This copy is a reprint which includes current pages from Changes 1 and 2.

TM 5-6115-320-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL

MAINTENANCE MANUAL

GENERATOR SET, GAS TURBINE ENGINE:

45 KW, AC, 120/208, 240/416V, 3 PHASE, 4 WIRE:

SKID MOUNTED; WINTERIZED

(AIRESEARCH MODEL GTGE 70-6-1)

FSN 6115-075-1639

HEADQUARTERS, DEPARTMENT OF THE ARMY

WARNING

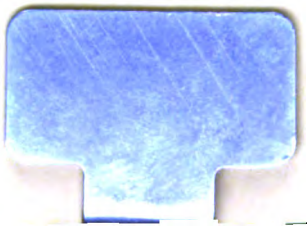
Be sure generator set is properly grounded before operation. Serious injury or death may result from electrical shock if set is not gı ounded.

WARNING

Turbine or compressor failures caused by foreign material entering the generator set may cause injury to personnel in the immediate area. During engine start, do not stand or work in stand clear area shown in figure 2-11.

WARNING

When the unit is operating, stand clear of exhaust stream. Ear plugs should also be worn.



CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *3 October 1972*

Operator and Organizational Maintenance Manual

GENERATOR SET, GAS TURBINE ENGINE: 45-KW, AC, 120/208, 240/416V, 3-PHASE, 4-WIRES; SKID MOUNTED; WINTERIZED (AIRESEARCH MODEL GTGE 70-6-1) FSN 6115-075-1639

TM 5-6115-320-12, 24 November 1971, is changed as follows:

Warning Page. Add the following:

WARNING

Do not attempt paralleling operation of generator sets. Frequency adjustments must be performed by direct support personnel in accordance with TM 5-6115-320-34.

Page 1-2, paragraph 1-6. Add note at end of paragraph.

NOTE

Paralleling and electrical frequency adjust capabilities removed by MWO 5-6115-320-50/1.

Page 1-5, paragraph 1-6*d*(1), line 4. "40,800 rpm" is changed to "41,000 rpm".

Paragraph 1-6*d*(2), line 7. The third sentence is superseded as follows:

The fuel control unit incorporates a fuel pump with pressure relief valve and filter, fuel scheduling valve, governor assembly, and connections for pneumatic control, fuel bypass, and a fuel self-leakage drain manifold.

Page 1-6, paragraph 1-6*d*(2)(*b*). "Acceleration limiter valve" is changed to read "fuel scheduling valve" here and wherever it appears elsewhere in the manual.

Paragraph 1-6*d*(2)(*c*). Line 19 to end of paragraph is superseded as follows: "The spring tension for the spring-loaded flyweights in the governor is adjusted normally to permit the frequency output of the generator set to be varied."

Page 1-7, paragraph 1-6*f*(2), line 7. The sentence starting with the word "Switches" is deleted in its entirety.

Page 1-8, paragraph 1-6*f*(6)(*b*), line 4. Second sentence is changed to read as follows: "It's function is nullified by application of MWO 5-6115-320-50/1."

Paragraph 1-6*f*(6)(*b*). Subparagraphs *1* through *4* are deleted.

Page 1-9, paragraph 1-7*a*, line 3. "5" is changed to read "8".

Page 1-11, paragraph 1-7*b*(2), line 5. "40,800" is changed to read "No-load speed, 41,000".

Page 1-13, paragraph 1-7*b*(28) is superseded as follows:

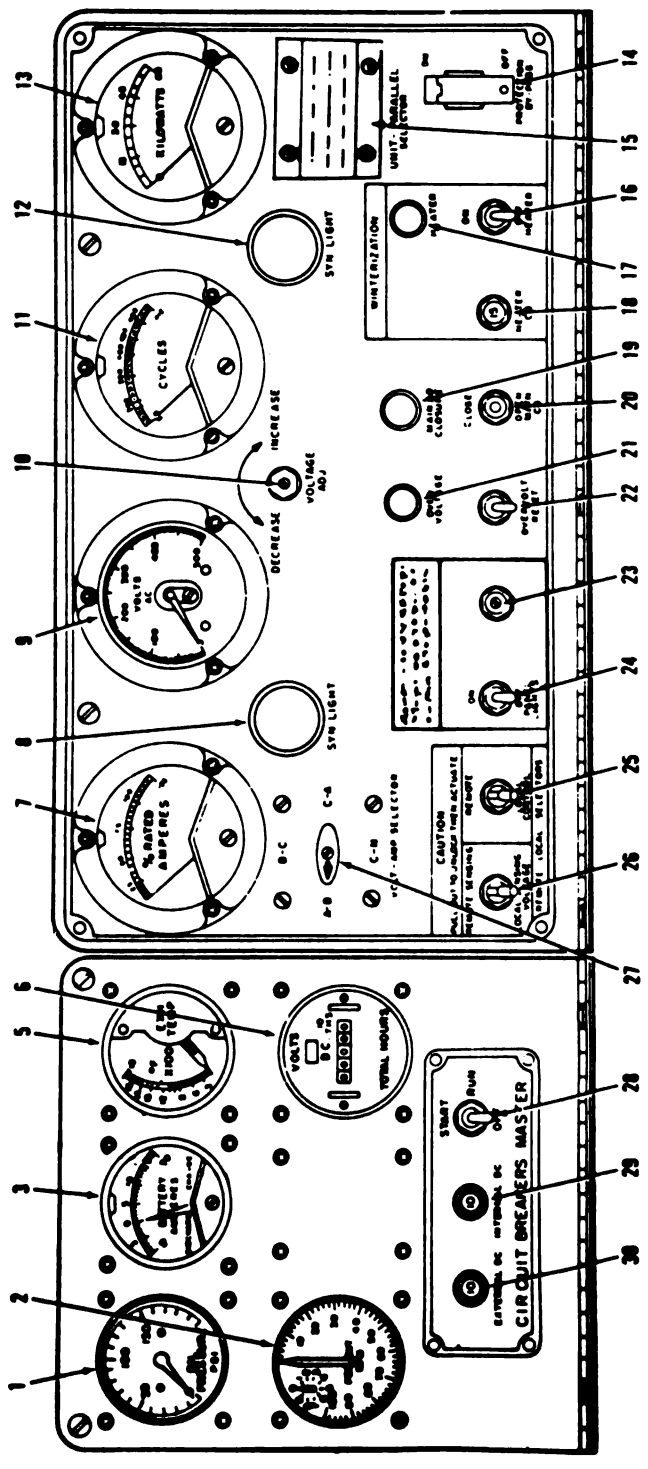
(28) *Frequency adjust potentiometer* not used after application of MWO 5-6115-320-50/1.

Page 2-7, paragraph 2-2*b*(8)(*a*). Delete "(a)" and that portion of first sentence that reads "For applications *** is not required".

Subparagraph (*b*) is rescinded.

Paragraph 2-2*b*(9)(*b*), line 9. The words "frequency adjustment" are deleted.

Page 2-9. Figure 2-6 is superseded as follows:



1. OIL PRESSURE GAGE (80 TO 100 PSIG)
2. TACHOMETER INDICATOR (10 TO 15 PERCENT, COMBUSTION OCCURS; 0 TO 100 PERCENT, OIL PRESSURE IS INCREASING AND SHOULD BE 80 TO 100 PSIG; 95 TO 100 PERCENT, GENERATOR SET READY FOR LOAD)
3. BATTERY CHARGING AMMETER (11 AMPS AFTER INITIAL ENGINE START, 2 TO 5 AMPS AFTER 2 HOURS OF OPERATION)
4. START COUNTER (0 TO 9999) (NOT REQUIRED)
5. EXHAUST GAS TEMPERATURE INDICATOR (1200 F. MAXIMUM DURING STEADY STATE OPERATION AT FULL LOAD)
6. TIME TOTALIZING METER (0 TO 9999.9 HOURS)
7. AC AMMETER
- *8. SYN (SYNCHRONIZING) LIGHT (LOWEST ILLUMINATION LEVEL DURING PARALLEL OPERATION)
9. VOLTMETER (RED MARK AT 120,208,240, AND 416 VOLT POINTS)
10. VOLTAGE ADJ (ADJUST) SCREW
11. FREQUENCY METER (400 ± 1 CPS)
- *12. SYN (SYNCHRONIZING) LIGHT (LOWEST ILLUMINATION LEVEL DURING PARALLEL OPERATION)
13. WATTMETER (0 TO 45 KILOWATTS)
14. PROTECTION BY-PASS SWITCH (NORMALLY IN OFF POSITION)
- *15. UNIT-PARALLEL SELECTOR SWITCH
16. WINTERIZATION HEATER SWITCH
17. WINTERIZATION HEATER LAMP (ILLUMINATED DURING HEATER OPERATION)
18. WINTERIZATION HEATER CB (CIRCUIT BREAKER)
19. MAIN CB (CIRCUIT BREAKER) CLOSURE LAMP (ILLUMINATES WHEN MAIN CIRCUIT BREAKER CLOSES)
20. MAIN CB (CIRCUIT BREAKER) SWITCH
21. OVER VOLTAGE LAMP (EXTINGUISHED)
22. OVER VOLT RESET SWITCH
23. FREQUENCY ADJ (ADJUST) SCREW
24. PANEL LIGHTS SWITCH
25. REMOTE-LOCAL CONTROL SELECTOR SWITCH
26. REMOTE-LOCAL VOLTAGE SENSING SELECTOR SWITCH
27. VOLT-AMP SELECTOR SWITCH
28. MASTER SWITCH
29. INTERNAL DC CIRCUIT BREAKER RESET BUTTON
30. EXTERNAL DC CIRCUIT BREAKER RESET BUTTON

*NOTE: PARALLELING AND ELECTRICAL FREQUENCY ADJUST CAPABILITIES REMOVED BY APPLICATION OF MWOS-6115-320-50 1.

ME 6115-320-12/2-6 C1

Figure 2-6. Controls and instruments.

Page 2-11, paragraph 2-2*d*(2)(*f*). Delete first sentence of Caution.

Page 2-12, paragraph 2-2*d*(4)(*b*). Caution is superseded as follows:

CAUTION

Make sure the internally wired plug (fig. 2-5) is securely installed in the REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5). If internally wired plug is not installed in J-14 receptacle and the REMOTE LOCAL CONTROL SELECTOR switch (25, fig. 2-6) is placed in the REMOTE position for operation of the generator set from the Launching Station remote control panel, an overvoltage condition will occur if the set has a Bendix generator and voltage regulator. An undervoltage condition will occur if the set has a General Electric generator and voltage regulator. In either case the main circuit breaker will open.

Paragraph 2-3, line 1. Delete "a".

Paragraph 2-3*b* is deleted in its entirety.

Page 2-17. Paragraph 2-6*i* is superseded as follows:

i. Synchronizing lights (8 and 12). Paralleling capabilities were removed by installation of MWO 5-6115-320-50/1.

Page 2-18. Paragraph 2-6*o* is superseded as follows:

o. Unit-Parallel Selector Switch (15). The unit-parallel selector switch is a two-position rotary switch.

Paragraph 2-6*w* is superseded as follows:

w. Frequency Adjust Screw (23). The frequency-adjust screw is a slotted-head adjustment screw with locking nut.

Page 2-20. Paragraph 2-8*a*(4)(*a*), is superseded as follows:

(*a*) UNIT-PARALLEL SELECTOR Switch (15, fig. 2-6) in UNIT position

Paragraph 2-8*a*(4)(*d*). First sentence of Caution is rescinded.

Page 2-23. Figure 2-13(1) is superseded as follows:

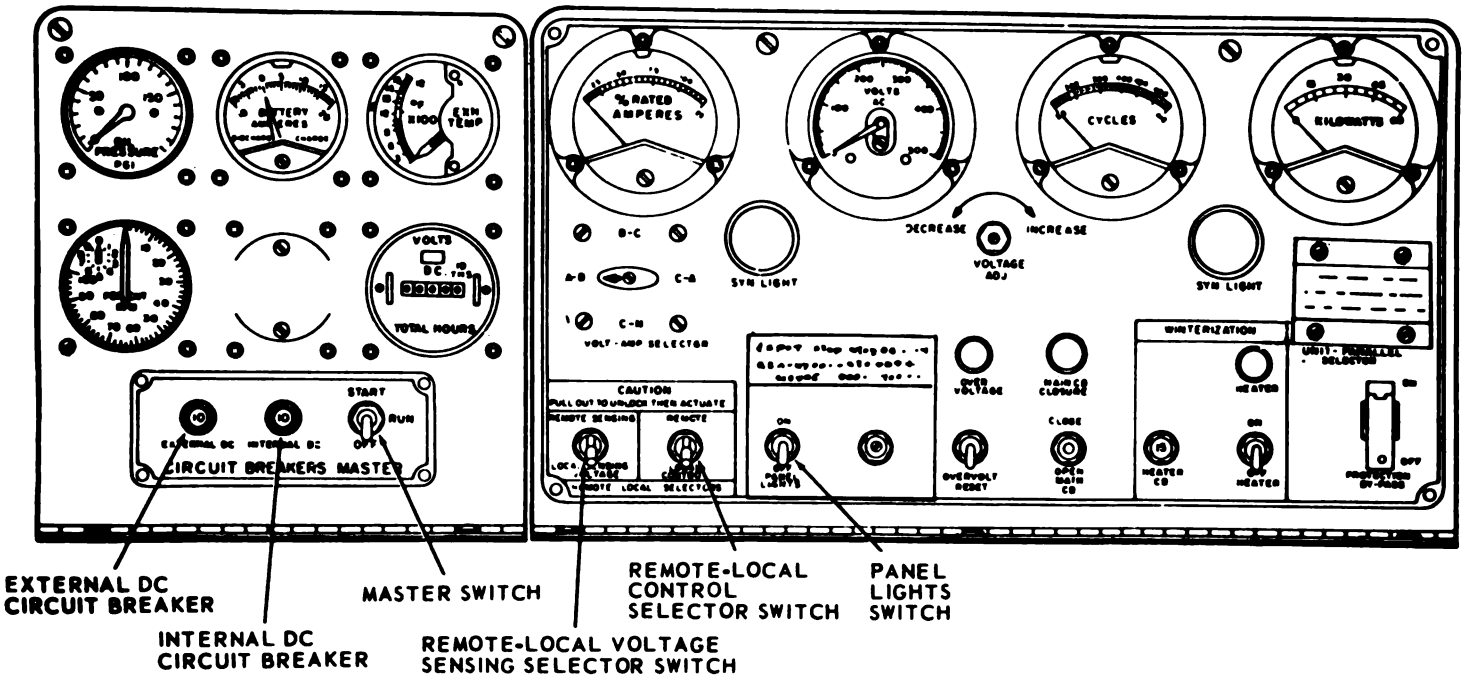


Figure 2-13(1). Starting the generator set (sheet 1 of 5).

CAUTION: REMOTE CONTROL RECEPTACLE J-14 AND J-25 MUST BE SECURELY CAPPED WITH THEIR INTERNALLY WIRED PLUGS. IF RECEPTACLE J-25 IS NOT CAPPED WITH ITS INTERNALLY WIRED PLUG, THE MAIN CIRCUIT BREAKER WILL CLOSE AND CANNOT BE OPENED IN A NORMAL MANNER, IT WILL CYCLE IF THE MAIN CIRCUIT BREAKER IS HELD IN THE OPEN POSITION OR IF A PERSISTANT OVERVOLTAGE, UNDER-VOLTAGE, UNDER-FREQUENCY, OR SHORT CIRCUIT CONDITION SHOULD HAPPEN TO EXIST CONCURRENTLY WITH THE UNCAPPED CONDITION OF RECEPTACLE J-25; DAMAGE TO THE GENERATOR SET OR THE LOAD MAY RESULT.

NOTE: 1 IF LIGHT CONDITION REQUIRES ILLUMINATION OF CONTROL PANELS, PLACE PANEL LIGHTS SWITCH IN ON POSITION.

NOTE: 2 REMOTE AND PANEL FREQUENCY ADJUSTMENT CAPABILITIES WERE REMOVED BY MWO5-6115-320-50/1.

WARNING: FOR ENGINE OPERATING STAND CLEAR AREAS, REFER TO FIGURE 2-11.

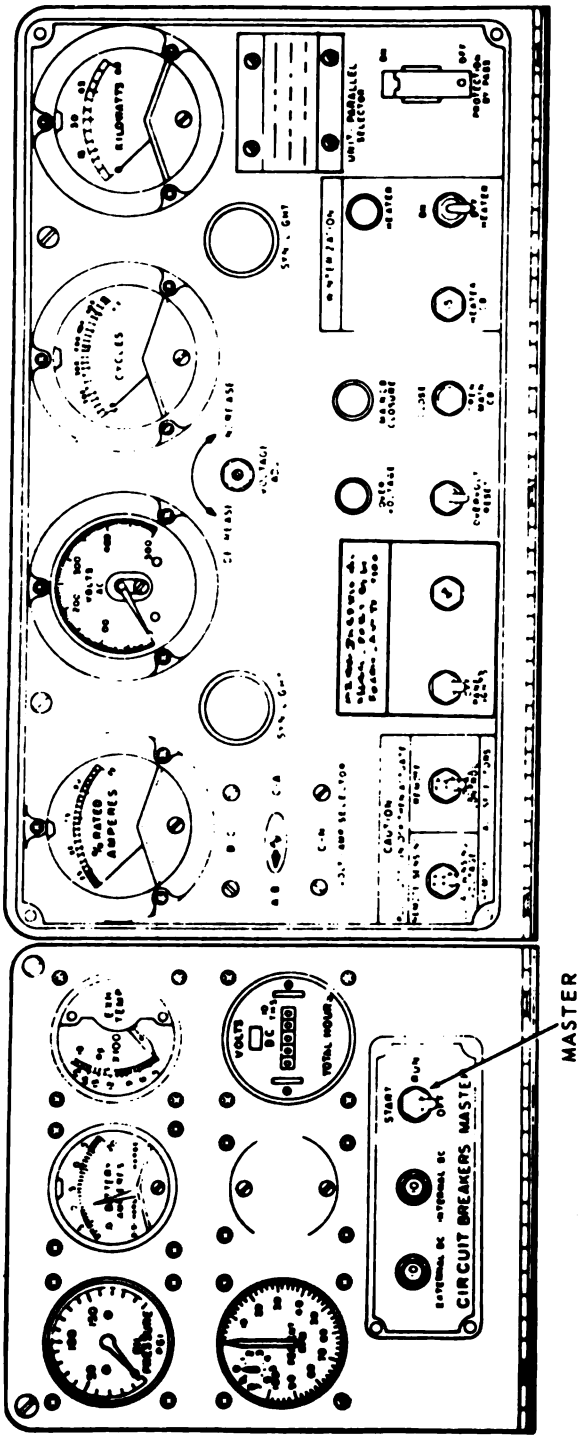
STEP 1. PLACE REMOTE-LOCAL VOLTAGE SENSING SELECTOR SWITCH IN LOCAL SENSING POSITION IF REMOTE VOLTAGE SENSING IS NOT EMPLOYED.

STEP 2. PLACE REMOTE-LOCAL CONTROL SELECTOR SWITCH IN LOCAL POSITION.

STEP 3. PRESS EXTERNAL DC AND INTERNAL DC CIRCUIT BREAKERS TO INSURE THAT THEY ARE CLOSED (RESET).

STEP 4. PLACE MASTER SWITCH IN RUN POSITION FOR 3-5 SECONDS. FUEL BOOST PUMP WILL AUTOMATICALLY START AND CONTINUE OPERATING UNTIL MASTER SWITCH IS PLACED IN OFF POSITION. ENGINE WILL NOT START IF FUEL BOOST PUMP FAILS TO OPERATE. FEEL VIBRATION OR LISTEN FOR OPERATION OF FUEL BOOST PUMP MOTOR. REFER TO TABLE 4-2, 1 FOR CORRECTIVE ACTION IF FUEL BOOST PUMP FAILS TO RUN.

Page 2-24. Figure 2-13(2) is superseded as follows:



STEP 5. MOMENTARILY PLACE MASTER SWITCH IN START POSITION. ENGINE WILL AUTOMATICALLY START AND ACCELERATE. WHEN MASTER SWITCH IS RELEASED, IT WILL AUTOMATICALLY RETURN TO RUN POSITION AND ENGINE WILL CONTINUE TO OPERATE. REFER TO TABLE 4-2,2 FOR CORRECTIVE ACTION IF STARTER FAILS TO RUN, REFER TO TABLE 4-2,3 FOR CORRECTIVE ACTION IF STARTER RUNS BUT DOES NOT ROTATE THE ENGINE; REFER TO TABLE 4-2,4 FOR CORRECTIVE ACTION IF ENGINE STOPS MOTORING WHEN MASTER SWITCH RETURNS TO RUN POSITION, REFER TO TABLE 4-2,6 FOR CORRECTIVE ACTION IF ENGINE MOTORS BUT DOES NOT START.

CAUTION: DO NOT EXCEED STARTER MOTOR DUTY CYCLE OF 1 MINUTE ON AND 4 MINUTES OFF. OVERHEATING AND DAMAGE TO STARTER MOTOR MAY OTHERWISE RESULT. MAKE SURE AIR INTAKE OPENINGS ARE FREE FROM OBSTRUCTIONS TO INSURE ADEQUATE AIR INTAKE TO ENGINE. ERRATIC OPERATION OR FAILURE OF ENGINE TO OPERATE MAY OTHERWISE RESULT.

NOTE: APPROXIMATELY 3 START CYCLES MAY BE EXPECTED FROM FULLY CHARGED BATTERIES WHEN ATTEMPTING TO START THE GENERATOR SET IN EXTREME COLD WEATHER CONDITIONS. APPROXIMATELY 8 TO 10 START CYCLES MAY BE EXPECTED DURING NORMAL OR EXTREME HOT WEATHER CONDITIONS. THIS ASSUMES NO CHARGING OF BATTERIES BETWEEN START CYCLES.

ME 6115-320-12/2-13 ② C1

Figure 2-13(2). Starting the generator set (sheet 2 of 5).

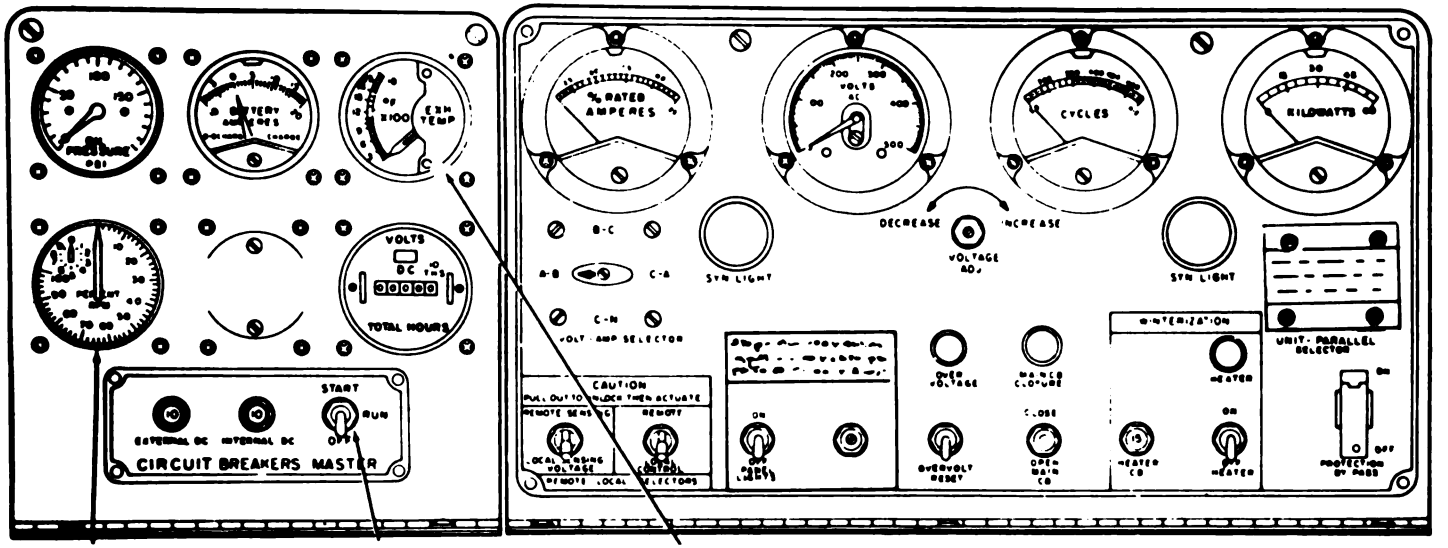


Figure 2-13(3). Starting the generator set (sheet 3 of 5).

STEP 6. LISTEN FOR ENGINE COMBUSTION (CHARACTERISTIC ROAR) AND OBSERVE TACHOMETER INDICATOR DURING ENGINE ACCELERATION. ENGINE CONBUSTION SHOULD OCCUR AND ENGINE SHOULD ACCELERATE SMOOTHLY TO NORMAL OPERATING RPM OF 100 ± 3 PERCENT IN 20 TO 30 SECONDS. PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF ENGINE COMBUSTION DOES NOT OCCUR OR ENGINE DOES NOT HAVE NORMAL ACCELERATION. REFER TO TABLE 4-2,6 FOR CORRECTIVE ACTION IF COMBUSTION DOES NOT OCCUR, REFER TO TABLE 4-2,7 IF ENGINE SHUTS DOWN IMMEDIATELY AFTER COMBUSTION OCCURS: REFER TO TABLE 4-2,8 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO SLOWLY; REFER TO TABLE 4-2,9 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES ERRATICALLY: REFER TO TABLE 4-2,10 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO FAST; REFER TO TABLE 4-2,12 FOR CORRECTIVE ACTION ENGINE SHUTS DOWN AFTER NORMAL ACCELERATION TO GOVERNED RPM OR LESS: REFER TO TABLE 4-2,13,14 FOR CORRECTIVE ACTION IF GOVERNED ENGINE SPEED IS LESS THAN 97 PERCENT OR MORE THAN 103 PERCENT.

CAUTION: IF ENGINE COMBUSTION FAILS TO OCCUR, WAIT AT LEAST 5 MINUTES AFTER MASTER SWITCH IS PLACED IN OFF POSITION BEFORE ATTEMPTING RESTART. THIS ALLOWS ANY ACCUMULATED FUEL IN ENGINE PLENUM TO DRAIN FROM PLENUM DRAIN FITTING (FIG. 16), AND EVAPORATE. BEFORE ATTEMPTING RESTART. ACCUMULATED FUEL IN ENGINE PLENUM MAY RESULT IN A HOT (FLAMING) START OR OVERSPEED CONDITION DURING NEXT STARTING ATTEMPT AND ENGINE MAY BE EXTENSIVELY DAMAGED THEREBY. ENGINE OVERTEMPERATURE AND OVERSPEED PROTECTION DEVICES ARE OF NO VALUE UNDER THESE CONDITIONS. FOR THIS REASON, ALWAYS BE SURE THAT PLENUM DRAIN IS OPEN.

STEP 7. OBSERVE EXHAUST GAS TEMPERATURE INDICATOR DURING ENGINE ACCELERATION. EXHAUST GAS TEMPERATURE SHALL NOT EXCEED 1,150° F FOR MORE THAN 5 SECONDS. REFER TO TABLE 4-2,11 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION.

CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION. DAMAGE TO ENGINE COMPONENTS MAY RESULT FROM TEMPERATURES EXCEEDING 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION.

STEP 8. OBSERVE THAT NO SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY (12, FIG. 1-2) REFER TO TABLE 4-2,15 FOR CORRECTIVE ACTION IF BLUE OR BLACK SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY DURING ACCELERATION.

Page 2-25. Figure 2-13(3) is superseded as follows:

Page 2-26. Figure 2-13(4) is superseded as follows:

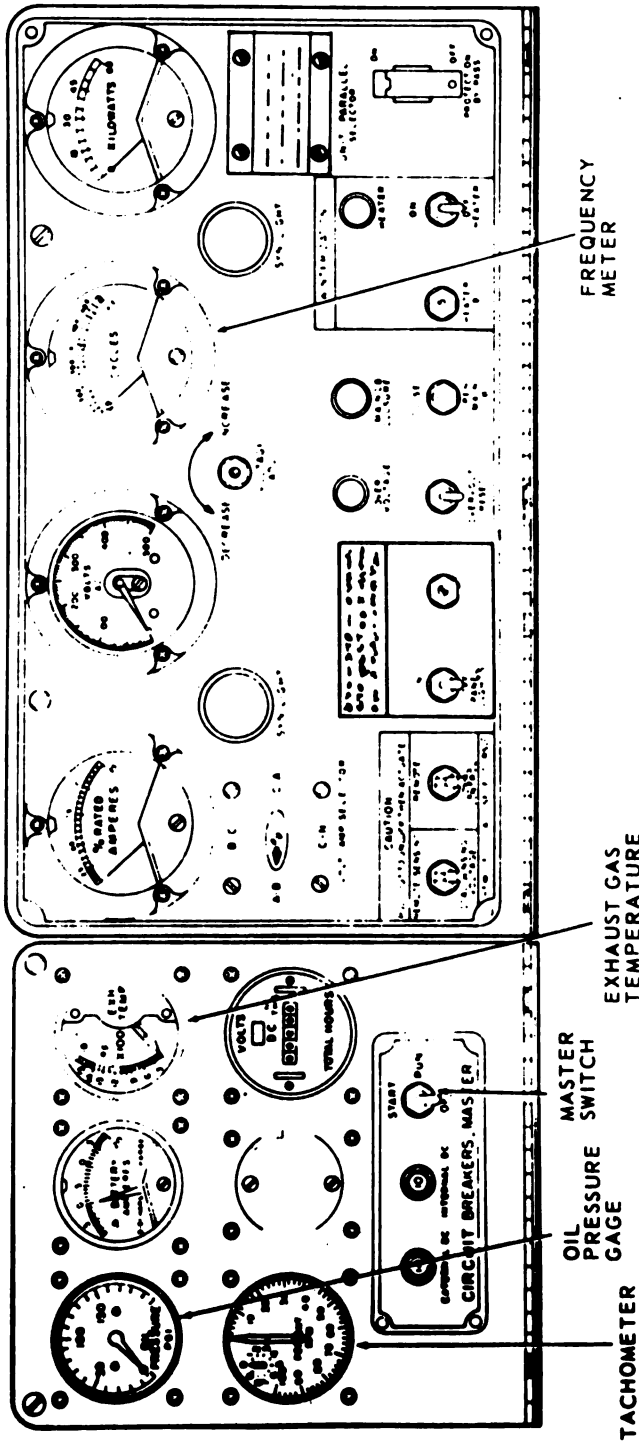
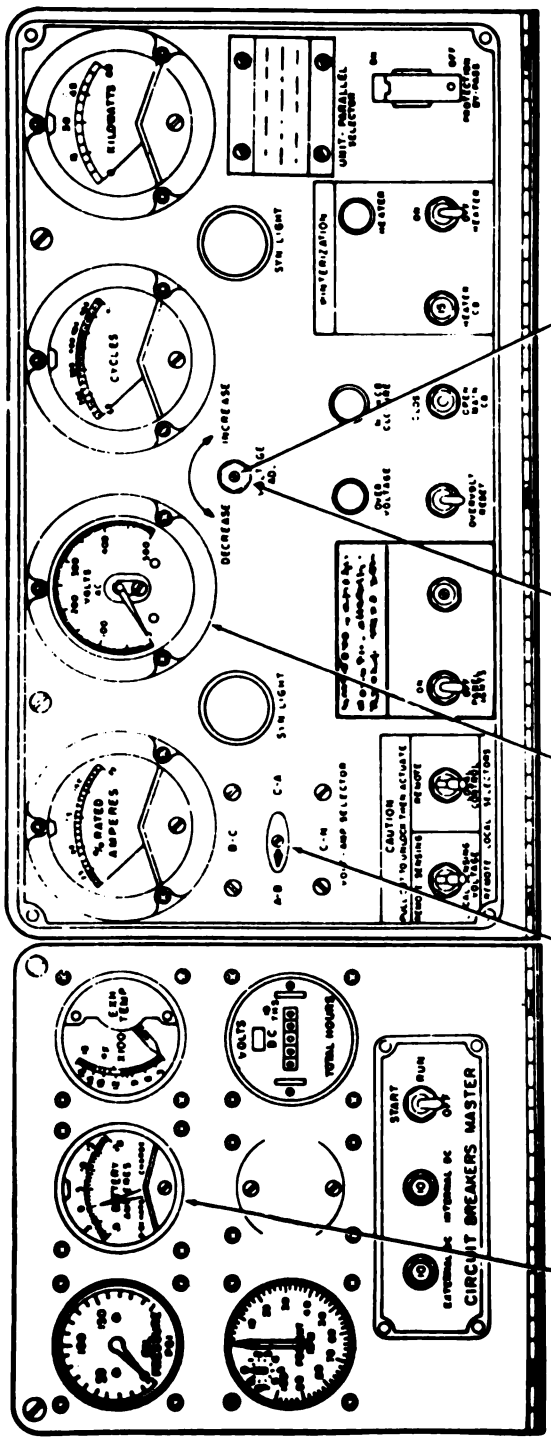


Figure 2-13(4). Starting the generator set (sheet 4 of 5).

Page 2-27. Figure 2-13(5) is superseded as follows:



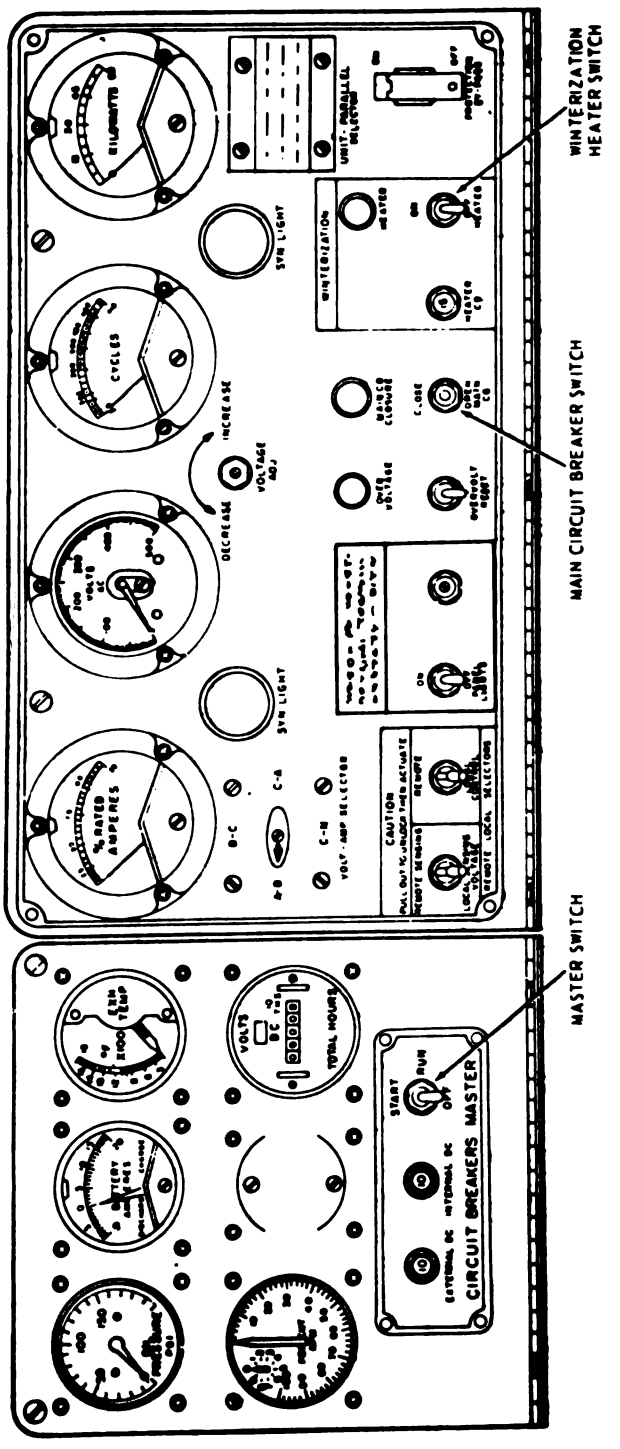
STEP 12. PLACE VOLT-AMP SELECTOR SWITCH IN A-B POSITION. OBSERVE VOLTMETER FOR 208 VOLTS INDICATION WHEN GENERATOR SET IS CONNECTED FOR LOW VOLTAGE OPERATION OR 416 VOLTS INDICATION FOR HIGH VOLTAGE OPERATION LOOSEN VOLTAGE ADJUST SCREW LOCKNUT AND ADJUST SCREW WITH SCREWDRIVER AS REQUIRED TO OBTAIN THE DESIRED VOLTAGE INDICATION. TIGHTEN LOCKNUT WITHOUT CHANGING ADJUSTED POSITION OF VOLTAGE ADJUST SCREW. REFER TO TABLE 4-2,23,24 FOR CORRECTIVE ACTION IF DESIRED INDICATION CANNOT BE OBTAINED.

NOTE: LOW VOLTAGE ADJUSTMENT RANGE OF VOLTAGE ADJUST SCREW IS AT LEAST 198 TO 219 VOLTS LINE-TO-LINE. HIGH VOLTAGE ADJUSTMENT RANGE IS AT LEAST 396 TO 436 VOLTS LINE-TO-LINE.

STEP 13. OBSERVE BATTERY CHARGING CURRENT INDICATED ON BATTERY CHARGING AMMETER. BATTERY CHARGING AMMETER WILL INDICATE ABOUT 11 AMPS IF BATTERY VOLTAGE IS LOW. WHEN BATTERY HAS CHARGED TO NORMAL VOLTAGE, BATTERY CHARGING AMMETER SHALL INDICATE 2 TO 5 AMPS. REFER TO TABLE 4-2, 27 FOR CORRECTIVE ACTION IF BATTERY CONTINUES TO CHARGE CONDIDERABLY IN EXCESS OF 5 AMPS AFTER 2 HOURS SINCE ENGINE START.

Figure 2-13(5). Starting the generator set (sheet 5 of 5).

Page 2-29. **Figure 2-14 is superseded as follows:**



STEP 1 PLACE MAIN CIRCUIT BREAKER SWITCH IN OPEN POSITION TO REMOVE ELECTRI CAL LOAD BEFORE ENGINE SHUTDOWN

NOTE OPERATE ENGINE FOR APPROXIMATELY 2 MINUTES UNDER NO-LOAD CONDITIONS PRIOR TO STOPPING ENGINE THIS PERMITS GRADUAL COOLING OF ENGINE

STEP 2 PLACE MASTER SWITCH IN OFF POSITION AND ALLOW ENGINE TO COME TO COM PLETE STOP

STEP 3 INSURE THAT WINTERIZATION HEATER SWITCH IS IN THE OFF POSITION TO AVOID DISCHARGE OF THE BATTERIES THROUGH THE BATTERY ELECTROLYTE TEMPER ATURE SENSOR

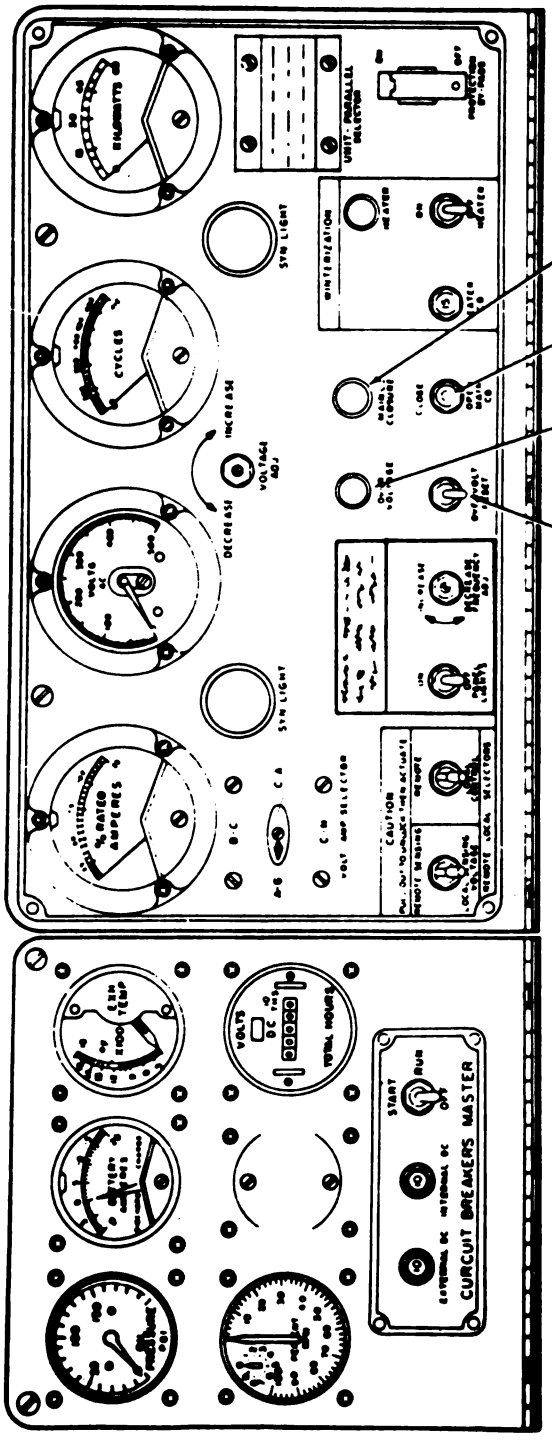
ME 6114-320-12/2-14 C1

Figure 2-14. Stopping the generator set.

Page 2-30. Paragraph 2-10*d* is superseded as follows:

d. Parallel operation. Paralleling capabilities were removed by MWO 5-6115-320-50/1.

Page 2-31. Figure 2-15 is superseded as follows:



WARNING: IN CASE OF ACCIDENT FROM ELECTRIC SHOCK, SHUTDOWN GENERATOR SET AT ONCE. IF GENERATOR SET CANNOT BE SHUTDOWN, FREE VICTIM FROM LIVE CONDUCTOR WITH A BOARD OR ANY NONCONDUCTOR. IF VICTIM IS UNCONSCIOUS, APPLY ARTIFICAL RESPIRATION AND OBTAIN MEDICAL HELP.

STEP 1. MOMENTARILY PLACE MAIN CIRCUIT BREAKER SWITCH IN CLOSE POSITION.

STEP 2. OBSERVE THAT MAIN CIRCUIT BREAKER CLOSURE LAMP ILLUMINATES TO INDICATE CONNECTION OF ELECTRICAL LOAD. REFER TO TABLE 4-2,25 FOR CORRECTIVE ACTION IF MAIN CIRCUIT BREAKER CLOSURE LAMP DOES NOT ILLUMINATE OR EXTINGUISHES DURING OPERATION OF GENERATOR SET.

NOTE: IF OVER VOLTAGE LAMP ILLUMINATES WHEN ELECTRICAL LOAD IS CONNECTED OR DURING OPERATION OF GENERATOR SET, AN OVERVOLTAGE CONDITION HAS TRIPPED OVERVOLTAGE RELAY TO CAUSE LOSS OF EXCITATION AND DISCONNECTION OF LOAD. REFER TO TABLE 4-2,26 FOR CORRECTIVE ACTION. PLACE OVER VOLT RESET SWITCH MOMENTARILY IN UP POSITION TO RESET OVERVOLTAGE CIRCUIT WHEN CAUSE OF OVERVOLTAGE CONDITION HAS BEEN CORRECTED, THEN REPEAT STEPS 1 AND 2 ABOVE.

ME 6115-320-12/2-15 (1) C1

Figure 2-15. Operating the generator set (sheet 1 of 2).

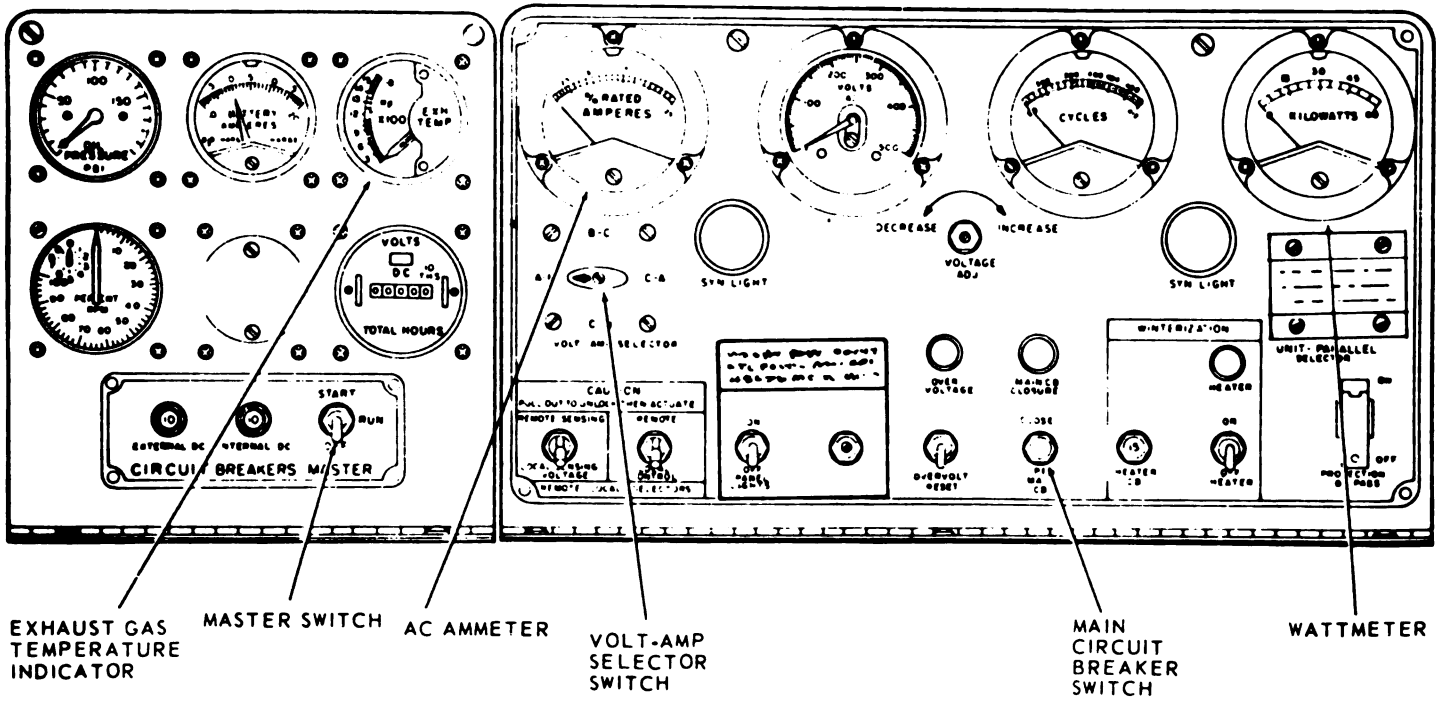


Figure 2-15. Operating the generator set (sheet 2 of 2).

STEP 3. OBSERVE THAT WATTMETER INDICATES NOT MORE THAN 45 KW. IF WATTMETER INDICATES MORE THAN 45 KW, PLACE MAIN CIRCUIT BREAKER SWITCH IMMEDIATELY IN OPEN POSITION AND CHECK ELECTRICAL LOADS.

STEP 4. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAT 1,200° F. FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE. EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

STEP 5. OBSERVE AC AMMETER WHEN VOLT-AMP SELECTOR SWITCH IS PLACED IN A-B, B-C, AND C-A POSITIONS. AC AMMETER INDICATIONS SHALL BE EQUAL WITHIN 25 PERCENT.

CAUTION: AVOID LETTING GENERATOR SET RUN OUT OF FUEL SINCE THIS WILL INTRODUCE AIR INTO FUEL SYSTEM AND MAY REQUIRE PURGING OR PRIMING ON THE NEXT STARTING ATTEMPT. ALSO IF REPEATED OFTEN ENOUGH, THIS PRACTICE WILL RESULT IN DAMAGE TO FUEL CONTROL UNIT SINCE IT DOES NOT RECEIVE BENEFIT OF LUBRICATION FROM FUEL WHEN ENGINE STOPS DUE TO LACK OF FUEL.

Page 2-33. Figure 2-16(1) is rescinded.

Page 2-34. Figure 2-16(2) is rescinded.

Page 2-35, paragraph 2-11*a*, lines 9 and 10. Delete "frequency adjustment."

Page 2-37, paragraph 2-21*b*. Caution is superseded as follows:

CAUTION

If the generator set is being operated remotely from the launching station OMTS van, and receptacle J14 (fig. 2-5) is not capped with its internally wired plug; an overvoltage condition will be experienced on sets having Bendix electrical components; an undervoltage condition will be experienced on sets having General Electric equipment components. In either case the main circuit breaker will open.

Paragraph 2-21c is superseded as follows:

c. UNIT-PARALLEL SELECTOR Switch (15, fig. 2-6). This switch must be in UNIT position.

Page 2-39, paragraph 2-22*a*(1)(*a*). First sentence of CAUTION is rescinded.

Page 2-41. Figure 2-17(1) is superseded as follows:

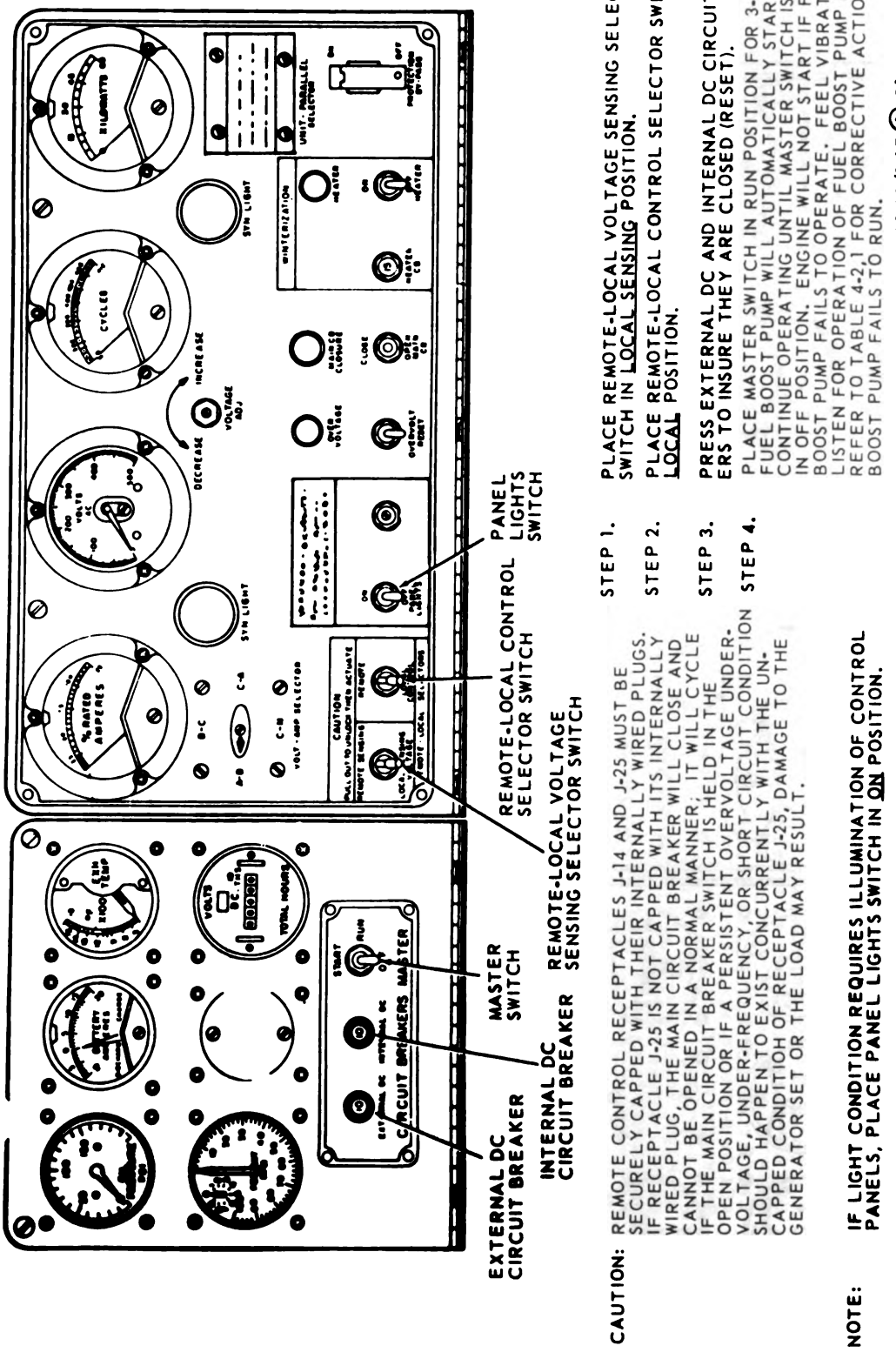
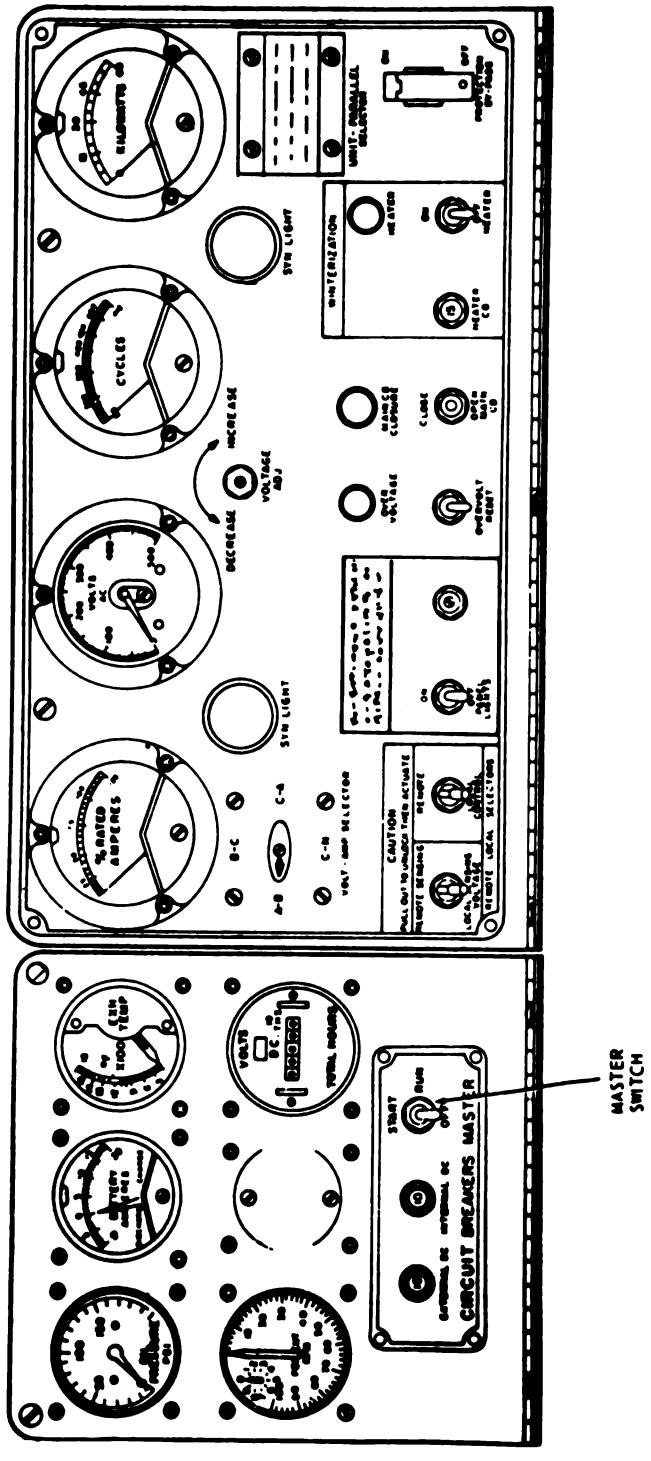


Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation (sheet 1 of 5).

Page 2-42. Figure 2-17(2) is superseded as follows:



STEP 5. MOMENTARILY PLACE MASTER SWITCH IN START POSITION. ENGINE WILL AUTOMATICALLY START AND ACCELERATE WHEN MASTER SWITCH IS RELEASED. IT WILL AUTOMATICALLY RETURN TO RUN POSITION AND ENGINE WILL CONTINUE TO OPERATE. REFER TO PARAGRAPH 47 FOR CORRECTIVE ACTION IF STARTER FAILS TO RUN. REFER TO PARAGRAPH 48 FOR CORRECTIVE ACTION IF START-ER RUNS BUT DOES NOT ROTATE THE ENGINE. REFER TO PARAGRAPH 49 FOR CORRECTIVE ACTION IF ENGINE STOPS MOTORING WHEN MASTER SWITCH RETURNS TO RUN POSITION. REFER TO PARAGRAPH 51 FOR CORRECTIVE ACTION IF ENGINE MOTORS BUT DOES NOT START.

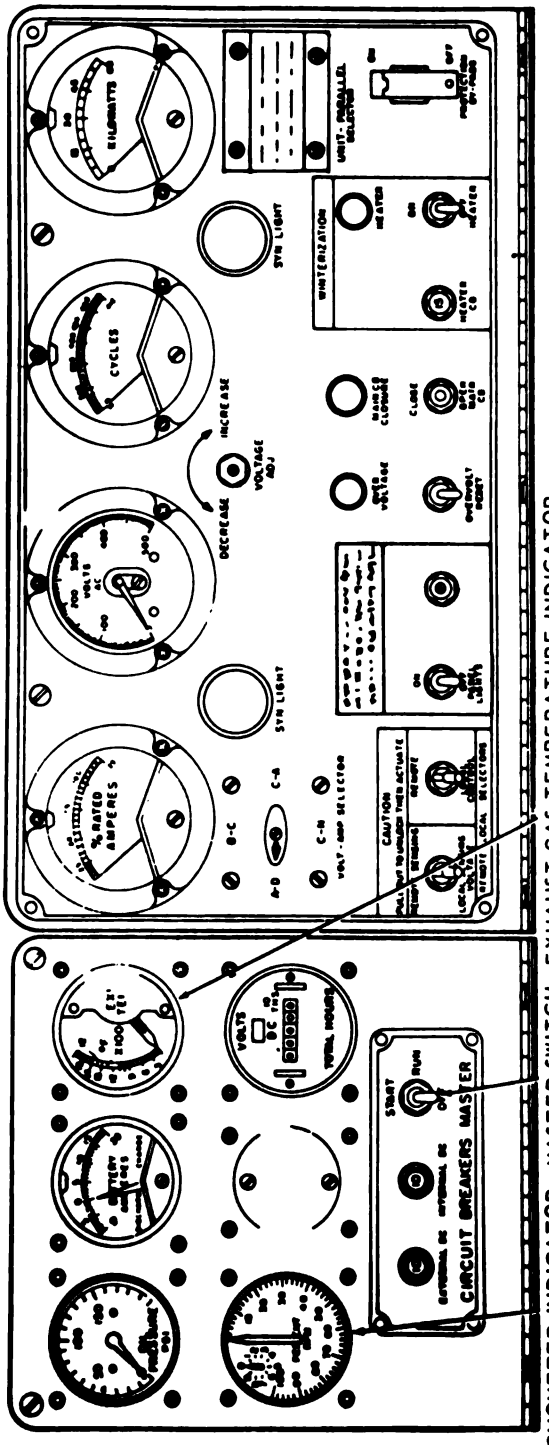
CAUTION DO NOT EXCEED STARTER MOTOR DUTY CYCLE OF 1 MINUTE ON AND 4 MINUTES OFF. OVERHEATING AND DAMAGE TO STARTER MOTOR MAY OTHERWISE RESULT. MAKE SURE AIR INTAKE OPENINGS ARE FREE FROM OBSTRUCTIONS TO INSURE ADEQUATE AIR INTAKE TO ENGINE. ERRATIC OPERATION OR FAILURE OF ENGINE TO OPERATE MAY OTHERWISE RESULT.

NOTE APPROXIMATELY 3 START CYCLES MAY BE EXPECTED FROM FULLY CHARGED BATTERIES WHEN ATTEMPTING TO START THE GENERATOR SET IN EXTREME COLD WEATHER CONDITIONS. APPROXIMATELY 8 TO 10 START CYCLES MAY BE EXPECTED DURING NORMAL OR EXTREME HOT WEATHER CONDITIONS. THIS ASSUMES NO CHARGING OF BATTERIES BETWEEN START CYCLES.

ME 6115-320-12/2-17 (2) C1

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation (sheet 2 of 5).

Page 2-43. Figure 2-17(3) is superseded as follows:



TACHOMETER INDICATOR MASTER SWITCH EXHAUST GAS TEMPERATURE INDICATOR

STEP 6. LISTEN FOR ENGINE COMBUSTION (CHARACTERISTIC ROAR) AND OBSERVE TACHOMETER INDICATOR DURING ENGINE ACCELERATION. ENGINE COMBUSTION SHOULD OCCUR AND ENGINE SHOULD ACCELERATE SMOOTHLY TO NORMAL OPERATING RPM OF 100 ± 3 PERCENT IN 20 TO 30 SECONDS. PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF ENGINE COMBUSTION DOES NOT OCCUR OR ENGINE DOES NOT HAVE NORMAL ACCELERATION. REFER TO TABLE 4-2,6 FOR CORRECTIVE ACTION IF COMBUSTION DOES NOT OCCUR; REFER TO TABLE 4-2,7 IF ENGINE SHUTS DOWN IMMEDIATELY AFTER COMBUSTION OCCURS; REFER TO TABLE 4-2,8 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO SLOWLY, REFER TO TABLE 4-2,9 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES ERRATICALLY; REFER TO TABLE 4-2,10 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO FAST, REFER TO TABLE 4-2,12 FOR CORRECTIVE ACTION IF ENGINE SHUTS DOWN AFTER NORMAL ACCELERATION TO GOVERNED RPM OR LESS; REFER TO TABLE 4-2,13,14 FOR CORRECTIVE ACTION IF GOVERNED ENGINE SPEED IS LESS THAN 97 PERCENT OR MORE THAN 103 PERCENT.

CAUTION: IF ENGINE COMBUSTION FAILS TO OCCUR, WAIT AT LEAST 5 MINUTES AFTER MASTER SWITCH IS PLACED IN OFF POSITION BEFORE ATTEMPTING RESTART. THIS ALLOWS ANY ACCUMULATED FUEL IN ENGINE PLENUM TO DRAIN FROM PLENUM DRAIN FITTING (FIG. 2-7), AND EVAPORATE, BEFORE ATTEMPTING RESTART. ACCUMULATED FUEL IN ENGINE PLENUM MAY RESULT IN A HOT (FLAMING) START OR OVERSPEED CONDITION DURING NEXT STARTING ATTEMPT, AND ENGINE MAY BE EXTENSIVELY DAMAGED THEREBY. ENGINE OVER-TEMPERATURE AND OVERSPEED PROTECTION DEVICES ARE OF NO VALUE UNDER THESE CONDITIONS. FOR THIS REASON, ALWAYS BE SURE THAT PLENUM DRAIN IS OPEN.

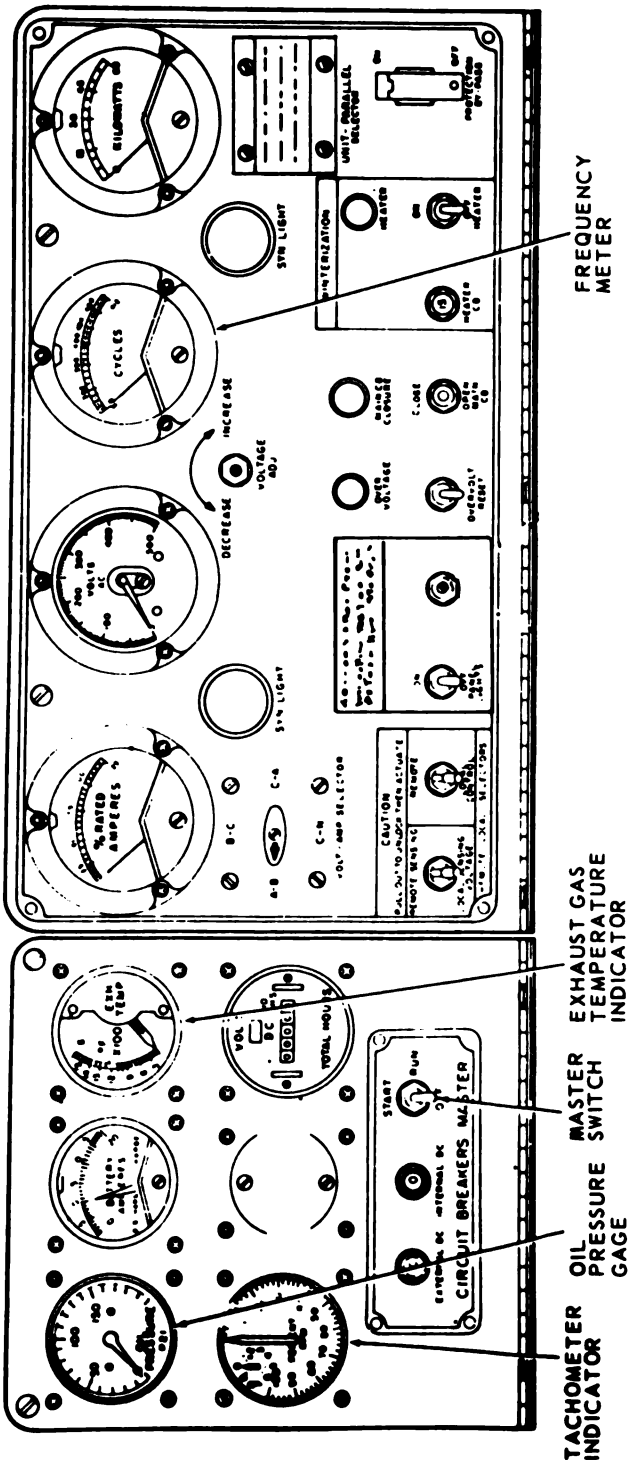
STEP 7. OBSERVE EXHAUST GAS TEMPERATURE INDICATOR DURING ENGINE ACCELERATION. EXHAUST GAS TEMPERATURE SHALL NOT EXCEED 1,150° F FOR MORE THAN 5 SECONDS. REFER TO TABLE 4-2,11 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° F FOR MORE THAT 5 SECONDS DURING ACCELERATION.

CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° FOR MORE THAN 5 SECONDS DURING ACCELERATION. DAMAGE TO ENGINE COMPONENTS MAY RESULT FROM TEMPERATURES EXCEEDING 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION.

STEP 8. OBSERVE THAT NO SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY (12, FIG. 1-2). REFER TO TABLE 4-2, 15 FOR CORRECTIVE ACTION IF BLUE OR BLACK SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY DURING ACCELERATION.

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation (sheet 3 of 5).

Page 2-44. Figure 2-17(4) is superseded as follows:



STEP 9. OBSERVE THAT OIL PRESSURE GAGE INDICATES 90 ± 10 PSIG. REFER TO TABLE 4-2,16 FOR CORRECTIVE ACTION IF OIL PRESSURE IS LOW. REFER TO TABLE 4-2,17 FOR CORRECTIVE ACTION IF OIL PRESSURE IS HIGH.

CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF OIL PRESSURE GAGE INDICATES LESS THAN 80 PSIG, OR MORE THAT 100 PSIG. ABNORMAL OIL PRESSURE MAY CAUSE DAMAGE TO ENGINE.

STEP 10. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAT 1,200° F FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

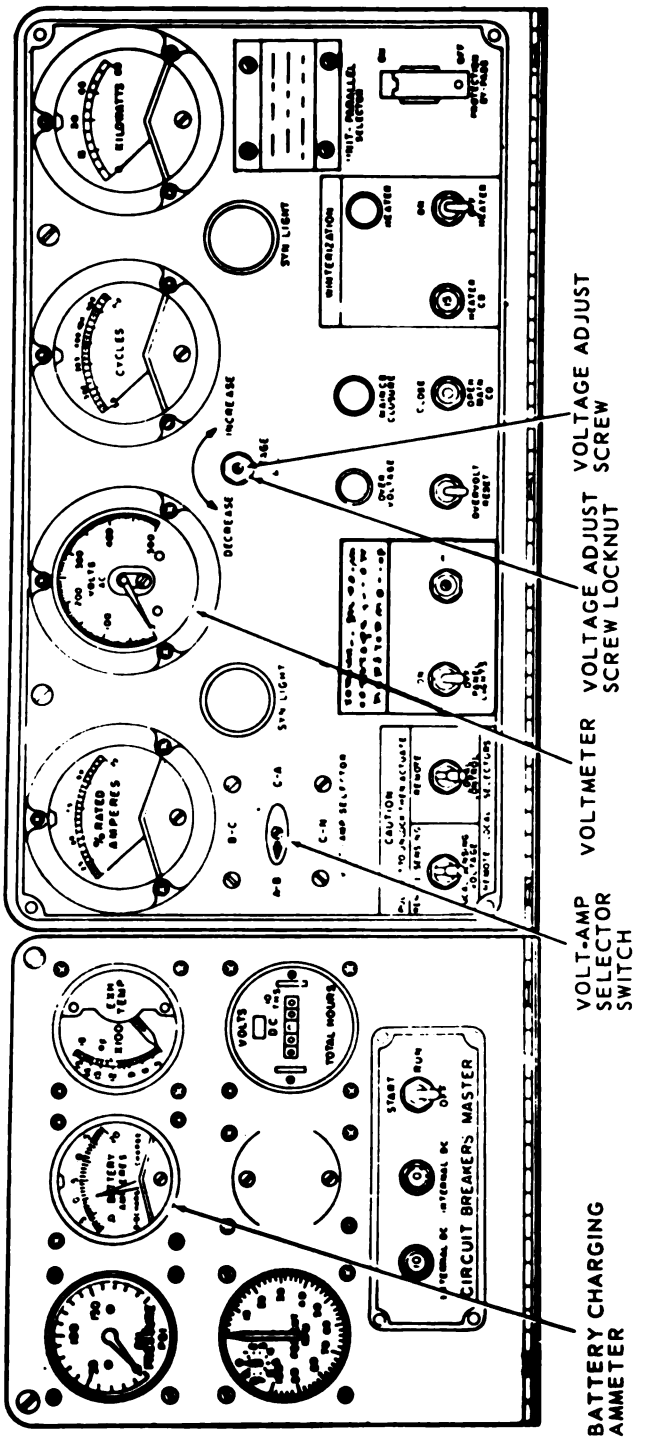
STEP 11. ALLOW ENGINE TO OPERATE 2 MINUTES AND THEN OBSERVE THAT FREQUENCY METER INDICATES 402 ± 1 CPS. REFER TO TABLE 4-2,21 FOR CORRECTIVE ACTION IF INDICATION CANNOT BE OBTAINED. REFER TO TABLE 4-2,22 FOR CORRECTIVE ACTION IF STABLE INDICATION IS NOT OBTAINED.

NOTE: ELECTRICAL FREQUENCY

ME 6115-320-12/2-17 ④ C1

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation (sheet 4 of 5).

Page 2-45. Figure 2-17(5) is superseded as follows:



ME 6115-320-12/2-17 (5) C1

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation (sheet 5 of 5).

Page 2-46. Figure 2-18(1) is superseded as follows:

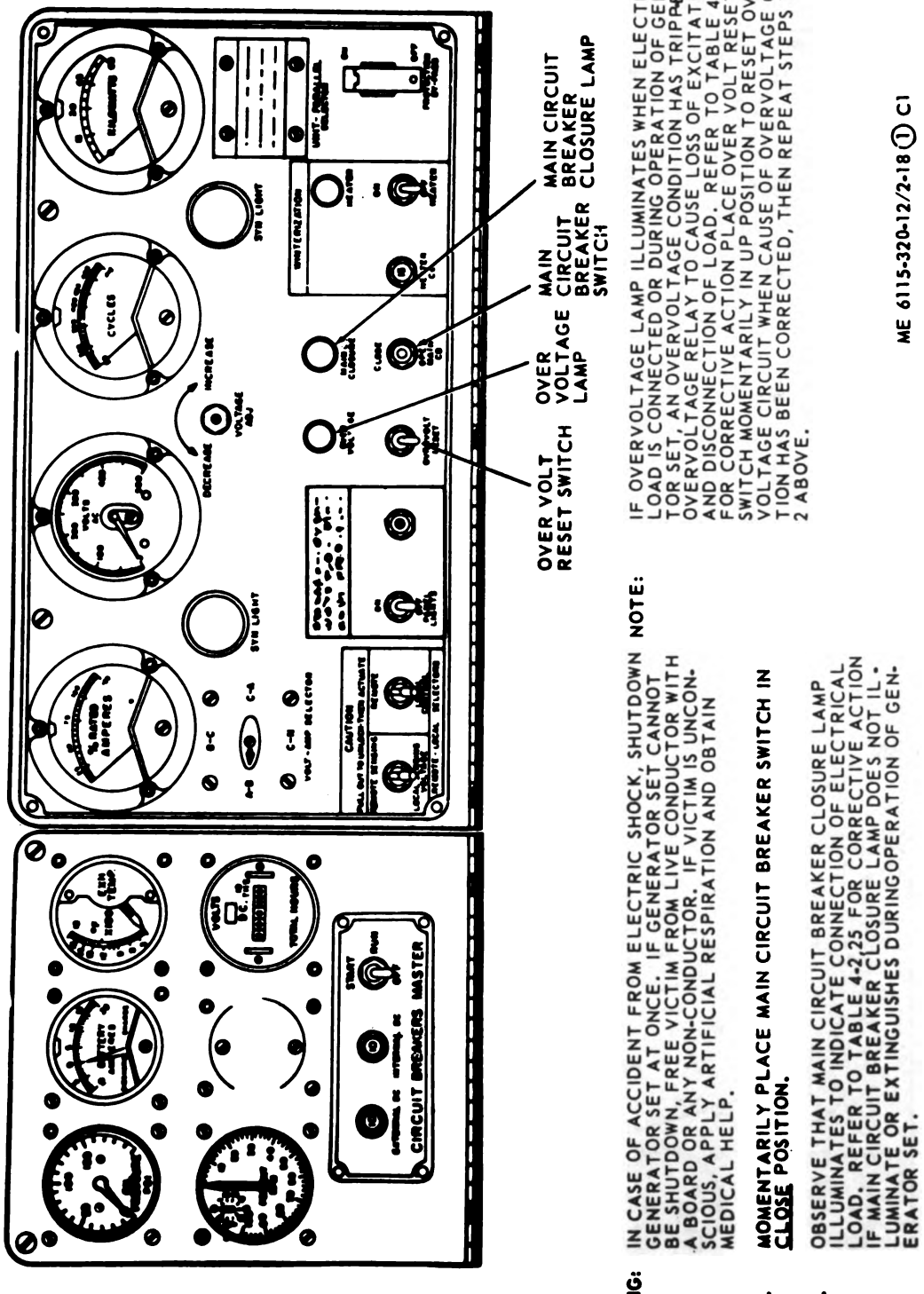
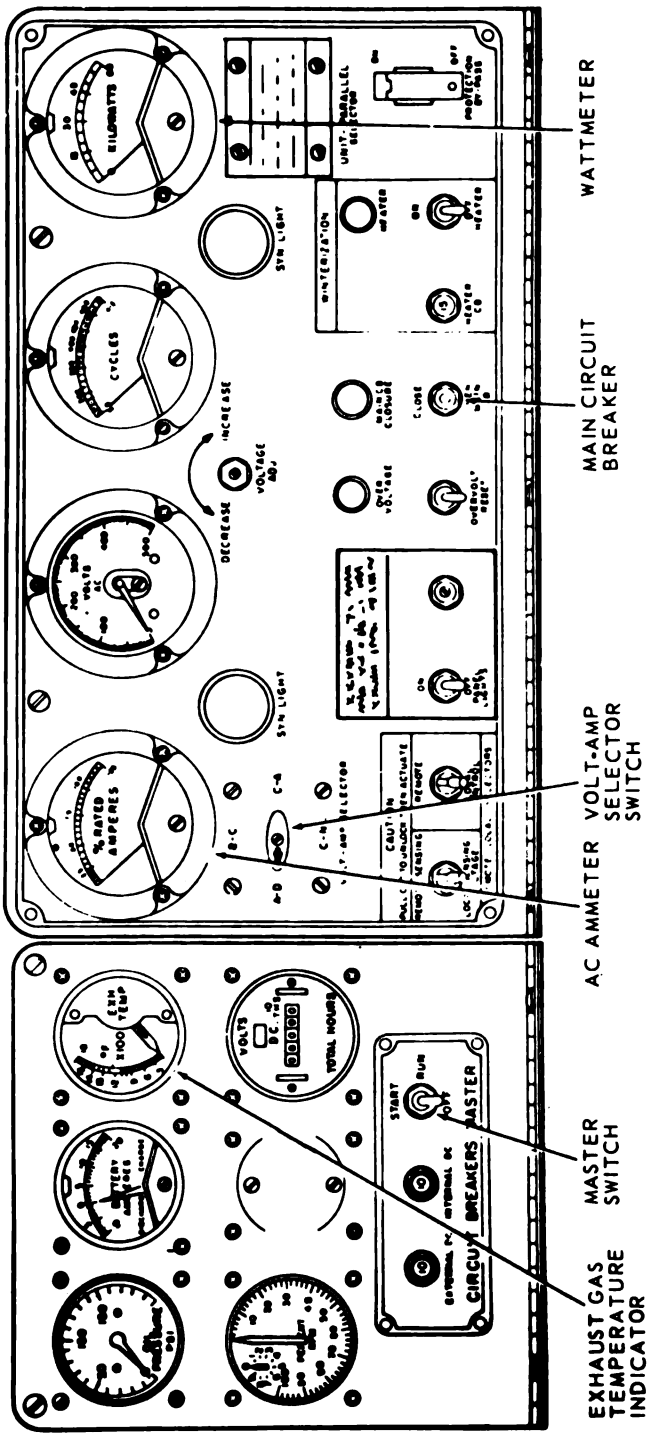


Figure 2-18. Operating the generator set launching station or M-105 trailer mounted operation (sheet 1 of 2).

