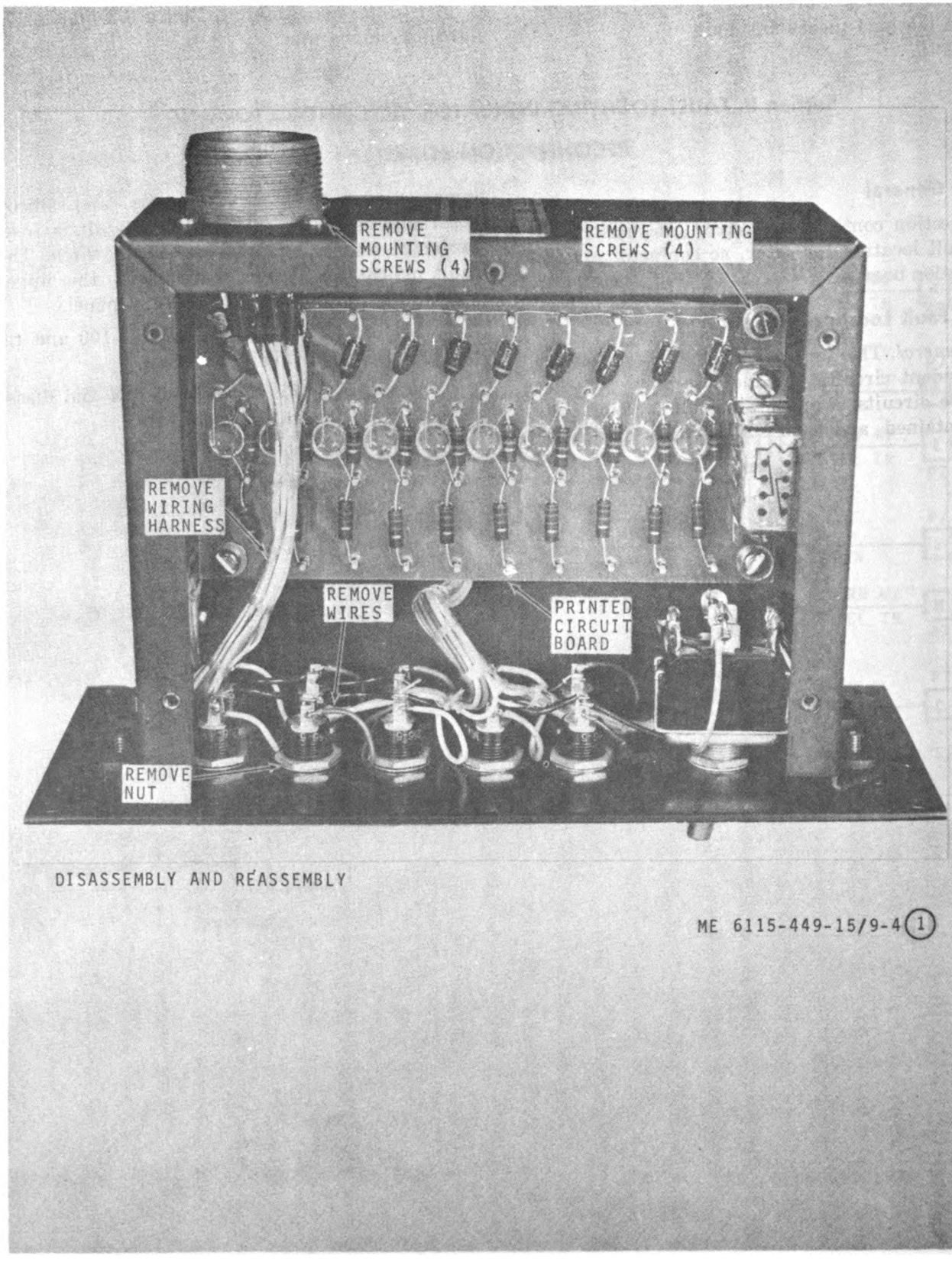


Figure 9-4. Fault locating indicator (Sheet 1 of 2).

Figure 9-4. Fault locating indicator (Sheet 2 of 2).

(Located in back of manual)

d. Testing.

(1) Test resistors for correct resistance range.

(2) Test capacitors for dielectric breakdown.

(3) Test silicon controlled rectifiers for proper operation.

(4) Test remaining rectifiers.

(5) Test neon lamps for continuity.

(6) Test relay for proper switching characteristics.

e. Repair. To repair the fault locating indicator, replace defective components.

f. Reassembly. Refer to figure 9-4 and reassemble the fault locating indicator.

g. Installation. Refer to paragraph 3-109 and install the fault locating indicator.

9-9. AC Contactor

a. General. The ac contactor is a circuit interrupter that is connected between the voltage reconnection system and the main output terminals. It is electrically operated from the 24 volt dc system by the circuit breaker switch located on the control panel. The contactor is located under the reconnection board in the lower right generator end of the generator set.

b. Removal. Refer to figure 9-5 and remove the ac contactor.

c. Testing.

(1) Test coil windings for continuity.

(2) Apply 24 volts dc to contactor power leads to test mechanism.

(3) Test for continuity between contacts.

(4) Replace ac contactor if found defective.

d. Installation. Refer to figure 9-5 and install the ac contactor.

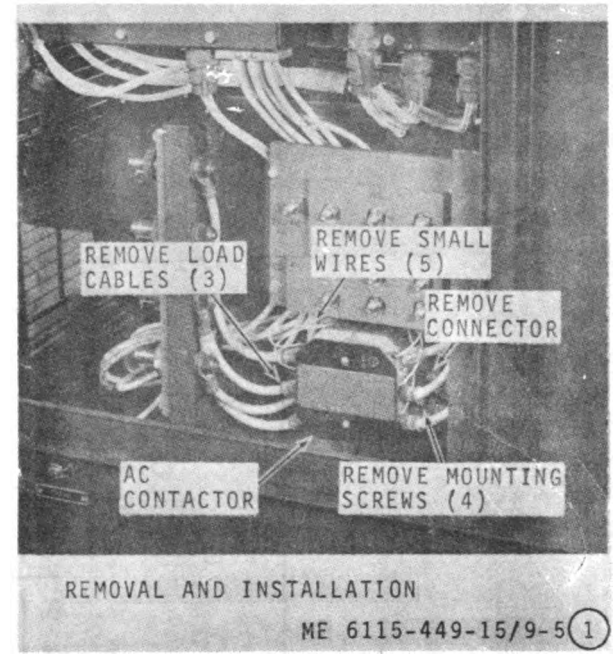
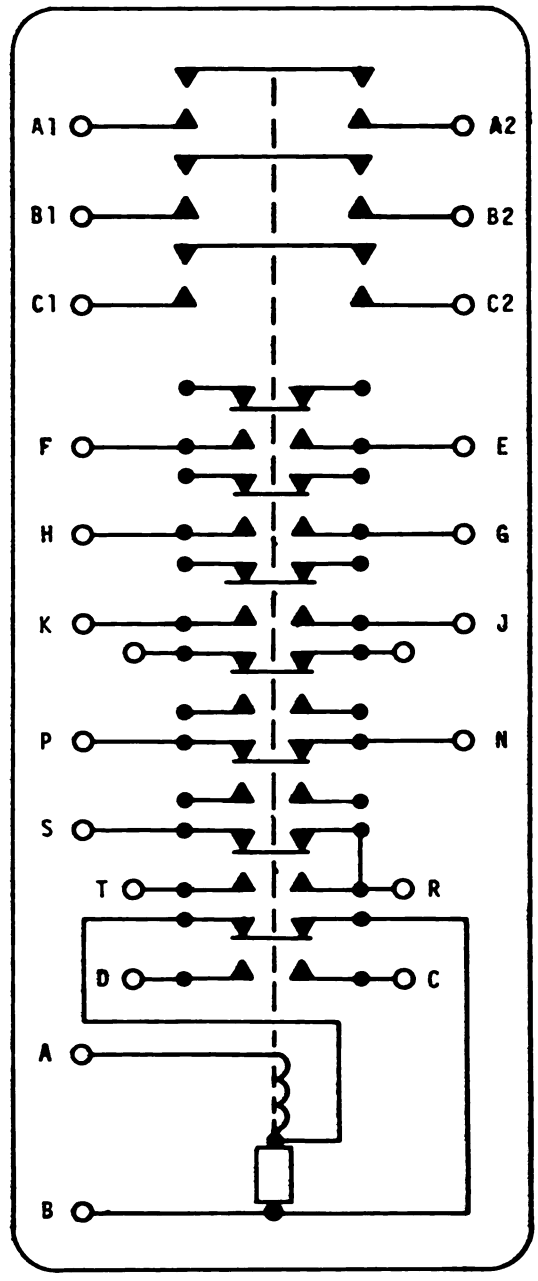


Figure 9-5. AC contactor (Sheet 1 of 2).



AC CONTACTOR

ME 6115-449-15/9-5(2)

Figure 9-5. AC contactor (Sheet 2 of 2).

9-10. Reconnection Board

a. General. The reconnection board allows easy reconnection of the phase winding for all the generator output voltages. The board provides for reconnection from 120/208 volts to 240/416 volts. The board is a link panel type located on the lower right side of the generator compartment.

b. Removal. Refer to figure 9-6 and remove the reconnection board.

c. Cleaning, Inspection and Repair.

(1) Clean board with an approved solvent.

(2) Clean all contacts and terminals with a fine wire brush.

(3) Inspect board for damage or deterioration.

(4) Replace defective reconnection board.

d. Installation. Refer to figure 9-6 and install reconnection board.

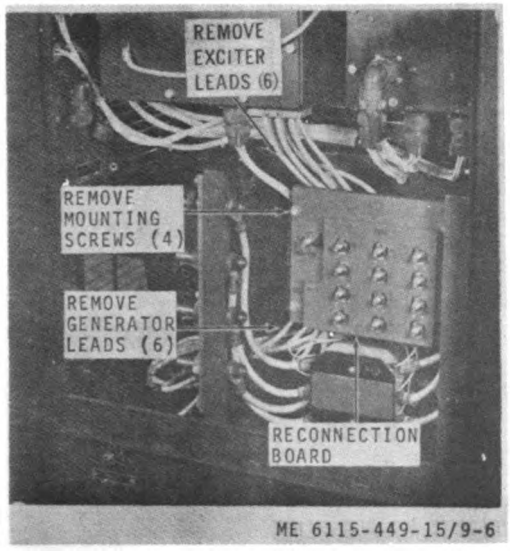


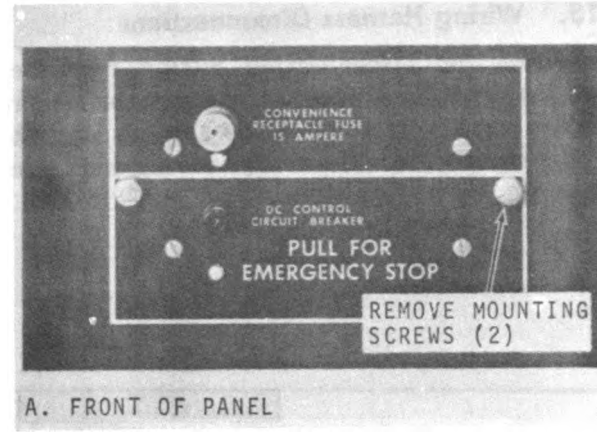
Figure 9-6. Reconnection board removal and installation.

9-11. DC Circuit Breaker Box

a. General. The dc circuit breaker box provides protection for the 24 volt dc circuit. It contains a fuse for the ac convenience receptacle and the dc circuit breaker. The dc circuit breaker box is located on the operator's control panel in the lower right side.

b. Removal. Refer to figure 9-7 and remove the dc circuit breaker box.

c. Installation. Refer to figure 9-7 and install the dc circuit breaker box.



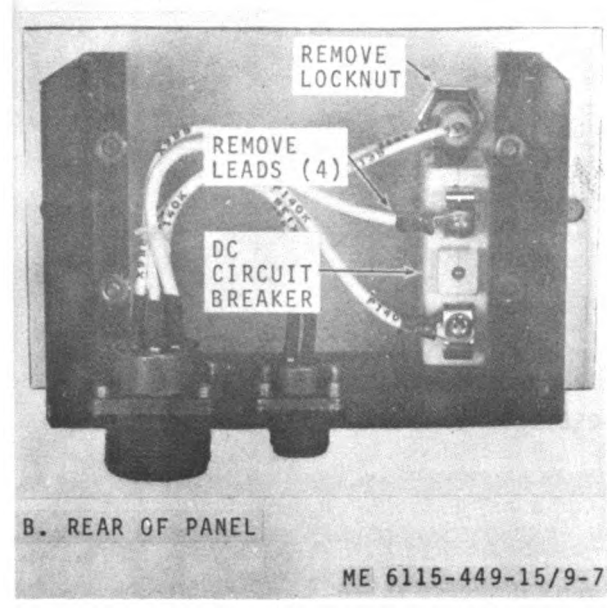


Figure 9-7. DC circuit breaker box, removal and installation.

Section III. WIRING HARNESSES

9-12. General

This section provides information for the repair of wiring harnesses connecting major components of the generator set. Wiring harnesses included herein are listed in paragraph 9-19 (fig. 1-3).

9-13. Wiring Harness Disconnections

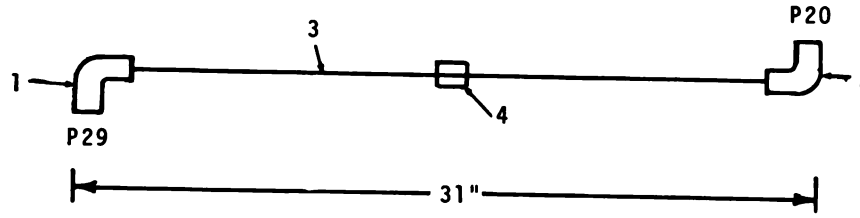
Procedures for disconnecting wiring harnesses from major components of the generator set are given in applicable chapters or sections describing the components. Generally, wiring harnesses will be disconnected by separating male and female connectors or removing lugs or straight wires from terminal board connection points.

9-14. Disassembly

Disconnect wiring harnesses as follows (fig. 9-8 through 9-23).

a. Remove any cable straps holding strands of wire together.

b. Remove wire from connectors or lugs.



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13216E7152-2	CONNECTOR	MS3108R18-1PX
2	13214E3267-5	CONNECTOR	MS3108R18-1S
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
P40E16	P29-A	P20-A
X29D16	P29-B	P20-B
X31D16	P29-C	P20-C
P45L16	P29-D	P20-D
P55NN16	P29-E	P20-E
P47J16	P29-F	P20-F
P44H16	P29-G	P20-G
P56F16	P29-H	P20-H

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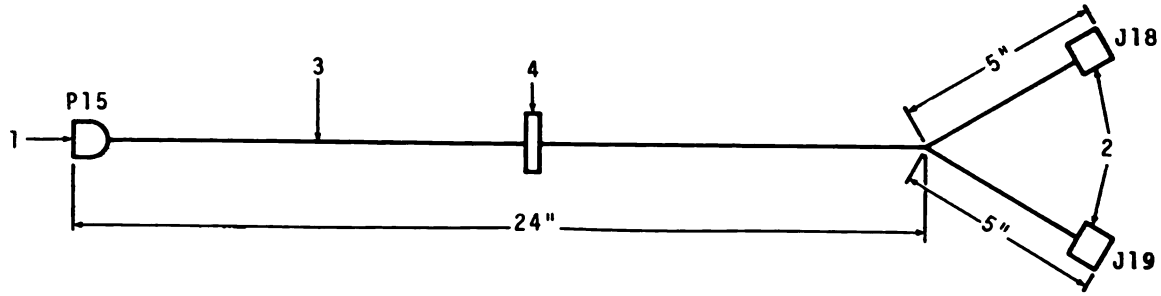
Figure 9-8. Relay control box assembly to remote control.



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13216E7151-2	CONNECTOR	MS3106R18-1PW
2	13216E7150	CONNECTOR	MS3100R18-4P
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
K112F16	P15-A	J19-A
K112E16	P15-B	J18-A
K111F16	P15-C	J19-B
K111E16	P15-D	J18-B
X98E16	P15-E	J18-C
X98F16	P15-F	J19-C
X96E16	P15-G	J18-D
X96F16	P15-H	J19-D

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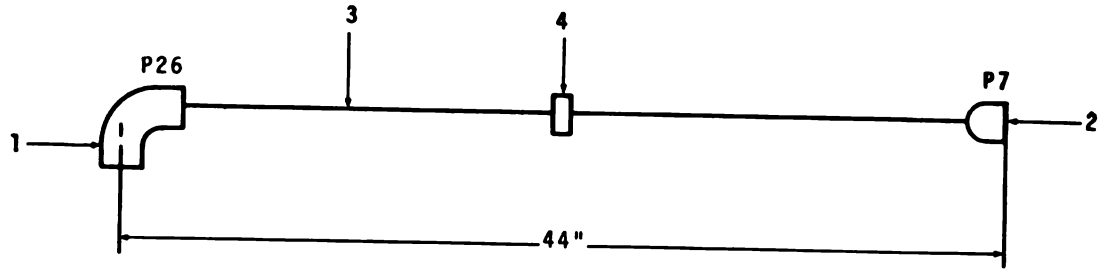
Figure 9-9. Relay control box assembly to paralleling receptacles.

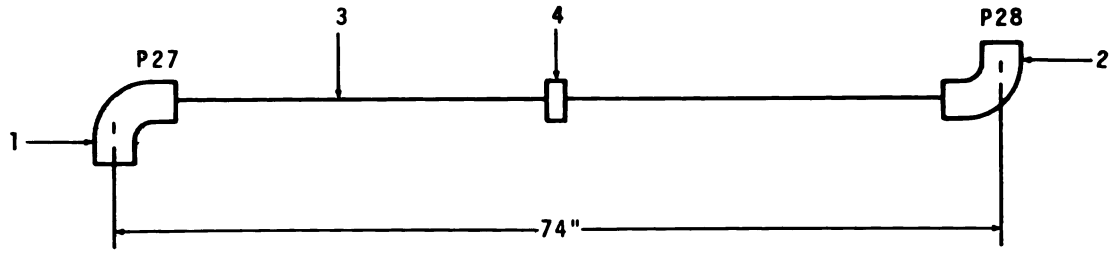


INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-7	CONNECTOR	MS3108R18-11S
2	13214E3270-6	CONNECTOR	MS3106R18-11P
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	STRAP, CABLE	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
P55E12	P26-A	P7-A
P51C12	P26-B	P7-B
V64A12	P26-C	P7-C
V65A12	P26-D	P7-D
P140G12	P26-E	P7-E

ME 6115-449-15/9-10

Figure 9-10. ***Relay control box assembly to heater control (optional).***

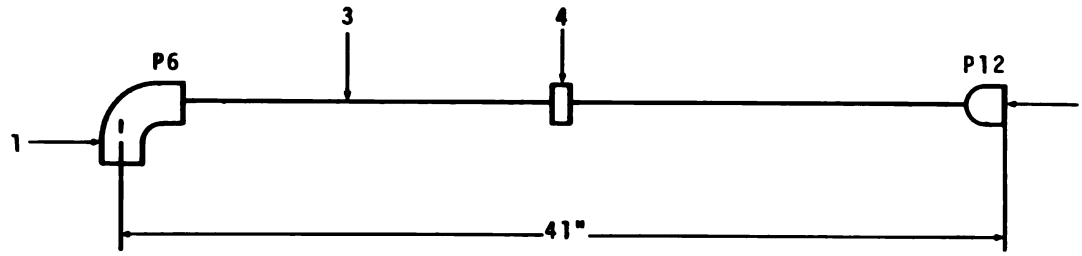


INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-6	CONNECTOR	MS3108R18-11P
2	13214E3267-7	CONNECTOR	MS3108R18-11S
3	TYPE II	ELEC. WIRE	MIL-W-9896
4	MS18034-1	STRAP, CABLE	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
P55YY12	P27-A	P28-A
P70816	P27-B	P28-B
VG4E12	P27-C	P28-C
P82A16	P27-D	P28-D
P83A12	P27-E	P28-E

ME 6115-449-15/9-11

Figure 9-11. *Heater control to heater (optional).*



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3270-8	CONNECTOR	MS3106R20-27P
2	13214E3267-10	CONNECTOR	MS3108R20-27S
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO	WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
P45K16	P12-A	P6-A	P210A16	P12-N	P6-N
P66B16	P12-B	P6-B			
P200A16	P12-C	P6-C			
P201A16	P12-D	P6-D			
P202A16	P12-E	P6-E			
P203A16	P12-F	P6-F			
P204A16	P12-G	P6-G			
P205A16	P12-H	P6-H			
P206A16	P12-I	P6-I			
P207A16	P12-K	P6-K			
P208A16	P12-L	P6-L			
P209A16	P12-M	P6-M			

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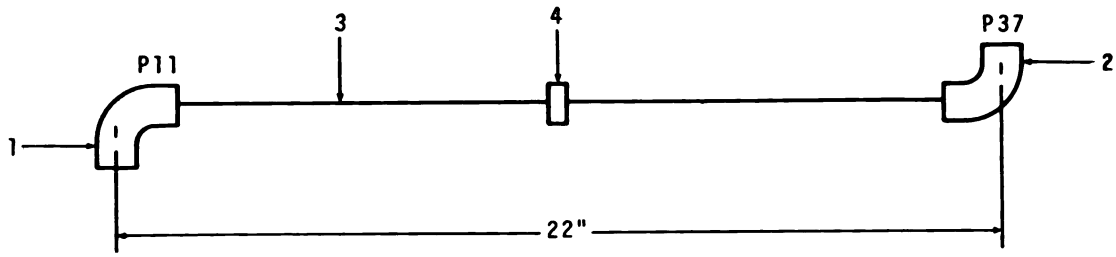
Figure 9-12. Relay control box assembly to fault indicator panel.



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-4	CONNECTOR	MS3108R18-1P
2	13214E3267-5	CONNECTOR	MS3108R18-1S
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
P44F16	P11-A	P37-A
P48A16	P11-B	P37-B
P54A16	P11-C	P37-C
P81C16	P11-D	P37-D
P80J16	P11-E	P37-E
P200D16	P11-F	P37-F
P47G16	P11-G	P37-G
P80A16	P11-H	P37-H
---	P11-I	P37-I
P202C16	P11-J	P37-J

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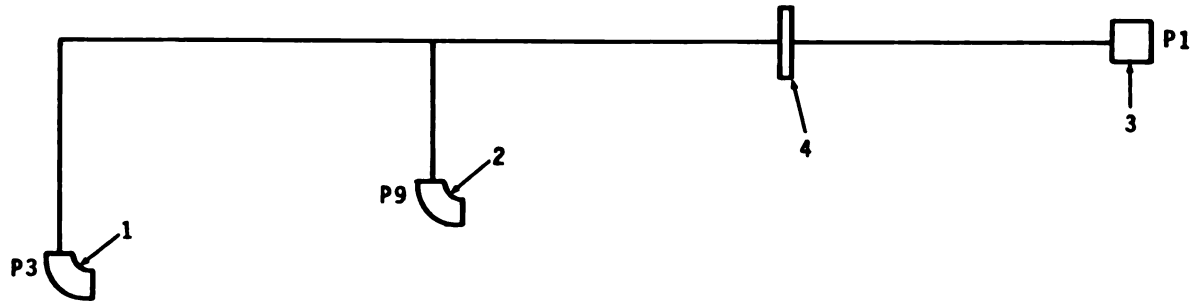
Figure 9-13. Relay control box assembly to speed switch.



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13216E7152-6	CONNECTOR	MS3108R36-7P
2	13216E7152-4	CONNECTOR	MS3108R28-21S
3	13214E3270-12	CONNECTOR	MS3106R36-7S
4	TYPE II	ELEC. WIRE	MIL-W-5086
5	MS18034-1	STRAP, CABLE	---

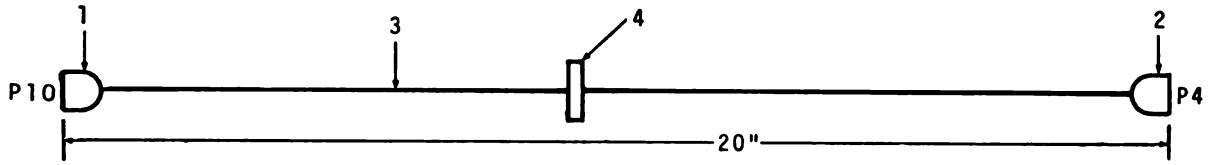
WIRE MARKING NO.	FROM STATION NO.	TO STATION NO	WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
D20A16	P1-A	P9-A	K32B16	P1-M	P3-z
D21A16	P1-B	P9-B	K33B16	P1-N	P3-U
D22A16	P1-C	P9-C	X31B16	P1-O	P3-P
D24C16	P1-D	P3-a	X30B16	P1-P	P9-K
X7C16	P1-E	P9-D	P45F16	P1-R	P3-R
X8C16	P1-F	P9-E	X29B16	P1-S	P3-S
X14C16	P1-G	P9-L	K34B16	P1-T	P3-T
X15C16	P1-H	P9-M	X90C16	P1-U	P9-J
X16C16	P1-I	P9-N	E39B16	P1-V	P3-V
L25B16	P1-J	P3-y	E38B16	P1-W	P3-W
L26B16	P1-K	P3-s	E37B16	P1-X	P3-X
X91B16	P1-L	P9-H	E35B16	P1-Y	P3-Y

Figure 9-14. Relay control box assembly to control cubicle assembly and exciter and regulator (Sheet 1 of 2).

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO	WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
E36B16	P1-Z	P3-Z	X95A16	P3-L	P9-c
P47C16	P1-e	P3-e	X96A16	P3-M	P9-d
P44C16	P1-g	P3-g	P42B16	P3-N	P9-e
P62C16	P1-h	P3-h	P67B16	P3-O	P9-f
P56C16	P1-k	P3-k			
P80D16	P1-m	P3-m			
P55H16	P1-p	P3-p			
P55VV16	P1-r	P3-r			
P57C16	P1-t	P3-t			
P40M16	P1-u	P3-b			
P40L16	P1-v	P3-v			
P50H16	P1-w	P3-w			
P46B16	P1-x	P3-x			
X12C16	P1-y	P9-G			
X9C16	P1-z	P9-F			
L27B16	P3-A	P9-P			
L28B16	P3-B	P9-R			
X17A16	P3-C	P9-S			
X18A16	P3-D	P9-T			
X19A16	P3-E	P9-U			
X17E16	P3-F	P9-V			
X8E16	P3-G	P9-W			
X6C16	P3-H	P9-X			
X9J16	P3-I	P9-Z			
X12N16	P3-J	P9-a			
X94A16	P3-K	P9-b			

ME 6115-449-15/9-14 (2)

Figure 9-14. *Relay control box assembly to control cubicle assembly and exciter and regulator (Sheet 2 of 2).*



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3270-4	CONNECTOR	MS3106R18-1P
2	13214E3270-9	CONNECTOR	MS3106R20-29S
3	TYPE II	ELEC. WIRE	MIL-W-50B6
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
P63B16	P10-A	P41-A
P55N16	P10-B	P41-B
P56J16	P10-C	P41-C
P50S16	P10-D	P41-D
X138B16	P10-E	P41-E
X98A16	P10-F	P41-F
K112A16	P10-G	P41-G
K110C16	P10-H	P41-H

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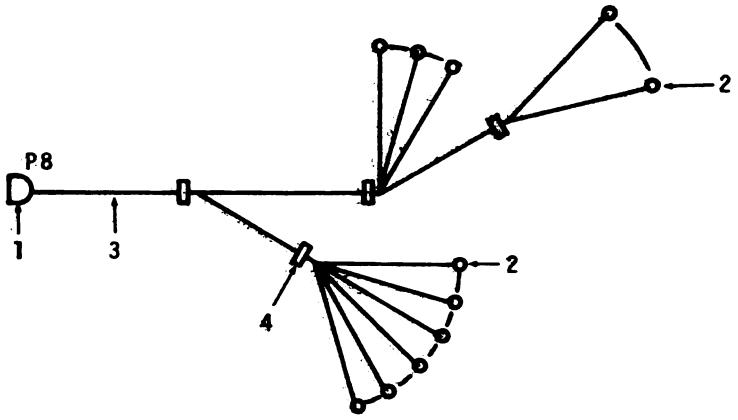
Figure 9-15. Relay control box assembly to CB2 contactor.

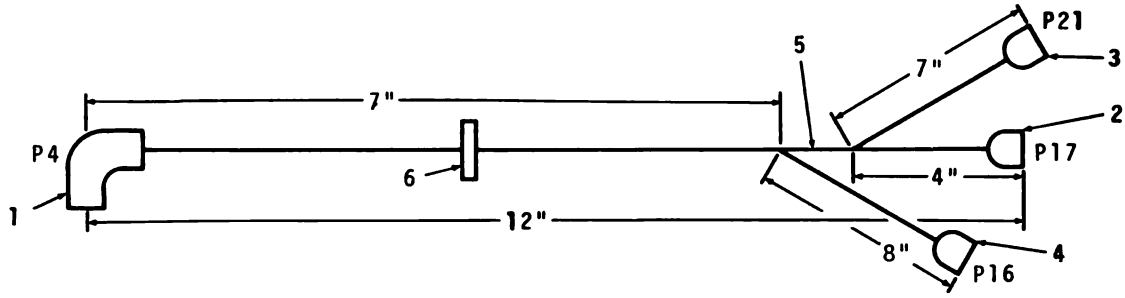


INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13216E7151-3	CONNECTOR	MS3106R20-27S
2	MS25036-14	LUG TERMINAL	---
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
X14A16	P8-A	CB2-A1
X15A16	P8-B	CB2-B1
X16A16	P8-C	CB2-C1
L27D16	P8-D	CB2-A2
L28D16	P8-E	CB2-B2
X4B16	P8-F	TB6-4
X5B16	P8-G	TB6-5
X6E16	P8-H	TB6-6
X10B16	P8-I	TB6-10
X11B16	P8-J	TB6-11
X12S16	P8-K	TB6-12

ME 6115-449-15/9-16

Figure 9-16. Exciter and regulatory to CB2 contactor and TB6 reconnection board.



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13216E7152-3	CONNECTOR	MS3108R28-21P
2	13216E7151-4	CONNECTOR	MS3106R22-14S
3	13214E3269	CONNECTOR	MS3106R10SL-4S
4	13214E3270-9	CONNECTOR	MS3106R20-29S
5	TYPE II	ELEC. WIRE	MIL-W-5086
6	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO	WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
X9S16	P4-A	P17-A	K101D16	P4-U	P17-U
X12T16	P4-B	P17-B	---	P4-V	P17-V
P81A16	P4-C	P21-A	K113A16	P17-C	P17-D
P55S16	P4-D	P21-B	X7G16	P4-W	P16-A
K105A16	P4-E	P17-E	X8G16	P4-X	P16-B
K107A16	P4-F	P17-F	X9N16	P4-Z	P16-C
K110A16	P4-G	P17-G	X115D16	P4-a	P16-D
K106A16	P4-H	P17-H	X116D16	P4-b	P16-E
K111A16	P4-J	P17-J	X117D16	P4-c	P16-F
K114A16	P4-K	P17-K	D24G16	P4-d	P16-G
K115A16	P4-L	P17-L	X12Y16	P4-e	P16-K
K32D16	P4-M	P17-M	X12Z16	P4-f	P16-L
K103B16	P4-N	P17-N	X12AA16	P4-g	P16-M
K108A16	P4-P	P17-P	K101A16	P4-h	P16-N
K109A16	P4-R	P17-R	K102A16	P4-m	P16-S
K102D16	P4-S	P17-S			
K104B16	P4-T	P17-T			

ME 6115-449-15/9-17 (1)

Figure 9-17. Relay control box to load measuring unit and governor control (Sheet 1 of 2).

WIRE HARNESS NAME	RELAY CONTROL BOX ASSEMBLY TO LOAD MEASURING UNIT AND GOVERNOR CONTROL

Refer to sheet 1

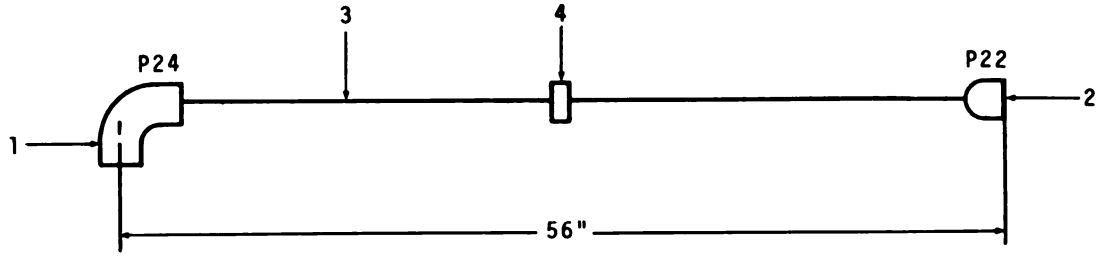
REFERENCE DWG. NO.

INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO	WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
X115D16	P4-a	P16-D			
X116D16	P4-b	P16-E			
X117D16	P4-c	P16-F			
D24G16	P4-d	P16-G			
X12Y16	P4-e	P16-K			
X12Z16	P4-f	P16-L			
X12AA16	P4-g	P16-M			
K101A16	P4-h	P16-N			
K102A16	P4-m	P16-S			

ME 6115-449-15/9-17 (2)

Figure 9-17. Relay control box to load measuring unit and governor control (Sheet 2 of 2).

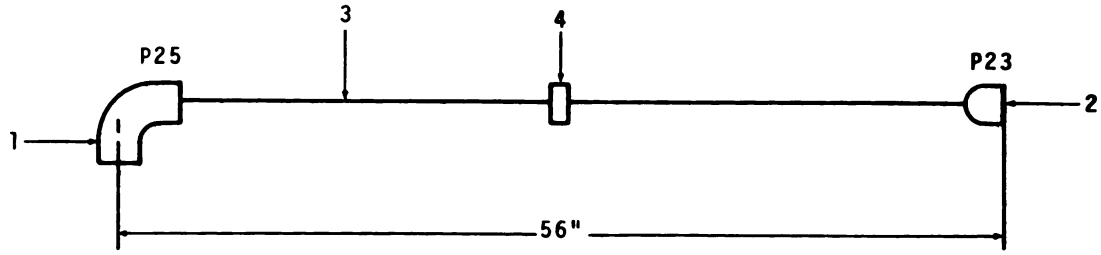


INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-3	CONNECTOR	MS3108R14S-5S
2	13214E3270-3	CONNECTOR	MS3106R14S-5S
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
K120A16	P22-A	P24-A
K121A16	P22-B	P24-B
K122A16	P22-C	P24-C
K123A16	P22-D	P24-D
---	P22-F	P24-E

ME 6115-449-15/9-18

Figure 9-18. *Governor control to governor actuator (P22 to P24).*



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-1	CONNECTOR	MS3108R14S-2P
2	13214E3270-1	CONNECTOR	MS3106R14S-2P
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

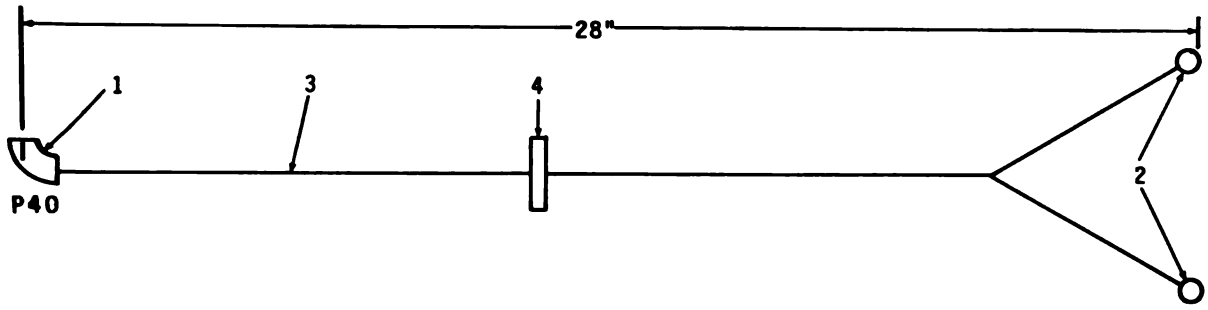
WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
K124A16	P23-A	P25-A
K125A16	P23-B	P25-B
K126A16	P23-C	P25-C
K127A16	P23-D	P25-D

ME 6115-449-15/9-19

Figure 9-19. *Governor control to governor actuator (P23 to P25).*

Figure 9-20. *Main wiring harness.*

(Located in back of manual)

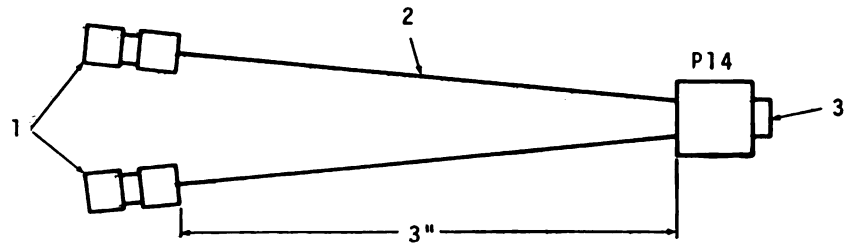


INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13216E7152-1	CONNECTOR	---
2	MS25036-53	LUG, TERMINAL	---
3	TYPE II	ELEC. WIRE	---
4	MS18034-1	STRAP, CABLE	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
X12GG16	P40-A	3
X13A16	P40-B	3

ME 6115-449-15/9-21

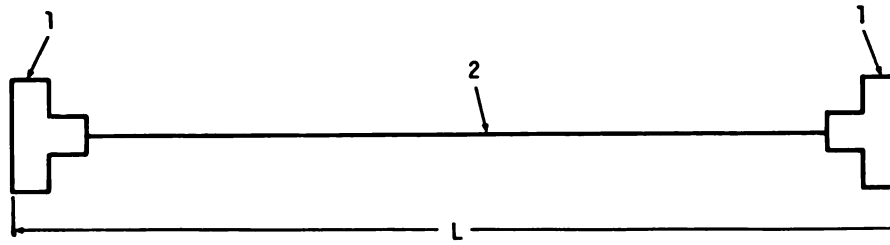
Figure 9-21. *DC control assembly to convenience receptacle.*



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13213E9867-1	CONNECTOR	---
2	13216E3173	CONNECTOR	---
3	M13486/1-3	ELEC. CABLE	MIL-C-13486/1

ME 6115-449-15/9-22

Figure 9-22. Relay control box assembly harness end to fuel pumps.