Page 2-47. Figure 2-18(2) is superseded as follows:



STEP 3. OBSERVE THAT WATTMETER INDICATES NOT MORE THAN 45 KW. IF WATTMETER INDICATES MORE THAN 45 KW, PLACE MAIN CIRCUIT BREAKER SWITCH IMMEDIATELY IN OPEN POSITION AND CHECK ELECTRICAL LOADS.

STEP 4. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAN 1,200° F FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE. EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

STEP 5. OBSERVE AC AMMETER WHEN VOLT-AMP SELECTOR SWITCH IS PLACED IN A-B, B-C AND C-A POSITIONS. AC AMMETER INDICATIONS SHALL BE EQUAL WITHIN 25 PERCENT.

CAUTION: AVOID LETTING GENERATOR SET RUN OUT OF FUEL SINCE THIS WILL INTRODUCE AIR INTO FUEL SYSTEM AND MAY REQUIRE PURGING OR PRIMING ON THE NEXT STARTING ATTEMPT. ALSO IF REPEATED OFTEN ENOUGH, THIS PRACTICE WILL RESULT IN DAMAGE TO FUEL CONTROL UNIT SINCE IT DOES NOT RECEIVE BENEFIT OF LUBRICATION FROM FUEL WHEN ENGINE STOPS DUE TO LACK OF FUEL.

ME 6115-320-12/2-18 (2) C1

Figure 2-18. Operating the generator set launching station or M-105 trailer mounted operation (sheet 2 of 2).

Page 2-48. Figure 2-19 is superseded as folllows:

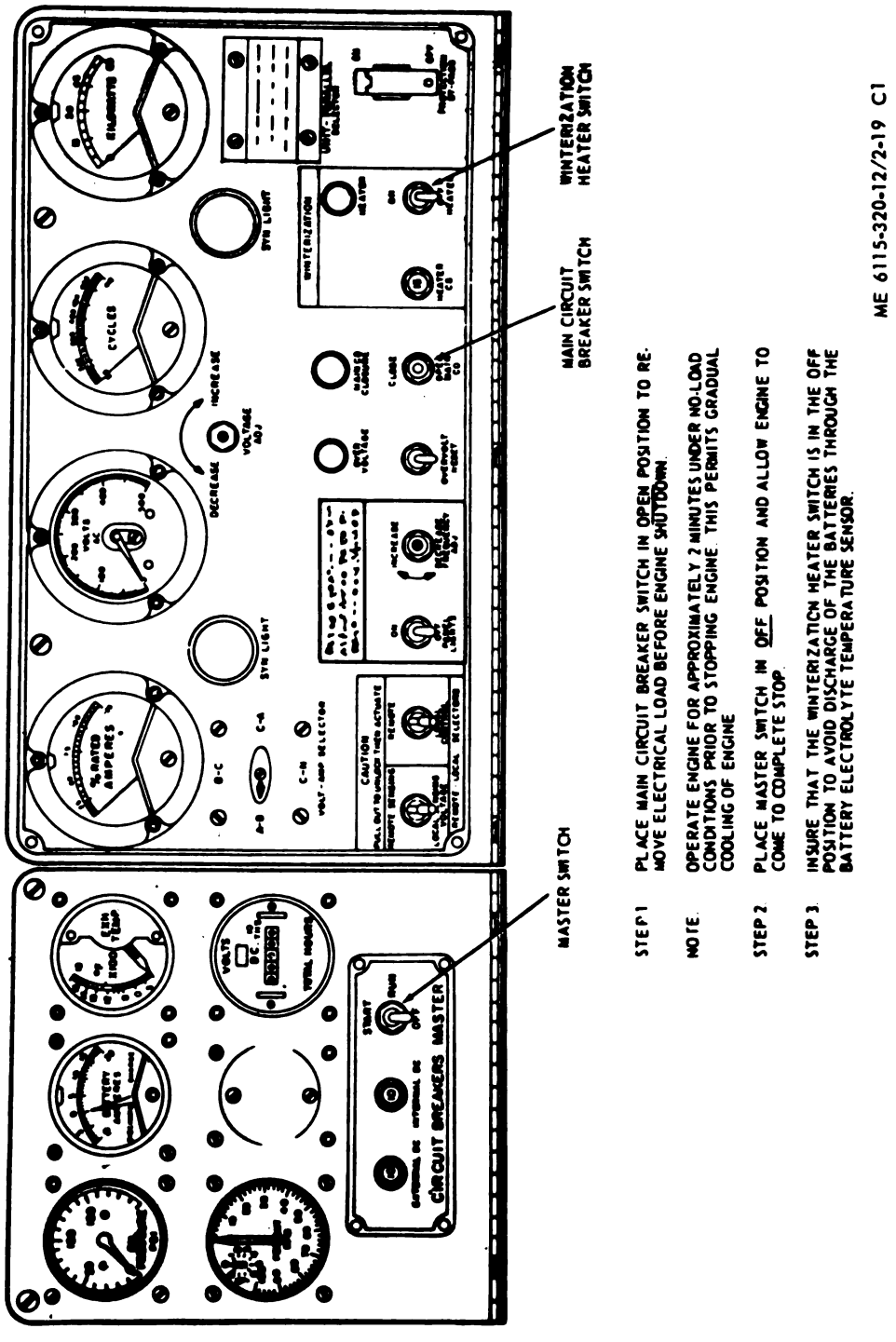


Figure 2-19. Stopping the generator set launching station or M-105 trailer mounted operation.

Page 3-5, table 3-2, Operators Troubleshooting. Steps 12, 13, and 14 are rescinded. Steps 15, 16, and 17 are renumbered 12, 13, and 14.

Paragraph 3-11*a* is rescinded. Subparagraphs *b*, *c*, *d*, and *e* are redesignated *a*, *b*, *c*, and *d*.

Page 3-11. Figure 3-7 is rescinded.

Page 4-8, table 4-2, step 14. Under "*Probable cause*" column, step "*b*" is rescinded. Under *Corrective Action* column, step "*b*" is rescinded.

Page 4-9. Steps 21 and 22 are superseded as follows:

Malfunction	*Probable cause*	*Corrective action*
21. Frequency incorrect	*a.* Frequency meter incorrect	*a.* Report condition to direct support maintenance
	b. Fuel control unit defective or out of adjustment	*b.* Report condition to direct support maintenance
22. Frequency will not stabilize	*a.* Erratic engine operation	*a.* Refer to item 9.

Page 4-11. Steps 29, 30, and 31 are rescinded. Steps 32 thru 39 are renumbered 29 thru 36.

By Order of the Secretary of the Army:

BRUCE PALMER, JR.
General, U. S. Army
Acting 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. 738) organizational maintenance requirements for Generator Sets, Engine Driven 45 KW, 60 HZ.

	A2	Thermal Watt Converter
•	A4	Load Anticipator
	A5	Battery Charger
	A7	Battery Heater
	A8	Ripple Filter
		Capacitor 40 MFD 75 W VDC
		Inductor 100 8 MHY 2 5 AMPS.
	B1	Starter Motor
	B3	Fuel Boost Pump
	B5	Heater Fuel Pump
	BT1	Battery
	BT2	Battery
	C1	Capacitor (Radio Noise Suppression) 0 1 MFD 500 VAC-DC
	C2	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
	C3	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
	C4	Capacitor (Radio Noise Suppression) 0 1 MFD 500 VAC-DC
	CB1	Internal Circuit Breaker
	CB2	Winterization Heater CB Circuit Breaker
	CB3	Main Circuit Breaker
	CB4	External Circuit Breaker (Sergeant Special)
	CT1	Current Transformer (Instrumentation)
	CT2	Current Transformer (Instrumentation)
	CT3	Current Transformer (Instrumentation)
	CT4	Current Transformer (Voltage Droop)
	DS1	Panel Lights Lamp
	DS2	Panel Lights Lamp
	DS3	Panel Lights Lamp
	DS4	Main CB Closure Lamp
	DS5	Winterization Heater Lamp
	DS6	Over Voltage Lamp
•	DS7	Syn Light Lamp
•	DS8	Syn Light Lamp
	E1	AC-DC External Ground Stud
	E2	Internal Ground Stud
	F1	Convenience Receptacle Fuse
	G1	AC Generator
	J1	Control Receptacle
	J3	Control Receptacle
	J14	Remote Control General J14 Receptacle
	J15	24V DC Slave Receptacle J15
	J18	400 Cycle Power J18 Receptacle
	J19	120V-400 Cycle-15 Amp Convenience Receptacle
	J25	Remote Control Special J25 Receptacle (Sergeant)
	J27	External Fuel Pump J27 Receptacle (Sergeant)
	J28	400 Cycle Power J28 Receptacle (Sergeant)
	J29	Fuel Tank Base Receptacle
	K1	Starter Relay
	K2	Master Relay
	K3	Holding Relay No 1
	K4	Holding Relay No. 2
	K5	Over Voltage Hold Relay
	K6	AC Reset Relay
	K7	AC Voltage Relay
	K8	Protection By-Pass Relay
	K9	Temperature Control Relay
	K10	Over Voltage Relay
	K11	Under Voltage Relay AC
	K12	Generator Control Relay
	K13	Fire Sensing Relay
	K14	Overcurrent (Short Circuit) Relay
	K15	Battery Temperature Sensing Relay
	K16	Local Remote Voltage Sensing Relay
	M1	Tachometer Indicator
	M2	Exhaust Gas Temperature Gage
	M3	Oil Pressure Gage
	M4	Battery Charging Ammeter
	M5	Start Counter
	M6	Engine Hourmeter
	M7	AC Voltmeter
	M8	Frequency Meter
	M9	AC Ammeter
	M10	Kilowatt Meter
	M1	Frequency Transducer
	P1	Control Plug
	P2	Gas Turbine Plug
	P3	Control Plug
	P7	AC Generator Plug
	P8	Battery Heater Plug
	P9	Load Anticipator Plug
	P10	Load Anticipator Plug
	P11	Voltage Regulator Plug
	P12	Battery Charger Plug
	P13	Main Circuit Breaker Plug
	P14	Internally Wired Plug
	P17	Battery Electrolyte Temperature Sensor Plug
	P20	Fuel Boost Pump Plug
	P21	Battery Heater Fuel Pump Plug
	P24	Tachometer Indicator Plug
	P25	Internally Wired Plug (Sergeant)
	R1	Voltage Adj Rheostat 350 Ohms 12.5 Watt
•	R2	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
•	R3	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
•	R4	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
•	R5	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
•	R6	Frequency Droop Rheostat 3300 Ohms 12 5 Watt
•	R7	Voltage Droop Rheostat 25 Ohms 25 Watt
•	R8	Frequency Adj Potentiometer 2500 Ohms 2 Watt
•	R9	Resistor 1000 Ohms 1 Watt
	R10	Resistor 1000 Ohms 1 Watt
	R11	Resistor 1000 Ohms 1 Watt
	R12	Resistor 15 Ohms 10 Watt
	S1	Panel Lights Switch
	S2	Master Switch
	S3	Local Remote Control Selector Switch
	S4	Over Volt Reset Switch
	S5	Main CB Circuit Breaker Switch
	S6	Protection Bypass Switch
	S8	Winterization Heater Switch
	S10	Battery Electrolyte Temperature Sensor
	S11	Volt Amp Selector Switch
•	S12	Unit-Parallel Selector Switch
	S13	Local Remote Sensing Voltage Selector Switch
	TB1	Terminal Board
	TB2	Terminal Board
	TB3	Terminal Board
	TB4	Terminal Board
	TB5	Voltage Change Panel
	TB7	AC Power Output Terminal Board
	TB8	Terminal Board
	TB9	Terminal Board
	TC1	Fire Detector
	TC2	Fire Detector
	TC3	Fire Detector
	TC4	Fire Detector
	VR1	Voltage Regulator

ME 6115-320-12/FO-1 (1) C1

NOTE 1: PARALLELING AND ELECTRICAL FREQUENCY ADJUST CAPABILITIES WERE REMOVED BY MWO5-6115-320-50/1

REFERENCE POINTS FROM	TO	VOLTAGE	OHMS	BREAKERS CIRCUIT BREAKER REF DES	POSITION	GENERATOR SET	SWITCH REF DES	POSITION
P14-N	P14-N	0	0	CB-3	CLOSED		S2	OFF
							S12	UNIT
ALL OTHERS	ANY	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
P25-L	P25-E	0	0	CB-3	CLOSED		S2	OFF
							S12	UNIT
ALL OTHERS	ANY	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-L	J14-V	0	1200	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-K	J14-V	0	1220	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-A	J14-V	0		CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-B	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-C	J14-V	0	30	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-D	J14-V	0	3.1	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-E	J14-V	0	3.1	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-F	J14-V	0	9.1	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-J	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-P	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-M	J14-V	0	0	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-S	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-U	J14-V	0	2.7K	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-R	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-G	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J18-3	J18-4	0	2600	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
J28 A	J28-D	0	2600	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
J28-B	J28-D	0	INFINITY	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
J28-C	J28-D	0	2600	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
TB7-L1	TB7-L0	0	2600	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
TB7-L2	TB7-L0	0	INFINITY	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
TB7-L3	TB7-L0	0	2600	CB-3	OPEN		S2	OFF
							* S12	PARALLEL
			B. AC GENERATOR (G1)					
T1	T4	0	0.0220 TO 0.0244					
T2	T5	0	0.0220 TO 0.0244					
T3	T6	0	0.0220 TO 0.0244					
T7	T10	0	0.0220 TO 0.0244					
T8	T11	0	0.0220 TO 0.0244					

* SEE NOTE 1

REFERENCE POINTS FROM	TO	VOLTAGE	OHMS	REMARKS: CIRCUIT BREAKER REF DES	CIRCUIT BREAKER POSITION	GENERATOR SET	SWITCH REF DES	SWITCH POSITION
J1-q	J1-u	0	INFINITY					
J1-r	J1-u	0	INFINITY					
J1-v	J1-u	0	INFINITY					
J1-w	J1-u	0	INFINITY					
J1-y	J1-u	0	INFINITY					
J1-z	J1-u	0	0					
J1-U	ANY OTHER	0	INFINITY					
J1-a	ANY OTHER	0	INFINITY					
J1-b	ANY OTHER	0	INFINITY					
J1-c	ANY OTHER	0	INFINITY					
J1-f	ANY OTHER	0	INFINITY					
J1-n	ANY OTHER	0	INFINITY					
J1-z	ANY OTHER	0	INFINITY					
J3-A	J3-V	0	INFINITY					
J3-C	J3-V	0	220					
J3-D	J3-V	0	INFINITY					
J3-E	J3-V	0	260					
J3-G	J3-V	0	220					
J3-H	J3-V	0	40					
J3-J	J3-V	0	INFINITY					
J3-K	J3-V	0	70					
J3-L	J3-V	0	70					
J3 M	J3-V	0	INFINITY					
J3-N	J3-V	0	INFINITY					
J3-P	J3-V	0	INFINITY					
J3-R	J3-V	0	INFINITY					
J3-S	J3-V	0	70					
J3-T	J3-V	0	INFINITY					
J3-U	J3-V	0	200			J1 AND J3 WITH BOTH P1 AND P3 DISCONNECTED		
J3-W	J3-V	0	INFINITY					
J3-X	J3-V	0	INFINITY					
J3-Z	J3-V	0	INFINITY					
J3-a	J3-V	0	INFINITY					
J3-b	J3-V	0	37					
J3-c	J3-V	0	INFINITY					
J3-d	J3-V	0	INFINITY					
J3-e	J3-V	0	200					
J3-g	J3-V	0	INFINITY					
J3 h	J3-V	0	INFINITY					
J3-j	J3-V	0	INFINITY					
J3-m	J3-V	0	150					
J3-n	J3-V	0	INFINITY					
J3-p	J3-V	0	INFINITY					
J3-r	J3-V	0	150					
J3-s	J3-V	0	INFINITY					
J3-B	ANY OTHER	0	INFINITY					
J3-F	ANY OTHER	0	INFINITY					
J3-f	ANY OTHER	0	INFINITY					
J3-k	ANY OTHER	0	INFINITY					
			1. CONTROL CUBICLE PLUGS					
P1-A	P1-u	0	INFINITY					
P1-B	P1-u	0	INFINITY					
P1-C	P1-u	0	INFINITY					
P1-D	P1-u	0	INFINITY					
P1-E	P1-u	0	INFINITY					
P1-F	P1-u	0	INFINITY					
P1-G	P1-u	0	2.1K					
P1-H	P1-u	0	INFINITY					
P1-J	P1-u	0	INFINITY					
P1-K	P1-u	0	0					

* WITH ALL CIRCUIT BREAKERS CLOSED AND ALL SWITCHES IN OFF OR NEUTRAL POSITION, "UNIT-PARALLEL" SWITCH IN "PARALLEL" POSITION, VOLT-AMP SELECTOR IN POSITION "C-A", BOTH P1 AND P3 REMOVED

ME 6115-320-12/FO-1 (4) C1

* SEE NOTE 1

	A2	Thermal Watt Converter
•	A4	Load Anticipator Governor Control
	A5	Transformer Rectifier
	A7	Battery Heater
	A8	Ripple Filter Capacitor 40 MFD 75 W VDC Inductor 100 8 MHY 2 5 AMPS
	B1	Starter Motor
	B3	Fuel Boost Pump
	B5	Heater Fuel Pump
	BT1	Battery
	BT2	Battery
	C1	Capacitor Radio Noise Suppression 0 1 MFD 500 VAC DC
	C2	Capacitor Radio Noise Suppression 0 1 MFD 500 VAC DC
	C3	Capacitor Radio Noise Suppression 0 1 MFD 500 VAC DC
	C4	Capacitor Radio Noise Suppression 0 1 MFD 500 VAC DC
	CB1	Internal Circuit Breaker
	CB2	Winterization Heater CB Circuit Breaker
	CB3	Main Circuit Breaker
	CB4	External Circuit Breaker Sergeant Special
	CT1	Current Transformer Instrumentation
	CT2	Current Transformer Instrumentation
	CT3	Current Transformer Instrumentation
	CT4	Current Transformer Voltage Droop
	DS1	Panel Lights Lamp
	DS2	Panel Lights Lamp
	DS3	Panel Lights Lamp
	DS4	Main CB Closure Lamp
	DS5	Winterization Heater Lamp
	DS6	Over Voltage Lamp
•	DS7	Syn Light Lamp
•	DS8	Syn Light Lamp
	E1	AC DC External Ground Stud
	E2	Internal Ground Stud
	F1	Convenience Receptacle Fuse
	G1	AC Generator
	J1	Control Receptacle
	J3	Control Receptacle
	J14	Remote Control General J14 Receptacle
	J15	24V DC Slave Receptacle J15
	J18	400 Cycle Power J18 Receptacle
	J19	120V 400 Cycle 15 Amp Convenience Receptacle
	J25	Remote Control Special J25 Receptacle Sergeant
	J27	External Fuel Pump J27 Receptacle Sergeant
	J28	400 Cycle Power J28 Receptacle Sergeant
	J29	Fuel Tank Base Receptacle
	K1	Starter Relay
	K2	Master Relay
	K3	Holding Relay No 1
	K4	Holding Relay No 2
	K5	Over Voltage Hold Relay
	K6	AC Reset Relay
	K7	AC Voltage Relay
	K8	Protection By Pass Relay
	K9	Temperature Control Relay
	K10	Over Voltage Relay AC
	K11	Under Voltage Relay AC
	K12	Generator Control Relay
	K13	Fire Sensing Relay
	K14	Overcurrent Short Circuit Relay
	K15	Battery Temperature Sensing Relay
	K16	Local Remote Voltage Sensing Relay
	M1	Tachometer Indicator
	M2	Exhaust Gas Temperature Gage
	M3	Oil Pressure Gage
	M4	Battery Charging Ammeter
	M5	Start Counter
	M6	Engine Hourmeter
	M7	AC Voltmeter
	M8	Frequency Meter
	M9	AC Ammeter
	M10	Kilowatt Meter
	MT	Frequency Transducer
	P1	Control Plug
	P2	Gas Turbine Plug
	P3	Control Plug
	P7	AC Generator Plug
	P8	Battery Heater Plug
	P9	Load Anticipator Plug
	P10	Load Anticipator Plug
	P11	Voltage Regulator Plug
	P12	Transformer Rectifier Plug
	P13	Main Circuit Breaker Plug
	P14	Internally Wired Plug
	P17	Battery Electrolyte Temperature Sensor Plug
	P20	Fuel Boost Pump Plug
	P21	Battery Heater Fuel Pump Plug
	P24	Tachometer Indicator Plug
	P45	Internally Wired Plug (Fuel Tank Base Receptacle)
	P25	Internally Wired Plug Sergeant)
	R1	Voltage Adj Rheostat 350 Ohms 12 5 Watt
•	R2	Resistor Synchronizing Light 2500 Ohms 10 Watt
•	R3	Resistor Synchronizing Light 2500 Ohms 10 Watt
•	R4	Resistor Synchronizing Light 2500 Ohms 10 Watt
•	R5	Resistor Synchronizing Light 2500 Ohms 10 Watt
•	R6	Resistor Frequency Droop Rheostat 3500 Ohms 12 5 Watt
•	R7	Voltage Droop Rheostat 25 Ohms 25 Watt
•	R8	Frequency Adj Potentiometer 3500 Ohms 3 Watt
	R9	Resistor 1000 Ohms 1 Watt
	R10	Resistor 1000 Ohms 1 Watt
	R11	Resistor 1000 Ohms 1 Watt
	R12	Resistor 15 Ohms 10 Watt
	S1	Panel Lights Switch
	S2	Master Switch
	S3	Local Remote Control Selector Switch
	S4	Over Volt Reset Switch
	S5	Main CB Circuit Breaker Switch
	S6	Protection Bypass Switch
	S8	Winterization Heater Switch
	S10	Battery Electrolyte Temperature Sensor
	S11	Volt Amp Selector Switch
•	S12	Unit Parallel Selector Switch
	S13	Local Remote Sensing Voltage Selector Switch
	TB1	Terminal Board
	TB2	Terminal Board
	TB3	Terminal Board
	TB4	Terminal Board
	TB5	Voltage Change Panel
	TB8	Terminal Board
	TB9	Terminal Board
	TC1	Fire Detector
	TC2	Fire Detector
	TC3	Fire Detector
	TC4	Fire Detector
	VR1	Voltage Regulator

THIS WIRING DIAGRAM USED ON UNITS
SERIAL NUMBER P21468 AND SUBSEQUENT

	A2	Thermal Watt Converter
*	A4	Load Anticipator
	A5	Battery Charger
	A7	Battery Heater
	A8	Ripple Filter
		Capacitor 40 MFD 75 W VDC
		Inductor 100 8 MHY 2.5 AMPS.
	B1	Starter Motor
	B3	Fuel Boost Pump
	B5	Heater Fuel Pump
	BT1	Battery
	BT2	Battery
	C1	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
	C2	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
	C3	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
	C4	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
	CB1	Internal Circuit Breaker
	CB2	Winterization Heater CB Circuit Breaker
	CB3	Main Circuit Breaker
	CB4	External Circuit Breaker (Sergeant Special)
	CT1	Current Transformer (Instrumentation)
	CT2	Current Transformer (Instrumentation)
	CT3	Current Transformer (Instrumentation)
	CT4	Current Transformer (Voltage Droop)
	DS1	Panel Lights Lamp
	DS2	Panel Lights Lamp
	DS3	Panel Lights Lamp
	DS4	Main CB Closure Lamp
	DS5	Winterization Heater Lamp
	DS6	Over Voltage Lamp
*	DS7	Syn Light Lamp
*	DS8	Syn Light Lamp
	E1	AC-DC External Ground Stud
	E2	Internal Ground Stud
	F1	Convenience Receptacle Fuse
	G1	AC Generator
	J1	Control Receptacle
	J3	Control Receptacle
	J14	Remote Control General J14 Receptacle
	J15	24V DC Slave Receptacle J15
	J18	400 Cycle Power J18 Receptacle
	J19	120V-400 Cycle-15 Amp Convenience Receptacle
	J25	Remote Control Special J25 Receptacle (Sergeant)
	J27	External Fuel Pump J27 Receptacle (Sergeant)
	J28	400 Cycle Power J28 Receptacle (Sergeant)
	J29	Fuel Tank Base Receptacle
	K1	Starter Relay
	K2	Master Relay
	K3	Holding Relay No. 1
	K4	Holding Relay No. 2
	K5	Over Voltage Hold Relay
	K6	AC Reset Relay
	K7	AC Voltage Relay
	K8	Protection By-Pass Relay
	K9	Temperature Control Relay
	K10	Over Voltage Relay
	K11	Under Voltage Relay AC
	K12	Generator Control Relay
	K13	Fire Sensing Relay
	K14	Overcurrent (Short Circuit) Relay
	K15	Battery Temperature Sensing Relay
	K16	Local-Remote Voltage Sensing Relay
	M1	Tachometer Indicator
	M2	Exhaust Gas Temperature Gage
	M3	Oil Pressure Gage
	M4	Battery Charging Ammeter
	M5	Start Counter
	M6	Engine Hourmeter
	M7	AC Voltmeter
	M8	Frequency Meter
	M9	AC Ammeter
	M10	Kilowatt Meter
	MT	Frequency Transducer
	P1	Control Plug
	P2	Gas Turbine Plug
	P3	Control Plug
	P7	AC Generator Plug
	P8	Battery Heater Plug
	P9	Load Anticipator Plug
	P10	Load Anticipator Plug
	P11	Voltage Regulator Plug
	P12	Battery Charger Plug
	P13	Main Circuit Breaker Plug
	P14	Internally Wired Plug
	P17	Battery Electrolyte Temperature Sensor Plug
	P20	Fuel Boost Pump Plug
	P21	Battery Heater Fuel Pump Plug
	P24	Tachometer Indicator Plug
	P25	Internally Wired Plug (Sergeant)
	R1	Voltage Adj Rheostat 250 Ohms 12.5 Watt
*	R2	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
*	R3	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
*	R4	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
*	R5	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
*	R6	Frequency Droop Rheostat 2500 Ohms 12.5 Watt
*	R7	Voltage Droop Rheostat 25 Ohms 25 Watt
*	R8	Frequency Adj Potentiometer 2500 Ohms 3 Watt
	R9	Resistor 1000 Ohms 1 Watt
	R10	Resistor 1000 Ohms 1 Watt
	R11	Resistor 1000 Ohms 1 Watt
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	S8	Winterization Heater Switch
	S10	Battery Electrolyte Temperature Sensor
	S11	Volt-Amp Selector Switch
*	S12	Unit-Parallel Selector Switch
	S13	Local Remote Sensing Voltage Selector Switch
	TB1	Terminal Board
	TB2	Terminal Board
	TB3	Terminal Board
	TB4	Terminal Board
	TB5	Voltage Change Panel
	TB7	AC Power Output Terminal Board
	TB8	Terminal Board
	TB9	Terminal Board
	TC1	Fire Detector
	TC2	Fire Detector
	TC3	Fire Detector
	TC4	Fire Detector
	VR1	Voltage Regulator

* NOTE: PARALLELING AND ELECTRICAL ADJUST CAPABILITIES REMOVED BY MWOS-6115-320-50/1

TM 5-6115-320-12
C 2

Change No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *27 September 1973*

Operator's and Organizational Maintenance Manual GENERATOR SET, GAS TURBINE ENGINE: 45 KW, AC, 120/208, 240/416V, 3 PHASE, 4 WIRE: SKID MOUNTED; WINTERIZED (AIRESEARCH MODEL GTGE 70-6-1) FSN 6115-075-1639

TM 5-6115-320-12, 24 November 1971, is changed as follows:

Page C-1. Appendix C is superseded as follows:

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

Section I. INTRODUCTION

C-1. Scope

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

C-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 it is evacuated.

C-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of items troop installed or authorized list, section III.

a. Source, Maintenance, and Recoverability Code (s) (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 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 number	(3) Description	(4) Unit of meas	(5) Qty auth
	7520-559-9618	CASE, MAINTENANCE AND OPERATIONAL MANUALS.	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. 738) Organizational Maintenance Requirements for Generator Sets: 45 KW, 60 HZ.

TECHNICAL MANUAL
NO. 5-6115-320-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *24 November 1971*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

GENERATOR SET, GAS TURBINE ENGINE:

45 KW, AC, 120 / 208, 240 / 416V, 3 PHASE, 4 WIRE:

SKID MOUNTED; WINTERIZED

(AIRESEARCH MODEL GTGE 70-6-1)

FSN 6115-075-1639

* This manual supersedes TM 5-6115-320-12, 31 August 1965, including all changes.

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS—Continued

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual is for use in operating and maintaining the generator set, Model GTGE 70-6-1 as allocated by the maintenance allocation chart. It provides information on the operation, preventive maintenance checks and services and organizational maintenance of the equipment.

1-2. Maintenance Forms and Records

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed in TM 38-750.

1-3. Reporting of Errors

Report 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 forwarded direct to Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120. A reply will be furnished directly to you.

1-4. Equipment Serviceability Criteria

This equipment is not covered by an ESC.

1-5. Destruction of Army Materiel to Prevent Enemy Use.

For information applicable to destruction of the equipment refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

Section II. DESCRIPTION AND DATA

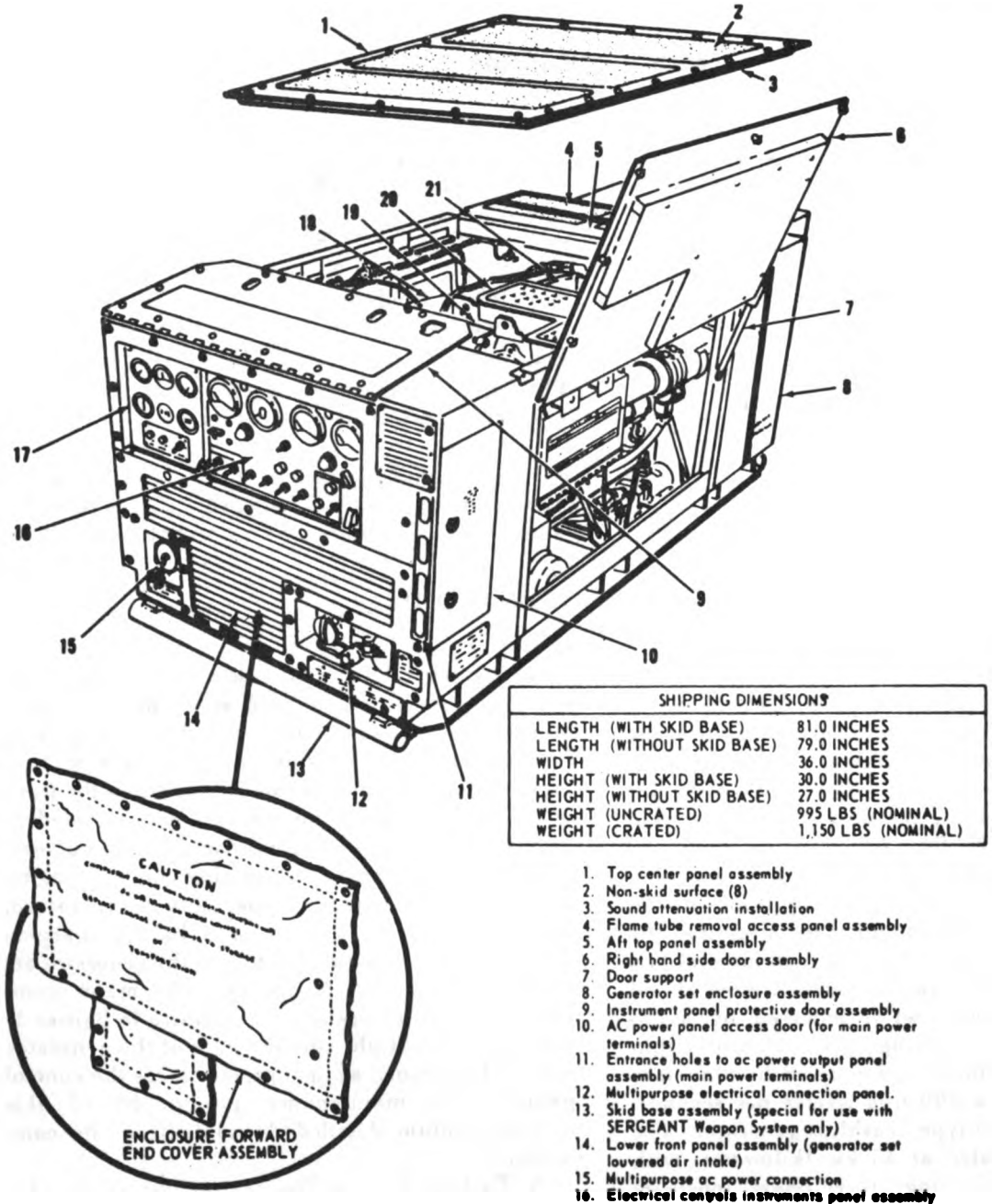
1-6. Description

a. General. The generator set (fig. 1-1 thru 1-3) is a compact, lightweight source of ac (alternating current) power contained within a weather resistant and winterized enclosure. The enclosure has provisions for mounting the unit on a special skid base assembly (13, fig. 1-1) for use with the Launching Station. This special skid base assembly is not normally employed for multipurpose use of the unit. Provisions are included for mounting the unit on a skid base assembly having an integral fuel tank for applications requiring such an integral fuel supply. The generator set is powered by a gas turbine engine operating at 40,800 rpm (revolutions per minute) and coupled by planetary reduction gears to a 400 hps (Hertz per second), three phase, aircraft-type brushless generator. The generator set is rated at 45 kw (kilowatts) with 0.80 power factor (lagging), three phase, four-wire outputs. The generator set may be connected for low-voltage operation to produce 208 volts line-to-line and 120 volts line-to-neutral, or for high voltage operation to obtain 416 volts line-to-line and 240 volts line to neutral. Provisions for parallel operation with a like unit are incorporated into the generator set. The generator set is self-sufficient when supplied with an external-connected fuel supply. It is also completely self-sufficient when mounted on the skid base assembly with integral fuel tank. Turbine operation is automatic when the start is initiated by actuation of the master switch or a remote starting circuit. Controls and indicating instruments for operating the generator set are mounted on two control panels located on the front of the set. Indicating instruments are provided to indicate output voltage, frequency, output current, output power, engine operating hours, engine starts, oil pressure, exhaust gas temperature, percentage of engine rpm, and battery-charging rate. Means are provided to adjust the generator set output voltage and frequency. The major components of the generator set are shown in figures 1-1 through 1-3. Right and left sides of the generator set are determined as the operator faces the control panels. The maintenance paragraphs of this manual contain detailed descriptions of its components.

b. Turbine Engine. The gas turbine engine is a lightweight, compact engine consisting of a turbine section, compressor section, and accessory section. The turbine runs at a constant speed of 40,800± 100 rpm and is coupled to a 6000 rpm ac generator through a planetary reduction gear.

(1) *Turbine section.* The turbine section is located at the rear of the unit and is accessible by removal of the aft top panel assembly (5, fig. 1-1). It utilizes a radial inward-flow turbine wheel to convert the energy of the burning gases to

rotational mechanical energy. A portion of the power developed by the turbine wheel is utilized to drive the compressor and accessories, the remainder is available for output-shaft power. The turbine section consists of the turbine assembly, combustion assembly, and turbine plenum.

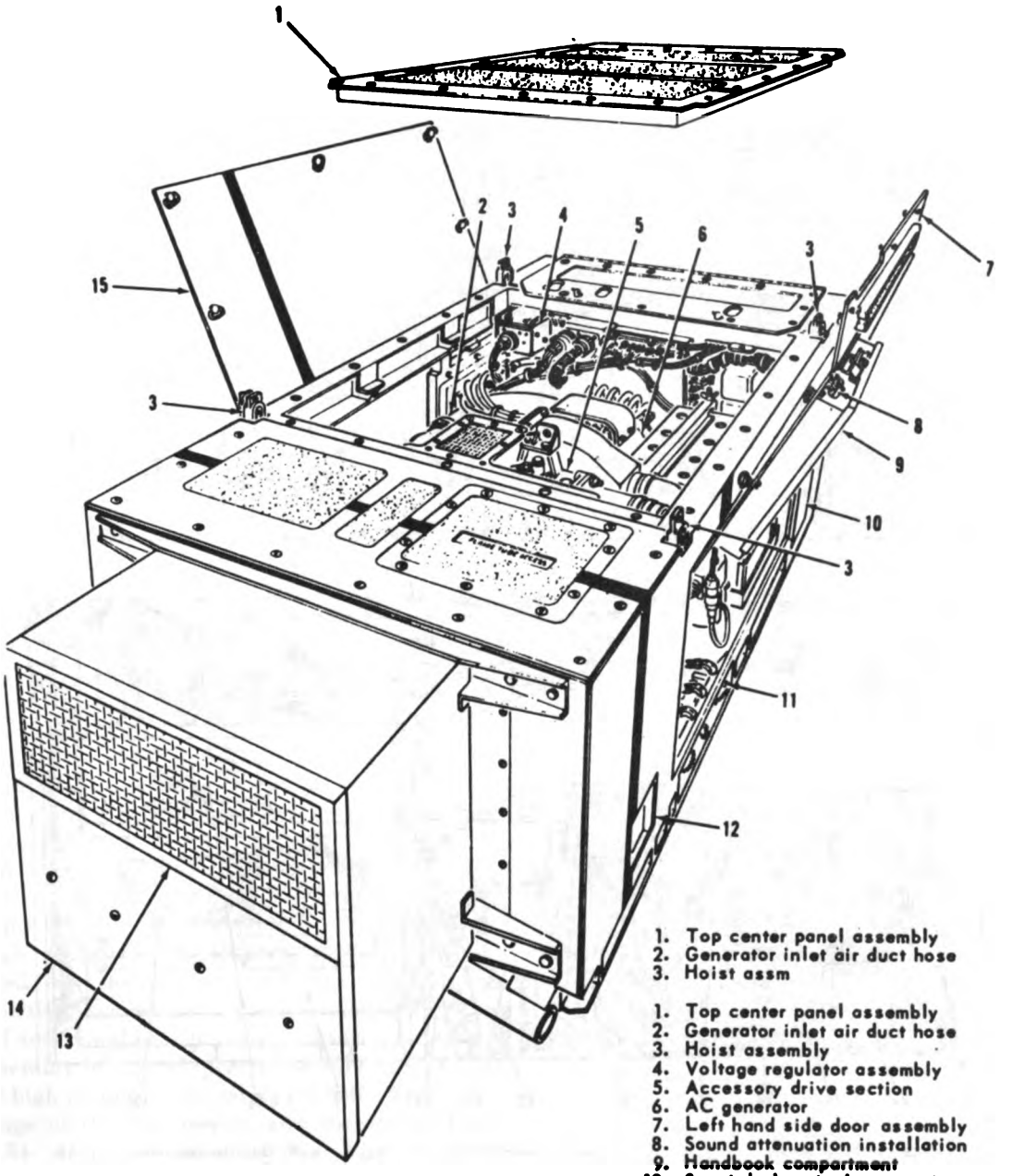


SHIPPING DIMENSIONS	
LENGTH (WITH SKID BASE)	81.0 INCHES
LENGTH (WITHOUT SKID BASE)	79.0 INCHES
WIDTH	36.0 INCHES
HEIGHT (WITH SKID BASE)	30.0 INCHES
HEIGHT (WITHOUT SKID BASE)	27.0 INCHES
WEIGHT (UNCRATED)	995 LBS (NOMINAL)
WEIGHT (CRATED)	1,150 LBS (NOMINAL)

1. Top center panel assembly
2. Non-skid surface (8)
3. Sound attenuation installation
4. Flame tube removal access panel assembly
5. Aft top panel assembly
6. Right hand side door assembly
7. Door support
8. Generator set enclosure assembly
9. Instrument panel protective door assembly
10. AC power panel access door (for main power terminals)
11. Entrance holes to ac power output panel assembly (main power terminals)
12. Multipurpose electrical connection panel.
13. Skid base assembly (special for use with SERGEANT Weapon System only)
14. Lower front panel assembly (generator set louvered air intake)
15. Multipurpose ac power connection
16. Electrical controls instruments panel assembly
17. Engine controls instruments panel assembly
18. Generator cooling air discharge air duct hose
19. Starter motor assembly
20. Air inlet screen assembly
21. Compressor section

ME 6115-320-12/1-1

Figure 1-1. Generator set, right front, three-quarter view with shipping dimensions.

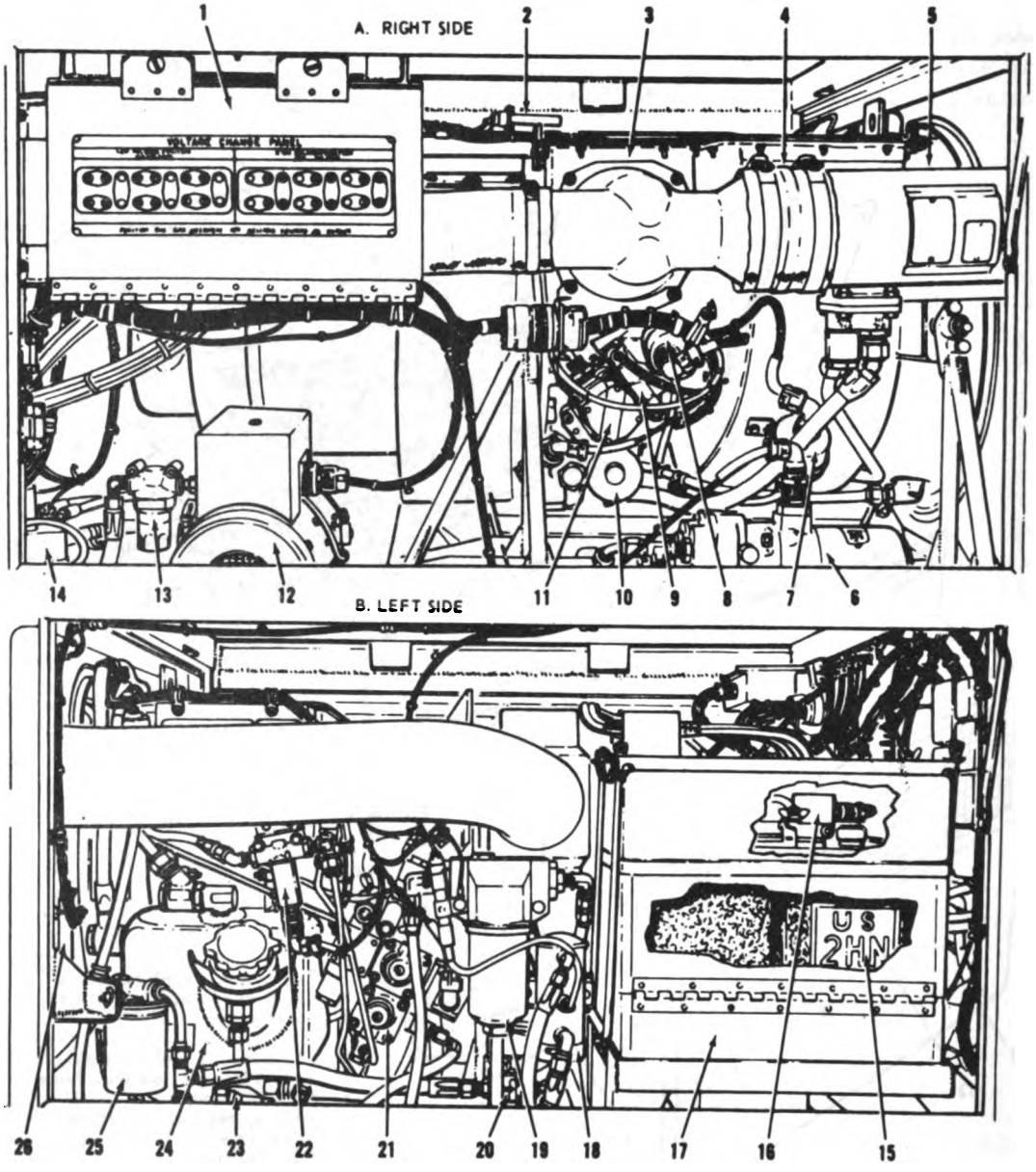


1. Top center panel assembly
2. Generator inlet air duct hose
3. Hoist assm

1. Top center panel assembly
2. Generator inlet air duct hose
3. Hoist assembly
4. Voltage regulator assembly
5. Accessory drive section
6. AC generator
7. Left hand side door assembly
8. Sound attenuation installation
9. Handbook compartment
10. Special electrical connection panel
11. Auxiliary plumbing connection panel
12. Fuel access opening (for installation on skid base with intergal fuel tank when required)
13. Exhaust screen
14. Exhaust muffler assembly
15. Right hand side door assembly

ME 6115-320-12/1-2

Figure 1-2. Generator set, left-rear, three-quarter view.



1 Voltage distribution panel
2. Fire detector probe
3. Cooling air fan assembly
4. Oil cooler cooling air duct
5. Tubular oil cooler
6. Fuel boost pump and motor assembly
7. Low oil pressure switch
8 Oil pressure sequencing switch
9 Centrifugal switch assembly
10. Oil pump assembly
11. Tachometer generator
12. Internal combustion battery heater
13. Battery heater fuel filter assembly
14. Start relay
15. Batteries
16. Battery electrolyte temperature sensor
17. Battery box assembly
18. Battery heater electric fuel pump
19. Oil filter assembly
20 Battery heater fuel shutoff valve
21 Fuel control unit
22. Fuel solenoid valve
23 Oil drain valve
24 Oil tank assembly
25. Fuel filter assembly
26. Fire detector probe

ME 6115-320-12/1-3

Figure 1-3. Generator set, right and left side views, partial.

(a) Turbine assembly. The turbine assembly consists of the turbine wheel with integral shaft, bearing housing, bearings, turbine nozzle, seals and torus. The turbine nozzle forms a shroud around the turbine wheel and contains fixed nozzles that direct gases from the combustion assembly against the turbine wheel blades. The exhaust flange in the turbine assembly contains two thermostats and a thermocouple. The exhaust gases are discharged from the turbine section to a muffler assembly to reduce engine noise.

(b) Combustion assembly. The combustion

assembly is a single tube reverse-flow type. The combustion chamber incorporates a combustion chamber assembly and combustor cap assembly. A fuel atomizer and igniter plug are mounted on the combustor cap assembly. The discharge end of the combustion chamber assembly, within the turbine plenum assembly, mates with the turbine torus. The torus directs combustion gases into the nozzle ring leading to the turbine wheel.

(c) Turbine plenum. The turbine plenum serves as a receiving chamber for discharge air from the compressor assembly and as an effective heat shield and enclosure for the torus and combustion chamber assembly.

(d) Engine acceleration and over-temperature thermostat. The engine is equipped with a pneumatic thermostat (located in the exhaust flange). It operates to bleed air from a pneumatic connection to the fuel control unit when a safe operating temperature for the engine is exceeded during acceleration and operation of the generator set. This causes the fuel control to reduce flow of fuel into the engine; the engine speed will drop until the generator under-frequency protective system operates to open the main circuit breaker and disconnect the load.

(2) *Compressor section.* The compressor section (21) is a two-stage centrifugal type utilizing two radial outward-flow impellers mounted on a common shaft, an interstage diffuser between the impellers, and a second diffuser following the second stage impeller. The pressure and temperature of ambient air entering the compressor from the air inlet screen assembly (20) is increased through two stages of compression prior to being directed to the turbine plenum. Continuous combustion then occurs in the combustion chamber to add additional heat to the compressed air. An oil jet assembly in the compressor section functions to direct high pressure lubricating oil to the high speed bearings of the compressor and turbine sections.

(3) *Accessory drive section.* The accessory drive section (5, fig. 1-2) consists of a planetary reduction gear drive assembly mounted on the forward end of the compressor, and is a separate assembly. A torsion shaft directly couples an accessory drive pinion to the compressor shaft. The accessory drive housing provides mounting for six engine accessories; fuel control unit (21, fig. 1-3), starter motor assembly (19, fig. 1-1), centrifugal switch assembly (9, fig 1-3), cooling air fan assembly (3), oil pump assembly (10), and tachometer generator (11). The arrangement of gears in the accessory drive train is such that the starter motor assembly drives all accessories in addition to driving the compressor and turbine assemblies during the initial starting. The forward portion of the accessory drive assembly is attached to the ac generator.

c. AC Generator. The ac generator (6, fig. 1-2) is a brushless, self-excited, 400 hz, three phase generator driven by the engine through a planetary reduction gear drive assembly. When the generator set is operating, a generator control relay connects a permanent-magnet generator (mounted on the exciter end of generator) to supply power to the voltage regulator assembly (4). The voltage regulator assembly then supplies power to the generator exciter field windings to produce voltage in the exciter armature. The ac output of the exciter armature is converted by silicon rectifiers to dc (direct current) and applied to the rotor windings of the generator. The voltage regulator reacts to voltage changes (as occur from varying electrical loads) and by changing the excitation to the exciter field, thus regulates the current fed to the rotor windings. This causes the voltage (at the output terminals and receptacles of the generator set) to remain essentially constant under conditions of varying load, speed, ambient temperature, and warm up. The generator has multiple stator windings to permit the voltage reconnection mentioned in paragraph 1-7 a. The windings are reconnectable at the voltage change panel assembly. The generator is cooled by an internal fan which draws blast air from the cooling air fan assembly (3, fig. 1-3).

d. Fuel System.

(1) The fuel system consists of mechanical, pneumatic, and electrical components which function automatically to accelerate the engine to 40,800 rpm and maintain the engine speed within ±100 rpm under varying electrical loads. The fuel system is comprised mainly of the fuel control unit (21, fig. 1-3), fuel atomizer assembly, fuel solenoid valve (22), pneumatic thermostat, fuel boost pump and motor assembly (6), fuel filter assembly (25), and fuel lines and fittings. A detailed description of the fuel system is given in Direct Support and General Support Maintenance Instructions of TM 5-6115-320-34.

(2) The fuel control unit (21) is the major component of the fuel system and is driven by the accessory section gear train. The fuel control unit regulates the flow of fuel to the fuel atomizer assembly in response to engine acceleration conditions and varying load conditions at governed speed. The fuel control unit incorporates a fuel pump with pressure relief valve and filter, acceleration limiter valve, governor assembly with governor trim motor, and connections for pneumatic control, electrical control, fuel inlet, fuel outlet, fuel bypass, and a fuel seal-leakage drain manifold.

(a) The fuel pump is a two-gear, positive-displacement, high-pressure pump. The pump incorporates two steel pump gears with integral shafts. The fuel pump housing contains a spring-loaded ball-type pressure relief valve which returns fuel (through cored passages in the housing), to the pump inlet after sufficient fuel pressure is attained for operating the unit. A micronic fuel filter is located adjacent to the fuel outlet port and functions to filter all fuel passing from the fuel pump to the fuel control components.

(b) The acceleration limiter valve is a spring-loaded, diaphragm-controlled relief valve. The acceleration limiter valve incorporates an adjusting spring, two diaphragm assemblies, a spring-loaded half-ball valve, and a cover. The valve functions during engine acceleration to control rate of acceleration and exhaust gas temperatures in response to pneumatic pressure in the compressor as modulated by the acceleration and over-temperature control thermostat, thus, fuel flow to the fuel atomizer assembly is constantly regulated by the acceleration limiter valve during engine acceleration to provide the correct fuel flow for the available compressed air and to prevent excessive exhaust gas temperature. When the engine reaches governed speed fuel control is provided by the governor assembly instead of the acceleration limiter valve. The acceleration limiter valve cover incorporates a spring tension adjustment screw, connection boss for penumatic control air, and an orifice for venting pneumatic control air to outside ambient. This fixed orifice tends to bleed out any moisture which may be present in the control air without creating a significant pressure drop in the control air.

(c) The governor assembly is a centrifugal type governor incorporating spring-loaded flyweights to position a slide valve for the bypass of fuel. An increase in centrifugal force on the flyweights, caused by an increase in engine speed, will reposition the slide valve to decrease the fuel delivered to the fuel atomizer assembly, thus, reducing engine speed to the desired governed speed. Conversely a decrease in centrifugal force on the flyweights will increase fuel and engine speed. An additional bypass valve is incorporated in the governor system to sense an initial speed change in the governor and provide an additional change in fuel flow until the governor slide valve again achieves a stable control point. This additional bypass valve provides a limiting affect on speed "droop" or "overshoot" from governed speed during the time required for the governor to adjust fuel flow for the new condition. The spring tension for the spring-loaded flyweights in the governor is controlled by the governor trim motor (electrical torque motor) through a lever system. The trim motor, through action on the spring-loaded flyweights, permits frequency output of the generator set to be varied by the frequency adjust rheostat on the electrical controls instruments panel assembly, position of the rheostat slider being converted by the load anticipator to an electrical input for the trim motor. Also as a result of load changes, signals are received from the load anticipator which cause the trim motor to act on the spring-loaded flyweights to change fuel flow in accordance with the new load requirements without a significant corresponding speed change.

e. Lubricating System. The lubricating system consists mainly of the oil tank assembly, oil pump assembly, oil filter assembly, tubular oil cooler, oil pressure sequencing switch, low oil pressure switch, and associated oil lines, fittings, and oil air cooling ducts. The lubrication system serves to provide oil under pressure to cool and lubricate the gears of the accessory drive section and high speed bearings of the compressor and turbine sections.

(1) *Oil tank assembly.* The oil tank assembly (24, fig. 1-3) functions as a 4-quart reservoir for the lubricating system and provides for separation of oil and entrained air. The oil tank assembly has an outlet to the oil pump assembly and inlet from the oil cooler (5, fig. 1-3). The compressor and turbine bearing cavities are vented to the oil tank assembly where it is then vented by the assembly to the turbine exhaust. An oil drain valve is installed in the oil line below the oil tank assembly to provide a means to drain contaminated oil from the lubricating system.

(2) *Oil pump assembly.* The oil pump assembly (10), consists of an oil pressure pump and a scavenge pump incorporated in a common housing, and the oil thermostatic switch. The oil pump assembly serves to provide lubricating oil under pressure to the accessory drive section and the turbine-compressor sump, and to return oil and entrained air to the oil tank assembly.

(a) Oil pressure pump. The oil pressure pump is a two-gear positive displacement type that is driven with the scavenge pump by a common shaft connected to the accessory drive section. An internal oil pressure regulator valve of the spring-loaded type regulates the oil pressure pump oil outlet pressure to 90 10 psig (pounds per square inch gage). The outlet of the oil pressure pump is connected to the oil filter assembly.

(b) Scavenge pump. The scavenge pump is a three-gear positive displacement type and functions to scavenge lubricating oil and entrained air from the accessory drive section and the turbine-compressor sump, and to return the lubricating oil to the oil tank assembly through the oil cooler.

(c) Oil thermostatic switch. The oil thermostatic switch is installed on the oil pump

assembly as a warning device which closes at 250°F (degrees Fahrenheit) to illuminate a high oil temperature warning lamp on the Launching Station remote control panel during Launching Station FMTS or OMTS van operation of the generator set.

(3) *Oil filter assembly.* The oil filter assembly (19), consists mainly of the housing filter element, and filter cover. The filtered lubricating oil outlet is fed from the oil filter housing to the accessory drive section and the oil jet assembly in the compressor section. A 50 to 55 psig safety bypass valve is built into the oil filter housing to provide a safety bypass of lubricating oil in the event that the oil filter becomes clogged.

(4) *Oil pressure sequencing switch.* The oil pressure sequencing switch (8), is actuated by the lubricating oil pressure to energize the ignition system and the fuel solenoid valve when the oil pressure is sufficient to protect the engine bearings and gears during start-up. The oil pressure switch is adjusted externally to actuate between 2.5 and 3.5 psig.

(5) *Low oil pressure switch.* The low oil pressure switch (7), is a protection device which causes the generator set to automatically shutdown if the lubricating oil pressure drops to 35 psig. The low oil pressure causes shutdown by de-energizing the fuel solenoid valve.

(6) *Tubular oil cooler and cooling air duct.* The tubular oil cooler (5) consists of mechanically bonded aluminum tubes housed in a shell with connecting cooling air duct (4). A cooling air fan assembly (3) draws fresh air through the air inlet screen and forces the cooling air through the duct to the oil cooler. The cooling air flows through the tubes of the oil cooler and cools hot lubricating oil circulated around the tubes. The hot lubricating oil is forced through the oil cooler by the scavenge pump and returned to the oil tank assembly.

f. Electrical System. The electrical system consists mainly of the 24v (volts) dc power circuit. electrical (generator) and engine controls instruments panel assemblies, starter circuit, ignition circuit, tachometer-generator, ac generator circuits, holding and control circuits, fire detection circuit, and battery winterization equipment.

(1) *24V DC power circuit.* The 24v dc power circuit consists of two series connected 12v dc batteries (15) and a 15-amp (amperes) battery charger located behind the lower front panel assembly (14, fig. 1-1). The 24v dc power circuit provides the dc power required to operate the fuel boost pump motor, fuel solenoid valve, start relay, starter motor, ignition circuit, holding and control circuits, and the battery winterization equipment. Primary application of 24v dc power is controlled by a master switch located on the engine controls instruments panel assembly. Two circuit breakers are provided on the engine controls instruments panel assembly; one protects dc circuits internal to the generator set; the other is peculiar to the Launching Station usage and protects circuits external to the generator set through receptacle J27. The 15-amp battery charger is of the transformer-rectifier type with a regulated and adjustable output. It is powered by the ac generator to recharge the batteries. A slave receptacle located on the generator set enclosure permits connection of an external 24v dc power source for starting the generator set in the event of battery failure. It also permits connection of external 24v dc battery charger for recharging weak batteries when the generator set is not operating. Although the battery charger has a capacity of 15 amps, only 10 to 11 amps will actually be available for charging the batteries; the other 4 to 5 amps are required to operate the fuel boost pump motor and dc control circuits. The battery charger is self-limiting at about 15 amps and cannot be seriously overloaded; it has an integral fuse for protection against accidental reversal of battery polarity. The charger is temperature compensated to automatically provide proper charging voltage over a wide range of ambient temperatures.

(2) *Electrical and engine controls instruments panel assemblies.* The electrical and engine controls instruments panel assemblies (16 and 17, fig. 1-1) contain circuit breakers other than the main circuit breaker (power output), switches, adjustment screws, indicator lamps, and panel instruments for starting and operating the generator set. Switches and adjustment screws are also provided to adjust the generator set for operation in parallel with another unit, and for remote operation. The panel assemblies are weather proof and need no protection from weather during operation of the generator set. However, a hinged instrument panel protective door assembly (9) is provided for mechanical protection during transportation of the generator set and to serve as a heat and blast shield for the instruments, when the unit is used on the Launching Station.

(3) *Starter circuit.* The starter circuit consists of a start relay (14, fig. 1-3) and a starter motor assembly (19, fig. 1-1). The starter motor assembly has three pawls and a clutch mechanism mounted on the starter shaft drive end to engage with a rachet on the accessory drive section. The pawls are spring-loaded and are in the retracted position until the starter motor is operated. The master switch, when in the START position, actuates the start relay, which applies 24v dc power to the starter motor. When the starter motor is operated, the

inertia of the pawls and cage overcome the spring load and forces the pawl teeth inward to engage with the ratchet. The torque is absorbed by the clutch mechanism which slips to prevent damage that may result due to shock at initial engagement. The starter motor operates until the engine rpm is 35 percent, at which time the start relay is de-energized by the centrifugal switch assembly through the holding and control circuit. The starter motor cannot be re-engaged when the generator set is at operating speed.

(4) *Engine ignition circuit.* The ignition circuit consists of the ignition unit, igniter plug electrical lead assembly, and the igniter plug. The ignition unit (mounted above the oil tank assembly on the side of the compressor inlet plenum) is a capacitor discharge type that provides high voltage to the igniter plug through the igniter plug electrical lead assembly, until the engine reaches 95 percent rpm during acceleration. The engine oil pressure increases to approximately 3 psig to close the oil pressure switch when the engine rpm reaches 10 to 15 percent during engine acceleration. The closing of the oil pressure switch applies dc power to the ignition unit and fuel solenoid valve. The igniter plug produces an intermittent high voltage spark to initiate combustion of the fuel mixture in the combustor chamber. At 95 percent rpm the centrifugal switch assembly de-energizes the ignition unit and combustion is self-sustained in the combustor chamber.

(5) *Tachometer-generator.* The tachometer-generator (11, fig. 1-3) is a two-pole, three phase ac generator that is mounted on the oil pump assembly and driven from the engine accessory drive section. The tachometer-generator provides an ac output signal, frequency of which is proportional to engine speed. The ac signal energizes the tachometer indicator on the engine controls instruments panel assembly.

(6) *AC generator circuit.* The ac generator circuit consists of the ac generator (with exciter), a voltage adjusting rheostat (on the electrical controls instruments panel assembly), voltage droop adjusting rheostat (behind the electrical controls instruments panel assembly), a current transformer (voltage droop), voltage regulator assembly, and ac generator protection circuits.

(a) AC generator protection circuits. The ac generator protection circuits protect the ac generator and electrical loads from damage caused by overvoltage, undervoltage, and short circuit conditions external to the generator set. When any of these conditions occur, control relays are energized to open the main circuit breaker. In addition, if an overvoltage occurs, control relays are energized to remove exciter excitation, causing the alternator output to drop approximately to zero. This condition is indicated by an amber light on the electrical controls instruments panel assembly. A manual reset switch is provided on the electrical controls instruments panel assembly to permit recovery of excitation after cause of overvoltage has been determined. Action of any of the engine protective devices (overspeed, underspeed, low oil pressure, high exhaust temperature) and the fire detectors will also cause the main circuit breaker to open (directly or indirectly).

(b) Load anticipator assembly. This assembly is located within the generator set enclosure immediately behind the engine controls instruments panel assembly. It is used in conjunction with the fuel control system to provide the following functions:

1. Through use of watt sensing circuits, it supplies a signal to the governor trim motor on the fuel control unit to change fuel flow immediately upon change in load. In other words, it is not necessary for the engine speed to change before a corresponding change takes place in fuel flow to accommodate the load change. This means that the governor system will have a very rapid response and that frequency transients which result from load changes will be minimized.

2. In conjunction with the frequency adjusting potentiometer on the electrical control panel, the load anticipator, by varying the steady-state current in the governor trim motor, will permit the frequency of the generator set output to be adjusted at any value, as may be required, within the range of 388 to 412 cps (minimum band of adjustment). It will also permit readjustment to 400 cps if output frequency is incorrect.

3. When the UNIT-PARALLEL switch is placed in the PARALLEL position, the mode of operation of the watt sensing circuits mentioned in *1* above, changes. The anticipator watt sensing circuits no longer have a primary function to minimize frequency transients. They will act to cause generator frequency to droop as load is added to the generator set. Amount of droop (difference between no-load and full-load frequency) is adjustable (by means of a rheostat behind the electrical controls instruments panel assembly) to 3 percent or more. Speed droop on each generator set is required to permit satisfactory load division of model GTGE 70-6-1 generator sets operated in parallel; further each generator set must have about the same amount of droop, that is, about 3 percent.

4. The load anticipator is provided with a gain adjust potentiometer which is accessible when the engine control panel is opened.

NOTE

Setting of this potentiometer is a factory adjustment; it should not be disturbed or tampered with by organizational or direct support or general support maintenance personnel.

(7) *Holding and control circuits.* The holding and control circuits consist of relays and switches which automatically control the sequence of events for engine start, acceleration, and full speed operation of the engine, and for automatic shutdown of the engine and ac generator if a malfunction should occur. A detailed description of the holding and control circuits is given in Direct Support and General Support maintenance instructions of TM 5-6115-320-34.

(8) *Fire detection circuit.* The fire detection circuit consists of four strategically located thermal actuated detectors in the generator set enclosure, which energize a fire detection relay. The fire detection relay de-energizes the fuel solenoid valve to shut down the engine when a fire detector is actuated by the flame of a fire or if extremely high temperatures exist within the enclosure for any other reason.

(9) *Battery winterization equipment.* The battery winterization equipment consists of a battery electrolyte temperature sensor (16), an internal combustion battery heater (12), an insulated battery box assembly (17), and connecting ducts and piping. The winterization equipment serves to permit warmup of the batteries in preparation to starting the generator set at extremely low ambient temperature (—25° F and below). It also serves as a means whereby the generator set batteries may be kept warm to keep the generator set in a stand-by condition (ready to start on demand) for a period of at least 12 hours at ambient temperatures down to minus 65° F. The winterization equipment may be used at temperatures above minus 25° F, but such usage will generally not be necessary.

(a) Battery electrolyte temperature sensor. The battery electrolyte temperature sensor (16) is a transistorized, thermistor controlled temperature sensing device used to automatically control the operation of the battery heater during extreme cold ambient temperatures. The sensor is mounted in place of a battery vent cap, with a thermistor probe extending into the battery electrolyte to monitor the electrolyte temperature. The sensor energizes a temperature control relay to turn on the battery heater when the electrolyte temperature decreases to 0° F. The temperature control relay is de-energised when the electrolyte temperature increases to 20° F. Primary power (24v dc) for the sensor and temperature control relay is controlled through a winterization heater switch on the electrical controls instruments panel assembly.

(b) Internal combustion battery heater. The internal combustion battery heater (12) provides heated air to the battery box assembly (17). Fresh air is drawn around a combustion chamber within the heater by an electrically driven fan and is ducted to the bottom of the battery box assembly. The heated air circulates within the battery box to heat the batteries. Heater circuitry is protected by a circuit breaker on the electrical controls instruments panel assembly. There are two (alternate) capped outlets in the generator set enclosure for discharge of the heater exhaust. One is in the bottom of the generator set and is accessible only from underneath. The other is on the left side of the unit forward from the fuel inlet fitting. Uncap the outlet best suited for the particular application involved, before operating the heater; leave the other opening capped.

(10) *Wiring.* Except for the large starter circuit cables, all dc wiring energized from the battery is red or has a red tracer for identification purposes.

1-7. Identification and Tabulated Data

a. Identification Plates. The generator set and its major components have 19 major identification plates and 5 information plates. The information contained on these plates is given in (1) through (23) below.

(1) *Corps of Engineers identification plates.* Two Corps of Engineers identification plates are installed on the upper front corner of the generator set enclosure assembly left side. The plates provide the official nomenclature, stock number, serial number, Corp of Engineers model number, manufacturer's name and model number, shipping dimensions and weight, and electrical capacity.

(2) *Corps of Engineers ac generator identification plate.* The Corps of Engineers ac generator identification plate is installed on the lower front of the generator set enclosure assembly right side. The plate provides the official nomenclature, manufacturer's name and model number, electrical outputs, and inner shaft assembly rpm.

(3) *Tubular oil cooler identification plates.* Two oil cooler identification plates are installed on the side of the oil cooler housing. The plates provide the manufacturer's name, address, part number, model number, and nomenclature.

(4) *Starter motor assembly identification plates.* Two starter motor assembly identification plates are installed on the side of the motor housing of the starter motor assembly. One plate is applicable to the complete starter motor assembly (motor and clutch) and provides the manufacturer's name, address, part number, and

nomenclature. The second plate is applicable to the motor without the clutch and provides the manufacturer's name, address, nomenclature, model number, part number, voltage, amperage, duty cycle, horsepower, and rpm.

(5) *Ignition unit identification plate.* The ignition unit identification plate is mounted on the side of the ignition unit. The plate provides the manufacturer's name, address, part number, change number, order number, serial number, date, and operating warning.

(6) *Oil pressure sequencing switch identification plate.* The oil pressure sequencing switch identification plate is mounted on the side of the oil pressure sequencing switch, and provides the manufacturer's name, address, type number, serial number, and order number.

(7) *Low oil pressure switch identification plate.* The low oil pressure switch identification plate is mounted on the side of the low oil pressure switch and provides the manufacturer's name, address, part number, nomenclautre, pressure rating, and serial number.

(8) *Tachometer indicator identification plate.* The tachometer indicator identification plate is mounted on the end of the tachometer indicator housing and provides the manufacturer's name, nomenclature, stock number, contract number, serial number, manufacturer's part number, and the MS number.

(9) *Oil pressure gage identification plate.* The oil pressure gage identification plate is mounted on the back end of the oil pressure gage and provides the manufacturer's name, nomenclature, part number, serial number, and the applicable Military Specification.

(10) *Tachometer-generator identification plate.* The tachometer-generator identification plate is mounted on the end of the tachometer-generator housing and provides the nomenclature, pole type, AN part number, manufacturer's name, address, and part number.

(11) *Exhaust gas temperature thermoswitch identification plate.* The exhaust gas temperature thermoswitch identification plate is mounted on the end of the switch housing and provides the manufacturer's name, address, part number, and model number.

(12) *Gas turbine engine identification plate.* The gas turbine engine identification plate is mounted on the ignition unit bracket on the left side of the engine compressor inlet plenum. The plate provides the manufacturer's name, address, part number, series number, and model number.

(13) *Battery heater identification plate.* The battery heater identification plate is mounted on the side of the battery heater housing. The plate provides the manufacturer's name, address, model number, btu output, air output, volts, amps, and serial number.

(14) *Voltage regulator assembly identification plate.* The voltage regulator assembly identification plate is mounted on the end of the regulator beneath the electrical connector. The plate provides the manufacturer's name, address, nomenclature, voltage rating, frequency rating, part number, style, and contract number.

(15) *Fuel boost pump and motor assembly identification plates.* The fuel boost pump and motor assembly identification plates are mounted on top of the pump housing and the motor housing. The plates provide the manufacturer's name, address, motor part numbers, motor rating, amperes, rpm, volts dc, and the motor frame number.

(16) *Contactor (main circuit breaker) identification plate.* The contactor identification plate is mounted on the side of the contactor. The plate provides the manufacturer's name, address, type of contactor, part number, type of contacts, rating of contacts in amperes and volts, coil voltage, coil frequency, and coil rating.

(17) *Overcurrent sensing relay identification plate.* The overcurrent sensing relay identification plate is located on the side of the relay. The plate provides the manufacturer's name, address, part number, type of contacts, voltage, and frequency rating.

(18) *Transformer rectifier unit identification plate.* The transformer rectifier unit identification plate is mounted on the end of the transformer rectifier unit adjacent to the electrical connector. The plate provides the manufacturer's name, address, nomenclature, voltage input, frequency, phase, amperage and voltage output, model number, and customer's name.

(19) *Engine lubrication instruction plate.* The engine lubrication instruction plate is mounted on the oil tank assembly adjacent to the fill spout. The plate specifies recommended oil change periods, oil capacity, oil specifications, and minimum starting temperature.

(20) *Operating instructions plate.* The operating instructions plate is mounted on the upper-right front of the generator set enclosure adjacent to the instrument panel protective door assembly. The operating instructions plate provides the basic operating instructions.

(21) *Voltage change panel instructions plate.* This plate is located on the voltage change panel access door and shows how ac generator windings are connected for 120/208 or 240/416 volts output.

(22) *Plumbing schematic.* The plumbing schematic is located on the handbook compartment

door of the enclosure left hand side door assembly. The schematic shows the engine main fuel system and the winterization battery heater fuel system. The schematic also shows the oil flow of the engine oil system and a legend to identify the major components of each system.

(23) *Control circuit wiring diagram.* The control circuit wiring diagram is located on the enclosure left hand side door assembly adjacent to the handbook compartment. It shows the electrical control circuits of the generator set.

b. Tabulated Data.

(1) *Generator set.*

Manufacturer	Airesearch Mfg Div (manufacturing division), Phoenix, Arizona
Model	GTGE 70-6-1
Type	Enclosed

(2) *Gas turbine engine.*

Manufacturer	Airesearch Mfg Div, Phoenix, Arizona
Type	Gas Turbine
Model	GTP 70-50
Full-load speed	40,800 ± 100 rpm
No-load speed	40,800 ± 100 rpm
Output shaft speed	6000 rpm
Compressor	Two stage, centrifugal flow
Turbine	Single stage, radial flow
Exhaust gas temp (steady-state, 45 kw (kilowatt) output on generator	1,200° F max
Operating oil pressure	90 ± 10 psig
Electrical system	24v dc (negative ground)
Rated power	75 hp (horsepower) min (minimum)
Fuel consumption rate (nominal for steady-state, 45 kw output on generator)	100 lbs/hr (pounds per hour; 15.4 gallons per hour)

(3) *AC generator.*

Manufacturer	General Electrical Co (company)
Manufacturer (alternate)	Bendix Corp (corporation), Redbank Div
Type	Brushless
Model	2CM355B2
Model (Bendix Corp, Redbank Div-alternate)	28B190-1A
Operating speed	6000 rpm
Kw rating (with engine; 8000 ft elevation)	45
Kw rating (generator only)	60
Kva (kilovolt- amperes) rating (with engine; 8000 ft elevation)	56
Kva rating (generator only)	75
Volts	120/208, 240/416
Frequency	400 cps
Phase	3
Power factor	0.80 (lagging)
Excitation	Self-excited
Type of connection	Four-wire wye
Cooling	Blast air with internal fan

(4) *AC generator voltage regulator assembly.*

Manufacturer	General Electric Co
Manufacturer (alternate)	Bendix Corp, Redbank Div
Model	352020BR129-B1
Model (bendix Corp, Redbank Div—alternate)	20B105-1

(5) *Internal combustion battery heater.*

Manufacturer	Benmar Co
Type	Internal combustion
Model	AP-2030
Output	20,000 btu/hr (British thermal units per hour)
Fresh air delivery	100 cfm (cubic feet per minute)
Operating voltage	24v dc
Operating power requirement	72w (watts)
Fuel burning rate	11 to 13 cc/minute (cubic centimeters per minute; 0.11 to 0.21 gallon per hour)
Fuel	Multifuel

(6) *Heater electric fuel pump.*

Manufacturer	Bendix Aviation Corp, Eclipse Machine Div
Type	Pulsating
Volts	24v dc
Operating pressure	7½ psig

(7) *Battery (2).*

Type	Lead-acid, auto
Part number	MS35000-1
Ampere-hours	45
Voltage	24 (two 12 volt batteries connected in series)
Specific gravity (full charge at 68° F)	1.285
Weight (filled)	36 lbs (pounds) per battery

(8) *Battery charger assembly.*

Manufacturer	General Motors Co, Delco-Remy Div
Type	Transformer-rectifier, regulated
Model	110173
Input	120V ac, single phase, 400 cps
Output volts	28 volts dc (nominal)(adjustable 26 to 30v dc regulated)
Output current	15-amps max (maximum)

(9) *Fuel boost pump and motor assembly.*

Manufacturer	J. S. Barnes Co
Type	Electrical motor driven rotary gear type with internal bypass
Model	GC-1242-A3
Volts	24v dc
Current requirement	1.8 amps
Discharge pressure	15.0 psig max (preset)
Flow rate	130 lbs/hr at —59° F (20 gal/hr)
Pumping rpm	2000

(10) *Main fuel filter assembly.*

Manufacturer	AC Sparkplug, Div of General Motors Corp
Type	Replaceable element
Part number	854924
Filtration rating	10 micron
Element service life	125 hrs (operating time)

(11) *Battery heater fuel filter assembly.*

Manufacturer	Bendix Corp, Skinner Div
Type	Replaceable element
Part number	450-0
Filtration rating	10 micron
Element service life	125 hrs

(12) *Oil filter assembly.*

Manufacturer	Military Standard MS28720-12
Capacity	12 gals (gallons) per minute
Element	Replaceable micronic line type
Element service life	125 hrs

(13) *Tubular oil cooler.*

Manufacturer	Airesearch Mfg Div, Los Angeles, California
Model number	OCTA100-41-1
Capacity	48 degrees differential between inlet and discharge oil temperature for 180 gal/hr (gallons per hour)

(14) *Starter motor assembly.*

Manufacturer	Airesearch Mfg Div, Los Angeles, California
Motor model number	DCM40-13-1
Voltage	24v dc
Amperage	135 amps
Horsepower	1.5
RPM	5000
Duty cycle	1 minute on and 4 minutes off

(15) *Start relay.*

Manufacturer	Cutler-Hammer Inc
Model number	6042H1S2
Type	4 pole, double throw
Nominal voltage rating	24v dc
Actuating current	5 amps
Continuous current carrying capacity	200 amps
Maximum inrush amperage	1200 amps

(16) *Ignition unit.*

Manufacturer	General Laboratory Associates, Inc (incorporated)
Part number	75425
Voltage range	14 to 30v dc
Input current	2.0 amps (max)
Minimum spark rate	1 per sec at 14 volts
Maximum spark rate	5 per sec at 30 volts
Minimum stored energy	0.7 joules per spark

(17) *Igniter plug.*

Manufacturer	Airesearch Mfg Div, Phoenix, Arizona
Part number	75153
Type	High voltage annular air gap

(18) *Battery electrolyte temperature sensor.*

Manufacturer	Airesearch Mfg Div, Phoenix, Arizona
Part number	305164-1
Actuation (turn-on)	0° F
Deactuation (turn-off)	20° F

(19) *Voltmeter.*

Manufacturer	Weston Instruments and Electronics Div of Daystrom Inc
Part number	182324
Nominal input frequency	400 cps
Scale range	0 to 500v ac
Normal reading (meter red index Marks)	Low voltage: 120 volts line-to-neutral 280 volts line-to-line High voltage: 240 volts line-to-netural 416 volts line-to-line

(20) *AC ammeter.*

Manufacturer	Weston Instruments and Electronics Div of Daystrom Inc
Part number	196133
Scale range	0 to 125 pct (percent) of rated current
Normal Reading	0 to 100 pct

(21) *Oil pressure gage.*

Manufacturer	U. S. Gauge Co
Part number	AW1814AB06
Range	0 to 200 psig
Normal reading	80 to 100 psig

(22) *Time totalizing meter.*

Manufacturer	Airesearch Mfg Div, Phoenix, Arizona
Type	Direct reading
Recording range	0 to 999.9 hrs
Voltage range	24 to 38v dc

(23) *Tachometer indicator.*

Manufacturer	Norden-Ketay Corp, (Military Specification MS28000-1)
Dial range	0 to 110 pct rpm
Normal reading	100 ± 2 pct

(24) *Start counter.* Start counts are not required on this equipment and all maintenance will be conducted on hours of operation.