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E7270-5	CONNECTOR	MS3106E-18-45
2	CU-04 MGF (4/16)0390	CABLE	MIL-C-3432

ME 6115-449-15/9-23

Figure 9-23. Paralleling cable assembly.

9-15. Cleaning, Inspection, and Repair

a. Inspect all electrical contact surfaces for pitting or dirt.

b. Inspect male connectors for broken or bent pins.

c. Inspect connectors for cracks or faulty insulation.

d. Inspect wire for breaks or faulty insulation by visual inspection and testing (para 9-16).

e. Clean all electrical contact surfaces found to be dirty or in a condition which will reduce proper contact.

f. Repair damaged or defective parts by replacement.

9-16. Testing

Use a multimeter or continuity tester and test for continuity between two points. Refer to applicable figures 9-8 through 9-23 for points of connection.

9-17. Reassembly

Reassemble cable harnesses as shown in figures 9-8 through 9-23. Test wiring harnesses as described in paragraph 9-16.

9-18. Connecting Wiring Harnesses

Procedures for connecting wiring harnesses to major components of the generator set are included in applicable chapters or sections describing the components. Generally, wiring harnesses will be connected by joining male and female connectors and securing lugs or straight wires to terminal board connection points.

9-19. Wiring Harness Listing

Wiring harnesses contained in this section are listed below to facilitate location of required information.

Wiring harness	*Figure*
Relay control box assembly to remote control	9-8
Relay control box assembly to paralleling receptacles	9-9
Relay control box assembly to heater control (optional)	9-10
Heater control to heater (optional)	9-11
Relay control box assembly to fault indicator panel	9-12
Relay control box assembly to speed switch	9-13
Relay control box assembly to control cubicle assembly and exciter and regulator	9-14
Relay control box assembly to CB2 contactor	9-15
Exciter and regulator to CB2 contactor and TB6 reconnection board	9-16
Relay control box to load measuring unit and governor control	9-17
Governor control to governor actuator	9-18, 9-19
Relay control box* assembly to:	9-20
DC control assembly	
Starter	
Coolant temperature switch	
Coolant temperature transmitter	
Heater thermostat	
Fuel level switch	
Fuel level transmitter	
Ether solenoid	
DC alternator	
Fuel solenoid	
Fuel pumps	
Oil pressure transmitter	
Oil pressure switch	
Fuel solenoid day tank	
*(Referred to as Wiring Harness Branched, Engine Accessories)	
DC Control assembly to convenience Receptacle	9-21
Relay control box assembly harness end to fuel pumps	9-22
Paralleling cable assembly	9-23

CHAPTER 10

FUEL TANK ASSEMBLY, AUXILIARY FUEL HOSE, CENTER SUPPORT, FRONT AND REAR PANEL ASSEMBLIES, SKID BASE, WINTERIZATION SYSTEM AND REMOTE CONTROL BOX REPAIR INSTRUCTIONS

Section I. FUEL TANK ASSEMBLY AND AUXILIARY FUEL HOSE

10-1. General

Fuel is supplied to the generator set either from the fuel tank or from an external source via the auxiliary fuel hose. The fuel tank is located below the main generator and is secured to the skid base by mounting straps. Fuel filler neck components, fuel level transducer, fuel selector valve and fuel tank drains make up the assembly.

10-2. Fuel Tank Assembly

a. Removal and Disassembly.

(1) Refer to paragraph 3-9 and drain fuel tank.

(2) Refer to figure 10-1 and remove and disassemble fuel tank assembly.

Warning: **Do not smoke, use an open flame or subject the fuel tank assembly to sparks during periods when the fuel tank assembly is not sealed.**

1 Screw, machine
2 Cap, auxiliary fuel
3 Screw, machine
4 Handle, fuel selector valve
5 Screw, machine (2)
6 Lockwasher, internal (2)
7 Nut, hex (2)
8 Fitting, auxiliary fuel
9 Coupling, hex
10 Elbow, street
11 Nipple, hex
12 Valve, fuel selector
13 Elbow, male
14 Elbow, male
15 Hose
16 Elbow, male
17 Transducer, fuel level
18 Cap assembly, fuel with gasket
19 Inner sleeve, filler neck
20 Screw, machine
21 Flange, filler neck
22 Gasket, filler neck flange
23 Screw, machine
24 Lockwasher, internal
25 Nut, hex
26 Clamp assembly, filler neck
27 Clamp, hose
28 Hose, fuel fill
29 Clamp, hose
30 Screw, machine (8)
31 Elbow, fuel tank
32 Spacer
33 O-Ring
34 Line, fuel
35 Elbow, male
36 Line, fuel vent
37 Tee, male
38 Line, fuel
39 Elbow, male
40 Nut, hex (2)
41 Strap, front fuel tank
42 Nut, hex
43 Strap, rear fuel tank
44 Tank, fuel
45 Drain, rear fuel
46 Drain, front fuel

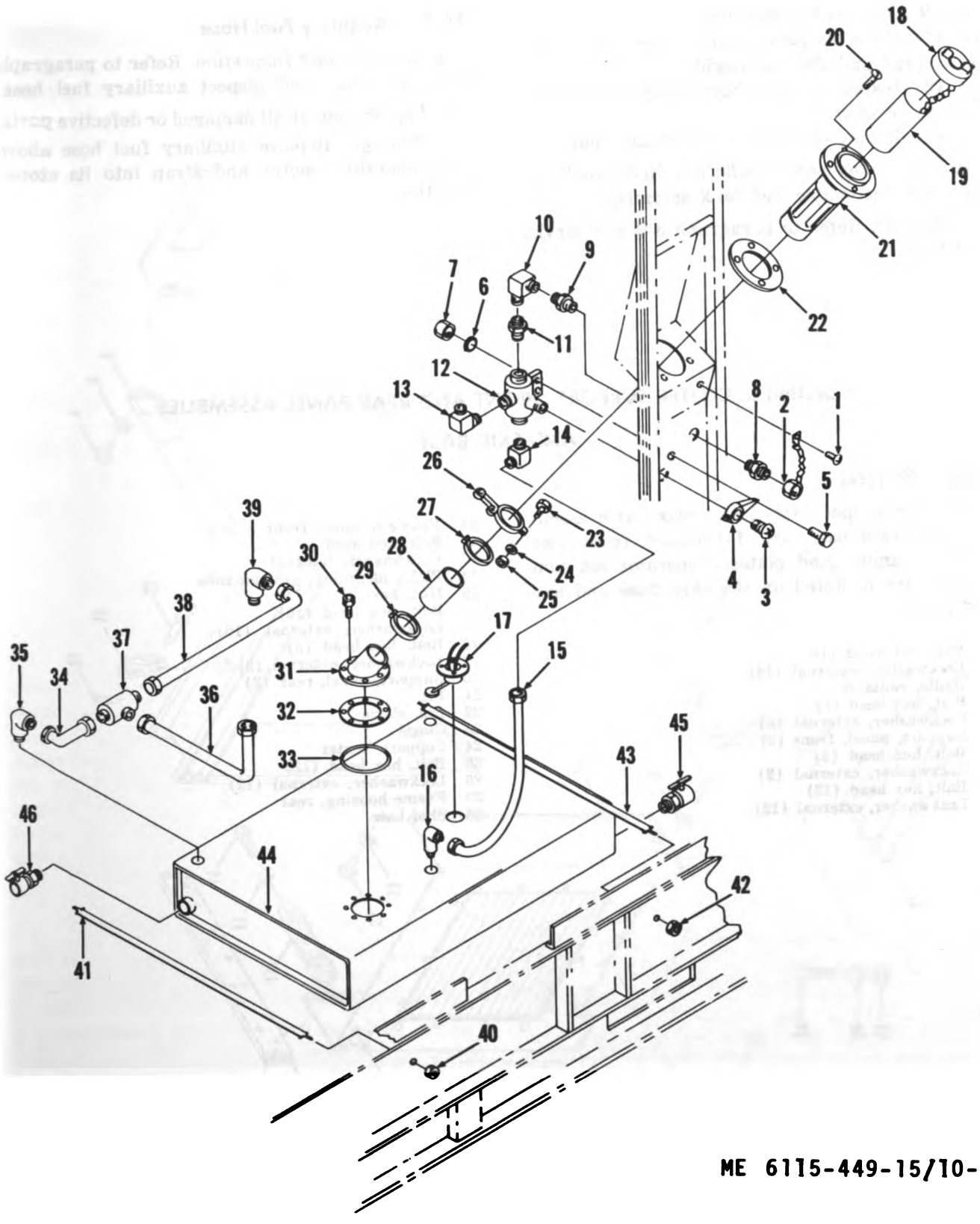


Figure 10-1. *Fuel tank assembly, removal, disassembly, reassembly and installation.*

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, dents, leaks, damage or wear.

(3) Repair or replace all damaged parts.

c. Reassembly and Installation. Refer to figure 10-1 and reassemble fuel tank assembly.

d. Service. Refer to paragraph 3-9 and service fuel tank.

10-3. Auxiliary Fuel Hose

a. Cleaning and Inspection. Refer to paragraph 3-74 and clean and inspect auxiliary fuel hose.

b. Repair. Repair all damaged or defective parts.

c. Storage. Replace auxiliary fuel hose above the generator exciter and strap into its stored position.

Section II. CENTER SUPPORT, FRONT AND REAR PANEL ASSEMBLIES AND SKID BASE

10-4. General

The center support, front and rear panel assemblies and skid base are fabricated from steel channels, angles and plates. Generator set components are mounted on the skid base and support frame.

1 Bolt, hex head (14)
2 Lockwasher, external (14)
3 Grille, radiator
4 Bolt, hex head (8)
5 Lockwasher, external (8)
6 Support, panel, front (2)
7 Bolt, hex head (2)
8 Lockwasher, external (2)
9 Bolt, hex head (12)
10 Lockwasher, external (12)
11 Frame housing, front
12 Bolt, hex head
13 Lockwasher, internal
14 Plate, mounting, exhaust tube
15 Nut, hex
16 Bolt, hex head (16)
17 Lockwasher, external (16)
18 Bolt, hex head (8)
19 Lockwasher, external (8)
20 Support, panel, rear (2)
21 Pin
22 Pin, clevis
23 Clevis
24 Support, center
25 Bolt, hex head (12)
26 Lockwasher, external (12)
27 Frame housing, rear
28 Skid base

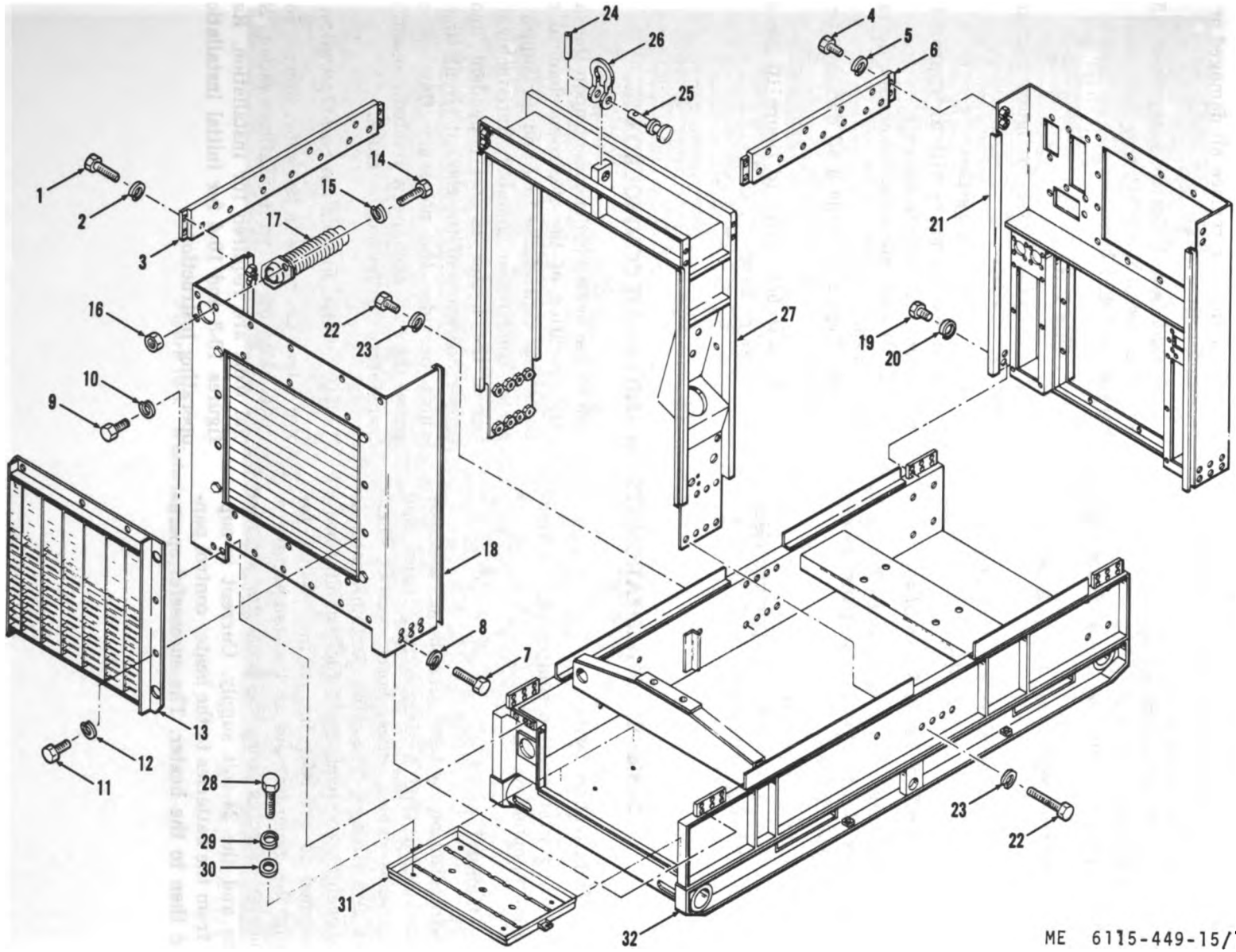


Figure 10-2. Center support, frame housing and skid base disassembly and reassembly.

10-5. Center Support

a. Removal and Disassembly. Refer to figure 10-2. Remove and disassemble center support.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, dents, damage or wear.

(3) Repair or replace all damaged or defective parts.

c. Reassembly. Refer to figure 10-2 and reassemble and install center support.

10-6. Front and Rear Panel Assemblies

a. Removal. Refer to paragraphs 6-37 and 6-38 and remove the front and rear panel assemblies from the skid base.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, dents, damage or wear.

(3) Repair or replace all damaged or defective parts.

c. Installation. Refer to paragraphs 6-37 and 6-38 and install the front and rear panel assemblies to the skid base.

10-7. Skid Base

a. Disassembly. Refer to figure 10-2 and disassemble skid base.

b. Cleaning and Inspection.

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

(2) Inspect all parts for cracks, dents, damage or wear.

(3) Repair or replace all damaged or defective parts.

c. Reassembly. Refer to figure 10-2 and reassemble skid base.

Section III. WINTERIZATION SYSTEM AND REMOTE CONTROL BOX

10-8. Winterization System

The following winterization equipment is optional and not supplied on all sets.

10-9. General

The winterization system consists of a vapor pot combustion type heater, control panel and miscellaneous cables, lines, hoses, valves, thermostat and fittings. The winterization heater is a light-weight, compact, multi-fuel burning heater designed to pre-heat the engine coolant for starting the generator set at low temperatures. The heater operates from the generator set fuel system and the 24-volt supply. Current is supplied from the batteries to the heater control panel and then to the heater. The successful operation of the heater is dependent upon the satisfactory operation of the electro-mechanical components that control the fuel and air supply to the heater combustion chamber. Satisfactory operation of the heater is also dependent upon the proper operation of the coolant circulating pump which provides the necessary flow of coolant across the heat exchanger. Heated coolant is then transferred to the engine block.

10-10. Initial Installation and Operation

Provisions are made in the generator set for field installation of the winterization system. No special tools are required for installation. Refer to figures 10-3 and 10-4 for initial installation and operating instructions.