(25) *Exhaust gas temperature gage.*

Manufacturer	Lewis Engineering Co
Part number	149E31J
Scale range	0°F to 1800°F

Normal readings	1150° F max (during engine acceleration) 1200° F max (during steady-state, full-load engine operation) 1225° F max absolute (colored green from 0° F to 1225° F; colored red from 1225° F to 1800° F)

(26) *Frequency meter and transducer (matched set).*

Manufacturer	Weston Instruments and Electronics Div of Daystrom Inc
Part number (transducer)	182873
Part Number (frequency meter)	196999
Scale range	388 to 412 cps
Normal reading	400 ± 1 cps (index marked red at 400 cps).

(27) *Wattmeter and thermal watt converter (matched set).*

Manufacturer	Weston Instruments and Electronics Div of Daystrom Inc
Part number (wattmeter)	196132
Part number (thermal watt converter)	182858
Scale range	0 to 60 kw
Normal reading	0 to 45 kw (scale colored red from 45 to 60 kw)

(28) *Frequency adjust potentiometer.*

Type	RA30LASD352A
Range	0 to 3.5K ohms (1000 ohms)
Wattage	12.5W

(29) *Voltage adjust rheostat.*

Part number	MS91428
Type	RP11-1-SD-351-JJ
Range (General Electric Co voltage regulator)	0 to 350 ohms
Wattage	12.5W

(30) *Voltage droop adjust rheostat.*

Part number	MS91430
Type	RP16-1-SD-250-JJ
Range	0 to 25 ohms
Wattage	25W

(31) *Frequency droop rheostat.*

Part number	MS91428
Type	RP11-1-SD-352-JJ
Range	0 to 3.5K ohms
Wattage	12.5W

(32) *DC ammeter.*

Manufacturer	Weston Instrument and Electronics Div of Daystrom Inc
Part number	196910
Scale range	(Red) 10-0-20 (green)
Normal reading	+2 to +11 amps

(33) *Capacities.*

Lubrication system	4 qts (US quarts)

(34) *Dimensions and weight (fig. 1-1).*

Overall length (with skid base)	81.0 in. (inches)
Overall length (without skid base)	79.0 in.
Overall width	36.0 in.
Overall height (with skid base)	30.0 in.
Overall height (without skid base)	27.0 in.
Gross weight	995 lbs (nominal)

CAUTION

General Electric and Bendix components cannot be mixed. AC generator, voltage regulator, voltage adjusting rheostat, and current transformer (voltage droop-CT4) may be interchanged as a set.

(35) *Wiring diagram.* Refer to FO-1 (Located in back of manual) for wiring diagram of generator set.

(36) *Schematic wiring diagram.* Refer to figure FO-2 (Located in back of manual) for schematic wiring diagram of generator set.

(37) *Base plan.* Refer to figure 1-4 for base plan of generator set for Launching Station installations.

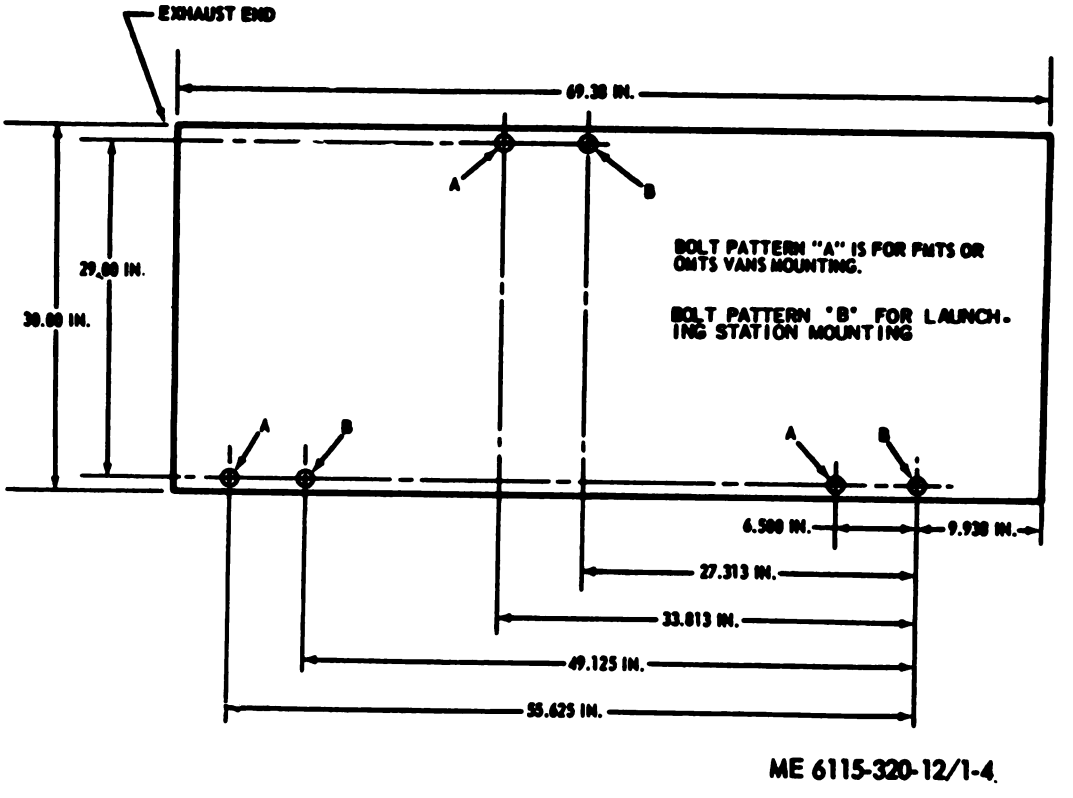


Figure 1-4. Base plan for launching station installation.

1-8. Difference in Models

This manual covers only the model GTGE 70-6-1 generator set. A difference exists in the wiring covering, serial number P21468 and up. See figure FO-2, sheets 6 of 7 and 7 of 7.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. Inspecting and Servicing the Equipment

a. Inspection.

(1) Inspect the identification plate for positive identification of the generator set.

(2) Make thorough inspection of the generator set for any damage that may have occurred during shipment.

(3) Compare the equipment with the packing list to make certain that all items are accounted for and are in serviceable condition.

(4) Inspect the entire unit carefully for loose and missing hardware.

(5) Insure that engine, engine accessories, ac generator, battery heater, and electrical components are securely mounted and undamaged.

b. Unit Service.

(1) Perform the daily and weekly preventive maintenance services (para 3-3).

(2) Remove all tags and tape, cloth, and other barrier material.

(3) Lubricate the engine of the generator set in accordance with the instructions in the current lubrication order for the engine.

(4) Correct all deficiencies that are found or report the conditions to organizational maintenance.

c. Battery Service.

(1) The electrolyte for the battery is shipped in a separate container. When the unit is ready for operation, unpack the electrolyte, remove the battery vent caps, and fill each cell of the battery to the proper level with electrolyte. The correct level is 3 / 8 inch above the plates. Install the vent caps.

(2) Install the battery cables, making certain that the correct polarity is observed.

WARNING

When servicing the battery, do not smoke or use an open flame in the vicinity. Batteries generate a highly explosive gas.

(3) For continued routine battery service instructions, refer to TM 9-6140-200-15.

WARNING

Use extreme care when handling electrolyte. Electrolyte contains sulfuric acid and will cause severe burns upon contact with the skin. If electrolyte comes in contact with the skin, clothing or painted surfaces, immediately flush the area with water to wash away all traces of acid.

2-2. Installation.

a. Location.

(1) Locations where generator set may be exposed to high humidity, sand, or dust should be avoided whenever possible. Moisture condenses on generator parts and electrical controls and may cause corrosion. Corrosion can seriously affect operation and efficiency of generator set. Sand, dust, and dirt shorten life of generator set parts and cause mechanical failure.

(2) Locate generator set where there is at least 30 in. clearance on the left hand side (service access); this clearance is also advisable for the right hand side, but is not mandatory. There should be at least 30 in. of unobstructed space at the front of the unit. The exhaust end of the unit should not be located closer than 4 ft from an obstructions and care should be taken to insure that no object will deflect the exhaust (which leaves the unit at an angle of about 45 degrees with the horizontal) back into the intake louvers in the lower front panel assembly. A sufficient amount of exhaust fumes drawn into the intake louvers will cause erratic operation or failure of the generator set.

(3) Locate the generator set on any reasonably level surface, but always make the set as level as possible.

NOTE

Do not operate generator set at an angle that exceeds 15 degrees from level position.

b. Outdoor Installation.

(1) *Ground connection.* Connect one end of a No. 6 wire to AC—DC EXTERIOR GROUND E-1 terminal (fig. 2-1) and other end to a ground electrode, such as underground water piping system or ground rod. The electrode must be ¾ in. minimum in diameter if piping system is used. If ground rod is used, it must be driven in earth to a depth of 8 ft. minimum and have ⅝ in. minimum diameter.

(2) *Fuel connection.* Remove cap from FUEL IN fitting (fig. 2-2) and connect a fuel line from an external fuel supply.

NOTE

The fuel supply must be within 25 ft horizontally and not more that 12 ft below FUEL IN fitting connection. When starting a new unit or a unit which has been idle for a long period of time, priming of the fuel system may be required (fig. 2-12).

NOTE

Be sure the fuel and its container are uncontaminated and clean (usual contaminates are water, dirt, fungus, gums, and so on). Contaminated fuel may cause erratic starting and operation, inability to carry load, and excessive maintenance. The fuel container should have a drain at the bottom to permit draining off of water, sludge, and so on.

(3) *Fuel schedule vent connection.* Remove cap from FUEL SCHEDULE VENT fitting (fig. 2-2). Install a drain line on FUEL SCHEDULE VENT fitting and extend line into suitable container.

(4) *Bleed air connection.* This fitting is the extreme left fitting shown on figure 2-2. It should be kept tightly capped except for applications which require its use. Failure to comply will result in loss of power and increased fuel consumption for the engine.

(5) *Launching Station special electrical connection panel.* The Launching Station special electrical connection panel (fig. 2-3) includes receptacles which permit utilization of the generator set in the Launching Station. These receptacles should be capped and thereafter ignored for all other applications of the generator set, except that a periodic check should be made to insure that the internally wired plug for REMOTE CONTROL SPECIAL J25 receptacle is firmly secured in place.

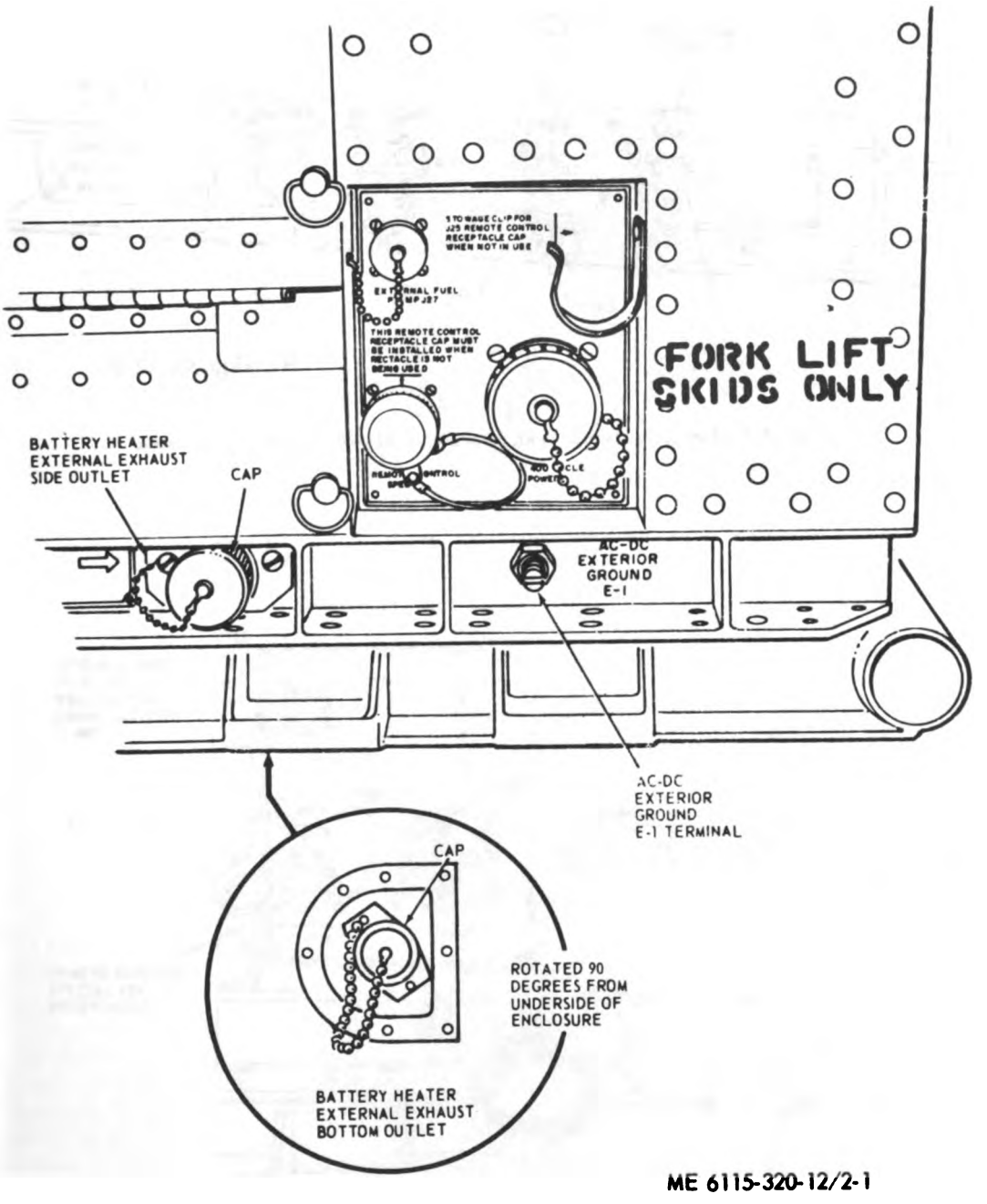


Figure 2-1. AC—DC exterior ground E-1 terminal connection and battery heater external exhaust outlets.

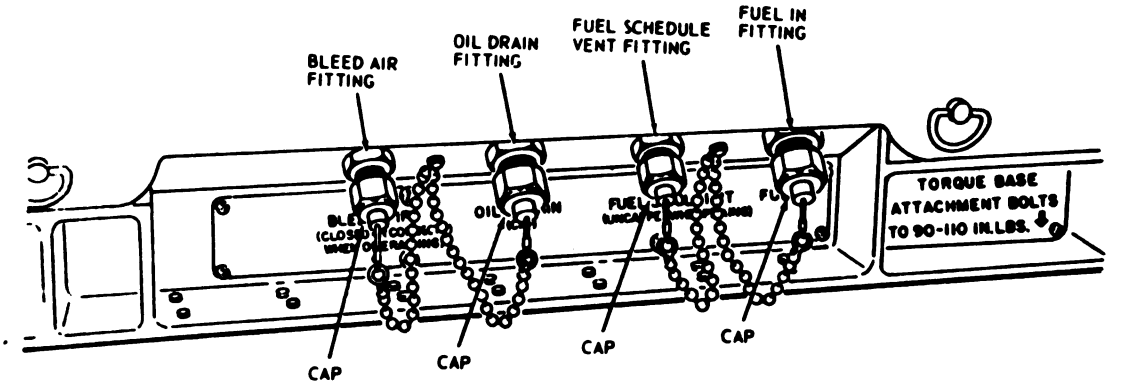


Figure 2-2. Fuel in, fuel schedule, vent, oil drain, and bleed air fitting connections.

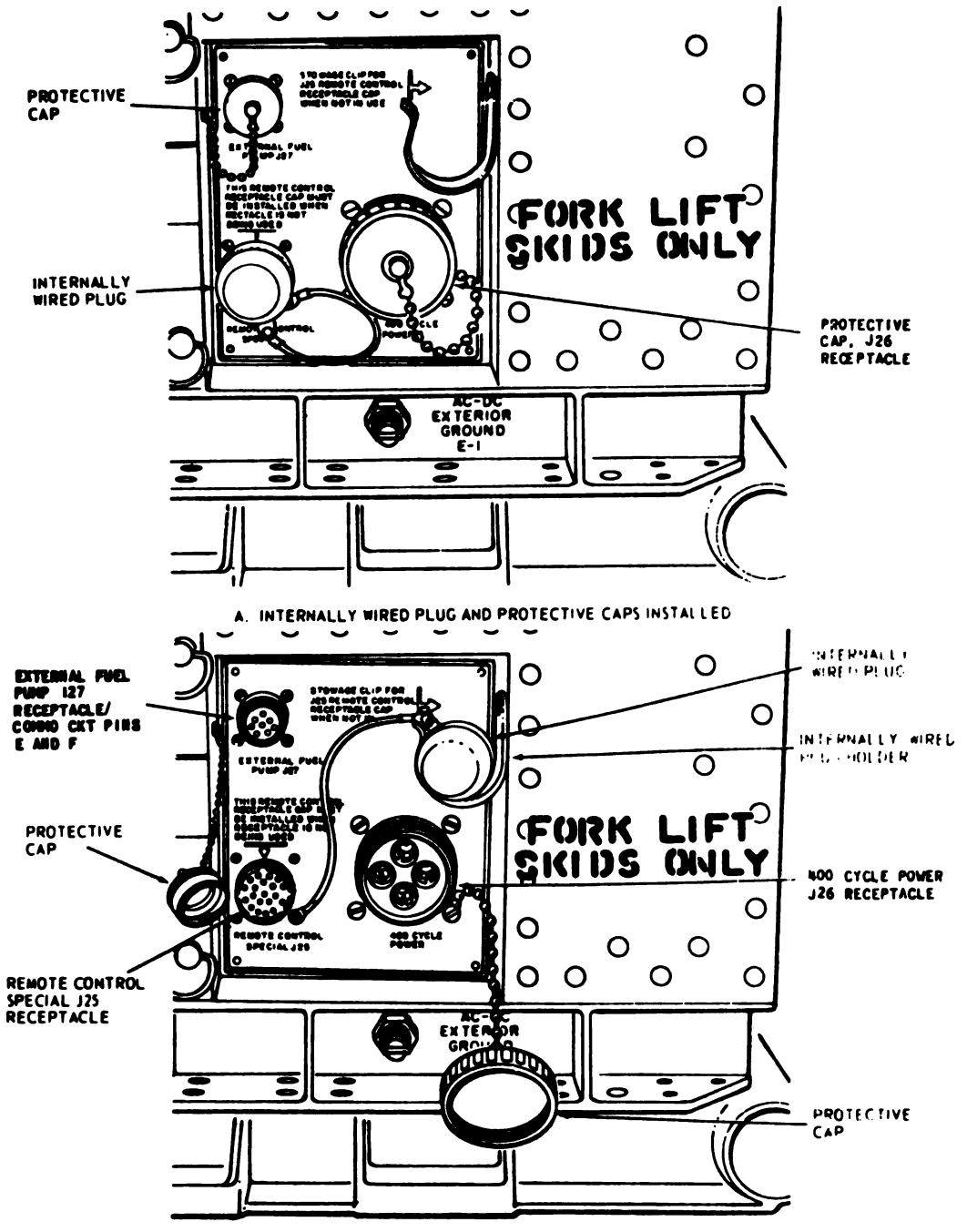


Figure 2-3. Launching station special electrical connection panel.

CAUTION

If the internally wired plug for REMOTE CONTROL SPECIAL J25 receptacle is not in place, the generator set main circuit breaker will close when the unit is started, and cannot be opened in a normal manner with the MAIN CB circuit breaker switch located on the electrical controls instruments panel assembly. Also, the main circuit breaker and generator control relay will cycle if a persistent overvoltage condition exists and an intermittent overvoltage will be applied to the electrical loads.

(6) *Load connections.* Connect leads from the load to the 400 CYCLE POWER J18 receptacle (fig. 2-4); or open the ac power panel access door (10, fig. 1-1) for the main power terminals and connect the leads thereto, after first feeding them through entrance holes (11), if the leads do not terminate in an electrical connector (plug). Close and fasten the access door. The receptacle and terminals both have capacity to carry the full output of the generator set for both possible connections of the generator windings.

(7) *24V DC slave receptacle J15.* Leave 24V DC SLAVE RECEPTACLE J15 (fig. 2-5) capped, except when necessary to charge generator set batteries in place, or when connecting an auxiliary power source as a starting aid (slave) when the generator set batteries are in a low state of charge.

CAUTION

Do not use this receptacle to supply dc power to external loads, since it will then be difficult to keep the batteries in a high state of charge, and starting reliability of the unit will be impaired.

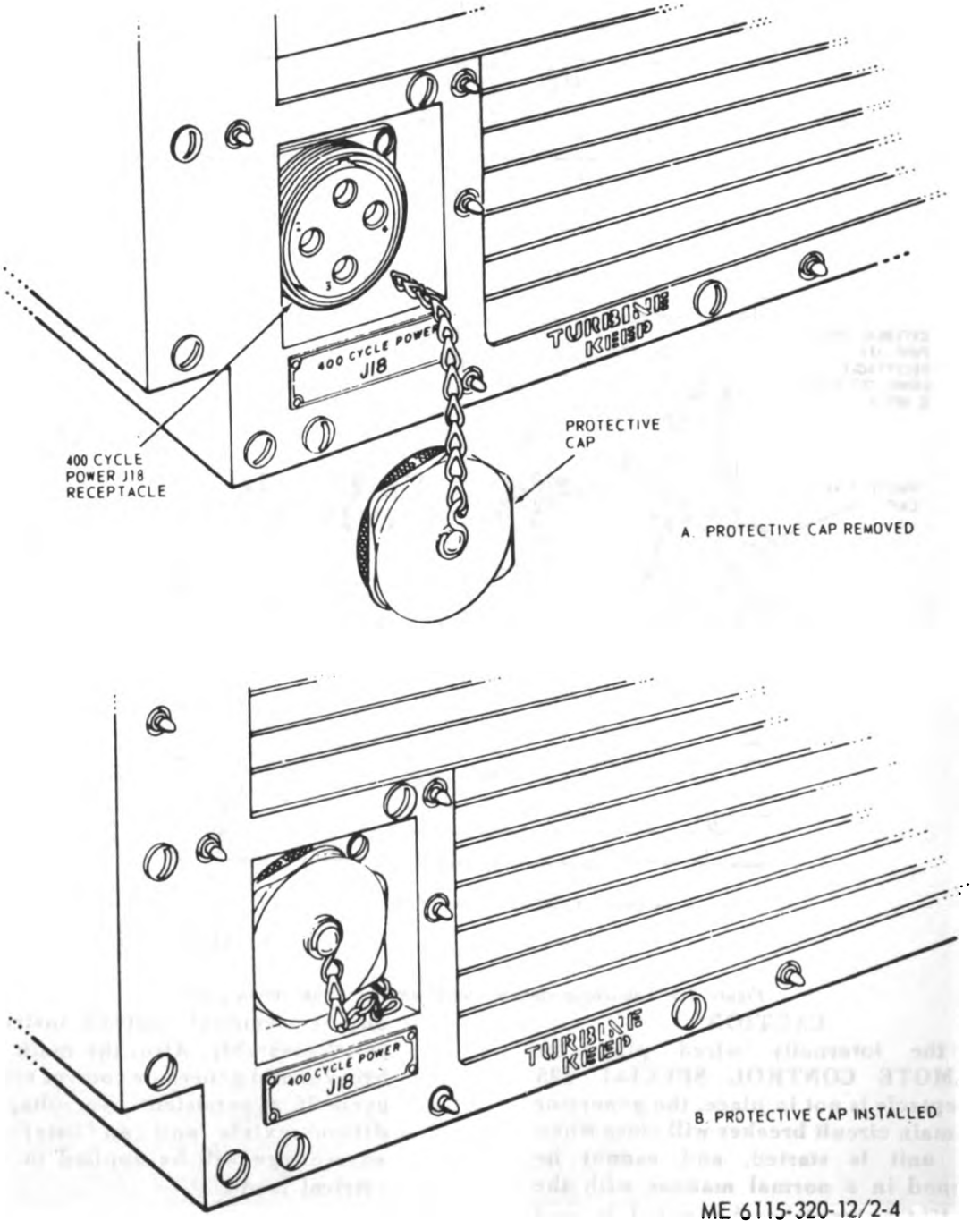


Figure 2-4. Multipurpose output receptacle.

(8) *Unit-parallel selector switch.*

(a) For applications wherein parallel operation is not required, the UNIT-PARALLEL selector switch (15, fig. 2-6) should be placed in the UNIT position, and ignored thereafter, except for a periodic check to insure that it has not been tampered with and inadvertently placed in the PARALLEL position. Failure to comply with these instructions will result in higher frequency and voltage regulation than is normal for single unit operation of the generator set.

(b) If parallel operation of two or more generator sets is required for any particular application, it will be necessary to deliberately increase the voltage and speed regulation by means of certain controls which are active only when the UNIT-PARALLEL selector switch (15) is in PARALLEL position. This increased voltage and frequency regulation is necessary to insure that the generator sets operated in parallel will share system load approximately equally. Before placing generator sets intended for parallel operation in use, perform 1 through 7 below for each set.

1. Refer to paragraph 2-8 and start generator set: allow generator set to warm up for approximately 15 minutes.

2. Place UNIT-PARALLEL selector switch (15) in PARALLEL position.

3. Loosen locknut on FREQUENCY ADJ screw (23) and adjust screw to obtain 412 hps no-load frequency indication on frequency meter (11). Tighten locknut without changing adjusted position of screw.

4. Loosen locknut on VOLTAGE ADJ screw (10) and adjust screw to obtain 216 or 432 volts (as appropriate) no-load line-to-line indication (CN-BC-CA) on voltmeter (9). Tighten locknut without changing adjusted position of screw.

5. Load generator set to 45 kw at 0.80 power factor (lagging); indication on voltmeter should decrease to 208 volts (or 416 volts, as appropriate): indication on frequency meter should decrease to 400 hps. If these indications are obtained, the generator set is correctly adjusted and no further adjustment is needed.

6. If voltage and frequency indications obtained under load are not 208 volts (or 416 volts) and 400 hps, respectively, open electrical controls instruments panel assembly (16, fig. 1-1) and locate VOLTAGE DROOP and FREQUENCY DROOP rheostats (with screw driver slots and locknuts). Loosen locknuts and adjust rheostats to obtain the required indications under load. Tighten locknuts without changing adjusted positions of rheostats.

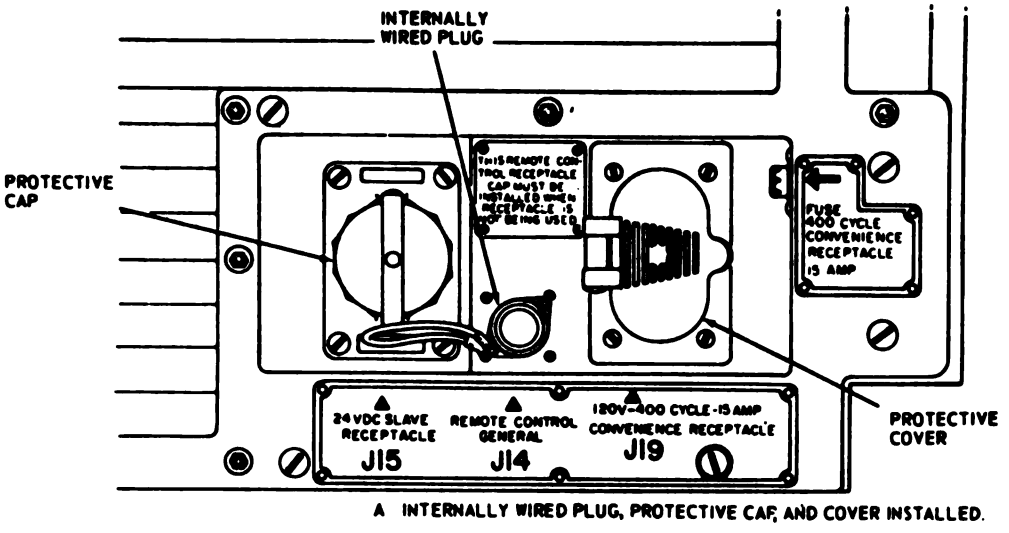
7. Once correct adjustment of VOLTAGE DROOP AND FREQUENCY DROOP rheostats have been made as described in *6* above, further adjustments of these rheostats will not be required for normal usage of the generator set.

8. Refer to paragraph 2-3 *b* for operating instructions for generator sets connected in parallel.

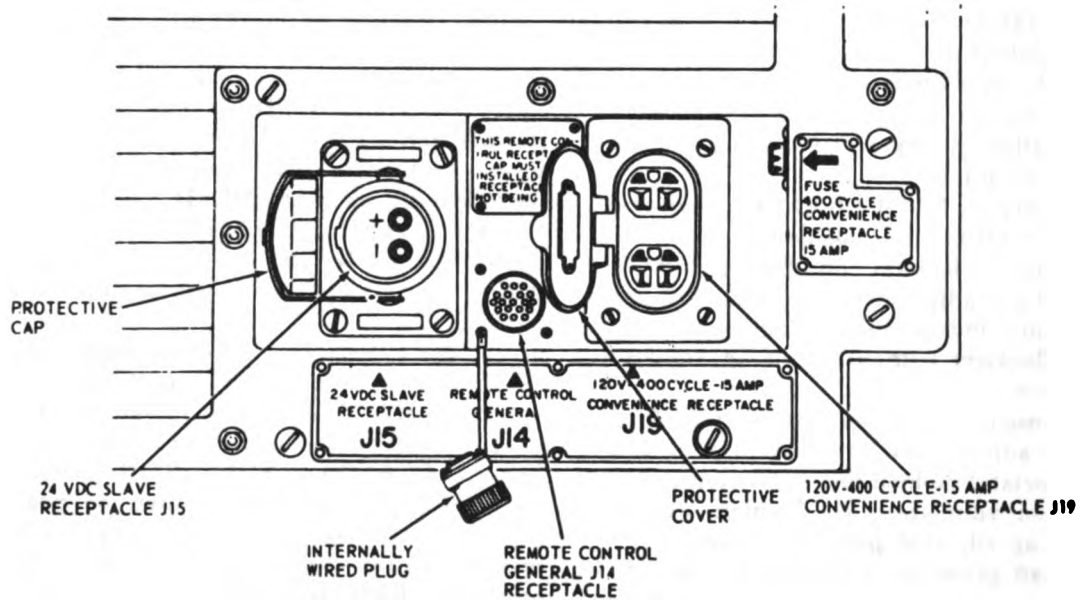
(9) *Remote-local control selector switch.*

(a) For applications wherein remote control is not required, place the REMOTE-LOCAL CONTROL SELECTOR switch in LOCAL position and ignore it, except for a periodic check to insure that it has not been tampered with and inadvertently placed in REMOTE position. Keep REMOTE CONTROL SPECIAL J25 and REMOTE CONTROL GENERAL J14 receptacles (fig. 2-3 and 2-5) capped with their internally wired plugs.

(b) If remote control of generator set is required, remove internally wired plug from J14 receptacle (fig. 2-5), connect remote control cable to J14 receptacle, and place the REMOTE-LOCAL CONTROL SELECTOR switch in the REMOTE position. It will then be possible to perform the following functions at a properly wired remote control station: start, stop, voltage adjustment, frequency adjustment, main circuit breaker operation, and monitoring of voltage and frequency.



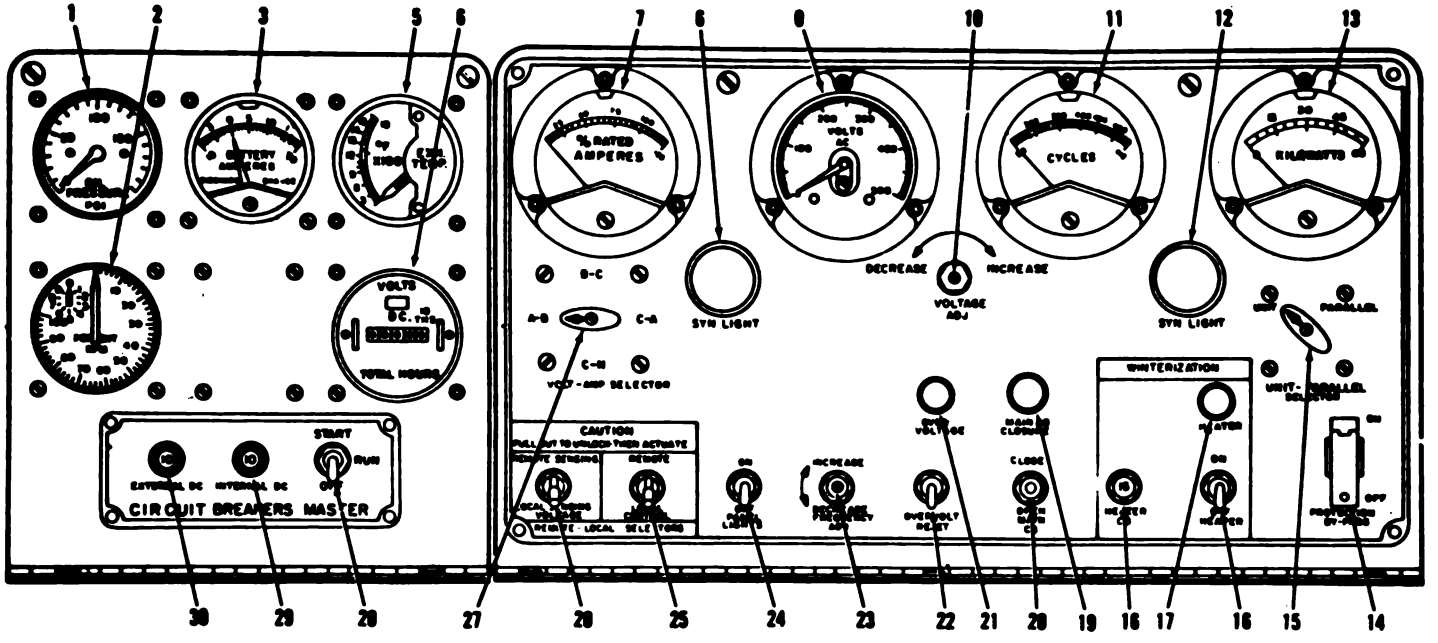
A INTERNALLY WIRED PLUG, PROTECTIVE CAP, AND COVER INSTALLED.



B. INTERNALLY WIRED PLUG, PROTECTIVE CAP, AND COVER REMOVED.

ME 6115-320-12-2-5

Figure 2-5. Multipurpose electrical connection panel.



1. Oil pressure gage (80 to 100 psig)
2. Tachometer indicator (10 to 15 percent, combustion occurs; 0 to 100 percent, oil pressure is increasing and should be 80 to 100 psig; 95 to 100 percent, generator set ready for load)
3. Battery charging ammeter (+11 amps after initial engine start; -2 to +5 amps after 2 hours of operation).
4. Start counter (0 to 9999) (Not required)
5. Exhaust gas temperature indicator (1200° F maximum during steady state operation at full load)
6. Time totalizing meter (0 to 9999.9 hours)
7. AC ammeter
8. SYN (synchronizing) LIGHT (lowest illumination level during parallel operation)
9. Voltmeter (red mark at 120, 208, 240, and 416 volt points)
10. VOLTAGE ADJ (adjust) screw
11. Frequency meter (400 ± 1 cps)
12. SYN (synchronizing) LIGHT (lowest illumination level during parallel operation)
13. Wattmeter (0 to 45 kilowatts)
14. PROTECTION BY-PASS switch (normally in OFF position)
15. UNIT-PARALLEL SELECTOR switch
16. WINTERIZATION HEATER switch
17. WINTERIZATION HEATER lamp (illuminated during heater operation)
18. WINTERIZATION HEATER CB (circuit breaker)
19. MAIN CB (circuit breaker) CLOSURE lamp (illuminates when main circuit breaker closes)
20. MAIN CB (circuit breaker) switch
21. OVER VOLTAGE lamp (extinguished)
22. OVER VOLT RESET switch
23. FREQUENCY ADJ (adjust) screw
24. PANEL LIGHTS switch
25. REMOTE-LOCAL CONTROL SELECTOR switch
26. REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch
27. VOLT-AMP SELECTOR switch
28. MASTER switch
29. INTERNAL DC CIRCUIT BREAKER reset button
30. EXTERNAL DC CIRCUIT BREAKER reset button

ME 6115-320-12/2-6

Figure 2-6. Controls and instruments.

CAUTION

(1) Keep REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) firmly capped with its internally wired plug; failure to comply will cause the main circuit breaker to close and it will not be possible to open it in a normal manner; it will cycle if the main circuit breaker switch is held in the open position or if a persistent overvoltage, under voltage, under frequency or short circuit conditions should happen to exist concurrently with the uncapped condition of receptacle J25; damage to the generator set or the load may result. (2) If the generator set controls are set for remote operation (REMOTE-LOCAL CONTROL SELECTOR switch (25, fig. 2-6) in REMOTE position), and the remote control station is not connected, the generator set will not start; if the remote control station is inadvertently disconnected while the set is in operation; it will shut down.

(10) *Remote-local voltage sensing selector switch.*

(a) If remote voltage sensing is not required, place REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch (26, fig. 2-6) in LOCAL SENSING position. Make a periodic check to determine that it is in LOCAL SENSING position.

(b) If application involved requires that generator set voltage regulator sense voltage at the load (because of excessive line drop in connecting load cables), place REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch in REMOTE position. Also, after removing the internally wired plug from REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5), connect voltage sensing leads from load through pins P, S, and R in J14 receptacle. These sensing leads should be brought to the generator set through a connector (plug) which mates with J14 receptacle and which has shorting connections between pins K and U, G and T, and H and N if local control of generator set and remote voltage sensing are employed concurrently. If remote control and remote voltage sensing are employed concurrently, remote sensing leads will be included in the remote control cable.

(c) If generator set is connected for high voltage output (240/416 volts), a three phase step-down transformer (2:1 ratio) must be located in the remote sensing lead circuit to provide 120/208 volts at pins P, S, and R of J14 receptacle.

CAUTION

If REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch is placed in REMOTE SENSING position without having remote sensing leads connected to the load, an overvoltage condition will occur when the main circuit breaker is closed; this will cause loss of excitation and may possibly damage the load equipment.

(11) *Convenience outlet connection.* The 120V-,400 CYCLE - 15 AMP CONVENIENCE RECEPTACLE J19 (fig. 2-5) is provided for hook-up of portable tools, drop-cord lights, and other such non-scheduled 120 volts, single phase, 400 hps loads. Open the protective cover and make connections as required, but do not exceed 15 amp total from this receptacle.

(12) *Plenum drain connection.* If conditions require, connect a drain line to PLENUM DRAIN fitting (fig. 2-7). Extend drain line into suitable container. This connection must not be blocked or capped.

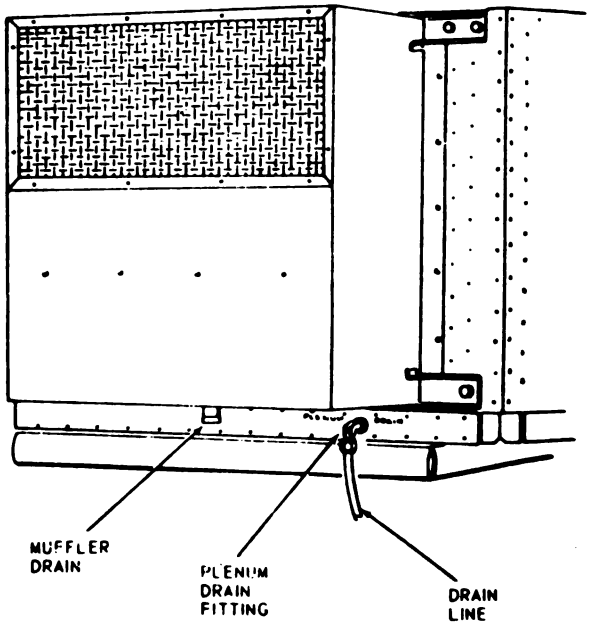


Figure 2-7. Plenum drain and muffler drain connections.

CAUTION

Insure that PLENUM DRAIN fitting is open to prevent accumulation of fuel in turbine plenum. Accumulation of fuel in turbine plenum may cause flaming start of the engine which could result in severe overtemperature and/or overspeed conditions causing extensive damage to the engine.

WARNING

Above condition could cause an explosion.

(13) *Muffler drain.* If conditions require, connect a drain line to muffler drain fitting (fig. 2-7) and extend line into suitable container.

c. Indoor Installation. The procedure for indoor installation of the generator set for multipurpose operation is the same as for outdoor installation described in *b* above.

WARNING

Do not operate generator set in an enclosed area unless exhaust gases are piped inside. Inhalation of exhaust fumes will result in serious illness, or death. Make certain there is adequate ventilation to carry off escaping exhaust fumes and to provide an ample supply of oxygen.

NOTE

Exhaust gases may be piped to the outside by attaching heat-insulated ducting over the exhaust screen (13, fig. 1-2) of the muffler assembly, and by extending the ducting through an exit to the outside. An existing exit may be used, or one may be made if conditions permit. As an alternate method, when permitted by the particular application of the generator set, the set may be positioned to permit the muffler assembly to protrude through an opening to the outside. Use heat-resistant material to seal clearances around the muffler assembly to prevent the back-flow of exhaust gases to the inside.

d. Installation or Setting Up Instructions for Launching Station Operation.

(1) *Launching station mounting.* With skid base assembly (13, fig. 1-1) bolted to generator set, mount generator set on launcher in accordance with bolt pattern "B" of figure 1-4. Additional information for launcher mounting is given in section VII of this chapter.

(2) *Launching Station Installation.*

(a) Fuel connection. Remove cap from FUEL IN fitting (fig. 2-2) and connect fuel line from an external fuel supply.

NOTE

The fuel supply must be within 25 ft horizontally and not more than 12 ft below FUEL IN fitting connection. When starting a new unit or a unit which has been idle for a long period of time, priming of the fuel system may be required (fig. 2-9).

NOTE

Be sure the fuel and its container are uncontaminated and clean (usual contaminates are water, dirt, fungus, gums, and so on). Contaminated fuel may cause erratic starting and operation, inability to carry load, and excessive maintenance. The fuel container should have a drain at the bottom to permit draining off of water, sludge, and so on.

(b) Fuel schedule vent connection. Remove cap from FUEL SCHEDULE VENT fitting (fig. 2-2). Install drain line on FUEL SCHEDULE VENT fitting and extend into suitable container.

NOTE

Engine will not start properly if FUEI SCHEDULE VENT fitting is capped or clogged.

(c) Bleed air connection. Remove cap from BLEED AIR fitting (fig. 2-2). Connect launcher hydraulic sump to BLEED AIR fitting.

(d) External fuel pump electrical connection. Remove protective cap from EXTERNAL FUEL PUMP J27 receptacle (fig. 2-3). Connect external fuel pump cable to J27 receptacle.

(c) 24V DC slave receptacle J15. Leave 24V DC SLAVE RECEPTACLE J15 (fig. 2-5) capped, except when necessary to charge generator set batteries in place, or when connecting an auxiliary power source as a starting aid (slave) when the generator set batteries are in a low state of charge.

CAUTION

Do not use this receptacle to supply dc power to external loads, since it will then be difficult to keep the batteries in a high state of charge, and starting reliability of the unit will be impaired.

NOTE

The above must be validated to use auxiliary Hyd system air brake — spare batteries may be required.

(f) Internally wired plugs. Insure that internally wired plugs (fig. 2-3 and 2-5) are securely installed in REMOTE CONTROL GENERAL J14 receptacles (fig. 2-3 and 2-5).

CAUTION

If REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5) is not capped with its internally wired plug, it will not be possible to adjust the generator frequency with the appropriate screw on the electrical controls instruments panel assembly. If REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) is not capped with its internally wired plug, the main circuit breaker will close and cannot be opened in a normal manner; it will cycle if the main circuit breaker switch is held in the open position or if a persistent overvoltage, undervoltage, under frequency, or short circuit condition, should happen to exist concurrently with the uncapped condition of receptacle J25. Damage to the generator set or the load may result.

(g) Convenience outlet connection. If a 120v, 400 hps, single phase, 15 amps power source

is required, open protective cover of 120V-400 HERTZ — 15 AMP CONVENIENCE RECEPTACLE J19 (fig. 2-5). Connect electrical load lines to J19 receptacle.

(h) Plenum drain connection. Connect a drain line to PLENUM DRAIN fitting (fig. 2-7). Extend drain line into suitable container.

CAUTION

Insure that PLENUM DRAIN fitting is not clogged and is open to prevent accumulation of fuel in turbine plenum. Accumulation of fuel in turbine plenum may cause flaming start of engine which could result in severe overtemperature and / or overspeed conditions causing extensive damage to the engine.

(i) Muffler drain connection. Place suitable container under muffler drain fitting (fig. 2-7). If conditions require, connect drain line to muffler drain fitting and extend line into container.

(j) Launching station power connection. Remove protective cap from 400 CYCLE POWER J26 receptacle (fig. 2-3). Connect electrical load line of Launching station to J26 receptacle.

CAUTION

Check to insure that generator set has been properly connected to deliver 120 / 208 volts output to fulfill power requirements of Launching station. Damage to electrical components of the Launching station may otherwise result.

(k) Battery heater external exhaust outlet. If battery heater is to be operated, remove cap from heater external exhaust outlet (fig. 2-1) on underside of generator set.

NOTE

Additional information for Launching station installation is given in section VII of this chapter.

(3) *FMTS or OMTS van mounting.* With skid base assembly (13, fig. 1-1) bolted to generator set, mount generator set on FMTS or OMTS van in accordance with bolt pattern "A" of figure 1-4. Additional information for FMTS or OMTS van mounting is given in section VII of this chapter.

(4) *FMTS or OMTS van installation.* The procedure for FMTS or OMTS van installation of the generator set is the same as for launcher installation described in *b* above except for the following:

(a) Bleed air connection. This fitting is the extreme left fitting shown on figure 2-2. It should be kept tightly capped. Failure to comply will result in loss of power and increased fuel consumption for the engine.

(b) Remote control special J25 receptacle connection. Remove internally wired plug (fig. 2-3) from REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3). Securely install cable plug of SERGEANT remote control panel in J25 receptacle.

CAUTION

Make sure the internally wired plug (fig. 2-5) is securely installed in the REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5). If internally wired plug is not installed in J14 receptacle, it will not be possible to adjust frequency at the electrical controls instruments panel assembly with the frequency adjust screw. Also when the REMOTE-LOCAL CONTROL SELECTOR switch (25, fig. 2-6) is placed in the REMOTE position for operation of the generator set from the Launching Station remote control panel an overvoltage condition will occur, if the set has a Bendix generator and voltage regulator; an undervoltage condition will occur, if the set has a General Electric generator and voltage regulator; in either case the main circuit breaker will open.

(c) Battery heater external exhaust outlet. If battery heater is to be operated, remove cap from heater external outlet (fig. 2-1) on left-hand side of generator set.

NOTE

Additional information for FMTS and OMTS van installation is given in section VII of this chapter.

2-3. Equipment Conversion

a. Voltage Change Panel Assembly. Open right side access door (6, fig. 1-1) and voltage change panel access door (fig. 2-8). Check position of voltage change panel assembly (fig. 2-8) to ascertain that generator windings are connected to give the output voltage (120 / 208 or 240 / 416) which is compatible with the requirements of the load equipment. Incorrect output voltage of the generator set will probably result in extensive damage to, or improper operation of, the load equipment. If there is any doubt as to the voltage for which the generator set is connected, be sure to check line-to-line voltage (A-B, B-C, or C-A), by means of VOLT-AMP SELECTOR switch (27, fig. 2-6) and voltmeter (9) immediately after initial start-up of the set, but before closing the main circuit breaker. Once correct voltage has been ascertained for any particular application, the voltage change panel access door should be latched in place and the voltage change panel assembly should be ignored thereafter.

b. Parallel Operation. Open ac power panel access door (10, fig. 1-1) for main power termina-

on both generator set; install interconnecting power lines between corresponding terminals (L1, L2, L3, and L0) on both sets, after first feeding them through entrance holes (11).

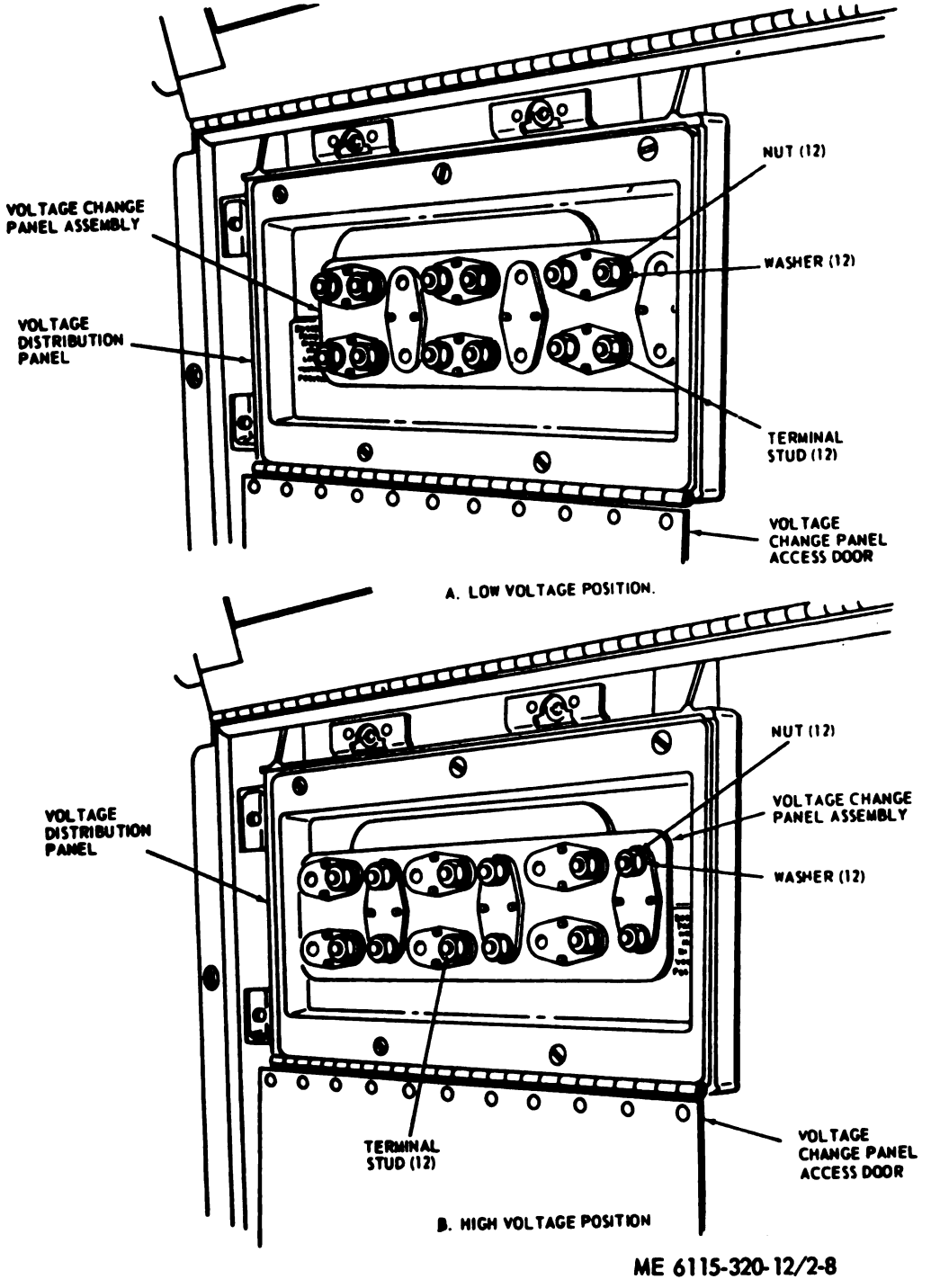


Figure 2-8. Voltage change panel assembly high and low voltage positions.

Section II. MOVEMENT TO A NEW WORKSITE

2-4. Dismantling for Movement

a. Disconnection.

(1) Remove all connections in reverse order of that described in paragraph 2-2 for multipurpose operation and for Launching Station, or FMTS, or OMTS van, operation.

(2) Loosen wingnuts (1, fig. 2-9) and remove battery box cover assembly (2). Lower battery box door assembly (10).

(3) Disconnect positive battery cable (15) from battery terminal lug and insulate cable terminal with electrical tape. Securely wedge the taped lug in the battery box assembly (7) in a manner such that it will not contact the battery terminal.

(4) Raise battery box door assembly into position and install battery box cover assembly in reverse order of removal procedure.

b. Preparation for Loading.

(1) Close and secure instrument panel protective door assembly (9, fig. 1-1) and install enclosure cover assembly (fig. 1-1) on front of generator set enclosure.

(2) Close and secure all access panels and doors of generator set enclosure.

c. Modes of Transportation. The generator set may be transported by a standard carrier, cargo plane, or helicopter.

d. Loading on Standard Carrier.

(1) Refer to figure 2-10 and attach lifting chains to the four generator set hoist assemblies.

CAUTION

Do not attach chains from the hoist assemblies to the lifting equipment in such a manner that the angle between any of the chains and the top of the generator set is less than 45°. Any angle less than 45° will cause an excessive strain, which could possibly bend the hoist assemblies.

(2) Using an overhead hoist or crane, lift generator set and position it on standard carrier. Remove lifting chains and secure generator set to standard carrier with tie-down cables, strapping, blocking, and the like.

WARNING

Do not use lifting equipment with capacity of less than 2000 lbs. Do not allow generator set to swing back and forth when it is suspended in the air. Failure to observe this warning may result in damage to equipment, or severe injury or death to personnel.

(3) Transport generator set to new worksite, or to cargo plane or helicopter if either mode of transportation is to be used.

e. Loading on Cargo Plane or Helicopter. A dolly truck or similar type equipment may be used for rolling generator set into and out of cargo plane or helicopter. The following procedure may be used as a basic guide in loading generator set on cargo plane or helicopter.

(1) Remove tie-down cables, strapping, blocking, and the like, that secure generator set to standard carrier.

(2) Refer to figure 2-10 and attach lifting chains to the four generator set hoist assemblies.

CAUTION

Do not attach chains from the hoist assemblies to the lifting equipment in such a manner that the angle between any of the chains and the top of the generator set is less than 45°. Any angle less than 45° will cause an excessive strain, which could possibly bend the hoist assemblies.

(3) Using an overhead hoist or crane, lift generator set from standard carrier and position it on a dolly truck or similar equipment.

WARNING

Do not use lifting equipment with capacity of less than 2000 lbs. Do not allow the generator set to swing back and forth when it is suspended in the air. Failure to observe this warning may result in damage to equipment, or severe injury or death to personnel.

(4) Remove lifting chains from the four generator set hoist assemblies and secure generator set to dolly, truck, or similar equipment.

(5) Roll equipment into cargo plane or helicopter and unload generator set. Tie down generator set for transporting.

f. Unloading from Cargo Plane or Helicopter. Unload generator set from cargo plane in reverse order of loading procedure described in *e* and load on standard carrier as described in *d*.

g. Unloading from Standard Carrier.

(1) Remove tie-down cables, strapping, blocking, and the like, that secure the equipment to standard carrier.

(2) Refer to figure 2-10 and attach lifting chains to the four generator set hoist assemblies.

CAUTION

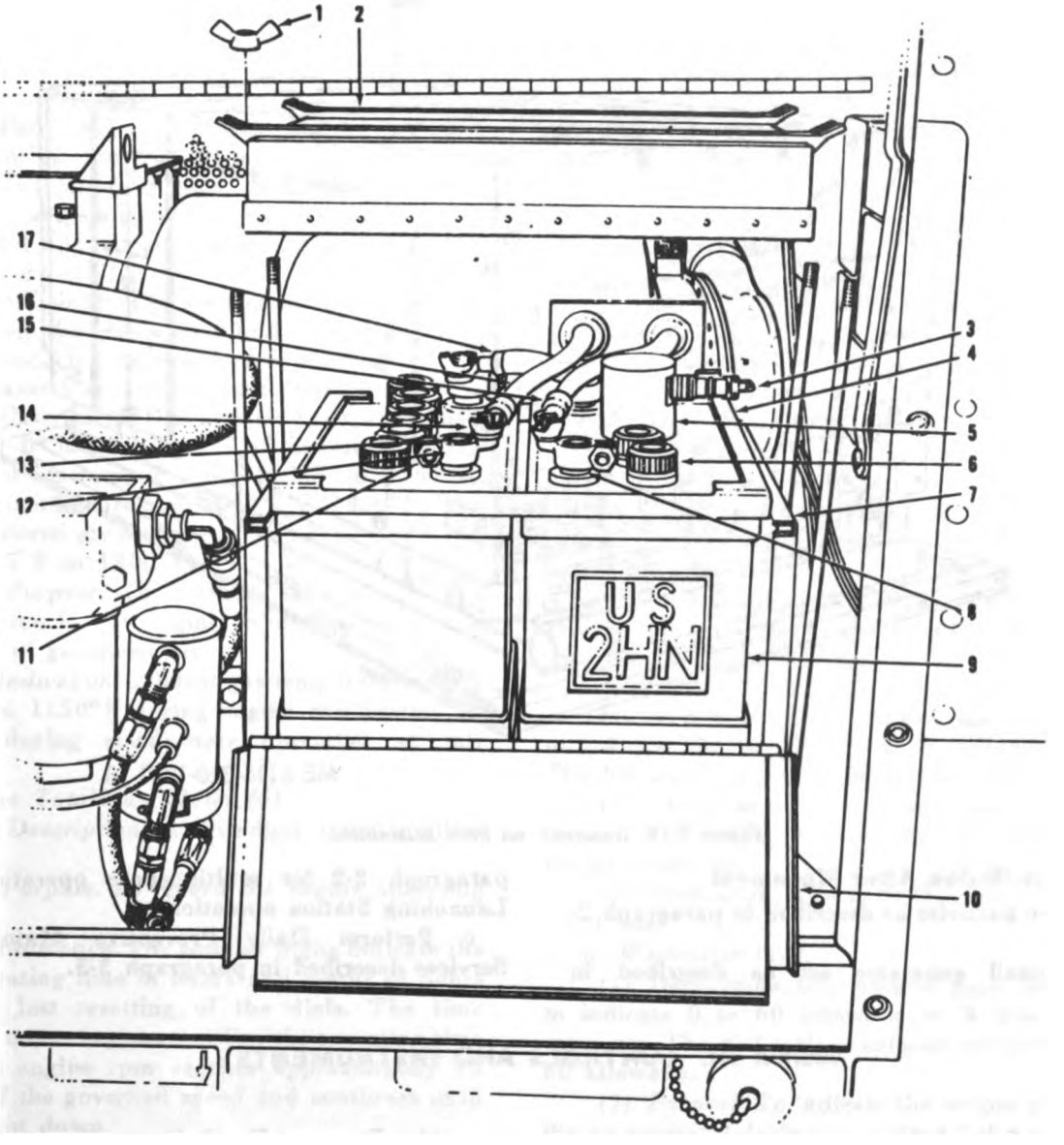
Do not attach chains from the hoist assemblies to the lifting equipment in such a manner that the angle between

any of the chains and the top of the generator set is less than 45°. Any angle less than 45° will cause an excessive strain, which could possibly bend the hoist assemblies.

(3) Using an overhead hoist or crane, lift generator set from standard carrier and locate it for installation in accordance with paragraph 2-2.

WARNING

Do not use lifting equipment with capacity of less than 2000 lbs. Do not allow generator set to swing back and forth when it is suspended in the air. Failure to observe this warning may result in damage to equipment, or severe injury or death to personnel.



1. Battery box cover wingnut (4)
2. Battery box cover assembly
3. Temperature sensor electrical harness
4. Battery bracket assembly
5. Battery electrolyte temperature sensor
6. Battery vent cap (11)
7. Battery box assembly
8. Battery positive terminal
9. Battery (2)
10. Battery box door assembly
11. Lug nut (4)
12. Battery terminal lug (4)
13. Battery negative terminal
14. Battery terminal lug wingnut (4)
15. Positive battery cable
16. Negative battery cable
17. Jumper cable

ME 6115-320-12/2-9

Figure 2-9. Battery installation.

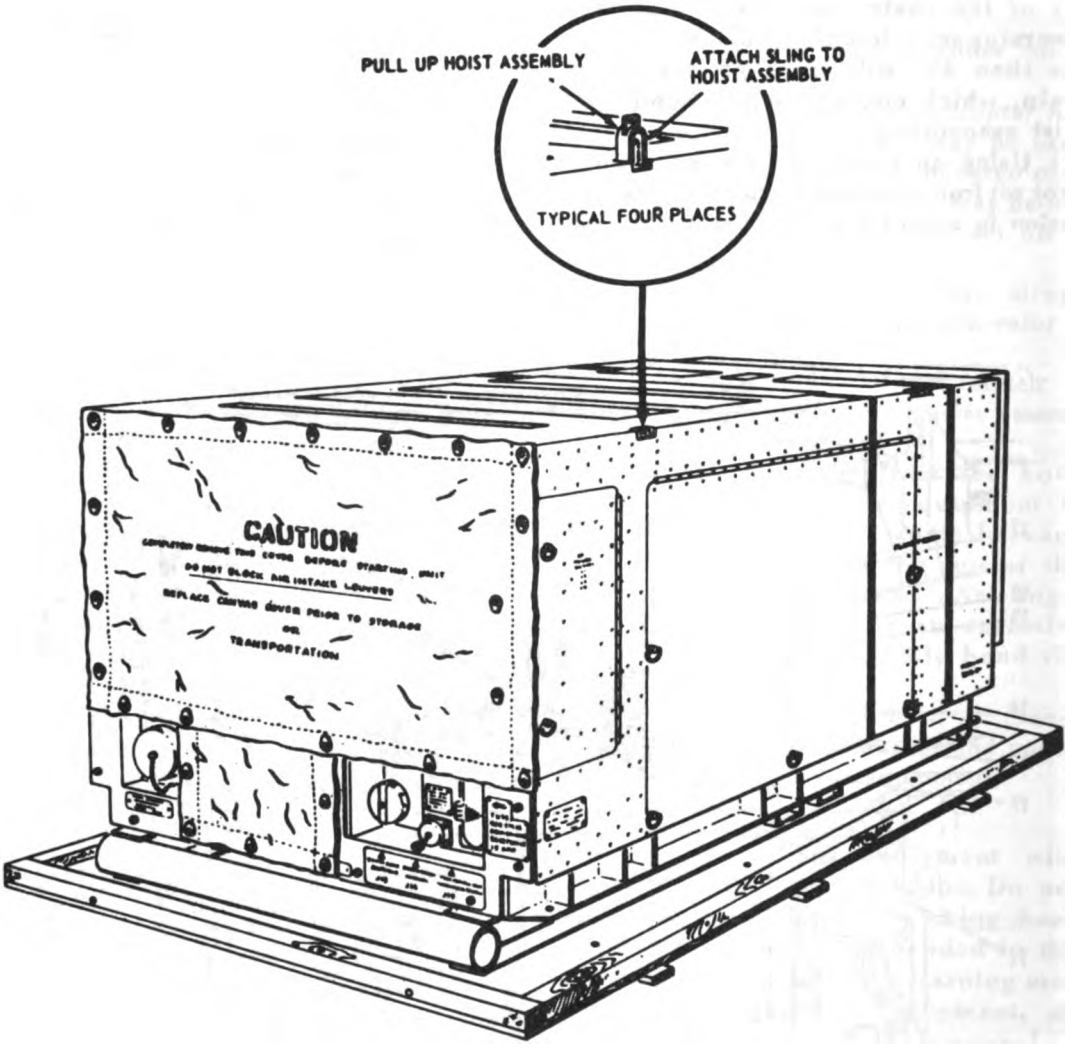


Figure 2-10. Generator set hoist assemblies.

2-5. Reinstallation After Movement

a. Service batteries as described in paragraph 2-1.

b. Reinstall generator set as described in paragraph 2-2 for multipurpose operation and Launching Station operation.

c. Perform Daily Preventive Maintenance Services described in paragraph 3-3.

Section III. CONTROLS AND INSTRUMENTS

2-6. Controls and Instruments

a. General. The purpose of the controls and instruments and the normal and maximum indications of the instruments are described below. The references shown in parentheses refer to figure 2-6.

b. Oil Pressure Gage (1).

(1) *Description.* Dial pointer gage, calibrated to indicate 0 to 200 psig in 10 psig increments.

(2) *Purpose.* To indicate the engine oil pressure during operation of generator set.

(3) *Indication.* Oil pressure of 80 to 100 psig during normal operation.

c. Tachometer Indicator (2).

(1) *Description.* Dial pointer gage, calibrated to indicate 0 to 100 percent rpm in 2 percent increments. The large dial indicates in percent, and the small dial indicates in tenths of percent.

(2) *Purpose.* To monitor engine rpm during operation of generator set.

(3) *Indication.* Normal rpm indications are:

(a) 10 to 15 percent: Ignition occurs.

(b) 50 to 100 percent: Oil pressure is increasing and should be 50 to 100 psig (normal).

(c) 95 to 100 percent: Generator set is ready for load application.

d. Battery Charging Ammeter (3).

(1) *Description.* Dial pointer gage, calibrated to indicate —10 to +20 amperes in 1 ampere increments. Scale is colored red from —10 to 0 and green from 0 to +20.

(2) *Purpose.* To indicate the battery charging current during operation of generator set.

(3) *Indication.* Battery charging current of about +11 amps after initial engine start, charging current of +2 to +5 amps after 2 hours operation of generator set.

e. Start Counter. The start counter is no longer required on this equipment and all maintenance will be conducted on hours of operation.

f. Exhaust Gas Temperature Indicator (5).

(1) *Description.* Dial pointer gage, calibrated to indicate 0° to 1800°F, in 100° increments up to 900°F, 50° increments from 900°F to 1500°F, and 100° increments from 1500°F to 1800°F. The scale is colored green from 0° to 1225°F and red from 1225°F to 1800°F.

(2) *Purpose.* To indicate the exhaust gas temperatures in the engine exhaust pipe during operation of generator set.

(3) *Indication.* Exhaust gas temperature must not exceed 1150°F during engine acceleration or 1200°F during steady-state operation at full load.

g. Time Totalizing Meter (6).

(1) *Description.* A five-digit time totalizer counter.

(2) *Purpose.* To record the engine operating periods.

(3) *Indication.* The counter digits indicate the total operating time in hours and tenths of hours since the last resetting of the dials. The time totalizing meter begins recording the operating time when the engine rpm reaches approximately 95 percent of the governed speed and continues until engine shut down.

h. AC Ammeter (7).

(1) *Description.* Dial pointer gage, calibrated to indicate percent of rated amperes. The dial is calibrated from 0 to 125 percent in 5 percent increments. The dial range is color coded red from 100 to 125 percent.

(2) *Purpose.* To indicate the line current of phases one through three, as selected through the VOLT-AMP SELECTOR switch (27), during operation of generator set.

(3) *Indication.* Normal range is 0 to 100 percent. Ammeter indications over 100 percent indicate an overload condition.

i. Synchronizing Lights (8 and 12).

(1) *Description.* Filament type panel lamps.

(2) *Purpose.* To indicate electrical synchronization between two generator sets when the sets are adjusted for parallel operation.

(3) *Indication.* The synchronizing point is established when the lamps are extinguished.

j. Voltmeter (9).

(1) *Description.* Dial pointer gage, calibrated to indicate 0 to 500v ac in 5 volt increments. The dial scale has red index marks at the 120, 208, 240, and 416 volt points.

(2) *Purposes.* To indicate line-to-line (phases one through three) and line-to-neutral voltages, as selected through the VOLT-AMP SELECTOR switch (27), during operation of generator set.

(3) *Indication.* Indicates 120, 208, 240, or 416v ac as determined by the position of the VOLT-AMP SELECTOR switch and voltage change panel assembly.

k. Voltage Adjust Screw (10).

(1) *Description.* A slotted-head adjustment screw with locking nut.

(2) *Purpose.* Used to adjust the output voltage of the ac generator during operation of the generator set.

(3) *Adjustment.* Clockwise adjustment increases the voltage and counterclockwise adjustment decreases the voltage.

l. Frequency Meter (11).

(1) *Description.* Dial pointer gage, calibrated to indicate 388 to 412 cps in ½ cps increments. The dial scale has a red index mark at 400 cps.

(2) *Purpose.* To indicate the operating frequency of the ac generator during operation of the generator set.

(3) *Indication.* The normal indication is 400 ±1 cps.

m. Wattmeter (13).

(1) *Description.* Dial pointer gage, calibrated to indicate 0 to 60 kilowatts in 5 kilowatt increments. The dial scale is colored red from 45 to 60 kilowatts.

(2) *Purpose.* To indicate the output power of the ac generator during operation of the generator set.

(3) *Indication.* Normal operating range of 0 to 45 kilowatts. A reading in excess of 45 kilowatts indicates an overload condition.

n. Protection By-pass Switch (14).

(1) *Description.* A two position on-off toggle switch. A red lock-out guard is installed over the switch to prevent accidental actuation of the switch.

(2) *Purpose.* Used in emergencies to bypass

protective devices (except overspeed and short circuit) on the generator set.

WARNING

The PROTECTION BY-PASS switch (14, fig. 2-6) must be in OFF position, with the red lockout guard in the closed (down) position. It should be used only in extreme emergencies when need for continued operation justifies risk incurred in loss of equipment, and / or injury to personnel.

o. Unit-parallel Selector Switch (15).

(1) *Description.* A two position rotary switch.

(2) *Purpose.* Provides for the activation of paralleling control circuit when in the PARALLEL position. When set to UNIT position, the switch deactivates the paralleling control circuits, and connects the generator set for single unit operation.

p. Winterization Heater Switch (16).

(1) *Description.* A two position on-off toggle switch.

(2) *Purpose.* Provides control of 24v dc power to battery heater and the battery electrolyte temperature sensor. When placed in ON position and the manual heater fuel shutoff valve is open, heater operation is automatically controlled by the battery electrolyte temperature sensor to heat the batteries during extremely cold ambient temperatures.

g. Winterization Heater Lamp (17).

(1) *Description.* A filament type press-to-test lamp with an amber lens.

(2) *Purpose.* Illuminates to indicate that the battery heater is operating.

r. Winterization Heater Circuit Breaker (18).

(1) *Description.* A press-to-reset circuit breaker button installed in the battery heater electrical supply circuit.

(2) *Purpose.* Provide short circuit protection for the battery heater circuits. The circuit breaker opening amperage (15 amps) is marked on the reset button.

s. Main CB Circuit Breaker Closure Lamp (19).

(1) *Description.* A filament type press-to-test lamp with a green lens.

(2) *Purpose.* Illuminates to indicate that the main circuit breaker is closed and 400 hps power is available at the ac outputs of the generator set. The illumination of the lamp may be regulated during blackout conditions by turning the lens cap.

t. Main CB Circuit Breaker Switch (20).

(1) *Description.* A three-position toggle switch, spring-loaded to the center position.

(2) *Purpose.* Provides local control of the main circuit breaker to connect (close) and disconnect (open) the electrical loads to the ac generator outputs.

u. Overvoltage Lamp (21).

(1) *Description.* A filament type press-to-test lamp with an amber lens.

(2) *Purpose.* To indicate when the overvoltage relay has operated due to an overvoltage condition of the ac generator. The lamp illuminates when the overvoltage relay operates.

v. Overvolt Reset Switch (22).

(1) *Description.* A normally closed, two-position spring-loaded toggle switch.

(2) *Purpose.* To reset the overvoltage protection circuits and permit recovery of excitation, after cause of overvoltage has been determined. Momentary actuation of switch to the up position resets the overvoltage protection circuits.

w. Frequency Adjust Screw (23).

(1) *Description.* A slotted-head adjustment screw with locking nut.

(2) *Purpose.* To provide adjustment of the generator output frequency. Frequency changes resulting from adjusting the screw clockwise (INCREASE) or counterclockwise (DECREASE) are monitored on the frequency meter (11).

x. Panel Lights Switch (24).

(1) *Description.* A two-position on-off toggle switch.

(2) *Purpose.* To control the 24v dc power to the panel illumination lamps.

y. Remote-local Control Selector Switch (25).

(1) *Description.* A two-position self-locking toggle switch.

(2) *Purpose.* Transfers the control circuits from the unit control panel to a remotely located control panel through either the REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) for Launching Station remote control panel cable connection or the REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5) for multipurpose remote control panel cable connection. The toggle must be pulled out to move the switch from REMOTE or LOCAL position.

z. Remote-local Voltage Sensing Selector Switch (26, fig. 2-6).

(1) *Description.* A two-position self-locking toggle switch.

(2) *Purpose.* Transfers the ac generator voltage regulator voltage sensing circuit from internal sensing (LOCAL SENSING) to external sensing (REMOTE SENSING). The toggle must be pulled out to move the switch from LOCAL SENSING or REMOTE SENSING position. Remote voltage sensing is employed to hold the steady-state voltage constant at the load in spite of large voltage drops in the connecting cables.

CAUTION

The voltage regulator assembly is designed to operate on 120/208 volt system. If remote sensing is used when the generator set is operated on the high voltage output (416 volts line-to-line), a two to one stepdown transformer must be installed in the voltage sensing leads to prevent damage to voltage regulator components and to insure that the voltage regulator will hold the voltage at the desired value.

aa. Volt-amp Selector Switch (27).

(1) *Description.* A four-position rotary switch.

(2) *Purpose.* Connects the ac ammeter and voltmeter for selective monitoring of the three line-to-line voltages, three line currents, and one line-to-neutral voltage during operation of the generator set. When the switch is placed in A-B, B-C, or C-A position, the line currents and line-to-line voltage of phases one through three, respectively, are monitored. The voltage from line-to-neutral is monitored when the switch is set in C-N position. The neutral current is not monitored.

ab. Master Switch (28).

(1) *Description.* A three-position toggle switch, spring-loaded return from the up position (START) to the center position (RUN).

(2) *Purpose.* Functions to energize the engine power circuit and provide a momentary start circuit until appropriate holding relays are energized to automatically complete the starting sequence. The switch also functions as an engine stop switch by de-energizing the engine 24v dc power circuit when set in OFF position.

ac. Internal DC Circuit Breaker Reset Button (29).

(1) *Description.* A button for a press-to-reset circuit breaker installed to protect all generator set dc control circuits internal to the generator set.

(2) *Purpose.* Provides protection for the internal 24v dc control circuits. The circuit breaker opening amperage (10 amps) is marked on the reset button.

ad. External DC Circuit Breaker Reset Button (30).

(1) *Description.* A button for a press-to-reset circuit breaker installed to protect certain external dc circuits used in the Launching Station and fed through EXTERNAL FUEL PUMP J27 receptacle (fig. 2-3).

(2) *Purpose.* Provides overload protection for certain external 24v dc circuits. The circuit breaker opening amperage (10 amps) is marked on the reset button.

Section IV. OPERATION UNDER USUAL CONDITIONS

2-7. General

a. The instructions in this section are for the 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 contains instructions on starting and stopping the generator set, on operating the generator set, and on coordinating the basic motions to perform the specific task for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

WARNING

Turbine or compressor failures caused by foreign material entering the generator set may cause injury to personnel in the immediate area. During engine start do not stand or work in stand clear areas shown in figure 2-11.

WARNING

Protection By-Pass Switch (14, fig. 2-6) must be in OFF position, with the red lockout guard in the closed (down) position. It should be used only in extreme emergencies when need for continued operation justifies risks incurred in loss of equipment, and/or injury to personnel.

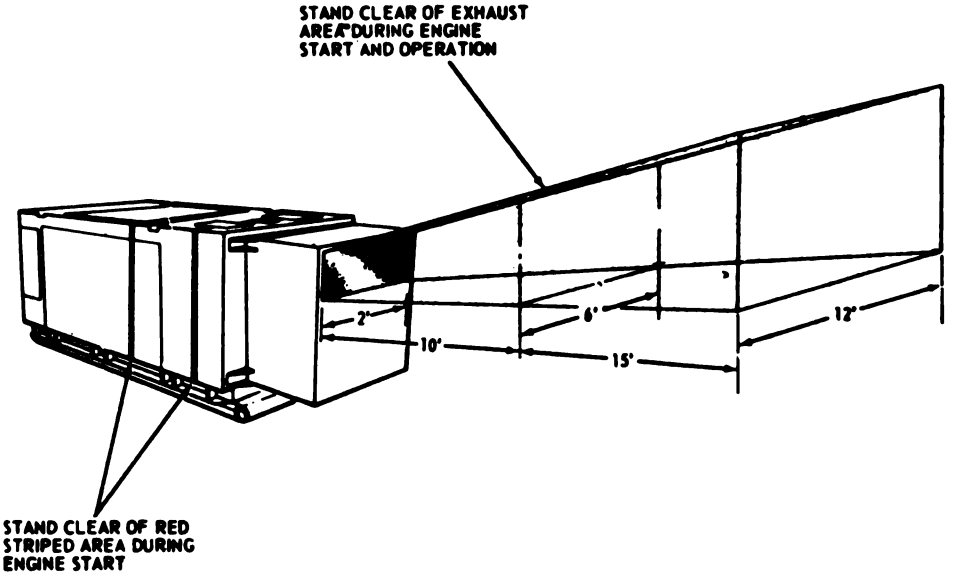


Figure 2-11. Engine operating stand clear area.

2-8. Starting the Equipment for Local Operation

a. Preparation for Starting.

(1) Remove enclosure cover assembly (fig. 1-2). Release and raise instrument panel protective door assembly (9).

(2) Perform Daily Preventive Maintenance Services described in paragraph 3-3.

(3) When the generator set is to be operated for the first time since receipt, or has not been operated for an extended period, prime the engine fuel system (fig. 2-12).

WARNING

When preserving, depreserving, or priming engine fuel system, make certain igniter plug electrical lead assembly is completely insulated to prevent accidental shock to personnel or ignition of fumes from atomizer fuel line.

(a) Refer to figure 3-13 and start generator set.

(b) Allow generator set to operate 5 minutes, then refer to figure 2-14 and stop generator set.

(c) Refer to figure 3-1 and service oil filter and oil tank screen.

(d) Drain lubricating oil and refill with fresh oil in accordance with lubrication chart.

(4) Check for proper position of the following devices:

(a) UNIT-PARALLEL SELECTOR switch (15, fig. 2-6) in UNIT position for single unit operation or PARALLEL position for parallel operation.

(b) REMOTE-LOCAL CONTROL SELECTOR switch (25) in LOCAL position.

(c) REMOTE-LOCAL VOLTAGE SENSING SELECTOR (26) in LOCAL SENSING position for local voltage sensing or REMOTE SENSING position for remote voltage sensing.

(d) Internally wired plugs for REMOTE CONTROL SPECIAL J25 and REMOTE CONTROL GENERAL J14 receptacles (fig. 2-3 and 2-5) securely installed.

CAUTION

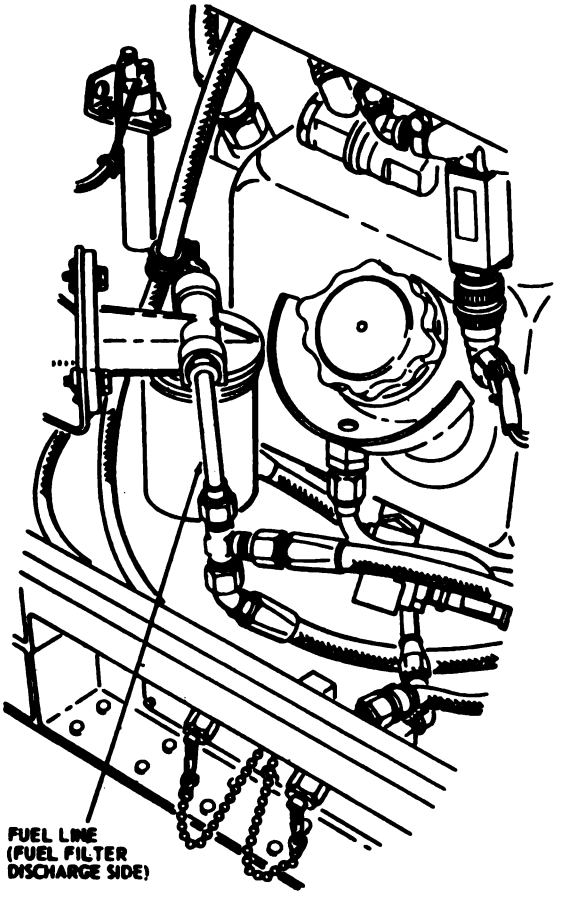
If REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5) is not capped with its internally wired plug, it will not be possible to adjust the generator frequency with the appropriate screw on the electrical controls instruments panel assembly. If REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) is not capped with its internally wired plug, the main circuit breaker will close and cannot be opened in a normal manner; it will cycle if the main circuit breaker switch is held in the open position or if a persistent overvoltage, undervoltage, underfrequency, or short circuit condition should happen to exist concurrently with the uncapped condition of receptacle J25, damage to the generator set or the load may result.

(e) PROTECTION BY-PASS switch (14, fig. 2-6) in OFF position, with red lockout guard in the closed (Down) position.

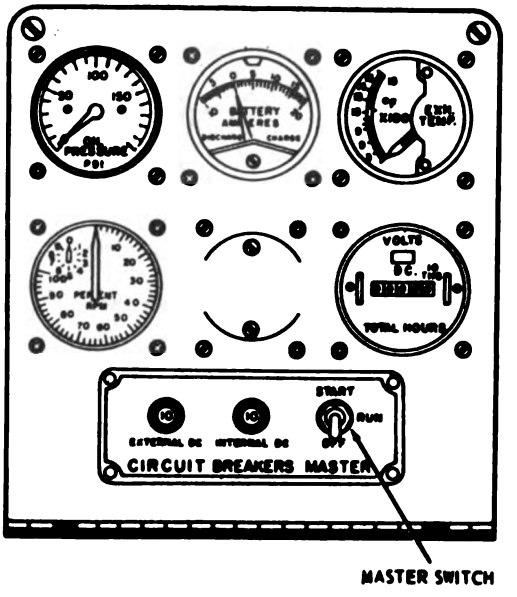
WARNING

The PROTECTION BY-PASS switch (14, fig. 2-6) must be in OFF position, with the red lockout guard in the closed (down) position. It should be used only in extreme emergencies when need for continued operation justifies risks incurred in loss of equipment, and / or injury to personnel.

b. Starting. Refer to figure 2-13 and start generator set.



A. FUEL FILTER ASSEMBLY



B. ENGINE CONTROLS INSTRUMENTS PANEL ASSEMBLY

STEP 1. GRAVITY FEED FUEL FROM FUEL SUPPLY TO FUEL IN FITTING ON LEFT SIDE OF GENERATOR SET.

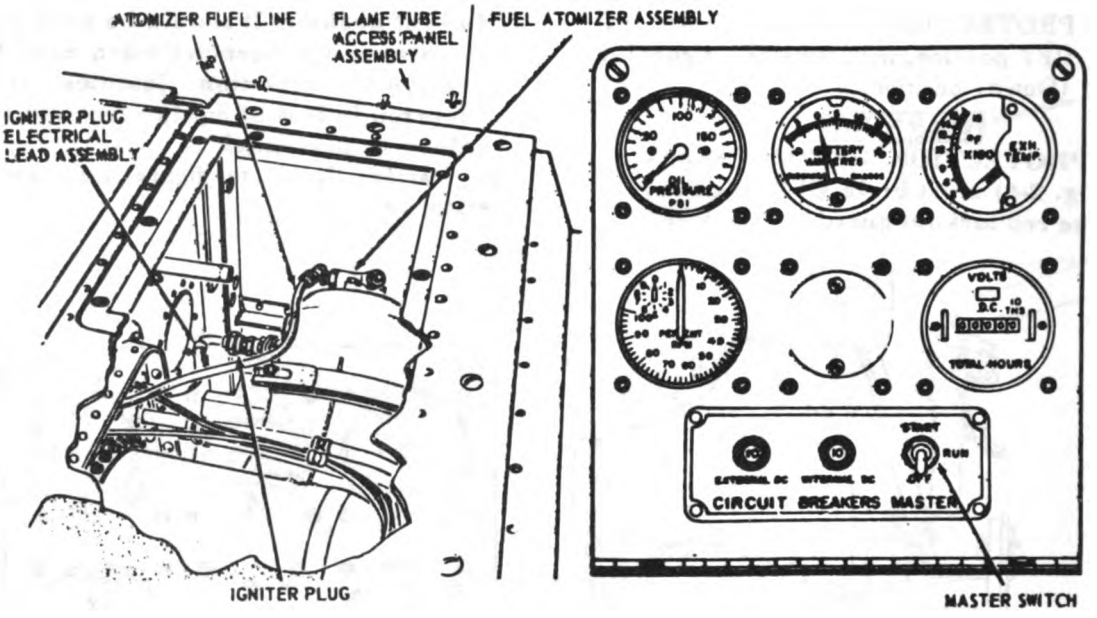
STEP 2. LOOSEN FUEL LINE CONNECTION ON DISCHARGE SIDE OF FUEL FILTER ASSEMBLY TO PERMIT DISCHARGE OF FUEL WHEN FUEL BOOST PUMP IS RUNNING.

STEP 3. PLACE MASTER SWITCH IN RUN POSITION AND ALLOW FUEL BOOST PUMP TO RUN UNTIL FUEL APPEARS ON DISCHARGE SIDE OF FUEL FILTER ASSEMBLY.

STEP 4. PLACE MASTER SWITCH IN OFF POSITION AND TIGHTEN FUEL LINE.

ME 6115-320-12/2-12 (1)

Figure 2-12. Priming the fuel system (sheet 1 of 2).



C. FUEL ATOMIZER ASSEMBLY AND IGNITER PLUG

D. ENGINE CONTROLS INSTRUMENTS PANEL ASSEMBLY

STEP 5. DISCONNECT IGNITER PLUG ELECTRICAL LEAD ASSEMBLY FROM IGNITER PLUG. GROUND LEAD ASSEMBLY BY TOUCHING CONTROL SPRING IN LEAD TO IGNITER PLUG THEN CAREFULLY INSULATE LEAD ASSEMBLY WITH ELECTRICAL TAPE.

WARNING. THE IGNITER PLUG ELECTRICAL LEAD ASSEMBLY MUST BE GROUNDED AS SOON AS IT IS REMOVED FROM IGNITER PLUG. HIGH VOLTAGE IS LIKELY TO BE PRESENT. THE STARTER WILL BE OPERATED TO PRIME ENGINE AND IGNITER PLUG ELECTRICAL LEAD ASSEMBLY WILL HAVE HIGH VOLTAGE PRESENT. MAKE CERTAIN LEAD ASSEMBLY IS COMPLETELY INSULATED TO PREVENT ACCIDENTAL SHOCK TO PERSONNEL OR IGNITION OF FUEL FUMES FROM ATOMIZER FUEL LINE.

STEP 6. DISCONNECT ATOMIZER FUEL LINE FROM FUEL ATOMIZER ASSEMBLY. EXTEND LINE INTO SUITABLE CONTAINER.

STEP 7. PLACE MASTER SWITCH IN RUN POSITION FOR 30 SECS TO ALLOW EXTERNAL FUEL PUMP AND FUEL BOOST PUMP TO BEGIN FUEL FLOW; THEN PLACE MASTER SWITCH IN START POSITION UNTIL FUEL FLOWS INTO CONTAINER.

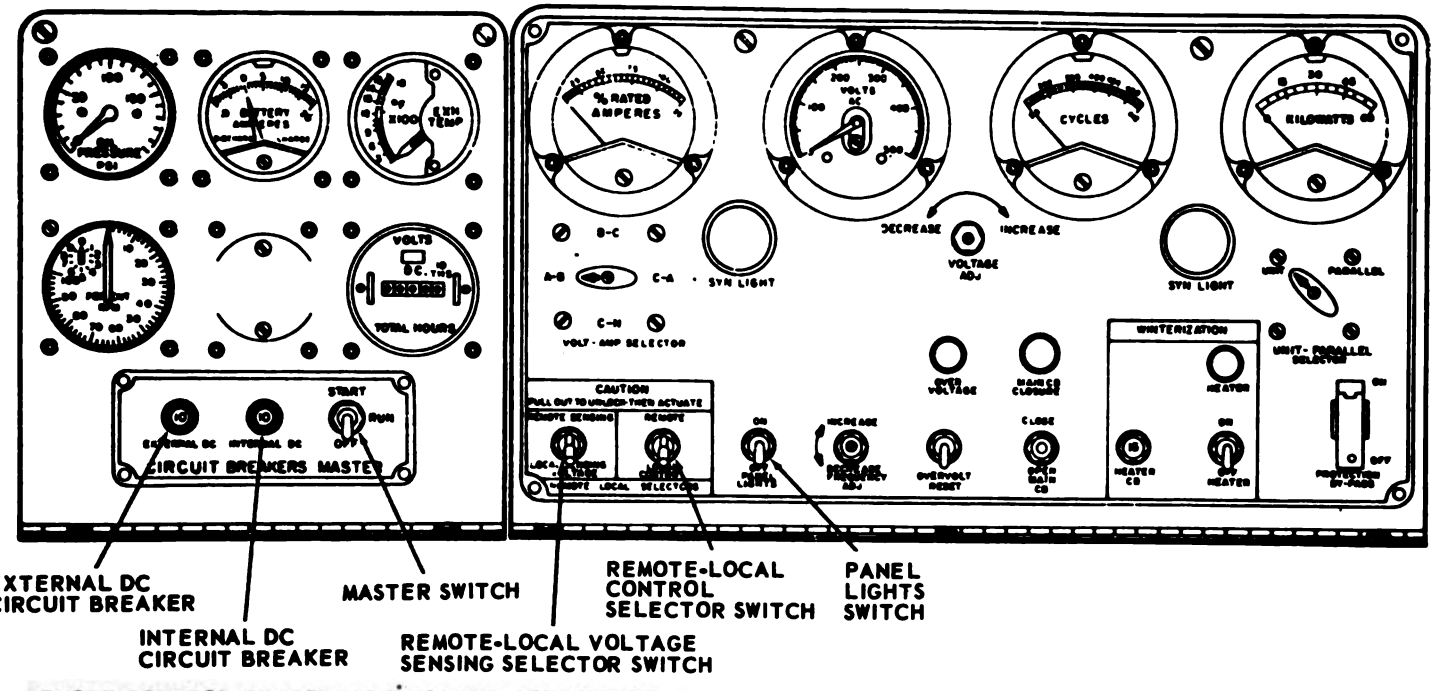
CAUTION: DO NOT EXCEED STARTER DUTY CYCLE OF 1 MINUTE ON AND 4 MINUTES OFF. OVERHEATING AND DAMAGE TO STARTER MOTOR MAY OTHERWISE RESULT.

NOTE: IF GENERATOR SET IS TO BE OPERATED FOR FIRST TIME, MAKE SURE FLOW FROM ATOMIZER FUEL LINE DURING PRIMING IS FUEL AND NOT PRESERVATIVE OIL. CONTINUE PRIMING UNTIL FUEL FLOWS INTO CONTAINER. PLACE MASTER SWITCH IN OFF POSITION WHEN FUEL FLOW OCCURS.

STEP 8. INSTALL THE ATOMIZER FUEL LINE AND IGNITER PLUG ELECTRICAL ASSEMBLY IN REVERSE ORDER OF REMOVAL PROCEDURES.

ME 6115-320-12/2-12 (2)

Figure 2-12. Priming the fuel system (sheet 2 of 2).



CAUTION: REMOTE CONTROL RECEPTACLE J-14 AND J-25 MUST BE SECURELY CAPPED WITH THEIR INTERNALLY WIRED PLUGS. IF RECEPTACLE J-14 IS NOT CAPPED WITH INTERNALLY WIRED PLUG, IT WILL NOT BE POSSIBLE TO ADJUST THE GENERATOR FREQUENCY WITH THE APPROPRIATE SCREW ON THE CONTROL PANEL. IF RECEPTACLE J-25 IS NOT CAPPED WITH ITS INTERNALLY WIRED PLUG, THE MAIN CIRCUIT BREAKER WILL CLOSE AND CANNOT BE OPENED IN A NORMAL MANNER, IT WILL CYCLE IF THE MAIN CIRCUIT BREAKER IS HELD IN THE OPEN POSITION OR IF A PERSISTANT OVERVOLTAGE, UNDERVOLTAGE, UNDERFREQUENCY, OR SHORT CIRCUIT CONDITION SHOULD HAPPEN TO EXIST CONCURRENTLY WITH THE UNCAPPED CONDITION OF RECEPTACLE J-25; DAMAGE TO THE GENERATOR SET OR THE LOAD MAY RESULT.

NOTE: IF LIGHT CONDITION REQUIRES ILLUMINATION OF CONTROL PANELS, PLACE PANEL LIGHTS SWITCH IN ON POSITION.

WARNING: FOR ENGINE OPERATING STAND CLEAR AREAS, REFER TO FIGURE 2-11.

STEP 1. PLACE REMOTE-LOCAL VOLTAGE SENSING SELECTOR SWITCH IN LOCAL SENSING POSITION IF REMOTE VOLTAGE SENSING IS NOT EMPLOYED.

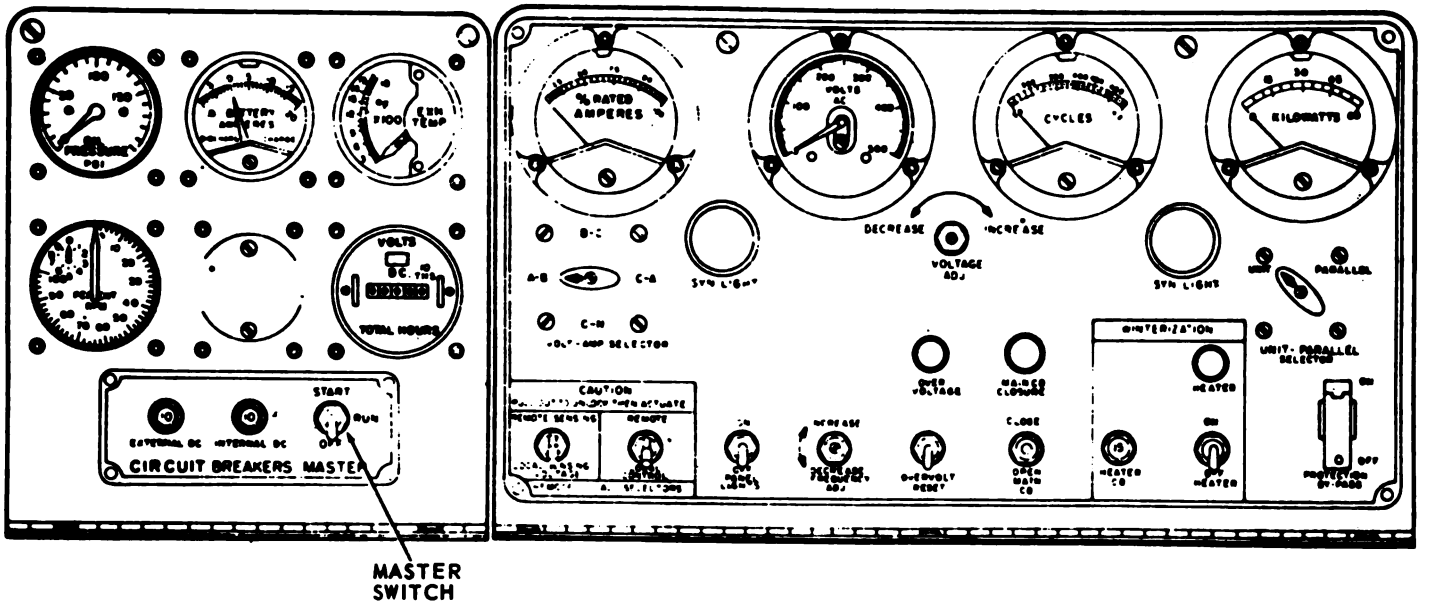
STEP 2. PLACE REMOTE-LOCAL CONTROL SELECTOR SWITCH IN LOCAL POSITION.

STEP 3. PRESS EXTERNAL DC AND INTERNAL DC CIRCUIT BREAKERS TO INSURE THAT THEY ARE CLOSED (RESET).

STEP 4. PLACE MASTER SWITCH IN RUN POSITION FOR 3-5 SECONDS. FUEL BOOST PUMP WILL AUTOMATICALLY START AND CONTINUE OPERATING UNTIL MASTER SWITCH IS PLACED IN OFF POSITION. ENGINE WILL NOT START IF FUEL BOOST PUMP FAILS TO OPERATE. FEEL VIBRATION OR LISTEN FOR OPERATION OF FUEL BOOST PUMP MOTOR. REFER TO TABLE 4-2, 1 FOR CORRECTIVE ACTION IF FUEL BOOST PUMP FAILS TO RUN.

ME 6115-320-12/2-13 (1)

Figure 2-13. Starting the generator set (sheet 1 of 5).

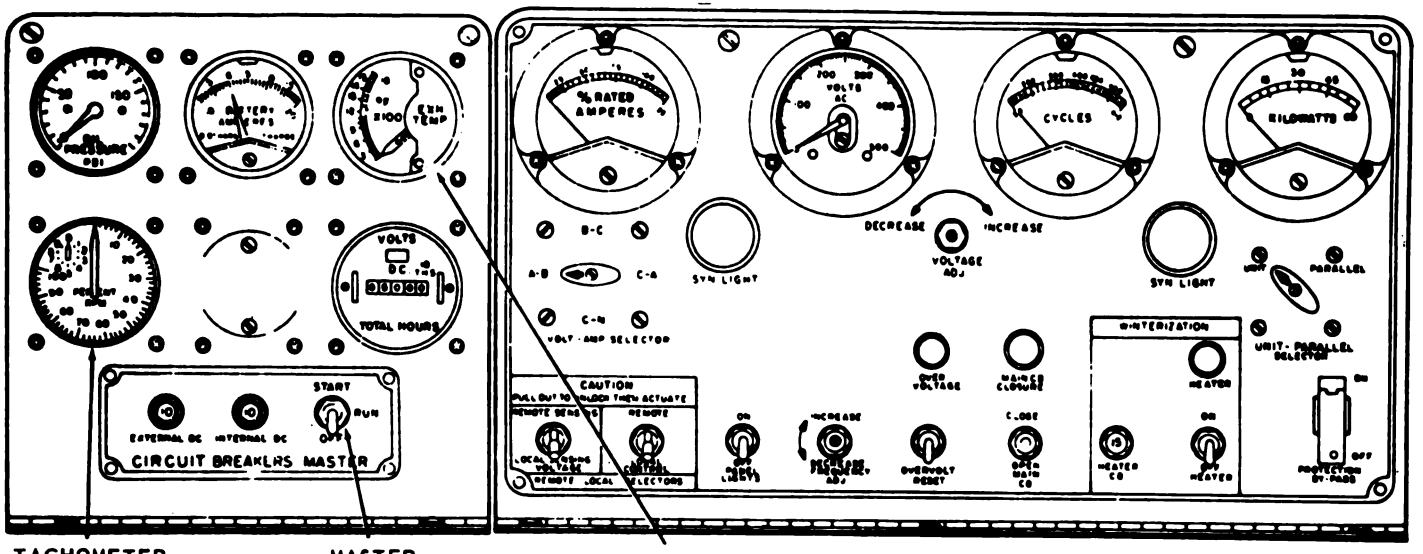


STEP 5. MOMENTARILY PLACE MASTER SWITCH IN START POSITION. ENGINE WILL AUTOMATICALLY START AND ACCELERATE. WHEN MASTER SWITCH IS RELEASED, IT WILL AUTOMATICALLY RETURN TO RUN POSITION AND ENGINE WILL CONTINUE TO OPERATE. REFER TO TABLE 4-2,2 FOR CORRECTIVE ACTION IF STARTER FAILS TO RUN, REFER TO TABLE 4-2,3 FOR CORRECTIVE ACTION IF STARTER RUNS BUT DOES NOT ROTATE THE ENGINE: REFER TO TABLE 4-2,4 FOR CORRECTIVE ACTION IF ENGINE STOPS MOTORING WHEN MASTER SWITCH RETURNS TO RUN POSITION, REFER TO TABLE 4-2,6 FOR CORRECTIVE ACTION IF ENGINE MOTORS BUT DOES NOT START.

CAUTION: DO NOT EXCEED STARTER MOTOR DUTY CYCLE OF 1 MINUTE ON AND 4 MINUTES OFF. OVERHEATING AND DAMAGE TO STARTER MOTOR MAY OTHERWISE RESULT. MAKE SURE AIR INTAKE OPENINGS ARE FREE FROM OBSTRUCTIONS TO INSURE ADEQUATE AIR INTAKE TO ENGINE. ERRATIC OPERATION OR FAILURE OF ENGINE TO OPERATE MAY OTHERWISE RESULT.

NOTE: APPROXIMATELY 3 START CYCLES MAY BE EXPECTED FROM FULLY CHARGED BATTERIES WHEN ATTEMPTING TO START THE GENERATOR SET IN EXTREME COLD WEATHER CONDITIONS. APPROXIMATELY 8 TO 10 START CYCLES MAY BE EXPECTED DURING NORMAL OR EXTREME HOT WEATHER CONDITIONS. THIS ASSUMES NO CHARGING OF BATTERIES BETWEEN START CYCLES.

Figure 2-13. Starting the generator set (sheet 2 of 5).



STEP 6. LISTEN FOR ENGINE COMBUSTION (CHARACTERISTIC ROAR) AND OBSERVE TACHOMETER INDICATOR DURING ENGINE ACCELERATION. ENGINE CONBUSTION SHOULD OCCUR AND ENGINE SHOULD ACCELERATE SMOOTHLY TO NORMAL OPERATING RPM OF 100 ± 3 PERCENT IN 15 TO 30 SECONDS. PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF ENGINE COMBUSTION DOES NOT OCCUR OR ENGINE DOES NOT HAVE NORMAL ACCELERATION. REFER TO TABLE 4-2,6 FOR CORRECTIVE ACTION IF COMBUSTION DOES NOT OCCUR, REFER TO TABLE 4-2,7 IF ENGINE SHUTS DOWN IMMEDIATELY AFTER COMBUSTION OCCURS: REFER TO TABLE 4-2,8 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO SLOWLY; REFER TO TABLE 4-2,9 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES ERRATICALLY: REFER TO TABLE 4-2,10 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO FAST; REFER TO TABLE 4-2,12 FOR CORRECTIVE ACTION ENGINE SHUTS DOWN AFTER NORMAL ACCELERATION TO GOVERNED RPM OR LESS: REFER TO TABLE 4-2,13,14 FOR CORRECTIVE ACTION IF GOVERNED ENGINE SPEED IS LESS THAN 97 PERCENT OR MORE THAN 103 PERCENT.

CAUTION: IF ENGINE COMBUSTION FAILS TO OCCUR, WAIT AT LEAST 5 MINUTES AFTER MASTER SWITCH IS PLACED IN OFF POSITION BEFORE ATTEMPTING RESTART. THIS ALLOWS ANY ACCUMULATED FUEL IN ENGINE PLENUM TO DRAIN FROM PLENUM DRAIN FITTING (FIG. 16), AND EVAPORATE.

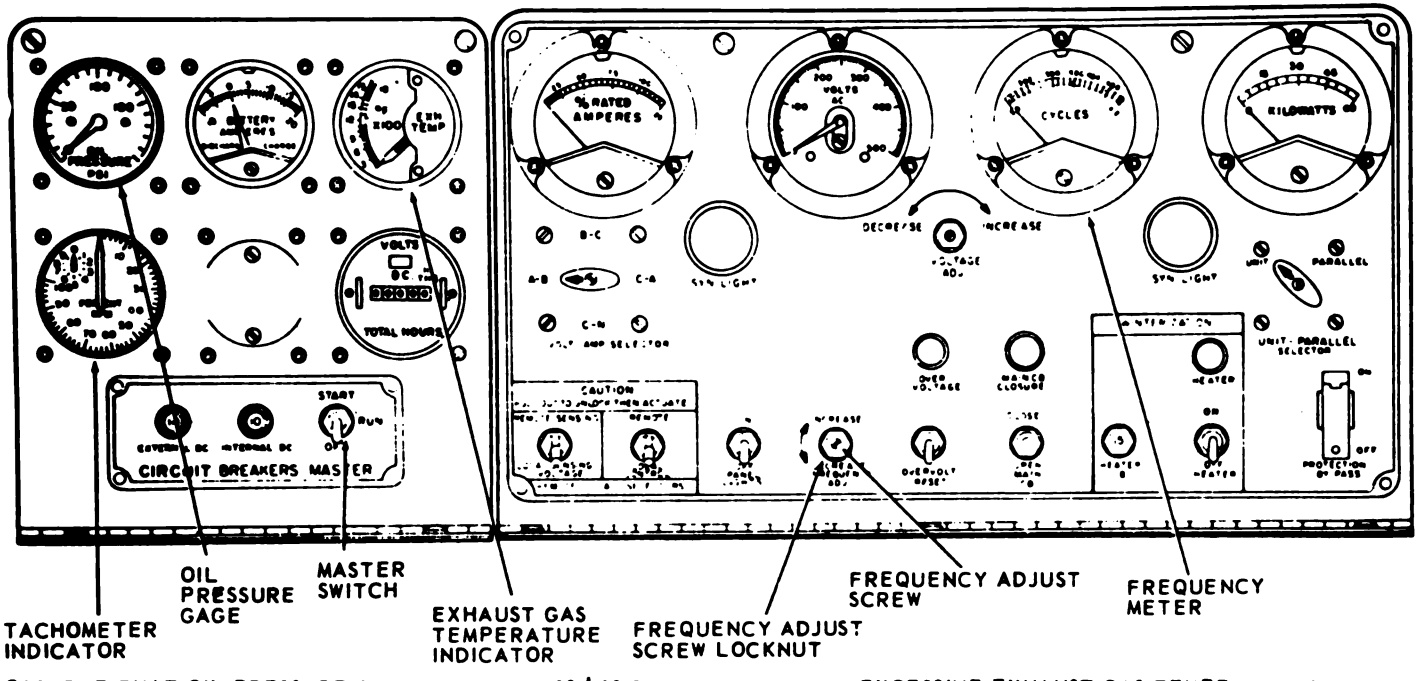
BEFORE ATTEMPTING RESTART. ACCUMULATED FUEL IN ENGINE PLENUM MAY RESULT IN A HOT (FLAMING) START OR OVERSPEED CONDITION DURING NEXT STARTING ATTEMPT, AND ENGINE MAY BE EXTENSIVELY DAMAGED THEREBY. ENGINE OVERTEMPERATURE AND OVERSPEED PROTECTION DEVICES ARE OF NO VALUE UNDER THESE CONDITIONS. FOR THIS REASON, ALWAYS BE SURE THAT PLENUM DRAIN IS OPEN.

STEP 7. OBSERVE EXHAUST GAS TEMPERATURE INDICATOR DURING ENGINE ACCELERATION. EXHAUST GAS TEMPERATURE SHALL NOT EXCEED 1,150° F FOR MORE THAN 5 SECONDS. REFER TO TABLE 4-2,11 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION.

CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION. DAMAGE TO ENGINE COMPONENTS MAY RESULT FROM TEMPERATURES EXCEEDING 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION.

STEP 8. OBSERVE THAT NO SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY (12, FIG. 1-2) REFER TO TABLE 4-2,15 FOR CORRECTIVE ACTION IF BLUE OR BLACK SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY DURING ACCELERATION.

Figure 2-13. Starting the generator set (sheet 3 of 5).



STEP 9. OBSERVE THAT OIL PRESSURE GAGE INDICATES 90 ± 10 PSIG. REFER TO TABLE 4-2,16 FOR CORRECTIVE ACTION IF OIL PRESSURE IS LOW. REFER TO TABLE 4-2,17 FOR CORRECTIVE ACTION IF OIL PRESSURE IS HIGH.

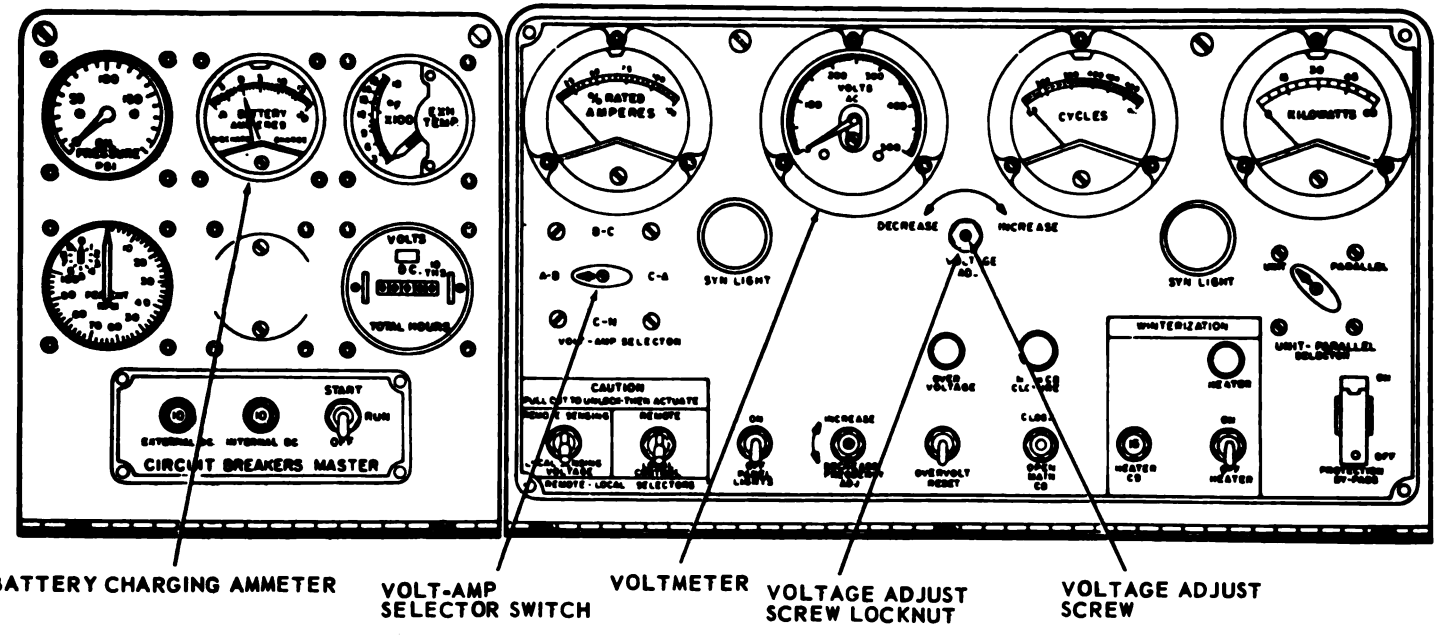
CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF OIL PRESSURE GAGE INDICATES LESS THAN 80 PSIG OR MORE THAN 100 PSIG. ABNORMAL OIL PRESSURE MAY CAUSE DAMAGE TO ENGINE.

STEP 10. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAT 1,200° F FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE. EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

STEP 11. ALLOW ENGINE TO OPERATE 2 MINUTES AND THEN OBSERVE THAT FREQUENCY METER INDICATES 400 ± 1 CPS. LOOSEN FREQUENCY, ADJUST SCREW LOCKNUT AND ADJUST FREQUENCY. ADJUST SCREW CLOCKWISE INCREASE OR COUNTERCLOCKWISE DECREASE WITH SCREWDRIVER AS REQUIRED TO OBTAIN DESIRED INDICATION. REFER TO TABLE 4-2,21 FOR CORRECTIVE ACTION IF INDICATION CANNOT BE OBTAINED. TIGHTEN LOCKNUT WITHOUT CHANGING ADJUSTED POSITION OF FREQUENCY. ADJUST SCREW: REFER TO TABLE 4-2,22 FOR CORRECTIVE ACTION IF INDICATION CAN BE OBTAINED BUT CANNOT BE STABILIZED.

Figure 2-13. Starting the generator set (sheet 4 of 5).



STEP 12. PLACE VOLT-AMP SELECTOR SWITCH IN A-B POSITION. OBSERVE VOLTMETER FOR 208 VOLTS INDICATION WHEN GENERATOR SET IS CONNECTED FOR LOW VOLTAGE OPERATION OR 416 VOLTS INDICATION FOR HIGH VOLTAGE OPERATION LOOSEN VOLTAGE ADJUST SCREW LOCKNUT AND ADJUST SCREW WITH SCREWDRIVER AS REQUIRED TO OBTAIN THE DESIRED VOLTAGE INDICATION. TIGHTEN LOCKNUT WITHOUT CHANGING ADJUSTED POSITION OF VOLTAGE ADJUST SCREW. REFER TO TABLE 4-2,23,24 FOR CORRECTIVE ACTION IF DESIRED INDICATION CANNOT BE OBTAINED.

NOTE: LOW VOLTAGE ADJUSTMENT RANGE OF VOLTAGE ADJUST SCREW IS AT LEAST 198 TO 219 VOLTS LINE-TO-LINE. HIGH VOLTAGE ADJUSTMENT RANGE IS AT LEAST 396 TO 436 VOLTS LINE-TO-LINE.

STEP 13. OBSERVE BATTERY CHARGING CURRENT INDICATED ON BATTERY CHARGING AMMETER. BATTERY CHARGING AMMETER WILL INDICATE ABOUT 11 AMPS IF BATTERY VOLTAGE IS LOW. WHEN BATTERY HAS CHARGED TO NORMAL VOLTAGE, BATTERY CHARGING AMMETER SHALL INDICATE 2 TO 5 AMPS. REFER TO TABLE 4-2, 27 FOR CORRECTIVE ACTION IF BATTERY CONTINUES TO CHARGE CONDIDERABLY IN EXCESS OF 5 AMPS AFTER 2 HOURS SINCE ENGINE START.

Figure 2-13. Starting the generator set (sheet 5 of 5).

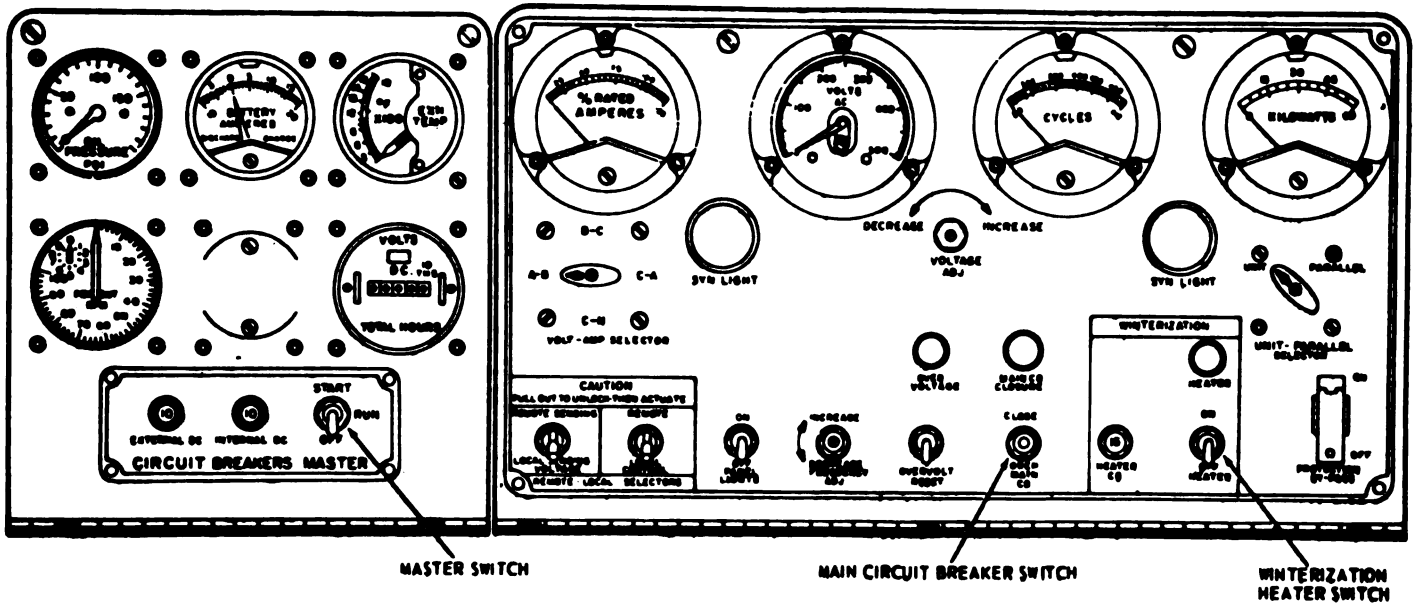
WARNING

When the unit is operated out-of-doors, stand clear of exhaust stream.

2-9. Stopping the Equipment

a. Refer to figure 2-14 and stop generator set.

b. Perform the necessary Daily Preventive Maintenance Services (para 3-3).



STEP 1	PLACE MAIN CIRCUIT BREAKER SWITCH IN OPEN POSITION TO REMOVE ELECTRICAL LOAD BEFORE ENGINE SHUTDOWN
NOTE	OPERATE ENGINE FOR APPROXIMATELY 2 MINUTES UNDER NO-LOAD CONDITIONS PRIOR TO STOPPING ENGINE THIS PERMITS GRADUAL COOLING OF ENGINE
STEP 2	PLACE MASTER SWITCH IN OFF POSITION AND ALLOW ENGINE TO COME TO COMPLETE STOP
STEP 3	INSURE THAT WINTERIZATION HEATER SWITCH IS IN THE OFF POSITION TO AVOID DISCHARGE OF THE BATTERIES THROUGH THE BATTERY ELECTROLYTE TEMPERATURE SENSOR

ME 6115-320-12/2-14

Figure 2-14. Stopping the generator set.

2-10. Operation Under Usual Conditions

a. General. When the generator set is in operation, make careful observations of instruments to be sure the unit is operating normally. Refer to paragraph 2-6 for descriptions and normal indications of the instruments.

b. Operation. Perform the following procedures for operating the generator set.

(1) Refer to paragraph 2-8 and start generator set.

(2) Refer to figure 2-15 and operate generator set.

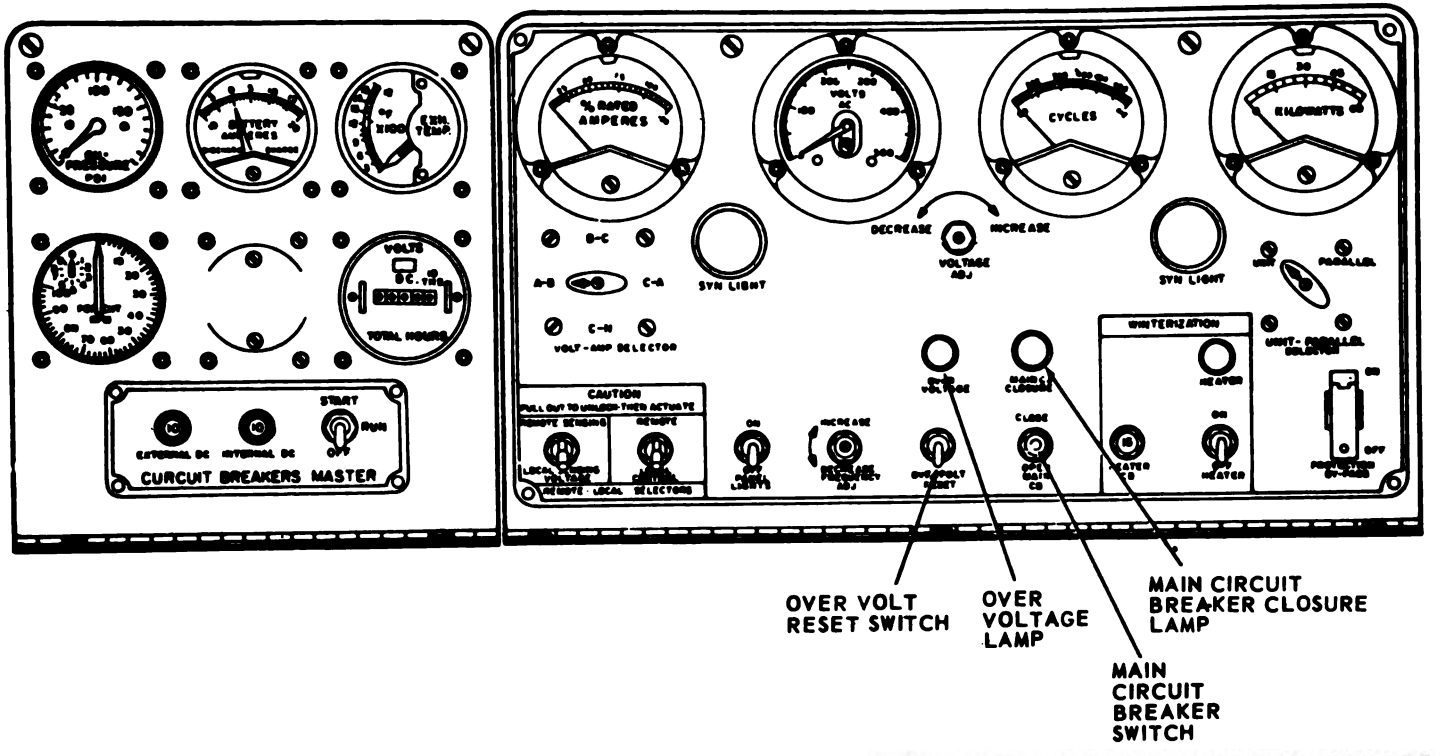
c. Battery Charger Operation. If operating experience with generator set over a period of time shows continued difficulty in keeping batteries in good state of charge, increase charging rate by turning battery charger voltage adjusting screw (fig. 4-20) in clockwise direction. If after a period of usage with adjusting screw at new setting, it is found that frequent addition of water to batteries is necessary, the charging rate was set too high, and adjusting screw should be turned counterclockwise to a position somewhere between the previous two settings.

d. Parallel Operation. Perform the following procedures for operating two generator sets in parallel.

(1) Check with organizational maintenance to determine that generator sets have been properly connected and adjusted for parallel operation.

(2) Start generator sets as described in paragraph 2-8.

(3) Refer to figure 2-16 and operate generator sets in parallel.



WARNING: IN CASE OF ACCIDENT FROM ELECTRIC SHOCK, SHUTDOWN GENERATOR SET AT ONCE. IF GENERATOR SET CANNOT BE SHUTDOWN, FREE VICTIM FROM LIVE CONDUCTOR WITH A BOARD OR ANY NONCONDUCTOR. IF VICTIM IS UNCONSCIOUS, APPLY ARTIFICAL RESPIRATION AND OBTAIN MEDICAL HELP.

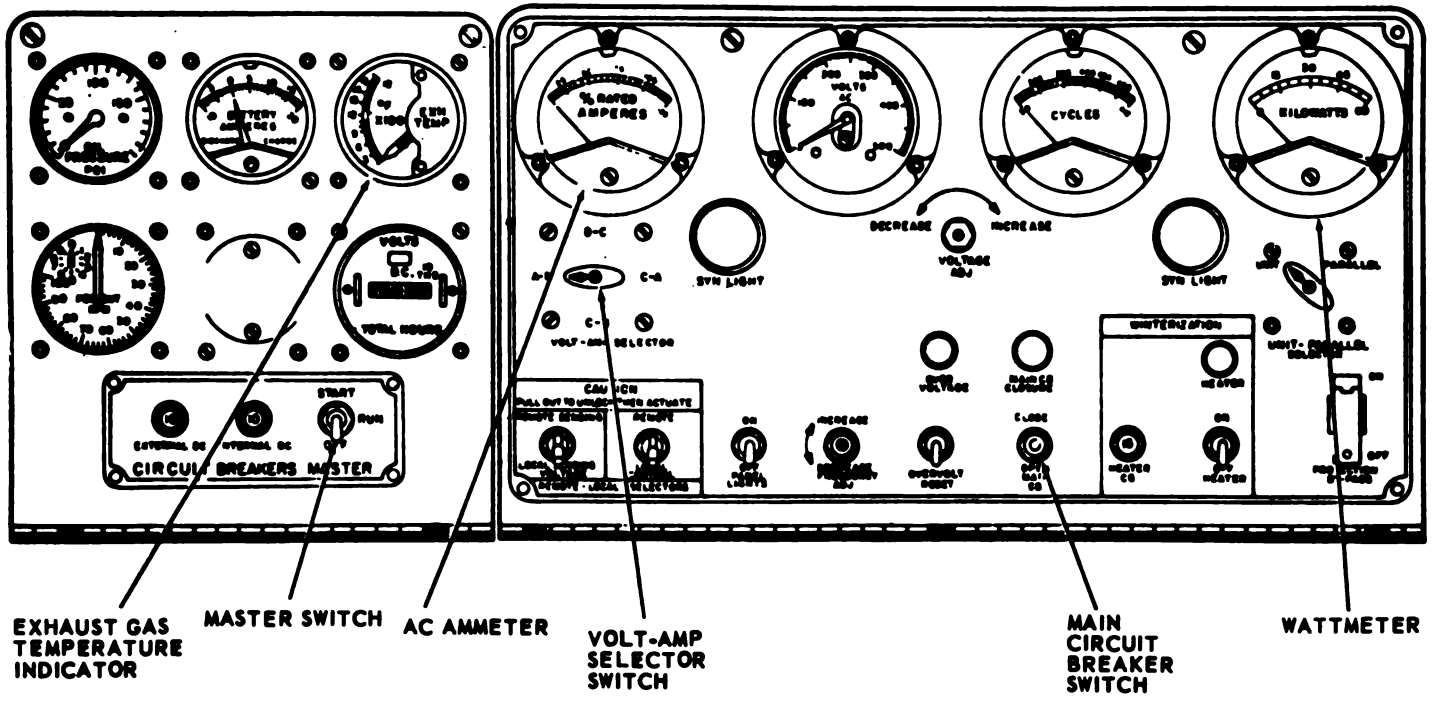
STEP 1. MOMENTARILY PLACE MAIN CIRCUIT BREAKER SWITCH IN CLOSE POSITION.

STEP 2. OBSERVE THAT MAIN CIRCUIT BREAKER CLOSURE LAMP ILLUMINATES TO INDICATE CONNECTION OF ELECTRICAL LOAD. REFER TO TABLE 4-2,25 FOR CORRECTIVE ACTION IF MAIN CIRCUIT BREAKER CLOSURE LAMP DOES NOT ILLUMINATE OR EXTINGUISHES DURING OPERATION OF GENERATOR SET.

NOTE: IF OVER VOLTAGE LAMP ILLUMINATES WHEN ELECTRICAL LOAD IS CONNECTED OR DURING OPERATION OF GENERATOR SET, AN OVERVOLTAGE CONDITION HAS TRIPPED OVERVOLTAGE RELAY TO CAUSE LOSS OF EXCITATION AND DISCONNECTION OF LOAD. REFER TO TABLE 4-2,26 FOR CORRECTIVE ACTION. PLACE OVER VOLT RESET SWITCH MOMENTARILY IN UP POSITION TO RESET OVERVOLTAGE CIRCUIT WHEN CAUSE OF OVERVOLTAGE CONDITION HAS BEEN CORRECTED, THEN REPEAT STEPS 1 AND 2 ABOVE.

ME 6115-320-12/2-15 (1)

Figure 2-15. Operating the generator set (sheet 1 of 2).



STEP 3. OBSERVE THAT WATTMETER INDICATES NOT MORE THAN 45 KW. IF WATTMETER INDICATES MORE THAN 45 KW, PLACE MAIN CIRCUIT BREAKER SWITCH IMMEDIATELY IN OPEN POSITION AND CHECK ELECTRICAL LOADS.

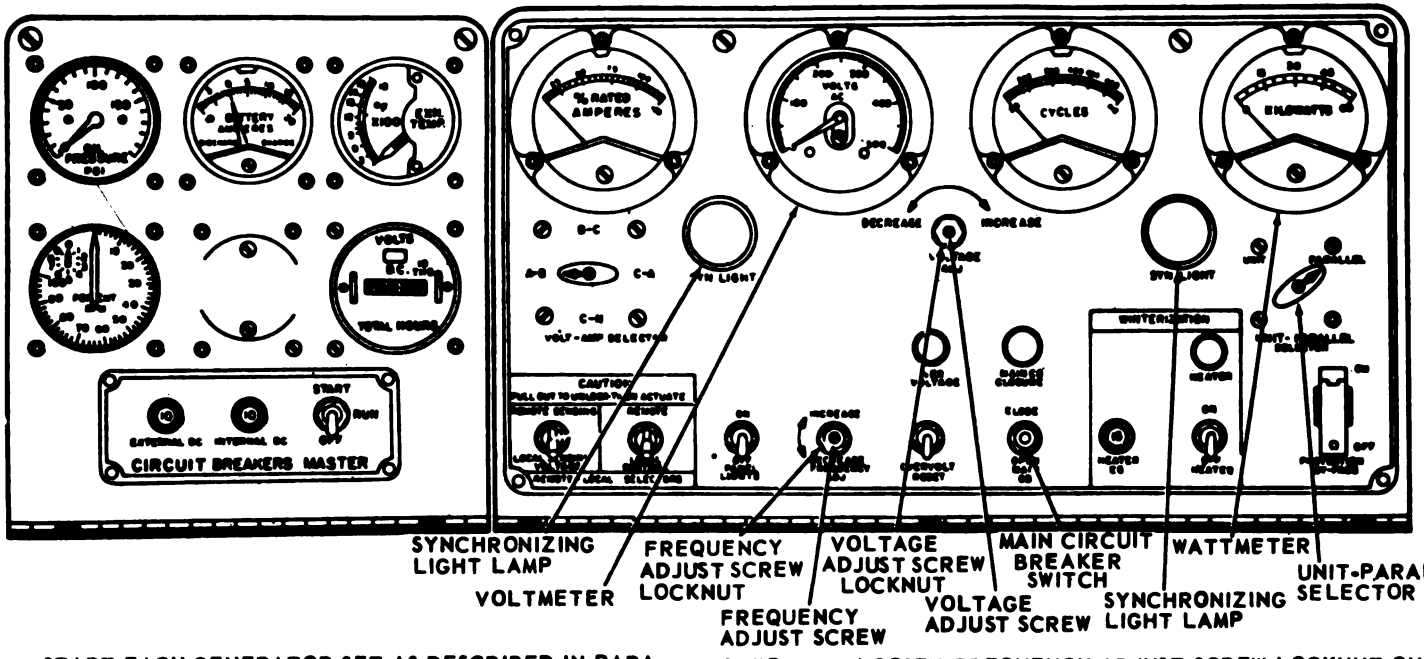
STEP 4. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAT 1,200° F. FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE. EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

STEP 5. OBSERVE AC AMMETER WHEN VOLT-AMP SELECTOR SWITCH IS PLACED IN A-B, B-C, AND C-A POSITIONS. AC AMMETER INDICATIONS SHALL BE EQUAL WITHIN 25 PERCENT.

CAUTION: AVOID LETTING GENERATOR SET RUN OUT OF FUEL SINCE THIS WILL INTRODUCE AIR INTO FUEL SYSTEM AND MAY REQUIRE PURGING OR PRIMING ON THE NEXT STARTING ATTEMPT. ALSO IF REPEATED OFTEN ENOUGH, THIS PRACTICE WILL RESULT IN DAMAGE TO FUEL CONTROL UNIT SINCE IT DOES NOT RECEIVE BENEFIT OF LUBRICATION FROM FUEL WHEN ENGINE STOPS DUE TO LACK OF FUEL.

Figure 2-15. Operating the generator set (sheet 2 of 2).



STEP 1. START EACH GENERATOR SET AS DESCRIBED IN PARAGRAPH 2-8 AND ALLOW SETS TO WARM UP FOR ABOUT 15 MINUTES.

STEP 2. PLACE UNIT-PARALLEL SELECTOR SWITCH ON BOTH GENERATOR SETS IN PARALLEL POSITION.

STEP 3. PLACE MAIN CIRCUIT BREAKER SWITCH ON GENERATOR SET CONNECTED TO ELECTRICAL LOAD (NO. 1 SET) IN CLOSE POSITION.

CAUTION: DO NOT CLOSE MAIN CIRCUIT BREAKER SWITCH ON NO. 2 SET UNTIL SETS ARE PROPERLY SYNCHRONIZED. EXTENSIVE DAMAGE TO ELECTRICAL COMPONENTS OF SETS MAY OTHERWISE RESULT.

STEP 4. OBSERVE THAT INDICATIONS OF VOLTMETERS ON GENERATOR SETS ARE EQUAL AND ARE AT LEVEL REQUIRED BY ELECTRICAL LOADS. LOOSEN LOCKNUT OF VOLTAGE ADJUST SCREW ON SET REQUIRING ADJUSTMENT AND ADJUST SCREW FOR REQUIRED INDICATION ON VOLTMETER. TIGHTEN LOCKNUT WITHOUT CHANGING ADJUSTED POSITION OF VOLTAGE ADJUST SCREW.

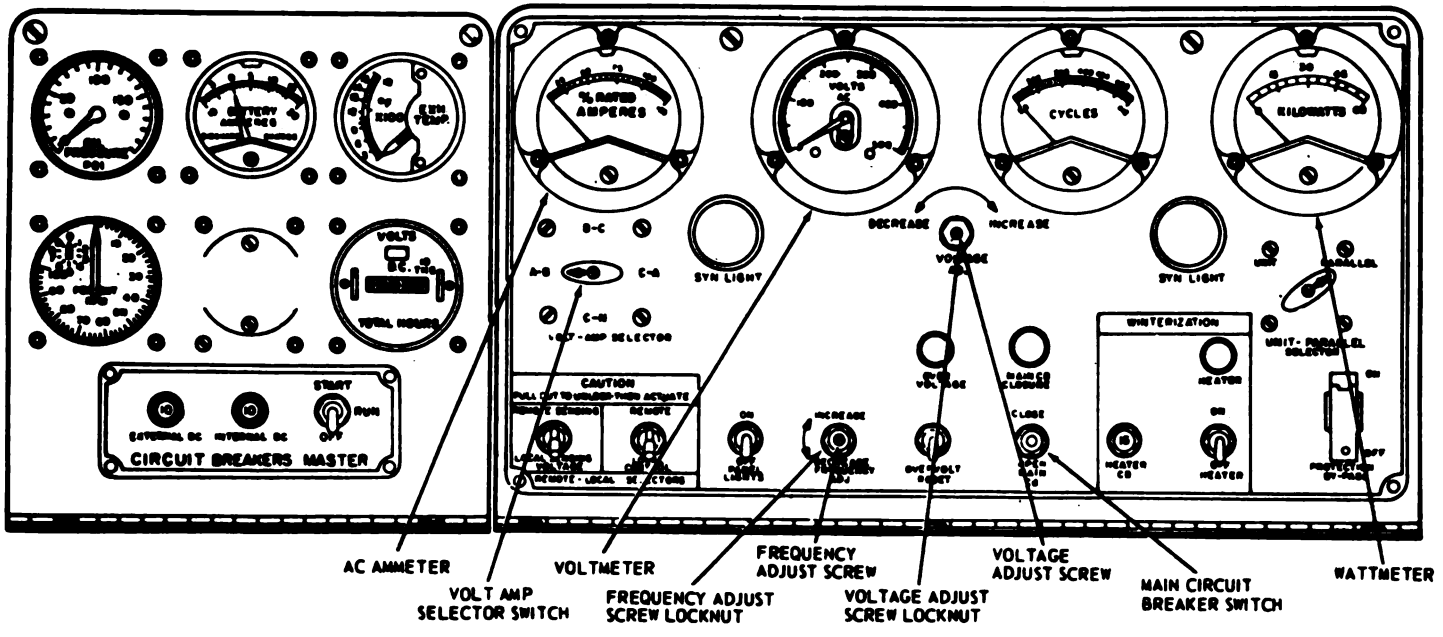
STEP 5. LOOSEN FREQUENCY ADJUST SCREW LOCKNUT ON NO.2 SET AND ADJUST SCREW CLOCKWISE (INCREASE) OR COUNTERCLOCKWISE (DECREASE) UNTIL RATE OF FLICKER OF SYNCHRONIZING LIGHT LAMPS IS NOT MORE THAN ONE FLICKER FOR APPROXIMATELY EVERY 5 SECONDS.

NOTE: REFER TO TABLE 4-2,31 FOR CORRECTIVE ACTION IF SETS CANNOT BE SYNCHRONIZED (SYNCHRONIZING LIGHT LAMPS CANNOT BE MADE TO FLICKER ON AND OFF TOGETHER IN A CONTROLLED MANNER WITH FREQUENCY ADJUST SCREW) OR WILL NOT REMAIN SYNCHRONIZED.

STEP 6. MOMENTARILY PLACE MAIN CIRCUIT BREAKER SWITCH ON NO. 2 SET IN CLOSE POSITION DURING PERIOD WHEN SYNCHRONIZING LIGHT LAMPS ARE COMPLETELY DARK.

ME 6115-320-12/2-16 (1)

Figure 2-16. Operating two generator sets in parallel (sheet 1 of 2).



STEP 7 IF ELECTRICAL LOAD IS NOT SHARED APPROXIMATELY EQUAL BETWEEN GENERATOR SETS (INDICATED ON WATTMETERS), LOOSEN FREQUENCY ADJUST SCREW LOCKNUTS OF SETS. TURN SCREW OF MORE HEAVILY LOADED SET SLIGHTLY COUNTERCLOCKWISE, AND SCREW ON OTHER SET SLIGHTLY CLOCKWISE, UNTIL LOAD IS BALANCED BETWEEN SETS. IF FREQUENCY IS NOT CORRECT FOR LOAD WHEN LOAD IS BALANCED, TURN BOTH SCREWS IN SAME DIRECTION UNTIL PROPER FREQUENCY IS OBTAINED WITHOUT UPSETTING DIVISION OF LOAD BETWEEN SETS.

STEP 8. AFTER PROPERLY DIVIDING KW LOAD, OBSERVE THAT LOAD CURRENT INDICATIONS OF AC AMMETERS OF BOTH GENERATOR SETS ARE APPROXIMATELY EQUAL WHEN MONITORING SAME PHASE (VOLT-AMP SELECTOR SWITCHES ARE IN SAME POSITION). IF INDICATIONS ARE NOT APPROXIMATELY EQUAL, LOOSEN VOLTAGE ADJUST SCREW LOCKNUTS OF SETS; TURN SCREW ON MORE HEAVILY LOADED SET SLIGHTLY COUNTERCLOCKWISE, AND SCREW ON OTHER SET SLIGHTLY CLOCKWISE, UNTIL CURRENT INDICATIONS ARE EQUAL BETWEEN SETS. IF VOLTMETERS ON SETS INDICATE INCORRECT VOLTAGE FOR LOAD, TURN BOTH SCREWS IN SAME DIRECTION UNTIL CORRECT VOLTAGE IS OBTAINED WITHOUT UPSETTING DIVISION OF LOAD CURRENT BETWEEN SETS

STEP 9 TIGHTEN LOCKNUTS OF FREQUENCY ADJUST AND VOLTAGE ADJUST SCREWS WITHOUT CHANGING ADJUSTED POSITIONS OF SCREWS.

NOTE IF THERE IS ANY EVIDENCE OF INSTABILITY (LOAD SWAPPING BETWEEN GENERATOR SETS) AT THE TIME SETS ARE PARALLELED, MOMENTARILY PLACE MAIN CIRCUIT BREAKER SWITCH ON ONE OF SETS IN OPEN POSITION AND REPORT CONDITION TO FIELD MAINTENANCE. LOAD SWAPPING WILL PROBABLY MANIFEST ITSELF BY EXTREME CONDITION OF VIBRATION AND RAPID PERIODIC FLUCTUATIONS (SURGING) IN SOUND OF ENGINE. LOAD SWAPPING WILL PROBABLY BE TOO RAPID TO BE NOTICED ON WATTMETERS AND AC AMMETERS OF SETS.

CAUTION: CONTINUED OPERATION OF GENERATOR SETS DURING AN UNSTABLE CONDITION CAN CAUSE DAMAGE TO SETS.

ME 6115-320-12/2-16 (2)

Figure 2-16. Operating two generator sets in parallel (sheet 2 of 2).

2-11. Remote Operation

a. If remote control of generator set is required, remove internally wired plug from REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5), connect remote control cable to J14 receptacle, and place REMOTE-LOCAL CONTROL SELECTOR switch (25, fig. 2-6) in REMOTE position. It will then be possible to perform the following functions at a properly wired remote control station; start, stop, voltage adjustment, frequency adjustment, main circuit breaker operation, and monitoring of voltage and frequency.

CAUTION

(1) Keep REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) firmly capped with its internally wired plug; failure to comply will cause the main circuit breaker to close, and it will not be possible to open it in a normal manner; it will cycle if the main circuit breaker switch is held in the open position or if a persistent overvoltage, undervoltage, underfrequency, or short circuit condition should happen to exist concurrently with the uncapped condition of receptacle J25; damage to the generator set or the load may result. (2) If the generator set controls are set for remote operation (REMOTE-LOCAL CONTROL SELECTOR switch (25, fig. 2-6) in REMOTE position) and the remote control station is not connected, the generator set will not start; if the remote control station is inadvertently disconnected while the set is in operation, it will shut down.

b. Start, operate, and stop generator set from remote control station as dictated by the needs of the system being powered. The remote control panel is not supplied as part of the generator set. Observe cautions and procedures of figures 2-13 through 2-15.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-12. Operation in Extreme Cold (Below 0°F).

a. The generator set will operate satisfactorily at ambient temperatures as low as —65° F. However, special precautions should be observed for the fuel system and the batteries. The battery heater should be operated when ambient temperatures are below —25° F to condition the batteries for starting. Approximately 1 hour of heating will be required at —65° F; heating time for temperatures between —25° F and —65° F will be proportionally less.

b. Keep fuel tank full at all times.

c. Service fuel filter (fig. 3-3).

d. Keep batteries fully charged (para 2-1).

CAUTION

Operate the generator set for at least 1 hour after adding water to batteries. Water added to batteries may freeze unless it is immediately mixed with electrolyte. Charging voltage and current required to maintain batteries fully charged varies with ambient temperatures. The battery charger may require adjustment if charging current is too low (less than 2 amps) to maintain batteries at full charge during extreme cold ambient temperatures.

CAUTION

An external 24v dc power source may be connected to 24V DC SLAVE RECEPTACLE J15 (fig. 2-5) for operating battery heater and starting generator set in event of battery failure. When connecting an external dc power source to J15 receptacle, be sure that polarity of power supply corresponds to markings on receptacle. Failure to comply will result in damage to generator set.

e. With generator set at standstill at temperatures as low as —65° F, the batteries (when initially fully charged) have sufficient capacity to operate the battery heater for 12 hours (in a cycling mode) and will be able to start the engine at least once at the end of the 12 hour period. This mode of operation is known as "standby" operation for the battery winterization equipment. During standby operation, it is desirable to charge the batteries in place from an external source through the J15 receptacle. In no case, after a long period of standby operation, should the heater be shut off and the batteries allowed to cool down without first recharging. The current drain of the heater is such that the batteries must have an external charge if on standby more than 12 hours.

CAUTION

In cold weather, keep the battery in a high state of charge to prevent freezing of the batteries and consequent damage thereto. Remove frozen batteries from the generator set immediately upon discovery to avoid damage caused by acid leaking from cracked cases when the battery thaws.

2-13. Operation in Extreme Heat

a. The generator set will operate satisfactorily at ambient temperatures up to 125° F.

b. Lubricate the generator set in accordance with LO 5-6115-320-12.

c. The operation of the generator set in extreme heat increases the evaporation rate of water from the battery electrolyte. Check battery electrolyte level frequently.

2-14. Operation in Dusty or Sandy Areas

a. Erect protective shield for generator set. Dust and sand shorten life of equipment parts and cause mechanical failure. Utilize natural barriers. Wipe down unit at frequent intervals using approved cleaning solvent. If water is plentiful, wet down surrounding area beyond immediate operating area.

b. Lubricate generator set in accordance with LO 5-6115-320-12. Clean oil tank screen and oil fill and level cap frequentl to prevent dust and abrasive material from entering engine. Clean tank screen and oil fill and level cap before adding or changing oil.

c. Keep fuel supply tank cap tightly closed to prevent dust and sand from entering tank. Clean area around fuel supply tank cap before removing cap to add fuel.

d. Keep all doors and covers closed as much as possible. When generator set is not being used, keep enclosure cover assembly (fig. 1-1) in place on front of unit.

2-15. Operation Under Rainy or Humid Conditions

a. The generator set has been weatherized to operate satisfactorily under rainy or humid conditions. However, special precautions should be observed to insure proper operation of the equipment and safety of personnel.

b. Secure all access panels and doors on generator set enclosure to minimize admittance of moisture to generator set components.

c. Close and secure instrument panel protective door assembly (9, fig. 1-1) after generator set has been started and adjusted for operation to prevent accumulation of excessive moisture on engine and electrical controls instruments panel assemblies. Remove excess moisture from control panels with a clean, dry cloth.

d. When generator set is not in use, secure enclosure cover assembly (fig. 1-1) in place on front of unit.

2-16. Operation in Salt Water Areas

a. Salt water has a corrosive action on metal. Prevention of rust and deterioration of electrical insulation in salt water areas requires constant exercise of preventive measures. Rust and corrosion at any point on generator set must be corrected immediately.

b. Wash down generator set regularly with fresh water. Avoid directing a water hose or other high pressure water source into louvers on lower front panel assembly (14, fig. 1-1). Dry generator set and inspect all painted surfaces for cracked, peeled, or blistered paint. Coat all exposed surfaces with corrosion preventive paint. Report severe corrosion of exposed surfaces to organizational maintenance.

2-17. Operation in High Altitudes

The generator set will operate satisfactorily without any special precautions to deliver 45 kw of power at elevations up to 8000 ft.

Section VI. OPERATION OF MATERIEL USED IN CONJUNCTION WITH THE EQUIPMENT

2-18. Internal Combustion Battery Heater

a. Descriptions. The internal combustion battery heater (12, fig. 1-3) provides heated air to the battery box assembly. Fresh air is drawn through the heater by an electrically driven fan and is ducted to the battery box assembly. The air is heated within the heater by circulating around a combustion chamber that is fired by engine fuel. The battery heater is energized through the WINTERIZATION HEATER switch on the electrical controls instruments panel assembly and is regulated by a battery electrolyte temperature sensor located in one of the batteries. The sensor actuates a relay circuit (which applies power to energize the solenoid coil of the heater pressure regulator valve (fuel valve), heater fuel pump, igniter, and fan motor when the WINTERIZATION HEATER switch is in the ON position and the battery electrolyte temperature decreases to approximately 0° F. A flame switch de-energizes the heater ignition system after initial combustion and the WINTERIZATION HEATER lamp illuminates to indicate heater operation. When the battery electrolyte temperature increases to approximately 20° F, the sensor causes the heater to shut down. A manual reset limit switch on the heater and the WINTERIZATION HEATER CB Circuit breaker on the electrical controls instruments panel assembly protect the heater electrical circuits.

b. Starting the Battery Heater.

(1) Check fuel supply to insure that adequate fuel is available for anticipated heater operating period.

(2) Open battery heater fuel shutoff valve (20, fig. 1-3).

(3) Press WINTERIZATION HEATER CB circuit breaker (18, fig. 2-6) to insure that it is closed (reset).

(4) Remove cap from one of the two battery heater external exhaust outlets (fig. 2-1).

(5) Press WINTERIZATION HEATER lamp (17, fig. 2-6) to insure that it illuminates.

(6) Place WINTERIZATION HEATER switch (16), in ON position.

NOTE

The operation of battery heater is automatic when WINTERIZATION HEATER switch is placed in ON position. The WINTERIZATION HEATER lamp illuminates during periods that heater is operating. If heater does not operate, check to insure that connector between the battery electrolyte temperature sensor (5, fig. 2-9) and temperature sensor electrical harness (3), is secure and free of dirt, grease, and corrosion. Refer to table 4-2 for other possible causes of heater operation failure.

c. Stopping the Battery Heater. Place WINTERIZATION HEATER switch in OFF position to stop battery heater.

NOTE

The battery heater will continue to operate for a short overrun period if battery heater was operating (WINTERIZATION HEATER LAMP illuminated) when WINTERIZATION HEATER switch was placed in OFF position. This is due to the purging of fuel already in the heater at the time of shut down. Close heater fuel shutoff valve and replace cap on heater exhaust outlet if battery heater operation is not anticipated in the near future.

Section VII. UTILIZATION IN THE LAUNCHING STATION

2-19. General

The GTGE 70-6-1 generator set is suitable for use in all areas of the Launching Station wherein a power unit is required; that is, on the launcher, the OMTS van, and in the auxiliary gas turbine vehicle (M-105 trailer carrying a generator set). The information contained herein is intended to supplement data and information presented in preceding sections and chapters to cover peculiarities of the equipment which apply for the generator set as it should be used in the Launching Station. The operator should study and be thoroughly familiar with the contents of the preceding sections and chapters.

2-20. Special Features

The generator set is equipped with certain special features which are required for compatibility with Launching Station usage. These features, which are not applicable to any other known usage of the generator set, are listed in *a* through *h* below.

a. A removable skid base assembly (13, fig. 1-1).

b. The three electrical receptacles J25, J26, and J27 (fig. 2-13), on the side of the generator set.

c. An EXTERNAL DC CIRCUIT BREAKER reset button (30, fig. 2-6) which protects external circuits fed from EXTERNAL FUEL PUMP J27 receptacle (fig. 2-3).

d. The bleed air fitting (fig. 2-2).

e. A ripple filter in the wires to pins e and f in EXTERNAL FUEL PUMP J27 receptacle (fig. 2-3). Power for the Launching Station communications system amplifiers are fed from these pins.

f. A special lubricating oil overtemperature detector.

g. A special exhaust overtemperature detector.

h. A special lubricating oil pressure detector.

NOTE

The special lubricating oil overtemperature, exhaust overtemperature, and lubricating oil pressure detectors feed malfunction signals into the remote control panel in the OMTS van, in the event of an engine malfunction; they do not operate to protect the engine as do other protective devices mentioned in preceding sections and chapters.

2-21. Multipurpose Features

The generator set contains a number of devices which make it suitable for a wide variety of applications. Some of these are not applicable for the Launching Station; they are listed below for information, along with instructions as to proper settings; once these settings have been made, the devices should be ignored thereafter, except for a periodic check to insure that they have not been disturbed.

a. 400 CYCLE POWER J18 receptacle (fig. 2-4) on the front of the generator set; leave it capped.

b. REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5) on the front of the generator set; leave it capped with its internally wired plug.

CAUTION

If internally wired plug for REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5) is not securely installed, it will not be possible to adjust the generator set frequency with the frequency adjust

screw on the electrical controls instruments panel assembly. Also, if the generator set is being operated remotely from the Launching Station, OMTS van and receptacle J14 is not capped with its internally wired plug, an overvoltage condition will be experienced on sets having Bendix electrical components; an undervoltage condition will be experienced on sets having General Electric equipment components; in either case the main circuit breaker will open.

c. UNIT-PARALLEL SELECTOR Switch (15, fig. 2-6). Place this switch in UNIT position; failure to do so will result in voltage and frequency regulation greater than is normal for single unit operation.

d. REMOTE-LOCAL VOLTAGE SENSING SELECTOR Switch (26). Place this switch in LOCAL position.

CAUTION

If the REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch (26) is placed or left in REMOTE position, an overvoltage condition will result when the main circuit breaker is closed; this will cause loss of excitation and possibly damage the load equipment.

NOTE

If it is desired to eliminate possibilities for abnormal operation through accidental use of this switch, the switch may be disabled by opening the electrical control panel, and removing wire no. 129 from the switch. The end of the wire should be carefully wrapped with insulating tape after removal from the switch. The switch has four wires connected to it; wire No. 129 will be the only wire connected to one of the two active switch terminals.

e. Voltage Change Panel Assembly (fig. 2-8). Open right side access door (6, fig. 1-1) and voltage change panel access door (fig. 2-8). Place voltage change panel assembly in position to give low voltage output (120 / 208 volts) from generator set, unless it is already in that position; be sure to tighten all nuts on electrical terminals (terminal studs). Incorrect output voltage of the generator set will probably result in extensive damage to, or improper operation of, load equipment. If there is any doubt as to the voltage for which the generator set is connected, be sure to check line-to-line voltage (A-B, B-C, or C-A) by means of voltmeter (9, fig. 2-6) and VOLT-AMP SELECTOR switch (27) immediately after initial start-up of the generator set, but before closing the main circuit breaker. Once correct voltage has been ascertained, the voltage change panel access door should be latched in place and the voltage change panel assembly should be ignored thereafter.

f. Mounting. The skid base assembly (13, fig. 1-1) has two sets of mounting holes in its bottom flanges. Refer to figure 7 for correct mounting holes for use of the generator set in each of the different applications in the Launching Station. If the wrong set of holes is used when the generator set is launcher mounted, there will be interference with fold back of launcher outriggers when readying the launcher for movement. If the wrong set of holes is used when the generator set is mounted on the OMTS van, the generator set muffler assembly (14, fig. 1-2) will project beyond the outline of the trailer van and may be damaged during transit.

g. Hold Down Bolts. Hold down bolts for mounting the generator set on the launcher, vans, and trailer are not supplied as part of the generator set. They are supplied by the Launching Station contractor. These bolts are special 5 / 16 in. high strength bolts. If any of these bolts are lost, be sure to replace with the exact same type. If standard bolts are used as substitute, they will fail during movement of the system over rough roads. The generator sets may bounce off the launcher or vans and be seriously damaged, or cause damage to other parts of the system.

h. Instrument Panel Protective Door Assembl (9, fig. 1-1). This door assembly should be left in the closed position when the generator set is launcher mounted to protect the electrical and engine controls instruments panel assemblies (16 and 17) from blast and flying debris when the missile is launched. The unit may be started and stopped and the main circuit breaker may be closed and opened through holes provided in the door assembly; if adjustments to controls are required, it will be necessary to raise the door assembly. When the generator set is mounted on the OMTS van, or the M-105 trailer, the door should preferably be folded back over the top of the enclosure during operation, although this is not absolutely necessary.

i. Battery Heater Exhaust Caps (fig. 2-1). Two caps for the battery heater exhaust outlets are provided. For launcher mounted generator sets, the exhaust outlet on the underside of the generator set enclosure should be uncapped and the other left capped when the battery heater is used. The exhaust outlet on the left side of the generator set should be uncapped and the one on the underside should be left capped when the battery heater is used for generator sets installed in the OMTS van or the M-105 trailer.

2-22. Starting, Operating, and Stopping

a. Launching Station and M-105 Trailer Mounted Generator Sets. Remote control is not

used for these applications of the generator sets. The procedures in (1) through (4) below apply.

(1) *Preparation for starting.*

WARNING

Turbine or compressor failures caused by foreign material entering the generator set may cause injury to personnel in the immediate area. During engine start, do not stand or work in stand clear areas shown in figure 2-11.

(a) CAP REMOTE CONTROL GENERAL J14 and REMOTE CONTROL SPECIAL J25 receptacles (figs. 2-3 and 2-5) with their internally wired plugs.

CAUTION

If REMOTE CONTROL GENERAL J14 receptacle (fig. 2-5) is not capped with its internally wired plug, it will not be possible to adjust the generator frequency with the appropriate screw on the electrical controls instruments panel assembly. If REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) is not capped with its internally wired plug, the main circuit breaker will close and cannot be opened in a normal manner; it will cycle if the main circuit breaker switch is held in the open position or if a persistent overvoltage, undervoltage, underfrequency, or short circuit condition should happen to exist concurrently with the uncapped condition of receptacle J25; damage to the generator set or the load may result.

(b) Place REMOTE-LOCAL SENSING SELECTOR switch (26, fig. 2-6) in LOCAL SENSING position.

CAUTION

If this switch is placed or left in the REMOTE position, an overvoltage condition will be experienced when the main circuit breaker is closed. This will cause loss of excitation.

(c) Place REMOTE-LOCAL CONTROL SELECTOR switch (25) in LOCAL position.

(2) *Starting.* Refer to figure 2-17 and start generator set.

(3) *Operating.* Refer to figure 2-18 and operate generator set.