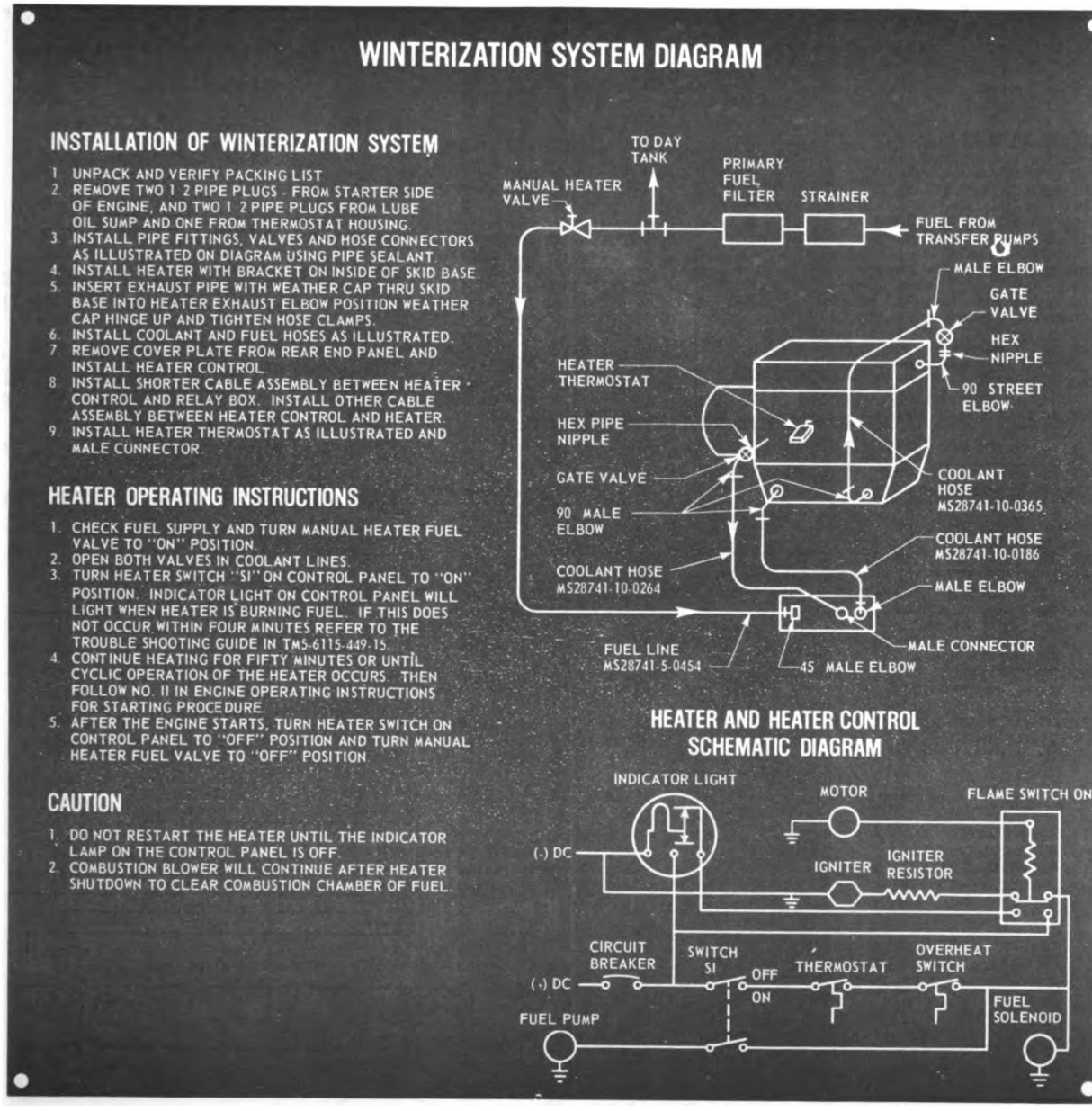


Figure 10-3. ***Winterization system diagram.***

10-11. Winterizing System Maintenance Instructions

Maintenance functions on the winterization system are the responsibility of direct support maintenance.

STEP 1. LOOSEN FUEL LINE FITTING AND REMOVE HEATER FUEL LINE FROM HEATER.
STEP 2. LOOSEN COOLANT LINE FITTINGS AND REMOVE COOLANT INLET AND OUTLET LINES FROM HEATER.
STEP 3. LOOSEN EXHAUST LINE FITTINGS AND REMOVE EXHAUST LINES.
STEP 4. REMOVE P28 WIRING HARNESS CONNECTOR.
STEP 5. REMOVE HEATER MOUNTING BOLTS, BRACKET, NUTS AND LOCKWASHERS.
STEP 6. REMOVE WINTERIZATION HEATER ASSEMBLY FROM SKID BASE MOUNTING PLATE.
STEP 7. INSTALL WINTERIZATION HEATER ASSEMBLY ON SKID BASE MOUNTING PLATE.
STEP 8. INSTALL HEATER MOUNTING BRACKET, BOLTS, NUTS AND LOCKWASHERS.
STEP 9. INSTALL WIRING HARNESS CONNECTOR P28.
STEP 10. INSTALL EXHAUST LINES AND TIGHTEN FITTINGS.
STEP 11. INSTALL INLET AND OUTLET COOLANT LINES TO HEATER AND TIGHTEN FITTINGS.
STEP 12. INSTALL HEATER FUEL LINE AND TIGHTEN FITTING.

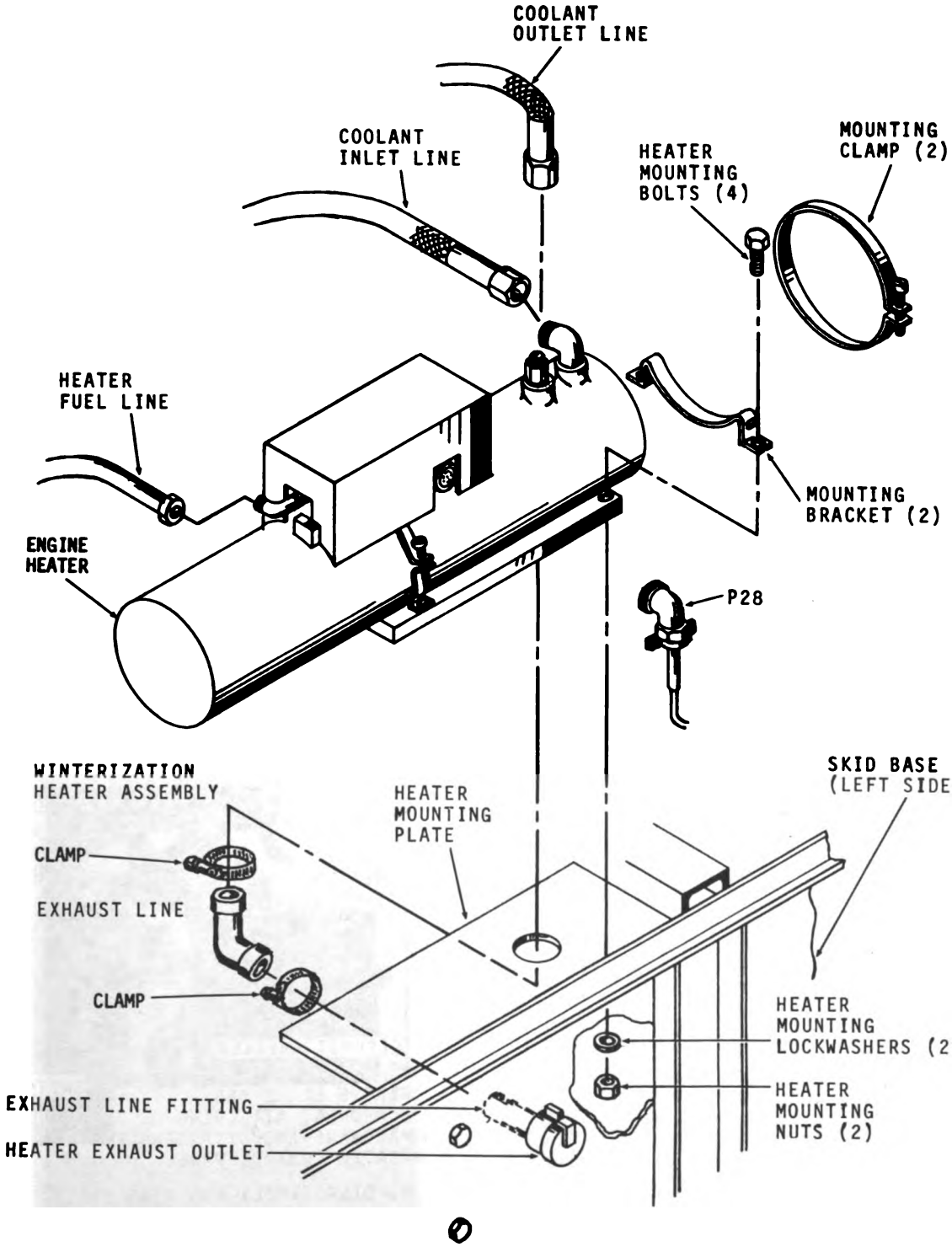


Figure 10-4. *Winterization heater assembly removal and installation.*

10-12. Winterization Equipment Control Panel

a. Removal.

(1) Remove two electrical connectors from the rear of the panel.

(2) Refer to figure 10-5 and remove control panel.

b. Disassembly. Refer to figure 10-5, remove control panel back cover and disassemble as required to perform maintenance.

c. Cleaning, Inspection and Repair.

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

(2) Inspect all parts for cracks, breaks or damage.

(3) Refer to the schematic diagram on figure 10-3 and parts breakdown on figure 10-5 to repair or replace defective parts.

d. Reassembly. Refer to figure 10-5 and reassemble control panel.

e. Installation. Refer to figure 10-5 and install control panel.

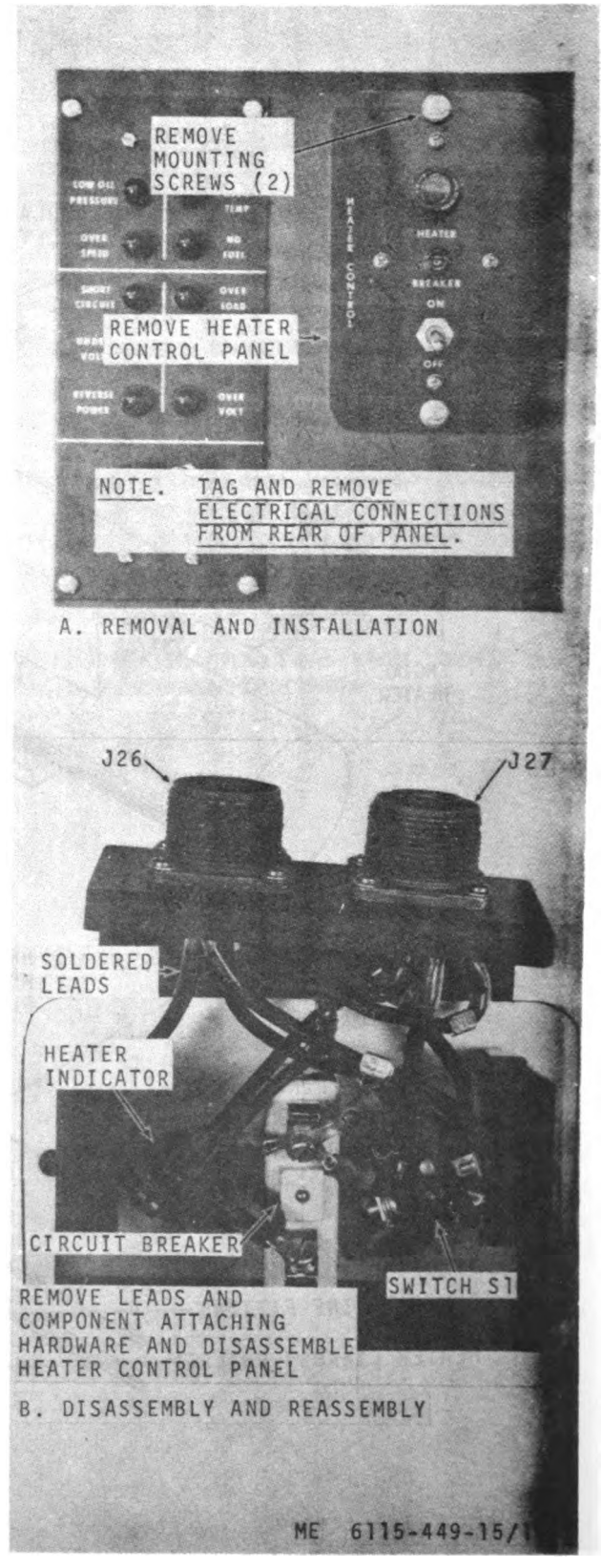


Figure 10-5. Heater control panel.

10-13. Winterization Wiring Harness

a. Removal. Refer to wiring diagram (fig. 1-3) and remove the following wiring harnesses.

(1) Remove harness No. 13216E7183 from the heater control panel to the heater assembly (fig. 1-3).

(2) Remove harness No. 1321E7186 from the heater control panel to the relay box assembly (fig. 1-3).

b. Cleaning and Inspection.

(1) Clean electrical contact surfaces found to be dirty or in a condition which will reduce proper contact.

(2) Inspect harnesses for cracks or frayed insulation, loose, broken, or damaged wires.

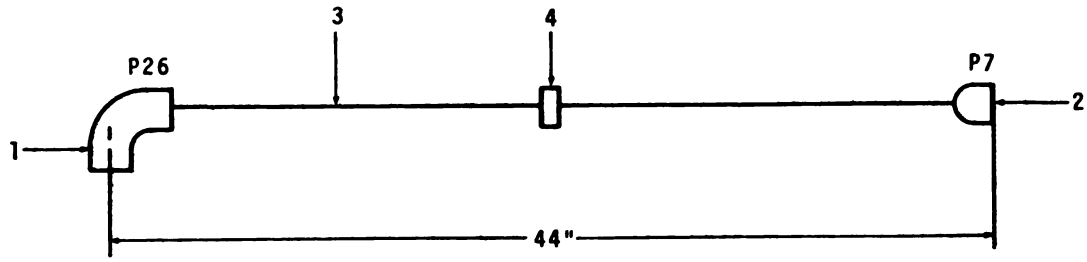
(3) Replace wiring harnesses damaged or defective beyond repair.

c. Repair. Refer to figure 10-6 and repair wiring harnesses.

d. Installation. Refer to wiring diagram (fig. 1-3) and install the following wiring harnesses.

(1) Install harness No. 13216E7186 from the relay box assembly to the heater control panel (fig. 1-3).

(2) Install harness No. 13216E7183 from the heater control panel to the heater assembly (fig. 1-3).

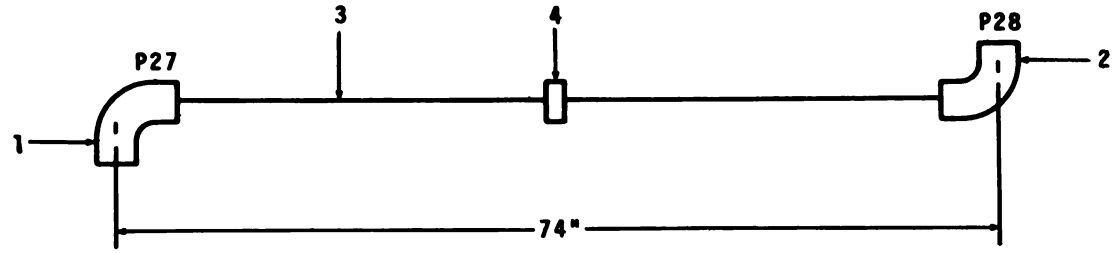


INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-7	CONNECTOR	MS3108R18-11S
2	13214E3270-6	CONNECTOR	MS3106R18-11P
3	TYPE II	ELEC. WIRE	MIL-W-5086
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
P55E12	P26-A	P7-A
P51C12	P26-B	P7-B
V64A12	P26-C	P7-C
V65A12	P26-D	P7-D
P140G12	P26-E	P7-E

ME 6115-449-15/10-6 (1)

Figure 10-6. *Winterization system wiring harness* (*Sheet* 1 *of* 2).



INDEX NO.	PART NUMBER	DESCRIPTION	SPECIFICATION
1	13214E3267-6	CONNECTOR	MS3108R18-11P
2	13214E3267-7	CONNECTOR	MS3108R18-11S
3	TYPE II	ELEC. WIRE	MIL-W-9896
4	MS18034-1	CABLE STRAP	---

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO
P55YY12	P27-A	P28-A
P70816	P27-B	P28-B
VG4E12	P27-C	P28-C
P82A16	P27-D	P28-D
P83A12	P27-E	P28-E

ME 6115-449-15/10-6 (2)

Figure 10-6. *Winterization system wiring harness (Sheet* 2 *of* 2).

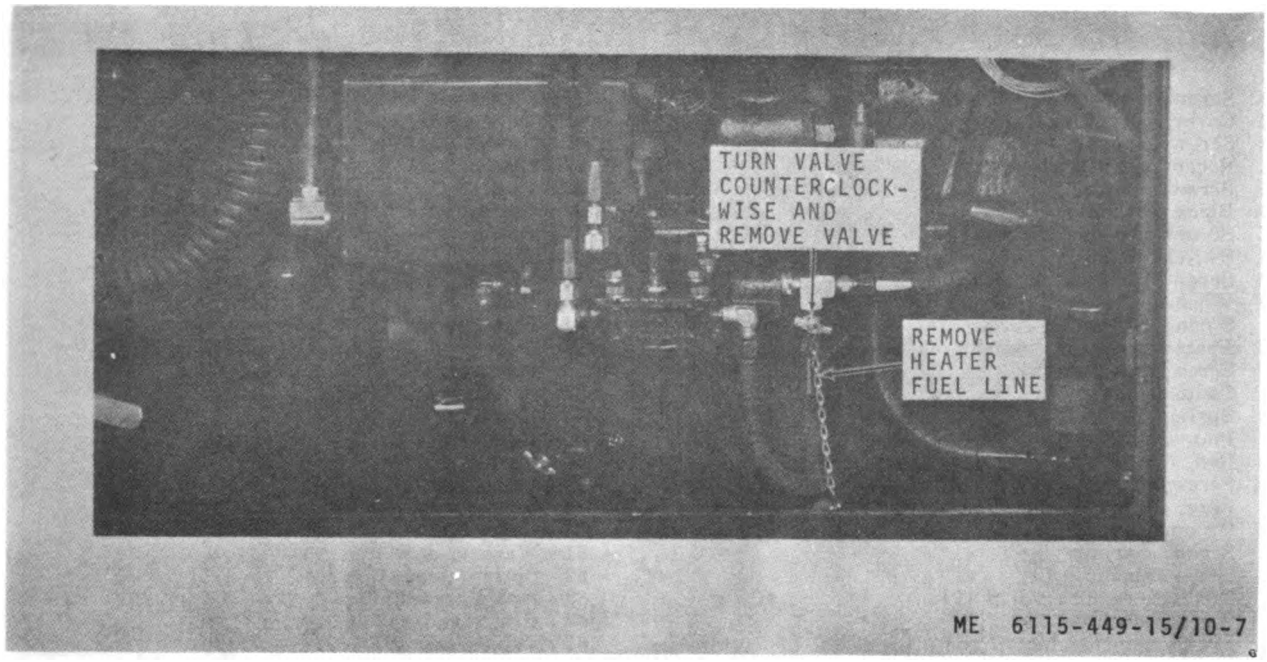


Figure 10-7. Manual heater fuel shutoff valve, removal and installation.