(4) *Stopping.* Refer to figure 2-19 and stop generator set.

b. OMTS Van Mounted Generator Sets. In these applications, the generator set should be started locally; the unit should be operated and stopped from a remote control station located within the van. It is also possible to start the unit from the remote control station provided the MASTER switch (28, fig. 2-6) has been left in RUN position; however, this procedure is not recommended (except possibly in emergencies) since, for safety reasons, it is desirable that the operator keep the generator set and its instrumentation in view during the starting operation. The internally wired plug should be removed from REMOTE CONTROL SPECIAL J25 receptacle (fig. 2-3) and the remote control cable (supplied with the OMTS van) should be connected to this receptacle. The procedures in (1) through (3) below apply.

(1) *Starting.*

(a) Place START-RUN-OFF switch on remote control panel (in van) in RUN position.

(b) Place REMOTE-LOCAL CONTROL SELECTOR switch (25, fig. 2-6) in LOCAL position.

(c) Place PROTECTION BY-PASS switch (14) in OFF position.

WARNING

The PROTECTION BY-PASS switch (14) must be in OFF position, with the red lockout guard in the closed (down) position. It should be used only in extreme emergencies when need for continued operation justifies risks incurred in loss of equipment, and / or injury to personnel.

(d) Place REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch (26) in the LOCAL position.

(e) Refer to figure 2-17 and start generator set.

NOTE

The part of the first caution in figure 2-17 (preceding step 1) which refers to capping of REMOTE CONTROL SPECIAL J25 receptacle will not apply.

(f) Place the REMOTE-LOCAL CONTROL SELECTOR switch (25, fig. 2-6) in the REMOTE position to gain control at the remote control panel in the van.

CAUTION

The REMOTE-LOCAL CONTROL SELECTOR switch is immediately adjacent to and is of the same type as the REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch (26), and care must be exercised not to operate the REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch by mistake since this will cause an overvoltage condition to occur with opening of the main circuit breaker and possible damage to the load. (para 2-21 *d*).

(2) *Operation.* After allowing the generator set to run unloaded for several minutes, perform procedures in *(a)* through *(c)* below.

(a) Test trouble indicator lamps on remote control panel (in the van) by pressing PRESS-TO-TEST LIGHTS button thereon.

(b) Press AC RESET button on remote control panel (in van). This action will cause main circuit breaker in the generator set to close and apply ac power to the van; the AC OFF indicating light on remote control panel will extinguish.

(c) Load generator set and observe indicators for any malfunctions.

NOTE

If for any reason an overvoltage condition should take place in the generator output, excitation will be lost and the main circuit breaker will open. The overvoltage protection circuit will operate if the voltage reaches 130 percent of rated voltage and remains at this high value for more than 180 milliseconds.

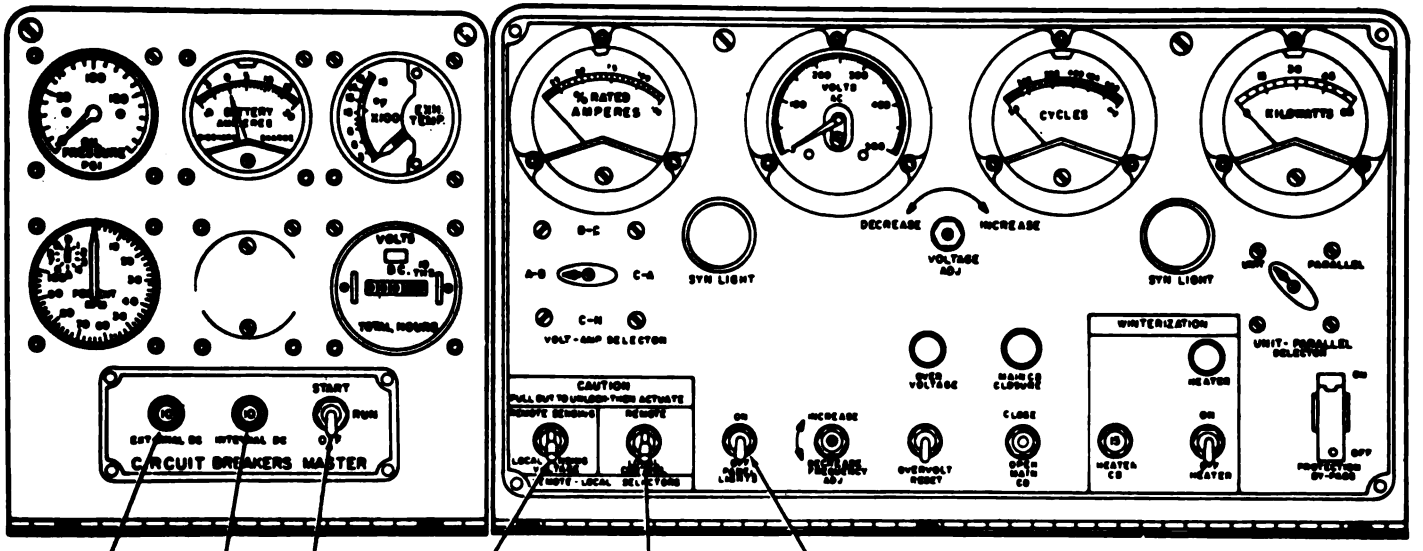
(3) *Stopping.*

(a) Reduce load to minimum practicable value and let generator set operate at this load for several minutes.

(b) Place START-RUN-OFF switch on remote control panel (in van) in OFF position.

(c) Insure that MASTER switch (28, fig. 2-6) and WINTERIZATION HEATER switch (16) are placed in the OFF position if generator set is to be out of operation for a long period.

c. Communications Circuits. Communications circuits for the Launching Station are fed through pins e and f of EXTERNAL FUEL PUMP J27 receptacle. The generator set contains a filter in the leads to these pins to suppress ripple voltage in the output of the battery charger (transformer-rectifier). This filter is subject to damage if the generator set battery polarity is reversed. If for some reason communications in the Launching Station should develop abnormal noise or hum, check the filter (especially the capacitor to determine whether or not it has been damaged). The filter is mounted on the left-front side of the generator set, behind the lower front panel assembly (14, fig. 1-1).



CAUTION: REMOTE CONTROL RECEPTACLES J-14 AND J-25 MUST BE SECURELY CAPPED WITH THEIR INTERNALLY WIRED PLUGS. IF RECEPTACLE J-14 IS NOT CAPPED WITH ITS INTERNALLY WIRED PLUG, IT WILL NOT BE POSSIBLE TO ADJUST THE GENERATOR FREQUENCY WITH THE APPROPRIATE SCREW ON THE CONTROL PANEL. IF RECEPTACLE J-25 IS NOT CAPPED WITH ITS INTERNALLY WIRED PLUG, THE MAIN CIRCUIT BREAKER WILL CLOSE AND CANNOT BE OPENED IN A NORMAL MANNER; IT WILL CYCLE IF THE MAIN CIRCUIT BREAKER SWITCH IS HELD IN THE OPEN POSITION OR IF A PERSISTENT OVERVOLTAGE, UNDERVOLTAGE, UNDERFREQUENCY, OR SHORT CIRCUIT CONDITION SHOULD HAPPEN TO EXIST CONCURRENTLY WITH THE UNCAPPED CONDITION OF RECEPTACLE J-25, DAMAGE TO THE GENERATOR SET OR THE LOAD MAY RESULT.

NOTE: IF LIGHT CONDITION REQUIRES ILLUMINATION OF CONTROL PANELS, PLACE PANEL LIGHTS SWITCH IN ON POSITION.

STEP 1. PLACE REMOTE-LOCAL VOLTAGE SENSING SELECTOR SWITCH IN LOCAL SENSING POSITION.

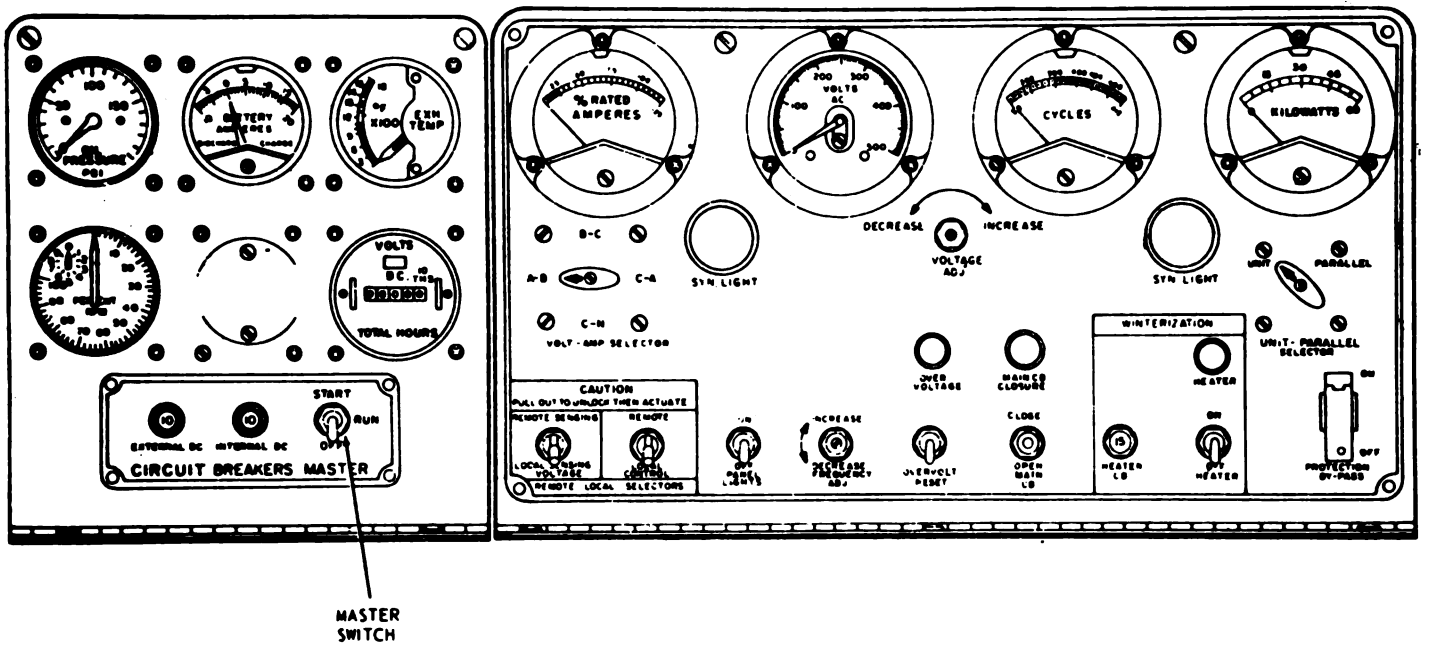
STEP 2. PLACE REMOTE-LOCAL CONTROL SELECTOR SWITCH IN LOCAL POSITION.

STEP 3. PRESS EXTERNAL DC AND INTERNAL DC CIRCUIT BREAKERS TO INSURE THEY ARE CLOSED (RESET).

STEP 4. PLACE MASTER SWITCH IN RUN POSITION FOR 3-5 SECONDS. FUEL BOOST PUMP WILL AUTOMATICALLY START AND CONTINUE OPERATING UNTIL MASTER SWITCH IS PLACED IN OFF POSITION. ENGINE WILL NOT START IF FUEL BOOST PUMP FAILS TO OPERATE. FEEL VIBRATION OR LISTEN FOR OPERATION OF FUEL BOOST PUMP MOTOR. REFER TO TABLE 4-2,1 FOR CORRECTIVE ACTION IF FUEL BOOST PUMP FAILS TO RUN.

ME 6115-320-12/2-17 (1)

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation. (Sheet 1 of 5).

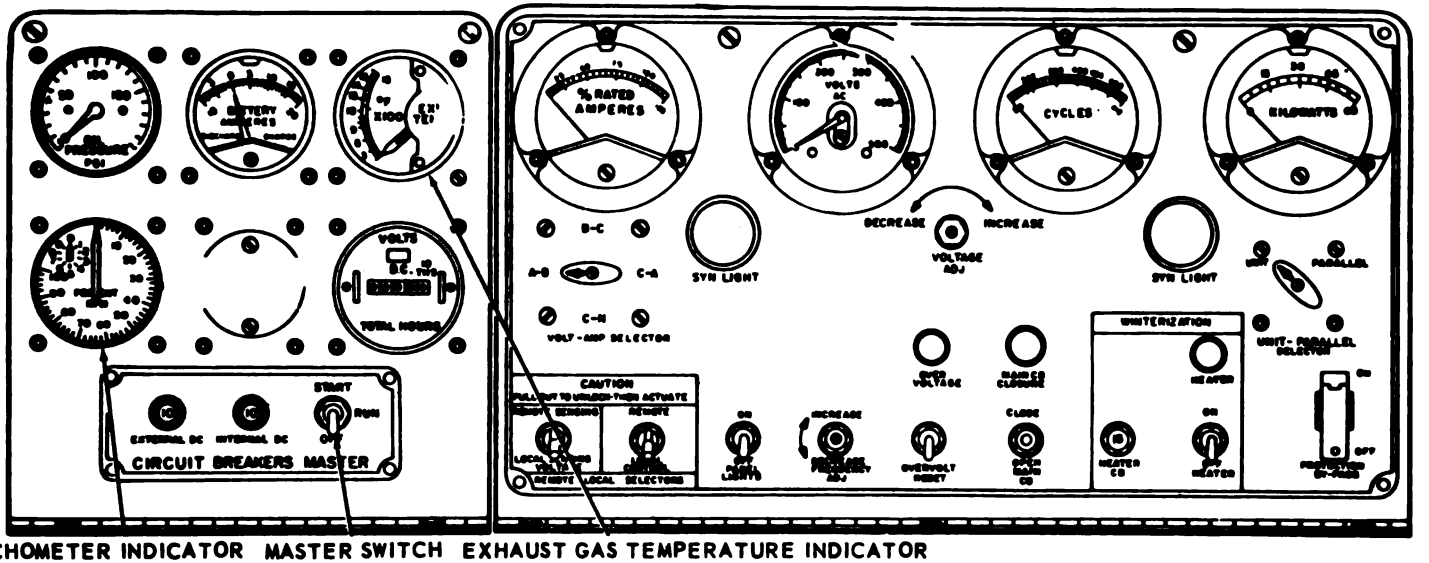


STEP 5 MOMENTARILY PLACE MASTER SWITCH IN START POSITION. ENGINE WILL AUTOMATICALLY START AND ACCELERATE. WHEN MASTER SWITCH IS RELEASED, IT WILL AUTOMATICALLY RETURN TO RUN POSITION AND ENGINE WILL CONTINUE TO OPERATE. REFER TO PARAGRAPH 47 FOR CORRECTIVE ACTION IF STARTER FAILS TO RUN. REFER TO PARAGRAPH 48 FOR CORRECTIVE ACTION IF START ER RUNS BUT DOES NOT ROTATE THE ENGINE. REFER TO PARAGRAPH 49 FOR CORRECTIVE ACTION IF ENGINE STOPS MOTORING WHEN MASTER SWITCH RETURNS TO RUN POSITION. REFER TO PARAGRAPH 51 FOR CORRECTIVE ACTION IF ENGINE MOTORS BUT DOES NOT START.

CAUTION DO NOT EXCEED STARTER MOTOR DUTY CYCLE OF 1 MINUTE ON AND 4 MINUTES OFF. OVERHEATING AND DAMAGE TO STARTER MOTOR MAY OTHERWISE RESULT. MAKE SURE AIR INTAKE OPENINGS ARE FREE FROM OBSTRUCTIONS TO INSURE ADEQUATE AIR INTAKE TO ENGINE. ERRATIC OPERATION OR FAILURE OF ENGINE TO OPERATE MAY OTHERWISE RESULT.

NOTE APPROXIMATELY 3 START CYCLES MAY BE EXPECTED FROM FULLY CHARGED BATTERIES WHEN ATTEMPTING TO START THE GENERATOR SET IN EXTREME COLD WEATHER CONDITIONS. APPROXIMATELY 8 TO 10 START CYCLES MAY BE EXPECTED DURING NORMAL OR EXTREME HOT WEATHER CONDITIONS. THIS ASSUMES NO CHARGING OF BATTERIES BETWEEN START CYCLES.

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation. (Sheet 2 of 5).



TACHOMETER INDICATOR MASTER SWITCH EXHAUST GAS TEMPERATURE INDICATOR

STEP 6. LISTEN FOR ENGINE COMBUSTION (CHARACTERISTIC ROAR) AND OBSERVE TACHOMETER INDICATOR DURING ENGINE ACCELERATION. ENGINE COMBUSTION SHOULD OCCUR AND ENGINE SHOULD ACCELERATE SMOOTHLY TO NORMAL OPERATING RPM OF 100 ± 3 PERCENT IN 15 TO 30 SECONDS. PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF ENGINE COMBUSTION DOES NOT OCCUR OR ENGINE DOES NOT HAVE NORMAL ACCELERATION. REFER TO TABLE 4-2,6 FOR CORRECTIVE ACTION IF COMBUSTION DOES NOT OCCUR; REFER TO TABLE 4-2,7 IF ENGINE SHUTS DOWN IMMEDIATELY AFTER COMBUSTION OCCURS; REFER TO TABLE 4-2,8 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO SLOWLY, REFER TO TABLE 4-2,9 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES ERRATICALLY: REFER TO TABLE 4-2,10 FOR CORRECTIVE ACTION IF ENGINE ACCELERATES TOO FAST; REFER TO TABLE 4-2,12 FOR CORRECTIVE ACTION IF ENGINE SHUTS DOWN AFTER NORMAL ACCELERATION TO GOVERNED RPM OR LESS: REFER TO TABLE 4-2,13,14 FOR CORRECTIVE ACTION IF GOVERNED ENGINE SPEED IS LESS THAN 97 PERCENT OR MORE THAN 103 PERCENT.

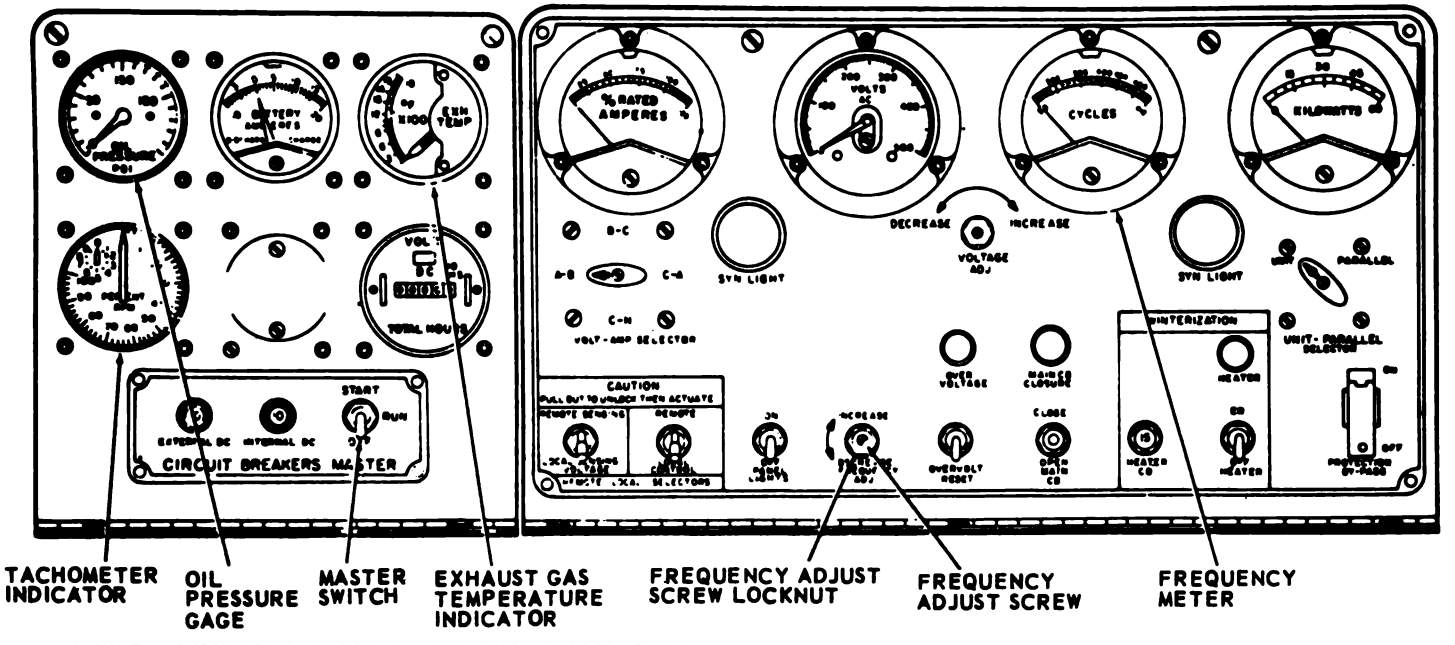
CAUTION: IF ENGINE COMBUSTION FAILS TO OCCUR, WAIT AT LEAST 5 MINUTES AFTER MASTER SWITCH IS PLACED IN OFF POSITION BEFORE ATTEMPTING RESTART. THIS ALLOWS ANY ACCUMULATED FUEL IN ENGINE PLENUM TO DRAIN FROM PLENUM DRAIN FITTING (FIG. 2-7), AND EVAPORATE, BEFORE ATTEMPTING RESTART. ACCUMULATED FUEL IN ENGINE PLENUM MAY RESULT IN A HOT (FLAMING) START OR OVERSPEED CONDITION DURING NEXT STARTING ATTEMPT, AND ENGINE MAY BE EXTENSIVELY DAMAGED THEREBY. ENGINE OVER-TEMPERATURE AND OVERSPEED PROTECTION DEVICES ARE OF NO VALUE UNDER THESE CONDITIONS. FOR THIS REASON, ALWAYS BE SURE THAT PLENUM DRAIN IS OPEN.

STEP 7. OBSERVE EXHAUST GAS TEMPERATURE INDICATOR DURING ENGINE ACCELERATION. EXHAUST GAS TEMPERATURE SHALL NOT EXCEED 1,150° F FOR MORE THAN 5 SECONDS. REFER TO TABLE 4-2,11 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° F FOR MORE THAT 5 SECONDS DURING ACCELERATION.

CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF EXHAUST GAS TEMPERATURE EXCEEDS 1,150° FOR MORE THAN 5 SECONDS DURING ACCELERATION. DAMAGE TO ENGINE COMPONENTS MAY RESULT FROM TEMPERATURES EXCEEDING 1,150° F FOR MORE THAN 5 SECONDS DURING ACCELERATION.

STEP 8. OBSERVE THAT NO SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY (12, FIG. 1-2). REFER TO TABLE 4-2, 15 FOR CORRECTIVE ACTION IF BLUE OR BLACK SMOKE OR FLAME IS EMITTED FROM MUFFLER ASSEMBLY DURING ACCELERATION.

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation. (Sheet 3 of 5).



STEP 9. OBSERVE THAT OIL PRESSURE GAGE INDICATES 90 ± 10 PSIG. REFER TO TABLE 4-2,16 FOR CORRECTIVE ACTION IF OIL PRESSURE IS LOW. REFER TO TABLE 4-2,17 FOR CORRECTIVE ACTION IF OIL PRESSURE IS HIGH.

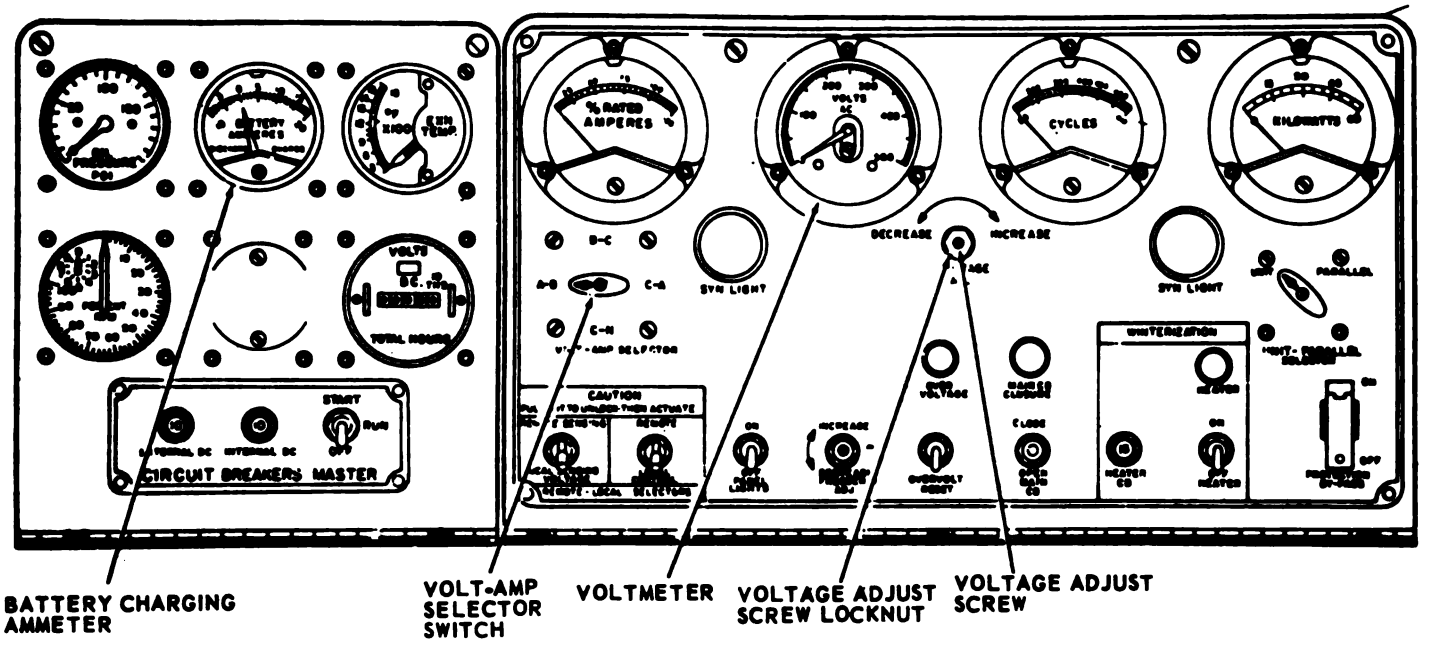
CAUTION: PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE IF OIL PRESSURE GAGE INDICATES LESS THAN 80 PSIG, OR MORE THAT 100 PSIG. ABNORMAL OIL PRESSURE MAY CAUSE DAMAGE TO ENGINE.

STEP 10. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAT 1,200° F FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

STEP 11. ALLOW ENGINE TO OPERATE 2 MINUTES AND THEN OBSERVE THAT FREQUENCY METER INDICATES 400 ± CPS. LOOSEN FREQUENCY ADJUST SCREW LOCKNUT AND ADJUST FREQUENCY ADJUST SCREW CLOCKWISE (INCREASE) OR COUNTERCLOCKWISE (DECREASE) WITH SCREWDRIVER AS REQUIRED TO OBTAIN DESIRED INDICATION. REFER TO TABLE 4-2,21 FOR CORRECTIVE ACTION IF INDICATION CANNOT BE OBTAINED. TIGHTEN LOCKNUT WITHOUT CHANGING ADJUSTED POSITION OF FREQUENCY ADJUST SCREW. REFER TO TABLE 4-2,22 FOR CORRECTIVE ACTION IF INDICATION CAN BE OBTAINED BUT CANNOT BE STABILIZED.

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation (Sheet 4 of 5).

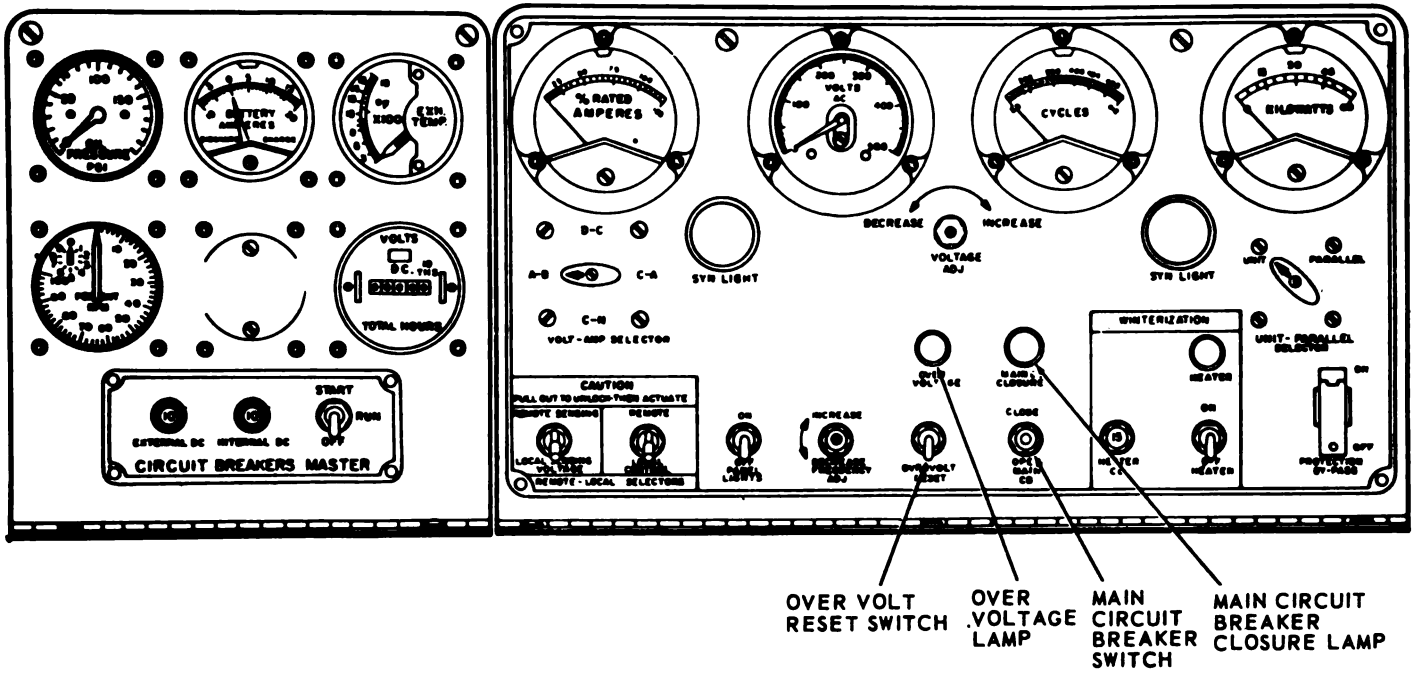


STEP 12. PLACE VOLT-AMP SELECTOR SWITCH IN C-N POSITION. OBSERVE VOLTMETER FOR 120 VOLTS INDICATION. LOOSEN VOLTAGE ADJUST SCREW LOCKNUT AND ADJUST SCREW WITH SCREWDRIVER AS REQUIRED TO OBTAIN THE DESIRED VOLTAGE INDICATION. TIGHTEN LOCKNUT WITHOUT CHANGING ADJUSTED POSITION OF VOLTAGE ADJUST SCREW. REFER TO TABLE 4-2, 23,24 FOR CORRECTIVE ACTION IF DESIRED INDICATION CANNOT BE OBTAINED.

NOTE: LOW VOLTAGE ADJUSTMENT RANGE OF VOLTAGE ADJUST SCREW IS AT LEAST 115 TO 125 VOLTS LINE-TO-LINE.

STEP 13. OBSERVE BATTERY CHARGING CURRENT INDICATED ON BATTERY CHARGING AMMETER. BATTERY CHARGING AMMETER WILL INDICATE ABOUT +11 AMPS IF BATTERY VOLTAGE IS LOW. WHEN BATTERY HAS CHARGED TO NORMAL VOLTAGE, BATTERY CHARGING AMMETER SHALL INDICATE +2 TO +5 AMPS. REFER TO TABLE 4-2,27 FOR CORRECTIVE ACTION IF BATTERY CONTINUES TO CHARGE CONSIDERABLY IN EXCESS OF 5 AMPS AFTER 2 HOURS SINCE ENGINE START.

Figure 2-17. Starting the generator set for launching station or M-105 trailer mounted operation. (Sheet 5 of 5).



WARNING: IN CASE OF ACCIDENT FROM ELECTRIC SHOCK, SHUTDOWN GENERATOR SET AT ONCE. IF GENERATOR SET CANNOT BE SHUTDOWN, FREE VICTIM FROM LIVE CONDUCTOR WITH A BOARD OR ANY NON-CONDUCTOR. IF VICTIM IS UNCONSCIOUS, APPLY ARTIFICIAL RESPIRATION AND OBTAIN MEDICAL HELP.

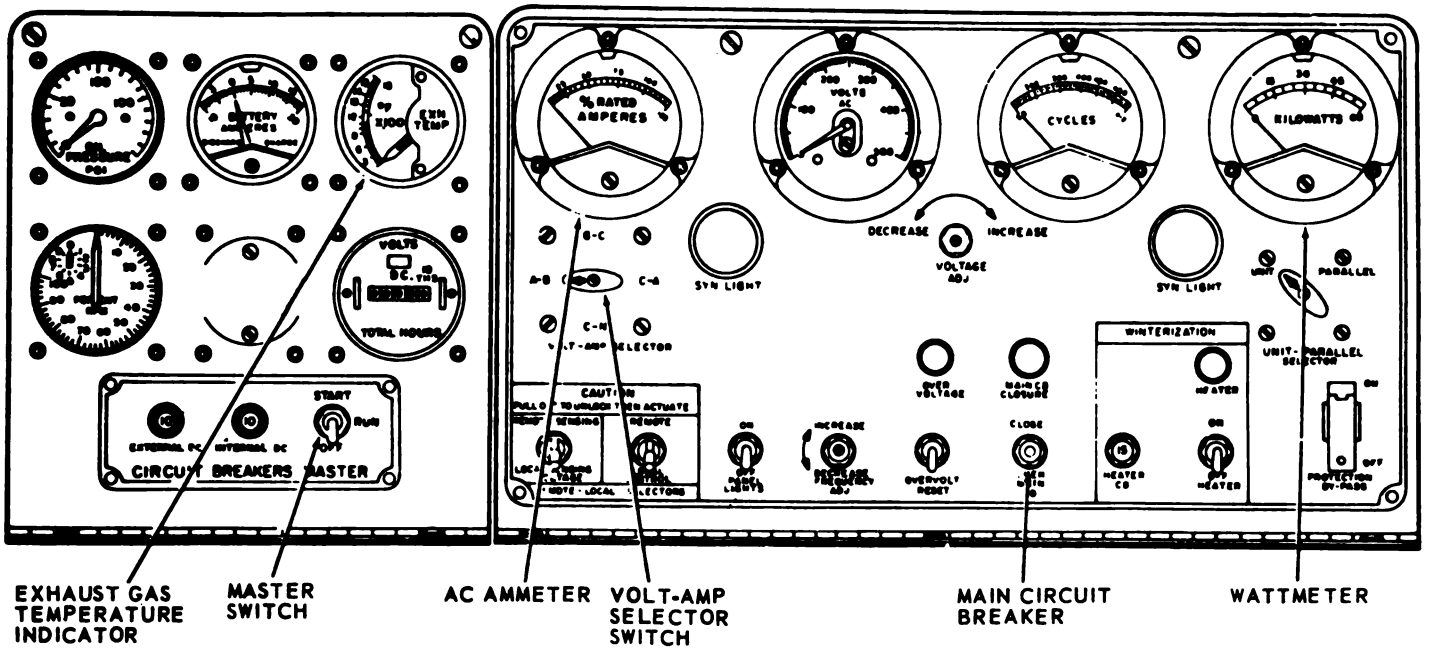
STEP 1. MOMENTARILY PLACE MAIN CIRCUIT BREAKER SWITCH IN CLOSE POSITION.

STEP 2. OBSERVE THAT MAIN CIRCUIT BREAKER CLOSURE LAMP ILLUMINATES TO INDICATE CONNECTION OF ELECTRICAL LOAD. REFER TO TABLE 4-2,25 FOR CORRECTIVE ACTION IF MAIN CIRCUIT BREAKER CLOSURE LAMP DOES NOT ILLUMINATE OR EXTINGUISHES DURINGOPERATION OF GENERATOR SET.

NOTE: IF OVERVOLTAGE LAMP ILLUMINATES WHEN ELECTRICAL LOAD IS CONNECTED OR DURING OPERATION OF GENERATOR SET, AN OVERVOLTAGE CONDITION HAS TRIPPED OVERVOLTAGE RELAY TO CAUSE LOSS OF EXCITATION AND DISCONNECTION OF LOAD. REFER TO TABLE 4-2,26 FOR CORRECTIVE ACTION PLACE OVER VOLT RESET SWITCH MOMENTARILY IN UP POSITION TO RESET OVERVOLTAGE CIRCUIT WHEN CAUSE OF OVERVOLTAGE CONDITION HAS BEEN CORRECTED, THEN REPEAT STEPS 1 AND 2 ABOVE.

ME 6115-320-12/2-18 (1)

Figure 2-18. Operating the generator set launching station or M-105 trailer mounted operation (Sheet 1 of 2).



STEP 3. OBSERVE THAT WATTMETER INDICATES NOT MORE THAN 45 KW. IF WATTMETER INDICATES MORE THAN 45 KW, PLACE MAIN CIRCUIT BREAKER SWITCH IMMEDIATELY IN OPEN POSITION AND CHECK ELECTRICAL LOADS.

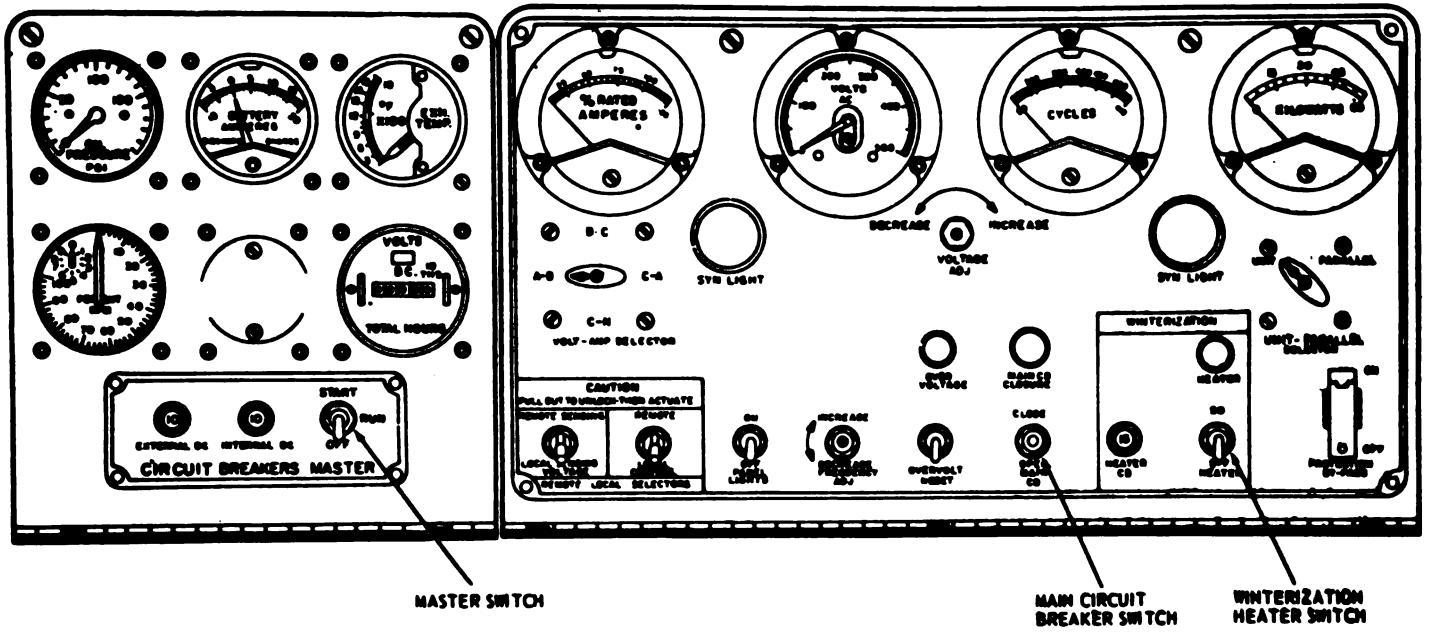
STEP 4. OBSERVE THAT EXHAUST GAS TEMPERATURE INDICATOR DOES NOT INDICATE MORE THAN 1,200° F FOR STEADY STATE OPERATION OF THE SET AT FULL LOAD.

CAUTION: IF EXHAUST GAS TEMPERATURE EXCEEDS 1,200° F DURING STEADY STATE OPERATION OF ENGINE, PLACE MASTER SWITCH IMMEDIATELY IN OFF POSITION TO STOP ENGINE. EXCESSIVE EXHAUST GAS TEMPERATURE DURING STEADY STATE OPERATION OF THE ENGINE MAY CAUSE EXTENSIVE DAMAGE TO ENGINE. REFER TO TABLE 4-2,19 FOR CORRECTIVE ACTION IF EXHAUST GAS TEMPERATURE IS TOO HIGH.

STEP 5. OBSERVE AC AMMETER WHEN VOLT-AMP SELECTOR SWITCH IS PLACED IN A-B, B-C, AND C-A POSITIONS. AC AMMETER INDICATIONS SHALL BE EQUAL WITHIN 25 PERCENT.

CAUTION: AVOID LETTING GENERATOR SET RUN OUT OF FUEL SINCE THIS WILL INTRODUCE AIR INTO FUEL SYSTEM AND MAY REQUIRE PURGING OR PRIMING ON THE NEXT STARTING ATTEMPT. ALSO IF REPEATED OFTEN ENOUGH, THIS PRACTICE WILL RESULT IN DAMAGE TO FUEL CONTROL UNIT SINCE IT DOES NOT RECEIVE BENEFIT OF LUBRICATION FROM FUEL WHEN ENGINE STOPS DUE TO LACK OF FUEL.

Figure 2-18. Operating the generator set launching station or M-105 trailer mounted operation (Sheet 2 of 2).



STEP 1. PLACE MAIN CIRCUIT BREAKER SWITCH IN OPEN POSITION TO REMOVE ELECTRICAL LOAD BEFORE ENGINE SHUTDOWN.

NOTE. OPERATE ENGINE FOR APPROXIMATELY 2 MINUTES UNDER NO-LOAD CONDITIONS PRIOR TO STOPPING ENGINE. THIS PERMITS GRADUAL COOLING OF ENGINE.

STEP 2. PLACE MASTER SWITCH IN OFF POSITION AND ALLOW ENGINE TO COME TO COMPLETE STOP.

STEP 3. INSURE THAT THE WINTERIZATION HEATER SWITCH IS IN THE OFF POSITION TO AVOID DISCHARGE OF THE BATTERIES THROUGH THE BATTERY ELECTROLYTE TEMPERATURE SENSOR.

ME 6115-320-12/2-19

Figure 2-19. Stopping the generator set launching station or M-105 trailer mounted operation.

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

Section I. BASIC ISSUE ITEMS

Tools, equipment and repair parts that are issued with or authorized for use with the generator sets are listed in the Basic Issue Items List, appendix C.

Section II. LUBRICATION INSTRUCTIONS

3-1. Detailed Lubrication Information

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

b. Cleaning. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating 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 in LO 5-6115-320-12.

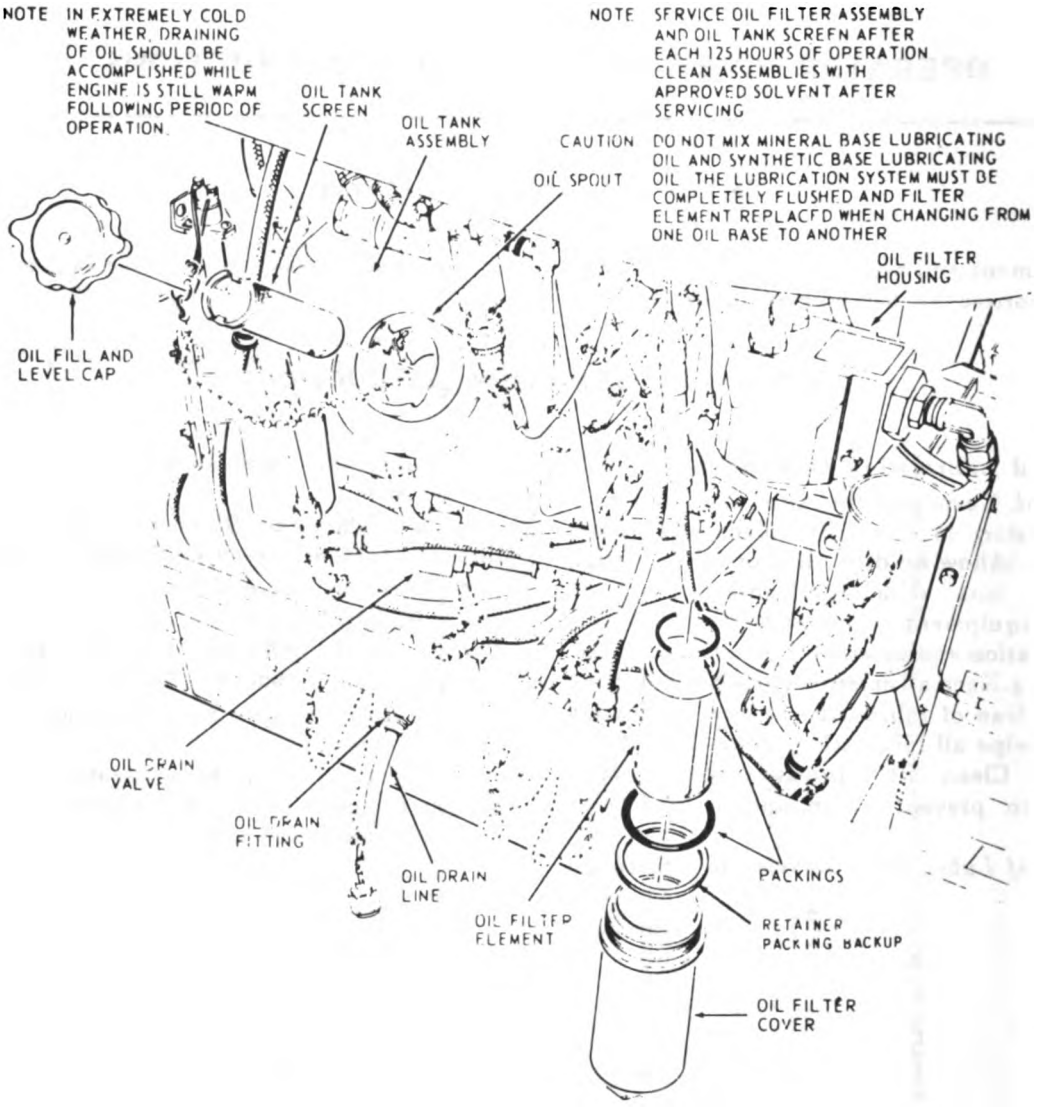
d. Oil Filter and Oil Tank Screen. Service oil filter and oil tank screen as illustrated in figure 3-1.

e. Flushing. Mineral base lubricating oil and synthetic base lubricating oil must not be mixed. Perform the procedures in (1) through (3) below when changing from one oil base to another.

(1) Refer to figure 3-1 and service oil filter and oil tank screen.

(2) Start and operate generator set at no-load governed speed for about 5 minutes.

(3) Repeat (1) and (2) above.



STEP 1 INSTALL OIL DRAIN LINE ON OIL DRAIN FITTING. EXTEND LINE INTO SUITABLE CONTAINER.
STEP 2 REMOVE OIL FILL AND LEVEL CAP FROM OIL SPOUT. CLEAN OIL FILL AND LEVEL CAP WITH APPROVED SOLVENT AND DRY THOROUGHLY.
STEP 3 REMOVE OIL TANK SCREEN FROM OIL SPOUT. CLEAN SCREEN WITH APPROVED SOLVENT AND DRY THROUGHLY. INSPECT SCREEN FOR CRACKS, ENLARGED HOLES, OR OTHER DAMAGE. REPLACE DEFECTIVE SCREEN.
STEP 4 OPEN OIL DRAIN VALVE AND ALLOW OIL TO DRAIN INTO CONTAINER. CLOSE VALVE WHEN OIL HAS DRAINED AND DISCONNECT OIL DRAIN LINE.
STEP 5 REMOVE OIL FILTER COVER FROM OIL FILTER HOUSING. REMOVE OIL FILTER ELEMENT, PACKINGS, AND RETAINER, PACKING BACKUP AND CLEAN COVER WITH APPROVED SOLVENT. DRY COVER THOROUGHLY AFTER CLEANING.
STEP 6 INSTALL NEW OIL FILTER ELEMENT, PACKINGS, RETAINER, PACKING BACKUP, AND OIL FILTER COVER IN REVERSE ORDER OF REMOVAL PROCEDURE.
STEP 7 INSTALL OIL TANK SCREEN IN OIL SPOUT AND FILL OIL TANK AT SPOUT AS SPECIFIED IN CURRENT LUBRICATION ORDER.
STEP 8 INSTALL OIL FILL AND LEVEL CAP IN OIL SPOUT

ME 6115-320-12/3-1

Figure 3-1. Servicing the oil filter and oil tank screen.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-2. General

To insure that the generator set 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 checks and services to be performed are listed and described in paragraph 3-3. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation that would damage the equipment if operation were continued. Faults that cannot be corrected by the operator or that are corrected by replacing parts will be recorded on DA Form 2404, TM 38-750 should be consulted for complete information on use of DA Form 2404.

Table 3-1. Preventive Maintenance Checks and Services

B — Before Operation D — During Operation A — After Operation W — Weekly M — Monthly Q — Quarterly

Item number	Interval: Operator: Daily B	Operator: Daily D	Operator: Daily A	Operator: Daily W	Org. M	Org. Q	Item to be inspected	Procedure	Reference
1	X		X				OIL LEVEL	Add oil to full mark on gage.	LO 5-6115-320-12
2	X						BATTERY	Check electrolyte level.	Fig. 3-2
3				X			FUEL FILTERS	Inspect and clean	Fig. 3-3
4				X			HEATER FUEL FILTER	Clean	Fig. 3-4
5	X	X	X				FUSE	Replace	Fig. 3-5, 3-6
6	X	X	X				LAMP	Replace	Fig. 3-7, 3-8, 3-9, 3-10.

3-3. Operators Preventive Maintenance Checks and Services

For preventive maintenance checks and services that are applicable to the operator, refer to table 3-1.

Section IV. TROUBLESHOOTING

3-4. General

This section provides information that may be useful to the operator in the diagnosis and correction of unsatisfactory operation or failure of the generator set. Malfunctions that may occur are listed in tabular form. Each malfunction is followed by a list of probable cause of the trouble and the recommended corrective action is described opposite the probable cause. Any trouble found that is beyond the scope of the operator will be reported to organizational maintenance.

3-5. Operators Troubleshooting

For troubleshooting information that is applicable to the operator, refer to table 3-2.

Table 3-2. Operators Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Fuel boost pump and motor assembly fails to run.	*a.* Internal DC circuit breaker tripped or defective	*a.* Reset circuit breaker. Replace defective circuit breaker (fig. 4-14).
	b. Battery cable disconnected or corroded.	*b.* Connect battery cables. Clean or replace battery cables (fig. 3-2).
	c. Low charged batteries	*c.* Check specific gravity of electrolyte. recharge or replace defective battery (fig. 3-2).
2. Starter motor fails to run	*a.* Internal DC circuit breaker tripped	*a.* Reset (press) circuit breaker. Replace defective circuit breaker (fig. 4-14).
	b. Battery leads disconnected or corroded.	*b.* Connect battery leads. Clean or replace battery cables (fig. 3-2).
	c. Low charged batteries.	*c.* Check specific gravity of electrolyte. Recharge or replace defective battery (fig. 3-2).
	d. Starter connections defective	*d.* Tighten or replace connections.
3. Engine motors but combustion does not occur.	*a.* Low-charged batteries	*a.* Check specific gravity of electrolyte. Recharge or replace defective battery (fig. 3-2)
	b. Low or depleted fuel supply.	*b.* Replenish fuel supply.
4. Engine shuts down immediately after combustion occurs	Low or depleted fuel supply	Replenish fuel supply
5. Engine does not accelerate or accelerates too slowly.	*a.* Low or depleted fuel supply	*a.* Replenish fuel supply
	b. Low-charged batteries	*b.* Check specific gravity of electrolyte. Recharge or replace defective batteries.
	c. Fuel filter partially clogged.	*c.* Replace fuel filter element (fig. 3-3).
6. Erratic engine acceleration or operation or inability to carry load.	*a.* Contamination in fuel supply	*a.* Drain and replenish fuel supply
	b. Fuel filter partially clogged.	*b.* Replace fuel filter element (fig. 3-3).
7. High exhaust temperature during operation (over 1200° F).	Electrical overload.	Reduce electrical load to 45 kw.
8. Engine shuts off during operation.	Fuel filter clogged	Replace fuel filter element (fig. 3-3).
9 Voltmeter does not indicate voltage when engine is operating at governed RPM (100 ± 2 percent.	*a.* Voltage ADJ screw in full clockwise position causing overvoltage condition.	*a.* Adjust voltage ADJ screw for required ac generator output voltage.
	b. Overvoltage relay tripped open (overvoltage lamp illuminating)	*b.* Momentarily place overvoltage reset switch in "up" position to reset overvoltage circuit.

Table 3-2. Operators Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
10. Main CB closure lamp does not illuminate when CB circuit breaker switch is placed in closed position (Main circuit breaker energized to close) or extinguished during operation.	*a.* Main CB closure lamp defective	*a.* Press main CB closure lamp lens to test lamp (fig. 3-8).
	b. Main CB closure lamp turned off.	*b.* Rotate main CB closure lamp lens counterclockwise for bright illumination.
11. Overvoltage lamp illuminates when main CB circuit breaker switch is placed in close position.	*a.* Internally wired plug not installed in Remote Control General J14 receptacle and Remote-Local Control Selector switch in Remote position.	*a.* Place Remote-Local Control Selector switch in Local position (during local operation only) and securely install internally wired plug. Momentarily place Main CB circuit breaker switch in closed position to close main circuit breaker.
	b. Remote-Local Voltage Sensing Selector switch in Remote position when remote voltage sensing is not employed	*b.* Place Remote-Local Voltage Sensing Selector switch in Local position.
	c. Voltage ADJ screw in full clockwise position.	*c.* Adjust Voltage ADJ screw for required ac generator output voltage.
	d. Overvoltage relay tripped open.	*d.* Momentarily place overvoltage reset switch in "up" position to reset overvoltage control circuit.
12. Voltage droop cannot be adjusted.	Unit-Parallel switch in unit position.	Place Unit-Parallel switch in Parallel position.
13. Frequency droop cannot be adjusted.	Unit-Parallel switch in Unit position.	Place Unit-Parallel switch in Parallel position.
14. Parallel Generators Sets will not synchronize or stay in synchronization	Unit-Parallel switch in Unit position.	Place Unit-Parallel switch in Parallel position.
15. Battery heater does not operate	*a.* Low charged batteries.	*a.* Recharge or replace batteries (fig. 3-2).
	b. Electrical connection to battery electrolyte temperature sensor defective (batteries electrolyte temperature below 0° F).	*b.* Clean, tighten, or replace electrical connection to battery electrolyte temperature sensor.
16. Battery heater blower operates but combustion does not occur.	*a.* Heater fuel shut-off valve closed.	*a.* Open heater fuel shut-off valve.
	b. Low or depleted fuel supply.	*b.* Replenish fuel supply.
	c. Low charged batteries.	c. Recharge or replace batteries (fig. 3-2).
17. Heater combustion occurs then goes out	*a.* Low or depleted fuel supply	*a.* Replenish fuel supply.
	b. Heater air inlet cover assembly screen obstructed.	*b.* Remove obstruction.

Section V. MAINTENANCE OF GENERATOR SET

3-6. General

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

3-7. Batteries Service

Refer to figure 3-2 and service batteries.

3-8. Fuel Filters Service

Refer to figure 3-3 and service main fuel filter and fuel control unit fuel filter.

3-9. Heater Fuel Filter Service

Refer to figure 3-4 and service heater fuel filter.

3-10. Fuse Replacement

a. Convenience Receptacle Fuse. Refer to figure 3-5 and replace convenience receptacle fuse.

b. Battery Charger Assembly Fuse. Refer to figure 3-6 and replace battery charger assembly fuse.

3-11. Lamp Replacement

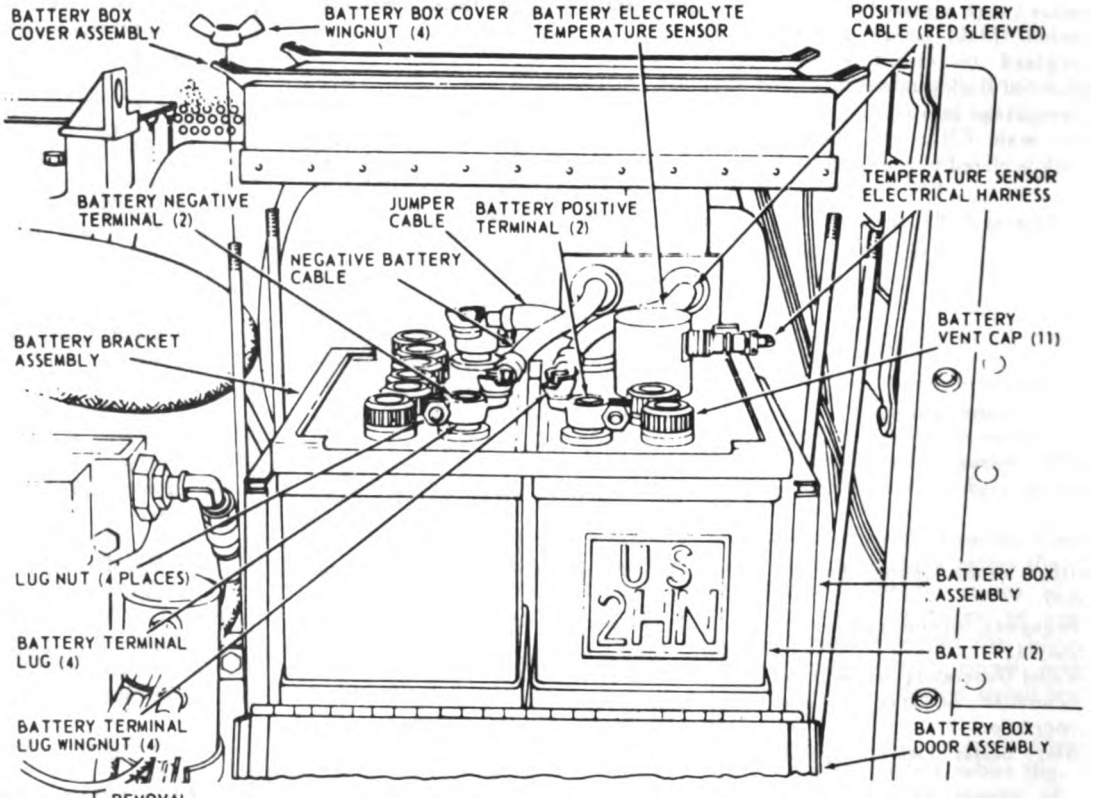
a. Synchronizing Lamps. Refer to figure 3-7 and replace synchronizing lamps.

b. Winterization Heater Lamp. Refer to figure 3-8 and replace winterization heater.

c. Main Circuit Breaker Lamp. Refer to figure 3-8 and replace main circuit breaker lamp.

d. Overvoltage Lamp Replacement. Refer to figure 3-8 and replace overvoltage lamp.

e. Panel Light Lamps. Refer to figure 3-9 and replace panel light lamps.



REMOVAL

STEP 1. REMOVE BATTERY BOX COVER WINGNUTS. REMOVE BATTERY BOX COVER ASSEMBLY AND LOWER THE BATTERY BOX DOOR ASSEMBLY.

STEP 2. DISCONNECT TEMPERATURE SENSOR ELECTRICAL HARNESS FROM BATTERY ELECTROLYTE TEMPERATURE SENSOR. REMOVE BATTERY ELECTROLYTE TEMPERATURE SENSOR.

STEP 3. REMOVE BATTERY CABLE WINGNUTS. REMOVE BATTERY CABLES AND JUMPER CABLE FROM BATTERY TERMINAL LUGS.

STEP 4. REMOVE BATTERY BRACKET ASSEMBLY. REMOVE BATTERIES FROM BATTERY BOX ASSEMBLY.

STEP 5. LOOSEN LUG NUTS AND REMOVE BATTERY TERMINAL LUGS FROM BATTERY TERMINALS.

CAUTION: DO NOT POUND OR PRY BATTERY TERMINAL LUGS FROM BATTERY TERMINALS. DAMAGE TO BATTERY CASE MAY RESULT.

CLEANING, INSPECTION, AND SERVICING

STEP 1. CLEAN BATTERY TERMINALS AND BATTERY TERMINAL LUGS FREE OF GREASE, DIRT, AND CORROSION.

STEP 2. CLEAN BATTERIES AND BATTERY BOX ASSEMBLY WITH CLEAR WATER AND BRUSH.

STEP 3. INSPECT BATTERY CASES AND TERMINALS FOR CRACKS OR OTHER DAMAGE. REPLACE BATTERIES THAT ARE LEAKING OR SEVERLY DAMAGED.

STEP 4. REMOVE BATTERY VENT CAPS AND INSURE VENT HOLE OF EACH CAP IS OPEN. BEFORE INSTALLING VENT CAPS, ADD DISTILLED WATER TO EACH BATTERY CELL TO LEVEL INDICATED AS PROPER ON BATTERY, OR AS REQUIRED TO MAINTAIN ELECTROLYTE LEVEL 3/8 INCH ABOVE THE CELL PLATES.

INSTALLATION

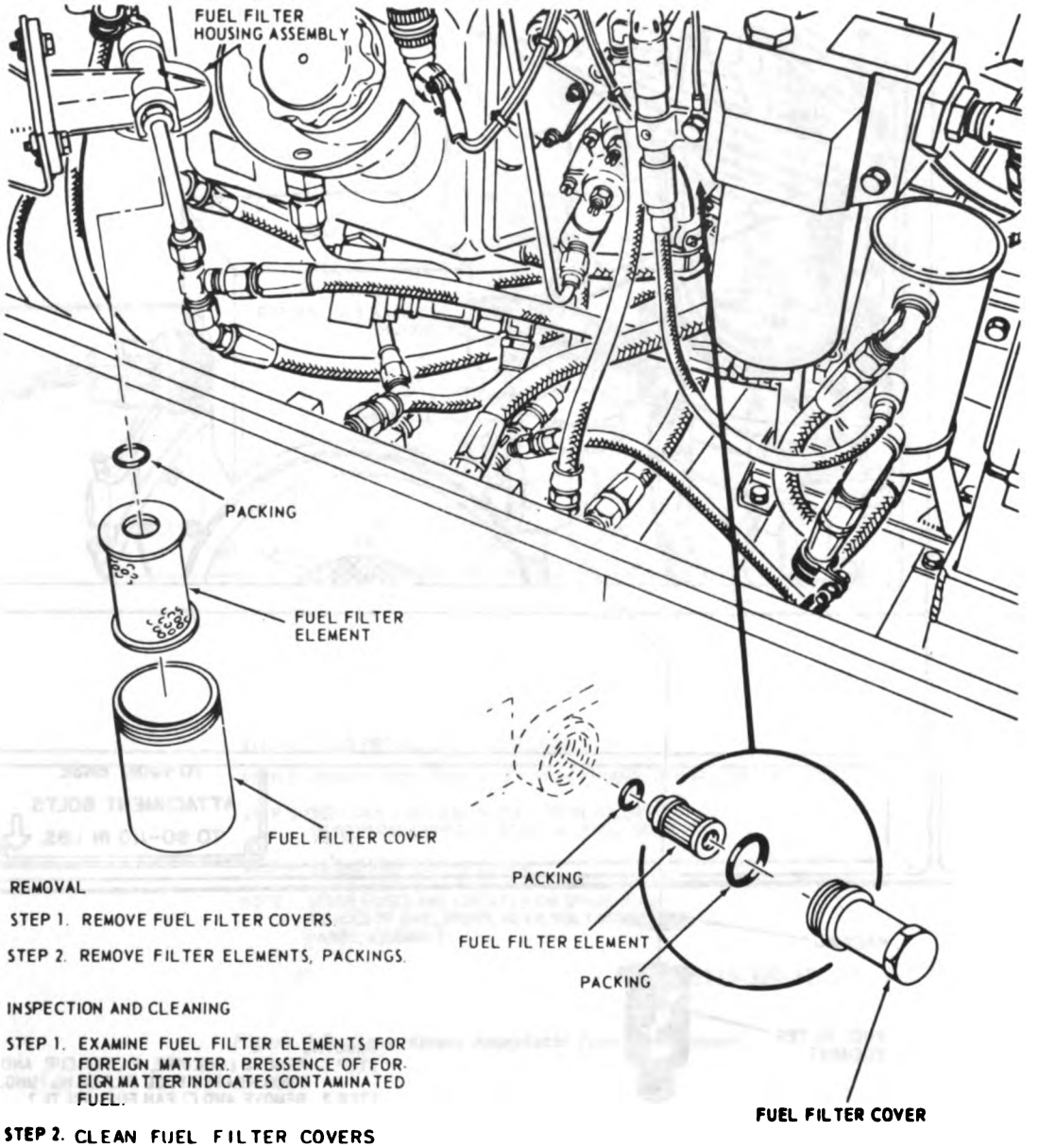
STEP 1. INSTALL BATTERIES IN THE REVERSE ORDER OF REMOVAL. POSITION POSITIVE AND NEGATIVE TERMINALS AS SHOWN IN ILLUSTRATION.

CAUTION: EXERCISE CARE TO ATTACH POSITIVE BATTERY CABLE TO POSITIVE BATTERY TERMINAL AND NEGATIVE BATTERY CABLE TO NEGATIVE BATTERY TERMINAL. DAMAGE TO GENERATOR SET 24 V DC COMPONENTS MAY OTHERWISE RESULT. THE POSITIVE BATTERY CABLE HAS RED SLEEVING NEAR END OF CABLE FOR IDENTIFICATION PURPOSES.

STEP 2. APPLY THIN COATING OF GREASE TO BATTERY TERMINALS AND BATTERY TERMINAL LUGS TO RETARD CORROSION.

ME 6115-320-12/3-2

Figure 3-2. Batteries servicing.



REMOVAL

STEP 1. REMOVE FUEL FILTER COVERS.

STEP 2. REMOVE FILTER ELEMENTS, PACKINGS.

INSPECTION AND CLEANING

STEP 1. EXAMINE FUEL FILTER ELEMENTS FOR FOREIGN MATTER. PRESSENCE OF FOREIGN MATTER INDICATES CONTAMINATED FUEL.

STEP 2. CLEAN FUEL FILTER COVERS WITH AN APPROVED CLEANING SOLVENT AND DRY THOROUGHLY.

INSTALLATION

STEP 1. INSTALL NEW FILTER ELEMENTS AND NEW PACKINGS IN REVERSE ORDER OF REMOVAL PROCEDURE.

STEP 2. OPERATE ENGINE FOR 5 MINUTES AND CHECK FUEL FILTERS FOR LEAKAGE

ME 6115-320-12/3-3

Figure 3-3. Main fuel filter and fuel control unit fuel filter service.

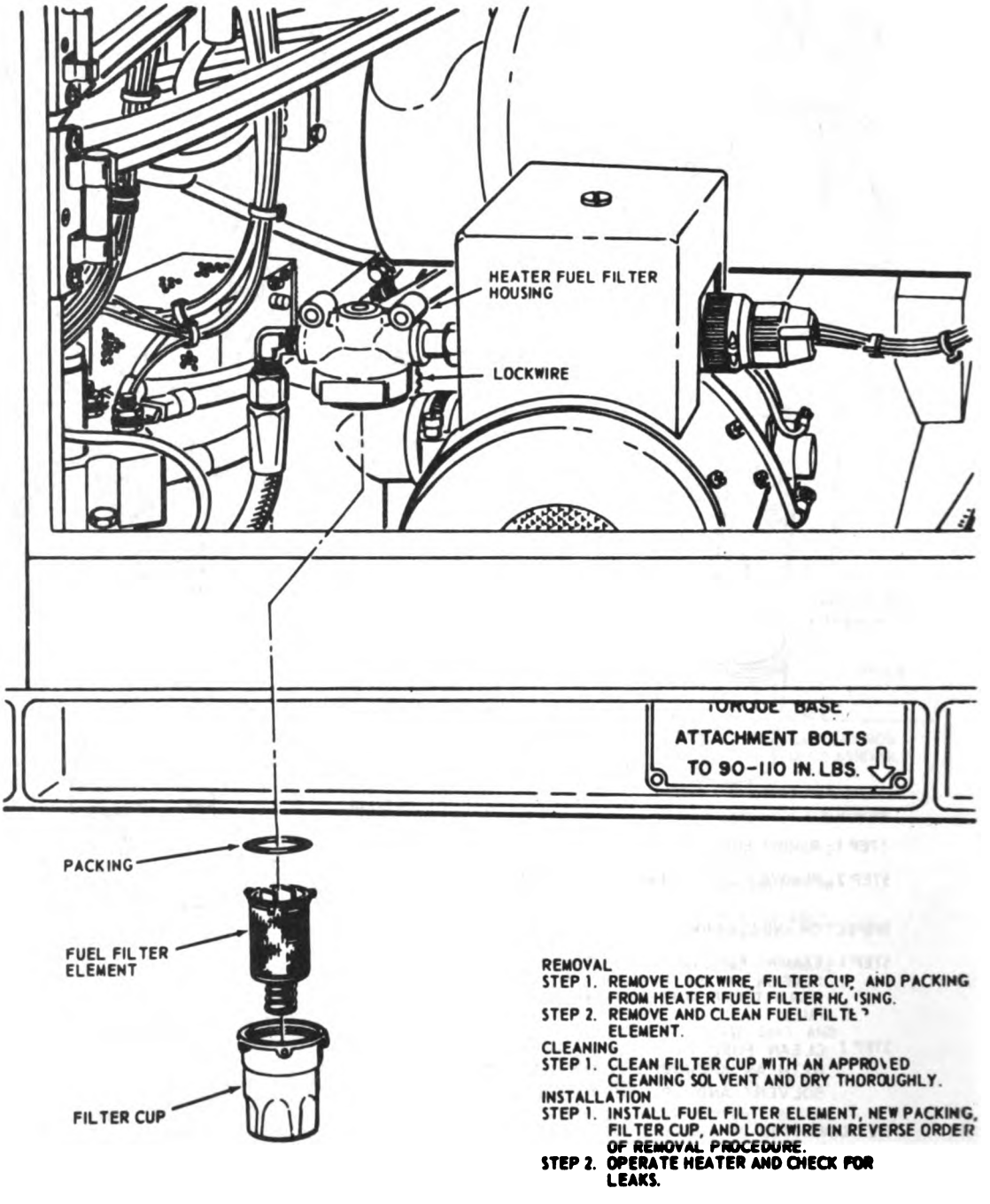
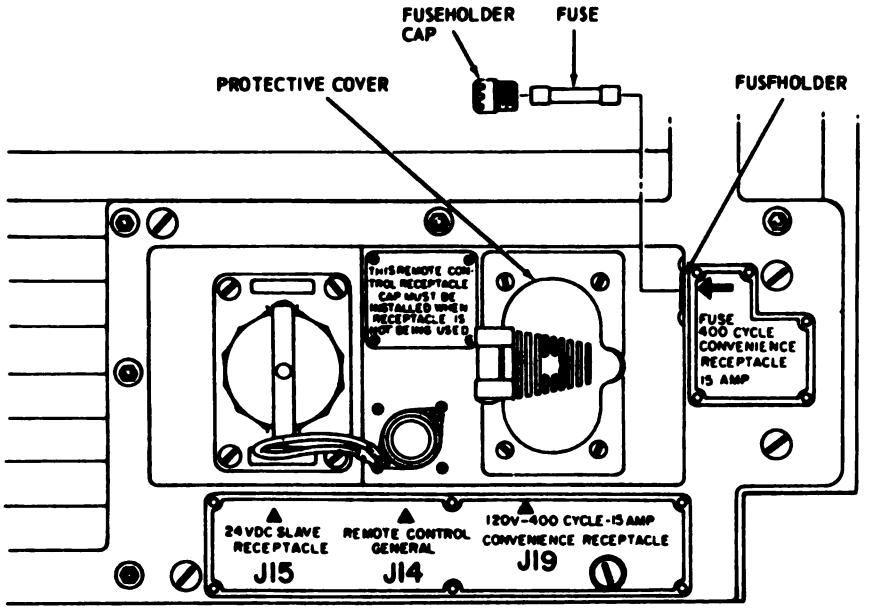


Figure 3-4. Heater fuel filter service.



STEP 1. HOLD PROTECTIVE COVER OPEN.

STEP 2. REMOVE FUSEHOLDER CAP FROM FUSEHOLDER AND REMOVE FUSE.

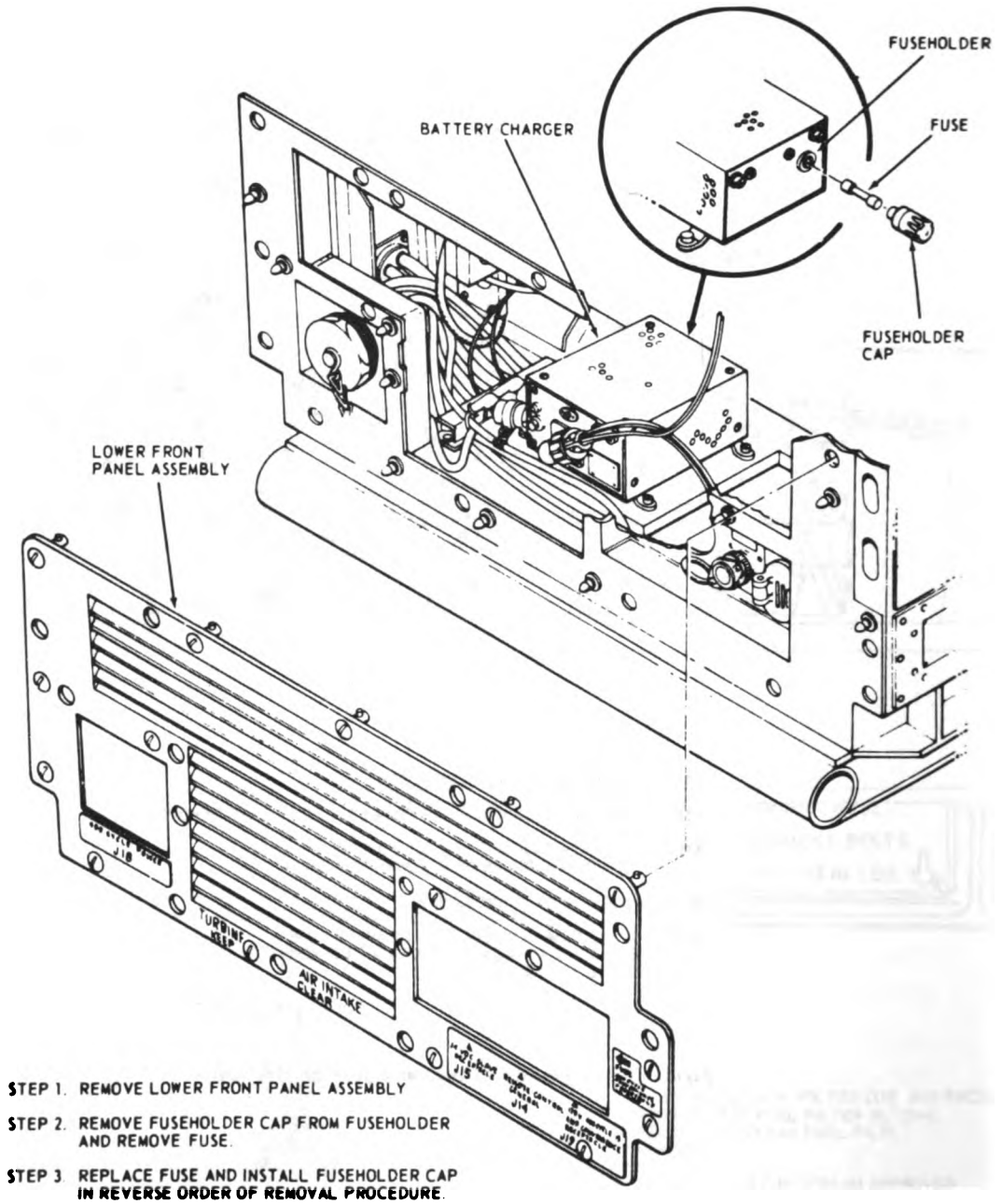
STEP 3. REPLACE FUSE AND INSTALL FUSEHOLDER CAP IN REVERSE ORDER OF REMOVAL PROCEDURE.

STEP 4. CLOSE PROTECTIVE COVER.

NOTE: SPARE FUSES ARE LOCATED ON SPARE FUSE BLOCKS OF ENCLOSURE NEAR VOLTAGE CHANGE PANEL ASSEMBLY.

ME 6115-320-12/3-5

Figure 3-5. Convenience receptacle fuse replacement.



STEP 1. REMOVE LOWER FRONT PANEL ASSEMBLY

STEP 2. REMOVE FUSEHOLDER CAP FROM FUSEHOLDER AND REMOVE FUSE.

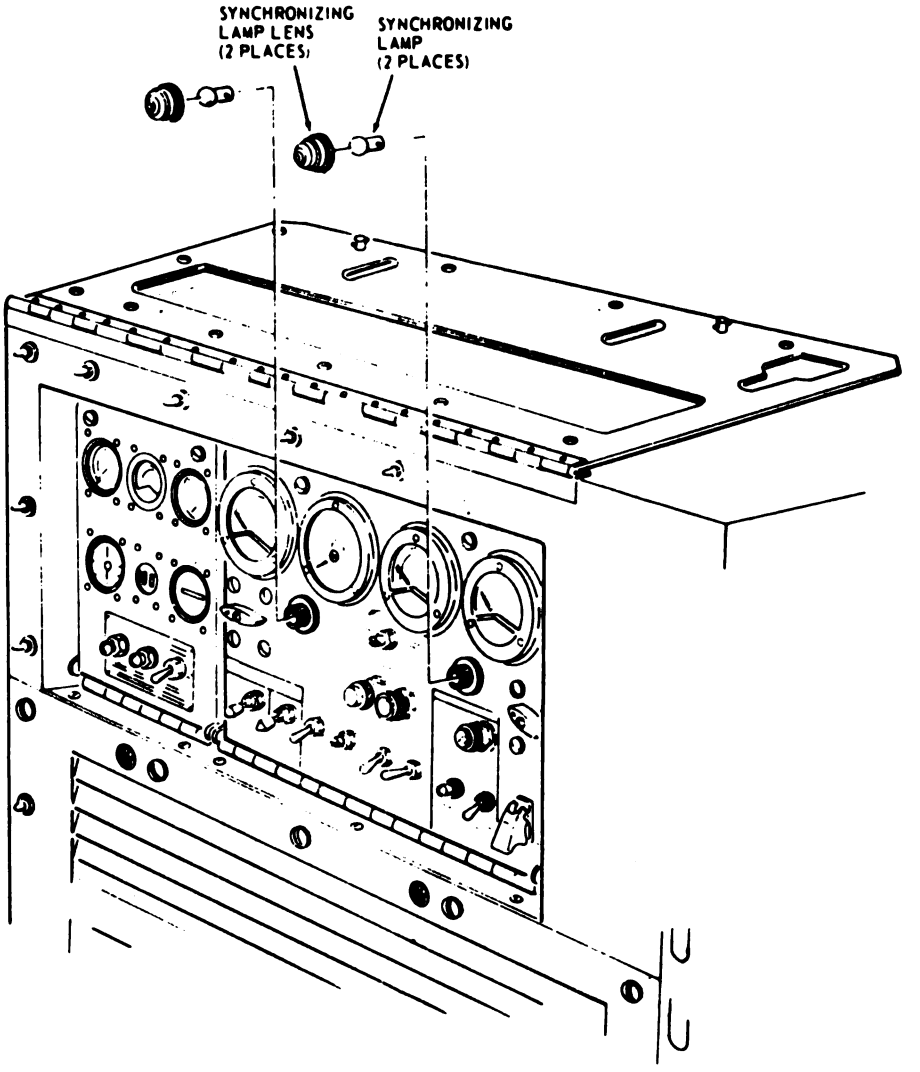
STEP 3. REPLACE FUSE AND INSTALL FUSEHOLDER CAP IN REVERSE ORDER OF REMOVAL PROCEDURE.

STEP 4. INSTALL LOWER FRONT PANEL ASSEMBLY.

NOTE: SPARE FUSES ARE LOCATED ON SPARE FUSE BLOCKS OF ENCLOSURE NEAR VOLTAGE CHANGE PANEL ASSEMBLY.

ME 6115-320-12/3-6

Figure 3-6. Battery charger assembly fuse replacement.



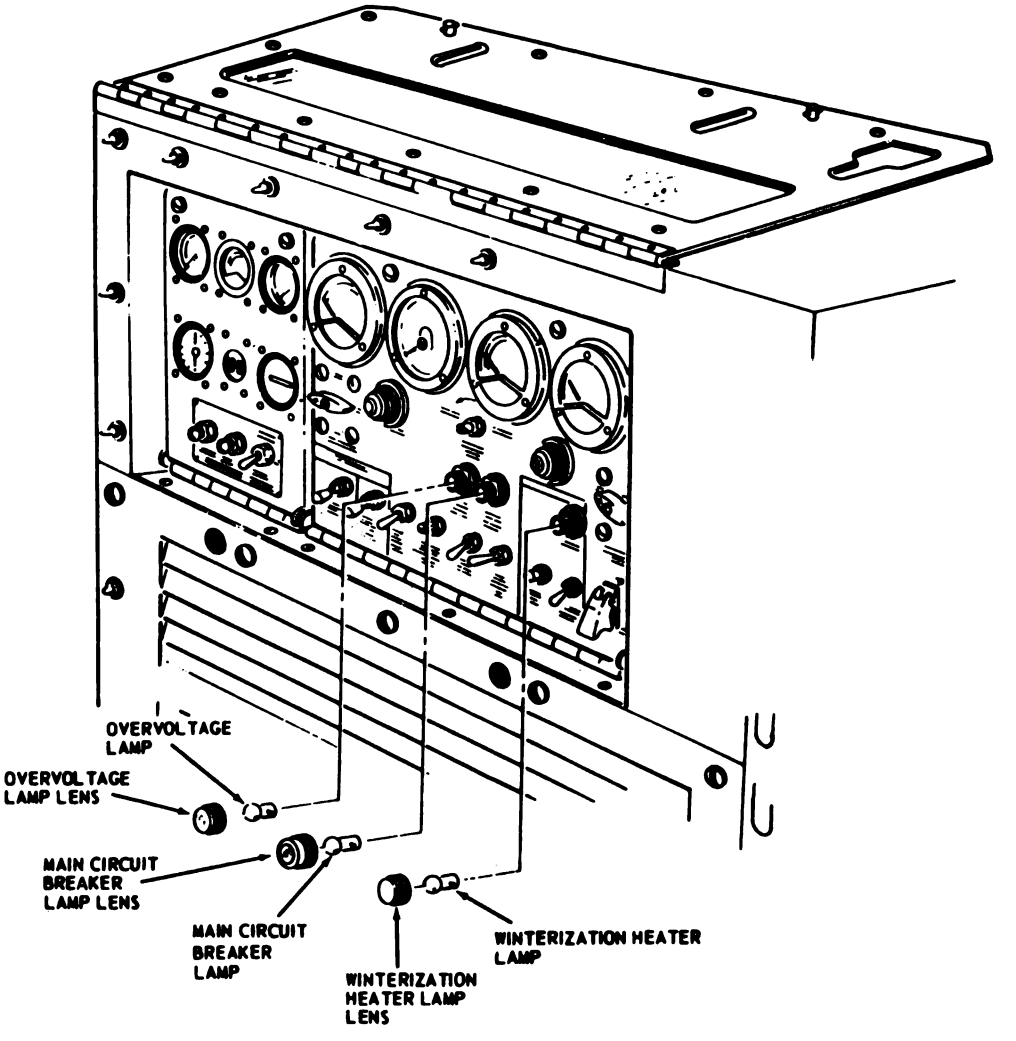
STEP 1. UNSCREW AND REMOVE SYNCHRONIZING LAMP LENS.

STEP 2. REMOVE AND REPLACE SYNCHRONIZING LAMP.

STEP 3. INSTALL SYNCHRONIZING LAMP LENS.

ME 6115-320-12/3-7

Figure 3-7. Synchronizing lamps replacement.



STEP 1. UNSCREW AND REMOVE LAMP LENS FROM DEFECTIVE LAMP.

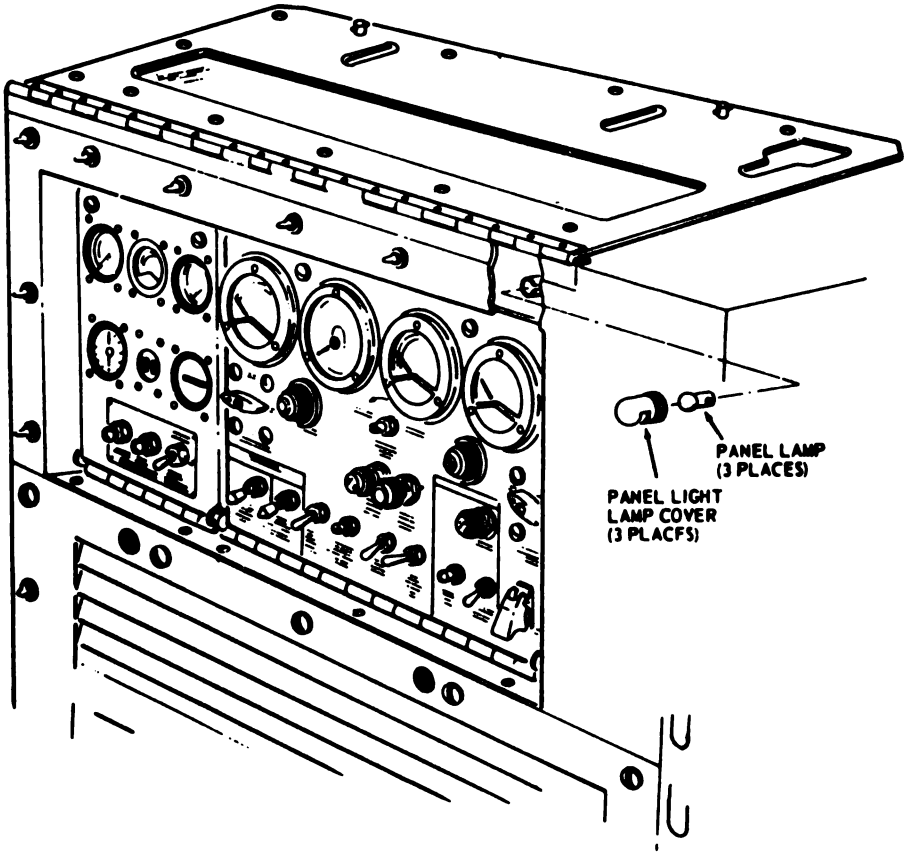
STEP 2. REMOVE AND REPLACE DEFECTIVE LAMP.

STEP 3. INSTALL LAMP LENS.

STEP 4. PRESS TO TEST LAMP LENS TO INSURE LAMP ILLUMINATES.

ME 6115-320-12/3-8

Figure 3-8. Winterization heater lamp, main circuit breaker lamp, and overvoltage lamp replacement.



STEP 1. REMOVE PANEL LIGHT LAMP COVER OF DFFECTIVF PANEL LIGHT LAMP

STEP 2. REMOVE AND REPLACE PANEL LIGHT LAMP.

STEP 3. INSTALL PANEL LIGHT LAMP COVER.

ME 6115-320-12/3-9

Figure 3-9. Panel light lamps replacement.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

For instructions covering the services of the equipment at the time of equipment receipt, see paragraph 2-1.

Section II. MOVEMENT TO A NEW WORKSITE

For instructions covering movement of the equipment to a new worksite, refer to paragraphs 2-4 and 2-5.

Section III. ADMINISTRATIVE STORAGE

For information pertaining to administrative storage of equipment, refer to TM 740-90-1, Administrative Storage of Equipment.

Section IV. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

4-1. Tools and Equipment

Tools, equipment, and repair parts that are issued with or authorized for the generator set are listed in the basic issue items list, appendix C.

4-2. Special Tools and Equipment

Special tools and equipment required by organizational maintenance for the maintenance of the generator set are listed in section III of appendix B.

4-3. Maintenance Repair Parts

Repair parts and equipment are listed and illustrated in the repair parts and special tools list covering the generator set TM 5-6115-320-20P.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-4. General

The generator set shall be inspected and serviced to ensure that it is ready for use at all times. The necessary monthly and quarterly preventive maintenance services to be performed are listed in paragraph 4-5. The item number indicated the sequence of the minimum inspection requirements. Faults that cannot be corrected by the operator or that are corrected by replacing parts will be recorded on DA Form 2404. TM 38-750 should be consulted for complete information on use of DA Form 2404.

4-5. Preventive Maintenance Checks and Services

For preventive maintenance checks and services that are applicable to organizational maintenance, refer to table 4-1.

Table 4-1. Preventive Maintenance Checks and Services

B — Before Operation A — After Operation M — Monthly
D — During Operation W — Weekly Q — Quarterly

Item number	Interval: Operator: Daily B	Daily D	Daily A	Operator: W	Org.: M	Org.: Q	Item to be inspected	Procedure	Reference
	X		X			X	OIL LEVEL	Add oil to full mark on gage.	LO 5-6115-320-12
					X		FUEL CONTROL UNIT FILTER	Replace filter element after each 125 hr.	
	X					X	FUEL SCHEDULING VENT FITTING	Clean a clogged fitting	
	X					X	BLEED AIR FTG.	Check cap for security. Inspect for damage	
					X		FUEL FILTER ASSY	Replace after each 125 hrs. Inspect.	Para 4-14
				X			COMBUSTION CHAMBER	Inspect at 50 hr. interval.	Para 4-45
	X					X	PLENUM DRAIN FITTING	Clean drain fitting	
	X					X	EXHAUST MUFFLER ASSY.	Clean, tighten loose fittings. Replace AR.	Para 4-47
	X					X	AIR INLET SCREEN	Clean, tighten loose fittings.	Para 4-44
						X	BATTERY HEATER FUEL FILTER	Clean filter after each 125 hrs.	Para 4-54
	X						LOWER FRONT PANEL	Clean obstruction from lower panel.	
	X					X	ELECTRICAL AND ENGINE CONTROLS	Inspect for damage.	
	X						INSTRUMENT PANEL	Replace defective lamps	Para 4-35
				X		X	BATTERIES	Tighten cable clamps. Check specific gravity.	Para 4-42
							OIL FILTER ASSY	Replace filter	LO 5-6115-320-12
						X	ENCLOSURE DOOR AND PANELS	Inspect doors and seals for damage.	
						X	STARTER MOTOR ASSY	Inspect, tighten loose cables	
						X	THERMOSTAT BY-PASS SOLENOID VALVE	Service	Para 4-16
						X	OIL DRAIN VALVE	Inspect for damage and leaks.	Para 4-22
						X	FUEL SOLENOID VALVE	Inspect for leaks and damage.	Para 4-15
						X	IGNITER PLUG LEAD	Inspect for damage	Para 4-31
						X	FLAME TUBE ACCESS PANEL ASSY.	Inspect for damage, replace AR	Para 4-49
						X	IGNITER PLUG	Replace damaged plug	Para 4-31
						X	FUEL ATOMIZER ASSY	Inspect for leaks and damage.	Para 4-17
						X	COMBUSTOR CAP ASSY	Inspect for damage. Replace cap assy AR.	Para 4-45
						X	COMBUSTION CHAMBER ASSY	Inspect for defects. Replace AR.	Para 4-45

Table 4-1. Preventive Maintenance Checks and Services—Continued

Item number	Interval: Operator: Daily B	Daily D	Daily A	Operator: W	Org.: M	Org.: Q	Item to be Inspected	Procedure	Reference
						X	TURBINE EXHAUST FLANGE ASSY	Inspect for damage and loose fittings.	Para 4-47
						X	TURBINE PLENUM ASSY	Inspect for damage and loose fittings.	
						X	OIL COOLER	Check for leaks.	Para 4-24
						X	FUEL BOOST PUMP AND MOTOR ASSY	Check for leaks; inspect for damage.	Para 4-13
						X	OIL PUMP ASSY	Inspect for leaks and damage.	
						X	COOLING AIR DUCTS	Inspect ducts for leaks and loose clamps.	Para 4-24
						X	BATTERY HEATER	Check for loose electrical connections. Inspect for damage.	Para 4-51
						X	START RELAY	Check for loose electrical connections	Para 4-29
						X	ENGINE CONTROLS INSTRUMENT PANEL	Inspect for damage	Para 4-33
						X	BATTERY ELECTROLYTE TEMPERATURE SENSOR	Check for loose electrical connections.	Para 4-56
						X	BATTERY BOX ASSY.	Clean battery box; inspect for damage.	Para 4-40
						X	BATTERY HEATER ELECTRICAL FUEL PUMP	Inspect for leaks and other damage.	Para 4-53
						X	BATTERY HEATER FUEL SHUTOFF VALVE.	Inspect for leaks and other damage.	Para 4-55

B — Before Operation D — During Operation A — After Operation W — Weekly M — Monthly Q — Quarterly

Section VI. TROUBLESHOOTING

4-6. General

This section provides information that may be useful to organizational maintenance personnel in the diagnosis and correction of unsatisfactory operation or failure of the generator set. Malfunctions that may occur are listed in tabular form. Each malfunction is followed by a list of probable causes of the trouble and the recommended corrective action is described opposite the probable cause. Any trouble found that is beyond the scope of organizational maintenance will be reported to direct support maintenance.

4-7. Organizational Maintenance Troubleshooting

For troubleshooting information that is applicable to organizational maintenance, refer to table 4-2.

Table 4-2. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Fuel boost pump and motor assy fails to run.	*a.* INTERNAL DC CIRCUIT BREAKER tripped or defective.	*a.* Reset circuit breaker. Replace defective circuit breaker (fig. 4-14).
	b. Battery cable disconnected or corroded.	*b.* Connect battery cables; clean or replace battery cables (para 4-42).
	c. Low-charged batteries.	*c.* Check specific gravity of electrolyte. Recharge or replace defective battery (para 4-38).
	d. MASTER switch defective.	*d.* Use 24-volt test light or dc voltmeter to check for voltage between terminal B1 (4 on serial No. P21468 and subsequent) or rear of MASTER switch and generator set ground when switch is in RUN position. Replace defective MASTER switch (fig. 4-15).
	e. REMOTE-LOCAL CONTROL SELECTOR switch defective.	*e.* Use 24-volt test light or dc voltmeter to check for voltage between terminal 1 on rear of REMOTE-LOCAL CONTROL SELECTOR switch and generator set ground when switch is in LOCAL position. Replace defective REMOTE-LOCAL CONTROL SELECTOR switch (fig. 4-16).
	f. Master relay defective.	*f.* Use 24-volt test light or dc voltmeter to check for voltage between terminal 2 on rear of REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch and generator set ground with MASTER switch in RUN position. If no voltage is present, report to direct support maintenance that master relay is defective.
	g. Electrical connections to fuel boost pump motor defective.	*g.* Tighten or replace defective connections to fuel boost pump motor.
	h. Fuel boost pump and motor assembly defective.	*h.* Replace fuel boost pump and motor assembly (fig. 4-21).
2. Starter motor fails to run.	*a.* INTERNAL DC CIRCUIT BREAKER tripped.	*a.* Reset (press) circuit breaker. Replace defective circuit breaker (fig. 4-15).
	b. Battery leads disconnected or corroded.	*b.* Connect battery leads; clean or replace battery cables (para 4-42).

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	c. Low charged batteries.	*c.* Check specific gravity of electrolyte. Recharge or replace defective battery (para 4-38).
	d. MASTER switch defective.	*d.* Use 24-volt test light or dc voltmeter and check for voltage between terminals A1 and A2 (1 and 2 on serial No. P21468 and subsequent) on rear of MASTER switch and generator set ground when switch is in RUN position and REMOTE-LOCAL CONTROL SELECTOR switch is in LOCAL position. Replace defective MASTER switch (fig. 4-15).
		NOTE. If voltage is not present at terminal A2 of MASTER switch, check that REMOTE-LOCAL CONTROL SELECTOR switch is not defective before replacing MASTER switch.
	e. REMOTE-LOCAL CONTROL SELECTOR switch defective	*e.* Use a 24-volt test light or voltmeter and check for dc voltage between terminal 1 on rear of REMOTE-LOCAL CONTROL SELECTOR switch and generator set ground when switch is in LOCAL position and MASTER switch is in RUN position. Replace defective REMOTE-LOCAL CONTROL SELECTOR switch (fig. 4-16).
	f. Starter connections defective.	*f.* Tighten or replace connections.
	g. Starter cables defective.	*g.* Replace starter cables (para 4-42).
	h. Start relay defective.	*h.* Check for start relay actuation by sound or feel when MASTER switch is placed in START position.; use 24-volt test light or dc voltmeter and check for voltage at terminal X1 of start relay when MASTER switch is in START position. Replace defective start relay (fig. 4-12).
	i. Defective starter motor assembly.	*i.* Replace starter motor assembly (fig. 4-11).
	j. Centrifugal switch assembly defective	*j.* Report condition to direct support maintenance.
3. Starter motor runs but does not rotate engine.	*a.* Starter motor assembly defective.	*a.* Replace starter motor assembly (fig. 4-11).
	b. Gear train in engine defective.	*b.* Report condition to direct support maintenance.
4. Engine stops motoring when master switch is released from start position.	*a.* MASTER switch defective.	*a.* Replace MASTER switch (fig. 4-15).
	b. Centrifugal switch assembly defective	*b.* Report condition to direct support maintenance.
	c. Master relay (K2) or holding relay No. 1 (K3) defective.	*c.* Report condition to direct support maintenance.
5. Starter motor fails to shutoff when engine RPM increases to 35 percent	*a.* Start relay defective	*a.* Replace start relay (fig. 4-12).
	b. Centrifugal switch defective.	*b.* Report condition to direct support maintenance.
6. Engine motors but combustion does not occur.	*a.* Low-charged batteries.	*a.* Check specific gravity of electrolyte. Recharge or replace defective battery (para 4-38).
	b. Low or depleted fuel supply.	*b.* Replenish fuel supply.
	c. FUEL SCHEDULE VENT fitting capped or clogged.	*c.* Remove cap; use wire to clear clogged fuel schedule vent fitting.

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	d. Fuel atomizer assembly clogged or defective.	*d.* Clean screen (para 4-17). Replace fuel atomizer assembly that is defective or has dirty fuel nozzle.
	e. Fuel filter clogged	*e.* Replace filter element (fig. 3-3).
	f. Low oil pressure.	*f.* Observe oil pressure indicated on oil pressure gage while engine is motoring. If pressure is below 5 psig, oil supply is low, oil filter is clogged, or oil pump assembly is defective. Replenish oil supply or replace oil filter element (fig. 3-1). Report defective oil pump assembly to direct support maintenance.
	g. Fuel boost pump and motor assembly defective	*g.* Disconnect fuel discharge line from pump and install line to discharge fuel into suitable container. Place MASTER switch in RUN position and check that full stream of fuel is pumped. Replace a defective fuel boost pump and motor assembly (fig. 4-2).
	h. Oil pressure sequence switch, fuel solenoid valve, or ignition components defective. NOTE. Because of interrelationship of these components, POSSIBLE REMEDY provided will isolate trouble to faulty component. Fuel mist from exhaust in muffler assembly is indicative of ignition failure.	*h.* Remove fuel line to fuel atomizer assembly and connect hose to drain fuel from fuel line into suitable container. Check for fuel flow and listen for ignition sound (rapid snapping sound). CAUTION: Do not exceed duty cycle of starter motor of 1 minute on and 4 minutes off. Overheating or damage to starter motor may otherwise result. If no fuel flows or ignition sound is not heard, replace oil pressure sequence switch (fig. 4-35). If ignition sound is heard but fuel does not flow, replace fuel solenoid valve (fig. 4-4). If fuel flows but ignition sound is not heard, replace igniter plug (fig. 4-14), igniter plug electrical lead assembly (fig. 4-14) or ignition unit (fig. 4-13).
	i. Centrifugal switch assembly defective.	*i.* Report condition to direct support maintenance.
	j. Fuel control unit defective.	*j.* Report condition to direct support maintenance.
	k. Heavy deposits on turbine wheel and nozzle.	*k.* Report condition to direct support maintenance.
	l. Air in fuel system.	*l.* Prime fuel system (fig. 2-12).
7. Engine shuts down immediately after combustion occurs.	*a.* Low or depleted fuel supply	*a.* Replenish fuel supply
	b. Fuel atomizer assembly clogged.	*b.* Clean screen (para 4-17). replace fuel atomizer assembly that is defective or has a dirty fuel nozzle.
	c. Fuel solenoid valve defective	*c.* Replace fuel solenoid valve (fig. 4-4).
	d. Oil pressure sequencing switch defective	*d.* Replace oil pressure sequencing switch (fig. 4-35).
	e. Holding relay No. 1 (K3) defective	*e.* Report condition to direct support maintenance.
	f. Fuel control unit defective	*f.* Report condition to direct support maintenance

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
8. Engine does not accelerate or accelerates too slowly.	*a.* Low or depleted fuel supply	*a.* Replenish fuel supply
	b. Low charged batteries.	*b.* Check specific gravity of electrolyte. Recharge or replace defective battery (para 4-38).
	c. Fuel atomizer assembly partially clogged	*c.* Clean screen (para 4-17). Replace fuel atomizer assembly that is defective or has dirty fuel nozzle.
	d. Fuel filter partially clogged	*d.* Replace fuel filter element (fig. 3-3).
	e. Fuel solenoid valve defective	*e.* Replace fuel solenoid valve (fig. 4-4).
	f. Air in fuel system	*f.* Prime fuel system (fig. 2-12).
	g. Heavy deposits on turbine wheel and nozzle	*g.* Report condition to direct support maintenance.
	h. Control air lines leaking	*h.* Check control air line from compressor housing to fuel control unit and thermostat bypass valve, and control line from acceleration and overtemperature control thermostat to fuel control unit. Tighten or replace leaking control air line or connection.
	i. Acceleration and overtemperature control thermostat defective.	*i.* Report condition to direct support maintenance.
	j. Fuel control unit defective	*j.* Report condition to direct support maintenance.
9. Erratic engine acceleration or operation or inability to carry load.	*a.* Contamination in fuel supply.	*a.* Drain and replenish fuel supply.
	b. Fuel atomizer assembly partially clogged	*b.* Clean screen (para 4-17). Replace fuel atomizer assembly that is defective or has dirty fuel nozzle.
	c. Fuel filter partially clogged.	*c.* Replace fuel filter element (fig. 3-3).
	d. Control air lines leaking.	*d.* Check control air line from compressor housing to fuel control unit and thermostat by pass valve, and control line from acceleration and overtemperature control thermostat to fuel control unit. Tighten or replace leaking control air line or connection.
	e. Accleration and overtemperature control thermostat defective	*e.* Report condition to direct support maintenance.
	f. Thermostat bypass solenoid valve defective	*f.* Replace thermostat bypass solenoid valve (fig. 4-4).
	g. Fuel control unit defective.	*g.* Report condition to direct support maintenance.
	h. Fuel boost pump and motor assembly defective	*h.* Replace fuel boost pump and motor assembly (fig. 4-2).
	i. Air in fuel system	*i.* Prime fuel system (fig. 2-12).
10. Engine operates too fast	Fuel control unit defective	Report condition to direct support maintenance.
11. High exhaust gas temperature during acceleration (over 1150° for more than 5 secs.).	*a.* Fuel accumulated in turbine plenum	*a.* Insure that plenum drain is open and allow accumulated fuel to drain.
	b. Acceleration and overtemperature control thermostat defective.	*b.* Report condition to direct support maintenance.
	c. Fuel control unit defective	*c.* Report condition to direct support maintenance.
	d. Thermocouple defective	*d.* Report condition to direct support maintenance.
	e. Exhaust gas temperature indicator defective	*e.* Report condition to direct support maintenance.
	f. Heavy deposits on turbine wheel and nozzle	*f.* Report condition to direct support maintenance.
	g. Mechanical overload.	*g.* Report condition to direct support maintenance.

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
12. Engine accelerates to governed RPM or less and shuts down	*a.* Low or depleted oil supply.	*a.* Replenish oil supply to proper level (LO 5-6115-320-12).
	b. Low oil pressure switch defective	*b.* Replace low oil pressure switch (fig. 4-38).
	c. Centrifugal switch assembly defective	*c.* Report condition to direct support maintenance.
	d. Fuel control defective.	*d.* Report condition to direct support maintenance.
	e. Fire detector probe defective	*e.* Report condition to direct support maintenance.
	f. Fire detector relay defective	*f.* Report condition to direct support maintenance
	g. INTERNAL DC CIRCUIT BREAKER opens.	*g.* Check for short circuits and reset (press) INTERNAL DC CIRCUIT BREAKER. Replace defective breaker (fig. 4-15).
13. Governed engine RPM less than 97 percent.	*a.* Control air lines leaking	*a.* Check control air line from compressor housing to fuel control unit and thermostat bypass solenoid valve, and from acceleration and overtemperature control thermostat to thermostat bypass solenoid valve. Tighten or replace leaking control air line or connection.
	b. Heavy deposits on turbine wheel and nozzle	*b.* Report condition to direct support maintenance.
	c. Fuel control unit defective	*c.* Report condition to direct support maintenance
14. Governed engine RPM is more than 103 percent	*a.* Fuel control unit defective or out of adjustment	*a.* Report condition to direct support maintenance
	b. FREQUENCY ADJ screw set too high (too far clockwise)	*b.* Adjust FREQUENCY ADJ screw counterclockwise for indication on frequency meter of 400 ± 1 cps.
15. Smoke or flame emitted from muffler assembly during acceleration.	*a.* Oil tank assembly overfilled	*a.* Drain oil to proper level.
	b. PLENUM DRAIN fitting clogged	*b.* Clean PLENUM DRAIN fitting
	c. Internal oil seals defective	*c.* Report condition to direct support maintenance
16. Low oil pressure.	*a.* Low oil level.	*a.* Replenish oil supply to proper level (LO 5-6115-320-12)
	b. Oil filter element dirty	*b.* Replace oil filter element (fig. 3-1)
	c Oil pressure gage or hose assembly defective	*c.* Replace gage or hose assembly (fig. 4-15)
	d. Oil pump assembly defective	*d.* Report condition to direct support maintenance
17. High oil pressure	*a.* Oil lines clogged	*a.* Clean or replace oil lines
	b. Oil pressure gage defective	*b.* Replace oil pressure gage (fig. 4-15).
	c. Oil pump assembly defective	*c.* Report condition to direct support maintenance
18. High oil temperature	*a.* Low oil supply	*a.* Replenish oil supply to proper level (LO 5-6115-320-12).
	b. Oil cooler air duct obstructed	*b.* Remove obstruction
	c. Cooling air fan assembly defective	*c.* Report condition to direct support maintenance
	d. Oil pump assembly defective	*d.* Report condition to direct support maintenance
19. High exhaust temperature during operation (over 1200° F).	*a.* Electrical overload.	*a.* Reduce electrical load to 45 kw.
	b. Acceleration and overtemperature control thermostat defective	*b.* Report condition to direct support maintenance
	c. Thermocouple defective	*c.* Replace defective thermocouple (fig 4-36).
	d. Heavy deposits on turbine wheel and nozzle	*d.* Report condition to direct support maintenance

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
	e. Exhaust gas temperature indicator defective	*e.* Replace exhaust gas temperature indicator (fig. 4-15).
	f. Mechanical overload	*f.* Report condition to direct support maintenance
20. Engine shuts off during operation	*a.* Fire within enclosure	*a.* Locate and extinguish fire. Report condition to direct support maintenance.
	b. Low or depleted fuel supply	*b.* Replenish fuel supply.
	c. Low or depleted oil supply	*c.* Replenish oil supply to proper level (LO 5-6115-320-12)
	d. Fuel filter clogged	*d.* Replace fuel filter element (fig. 3-3)
	e. Fuel atomizer screen clogged	*e.* Clean screen (para 4-17). Replace defective fuel atomizer assembly.
	f. Fuel solenoid valve defective	*f.* Replace fuel solenoid valve (fig. 4-4).
	g. Fuel boost pump motor brushes defective	*g.* Replace fuel boost pump motor brushes. Replace defective fuel boost pump and motor assembly (fig. 4-3).
	h. Low oil pressure switch defective	*h.* Replace low oil pressure switch (fig. 4-38).
	i. Oil pump assembly defective	*i.* Report condition to direct support maintenance
	j. Centrifugal switch assembly defective	*j.* Report condition to direct support maintenance
	k. Fuel control unit defective	*k.* Report condition to direct support maintenance
21. Frequency cannot be adjusted	*a.* Internally wired plug not installed in Remote-Control General J14 receptacle.	*a.* Securely install internally wired plug.
	b. Frequency meter defective	*b.* Report condition to direct support maintenance
	c. Frequency ADJ potentiometer defective	*c.* Replace frequency ADJ potentiometer (fig. 4-16).
	d. Load anticipator defective	*d.* Report condition to direct support maintenance
	e. Fuel control unit defective	*e.* Report condition to direct support maintenance
22. Frequency will not stabilize	*a.* Erratic engine operation	*a.* Refer to item 9.
	b. Load anticipator assembly defective	*b.* Report condition to direct support maintenance
23. Voltmeter does not indicate voltage when engine is operating at governed RPM (100 ± 2 percent)	*a.* Volt-Amp selector switch defective	*a.* Replace Volt-Amp selector switch (fig. 4-16)
	b. Voltmeter defective	*b.* Replace voltmeter (fig. 4-18).
	c. VOLTAGE ADJ screw in full clockwise position causing overvoltage condition	*c.* Adjust VOLTAGE ADJ screw for required ac generator output voltage
	d. Overvoltage relay tripped open (OVER VOLTAGE lamp illuminating).	*d.* Momentarily place OVER VOLT RESET switch in "up" position to reset overvoltage circuit.
	e. Voltage regulator assembly defective	*e.* Report condition to direct support maintenance
	f. AC generator or generator control component defective	*f.* Report condition to direct support maintenance
24. Voltage cannot be adjusted	*a.* Voltmeter defective	*a.* Replace defective voltmeter (fig. 4-18).
	b. VOLTAGE ADJ rheostat defective	*b.* Report condition to direct support maintenance
	c. Voltage regulator assembly defective	*c.* Report condition to direct support maintenance

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
25. Main CB closure lamp does not illuminate when main CB circuit breaker switch is placed in closed position (Main Circuit Breaker energized to close) or extinguished during operation.	*a.* MAIN CB CLOSURE lamp defective	*a.* Press MAIN CB CLOSURE lamp lens to test lamp. Replace defective MAIN CB lamp (fig. 3-8)
	b. MAIN CB CLOSURE lamp turned off	*b.* Rotate MAIN CB CLOSURE lamp lens counterclockwise for bright illumination.
	c. Overvoltage relay tripped open (OVER VOLTAGE lamp illuminating).	*c.* Momentarily place OVER VOLT RESET switch in "up" position to reset overvoltage relay. If OVER VOLTAGE lamp remains extinguished, place MAIN CB circuit breaker switch in CLOSE position to see if MAIN CB CLOSURE lamp illuminates. Report condition to direct support maintenance if OVER VOLTAGE lamp does not extinguish or remains extinguished.
	d. Main circuit breaker defective.	*d.* Place MAIN CB CLOSURE switch in CLOSE position and check for output voltage at load terminals with voltmeter. If no voltage is present, report defective main circuit breaker to direct support maintenance.
	e. Overcurrent relay tripped closed.	*e.* Check for and correct any short circuit condition caused by electrical loads. Report defective overcurrent relay to direct support maintenance.
	f. Voltage regulator assembly defective	*f.* Report condition to direct support maintenance
26. Overvoltage lamp illuminates when CB circuit breaker switch is placed in closed position.	*a.* Internally wired plug not installed in REMOTE CONTROL GENERAL J14 receptacle and REMOTE-LOCAL CONTROL SELECTOR switch in REMOTE position.	*a.* Place REMOTE-LOCAL CONTROL SELECTOR switch in LOCAL position (during local operation only) and securely install internally wired plug. Momentarily place MAIN CB circuit breaker switch in CLOSED position to close main circuit breaker.
	b. REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch in REMOTE position when remote voltage sensing is not employed.	*b.* Place REMOTE-LOCAL VOLTAGE SENSING SELECTOR switch in LOCAL position.
	c. VOLTAGE ADJ screw in full clockwise position	*c.* Adjust VOLTAGE ADJ screw for required ac generator output voltage.
	d. Overvoltage relay tripped open.	*d.* Momentarily place OVER VOLT RESET switch in "up" position to reset overvoltage control circuit.
	e. Overvoltage control circuit defective	*e.* Report condition to direct support maintenance
	f. Voltage regulator assembly defective	*f.* Report condition to direct support maintenance
27. Batteries charge in excess of +5 amps after 2 hrs of engine operation	*a.* Batteries defective	*a.* Check specific gravity of electrolyte. Replace defective battery (para 4-38).
	b. Battery charger out of adjustment	*b.* Adjust battery charger output (fig. 4-20).

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
28. Batteries charge at less than +2 amps after 2 hours of engine operation.	*a.* Battery charger fuse defective	*a.* Replace battery charger fuse (fig. 3-6)
	b. Battery charger out of adjustment	*b.* Adjust battery charger output (fig. 4-21).
	c. Battery charger defective	*c.* Report condition to direct support maintenance
29. Voltage droop cannot he adjusted.	*a.* UNIT-PARALLEL switch in UNIT position	*a.* Place UNIT-PARALLEL switch in PARALLEL position
	b. Voltage droop control R7 defective	*b.* Report condition to direct support maintenance
	c. Current transformer CT4 open or shorted.	*c.* Report condition to direct support maintenance
	d. Voltage regulator defective	*d.* Report condition to direct support maintenance
	e. Wiring defective	*e.* Report condition to direct support maintenance
30. Frequency droop cannot be adjusted.	*a.* UNIT-PARALLEL switch in UNIT position	*a.* Place UNIT-PARALLEL switch in PARALLEL position.
	b. Frequency droop control R6 defective	*b.* Report condition to direct support maintenance
	c. Load anticipator defective	*c.* Report condition to direct support maintenance
	d. Current transformers CT1, CT2, or CT3 defective	*d.* Report condition to direct support maintenance
	e. Wiring defective	*e.* Report condition to direct support maintenance
31. Parallel generator sets will not synchronize or stay in synchronization	*a.* UNIT-PARALLEL switch in UNIT position	*a.* Place UNIT-PARALLEL switch in PARALLEL position.
	b. Voltage droop control R7 not properly adjusted or defective	*b.* Adjust voltage droop control (para 2-2*b* (8)(*b*)). Report a defective voltage droop control to direct support maintenance.
	c. Frequency droop control R6 not properly adjust or defective	*c.* Adjust frequency droop control (para 2-2*b* (8)(*b*)). Report a defective frequency droop control to direct support maintenance
	d. Voltage regulator defective	*d.* Report condition to direct support maintenance
	e. Load anticipator defective	*e.* Report condition to direct support maintenance.
	f. Fuel control unit defective	*f.* Report condition to direct support maintenance.
	g. Wiring defective	*g.* Report condition to direct support maintenance.
32. Main Circuit Breaker lamp remaining illuminated when Main CB Circuit Breaker switch is in open position.	*a.* MAIN CB circuit breaker switch defective	*a.* Replace MAIN CB circuit breaker switch (fig. 4-16).
	b. Main circuit breaker defective	*b.* Report condition to direct support maintenance
33. Battery heater does not operate	*a.* WINTERIZATION HEATER CB circuit breaker open.	*a.* Reset (press) WINTERIZATION HEATER CB circuit breaker. Replace defective circuit breaker (fig. 4-16).
	b. WINTERIZATION HEATER switch defective	*b.* Replace WINTERIZATION HEATER switch (fig. 4-16).
	c. Heater overtemperature limit switch tripped or defective	*c.* Reset (press) heater overtemperature limit switch. Replace defective limit switch (fig. 4-29).
	d. Batteries electrolyte temperature above 0° F.	*d.* Battery electrolyte temperature sensor energizes battery heater when batteries electrolyte temperature decreases to 0° F and deenergizes the battery heater when electrolyte temperature increases to 20° F

Table 4-2. Troubleshooting—Continued

Malfunction	Probable Cause	Corrective Action
		(WINTERIZATION HEATER switch in ON position).
	e. Low charged batteries.	*e.* Recharge or replace batteries (para 4-38).
	f. Electrical connection to battery electrolyte temperature sensor defective (batteries electrolyte temperature below 0° F).	*f.* Clean, tighten, or replace electrical connection to battery electrolyte temperature sensor.
	g. Battery electrolyte temperature sensor defective (batteries electrolyte temperature below 0° F).	*g.* Replace battery electrolyte temperature sensor (fig. 3-21).
	h. Battery heater defective.	*h.* Replace battery heater (fig. 4-28).
34. Battery heater blower operates but combustion does not occur.	*a.* Heater fuel shutoff valve closed.	*a.* Open heater fuel shutoff valve.
	b. Low or depleted fuel supply	*b.* Replenish fuel supply.
	c. Heater fuel filter clogged.	*c.* Clean or replace heater fuel filter element (fig. 3-4).
	d. Heater fuel pump screen clogged	*d.* Clean screen. Replace defective heater fuel pump (fig. 4-31).
	e. Low charged batteries	*e.* Recharge or replace batteries (fig. 4-34).
	f. Heater fuel pump defective	*f.* Replace heater fuel pump (fig. 4-31).
	g. Heater metering orifice clogged	*g.* Clean metering orifice (fig. 4-29).
	h. Heater igniter assembly defective	*h.* Replace igniter assembly (fig. 4-29).
	i. Heater pressure regulator valve defective	*i.* Replace pressure regulator valve (fig. 4-29).
	j. Heater solenoid coil defective	*j.* Replace solenoid coil (fig. 4-29).
	k. Heater flame switch defective	*k.* Replace flame switch (fig. 4-29).
	l. Heater control relay defective	*l.* Report condition to direct support maintenance
35. Heater combustion occurs then goes out.	*a.* Low or depleted fuel supply	*a.* Replenish fuel supply.
	b. Heater air inlet cover assembly screen obstructed	*b.* Remove obstruction.
	c. Heater fuel pump defective.	*c.* Replace heater fuel pump (fig. 4-31).
	d. Heater pressure regulator valve defective.	*d.* Replace pressure regulator valve (fig. 4-31).
	e. Heater metering orifice clogged	*e.* Clean metering orifice (fig. 4-29).
	f. Heater fuel pump screen clogged	*f.* Clean screen. Replace defective heater fuel pump (fig. 4-31).
36. Heater smokes.	*a.* Heater blower motor assembly defective.	*a.* Replace blower motor assembly (fig. 4-29).
	b. Heater pressure regulator valve defective	*b.* Replace pressure regulator valve (fig. 4-29).
37. Heater combustion surges.	*a.* Heater fuel pump defective.	*a.* Replace heater fuel pump (fig. 4-31).
	b. Heater pressure regulator valve defective.	*b.* Replace pressure regulator valve (fig. 4-29).
38. Heater fails to automatically shut down when batteries electrolyte temperature increases.	*a.* Heater pressure regulator valve defective	*a.* Replace pressure regulator valve (fig. 4-29).
	b. Heater flame switch defective	*b.* Adjust or replace flame switch (fig. 4-29).
	c. Battery electrolyte temperature sensor defective	*c.* Replace battery electrolyte temperature sensor (para 4-52).
	d. Heater control relay defective	*d.* Report condition to direct support maintenance
39. Heater fails to shut down when winterization heater switch is placed in OFF position	*a.* WINTERIZATION HEATER switch defective	*a.* Replace a defective WINTERIZATION HEATER switch (fig. 4-16).
	b. Heater pressure regulator valve defective	*b.* Replace a defective pressure regulator valve (fig. 4-29).
	c. Heater control relay defective	*c.* Report condition to direct support maintenance

Section VII. RADIO INTERFERENCE SUPPRESSION

4-8. General Methods Used to Attain Proper Suppression

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

4-9. Interference Suppression Components

The generator set is provided with three capacitors as primary interference suppression components. One is mounted at the convenience receptacle, and two at the motor housing of the battery heater assembly. The capacitors at the output of the generator set on the main circuit and the convenience receptacle are 0.1 microfarad, 500V dc capacitors. The two capacitors on the battery heater motor housing are 0.005 microfarad, 600V dc (connected to terminal block) and 0.001 microfarad, 100V dc.

4-10. Replacement of Suppression Components

For replacement of radio interference suppression components, refer to figure 4-1.

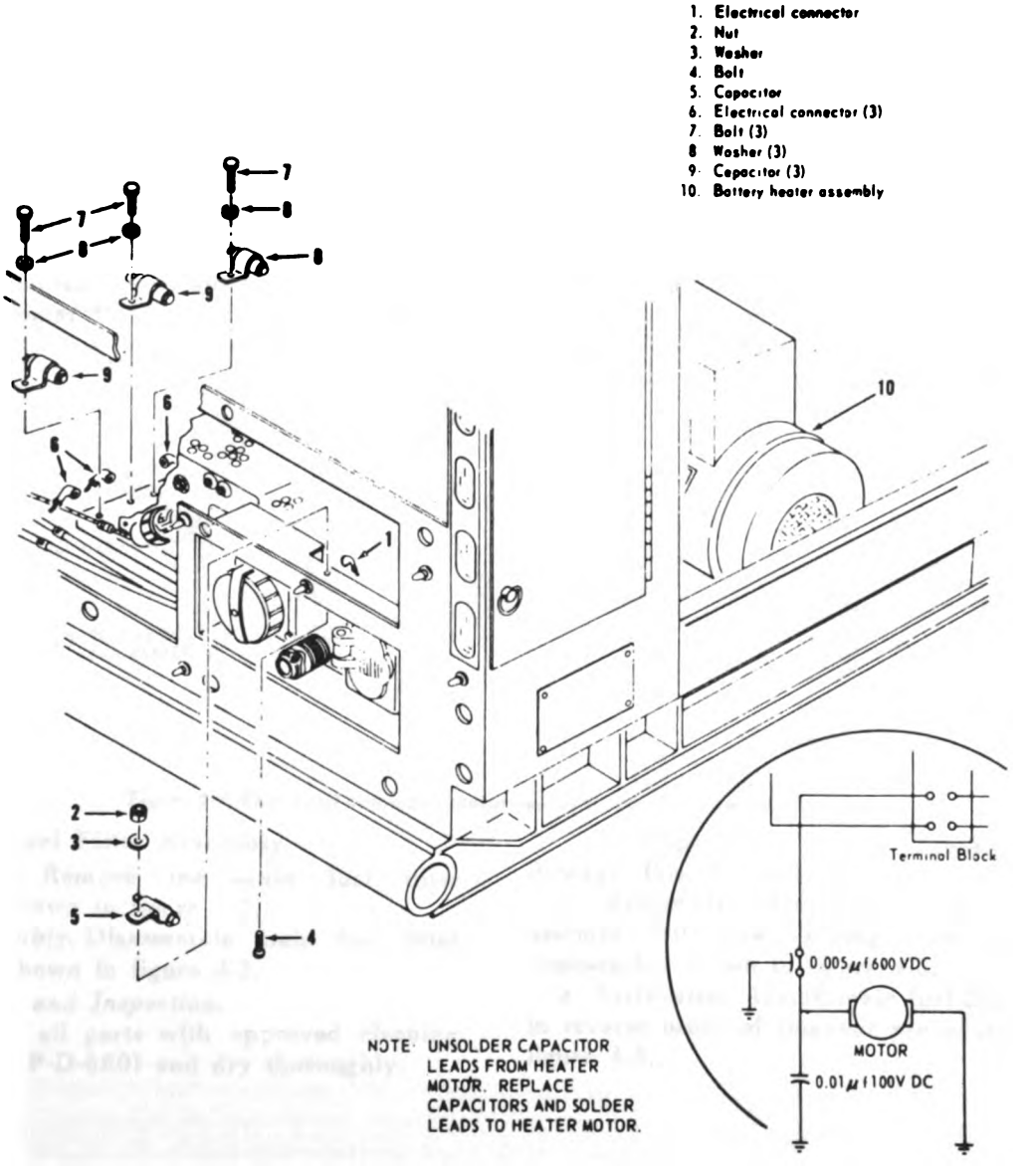


Figure 4-1. Radio interference suppression components removal.

4-11. Testing of Radio Interference Suppression Components

Test the capacitors for leaks, shorts, and open circuits, using a capacitor tester. Replace capacitors that fail to give a reading within 10 percent of the value in microfarads given in paragraph 4-9.

Section VIII. MAINTENANCE OF FUEL SYSTEM

4-12. General

The fuel system provides a metered fuel supply to automatically control the acceleration and operation of the engine, and a fuel supply to the battery heater. The electrically operated fuel boost pump and motor assembly draws fuel from an external fuel supply and supplies fuel under pressure to the fuel control unit through a fuel filter assembly, and to the electrically operated heater fuel pump through the heater shut-off valve. The heater fuel pump supplies fuel to the battery heater through the heater fuel filter assembly. The fuel control unit provides controlled fuel flow through the electrically actuated fuel solenoid valve to the fuel atomizer assembly. The fuel atomizer assembly provides the fuel spray pattern for engine combustion.

CAUTION

Be sure fuel lines do not make physical contact with other surfaces of the generator set. The high frequency vibration of the generator set during operation may cause rapid wear and damage of the fuel lines leading to fuel system failure.

4-13. Fuel Boost Pump and Motor Assembly

a. Removal. Remove fuel boost pump and motor assembly as shown in figure 4-2.

b. Cleaning and Inspection.

(1) Wipe fuel boost pump and motor assembly with cloth moistened in cleaning solvent (FED P-D-680) and allow to dry.

(2) Inspect pump for cracks, breaks, or other damage and mounting for security.

(3) Remove brushes as shown in figure 4-2. Inspect brushes for pitting or uneven wear. Install brushes in same position as they were removed. Inspect springs for distortion and cracks.

(4) Replace defective parts.

c. Installation. Install fuel boost pump and motor assembly in reverse order of removal procedure shown in figure 4-2.

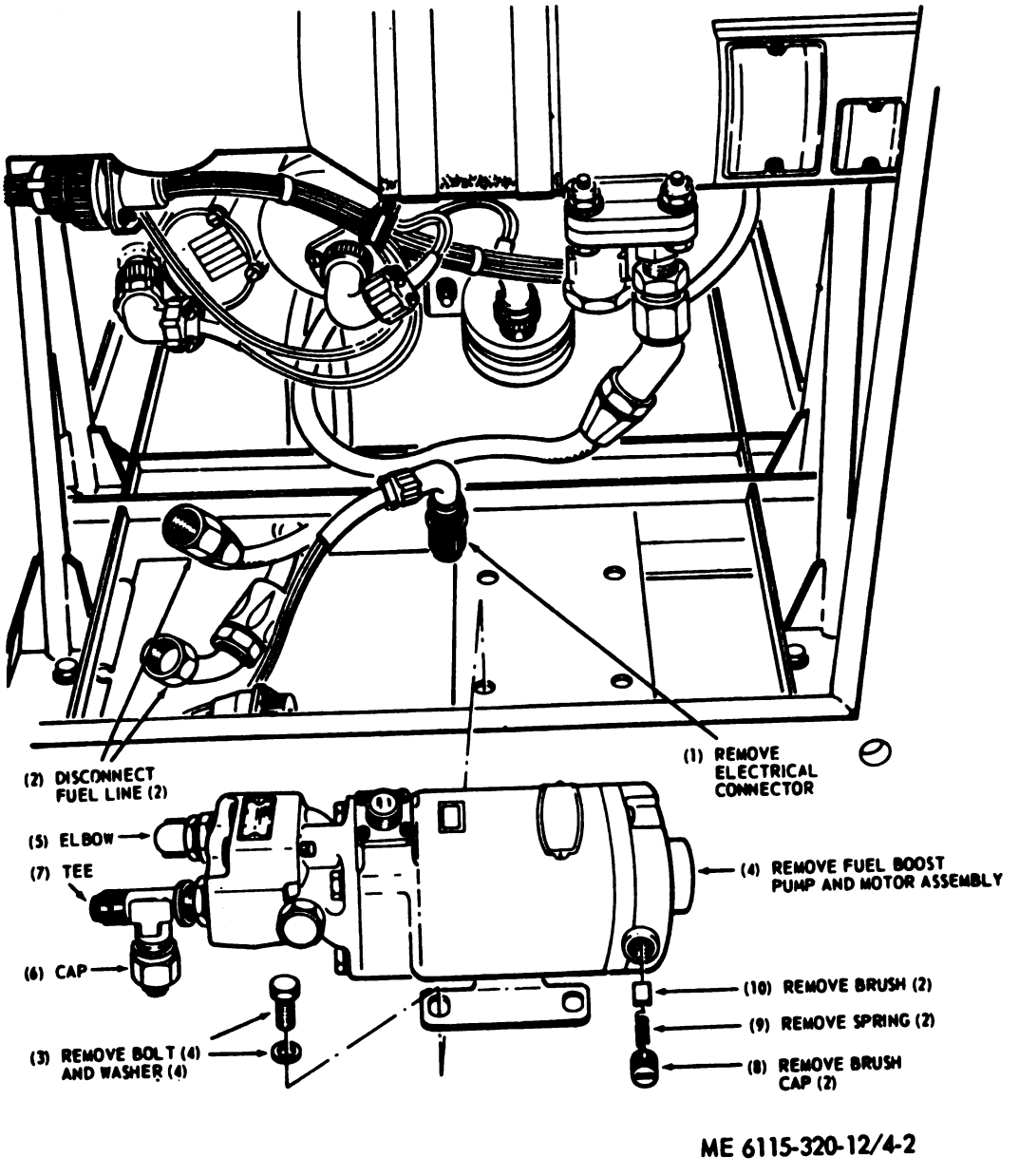


Figure 4-2. Fuel boost pump and motor assembly, removal and installation.

4-14. Main Fuel Filter Assembly

a. Removal. Remove the main fuel filter assembly as shown in figure 4-3.

b. Disassembly. Disassemble main fuel filter assembly as shown in figure 4-3.

c. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent (FED P-D-680) and dry thoroughly.

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

d. Assembly. Assemble main fuel filter assembly with new packing in reverse order of disassembly shown in figure 4-3.

e. Installation. Install main fuel filter assembly in reverse order of removal procedure shown in figure 4-3.

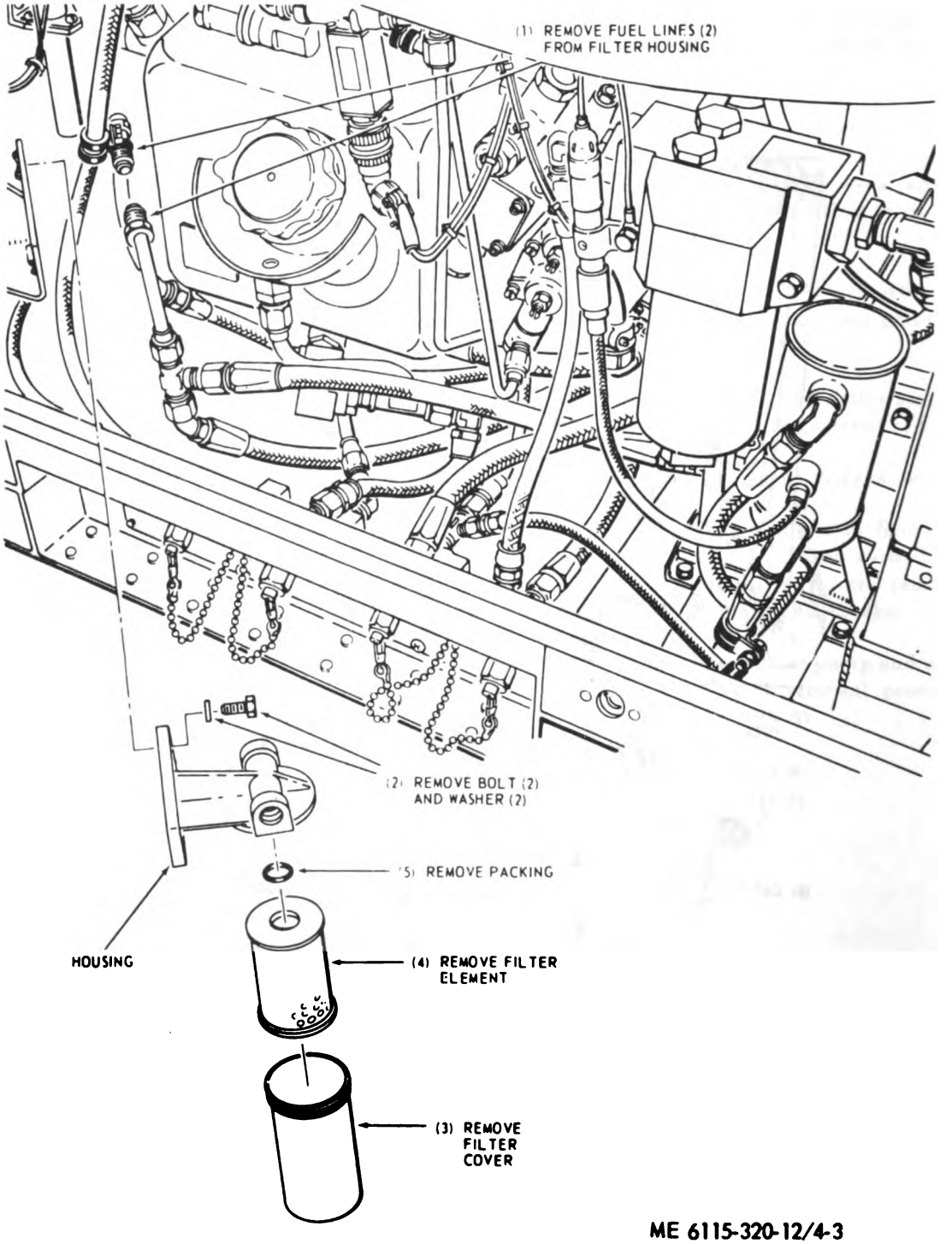


Figure 4-3. Main fuel filter assembly, removal, disassembly, assembly and installation.

4-15. Fuel Solenoid Valve

a. Removal. Remove fuel solenoid valve as shown in figure 4-4.

b. Cleaning and Inspection.

(1) Wipe solenoid valve with cloth moistened in cleaning solvent (FED P-D-680) and allow to dry.

(2) Inspect valve for cracks, breaks, or other damage. Inspect electrical connector for bent pins, stripped threads, or other damage.

c. Test. Connect 24v dc to the terminals of solenoid coil. If solenoid does not actuate when power is applied, replace solenoid valve.

d. Installation. Install fuel solenoid valve in reverse order of removal procedure shown in figure 4-4.

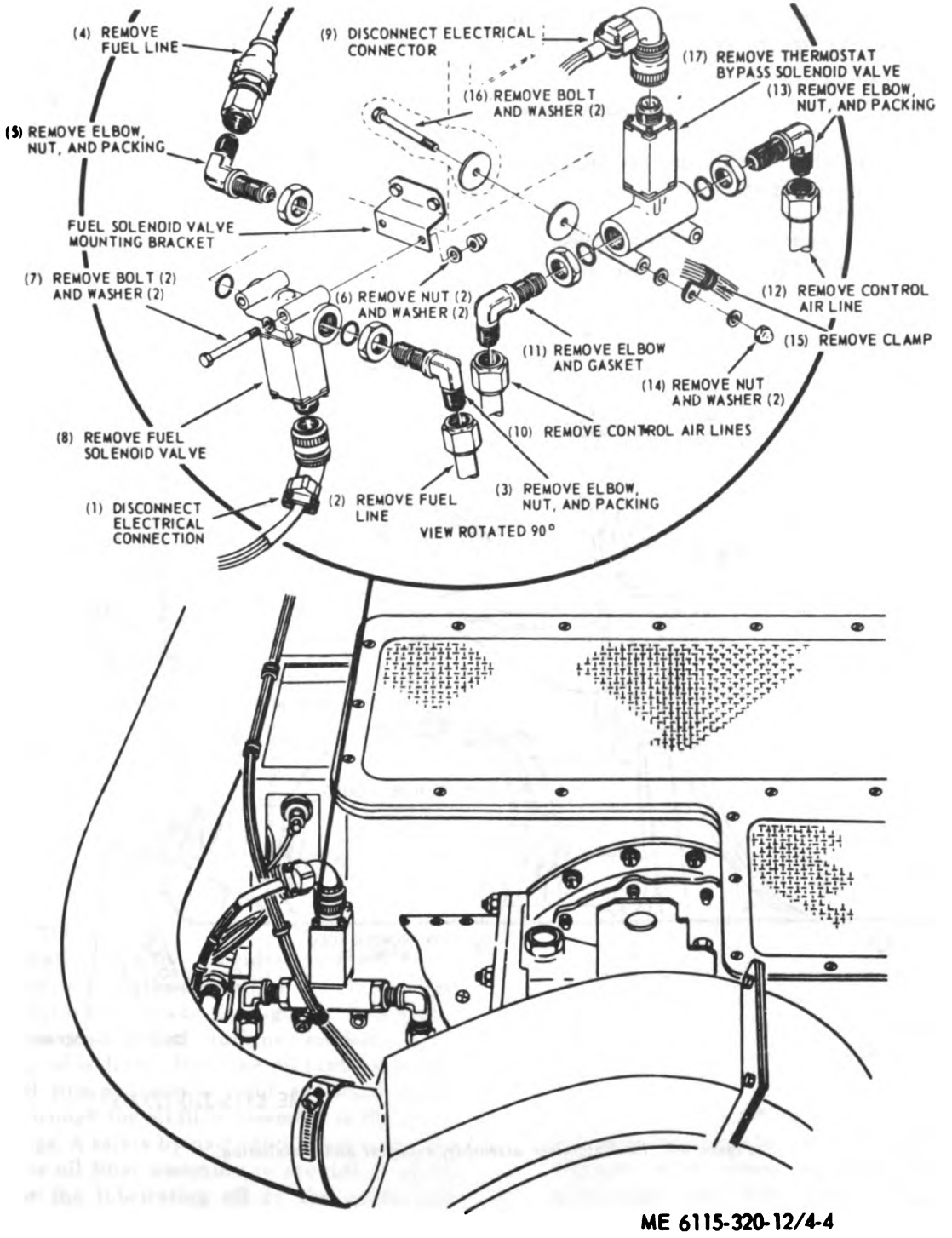


Figure 4-4. Fuel solenoid valve and thermostat by-pass solenoid valve, removal and installation.

4-16. Thermostat By-Pass Solenoid Valve

a. Removal. Remove thermostat by-pass solenoid valve as shown in figure 4-4.

b. Cleaning and Inspection.

(1) Wipe solenoid valve with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

(2) Inspect valve for cracks, breaks, or other damage. Inspect electrical connector for bent pins, stripped threads, or other damage.

c. Test. Connect 24v dc to the terminals of

solenoid coil. If solenoid does not actuate when power is applied, replace solenoid valve.

d. Installation. Install thermostat by-pass solenoid valve in reverse order of removal procedure shown in figure 4-4.

4-17. Fuel Atomizer Assembly

a. Removal. Remove fuel atomizer assembly as shown in figure 4-5.

b. Disassembly. Disassemble the fuel atomizer assembly as shown in figure 4-6.

c. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent (Fed P-D-680) and dry thoroughly.

(2) Inspect screen for clogging and breaks. If defective, replace screen. Discard packing and gasket. Inspect all other parts for cracks, breaks, or other damage.

d. Assembly. Assemble fuel atomizer assembly with new packing and gasket in reverse order of disassembly procedure shown in figure 4-6.

e. Installation. Install fuel atomizer assembly with new packing and gasket in reverse order of removal procedure shown in figure 4-5.

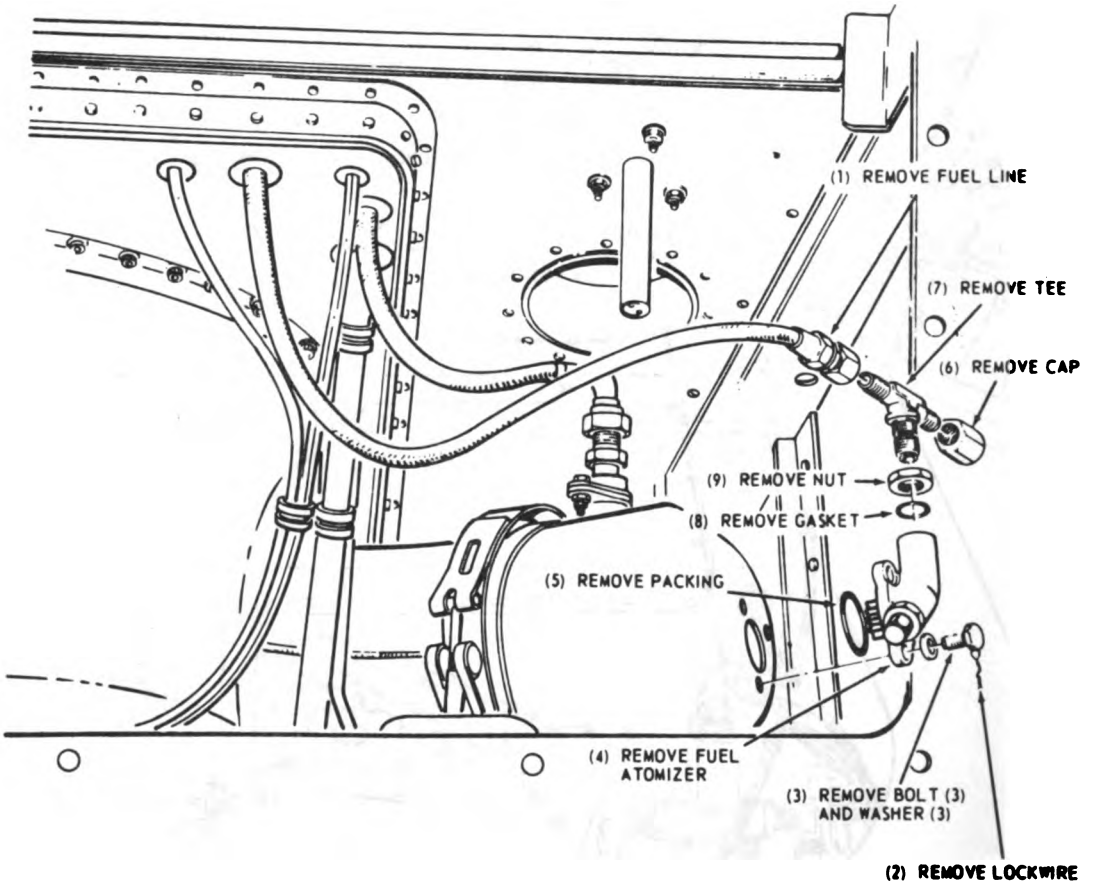


Figure 4-5. Fuel atomizer assembly, removal and installation.

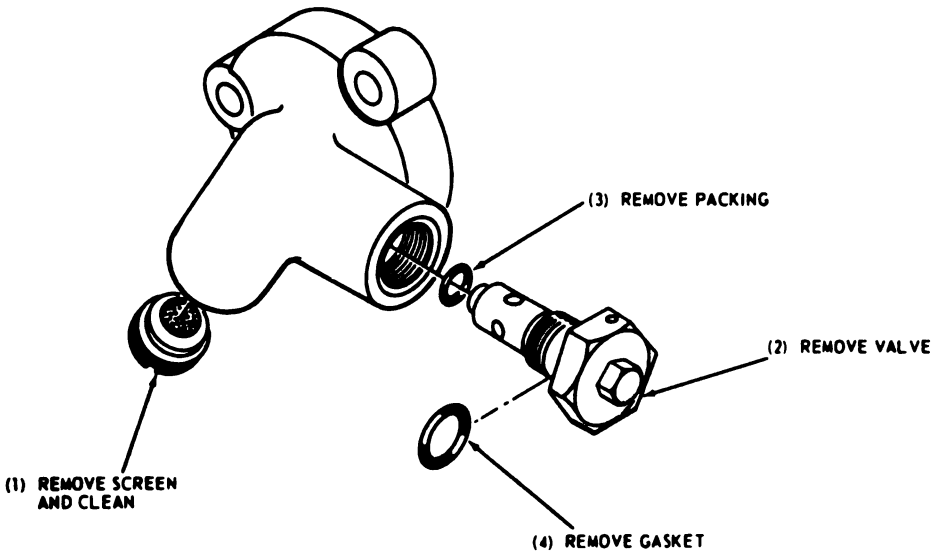


Figure 4-6. Fuel atomizer assembly, disassembly, service and assembly.

4-18. Hoses Lines and Fittings

a. Inspect.

(1) Inspect hoses for cuts, frays, chafing, and damaged couplings.

(2) Inspect lines for damaged couplings, cracked flares, sharp kinks, and evidence of chafing.

(3) Inspect fittings for damaged threads, and for excessive wear.

b. Replace defective hoses, lines, and fittings as required.

4-19. Fuel Control

a. Inspection.

(1) Inspect fuel control mounting and fittings for security.

(2) Inspect fuel control for evidence of leakage.

b. Service. Remove and replace filter.

Section IX. MAINTENANCE OF LUBRICATING SYSTEM

4-20. General

The lubricating system provides lubricating oil under pressure to cool and lubricate the gears of the accessory drive section and the high speed bearings of the compressor and turbine sections. The lubricating oil is drawn from the oil tank assembly by the oil pump assembly and supplied under pressure through the oil filter assembly to the gears and bearings. A safety by-pass valve is built into the body of the oil filter assembly to provide a safety bypass for the lubricating oil to the gears and bearings in the event that the oil filter element becomes clogged. An oil pressure sequencing switch is actuated by the lubricating oil pressure to energize the ignition system and fuel solenoid valve when the oil pressure is sufficient to adequately lubricate the gears and bearings during engine start. A low oil pressure switch is incorporated in the lubrication system to automatically shut down the engine if the lubricating oil pressure drops below 55 psig. A scavenge pump, an integral part of the oil pump assembly, returns the lubricating oil and entrained air from the gears and bearings through the oil cooler to the oil tank assembly. The entrained air is vented from the oil tank assembly to the turbine exhaust.

CAUTION

Be sure oil lines do not make physical contact with other surfaces of the generator set. The high frequency vibration of the generator set during operation may cause rapid wear and damage of the oil lines leading to lubricating system failure and automatic shutdown of the engine.

4-21. Oil Filter Assembly

a. Removal. Remove oil filter assembly as shown in figure 4-7.

b. Disassembly. Disassemble oil filter as shown in figure 4-7.

c. Cleaning and Inspection.

(1) Clean all parts with cleaning solvent (Fed P-D-680) and dry thoroughly.

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

d. Assembly. Assemble oil filter assembly with new packings in reverse order of disassembly procedure shown in figure 4-7.

e. Installation. Install oil filter assembly with new packings in reverse order of removal procedure shown in figure 4-7.

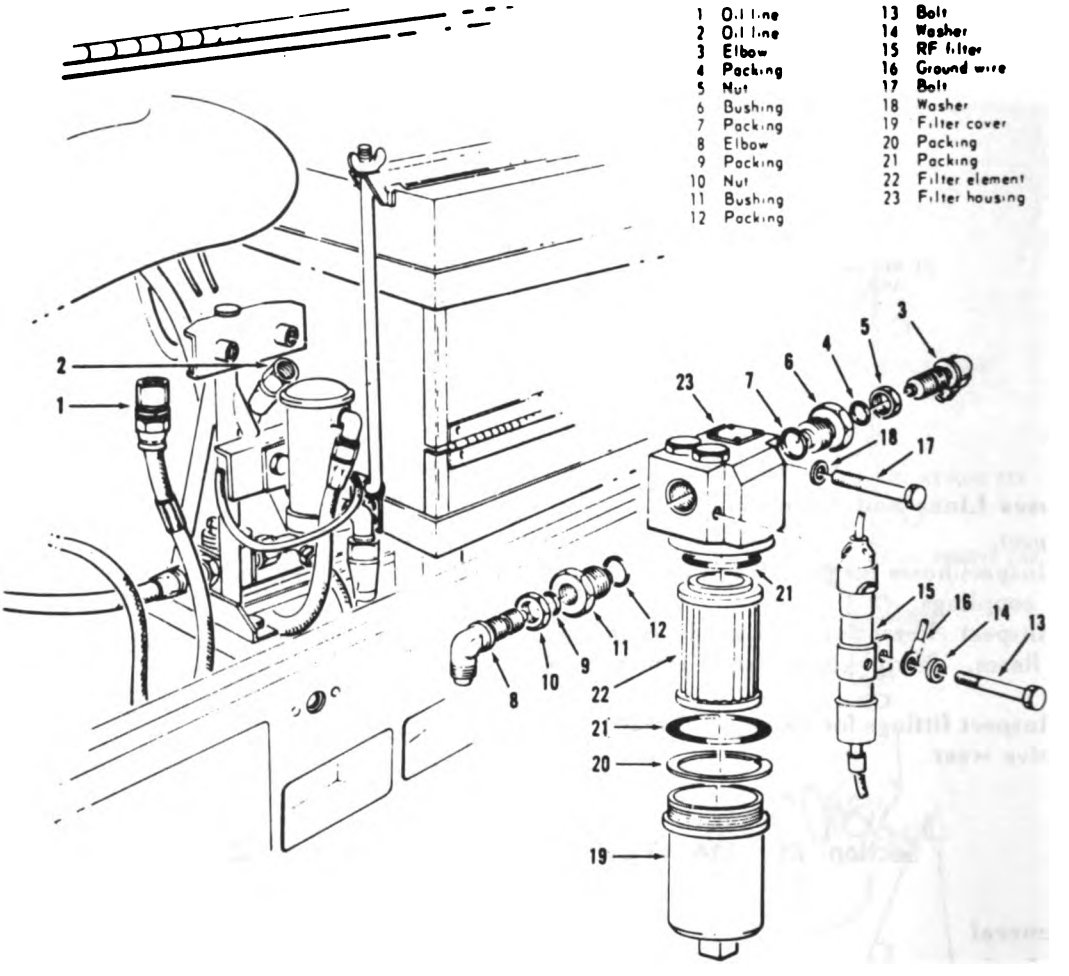


Figure 4-7. Oil filter assembly, removal, disassembly, repair, assembly, and installation.

4-22. Oil Drain Valve

a. Removal. Remove oil drain valve as shown in figure 4-8.

b. Cleaning and Inspection.

(1) Clean all parts with cleaning solvent (Fed P-D-680) and dry thoroughly.

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

c. Installation. Install oil drain valve with new packings in reverse order of removal procedure shown in figure 4-8.

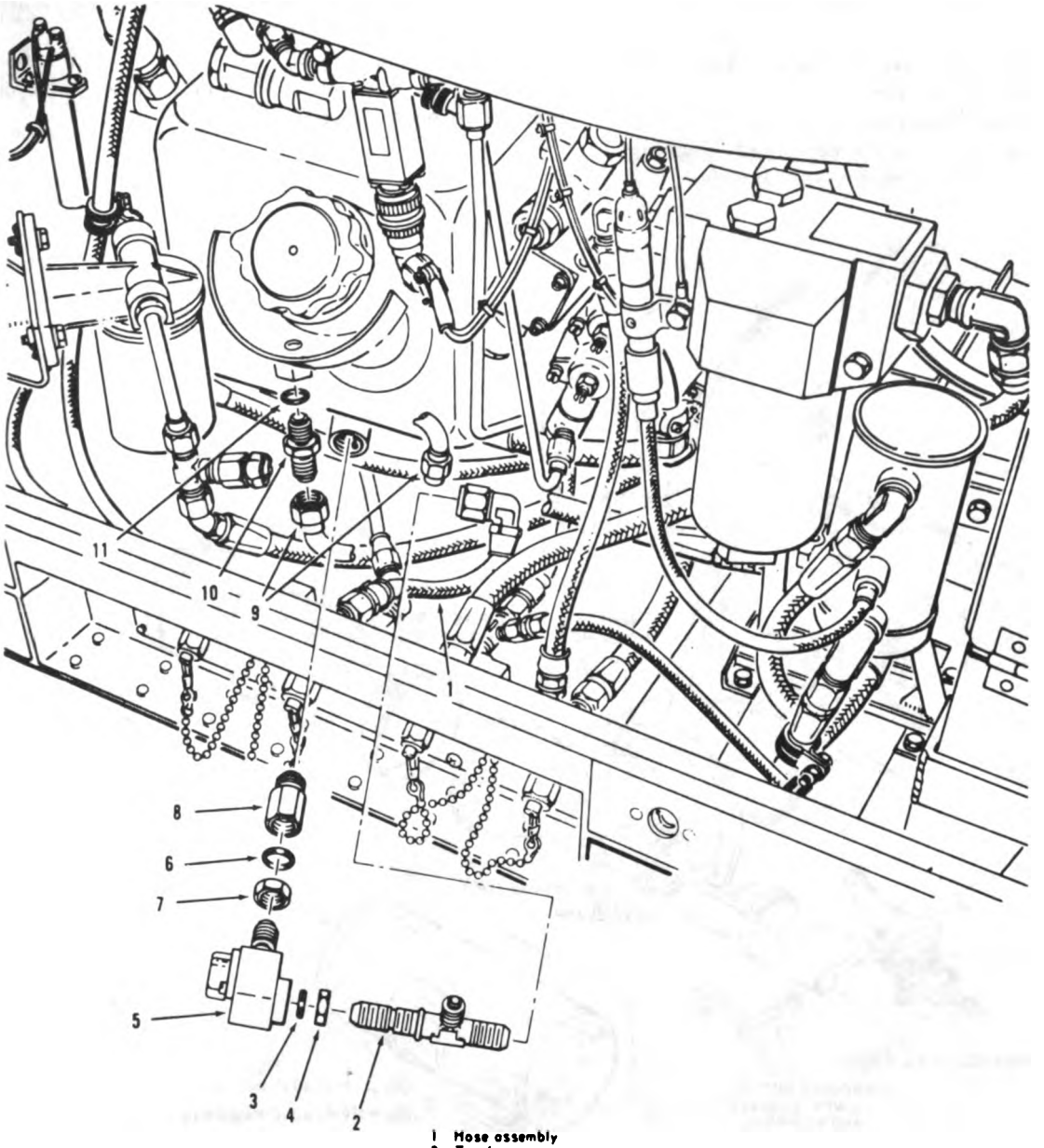


Figure 4-8. Oil drain valve, removal and installation.

4-23. Oil Tank Screen

a. Removal. Remove oil tank screen as shown in figure 3-1.

b. Cleaning and Inspection.

(1) Clean all parts with solvent (Fed P-D-680) and dry thoroughly.

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

c. Installation. Install oil tank screen as shown in figure 3-1.

4-24. Oil Cooler and Oil Cooler Air Duct and Hose

a. Removal. Remove oil cooler, air duct, and hose as shown in figure 4-9.

b. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent (Fed P-D-680) and dry thoroughly.

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

c. Installation. Install oil cooler with new packings, air duct, and hose in reverse order of removal procedure shown in figure 4-9.