10-14. Heater Thermostat Switch

a. Removal. Refer to fig. 10-8 and remove heater thermostat switch.

b. Cleaning and Inspection.

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

(2) Inspect all parts for defects or damage.

(3) Replace damaged or defective thermostat.

c. Installation. Refer to paragraph 3-92 and install heater thermostat switch.

10-15. Manual Heater Fuel Shutoff Valve

a. Removal. Refer to figure 10-7 and remove manual heater fuel shutoff valve.

b. Cleaning and Inspection.

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

(2) Inspect valve for cracks, breaks, leaks, or other defects.

(3) Replace damaged or defective valve.

c. Installation. Refer to figure 10-7 and install manual heater fuel shutoff valve.

10-16. Winterization Heater Assembly

a. Removal. Refer to figure 10-4 and remove winterization heater assembly from the skid base.

b. Disassembly. Refer to figure 10-8 and disassemble winterization heater assembly.

Note. **Coolant pump cannot be removed as a complete assembly. It must be disassembled during removal as the pump rotor is mounted on the motor shaft.**

1 Screw, machine
2 Cover, protective
3 Screw, machine (4)
4 Receptacle assembly
5 Screw, machine (4)
6 Block, terminal
7 Screw, machine (2)
8 Switch, limit
9 Screw, machine adjusting
10 Washer, flat
11 Spring, adjusting screw
12 Frame assembly, switch
13 Screw, machine (2)
14 Switch, micro
15 Spring, tension
16 Pad, spring
17 Rod, quartz
18 Screw, machine (5)
19 Plug, drain
20 Grommet, casing
21 Screw, machine (2)
22 Screw, machine (4)
23 Bracket, regular valve (2)
24 Screw, machine (2)
25 Pre-heater assembly, fuel (consists of automatic thermostat and two heating elements)
26 Tube assembly, fuel
27 Screw, set
28 Screw, set
29 Plug, metering orifice
30 Orifice assembly, metering
31 Body, filter
32 Gasket, filter body
33 Filter, sintered
34 Valve assembly, regulator
35 Screw, machine (2)
36 Name plate
37 Exchanger, heat
38 Casing, burner
39 Screw, machine (4)
40 Screw, machine (4)
41 Cover, air inlet
42 Date decal
43 Screw, machine (4)
44 Clamp, hose
45 Hose
46 Clamp, hose
47 Elbow
48 Plug
49 Spring, relief valve
50 Ball
51 Plate, port
52 O-ring
53 Ring, cam
54 Screw, set
55 Blade (4)
56 Rotor
57 O-ring
58 Adapter
59 O-ring
60 Cage, seal
61 Washer, seal
62 Spring, seal
63 Motor, assembly
64 Brush and spring
65 Cap, brush (2)
66 Screw, machine (2)
67 Inlet, combustion air
68 Screw, machine (4)
69 Plate, inlet
70 Screw, set
71 Fan, combustion
72 Screw, machine, burner leg (3)
73 Elbow
74 Igniter
75 Gasket, igniter
76 Burner assembly
77 Lock wire
78 Screw, machine (2)
79 Retainer, vaporizer
80 Vaporizer

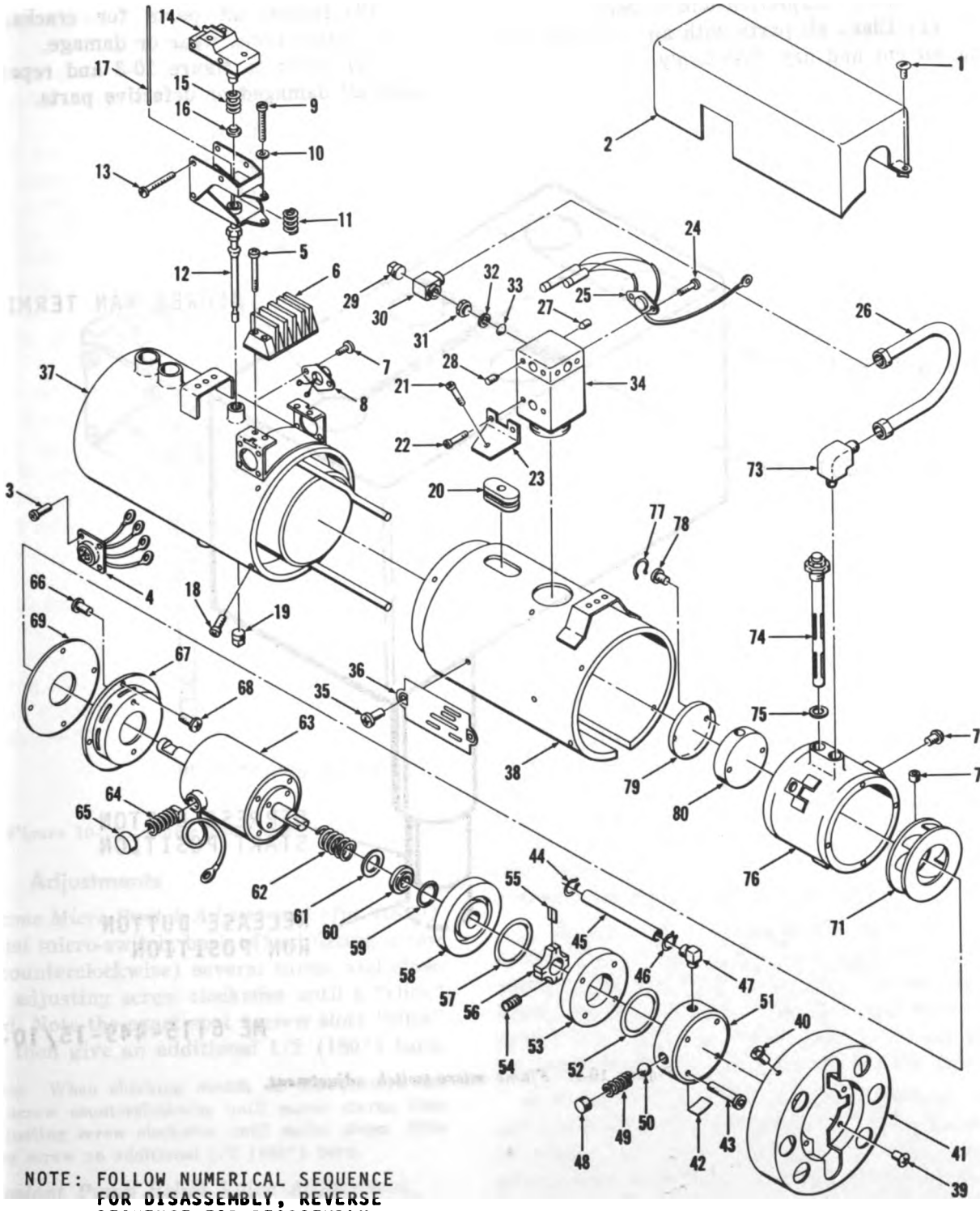


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Figure 10-8. *Winterization heater disassembly and reassembly.*

c. Cleaning, Inspection and Repair.

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

(2) Inspect all parts for cracks, breaks, leaks, obstructions, wear or damage.

(3) Refer to figure 10-8 and repair or replace all damaged or defective parts.

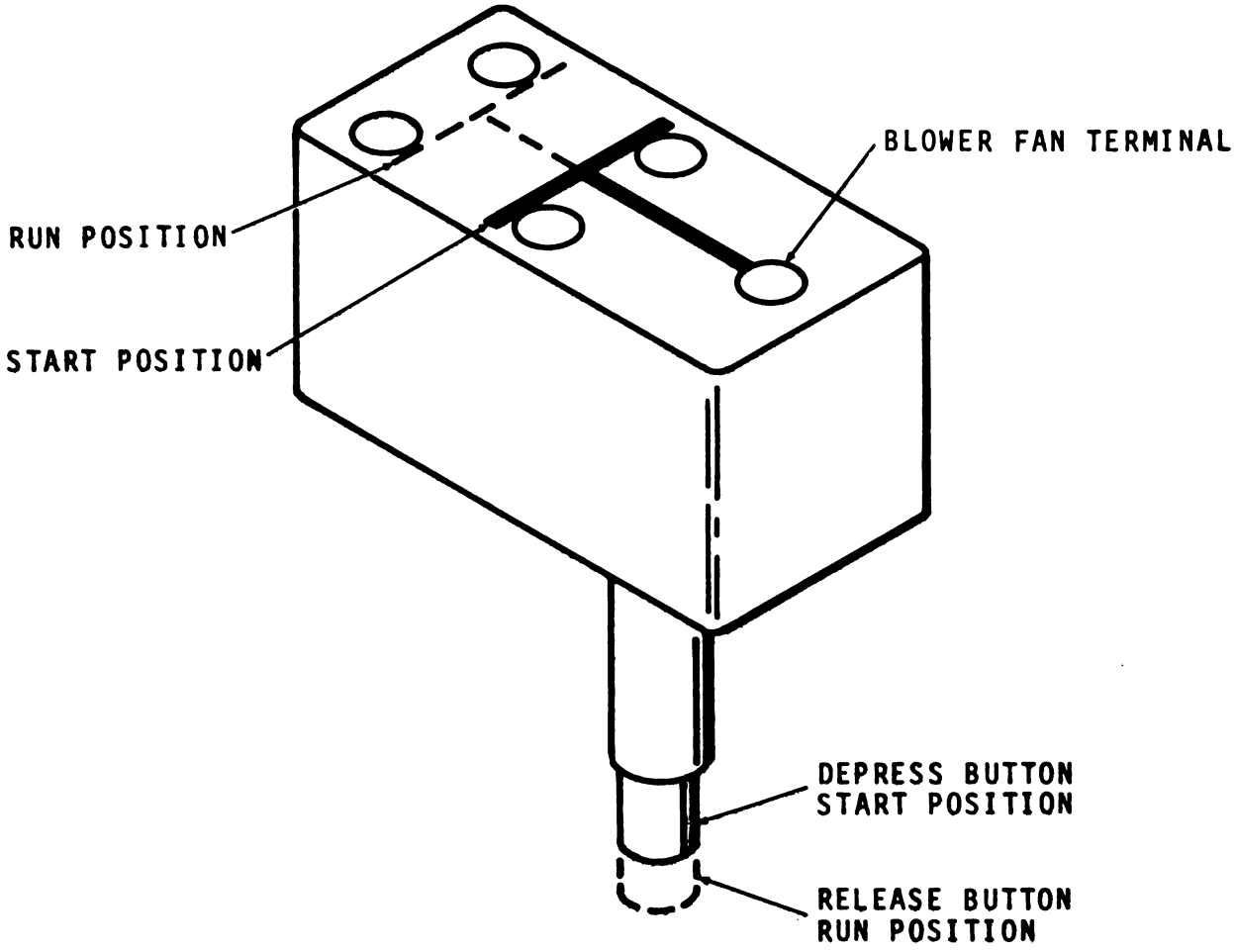
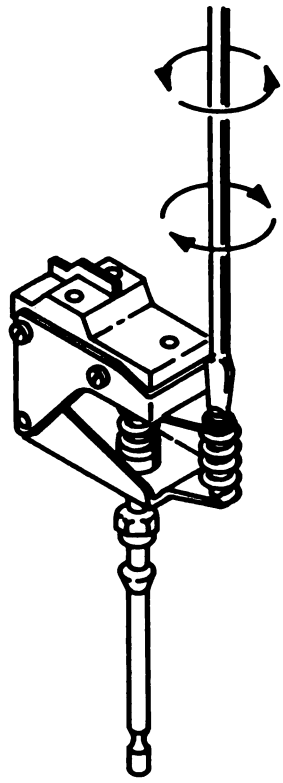


Figure 10-9. Flame micro-switch adjustment.



ME 6115-449-15/10-10

Figure 10-10. *Flame micro-switch test.*

10-17. Adjustments

a. Flame Micro-Switch Adjustment (fig. 10-10). To adjust micro-switch, back off adjusting screw (turn counterclockwise) several turns, and slowly turn adjusting screw clockwise until a "click" is heard. Note the exact spot (screw slot) "click" occurs, then give an additional 1/2 (180°) turn.

Note. When checking switch on heater, turn adjusting screw counterclockwise until motor starts, then turn adjusting screw clockwise until motor stops. Give adjusting screw an additional 1/2 (180°) turn.

b. Coolant Pump Relief Valve Adjustment. This relief valve is a non-adjustable type valve, set to relieve at 30-35 psi. To assure proper functioning of the valve, the spring should measure 1.164 inches free length and have a 0.750 inch working length with a load of 1 lb., ± 0.1 lb., applied. If spring fails to meet these requirements, replace spring.

c. Fuel Regulator Valve Adjustment. If fuel regulator valve is suspected of not producing a sufficient flow rate, or if valve adjustment has been disturbed for any reason, readjust the valve to produce the required flow. Proceed as follows: Disconnect fuel tube at orifice. Remove cover plate at top of valve to expose brass adjusting screw. With fuel inlet connected and fuel at the valve, apply 24 volts to valve solenoid. Use a stop watch and time the flow into a graduated beaker. Flow should measure 21 to 23 cc per minute. Turn adjusting screw clockwise to increase flow rate or counterclockwise to decrease flow rate.

Caution: **Disconnect electrical lead to igniter prior to checking fuel flow.**

10-18. Reassembly

Refer to figure 10-8 and reassemble winterization heater assembly.

10-19. Winterization Heater Assembly Test Procedures

a. General. The following sub-paragraphs cover testing of individual heater components. When these components are tested and are within specification, the heater should function normally when completely reassembled and installed in the equipment.

b. Regulator Valve Test. Connect a fuel supply (3 to 15 psi) and the rated voltage to the regulator. Regulator should operate and produce a steady stream of 21 to 23 cc of fuel per minute. If the fuel rate is not within these tolerances, adjust valve (para 10-17*c*). Test can be made using a graduated beaker and a stop watch.

c. Igniter Test. With igniter removed from heater, ground the igniter and apply 24 volts dc power to the igniter terminal only. Igniter should draw approximately 10.5 amperes and heat to a bright red color in a few seconds. If igniter does not meet these requirements, replace the igniter.

d. Motor Test. The blower motor (without coolant pump attached) can be tested while installed in heater. To check end play on motor shaft, grasp short shaft end and rotate in either direction at the same time moving in and out. The end play should not exceed 0.010—0.025 inch and fan should rotate freely. Check motor RPM with a strobe light while blower is assembled to heater. The fan speed should be approximately 8500 RPM when 24 volts dc power is applied. The blower motor should not draw more than 6 amperes. Higher amperage indicates a defective motor. Replace motor if defective.

e. Flame Switch Test. (fig. 10-9).

(1) Test flame switch using an ohmmeter to check continuity of the micro-switch.

(2) Depress the micro-switch button for the "Ignition" or start position of the switch. Continuity should be made between the two "NO" terminals and also between each of the "NO" terminals and the common terminal. There should be an open circuit between the two "NC" terminals, and also between the common terminal and the two "NC" terminals.

(3) Release the micro-switch button for the "Run" position of the micro-switch. Continuity should be made between the two "NC" terminals and the common terminal. There should be no continuity made between the "NO" and "Ignition" or start terminals, or between the "NO" terminals and the common terminal.

(4) Replace micro-switch if it doesn't check out correctly.

Note. The common terminal is connected to the blower motor which operates at all times when the heater is in operation.

f. Coolant Pump Test. After pump has been completely overhauled, test it before reinstalling in the heater. Refer to figure 10-11 and proceed as follows.

(1) Mount motor and pump assembly on test stand and install proper fittings in the inlet and outlet ports. Attach hose line from supply tank to port marked "IN".

(2) Attach discharge line, with pressure gage and needle valve, to the port marked "OUT" and return to the supply tank.

(3) Attach electrical plug to the motor receptacle and plug into dc power supply.

(4) Turn power switch ON and run-in unit for approximately 15 minutes on 24 volts dc.

(5) Close valve in outlet line. (Make certain the discharge pressure does not exceed a maximum of 30—35 psi when closing this valve.) Open and close valve a few times to check consistency of valve performance.

(6) To check pump for rated flow and pressure, adust valve in discharge line until a reading of 2 psi is obtained on the pressure gage. Using a suitable timer, check for rated flow of 80 gph minimum at 2 psi discharge pressure. Amperage draw should not exceed 6 amperes during this test. Observe smoothness of operation of both pump and motor. Seal leakage of 1 cc per hour is maximum when pump is operating at 2 psi discharge.

(7) Turn power supply OFF, then remove discharge line and fitting from "OUT" port. Plug this port and apply 40 psi hydrostatic pressure for 20 minutes. No leakage shall be evident during this test.