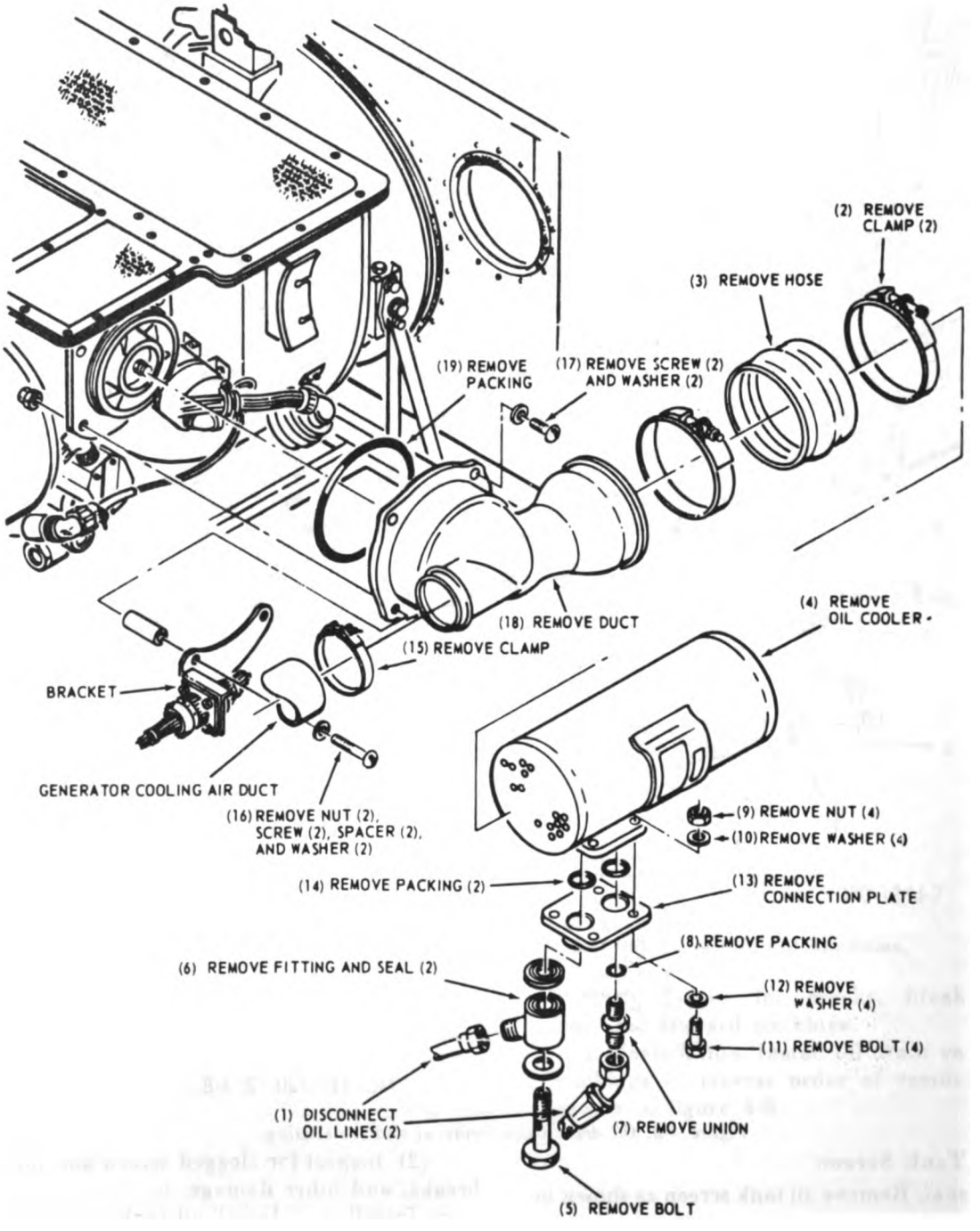


Figure 4-9. Oil cooler, oil cooler air duct, and hose, removal and installation.

4-25. Oil Pump Assembly

a. Clean dust and dirt from oil pump assembly with clean dry compressed air.

b. Inspect oil pump assembly for secure mounting and attached lines for leaks.

4-26. Oil Tank Assembly

a. Removal. Remove oil tank assembly according to sequence of index numbers assigned to figure 4-10.

b. Cleaning and Inspection.

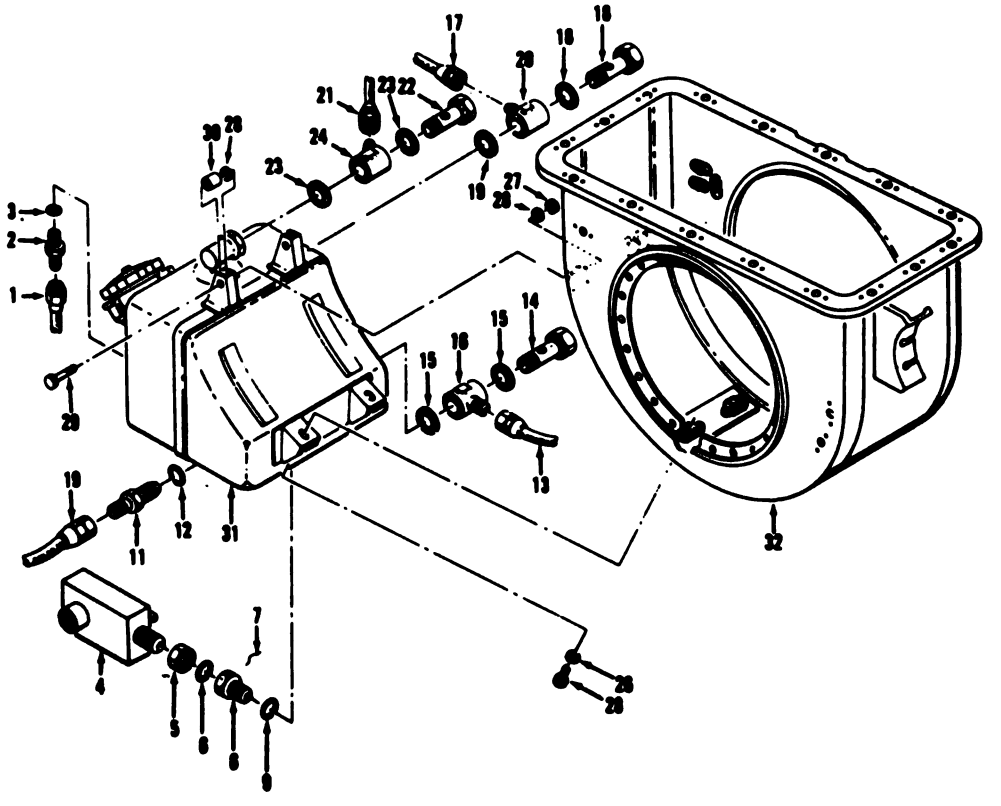
(1) Removal external dust, dirt, and foreign matter from the oil tank assembly with clean, dry compressed air.

(2) Clean the tank with solvent (Fed P-D-680).

(3) Inspect the oil tank assembly for evidence of damage, cracks, corrosion, excessive wear and stripped threads. If defective, replace the oil tank assembly.

c. Installation. Install the oil tank assembly in reverse order of removal procedure using figure 4-10 as a guide.

1. Hose assembly
2. Union
3. Preformed packing
4. Oil drain valve
5. Nut
6. Preformed packing
7. Lockwire
8. Reducer
9. Preformed packing
10. Hose assembly
11. Union
12. Preformed packing
13. Hose assembly
14. Bolt
15. Banjo seal
16. Elbow
17. Hose assembly
18. Bolt
19. Banjo seal
20. Elbow
21. Hose assembly
22. Bolt
23. Banjo seal
24. Elbow
25. Bolt (2)
26. Washer (2)
27. Nut (2)
28. Washer (as required)
29. Bolt (2)
30. Spacer (2)
31. Oil tank assembly
32. Compressor inlet plenum assembly



ME 6115-320-12/4-10

Figure 4-10. Oil tank assembly removal.

Section X. MAINTENANCE OF ENGINE ELECTRICAL SYSTEM

4-27. General

The integral parts of the engine electrical system include a 24v dc power circuit, an ignition unit, an igniter plug electrical lead assembly, an igniter plug, a start relay, a starter motor assembly, and holding and control relays. The 24v dc power circuit consists of two 12v dc batteries connected in series and a battery charger. The battery charger maintains the batteries charged during engine operation. The 24v dc power circuit provides the power required by the engine electrical system components and winterization equipment. The ignition unit supplies high voltage through the igniter plug electrical lead assembly to the igniter plug to ignite the fuel mixture for the turbine engine until the engine accelerates to 95 percent rpm. The holding and control relays provide electrical control of the engine electrical system components for automatically starting, operating, and stopping the engine.

CAUTION

Be sure the wiring harness or electrical leads do not make physical contact with other surfaces of the generator set. The high frequency vibration produced by the generator set during operation may cause rapid wear of electrical insulation. Rapid wear of electrical insulation may cause electrical shorts leading to damage to the generator set components.

4-28. Starter Motor Assembly

a. Removal. Remove starter motor assembly as shown in figure 4-11.

b. Cleaning and Inspection.

(1) Wipe starter motor assembly with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

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

c. Test. Apply 24v dc to the terminals of starter motor. If it does not operate, replace starter motor.

d. Installation. Install starter motor assembly with new packing in reverse order of removal procedure shown in figure 4-11.

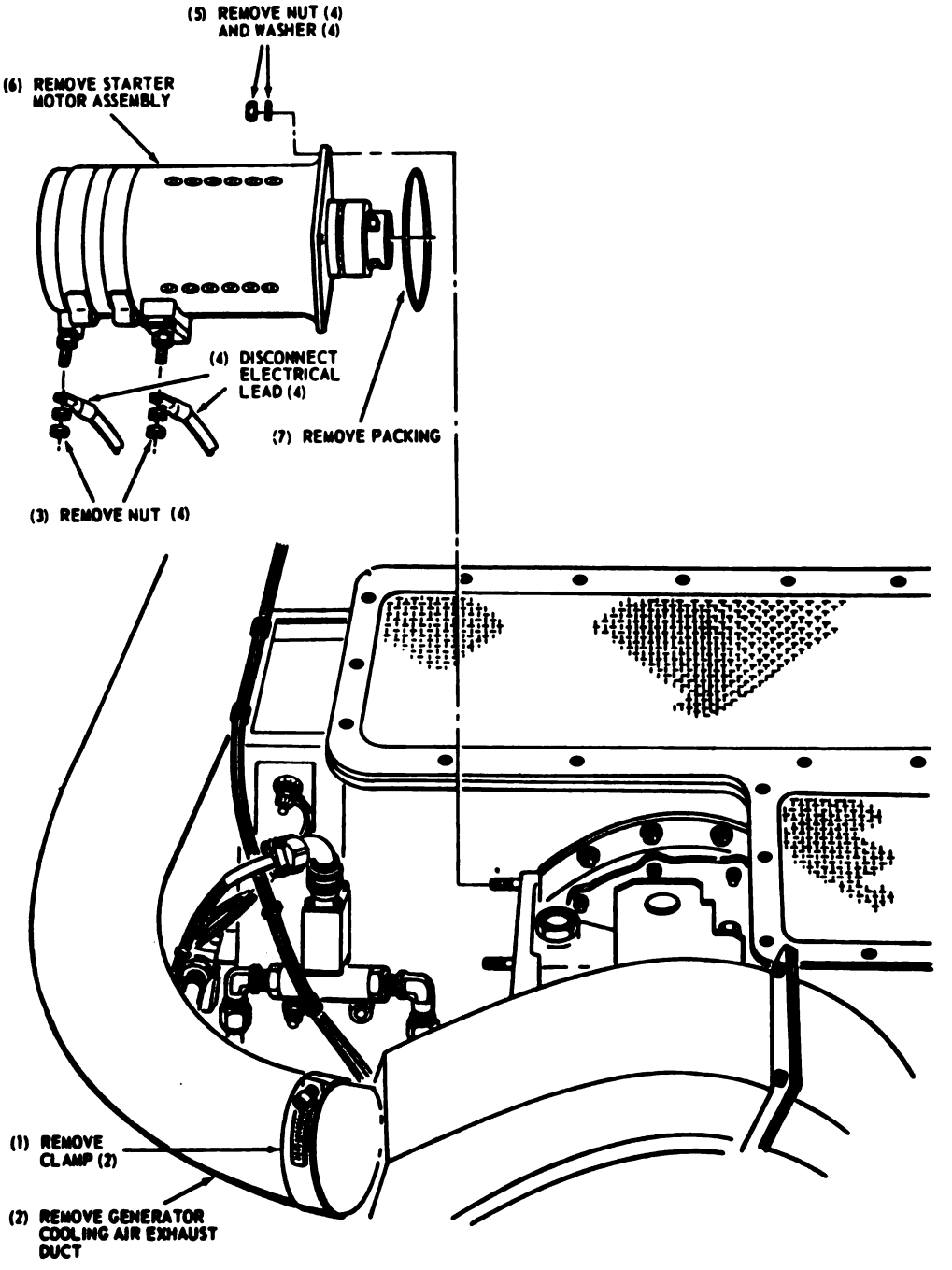


Figure 4-11. Starter motor assembly, removal and installation.

4-29. Start Relay

a. Removal. Remove start relay as shown in figure 4-12.

b. Cleaning and Inspection.

(1) Wipe start relay with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

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

c. Test. Apply 24v dc to the coil terminals (fig. 4-12) and listen for sound of relay actuation. If relay does not actuate, replace start relay.

d. Installation. Install start relay in reverse order of removal procedure shown in figure 4-12.

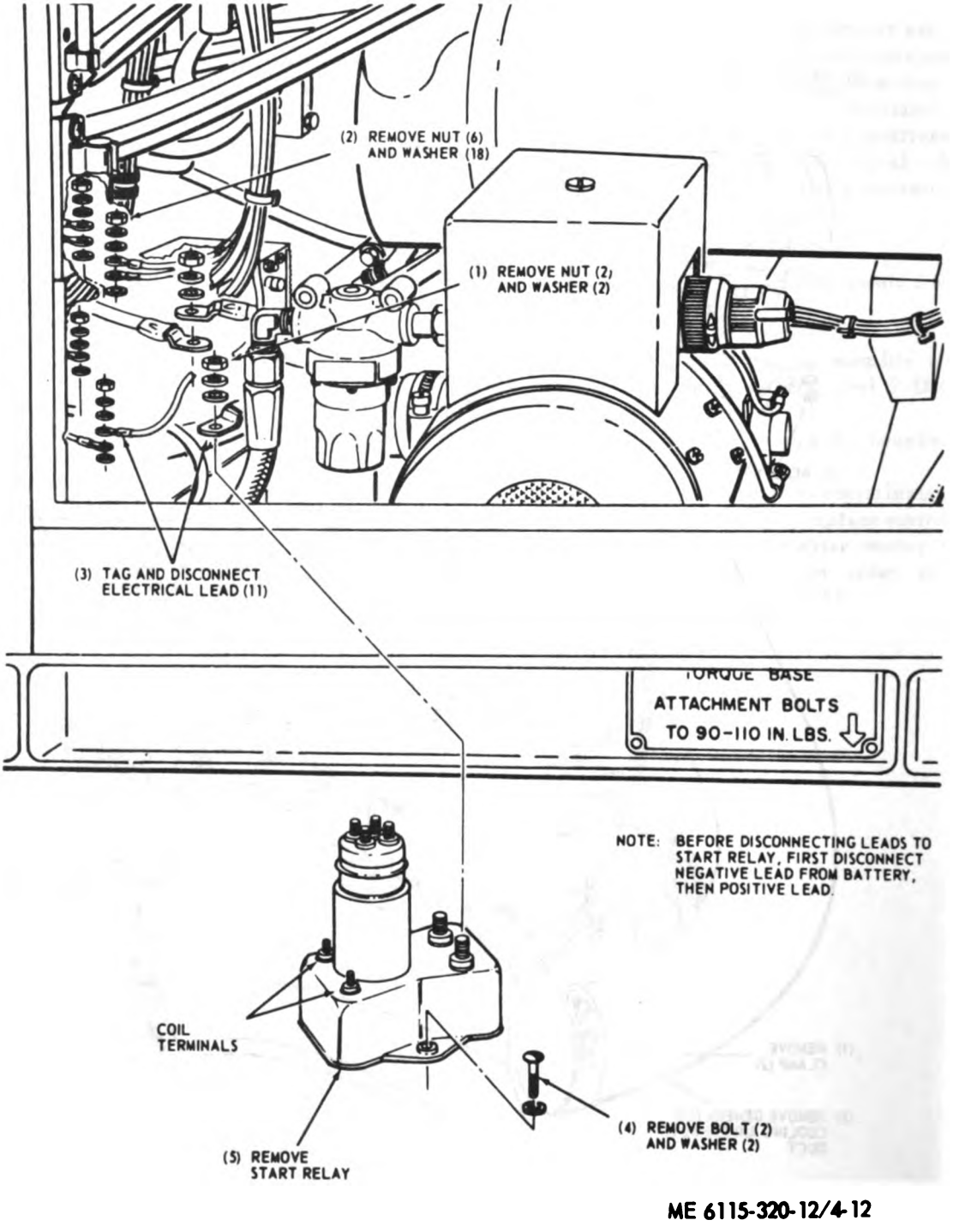


Figure 4-12. Start relay, removal and installation.

4-30. Ignition Unit and Bracket

a. Removal. Remove ignition unit and ignition unit bracket as shown in figure 4-13.

b. Cleaning and Inspection.

(1) Wipe ignition unit with cloth moistened in (Fed P-D-680) cleaning solvent and allow to dry. Clean all other parts with cleaning solvent (Fed P-D-680) and dry thoroughly.

(2) Inspect ignition unit and bracket for cracks, breaks, or other damage.

c. Installation. Install ignition unit and bracket in reverse order of removal procedure shown in figure 4-13.

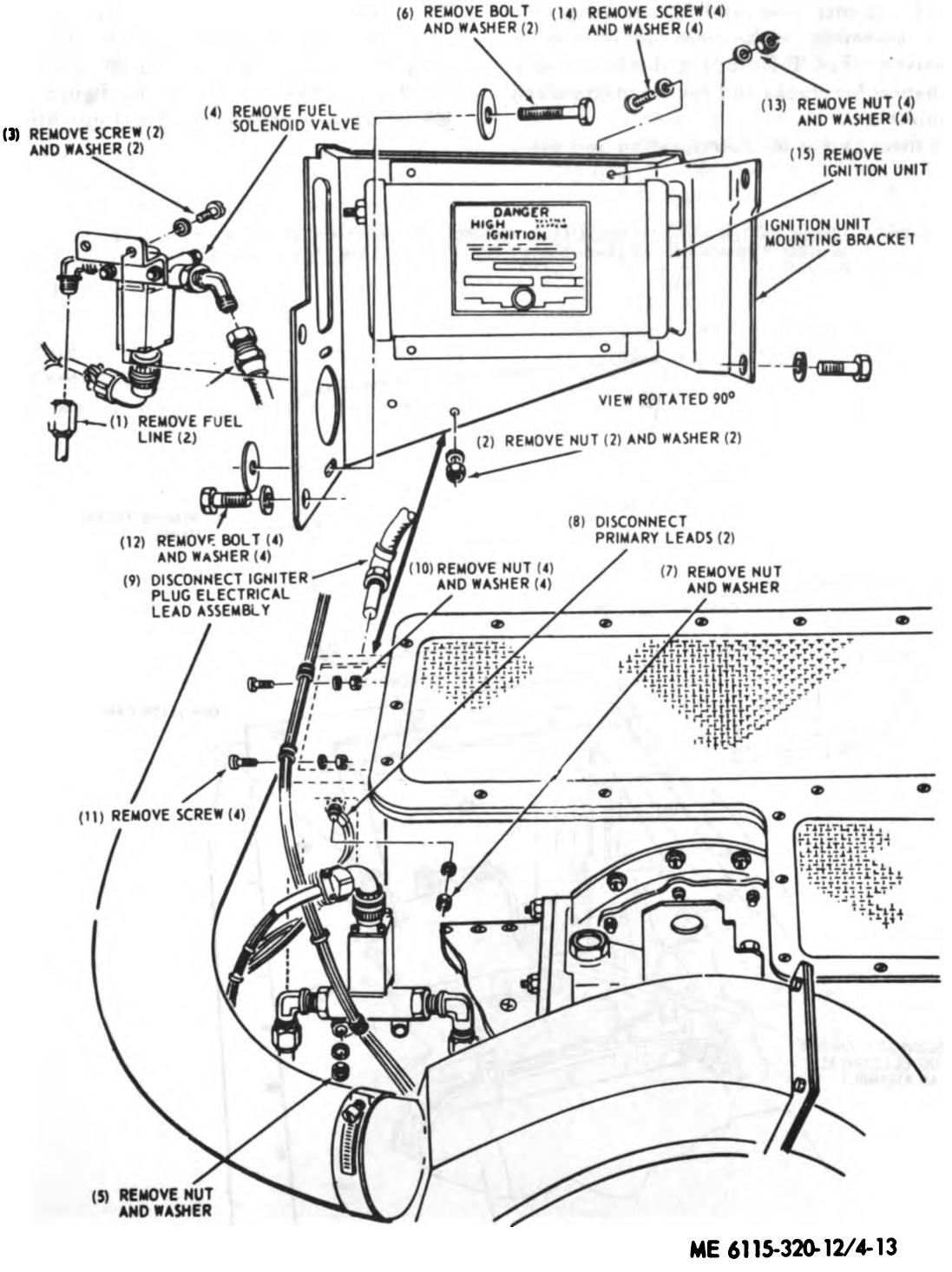


Figure 4-13. Ignition unit and bracket, removal and installation.

4-31. Igniter Plug and Igniter Plug Electrical Lead Assembly

WARNING

The igniter plug electrical lead assembly must be grounded as soon as it is removed from igniter plug. High voltage is likely to be present. Ground by touching control spring in lead to igniter plug.

a. Removal. **Remove igniter plug as shown in figure 4-14. Disconnect the igniter plug electrical lead assembly from ignition unit (fig. 4-13) and remove the lead assembly as shown in figure 4-14.**

b. Cleaning and Inspection.

(1) Wipe igniter plug and igniter plug electrical lead assembly with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

(2) Inspect for cracks and breaks, particularly in the insulation.

(3) Inspect gasket for deterioration and other damage.

(4) Replace igniter plug if found to be defective.

c. Installation. Install igniter plug and igniter plug electrical lead assembly in reverse order of removal procedure shown in figure 4-14. The igniter plug is tested by actual operation.

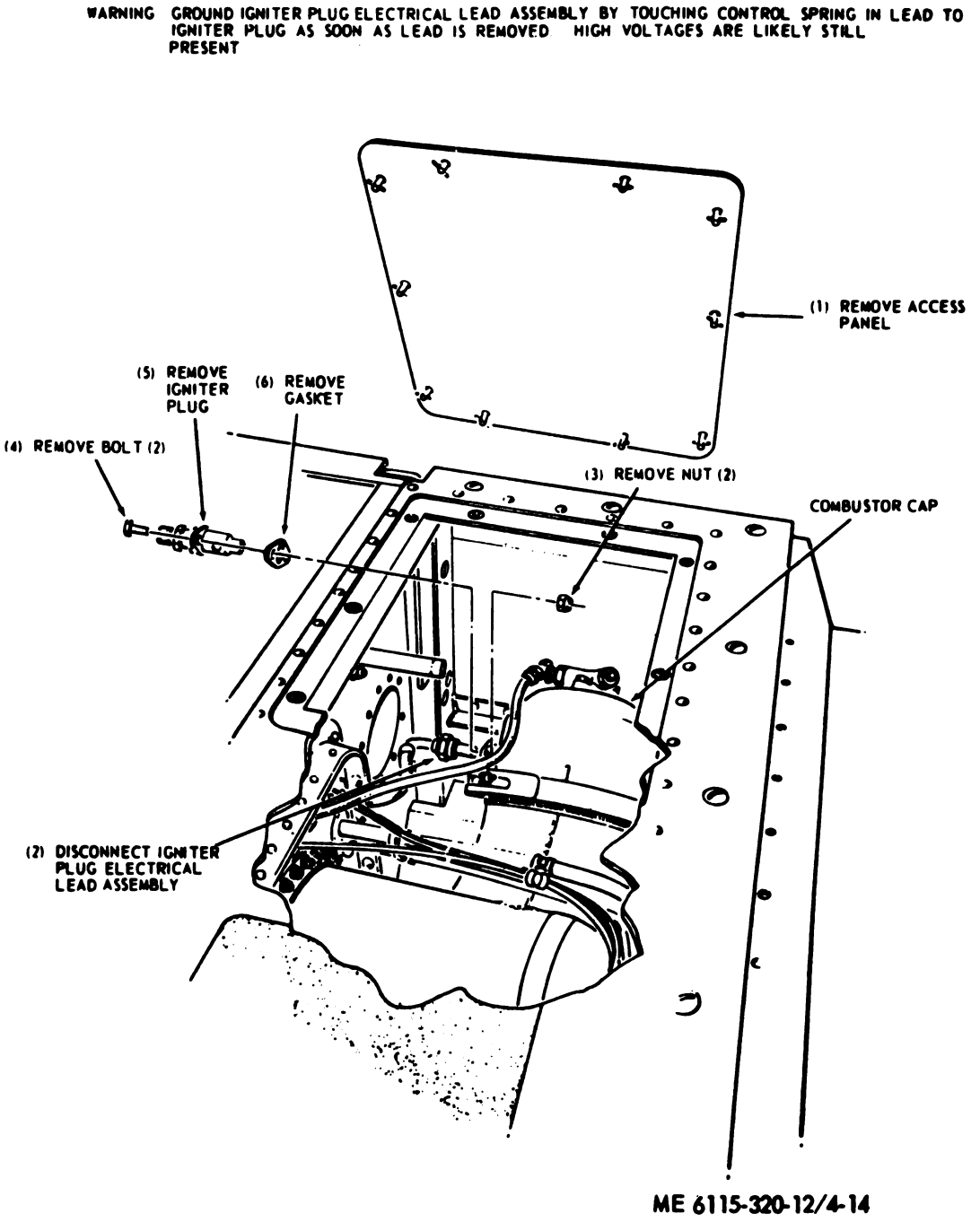


Figure 4-14. Igniter plug, and igniter plug electrical lead assembly, removal and installation.

Section XI. ENGINE CONTROLS INSTRUMENTS PANEL ASSEMBLY COMPONENTS

4-32. General

The engine controls instruments panel assembly contains the controls and instrument for starting, stopping, and monitoring the operation of the gas turbine engine. In addition to the engine controls and instruments, the panel includes a dc ammeter in the battery charging circuit and circuit breakers to protect both the internal and external dc circuits. The tachometer indicator is actuated by the voltage developed by the tachometer-generator, which is mounted on the oil pump assembly in the accessory drive section.

4-33. Engine Controls Instruments Panel Assembly Components.

a. Removal. Remove tachometer indicator, circuit breakers, start counter, master switch, exhaust gas temperature indicator, time totalizing meter, dc ammeter, and oil pressure gage as shown in figure 4-15.

b. Cleaning and Inspection.

(1) Wipe all parts with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

(2) Inspect for cracks and breaks, broken glass, stripped threads, and other damage.

c. Installation. Install tachometer indicator, circuit breakers, master switch, time totalizing meter, dc ammeter, and oil pressure gage in reverse order of removal procedure shown in figure 4-15. The start counter is not required. See paragraph 2-6 *e.*

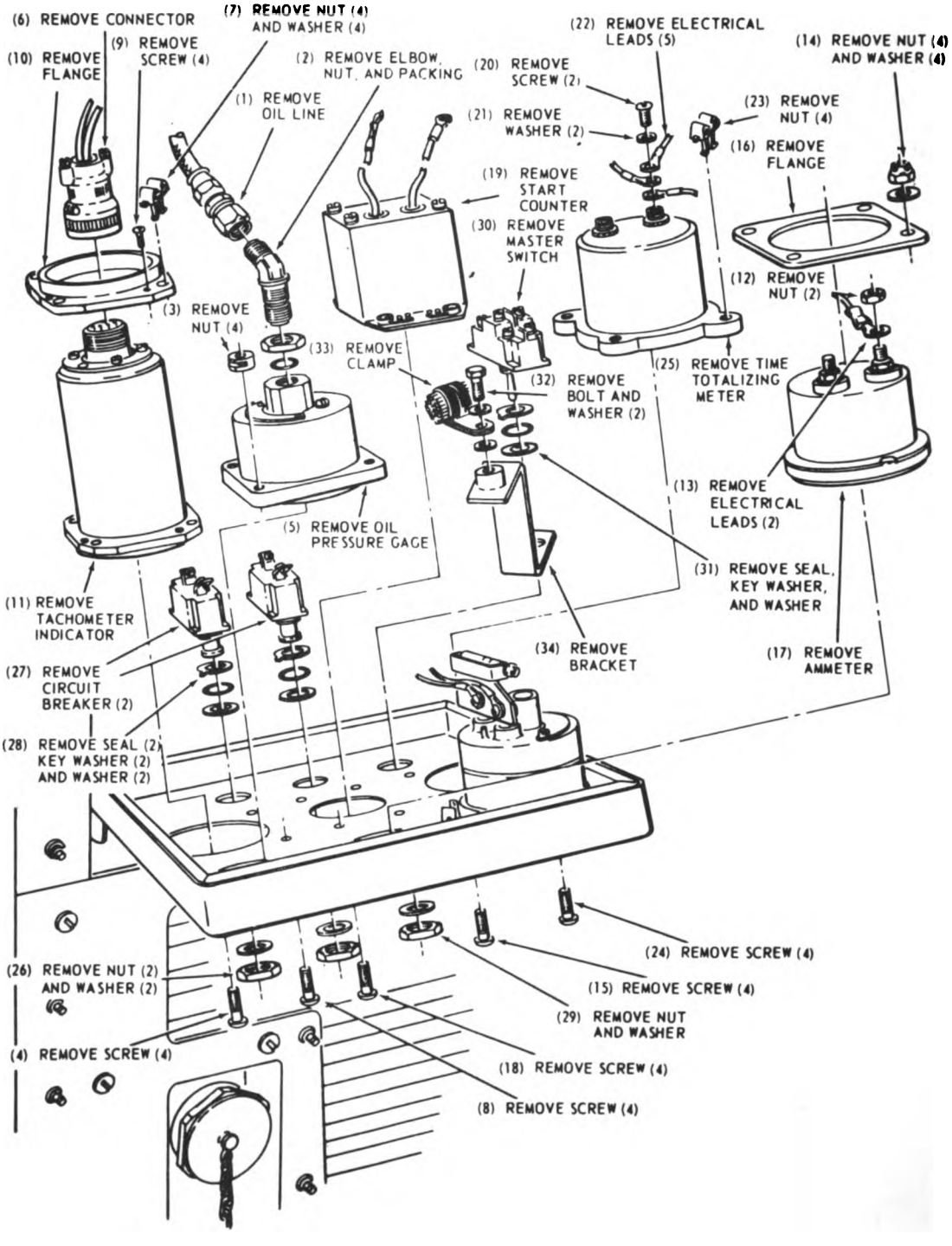


Figure 4-15. Engine controls instruments panel assembly components, removal and installation (Sheet 1 of 2)

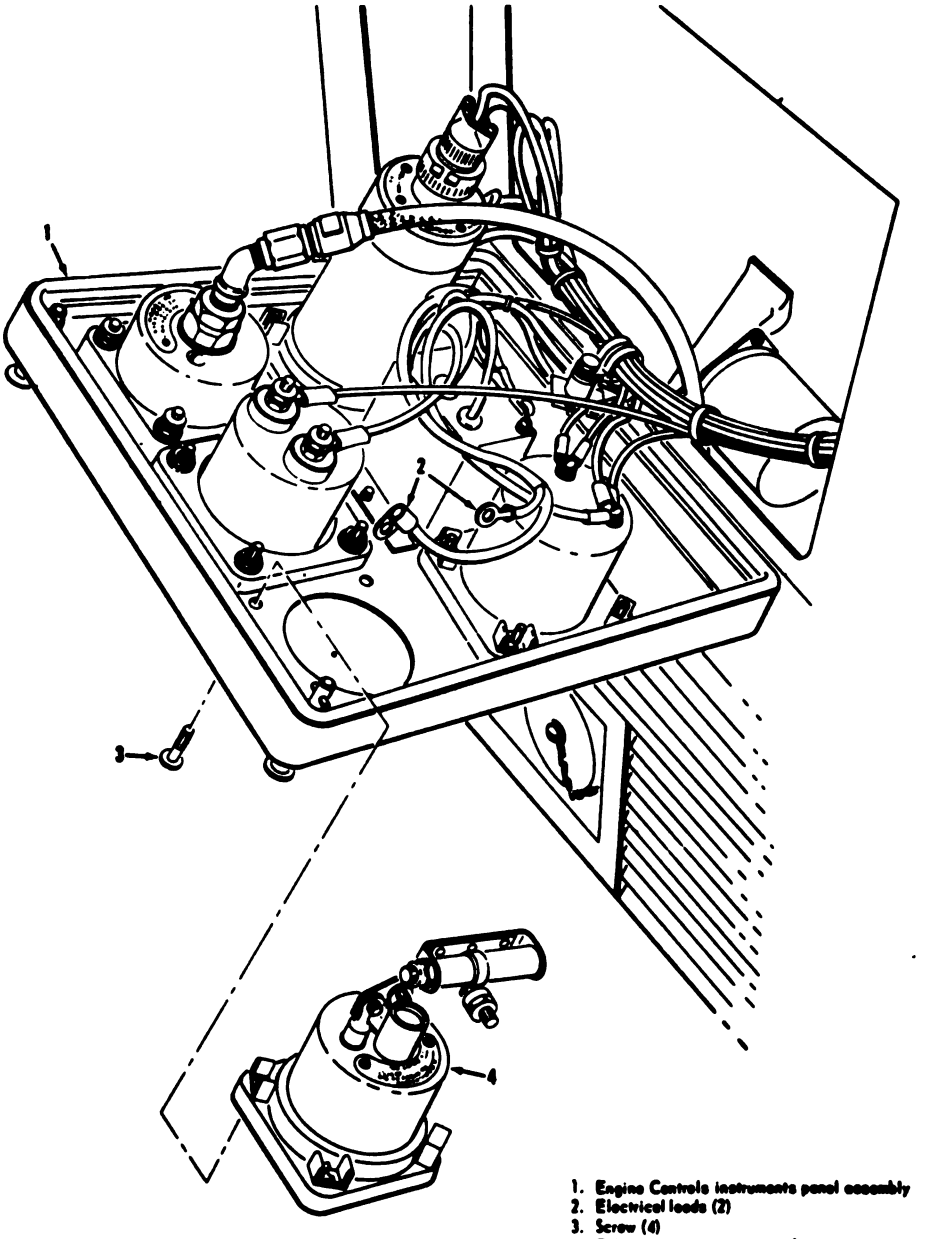


Figure 4-15. Engine controls instruments panel assembly components, removal and installation (Sheet 2 of 2)

Section XII. ELECTRICAL CONTROLS INSTRUMENTS PANEL ASSEMBLY AND VOLTAGE DISTRIBUTION PANEL ASSEMBLY COMPONENTS

4-34. General

The electrical controls instruments panel assembly and electrical equipment rack assembly (located behind the electrical controls instruments panel assembly) contain the controls and instruments for adjustment, operation, and monitoring of the ac power system and the battery heater circuits. The voltage distribution panel assembly contains the

removable voltage change panel assembly that is used to select 240/416 volts or 120/208 volts output of the generator set.

4-35. Electrical Controls Instruments Panel Assembly Components.

a. Removal. Remove switches, FREQUENCY ADJ potentiometer, and circuit breakers as shown in figure 4-16, indicator lights lamp holders as shown in figure 4-17, and voltmeter, ammeter, and synchronizing light resistors as shown in figure 4-18.

b. Cleaning and Inspection.

(1) Wipe all parts with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

(2) Inspect all parts for cracks, breaks, and other damage. Inspect resistors for charring. Inspect voltmeter and ammeter for broken glass.

c. Installation. Install switches, circuit breakers, indicator lights lamp holders, FREQUENCY ADJ potentiometer, voltmeter, ammeter, and synchronizing light resistors in reverse order of removal procedures shown in figures 4-16 through 4-18.

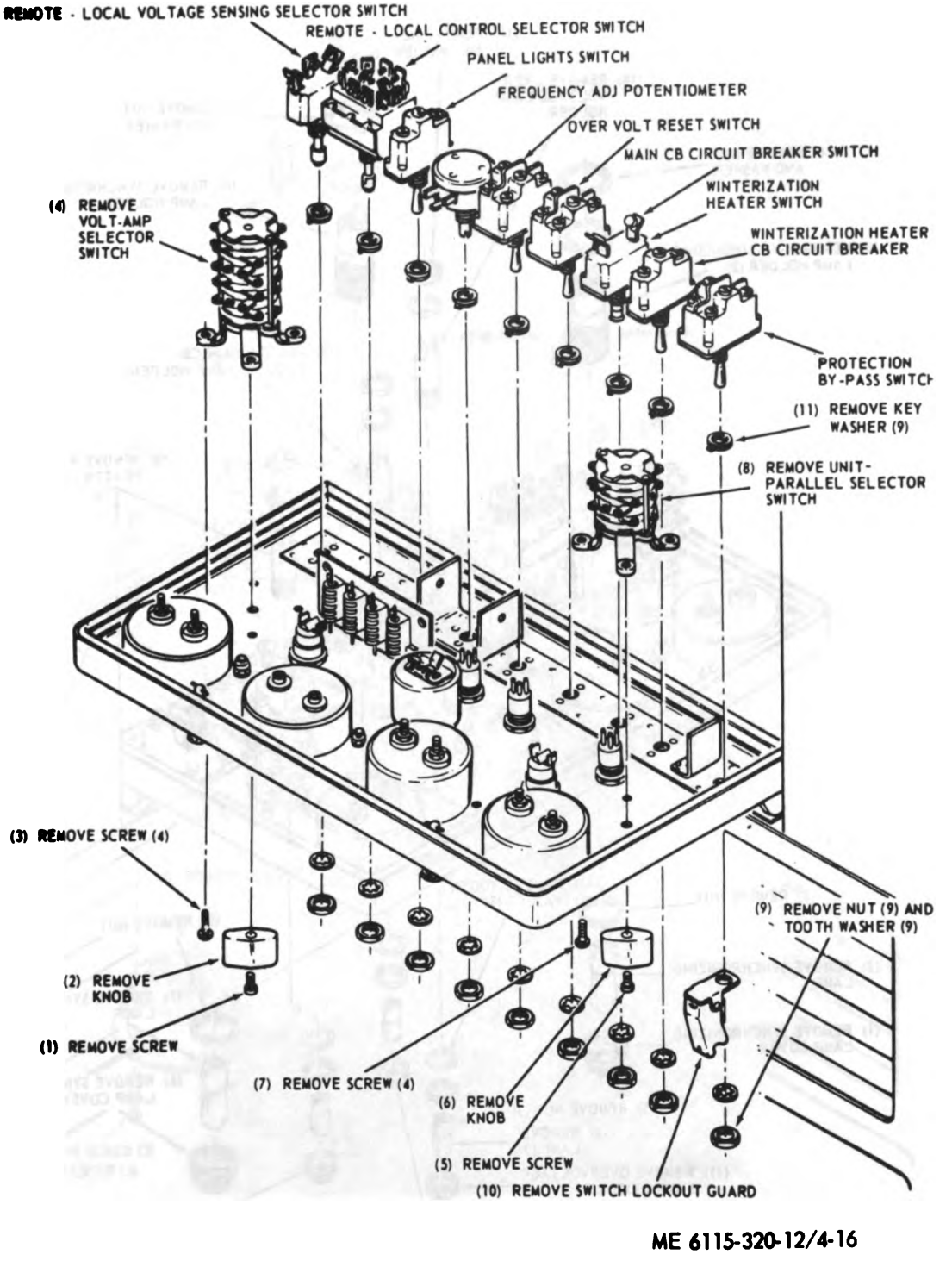


Figure 4-16. Electrical controls instruments panel assembly switches, frequency adjust potentiometer, and circuit breakers, removal and installation.

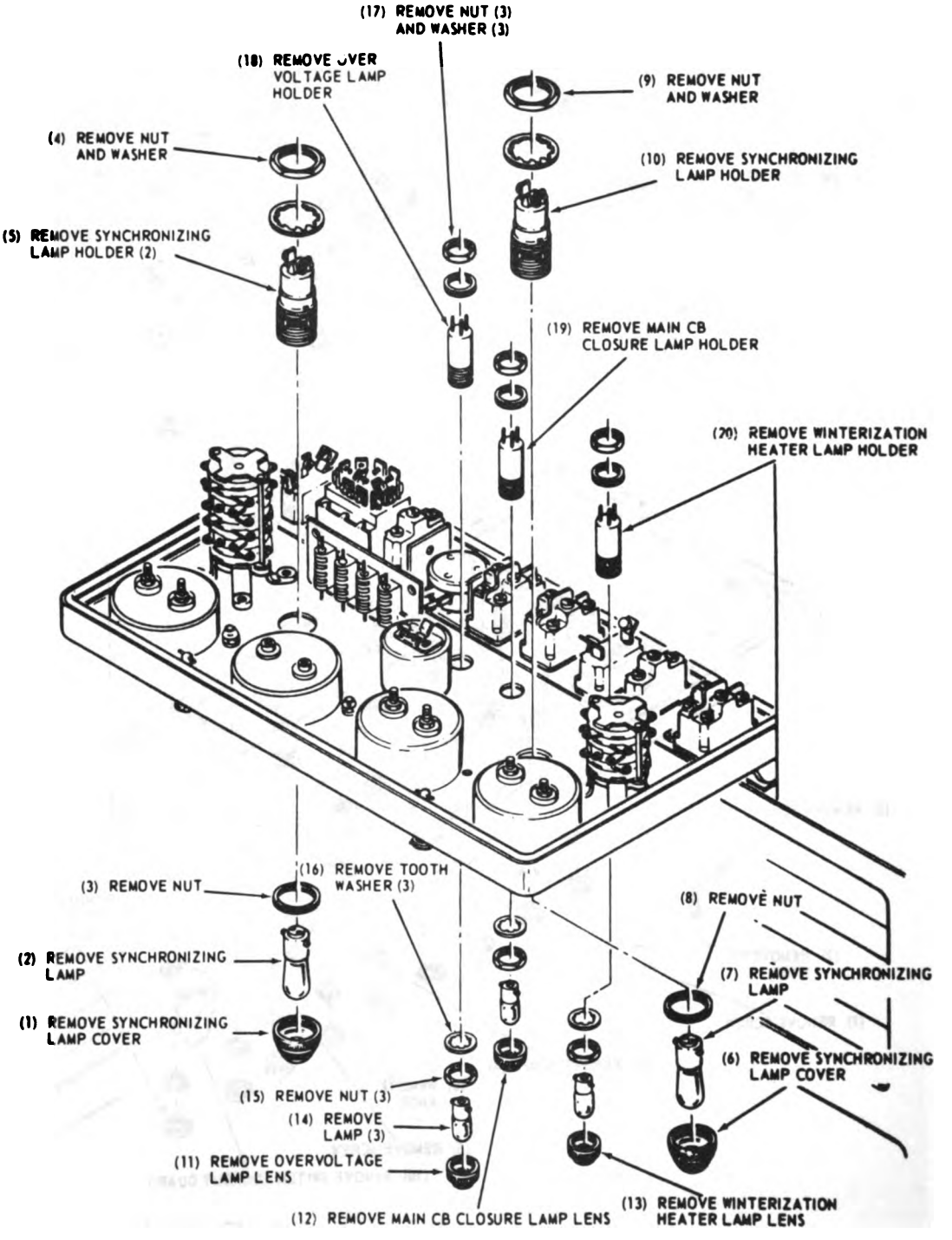


Figure 4-17. Electrical controls instruments panel assembly indicator lights, lamp holders, removal and installation.

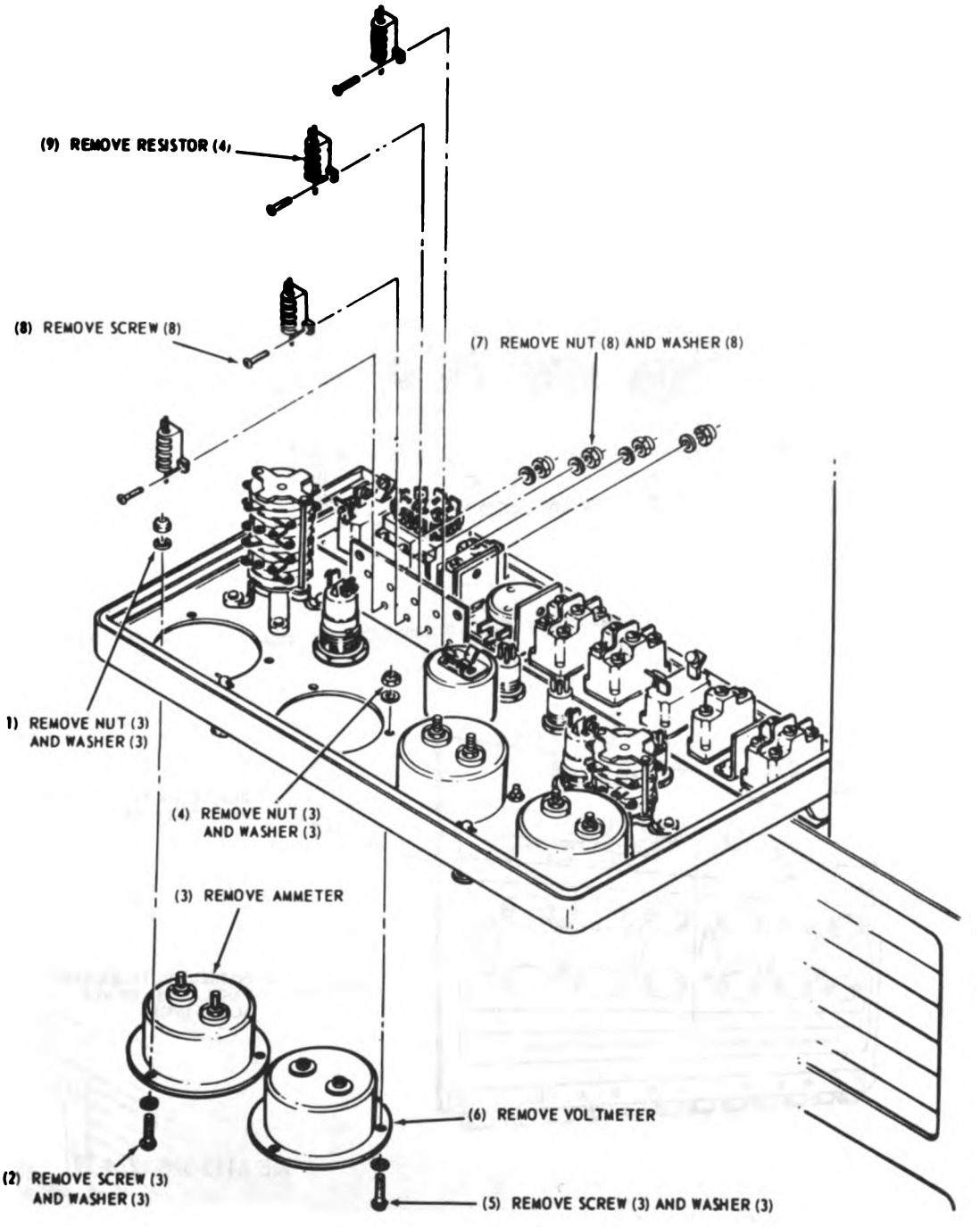


Figure 4-18. Electrical controls instruments panel assembly voltmeter, ammeter, and synchronizing light resistors, removal and installation.

4-36. Voltage Change Panel Access Door

a. Removal. Remove voltage change panel access door as shown in figure 4-19.

b. Cleaning and Inspection.

(1) Clean all parts with cleaning solvent (Fed P-D-680) and dry thoroughly.

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

c. Installation. Install voltage change panel access door in reverse order of removal procedure shown in figure 4-19.

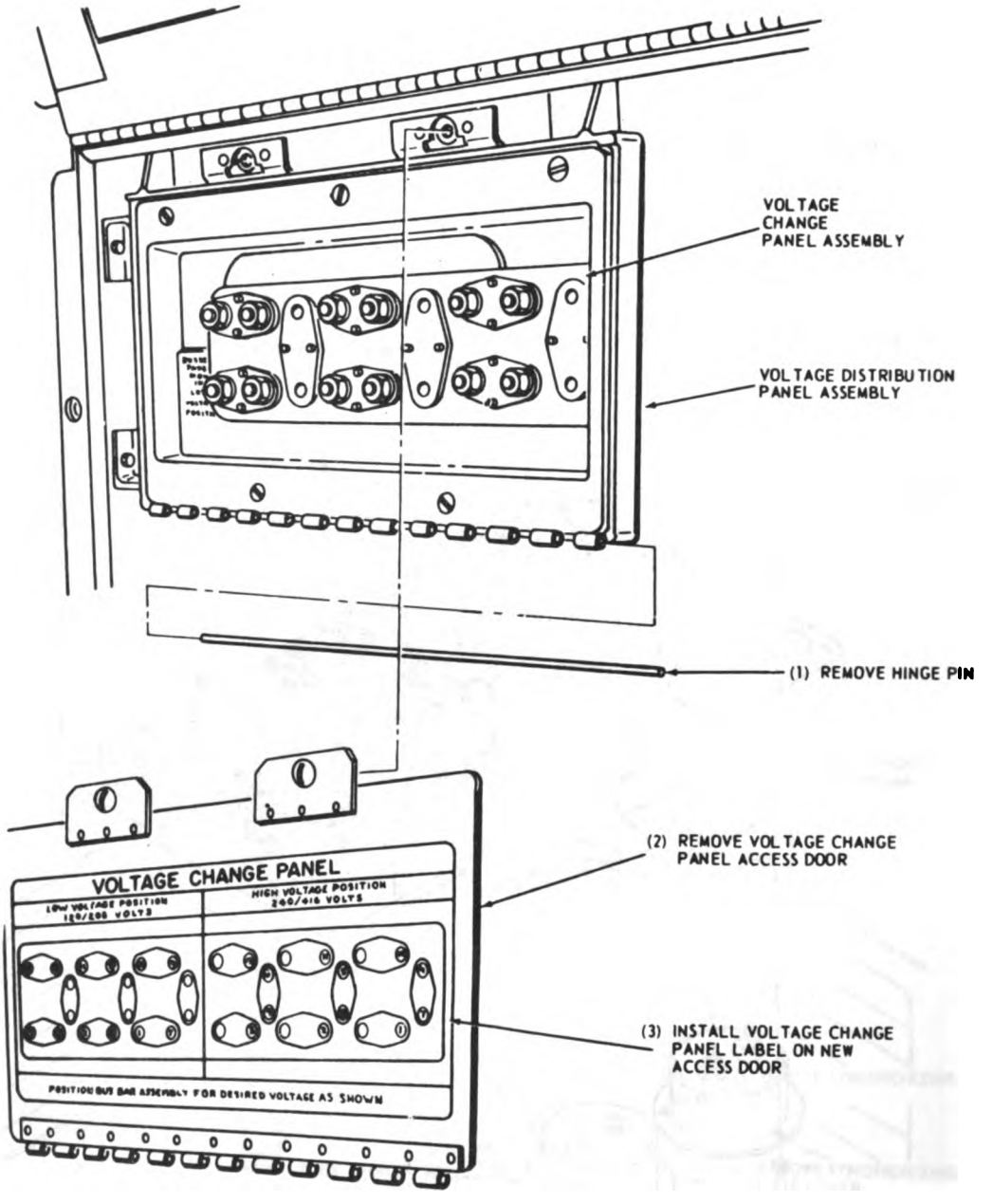


Figure 4-19. Voltage change panel access door, removal and installation.

Section XIII. BATTERIES, BATTERY BOX ASSEMBLY, BATTERY CHARGER, AND 24V DC SLAVE RECEPTACLE J15

4-37. General

The batteries are installed in an insulated and externally heated battery box assembly to provide starting and operating power for the engine. The batteries are recharged and maintained fully charged during operation of the generator set by the battery charger, which receives input power from the ac generator. A 24v dc slave receptable is provided for battery charging power from an external 24v dc battery charger, or for connection of external 24v dc starting power.

4-38. Battery

Remove the 11 vent caps and the battery electrolyte temperature sensor (fig. 3-2) from the cells of the atteries. Test the electrolyte of each cell with a ydrometer and note the specific gravity reading (para 2-1 *b*). If the average specific gravity for all the cells indicates that the battery is 50 pct charged or less, recharge the battery. If one or more cells have a specific gravity reading indicating less than half charge and this reading is much lower than the average reading, replace the battery (fig. 3-2).

4-39. Battery Charger

The normal battery charging rate with the generator set running varies from 2 to 5 amps with a fully charged battery to about 11 amperes with a low-charged battery. The battery charging rate is adjustable (fig. 4-20).

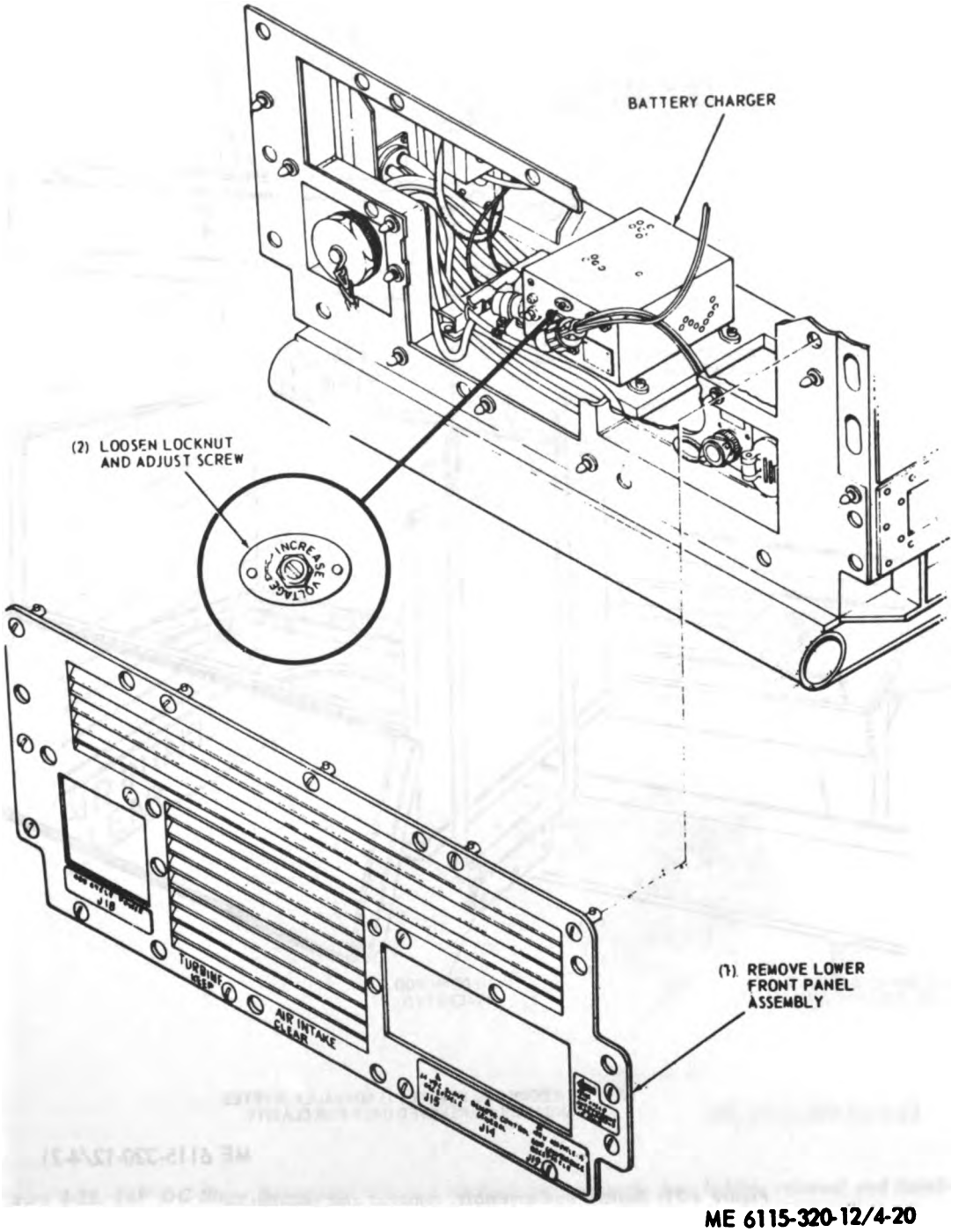


Figure 4-20. Battery charger adjustment.

4-40. Battery Box Assembly

a. Removal. Remove batteries (fig. 3-2). Remove battery box assembly as shown in figure 4-21.

b. Cleaning and Inspection.

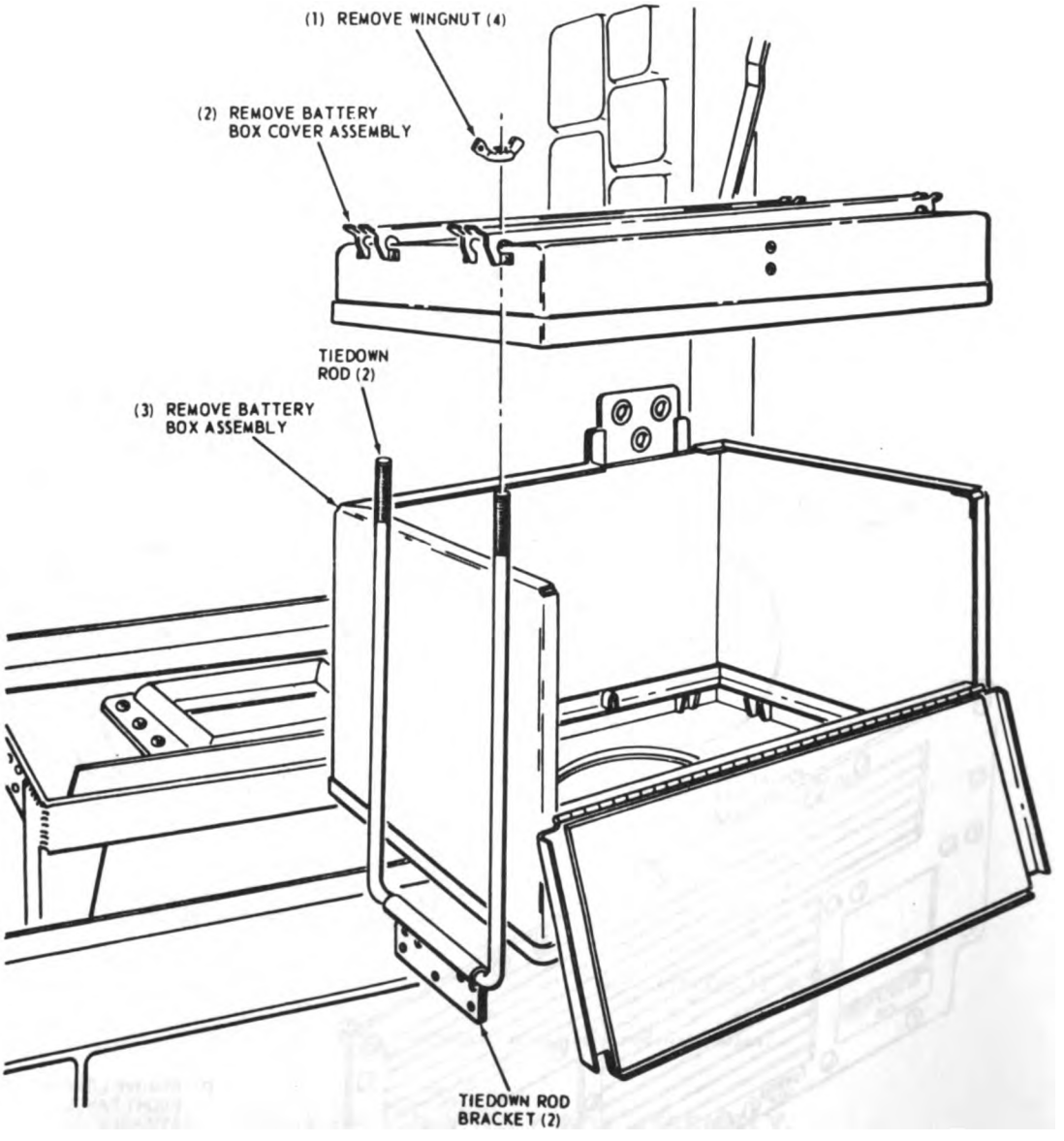
(1) Wipe all parts with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

(2) Neutralize acid corrosion with bicarbonate of soda.

(3) Inspect all parts for cracks, breaks, and other damage.

(4) Paint battery box with acid resistant paint.

c. Installation. Install battery box assembly in reverse order of removal procedure shown in figure 4-21.



NOTE. TIEDOWN ROD BRACKET IS NORMALLY RIVETED AND IS SHOWN REMOVED ONLY FOR CLARITY.

ME 6115-320-12/4-21

Figure 4-21. Battery box assembly, removal and installation.

441. 24V Dc Slave Receptacle J15 and Convenience Receptacle Fuse Holder

a. Removal. Remove 24V Dc SLAVE RECEPTACLE J15 and the 400 cycle convenience receptacle fuse holder as shown in figure 4-22.

b. Cleaning and Inspection.

(1) Wipe all parts with cloth moistened in cleaning solvent (MIL T-7003) and allow to dry.

(2) Inspect parts for cracks and breaks. Inspect connector for signs of arcing and other damage.

c. Installation. Install 24V DC SLAVE RECEPTACLE J15 and fuse holder in reverse order of removal procedure shown in figure 4-22.

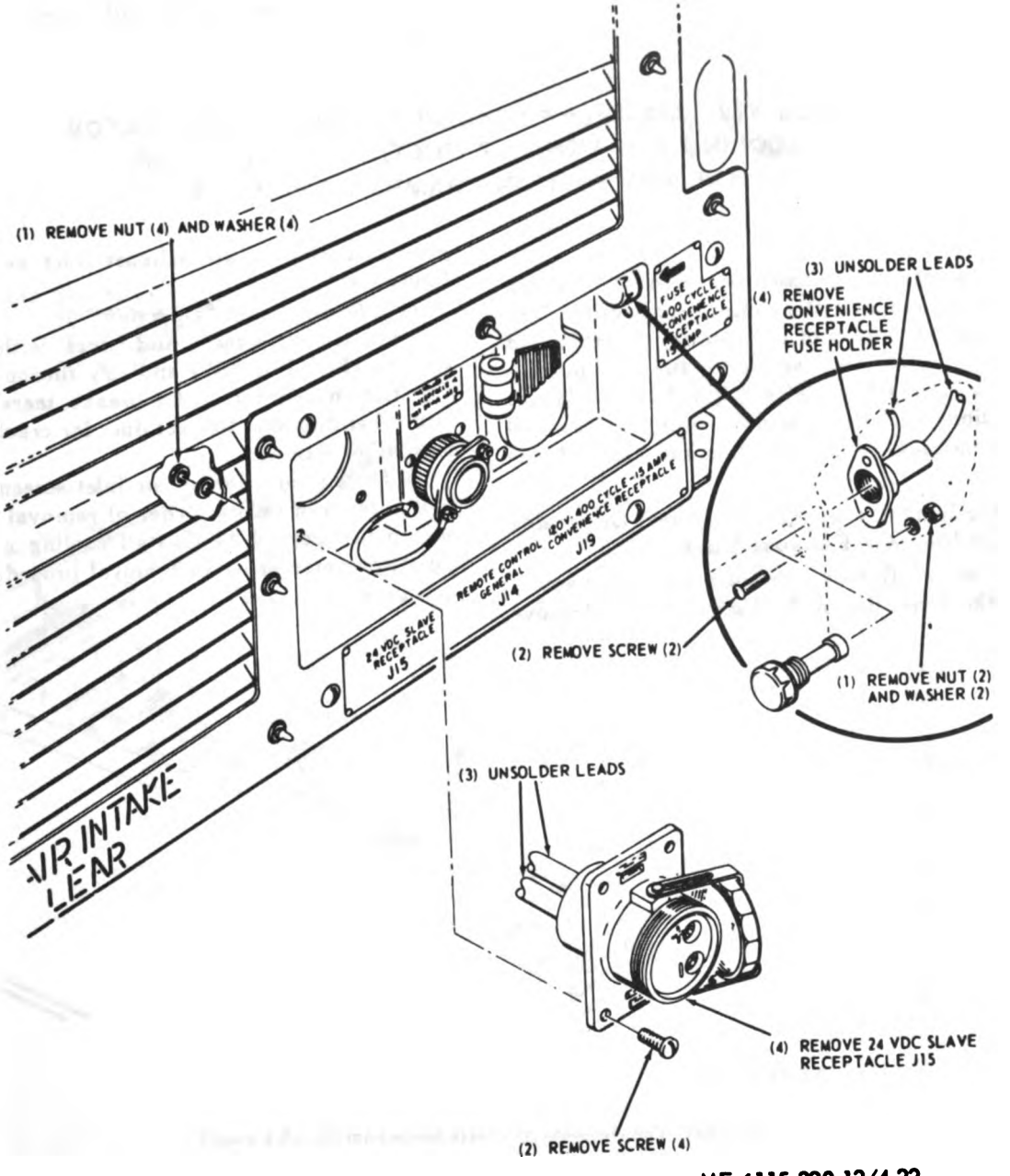


Figure 4-22. 24V DC Slave Receptacle J15 and convenience receptacle fuse holder, removal and installation.

4-42. Battery Cables

a. General. If battery cables require replacement, fabricate new cables. Cut required length of No. 2 cable, specification MIL-C-5756, and fabricate with terminal lugs specified for cable that is needed as given below.

b. Positive Battery Cable. Cut cable to 35½ in. and install one Part No. YAV2C-L and one Part No. YAB2C-L2 terminal lugs. Install red sleeve with Part No. YAV2C-L terminal lug and red sleeve with YAV2C-L2 terminal lug.

c. Negative Battery Cable. Cut cable to 48½ in. and install one Part No. YAV2C-1 and one Part No. YAV2C-L2 terminal lug. Install a black sleeve with each terminal lug.

d. Battery Jumper Cable. Cut cable to 3 in. and install two Part No. YAV2C-L2 terminal lugs.

e. Starter Positive Cable. Cut cable to same length as original cable and install two terminal lugs.

f. Starter Negative Cable. Cut cable to same length as original cable and install two terminal lugs.

Section XIV. AIR INLET SCREEN ASSEMBLY, GENERATOR COOLING AIR EXHAUST DUCT, COMBUSTOR CAP, AND COMBUSTION CHAMBER ASSEMBLY

4-43. General

The air inlet screen assembly prevents foreign objects from entering the compressor section. The combustor cap is part of the plenum chamber and partially houses and supports the combustion chamber assembly. The high heat-resistant combustion chamber assembly provides for fuel and air mixing in the combustion area of the engine.

4-44. Air Inlet Screen Assembly and Generator Cooling Air Exhaust Duct

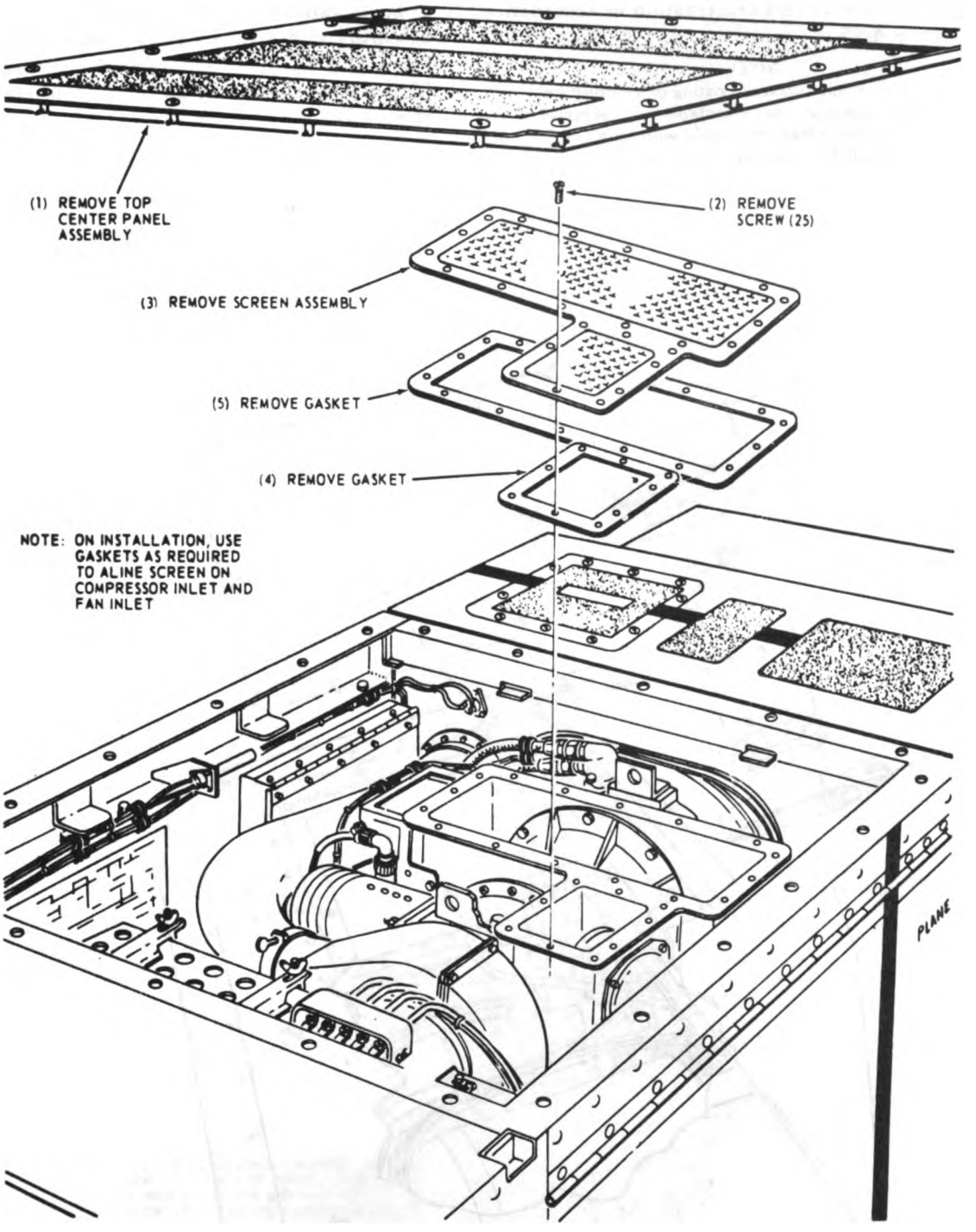
a. Removal. Remove air inlet screen assembly and gaskets as shown in figure 4-23. Remove generator cooling air exhaust duct as shown in figure 4-11.

b. Cleaning and Inspection.

(1) Clean screen and duct with cleaning solvent (Fed P-D-680) and dry thoroughly.

(2) Inspect screen for breaks, tears, clogging, and other damage. Inspect duct for cracks, breaks, and other damage.

c. Installation. Install air inlet screen assembly and gaskets in reverse order of removal procedure shown in figure 4-24. Install cooling air exhaust duct in reverse order of removal procedure shown in figure 4-11.



ME 6115-320-12/4-23

Figure 4-23. Air inlet screen assembly, removal and installation.

4-45. Combustor Cap and Combustor Chamber Assembly

a. Removal. Remove fuel atomizer assembly (fig. 4-5) and igniter plug (fig. 4-14). Remove combustor cap and combustion chamber assembly as shown in figure 4-24.

b. Cleaning and Inspection.

(1) Clean combustor cap and combustion chamber assembly with cleaning solvent (Fed P-D-680) and dry thoroughly.

(2) Inspect combustor cap for cracks, breaks, and other damage. Inspect combustion chamber

assembly for cracks and deformation in accordance with figure 4-25.

NOTE

Chipped or eroded ceramic coating on combustion chamber assembly is acceptable. If ceramic coating is flaky, clean thoroughly with wire brush to remove all loose ceramic material.

c. Installation. Install combustion chamber assembly and combustor cap in reverse order of removal procedures shown in figure 4-24. Install igniter plug (fig. 4-14) and fuel atomizer assembl (fig. 4-5).

1. Access panel
2. Combustor cap assembly
3. Gasket
4. Clamp
5. Combustion chamber assembly

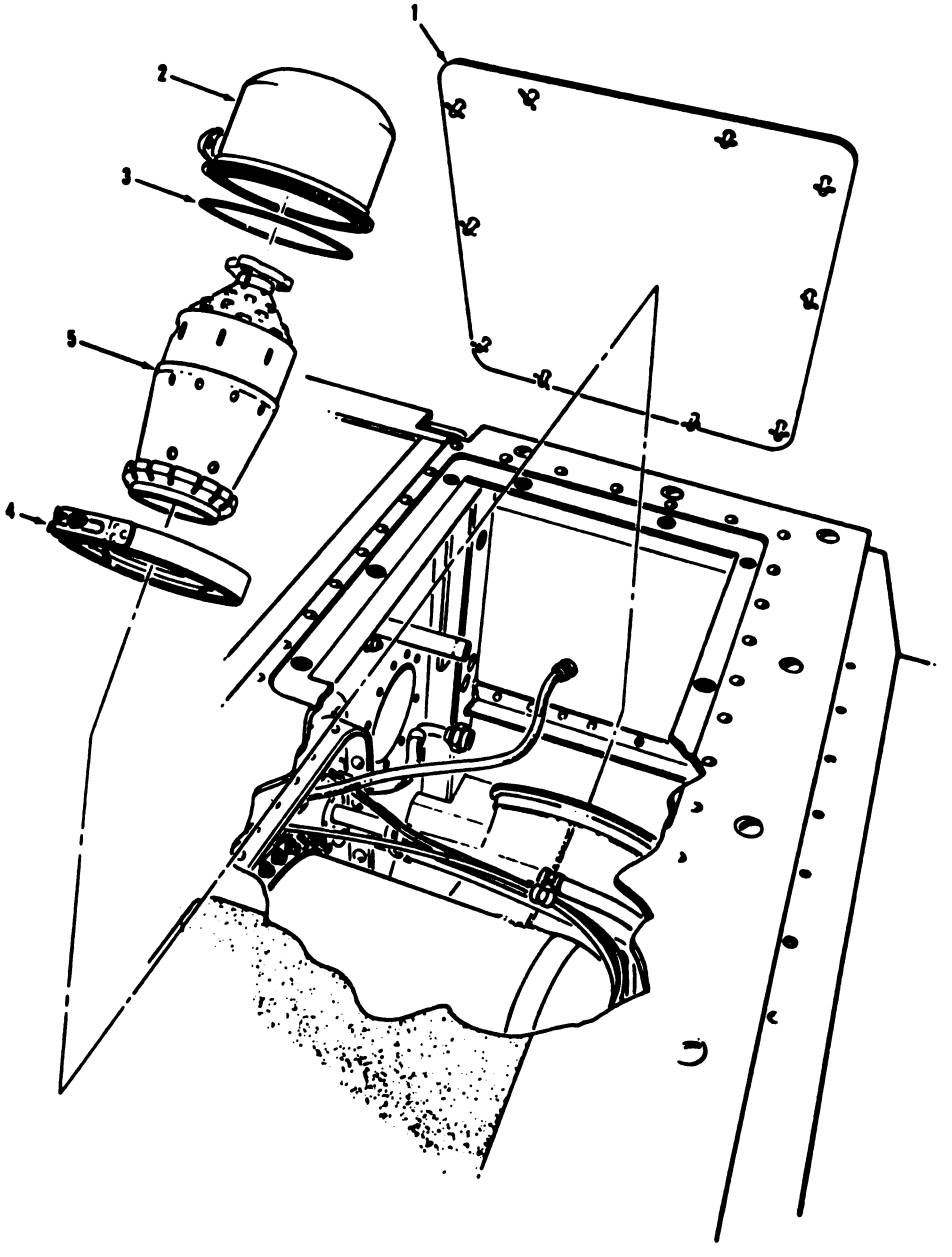
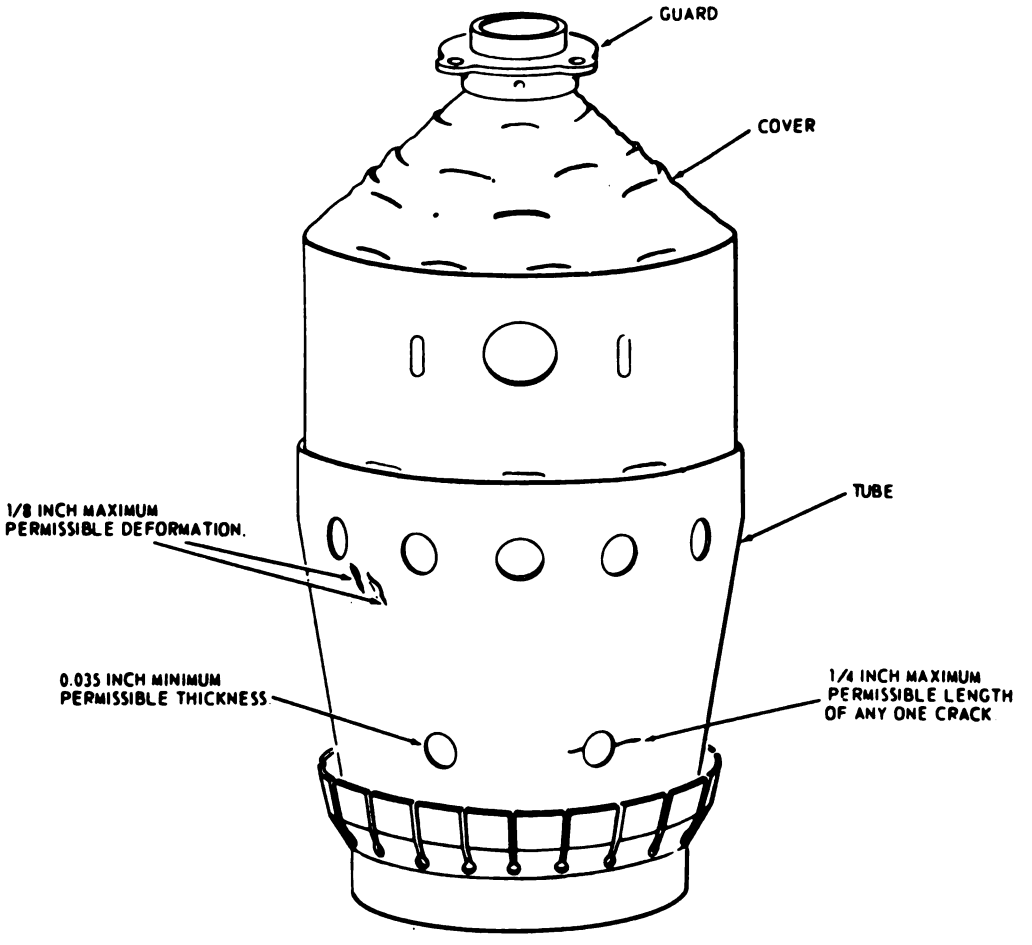


Figure 4-24. Combustion cap and combustion chamber assembly, removal and installation.