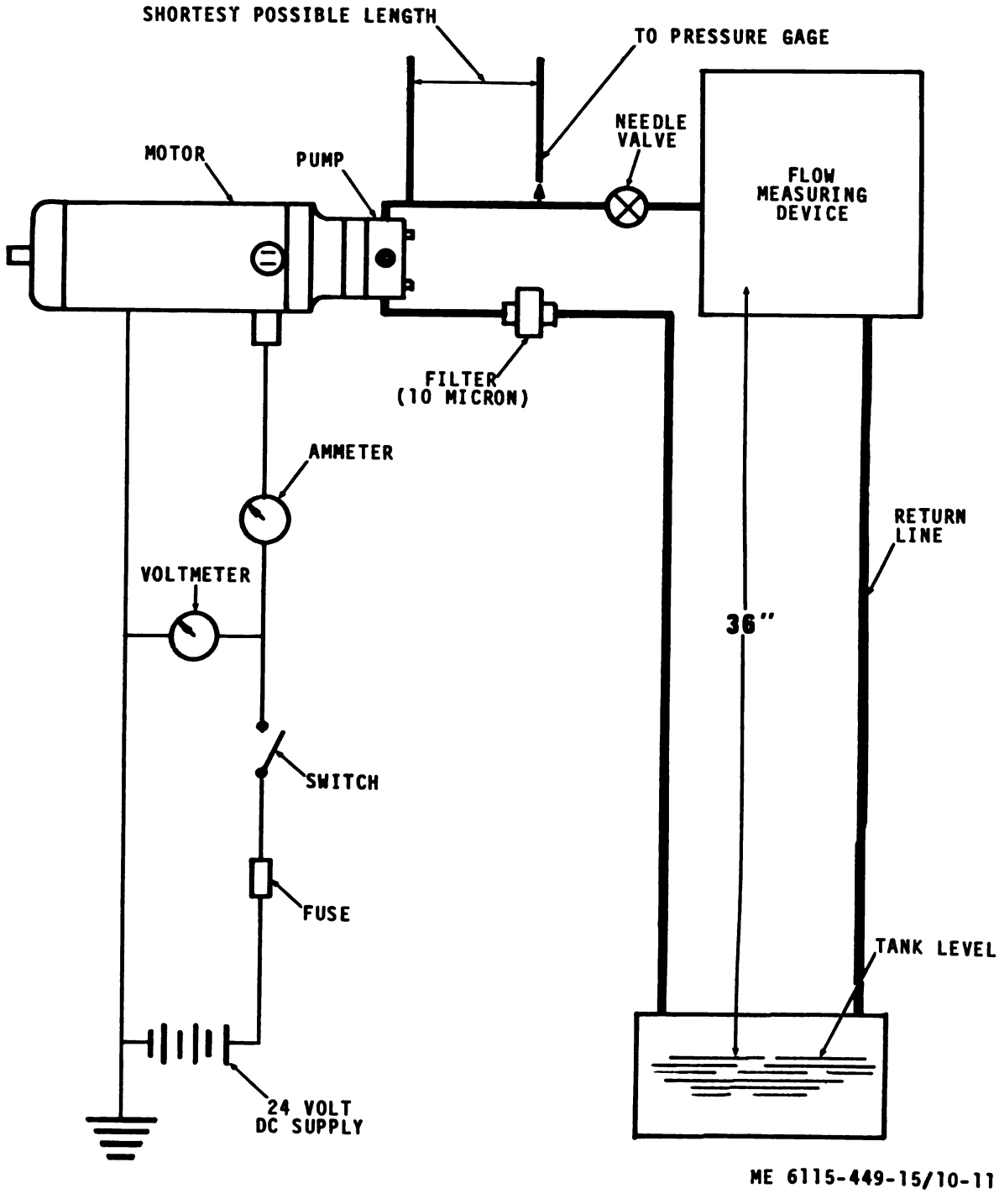


Figure 10-11. *Winterization heater coolant pump test diagram.*

10-20. Installation

Refer to figure 10-4 and install winterization heater assembly.

10-21. Remote Control Box

Note. The remote control box is optional equipment and is not supplied on all generator sets.

a. General. A remote control box is provided for starting and stopping the set from a remote station. The remote control box contains remote start and stop switches, on-off toggle switch, remote voltage sensing connector, remote start relay, remote stop relay, diodes and resistors. The remote control box is located on the right lower rear panel of the generator set.

b. Removal. Refer to figure 10-12 and remove the remote control box.

c. Testing.

(1) Test all switches for correct switching characteristics.

(2) Test relays for proper operation.

(3) Test diodes and silicon controlled rectifier for breakdown, continuity and polarity.

(4) Test resistors for proper resistance value.

(5) Test all wires for continuity.

d. Disassembly. Refer to figure 10-12 and disassemble the remote control box.

e. Cleaning, Inspection and Repair.

(1) Clean all metal parts with an approved solvent.

(2) Inspect insulation, terminal boards and connectors for damage or deterioration. Replace defective insulators, terminal boards and connectors.

(3) Inspect all components for damage. Replace damaged components.

(4) Replace components found defective during testing.

f. Reassembly. Refer to figure 10-12 and reassemble the remote control box.

g. Installation. Refer to figure 10-12 and install the remote control box.

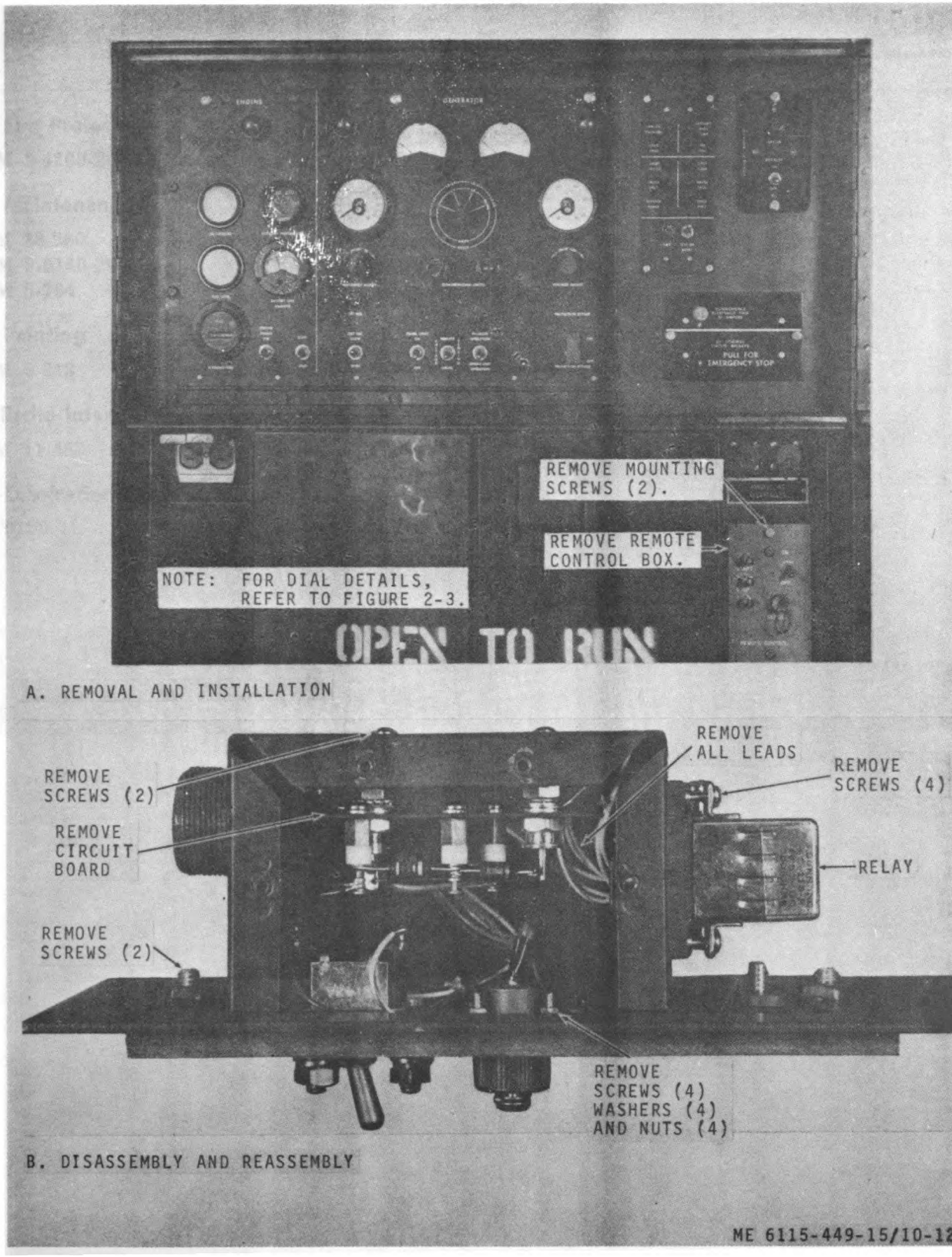


Figure **10-12.** ***Remote control box removal and installation.***

APPENDIX A

REFERENCES

A-1. Fire Protection

TM 5-4200-200-10	Hand Portable Fire Extinguisher for Army Use

A-2. Maintenance

TM 38-750	The Army Equipment Record System and Procedures
TM 9-6140-200-15	Storage Batteries, Lead Acid Type
TM 5-764	Electric Motor and Generator Repair

A-3. Painting

TM 9-213	Painting Instructions for Field Use

4-4. Radio Interference Suppression

TM 11-483	Radio Interference Suppression

A-5. Lubrication

C 9100 IL	Petroleum, Petroleum Base Products and Related Materials

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the generator set or are required for installation, operation, or operator's maintenance.

B-2. General

This basic issue items list is divided into the following sections:

a. Basic Issue Items—Section II. A list of items which accompany the generator set or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies—Section III. A listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column (1):

Note. Common hardware items known to be readily available in Army supply will be assigned Maintenance Codes only. Source Codes, Recoverability Codes, and Quantity Authorized will not be assigned to this category of items.

(1) Source Code, indicates the selection status and source for the listed item. Source codes are:

Code	*Explanation*
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
A	Applied to assemblies which are not procured or stocked as such, but made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item, and the failure of which should result in retirement of the end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of the next higher assembly or components.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Applied to repair parts authorized for local procurements. If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missile Army) funds for initial issue only to be used as exchange assemblies at DSU and GSU level or returned to depot supply level.

(2) Maintenance Code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level codes are:

Code	*Explanation*
C	Operator/crew
O	Organizational maintenance

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	*Explanation*
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.

Code	Explanation
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column (2). This column indicates the Federal stock number for the item.

c. Description, Column (3). This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the appicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of Issue, Column (4). This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit rack, Column (5). This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column (6). This column indicates the quantity of the item used in the functional group.

g. Quantity Furnished With Equipment, Column (7). This column indicates the quantity of an item furnished with the equipment.

h. Quantity Authorized, Column (8). This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

i. Illustration, Column (9). This column is divided as follows:

(1) *Figure number, column (9)(a).* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number, column (9)(b).* Indicates the callout number used to reference the item in the illustration.

B-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies—Section III.

a. Component Application, Column (1). This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number, Column (2). This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

c. Description, Column (3). This column indicates the item and brief description.

d. Quantity Required for Initial Operation, Column (4). This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation, Column (5). This column indicates the estimated quantities required for an average eight hours of operation.

f. Notes, Column (6). This column indicates informative notes keyed to data appearing in a preceding column.

Section II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) Qty furn with equip	(8) Qty auth	(9) Illustration (a) Fig No.	(9) Illustration (b) Item No.
		Group 31—Basic Issue Items Manufacturer Installed.							
		3100—Basic Issue Items Manufacturer or Depot Installed.							
FO	4720-021-3320	Aux Fuel Hose	ea			1	1		
PO	2910-066-1235	Adapter, Drum	ea			*	1		
PO	7510-889-3494	Log Book Binder	ea			1	1		
PO	7520-599-9618	Case, Maintenance & Operators Manual	ea			1	1		
		Department of The Army Lubrication Order LO 5-6115-449-15	ea			1	1		
		Department of The Army Technical Manual TM 5-6115-449-15	ea			1	1		
		Group 32—Basic Issue Items Troop Installed.							
		3200—Basic Issue Items Troop Installed or Authorized.							
	5975-878-3791	Rod, Ground (with attachments)	ea			*	1		
	5935-258-9156	Connector, Plug	ea			*	1		
	4210-555-8837	Fire Extinguisher	ea			*	1		

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
0101 CRANKCASE		Oil Lubricating; 5 gal pails as follows:			(1) Includes quantities of oil to fill engine crankcase, lines and filters.
Diesel Eng (1)	9150-265-9435	Grade OE30	8 1/2 qts	(2)	
	9150-265-9428	Grade OE10	8 1/2 qts	(2)	
	9150-242-7603	Grade OES	8 1/2 qts	(2)	
0306 TANK, FUEL		Fuel Oil, Diesel, Bulk as follows:			(2) Reference current L.O. for grade application and replenishment intervals.
	9140-286-5294	Regular Grade DF 2	29 gals (3)	(4)	
	9140-286-5286	Winter Grade DF 1	29 gals (3)	(4)	
	9140-286-5283	Arctic Grade DF A	29 gals (3)	(4)	(3) Tank capacity.
0308 GOVERNOR	9150-223-4134	Oil, Hydraulic; 1 gal cans OHA-MIL-H-5606	8 pints	(2)	(4) Average fuel consumption is 1 gal/10 KW hour
0501 RADIATOR		Water:			(5) Radiator capacity.
	6850-243-1992	Anti-Freeze: inhibited glycal	27.5 qts (5)		
	5850-174-1806	Anti-Freeze: compound Arctic	27.5 qts (5)		

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. Explanation of Columns in Section II

a. Group Number, Column (1). The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the MAC (Maintenance Allocation Chart) in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Functional Group, Column (2). This column contains a brief description of the components of each functional group.

c. Maintenance Functions, Column (3). This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions are defined as follows:

A—Inspect: To determine serviceability of an item by comparing the physical, mechanical, and electrical characteristics with established standards.

B—Test: To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C—Service: To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D—Adjust: To rectify to the extent necessary to bring into proper operating range.

E—Aline: To adjust specified variable elements of an item to bring to optimum performance.

F—Calibrate: To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the 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 with the certified standard.

G—Install: To set up for use in an operational environment such as an emplacement, site, or vehicle.

H—Replace: To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I—Repair: To restore an item to serviceable condition. This includes but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J—Overhaul: To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K—Rebuild: To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment, Column (4). This column is provided for referencing by code the special tools and test equipment, (sec. III) required to perform the maintenance functions (sec. II).

e. Remarks, Column (5). This column is provided for referencing by code the remarks (sec. IV) pertinent to the maintenance functions.

C-3. Explanation of Columns in Section III.

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T&TE (Tools and Test Equipment) requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal stock number of tools and test equipment.

C-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
01	ENGINE:													
0100	Engine Diesel	C	F	C	..	..	..	..	F	F	H	D	.....	.. A
0101	Crankcase, Block, Cylinder Head:													
	Block, cylinder	D	..	..	..	..	..	..	D	D	D	D		
	Cylinder head	F	..	..	..	..	..	..	F	F	H	..	.....	.. B
0102	Crankshaft:													
	Crankshaft	D	..	..	..	..	..	..	D	D	..	D	.....	.. C
0103	Flywheel Assembly:													
	Ring gear	F	..	..	..	..	..	..	H	F				
0105	Valves, Camshafts and Timing System:													
	Valve, poppet	O	..	..	O	..	..	..	F	F	..	..	.....	.. D
0106	Engine Lubrication System:													
	Pan, oil	O	..	O	..	..	..	..	F	F				
	Pump Assembly, Oil	..	..	..	..	..	..	..	F	F	F			
03	FUEL SYSTEM:													
0301	Fuel Injector:													
	Injector assembly	O	H	..	..	..	..	..	O	H	H	..	.....	.. E
0302	Fuel Pumps:													
	Pump, fuel injection	F	H	..	..	..	..	..	F	H	D	D	.....	.. E
0306	Tanks, Lines, Fittings:													
	Line assembly, fuel	O	..	..	..	..	..	..	O	O				
	Tank, fuel	O	..	C	..	..	..	..	F	H				
0308	Engine Speed Governor and Controls:													
	Actuator, electro hydraulic	F	H	O	F	..	..	..	F	H	H	..	.....	.. F
	Pump, hydraulic fluid	F	..	..	..	..	..	..	F	H	H			
	Tank, hydraulic fluid	O	..	C	..	..	..	..	O	H				
0309	Fuel Filter Assembly:													
	Filter assembly	..	..	C	..	..	..	O	..	..	..	..	.....	.. G

(1) Group No.	(2) Functional group	(3) Maintenance functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
05	COOLING SYSTEM:													
0501	Radiator Assembly	C	F	C	..	..	..	..	O	F				
0504	Water Pump:													
	Pump assembly	C	..	..	..	..	..	..	O	F	F			
0505	Fan Assembly:													
	Belt, drive	C	..	..	C	..	..	..	O					
06	ELECTRICAL SYSTEM (ENGINE & VEHICULAR):													
0601	Generator, Alternator													
	Alternator, Battery Charging	O	F	..	O	..	..	..	O	F	F			
0603	Starting Motor:													
	Starter, Electrical	O	..	..	..	..	..	..	O	F	F			
0606	Engine Safety Controls:													
	Controls, Safety	F	F	..	F	..	..	..	F					
	Governor, Overspeed	F	F	..	F	..	..	..	F					
0612	Batteries, Storage:													
	Storage, Battery	C	O	C	..	..	..	..	O					
	Cable, Battery	C	..	..	..	..	..	..	O	O				
0613	Hull or Chassis Wiring Harness:													
	Harness, wiring, engine													
	Electrical system	C	F	..	..	..	..	..	F	F				
15	FRAME, TOWING ATTACHMENT & DRAWBARS:													
1501	Frame Assembly	F	..	..	..	..	..	..	F	F				
18	BODY, CAB, HOOD & HULL:													
1801	Cover, Housing	O	..	..	..	..	..	..	O	O				
	Doors, Access	O	..	..	..	..	..	..	O	O				
	Frame, Housing	F	..	..	..	..	..	..	F	F				
	Panel, Housing	F	..	..	..	..	..	..	F	F				
	Support, Housing	F	..	..	..	..	..	..	F	F				
22	BODY CHASSIS or HULL & ACCESSORY ITEMS:													
2202	Accessory Items:													
	Cable assembly, parallel	O	F	..	..	..	..	..	O	F	..	..	.....	.. H
	Hose assembly, auxiliary fuel	O	..	..	..	..	..	..	O	F				
2207	Winterization Equipment:													
	Heater assembly	O	F	..	..	..	..	..	F	F	F			
	Heater control panel	O	..	..	..	..	..	..	F	F	F			
	Valve, shutoff	O	..	..	..	..	..	..	F	F				
40	ELECTRIC MOTORS & GENERATORS:													
4000	Generator Assembly:													
	Generator	C	F	O	..	..	..	..	F	F	D	D		
4001	Rotor Assembly:													
	Rotor	H	H	..	..	..	..	..	H	H	D	D	.....	.. I
4002	Stator Assembly:													
	Stator	H	H	..	..	..	..	..	H	H	D	D	.....	.. J
4009	Control Panels, Housings, Cubicles:													
	Remote control box	F	..	..	..	..	..	F	F	H	H			
4010	Master or Auxiliary Control Assembly:													
	Unit control, governor	..	H	..	O	..	..	..	O	H	D	D		
4013	Regulator, Voltage or Current:													
	Regulator, voltage	F	F	..	F	..	..	..	F	H	D	D		
4020	Static Exciter Comp:													
	Static exciter	F	..	..	..	..	..	..	F	F	D	D		

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
		No Special Tools or Test Equipment Required	

Section IV. REMARKS

Reference code	Remarks
A-B	Includes operational and compassion.
B-I	Includes refacing as necessary.
C-A	Includes micrometer measurements.
C-K	Includes metallizing and machining crank throws to standard.
D-I	Includes refacing valves.
E-B	Includes bench test.
F-C	Includes cleaning screen in hydraulic actuator.
G-C	Includes cleaning screen assembly.
H-B	Includes continuity test with ohmeter.
I-B	Includes checking rotor balance.
J-K	Includes stator rewinding.

INDEX

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

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

Distribution:

To be distributed in accordance with DA Form 12-25, Sec IV (qty rqr Block #734), Organizational maintenance requirements for 30 kw, 60 cycle, Generators.

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A1---CONVERTER, THERMAL WATT
A2---CONVERTER, FREQUENCY
A4---CONTROL PANEL RELAY ASSY.
CR1---DIODE BRIDGE
K6-----RELAY, REMOTE VOLTAGE SENSING
R1-----RESISTOR
A5---DC RELAY ASSY.
CR4---DIODE BRIDGE
K7-----RELAY, PAR. LIGHTS VOLTAGE SENSOR
R3, R4, R5, R6, R7----RESISTOR
A6---RESISTOR ASSY, GOVERNOR
C1-----CAPACITOR
R1, R2, R3, R4, R5----RESISTOR
CB2-CONTACTOR, MAIN AC
DS4, DS5---LIGHT, SYNCHRONIZING
G1---GENERATOR
K2---RELAY, OVER VOLTAGE
K11-RELAY, UNDER VOLTAGE
K13-RELAY, SHORT CIRCUIT
K14-RELAY, OVERLOAD
K15-RELAY, REVERSE POWER
K16-RELAY, PERMISSIVE PARALLELING
M6---METER, FREQUENCY
M7---METER, KILOWATT
M8---AMMETER
M9---VOLTMETER
R1---RHEOSTAT, FREQUENCY ADJUSTING
R2---RHEOSTAT, VOLTAGE ADJUSTING
R28-RHEOSTAT, LOAD SHARING
R29-RHEOSTAT, REACTIVE CURRENT
S5---SWITCH, LOCAL-REMOTE VOLTAGE
S6A, S6B---SWITCH, UNIT PARALLEL
S8---SWITCH, AMMETER-VOLTMETER TRANSFER
S10-SWITCH, 50/60 HERTZ
TB6-TERMINAL BOARD, RECONNECTION

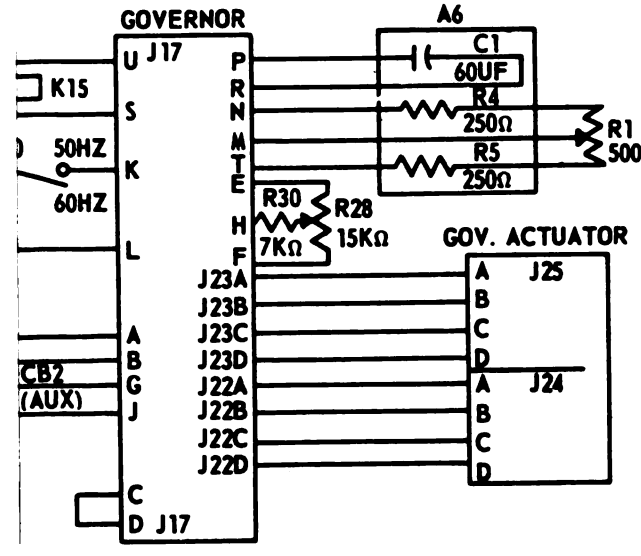

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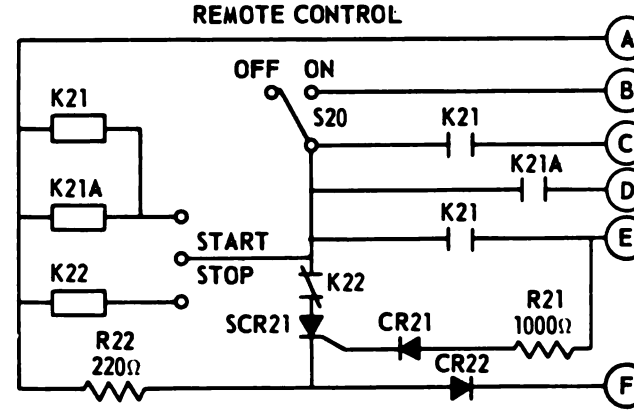
Figure 5-1. Schematic wiring diagram (sheet 1 of 2)

A3---FLASHER, PROTECTION BYPASS LAMP
CB1-CIRCUIT BREAKER, DC
CB2-CONTACTOR, AC
CR3, CR6---DIODE
DS1, DS2, DS3---LIGHT, PANEL
DS6-LIGHT, INDICATOR, CIRCUIT BREAKER
DS7-LIGHT, PROTECTION BYPASS
FL-1, FL-2--SWITCH, FUEL LEVEL
K1---RELAY, STOP-RUN
K2---RELAY, OVER VOLTAGE
K3---RELAY, CRANK
K5---RELAY, FIELD FLASH
K8---RELAY, FUEL LEVEL
K11-RELAY, UNDER VOLTAGE
K13-RELAY, SHORT CIRCUIT
K14-RELAY, OVERLOAD
K15-RELAY, REVERSE POWER
K16-RELAY, PERMISSIVE PARALLELING
M1---METER, OIL PRESSURE
M2---METER, COOLANT TEMPERATURE
M3---METER, FUEL LEVEL
M4---AMMETER, BATTERY CHARGING
M5---METER, TOTAL TIME
OP--SWITCH, OIL PRESSURE
S1---SWITCH, ENGINE PRIMER
S2---SWITCH, START-RUN-STOP
S3---SWITCH, CONTACTOR
S4---SWITCH, PANEL LIGHTS
S7---SWITCH, PROTECTION BYPASS
SR---RECEPTACLE, SLAVE
SS1--START-DISCONNECT AND FIELD FLASH*
SS2--GOVERNOR ON-OFF*
SS3--OVERSPEED*
WT--SWITCH, COOLANT TEMPERATURE
*SPEED SWITCH



K21, K21A---RELAY, REMOTE START
K22----------RELAY, REMOTE STOP
S20----------SWITCH, REMOTE ON-OFF
CR21, CR22-DIODE
SCR21--------RECTIFIER, SILICON CONTROLLED
R21, R22-----RESISTOR

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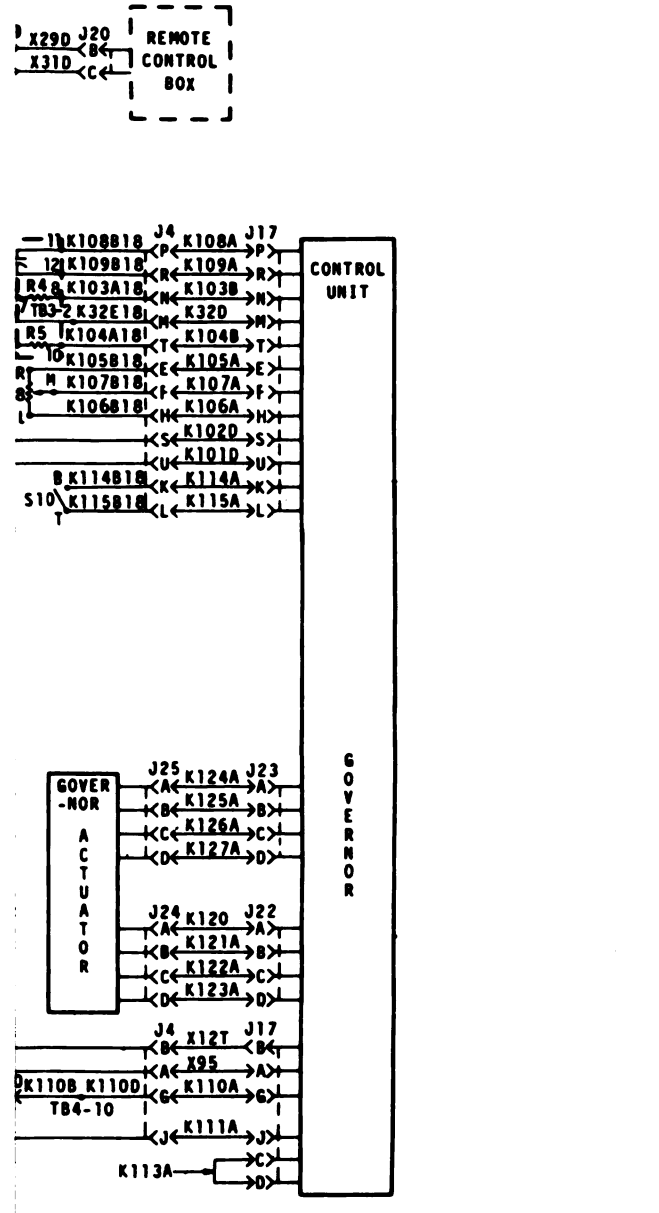
Figure 5-1. Schematic wiring diagram (sheet 2 of 2)



	K16	- RELAY, PERMISSIVE PARALLELING
	M6	- METER, FREQUENCY
	M7	- METER, KILOWATT
	M8	- METER, CURRENT, AC
LY	M9	- METER, VOLTAGE, AC
	R1,R3 THRU 27	- RESISTOR
	R1	- RHEOSTAT, FREQUENCY ADJUST
	R2	- RHEOSTAT, VOLTAGE ADJUST
	R28	- RHEOSTAT, LOAD SHARING
	R29	- RHEOSTAT, REACTIVE CURRENT
	S5	- SWITCH, LOCAL-REMOTE VOLTAGE
ENSOR	S6	- SWITCH, UNIT PARALLEL
	S8	- SWITCH, AMMETER-VOLTMETER TRANSFER
	S10	- SWITCH, 50-60 Hz TRANSFER
	TB6	- TERMINAL BOARD, RECONNECTION

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Figure 5-2. AC Troubleshooting (sheet 1 of 2)

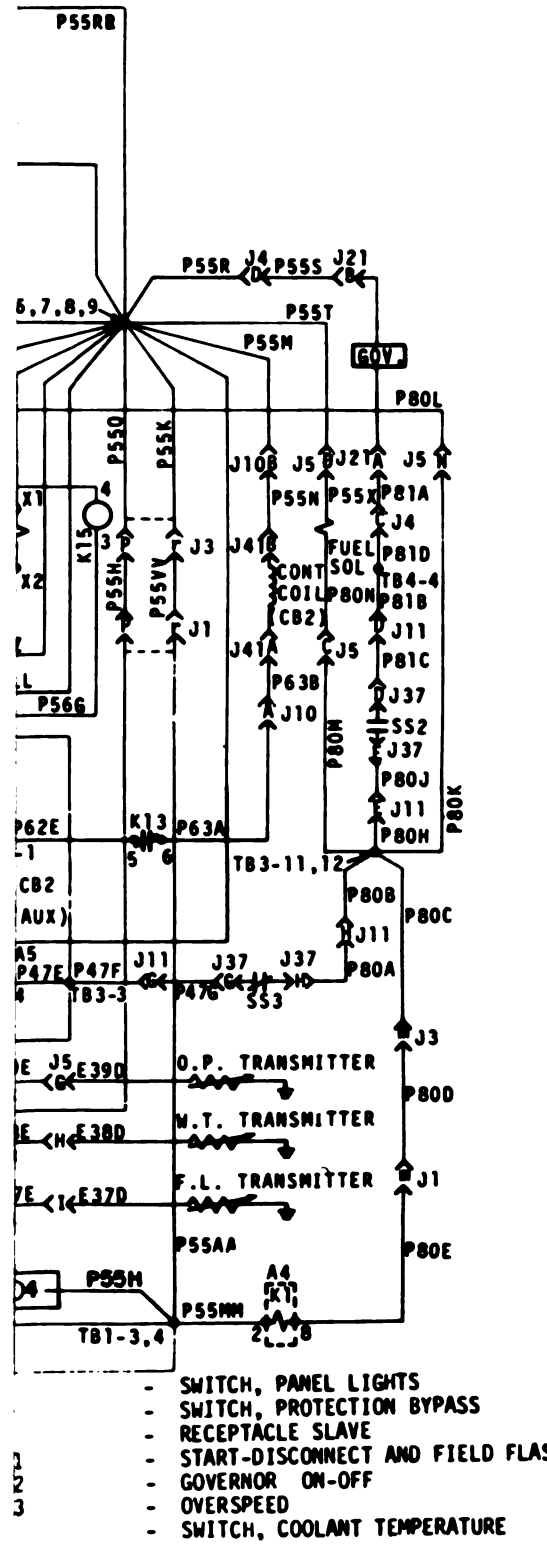

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Figure 5-2. DC Troubleshooting (sheet 2 of 2)

THRU CR6 - RECTIFIER
- SURGE SUPPRESSOR
J9 - CONNECTOR, RECEPTACLE
THRU L3 - REACTOR, LINEAR
- CONNECTOR, PLUG
THRU R4 - RESISTOR
THRU T3 - TRANSFORMER, SATURABLE
- TRANSFORMER
- TRANSFORMER, CURRENT
- TRANSFORMER. CURRENT, METERING
- TERMINAL BOARD

Figure 8-1. Static exciter (sheet 2 of 4)

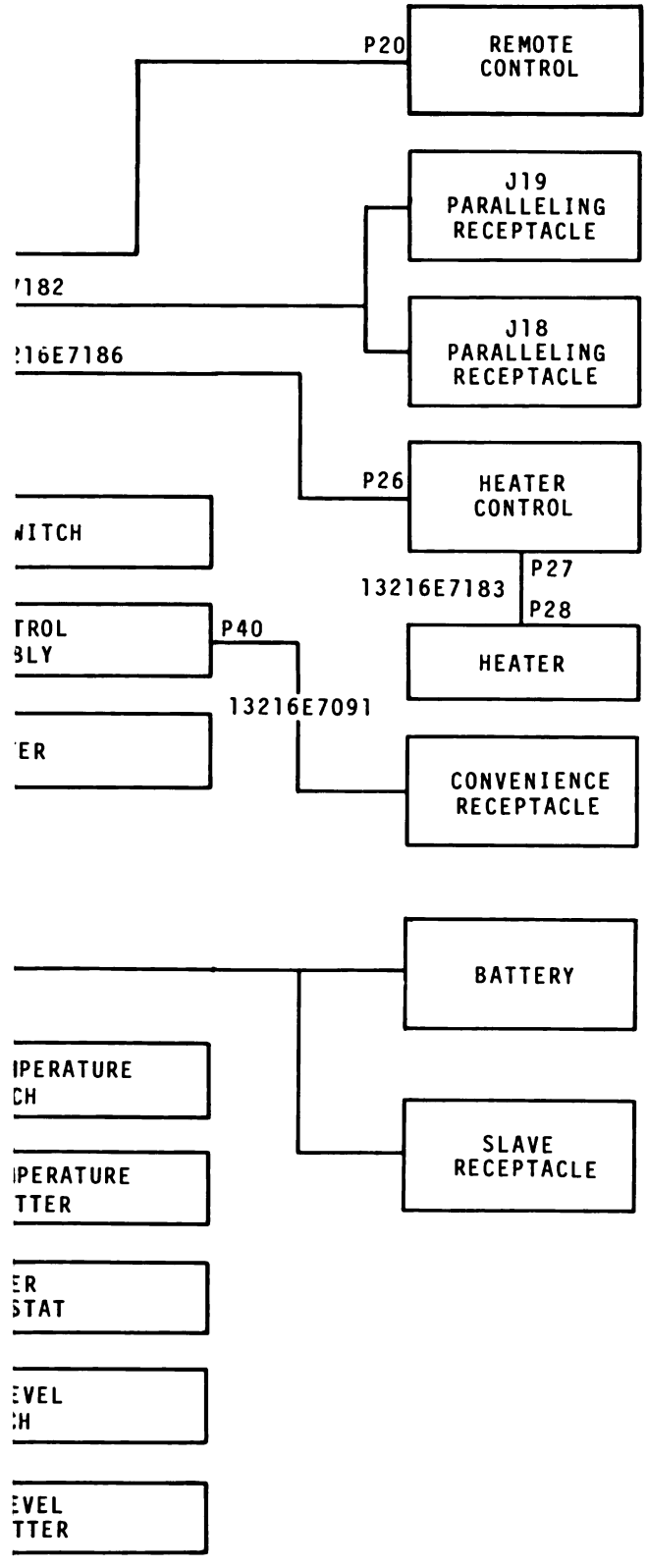

Figure 1-3.

A1___CONVERTER, THERMAL WATT
A2__CONVERTER, FREQUENCY
A4___CONTROL PANEL RELAY ASSY
CR1___DIODE BRIDGE
K6____RELAY, REMOTE VOLTAGE SENSING
R1____RESISTOR
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K15__RELAY, REVERSE POWER
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M7__METER, KILOWATT
M8__AMMETER
M9__VOLTMETER
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R2__RHEOSTAT, VOLTAGE ADJUSTING
R28_RHEOSTAT, LOAD SHARING
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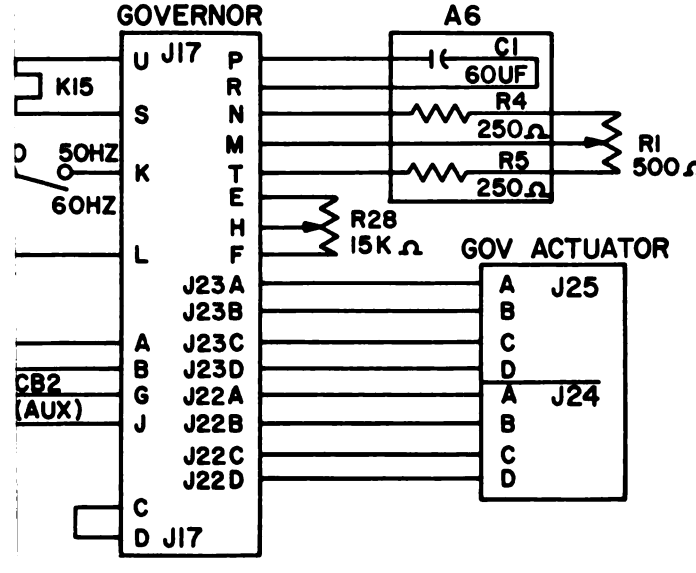
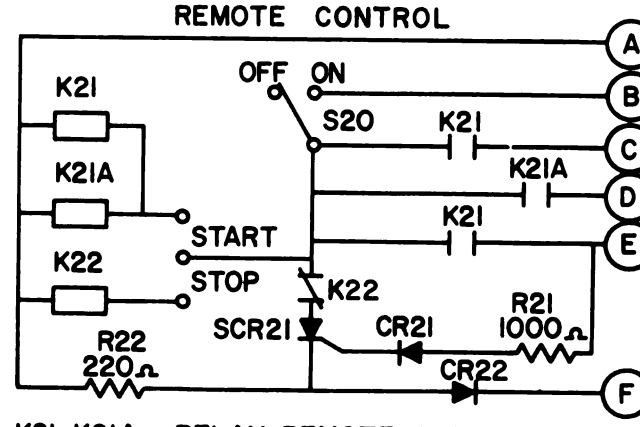
S5___SWITCH, LOCAL-REMOTE VOLTAGE
S6A, S6B___SWITCH, UNIT PARALLEL
S8___SWITCH, AMMETER-VOLTMETER TRANSFER
S10___SWITCH, 50/60 HERTZ
TB6__TERMINAL BOARD, RECONNECTION



ME 6115-449-15/5-1 (1)

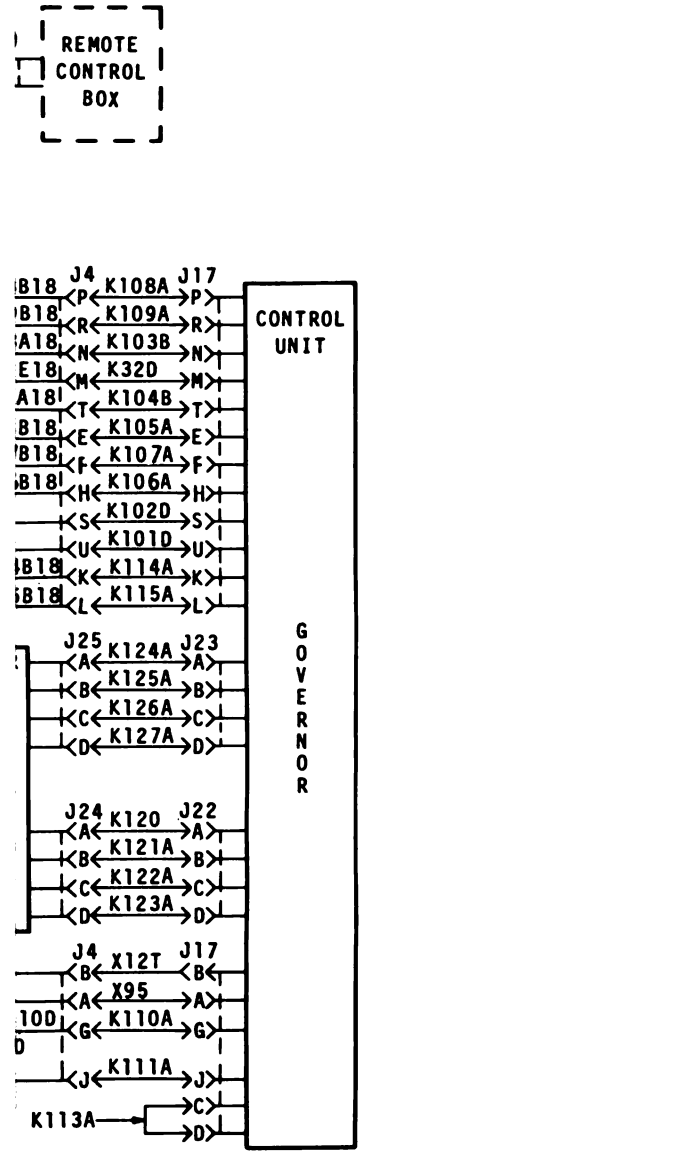
Figure 5-1.

A3--FLASHER, PROTECTION BYPASS LAMP
CB1-CIRCUIT BREAKER, DC
CB2-CONTACTOR, AC
CR3, CR6--DIODE
DS1, DS2, DS3--LIGHT, PANEL
DS6-LIGHT, INDICATOR, CIRCUIT BREAKER
DS7-LIGHT, PROTECTION BYPASS
FL-1, FL-2-SWITCH, FUEL LEVEL
K1--RELAY, STOP-RUN
K2--RELAY, OVER VOLTAGE
K3--RELAY, CRANK
K5--RELAY, FIELD FLASH
K8--RELAY, FUEL LEVEL
K11--RELAY, UNDER VOLTAGE
K13--RELAY, SHORT CIRCUIT
K14--RELAY, OVERLOAD
K15--RELAY, REVERSE POWER
M1---METER, OIL PRESSURE
M2--METER, COOLANT TEMPERATURE
M3--METER, FUEL LEVEL
M4--AMMETER, BATTERY CHARGING
M5--METER, TOTAL TIME
OP---SWITCH, OIL PRESSURE
S1---SWITCH, ENGINE PRIMER
S2--SWITCH, START-RUN-STOP
S3--SWITCH, CONTACTOR
S4--SWITCH, PANEL LIGHTS
S7--SWITCH, PROTECTION BYPASS
SR--RECEPTACLE, SLAVE
SS1--START-DISCONNECT AND FIELD FLASH*
SS2-GOVERNOR ON-OFF*
SS3-OVERSPEED*
WT--SWITCH, COOLANT TEMPERATURE
*SPEED SWITCH



K21, K21A--RELAY, REMOTE START
K22-----RELAY, REMOTE STOP
S20-----SWITCH, REMOTE ON-OFF
CR21, CR22-DIODE
SCR21----RECTIFIER, SILICON CONTROLLED
R21, R22---RESISTOR

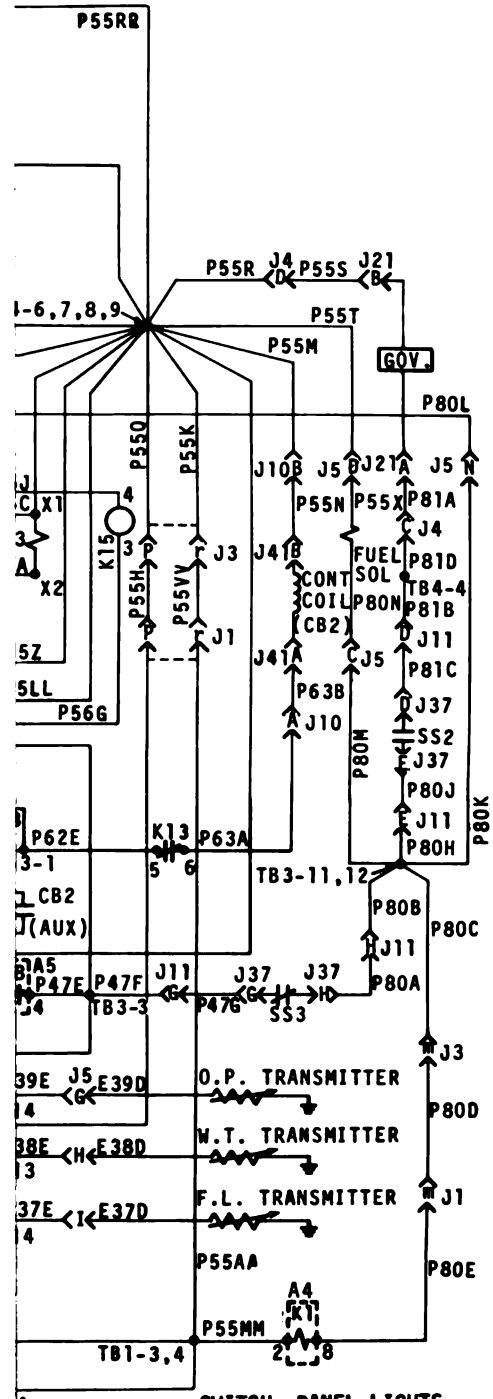
Figure 5-1.



K15	-	RELAY, REVERSE POWER
M6	-	METER, FREQUENCY
M7	-	METER, KILOWATT
M8	-	METER, CURRENT, AC
M9	-	METER, VOLTAGE, AC
R1,R3 THRU 27	-	RESISTOR
R1	-	RHEOSTAT, FREQUENCY ADJUST
R2	-	RHEOSTAT, VOLTAGE ADJUST
R28	-	RHEOSTAT, LOAD SHARING
R29	-	RHEOSTAT, REACTIVE CURRENT
S5	-	SWITCH, LOCAL-REMOTE VOLTAGE
S6	-	SWITCH, UNIT PARALLEL
S8	-	SWITCH, AMMETER-VOLTMETER TRANSFER
S10	-	SWITCH, 50-60 Hz TRANSFER
TB6	-	TERMINAL BOARD, RECONNECTION

ME 6115-449-15/5-2 (1)

Figure 5-2.



4 - SWITCH, PANEL LIGHTS
7 - SWITCH, PROTECTION BYPASS
R - RECEPTACLE SLAVE
S1 - START-DISCONNECT AND FIELD FLASH
S2 - GOVERNOR ON-OFF
S3 - OVERSPEED
T - SWITCH, COOLANT TEMPERATURE

Figure 5-2.

1 THRU CR6	-	RECTIFIER
7	-	SURGE SUPPRESSOR
,J9	-	CONNECTOR, RECEPTACLE
THRU L3	-	REACTOR, LINEAR
	-	CONNECTOR, PLUG
THRU R4	-	RESISTOR
THRU T3	-	TRANSFORMER, SATURABLE
	-	TRANSFORMER
	-	TRANSFORMER, CURRENT
	-	TRANSFORMER, CURRENT, METERING
2	-	TERMINAL BOARD

ME 6115-449-15/8-1 (2)

Figure 8-1.

N	WIRE MARKING NO. *	FROM STATION NO.	TO STATION NO.
	X30E16	R4-BOT	P2-F
1	X72A16	L1-4	T1-10
	X73A16	L1-6	T1-19
	X74A16	L2-4	T2-10
2	X75A16	L2-6	T2-19
	X76A16	L3-4	T3-10
	X77A16	L3-6	T3-19
3	X90D16	J9-J	T4-3
	X90E16	T4-3	R4-TOP
	X91C16	J9-H	TB2-3
	X91F16	TB2-3	P2-E
	L27E16	J8-D	TB2-1
	X94C16	J9-b	T5-X2
	X95D16	J9-c	T5-X1
	X95C16	T4-1	T5-X1
	X96G16	J9-d	T4-2
	X97A16	P2-C	GROUND LUG
	X136A16	T1-35	T2-30
	X137A16	T2-35	T3-30
	D20C16	J9-A	T6-A1
	D21C16	J9-B	T6-B1
	D22C16	J9-C	T6-C1
	L28C16	J9-R	TB2-2
	L28E16	J8-E	TB2-2
	P42C16	J9-e	R1
	P61A16	T3-35	R3-TOP
	P67C16	J9-f	CR7-(-)
	P67D16	CR7-(-)	P2-G
	P71A16	T1-30	R2-TOP
	P88A16	R3-BOT	P2-B
	P89A16	R2-BOT	P2-A
	P99D16	CR7-POS	R1
	P99A16	CR7-(+)	P2-H
	P99C16	CR7 (POS)	GF1 (+)
	P67G16	CR7(-)	GF2 (-)
	L27C16	J9-P	TB2-1

*NOTE: LAST TWO DIGITS INDICATE WIRE SIZE.

ME 6115-449-15/8-1 (3)

Figure 8-1.

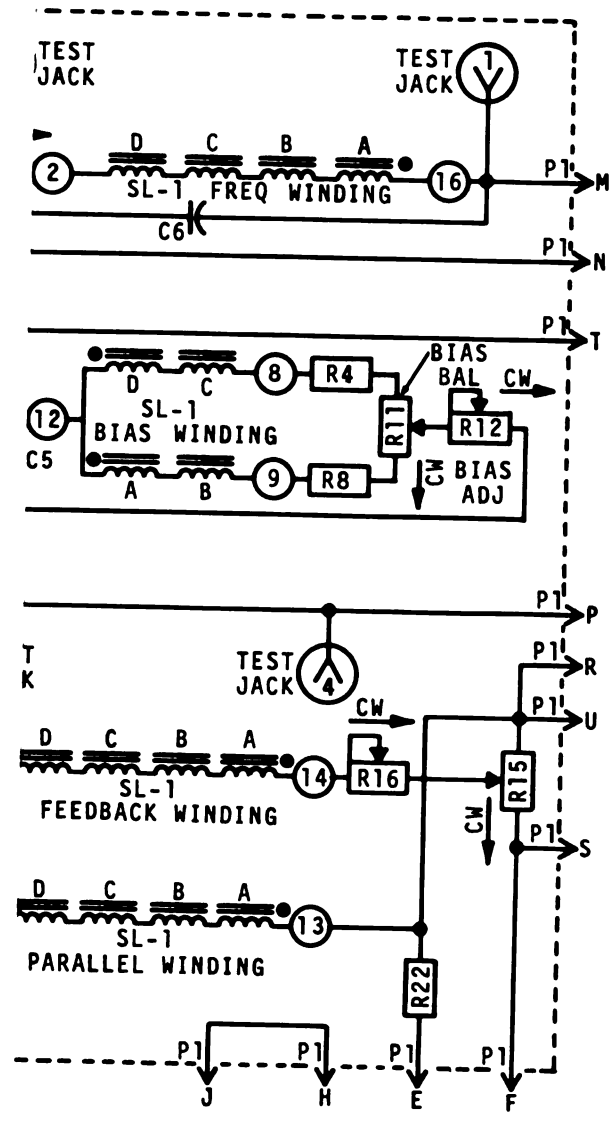
J2

C2,C4,C6,C7,C8,C11	-	CAPACITORS
CR1 THRU CR8	-	RECTIFIERS
CR9, CR10	-	RECTIFIERS, SILICON CONTROLLED
CR11, CR12, CR13	-	RECTIFIERS
J2	-	CONNECTOR, RECEPTACLE
L3,L4,L5	-	REACTORS, LINEAR
L6	-	AMPLIFIER, MAGNETIC
Q1,Q2	-	TRANSISTORS
R1 THRU R7	-	RESISTORS
R11 THRU R15, R17	-	RESISTORS
R19 THRU R23,R26	-	RESISTORS
R16,R18	-	RESISTORS, VARIABLE
R32	-	RESISTOR
T1	-	TRANSFORMER
TB1	-	TERMINAL BOARD
VR1,VR2	-	DIODES

ME 6115-449-15/8-2 (3)

f 4).

Figure 8-2.

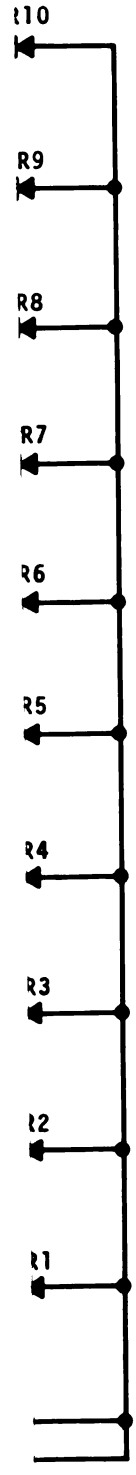


R11	-	BIAS BALANCE RESISTOR
R12	-	BIAS LEVEL RESISTOR
R14	-	FEEDBACK GAIN RESISTOR
R18	-	FREQUENCY GAIN RESISTOR
R20	-	DROPPING RESISTOR
R22	-	PARALLEL RESISTOR
R28	-	INVERTER STARTING RESISTOR
R37	-	TRANSDUCER LOAD RESISTOR
SL1	-	MAGAMP
T1	-	TRANSFORMER
T2	-	TRANSFORMER

ME 6115-449-15/9-2 (3)

of 8).

Figure 9-2.



R1 THRU R20 - RESISTORS
C1 THRU C10 - CAPACITORS
SCR1 THRU SCR10 - RECTIFIERS, SILICON
CR1 THRU CR10 - RECTIFIERS
DS1 THRU DS10 - LAMP, INCANDESCENT
F1 - FUSE
K1 - RELAY
J12 CONNECTOR - RECEPTACLE

ME 6115-449-15/9-4 (2)

)f 2).

Figure 9-4.

DESCRIPTION	SPECIFICATION
CONNECTOR	MS3106R32-7P
CONNECTOR	——
CONNECTOR	——
CONNECTOR	MS3106R10SL-4S
CONNECTOR	MS3106R14-2S
CONNECTOR	MS3106R18-5P
CONNECTOR	MS3106R18-11S
LUG, TERMINAL	——
LUG, TERMINAL	——
LUG, TERMINAL	——
ELEC. WIRE	MIL-W-5086
ELEC. WIRE	MIL-W-5086
STRAP, CABLE	——

WIRE MARKING NO.	FROM STATION NO.	TO STATION NO.
P41B12	P5-S	P41-3
P55A12	P5-T	P55-A
P140J12	P5-U	P39-B
P40A	P5-V	P39-A
P55WW16	P5-a	P39-C
X9U16	P5-b	P39-D
X12CC16	P5-c	P39-E
P50V16	P5-d	P33-A
P50W16	P5-e	P33-C
P68B16	P5-f	P33-D
P53A16	P5-g	P14-A
P207C16	P5-h	P14-B
P200H16	P5-j	P14-C
P200F16	P5-k	P13-D
P52A16	P13-B	P14-D
P69A16	P36-A	P33-B

ME 6115-449-15/9-20

Figure 9-20.