NOTE CRACKED TACK WELD AT ATOMIZER ASSEMBLY GUARD SHOULD NOT BE CAUSE FOR REPLACEMENT IF PARTS ARE PROPERLY REWELDED IN PLACE.

NOTE REPLACE COMBUSTION CHAMBER ASSEMBLY WHEN ANY CRACK CONNECTS TWO OR MORE LOUVERS OR HOLES.



NOTE REPLACE COMBUSTION CHAMBER ASSEMBLY WHEN ANY GROUP OF CRACKS LESS THAN 1/4 INCH IN LENGTH, APPEAR TO BE PROGRESSING TOWARD FUTURE BREAKING AWAY OF MATERIAL

ME 6115-320-12/4-25

Figure 4-25. Combustion chamber assembly inspection.

Section XV. EXHAUST PIPE ASSEMBLY, EJECTOR ASSEMBLY, AND MUFFLER ASSEMBLY

4-46. General

The gases discharged from the turbine engine pass through the exhaust pipe assembly, ejector assembly, and muffler assembly before reaching the atmosphere.

4-47. Exhaust Components

a. Removal. The muffler assembly, exhaust pipe assembly, and exhaust ejector assembly are removed as shown in figure 4-26.

b. Cleaning and Inspection.

(1) Wipe muffler assembly with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry. Clean all other parts with cleaning solvent (Fed P-D-680) and dry thoroughly.

(2) Inspect muffler assembly screen for breaks, tears, clogging, and other damage. Inspect inside of muffler assembly for deterioration of baffles. Inspect all other parts and exterior of muffler assembly for cracks, breaks, and other damage.

c. Installation. Install exhaust pipe assembly, ejector assembly, and muffler assembly in reverse order of removal procedures shown in figure 4-26.

NOTE

Torque exhaust pipe assembly screws between 40 to 60 in-lbs.

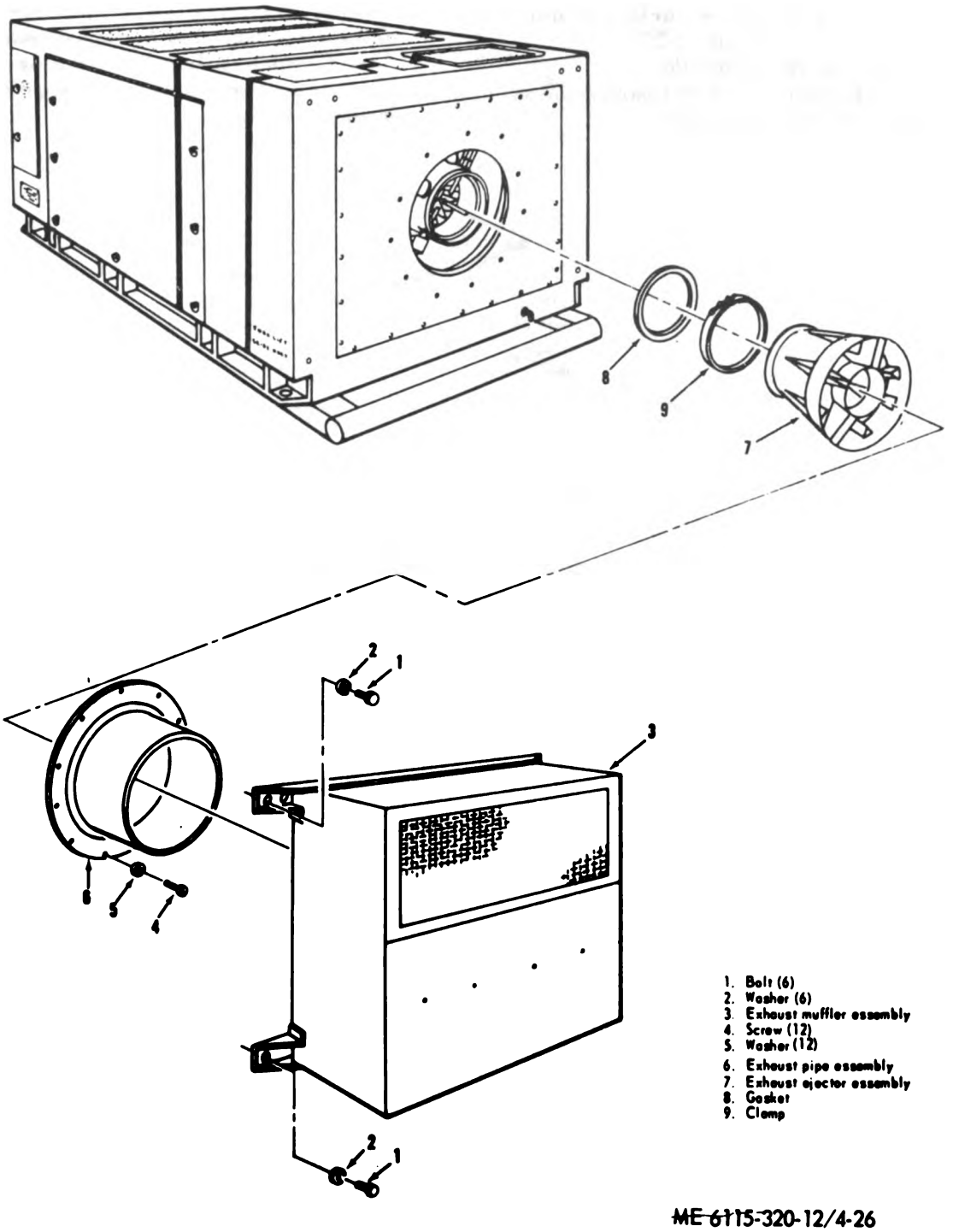


Figure 4-26. Exhaust muffler assembly, exhaust ejector assembly, and exhaust pipe assembly, removal and installation.

Section XVI. ENCLOSURE DOORS AND PANELS

4-48. General

The enclosure is a lightweight, sound-absorbing housing for the generator set. It is provided with access doors and panels for operation and service. Refer to TM 9-213 for specific instructions on the removal of protective finishes of the enclosure doors, and panels.

4-49. Enclosure Doors and Panels

a. Removal. Remove enclosure doors and panels as shown in figure 4-27.

b. Cleaning and Inspection.

(1) Clean all parts with cleaning solvent (Fed P-D-680) and dry thoroughly.

(2) Inspect doors and panels for cracks, breaks, deterioration of protective coating, damaged fasteners, and other defects.

c. Installation. Install enclosure doors and panels in reverse order of removal procedure shown in figure 4-27.

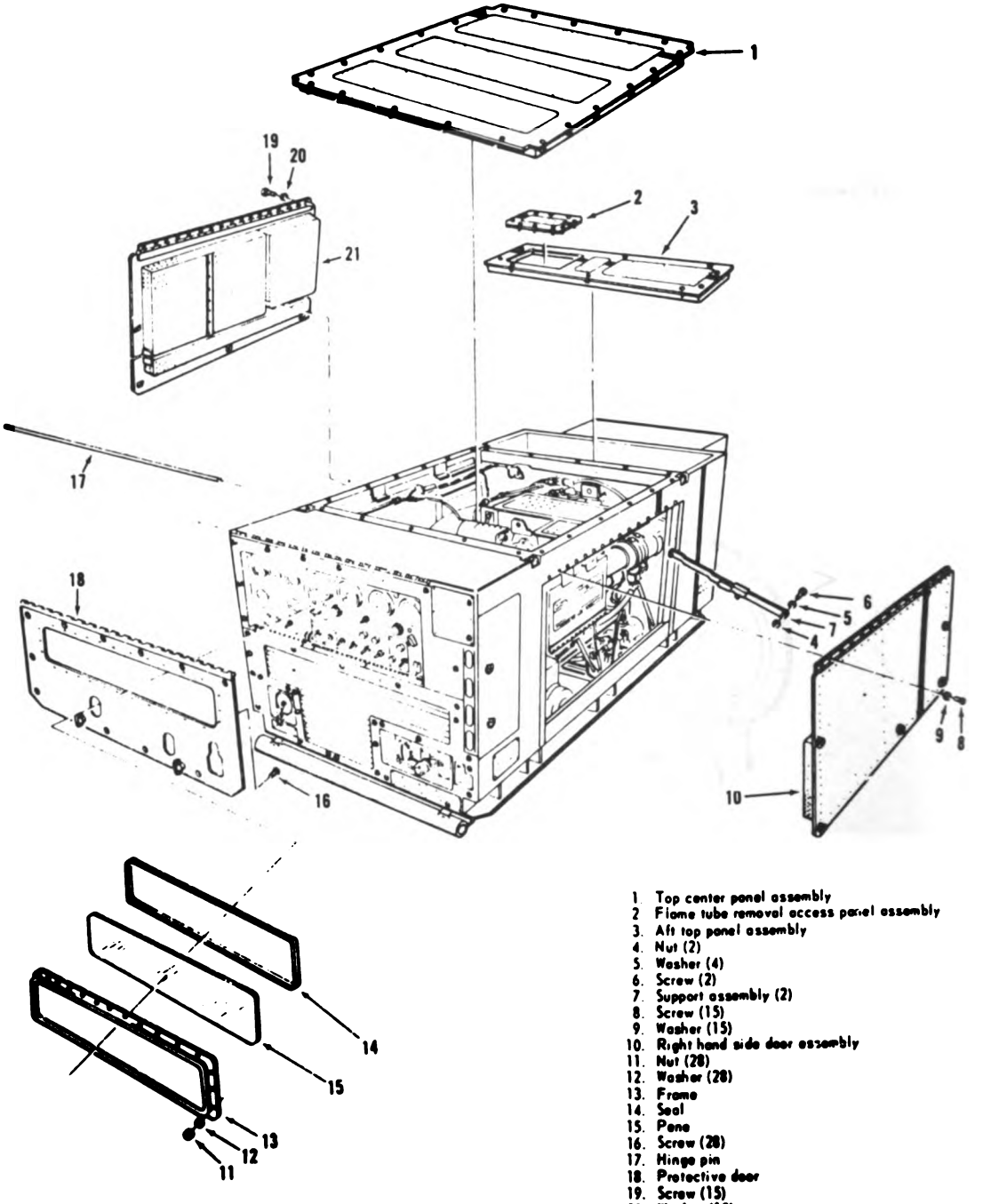


Figure 4-27. Enclosure doors and panels, removal and installation.

Section XVII. WINTERIZATION EQUIPMENT

4-50. General

The winterization equipment provides heated air to the battery box assembly during extreme cold weather conditions. A battery electrolyte temperature sensor monitors battery electrolyte temperature and provides automatic control of the battery heater. The sensor actuates to energize a relay circuit which applies power to the heater pressure regulator valve, fuel pump, igniter, and fan motor when the WINTERIZATION HEATER switch is in ON position and the battery electrolyte temperature is approximately 0° F. When the battery electrolyte temperature increases to approximately 20° F, the sensor de-energizes the heater circuit.

4-51. Battery Heater

a. Removal. Remove battery heater as shown in figure 4-28.

b. Disassembly. Disassemble battery heater as shown in figure 4-29.

c. Cleaning and Inspection.

(1) Wipe all electrical parts with cloth moistened in cleaning solvent (MIL T-7003) and allow to dry. Clean all other metal parts with cleaning solvent (Fed P-D-680) and dry thoroughly. Clean the metering orifice.

(2) Inspect all parts for cracks, breaks, and other damage. Inspect receptacle for bent pins and frayed insulation on leads. Inspect resistor assembly for charring and deterioration. Inspect solenoid coil for deterioration and frayed insulation on leads. Replace defective parts.

d. Assembly. Assemble battery heater in reverse order of disassembly procedure shown in figure 4-29.

e. Installation. Install battery heater in reverse order of removal procedure shown in figure 4-28.

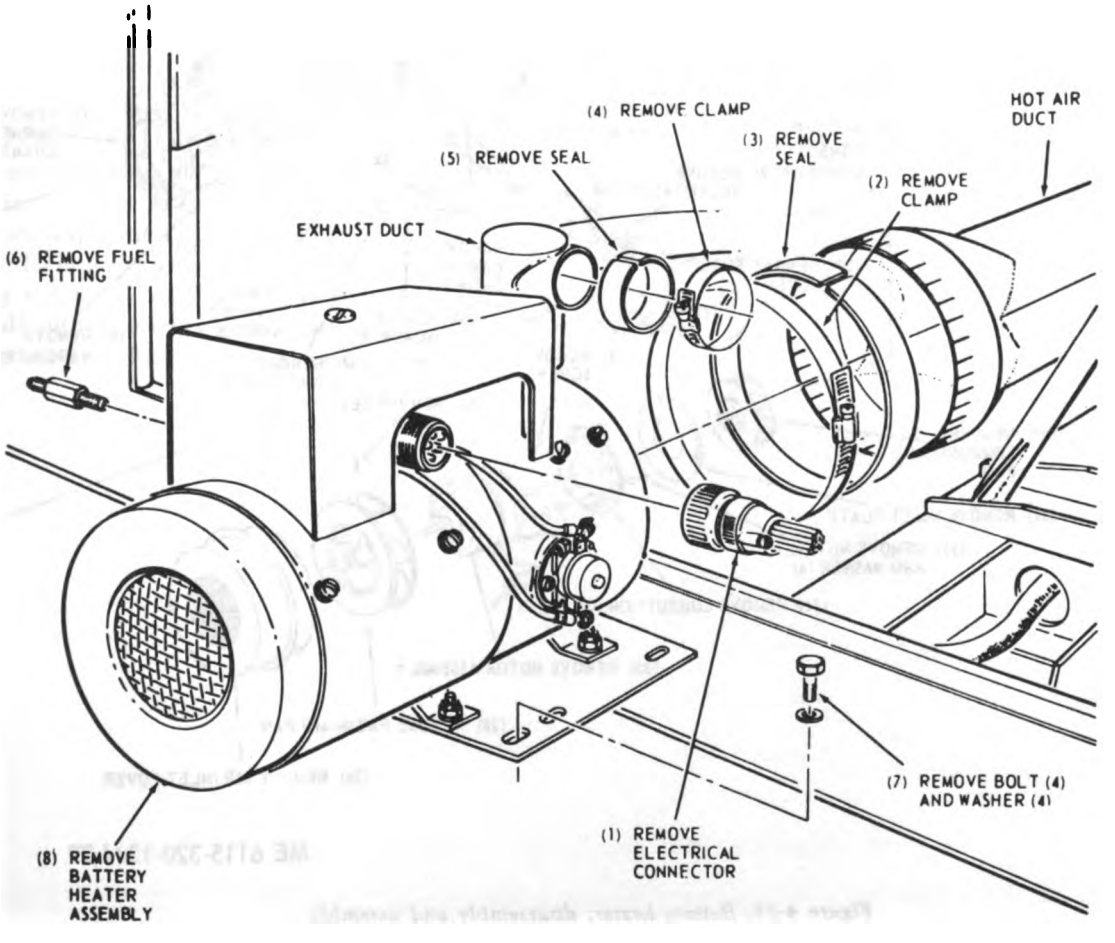


Figure 4-28. Battery heater, removal and installation.

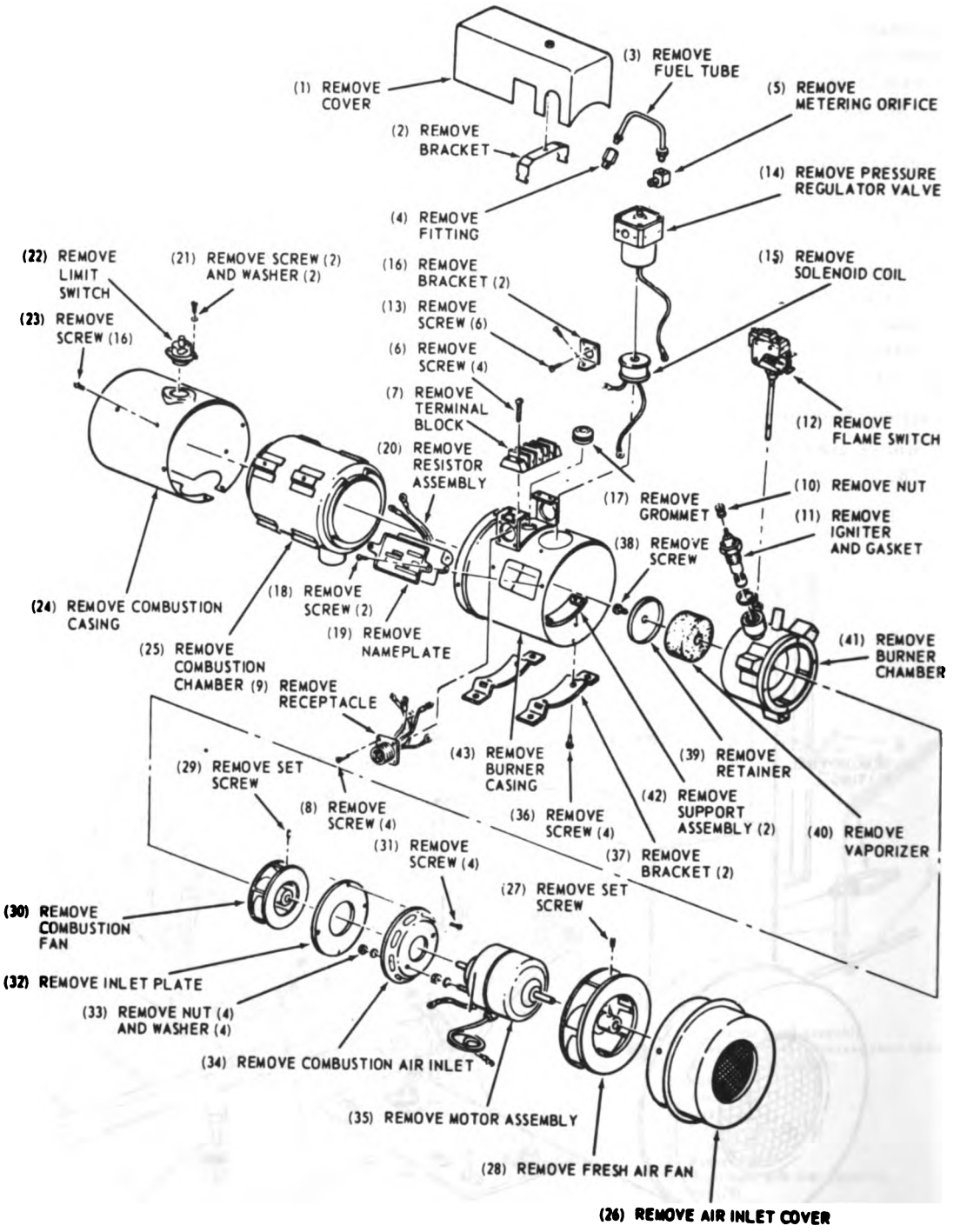


Figure 4-29. Battery heater, disassembly and assembly.

4-52. Battery Heater Adjustment

When the battery heater is at room, or ambient temperature, the flame switch may be adjusted as follows:

a. Remove cover from battery heater (fig. 4-29).

b. Place WINTERIZATION HEATER switch (16, fig. 2-6) in ON position.

c. Rotate adjustment screw on the flame switch (fig. 4-30) counterclockwise until the fan operates:

then turn adjustment screw slowly clockwise until the fan shuts off.

d. Rotate adjustment screw further clockwise one-half turn from the shutoff point as shown in figure 4-30.

e. Place WINTERIZATION HEATER switch on OFF position and install cover on battery heater.

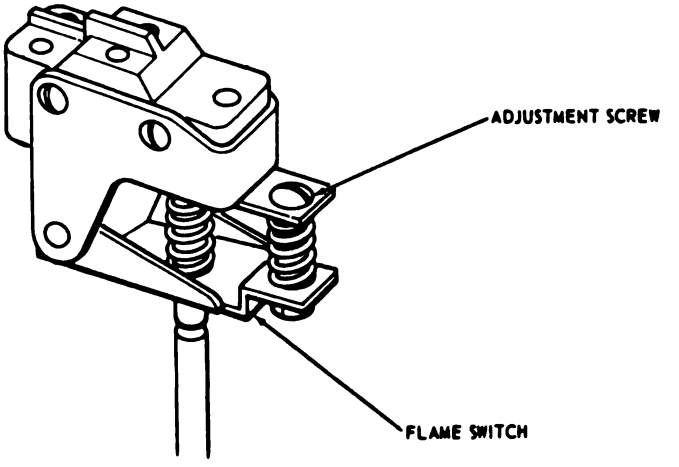


Figure 4-30. Flame switch adjustment screw.

4-53. Heater Fuel Pump

a. Removal. Remove heater fuel pump as shown in figure 4-31.

b. Cleaning and Inspection.

(1) Remove cap (fig. 4-31) and clean screen in cleaning solvent (Fed P-D-680). Dry thoroughly. Wipe all other parts with cloth moistened in cleaning solvent (Fed P-D-680) and allow to dry.

(2) Inspect screen for clogging, breaks, or other damage. Inspect leads for damage to insulation and inspect all other parts for cracks, breaks, or other damage.

c. Installation. Install heater fuel pump in reverse order of removal procedure shown in figure 4-31.

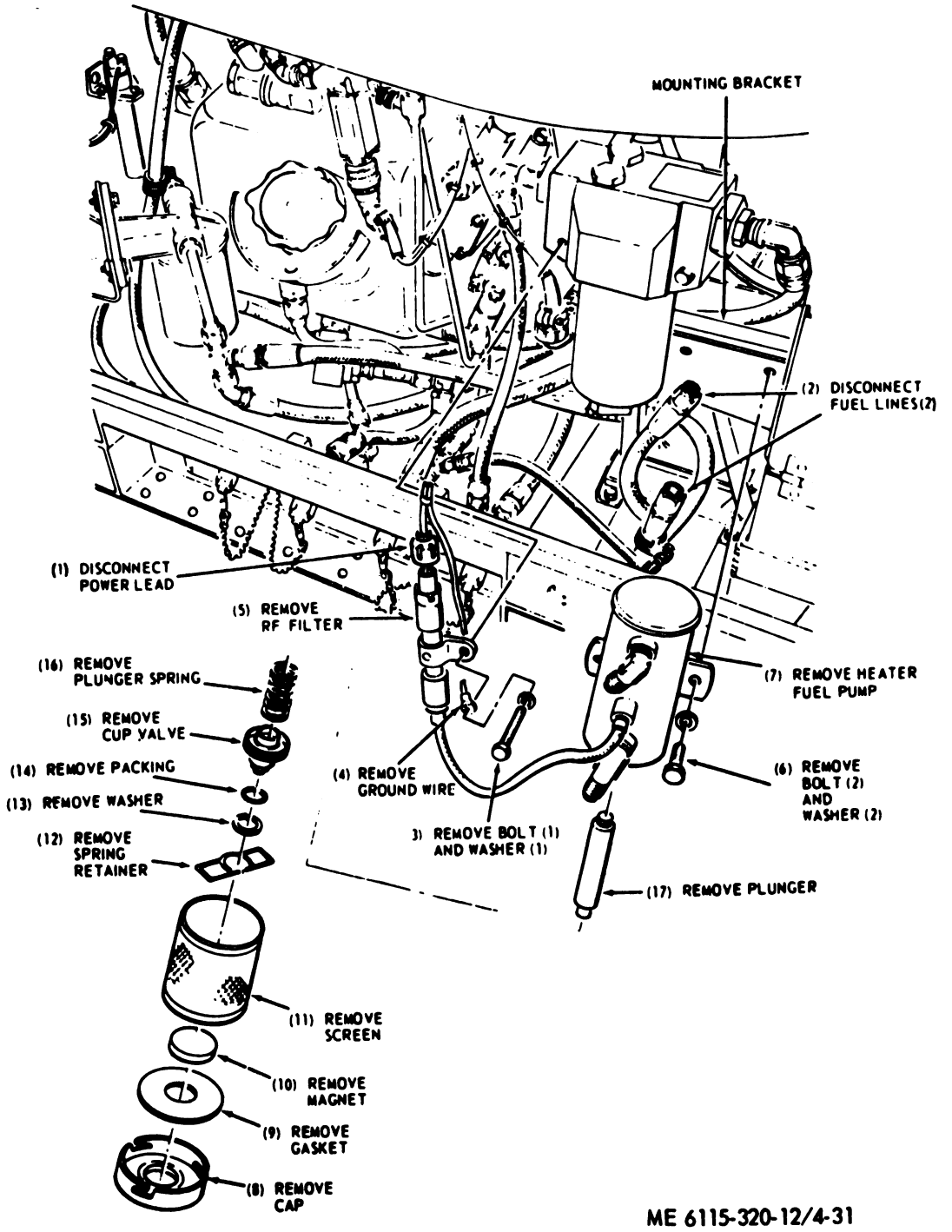


Figure 4-31. Heater fuel pump, removal and installation.

4-54. Heater Fuel Filter Assembly

a. Removal. Remove heater fuel filter assembly as shown in figure 4-32.

b. Cleaning and Inspection.

(1) Clean all parts in cleaning solvent (Fed P-D-680) and dry thoroughly with compressed air.

(2) Inspect all parts for cracks, breaks, and other damage. Replace fuel filter element if damaged or clogged. If fuel filter element is serviceable, clean and reinstall.

c. Installation. Install heater fuel filter assembly in reverse order of removal procedure shown in figure 4-32.

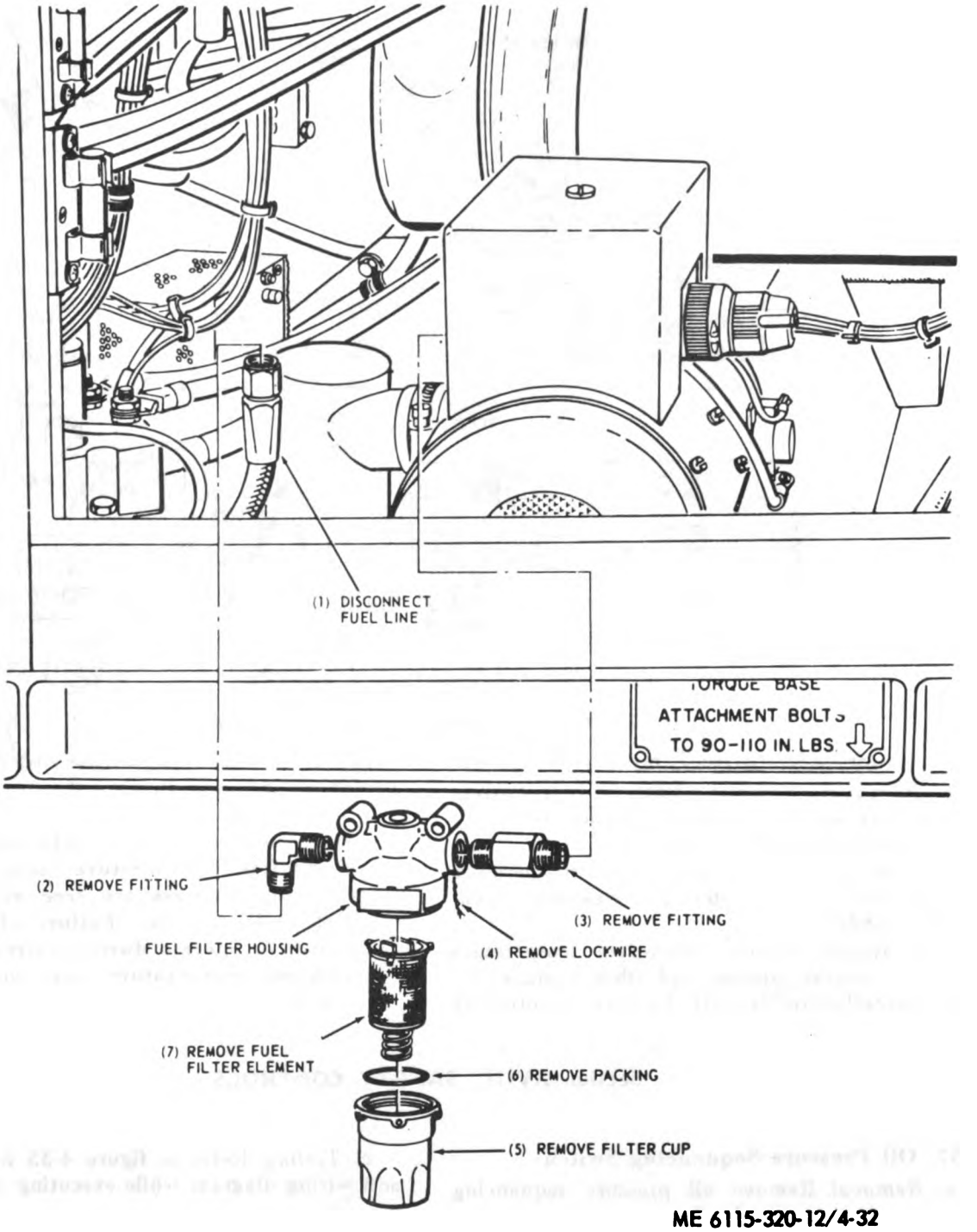


Figure 4-32. Heater fuel filter assembly, removal, service, and installation.

4-55. Heater Fuel Shutoff Valve

a. Removal. Remove heater fuel shutoff valve as shown in figure 4-33.

b. Cleaning and Inspection.

(1) Clean all parts in cleaning solvent (Fed P-D-680) and dry thoroughly.

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

c. Installation. Install heater fuel shutoff valve in reverse order of removal procedure shown in figure 4-33.

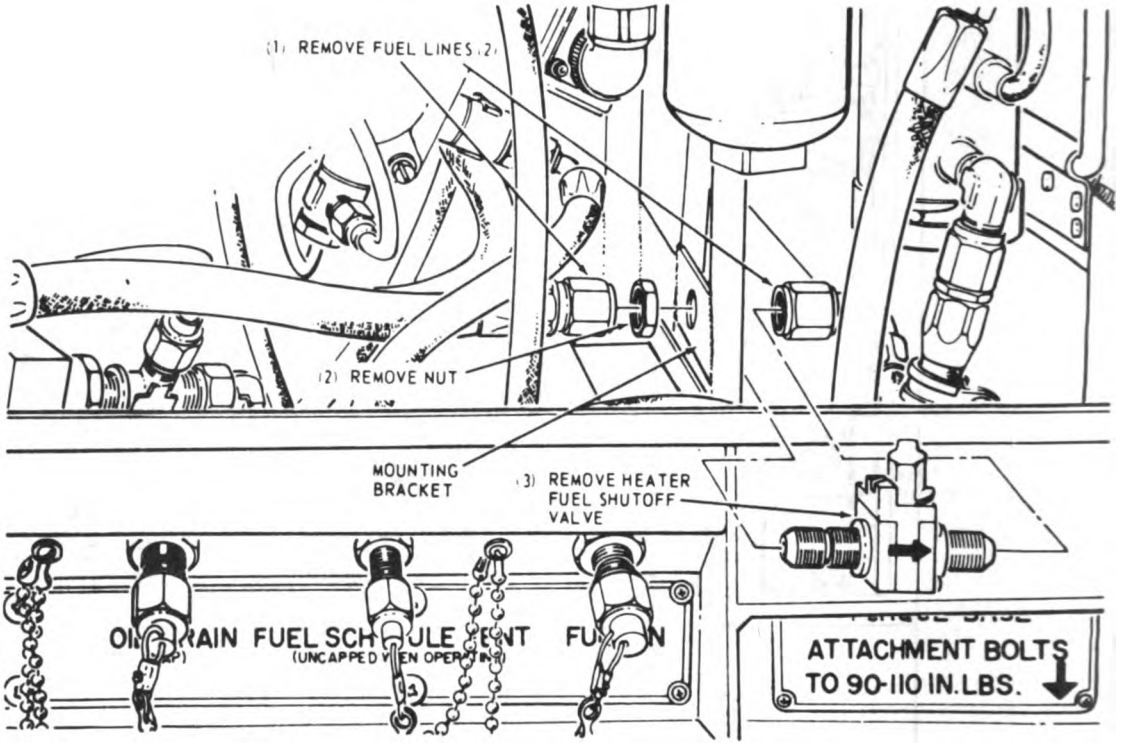


Figure 4-33. Heater fuel shutoff valve, removal and installation.

4-56. Battery Electrolyte Temperature Sensor

a. Removal. Remove battery electrolyte temperature sensor as shown in figure 3-2.

b. Cleaning and Inspection.

(1) Wipe battery electrolyte temperature sensor with a cloth moistened in cleaning solvent (Fed P-D-680).

(2) Inspect battery electrolyte temperature sensor for cracks, breaks, and other damage.

c. Installation. Install battery electrolyte temperature sensor in reverse order of removal procedure shown in figure 3-2.

CAUTION

Make sure connections between battery electrolyte temperature sensor and electrical harness are free of grease, dirt, and corrosion. Failure of battery heater to operate during extreme cold ambient temperature may otherwise result.

Section XVIII. SAFETY CONTROLS

4-57. Oil Pressure Sequencing Switch

a. Removal. Remove oil pressure sequencing according to sequence of index numbers assigned to figure 4-34.

b. Cleaning and Inspection.

(1) Remove all dust, dirt, and foreign matter from oil sequencing switch with clean dry compressed air.

(2) Clean oil pressure sequencing switch with solvent (Fed P-D-680) and dry thoroughly.

(3) Inspect oil pressure sequencing switch for evidence of wear or damage. If defective, replace oil pressure sequencing switch.

c. Testing. Refer to figure 4-35 for test setup and wiring diagram while executing the following procedures.

(1) Connect a regulated source of compressed air to oil pressure sequencing switch.

(2) Close valves (5 and 6), open valve (2) and start pump.

(3) Gradually open valve (6) and monitor gage (1).

(4) Switch must actuate at 2.5 to 3.5 psi.

(5) After switch actuates, the following continuities must be indicated on electrical receptacle on oil pressure switch; circuit through

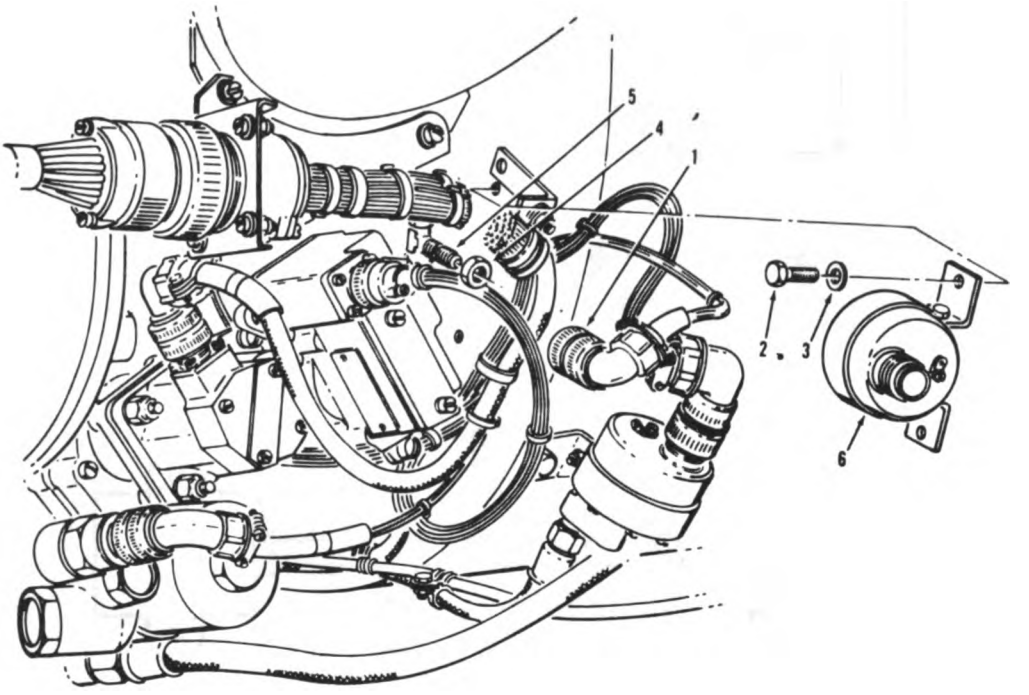
pins A and B closed; circuit through pins A and C open.

(6) Continuities in step (5) above should be read at 3.5 psi to 10 psi.

(7) Open valve (5) and gradually bleed off air pressure and monitor gage (1). Switch must reset at 1.5 psi minimum.

(8) After switch resets, the following continuities must be indicated; circuit through pins A and B open; circuit through pins A and C closed.

d. Installation. Install the oil sequencing switch in reverse order of removal using figure 4-34 as a guide.



1 Electrical connector
2 Bolt (2)
3 Washer (2)
4 Nut
5 Tee
6 Oil pressure sequencing switch

ME 6115-320-12/4-34

Figure 4-34. Oil pressure sequencing switch removal.

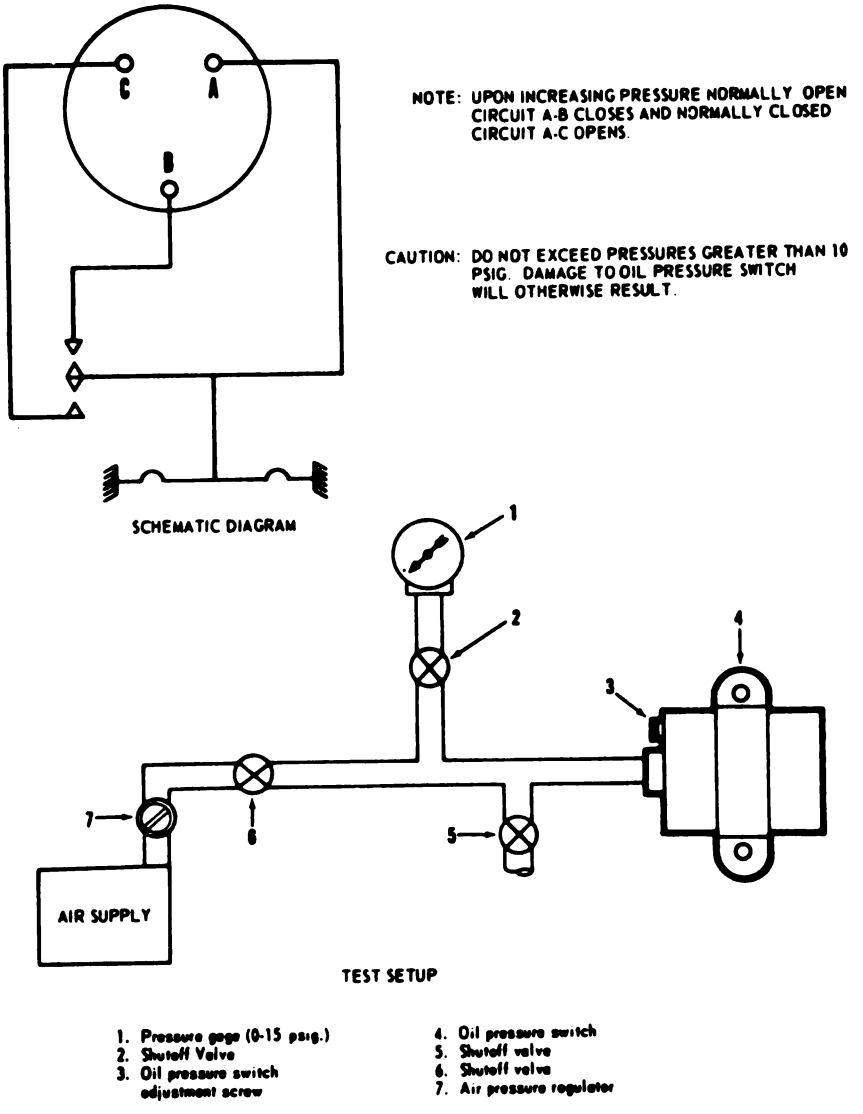


Figure 4-35. Oil pressure sequencing switch setup and wiring diagram.

4-58. Thermocouple

a. Removal. Remove thermocouple according to sequence of index numbers assigned to figure 4-36, observing the following:

(1) Remove muffler assembly (para 4-47).

(2) Tag electrical leads for identification.

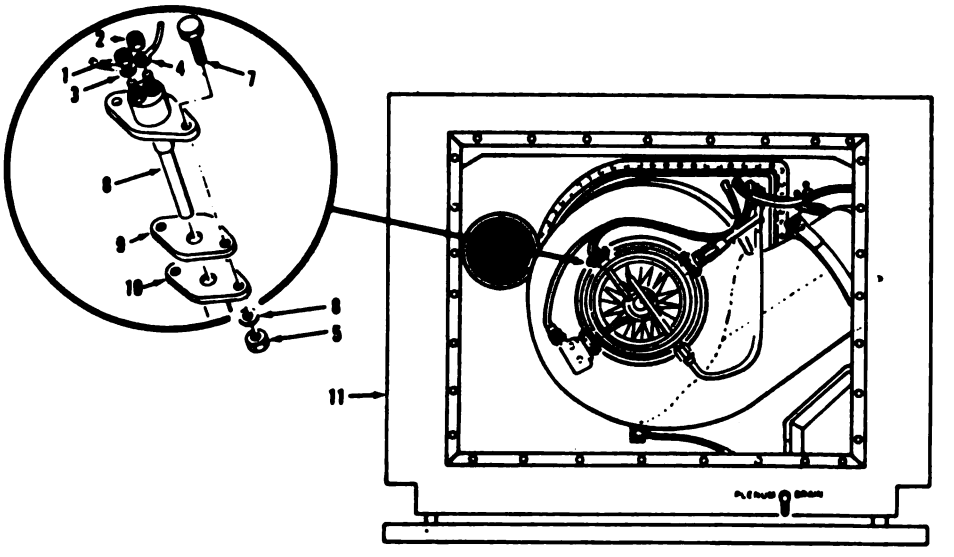
b. Cleaning and Inspection.

(1) Clean dust and dirt from thermocouple with clean, dry compressed air.

(2) Clean thermocouple with a cloth moistened in solvent (Fed P-D-680) and dry thoroughly.

(3) Inspect thermocouple for evidence of wear or damage. If defective, replace thermocouple.

c. Installation. Install the thermocouple in reverse order of removal procedure using a new gasket (9, fig. 4-36).



1 Nut
2 Nut
3 Alumel lead
4 Chromel lead
5 Nut (2)
6 Washer (2)
7 Bolt (2)
8 Thermocouple
9 Gasket
10 Mounting flange
11 Generator set enclosure (rear)

ME 6115-320-12/4-36

Figure 4-36. Thermocouple removal.

4-59. Thermostatic Oil Switch

a. Removal. Refer to figure 4-37 and remove the thermostatic oil switch.

b. Cleaning and Inspection.

(1) Clean dust and dirt from thermostatic oil switch with clean dry compressed air.

(2) Clean thermostatic oil switch in solvent (Fed P-D-680) and dry thoroughly.

(3) Inspect for evidence of damage or excessive wear. If defective, replace thermostatic oil switch.

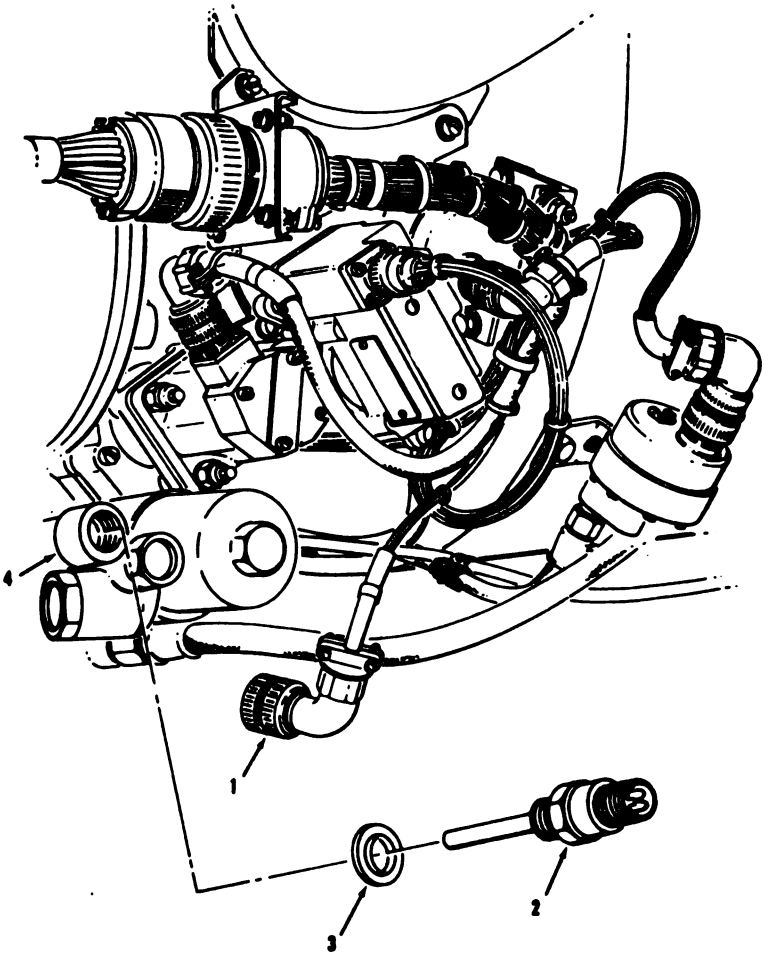
c. Testing. Test the thermostatic oil switch as follows:

(1) Place temperature bulb of switch into a container of oil. Place a thermometer into the container.

(2) Connect a multimeter to the terminals of the switch and heat container.

(3) The meter should show no continuity below 250° F ± 10° F (121° C ± 12.2° C).

d. Installation. Install the thermostatic oil switch in the reverse order of removal procedure using figure 4-37 as a guide.



1 Electrical connector
2 Thermostatic oil switch
3 Seal
4 Oil pump assembly

ME 6115-320-12/4-37

Figure 4-37. Thermostatic oil switch removal.

4-60. Low Oil Pressure Switch

a. Removal. Refer to figure 4-38 for removal of the low oil pressure switch.

b. Cleaning and Inspection.

(1) Clean dust, and dirt from low oil pressure switch with clean dry compressed air.

(2) Clean the low oil pressure switch with solvent (Fed P-D-680) and dry thoroughly.

(3) Inspect for evidence of damage or stripped threads. If defective, replace low oil pressure switch.

c. Testing. To test the low oil pressure switch, proceed as follows:

CAUTION

To avoid damage to the switch, do not exceed 70 psi during the following test.

(1) Connect a regulated source of compressed air to the low oil pressure switch.

(2) Connect a multimeter to A and B pins of the connector.

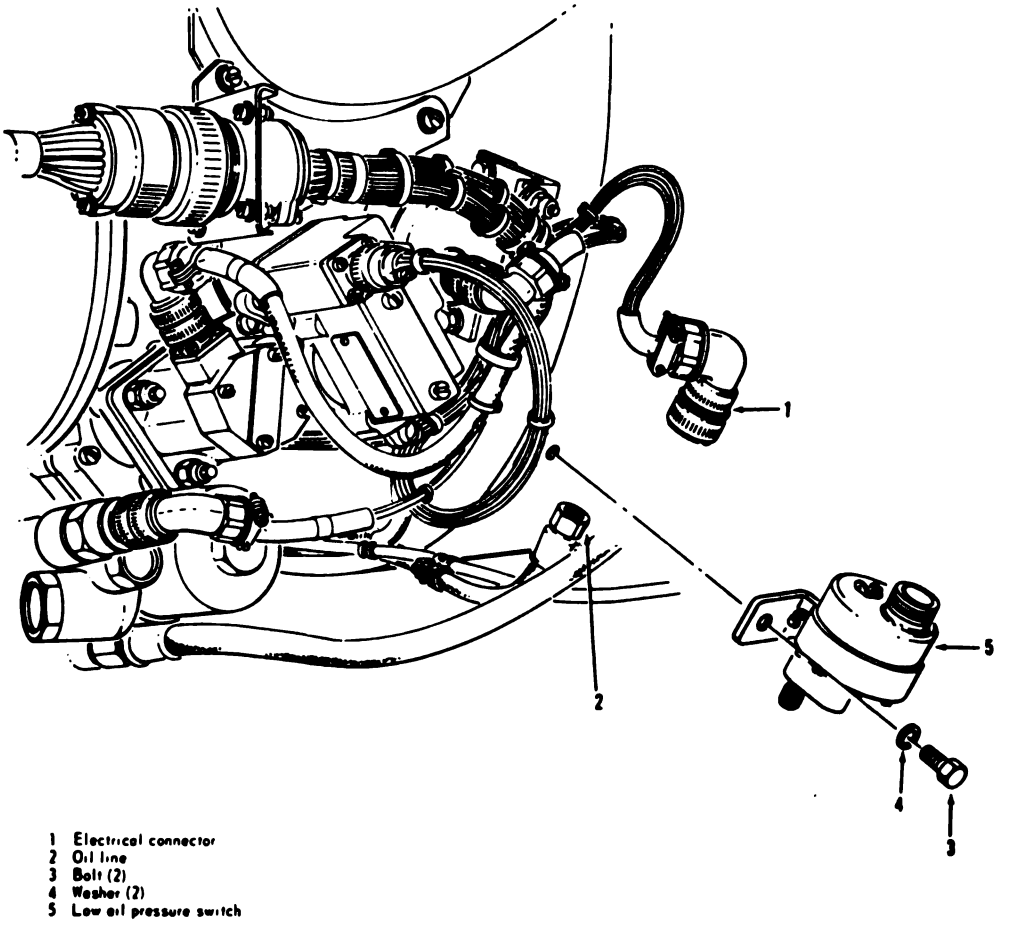
(3) Gradually increase the air pressure. The multimeter should indicate no continuity above 65 psi and should indicate continuity below 55 ± 3 psi.

(4) Connect the multimeter to terminals C and D of the switch.

(5) Contact actuation may be consecutive with a maximum of 1 psi differential provided the upper and lower values fall within the limits specified in steps (3) and (5) above. Replace if switch is defective.

d. Installation. Install the low oil pressure

switch in reverse order of removal procedure using figure 4-38 as a guide.



1 Electrical connector
2 Oil line
3 Bolt (2)
4 Washer (2)
5 Low oil pressure switch

ME 6115-320-12/4-38

Figure 4-38. Low oil pressure switch removal.

4-61. Centrifugal Switch Assembly

a. Clean dust and dirt from centrifugal switch assembly with clean dry compressed air.

b. Inspect centrifugal switch assembly mounting for security.

4-62. Acceleration and Overtemperature Control Thermostat

a. Clean dust and dirt from acceleration overtemperature control thermostat with clean dry compressed air.

b. Inspect acceleration and overtemperature control thermostat mounting, and air tube for security.

4-63. Tachometer—Generator

a. Clean dust and dirt away from tachometer-generator with clean dry compressed air.

b. Inspect tachometer-generator mounting and electrical connector for security.

APPENDIX A

REFERENCES

A-1. Fire Protection	
TB 5-4200-200-10	Hand Portable Fire Extinguishers For Army Users.
A-2. Lubrication	
C9100IL	Fuels, Lubricants, Oils and Waxes.
LO 5-6115-320-12	Lubrication Order.
A-3. Painting	
TM 9-213	Painting Instructions For Field Use.
A-4. Radio Suppression	
TM 11-483	Radio Interference Suppression.
A-5. Maintenance	
TB ENG-347	Winterization Techniques For Engineer Equipment.
TM 9-207	Operation and Maintenance of Army Materiel in Extreme Cold Weather, 0° to —65°
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 5-6115-320-20P	Organizational Maintenance Repair Parts and Special Tool List.
A-6. Shipment and Storage	
TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage.
TM 740-90-1	Administrative Storage of Equipment.
A-7. Destruction of Army Materiel	
TM 750-244-3	Procedure for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command).

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-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.

B-2. Explanation of Columns in Section II

a. Group Number, Column (1). The assembly group is a numerical group assigned to each assembly in a top down breakdown sequence. The applicable assembly groups are listed on the MAC in disassembly sequence beginning with the first assembly removed in a top down disassembly sequence.

b. Assembly Group, Column (2). This column contains a brief description of the components of each assembly 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 its 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, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

D—ADJUST: To rectify to the extent necessary to bring into proper operating range.

E—ALIGN: 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 comparison 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 like items.

I—REPAIR: Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

J—OVERHAUL: Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

K—REBUILD: The highest degree of materiel maintenance. It consists or restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

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.

B-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 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.

B-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) Assembly group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
01	ENGINE ASSEMBLY	C	F	C	..	..	..	..	F	O	D	..	1	A
	Compressor Assembly	O	..	..	..	..	..	..	H	D	D	..	2	
	Plenum Assy, Inlet	O	..	..	..	..	..	..	F	F	..	..	..	B
02	COMBUSTION ASSEMBLY													
	Cap, Combustor	O	..	..	..	..	..	..	O	..	..	..	..	C
	Chamber, Combustion	O	..	O	..	..	..	..	O	F				
	Plenum Turbine	O	..	..	..	..	..	..	F	F	..	..	3	
	Exhaust	O	..	..	..	..	..	..	O	..	..	..	..	D
	Muffler Assy	O	..	..	..	..	..	..	O	F				
	Exhaust Pipe Assy and Ejector	O	..	..	..	..	..	..	O					
03	TURBINE ASSEMBLY	O	..	..	..	..	..	..	F	F	D			
	Nozzle Assy	O	..	..	F	..	..	..	D					
	Torus	O	..	..	..	..	..	..	F	F	..	..	..	E
04	ACCESSORY DRIVE ASSY	O	..	..	..	..	..	..	H	F	D	..	4	F
	Rotating Assy, Fan	O	..	..	..	..	..	..	F	H				
05	FUEL SYSTEM													
	Fuel Control	O	..	O	..	..	..	..	F	..	..	..	..	G
	Pump Assy, Fuel Boost	O	F	O	..	..	..	..	O	F	D			
	Filter Assemblies	O	..	O	..	..	..	..	O					
	Atomizer Assy, Fuel	O	..	O	..	..	..	..	O	..	..	..	..	H
	Valve, Fuel Solenoid	O	O	..	..	..	..	..	O					
	Valve, Overtemp Bypass	O	O	..	..	..	..	..	O					
	Hoses, Lines and Fittings	O	..	..	..	..	..	..	O					
06	LUBRICATING SYSTEM													
	Pump Assy, Oil	O	F	..	..	..	..	..	F	F	D	..	5	I
	Filter Assy, Oil	O	..	O	..	..	..	..	O	O				
	Tank Assy, Oil	O	..	C	..	..	..	..	O	F	..	..	..	J
	Cooler, Oil	O	..	..	..	..	..	..	O	..	D			
	Nozzle & Tubes, Oil Jet	F	..	..	..	..	..	..	F					
	Screens, Valves, Lines, Hoses and Ducts	O	..	..	..	..	..	..	O	O				
07	ELECTRICAL SYSTEM													
	Starter Assembly	O	O	..	F	..	..	..	O	F	D	..	6	K
	Relay Assy, Holding	..	F	..	..	..	..	..	F					
	Relay, Starter	O	O	..	..	..	..	..	O					
	Igniter Plug	O	..	O	..	..	..	..	O					
	Igniter Unit	O	O	..	..	..	..	..	O	..	..	..	..	L
08	SAFETY CONTROLS													
	Switch Assy, Centrifugal	O	F	F	..	..	..	..	F	F	D	..	..	M
	Thermocouple	O	F	..	..	..	..	..	O					
	Switches, Oil Pressure	O	O	..	..	..	..	..	O					
	Thermostat, Acceleration	O	..	..	F	..	..	..	F					
	Circuit Breakers	O	..	..	..	..	..	..	O					
	Panel, Engine Control	O	..	..	..	..	..	..	F	O				
	Tachometer-Generator	O	..	..	..	..	..	..	F					

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Assembly group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
08	SAFETY CONTROLS—Continued													
	Switches, Lamps, Fuses and Instruments	O	..	..	..	..	..	..	O					
09	ENCLOSURE ASSEMBLIES	O	..	..	..	..	..	..	D	F	D			
	Battery, Storage	C	O	C	..	..	..	..	O					
	Battery Box	O	..	..	..	..	..	..	O					
	Wiring, Cables and Connectors	O	O	..	..	..	..	..	..	F				
10	ELECTRIC GENERATOR													
	Generator Assy, AC	O	F	..	..	..	..	..	F	F	D	..	....7..	...O-P
	Rotor Assy	..	F	..	..	..	..	..	F	F	D	..		....Q
	Stator Assy	..	F	..	..	..	..	..	F	F	D	..		....R
	Ducts, Hoses & Clamps	O	..	..	..	..	..	..	O					
11	REGULATOR, VOLTAGE	O	F	..	..	..	..	..	F	F	D			
	Relays	..	F	..	..	..	..	..	F					
	Transformers	..	F	..	..	..	..	..	F					
	Battery charger	O	F	..	O	..	..	..	F	F	D			
12	WINTERIZATION EQUIPMENT													
	Heater Assy	O	O	..	..	..	..	..	O	F	D			
	Switch, Relays & Wiring	O	..	..	..	..	..	..	F					
	Ducts, Hoses & Clamps	O	..	..	..	..	..	..	O					
	Valves and Lines	O	..	..	..	..	..	..	O					

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance category	Nomenclature	Tool number
1 - B	F	Engine Analyzer	4920-778-6091
1 - B	F	Cable Assy, Special	6115-872-7767
1 - B	F	Hose Kit, Analyzer	1450-799-8432
1 - H	F	Sling, Beam, Adjustable	6115-731-0051
2 - H	H	Stand, Portable Engine	4920-861-3068
2 - H	H	Adapter, Engine Stand	4920-717-7019
2 - H	H	Adapter, Engine Stand	4920-778-6089
2 - H	H	Mount, Lower	(99193)281449-2
3 - H	F	Wrench, Open End Fixed	5120-656-4774
4 - I	F	Puller, Mechanical Fan	5120-330-8527
4 - I	H	Holder, Seal Installing	4920-614-8483
4 - I	H	Wrench, Spanner	5120-778-6181
4 - I	H	Adapter, Wrench	5120-608-6794
4 - I	H	Driver, Seal	5120-778-6115
4 - I	H	Driver, Seal	5120-733-7113
5 - I	F	Puller, Mechanical Seal	5120-608-8239
6 - D	F	Adapter, Torque Wrench	5120-608-4756
6 - D	F	Holder, Clutch Torquing	4920-336-0648
7 - B	F	Multimeter	6625-553-0142
7 - B	F	Frequency Meter	6625-893-0021

Section IV. REMARKS

Reference code	Remarks
A-B	Test for proper functions using engine analyzer test set. Replacement of complete gas turbine assemblies should only be accomplished when a malfunction of a major section cannot be identified (Accessor, Compressor or Turbine)
B-I	Minor Repair
C-I	Stop drill cracks, minor welds
C-C	Remove carbone deposits
D-I	Minor weld on exhaust flange
E-I	Minor weld on Torus
F-I	Replace External seals only
G-I	Replace input shaft seal only
H-C	Service consists of cleaning screen and atomizer to remove deposits. Replace seals, valves, etc.
I-B	Test oil pump pressure using engine analyzer
I-I	Replace oil pump shaft seal
J-I	Repair consists of minor welding
K-B	Test for Open windings
K-D	Adjust clutch to proper torque
K-H	Replace starter and clutch as an assembly
K-I	Repair consists of installing new brushes
L-C	Service consists of removing deposits
M-B	Test for proper sequence using analyzer
M-D	Minor adjustment for proper sequence using analyzer
M-I	Repair consists of replacing switch assembly
N-D	Adjust by adding or removing shims for proper temperature. Add to decrease, remove to increase. .001 thick equals approximate 30° F temperature change.
O-B	Verify output performance characteristics. Test for fault isolation.
P-B	Test for continuity and insulation resistance
Q-I	Minor repair
R-I	Minor repair

APPENDIX C

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists items which accompany the generator set or are required for installation, operation, or operator's maintenance. Repair Parts and Special Tools assigned maintenance code "C" in the organizational portion of the Maintenance Repair Parts and Special Tools List Manuals, may be stocked at the operator level of maintenance when authorized by the Unit Commander.

C-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 and are required by the crew / operator for installation, operation, or maintenance.

b. Maintenance and Operating Supplies—Section III. A listing of maintenance and operating supplies required for initial operation.

C-3. Explanation of Columns

The following provides and explanation of columns in the tabular list of Basic Issue Items, section II.

a. Source, Maintenance, and Recoverability Codes (SMR):

(1) Source code, indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts, Special Tools and Test Equipment supplied from the GSA / DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts, Special Tools and Test Equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Repair parts, Special Tools and Test Equipment which are not procured or stocked, as such, in the supply system but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item or component. The failure of such part of assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts, Special Tools and Test Equipment which are not stocked and have no foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage, if not obtainable through cannibalization or salvage, the item may be requisitioned with exception data, from the end item manager, for immediate use.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

Note: Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded X1 and aircraft support items as restricted by AR 700-42.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
C	Crew / Operator

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are nonrecoverable. Recoverability codes are:

Code	*Explanation*
R	Applied to Repair parts, (assemblies and components) Special Tools and Test Equipment which are considered economically reparable at direct and general support maintenance levels. When the item is no longer economically repairable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts, Special Tools, Test Equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be

Code	Explanation
	uneconomically reparable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable Repair parts, Special Tools and Test Equipment which are subject to special handling and are issued on an exchange basis. Such items will be evacuated to the depot for overhaul or final disposition. Communication-Electronics and Missile Support items will be repaired/overhauled only at depots.
U	Repair parts, Special Tools and Test Equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value or reusable casings or castings.

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. The abbreviation "w/e", when used as a part of the nomenclature, indicates the Federal stock number, includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parenthesis. The usable on codes indicate different model and serial number application. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

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 Incorporated in Unit. This column indicates the quantity of the item used in the assembly group. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated (e.g. shims, spacers, etc.)

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. Illustration. This column is divided as follows:

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

(2) *Item number.* Indicates the callout number used to reference the item in the illustration.

C-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies—Section III

a. Component Application. This column identifies the component application of each maintenance or operating supply item.

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 item name and brief description.

d. Quantity Required for Initial Operation. 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. This column indicates the estimated quantities required for an average 8 hours of operation.

f. Notes. This column indicates informative notes keyed to data appearing in a preceding column.

C-5. Federal Supply Code for Manufacturers

Code	Manufacturer
40912	Mine Safety Appliances Co.

Section II. BASIC ISSUE ITEMS

(1) SMR code	(2) Federal stock number	(3) Description Ref No. & Mfr Code — Usable on code	(4) Unit of meas	(5) Qty inc in unit	(6) Qty furn with equip	(7) Illustration (A) Fig No.	(7) Illustration (B) Item No.
		BASIC ISSUE ITEMS MANUFACTURER OR DEPOT INSTALLED					
PC	7520-559-9618	CASE: Operation and Maintenance Publications, Cotton Duck, Water Repellent, Mildew Resistant, MIL-B-1174B	EA		1		
		DA LUBRICATION ORDER LO 5-6115-320-12			1		
		DA TECHNICAL MANUAL TM 5-6115-320-12			1		
		BASIC ISSUE ITEMS, TROOP INSTALLED					
PC	4210-889-2221	EXTINGUISHER, FIRE, DRY CHEMICAL: Hand Type; 2½ lb Capacity w / Wall Bracket	EA				
PC	5975-878-3791	Rod, Ground; 3 sect; Steel; 9 ft lg, ⅝ in. dia; copper coated finish; cone point; male thd end; separable clamp for attaching ground wire; furnished w / 6 ft grounding cable and ground terminal; MIL-R-11461, type II, style 2	EA				

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for 8 hours operation	(6) Notes
OIL TANK		OIL, LUBRICATING, TURBINE ENGINE: 1 qt can as follows:			(1) See C9100-IL for additional data and requisitioning procedures
	9150-782-2627 (1)	LGT, MIL-L-7808	4 qt (3)	(2)	
		LUBRICATING OIL, ENGINE: 5 gal can as follows:			(2) See current LO for grade application and replenishment intervals
	9150-265-9428 (1)	OE-10, MIL-L-2104	4 qt (4)	(2)	(3) Preferred choice
	9150-242-7603	OES, MIL-L-10295	4 qt (5)	(2)	
	9150-242-7603 (1)	OES, MIL-L-10295	4 qt (5)	(2)	(4) Second choice
Fuel tank		TURBINE FUEL, AVIATION: 55 gal drum as follows:			(5) Third choise
	9130-265-8617 (1)	JP4, MIL-T-5624	55 gal (3)	113 gal (8)	(6) Fourth choice
		GASOLINE, AVIATION: 55 gal drum as follows:			(7) Fifth choice
	9130-240-8208 (1)	Grade 80/87	55 gal (4)	113 gal (8)	(8) Average fuel consumption is 14.0 gal per hour of steady operation under full load conditions
	9130-221-0675 (1)	Grade 91/96	55 gal (4)	113 gal (8)	
	9130-221-0678 (1)	Grade 100/130	55 gal (4)	113 gal (8)	
	9130-179-1127 (1)	Grade 115/145	55 gal (4)	113 gal (8)	
		FUEL, COMPRESSION, IGNITION: 55 gal drum as follows:			
	9130-967-7002 (1)	MIL-F-46005	55 gal (5)	113 gal (8)	
		KEROSENE: 55 gal drum as follows:			
	9140-242-6751 (1)	K, VV-K-221	55 gal (6)	113 gal (8)	
		GASOLINE, AUTOMOTIVE COMBAT: 55 gal drum as follows:			
	9130-240-8204 (1)	91A	55 gal (7)	113 gal (8)	
	9130-240-8201 (1)	91C	55 gal (7)	113 gal (8)	

INDEX

By Order of the Secretary of the Army:

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

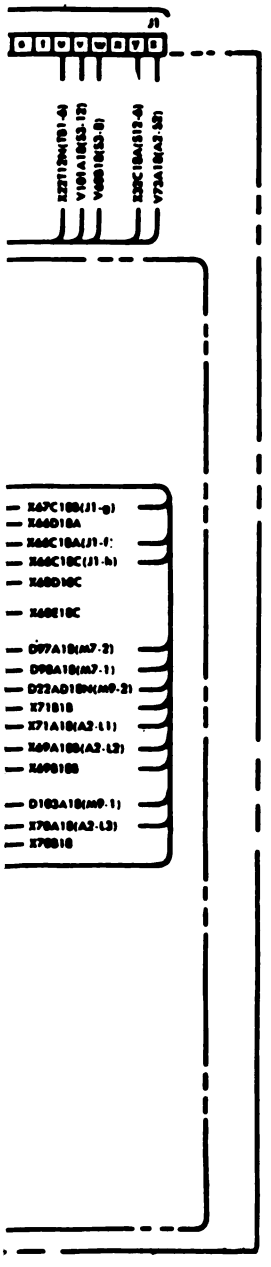
Official:

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

Distribution:

To be distributed in accordance with DA Form 25D, (qty rqr block No. 738) organizational maintenance requirements for Generator Sets, Engine Driven, 45 KW, 60 HZ.

☆U.S. GOVERNMENT PRINTING OFFICE : 1989 O - 242-451 (5198)



A2 Thermal Watt Converter
A4 Load Anticipator
A5 Battery Charger
A7 Battery Heater
A8 Ripple Filter
Capacitor 40 MFD 75 W VDC
Inductor 100 8 MHY 2.5 AMPS.
B1 Starter Motor
B3 Fuel Boost Pump
B5 Heater Fuel Pump
BT1 Battery
BT2 Battery
C1 Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C2 Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C3 Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C4 Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
CB1 Internal Circuit Breaker
CB2 Winterization Heater CB Circuit Breaker
CB3 Main Circuit Breaker
CB4 External Circuit Breaker (Sergeant Special)
CT1 Current Transformer (Instrumentation)
CT2 Current Transformer (Instrumentation)
CT3 Current Transformer (Instrumentation)
CT4 Current Transformer (Voltage Droop)
DS1 Panel Lights Lamp
DS2 Panel Lights Lamp
DS3 Panel Lights Lamp
DS4 Main CB Closure Lamp
DS5 Winterization Heater Lamp
DS6 Over Voltage Lamp
DS7 Syn Light Lamp
DS8 Syn Light Lamp
E1 AC-DC External Ground Stud
E2 Internal Ground Stud
F1 Convenience Receptacle Fuse
G1 AC Generator
J1 Control Receptacle
J3 Control Receptacle
J14 Remote Control General J14 Receptacle
J15 24V DC Slave Receptacle J15
J18 400 Cycle Power J18 Receptacle
J19 120V-400 Cycle-15 Amp Convenience Receptacle
J25 Remote Control Special J25 Receptacle (Sergeant)
J27 External Fuel Pump J27 Receptacle (Sergeant)
J28 400 Cycle Power J28 Receptacle (Sergeant)
J29 Fuel Tank Base Receptacle
K1 Starter Relay
K2 Master Relay
K3 Holding Relay No. 1
K4 Holding Relay No. 2
K5 Over Voltage Hold Relay
K6 AC Reset Relay
K7 AC Voltage Relay
K8 Protection By-Pass Relay
K9 Temperature Control Relay
K10 Over Voltage Relay
K11 Under Voltage Relay AC
K12 Generator Control Relay
K13 Fire Sensing Relay
K14 Overcurrent (Short Circuit) Relay
K15 Battery Temperature Sensing Relay
K16 Local-Remote Voltage Sensing Relay
M1 Tachometer Indicator
M2 Exhaust Gas Temperature Gage
M3 Oil Pressure Gage
M4 Battery Charging Ammeter
M5 Start Counter
M6 Engine Hourmeter
M7 AC Voltmeter
M8 Frequency Meter
M9 AC Ammeter
M10 Kilowatt Meter
M7 Frequency Transducer
P1 Control Plug
P2 Gas Turbine Plug
P3 Control Plug
P7 AC Generator Plug
P8 Battery Heater Plug
P9 Load Anticipator Plug
P10 Load Anticipator Plug
P11 Voltage Regulator Plug
P12 Battery Charger Plug
P13 Main Circuit Breaker Plug
P14 Internally Wired Plug
P17 Battery Electrolyte Temperature Sensor Plug
P20 Fuel Boost Pump Plug
P21 Battery Heater Fuel Pump Plug
P24 Tachometer Indicator Plug
P25 Internally Wired Plug (Sergeant)
R1 Voltage Adj Rheostat 250 Ohms 12.5 Watt
R2 Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R3 Resistor (Synchronizing Light) 5000 Ohms 10 Watt
R4 Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R5 Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R6 Frequency Droop Rheostat 2500 Ohms 12.5 Watt
R7 Voltage Droop Rheostat 25 Ohms 25 Watt
R8 Frequency Adj Potentiometer 2500 Ohms 3 Watt
R9 Resistor 1000 Ohms 1 Watt
R10 Resistor 1000 Ohms 1 Watt
R11 Resistor 1000 Ohms 1 Watt
R12 Resistor 15 Ohms 10 Watt
S1 Panel Lights Switch
S2 Master Switch
S3 Local Remote Control Selector Switch
S4 Over Volt Reset Switch
S5 Main CB Circuit Breaker Switch
S6 Protection Bypass Switch
S8 Winterization Heater Switch
S10 Battery Electrolyte Temperature Sensor
S11 Volt-Amp Selector Switch
S12 Unit-Parallel Selector Switch
S13 Local Remote Sensing Voltage Selector Switch
TB1 Terminal Board
TB2 Terminal Board
TB3 Terminal Board
TB4 Terminal Board
TB5 Voltage Change Panel
TB7 AC Power Output Terminal Board
TB8 Terminal Board
TB9 Terminal Board
TC1 Fire Detector
TC2 Fire Detector
TC3 Fire Detector
TC4 Fire Detector
VR1 Voltage Regulator

ME 6115-320-12/FO-1 (1)

Figure FO-1. Generator set practical wiring diagram (sheet 1 of 7).

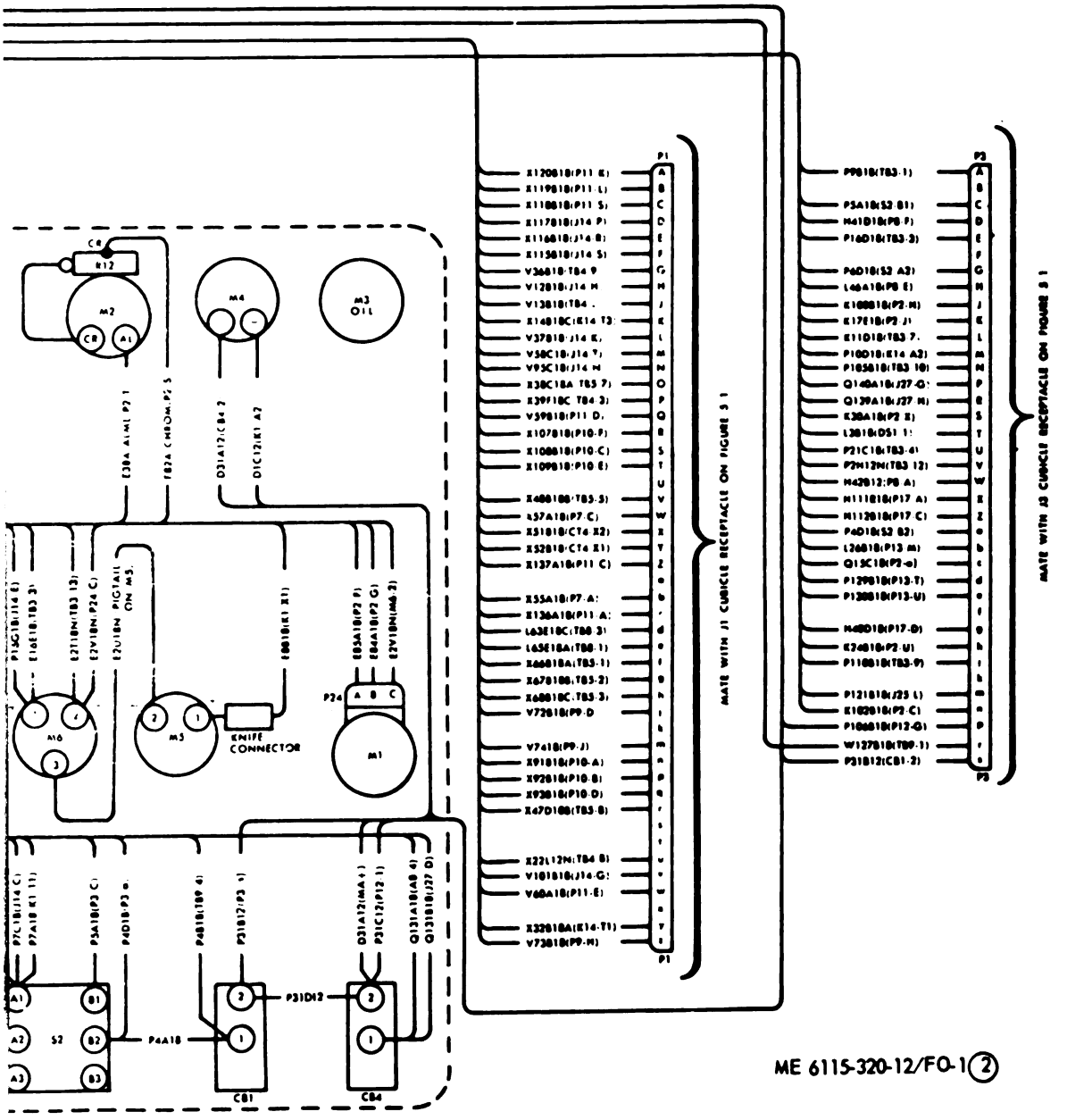


Figure FO-1. Generator set practical wiring diagram (sheet 2 of 7).

REFERENCE POINTS FROM	TO	VOLTAGE	OHMS	REMARKS CIRCUIT BREAKER REF DES	POSITION	GENERATOR SET	SWITCH REF DES	POSITION
P14-N	P14-H	0	0	CB-3	CLOSED		S2	OFF
							S12	UNIT
ALL OTHERS	ANY	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
P25-L	P25-E	0	0	CB-3	CLOSED		S2	OFF
							S12	UNIT
ALL OTHERS	ANY	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-L	J14-V	0	1390	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-K	J14-V	0	1220	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-A	J14-V	0		CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-B	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-C	J14-V	0	38	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-D	J14-V	0	3.1	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-E	J14-V	0	3.1	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-F	J14-V	0	9.1	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-J	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-P	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-M	J14-V	0	0	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-S	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-U	J14-V	0	2.7K	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-R	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J14-G	J14-V	0	INFINITY	CB-3	CLOSED		S2	OFF
							S12	UNIT
J18-3	J18-4	0	2600	CB-3	OPEN		S2	OFF
							S12	PARALLEL
J28 A	J28-D	0	2600	CB-3	OPEN		S2	OFF
							S12	PARALLEL
J28-B	J28-D	0	INFINITY	CB-3	OPEN		S2	OFF
							S12	PARALLEL
J28-C	J28-D	0	2600	CB-3	OPEN		S2	OFF
							S12	PARALLEL
TB7-L1	TB7-L0	0	2600	CB-3	OPEN		S2	OFF
							S12	PARALLEL
TB7-L2	TB7-L0	0	INFINITY	CB-3	OPEN		S2	OFF
							S12	PARALLEL
TB7-L3	TB7-L0	0	2600	CB-3	OPEN		S2	OFF
							S12	PARALLEL
			B. AC GENERATOR (G1)					
T1	T4	0	0.0220 TO 0.0244					
T2	T5	0	0.0220 TO 0.0244					
T3	T6	0	0.0220 TO 0.0244					
T7	T10	0	0.0220 TO 0.0244					
T8	T11	0	0.0220 TO 0.0244					

ME 6115-320-12/FO-1 (3)

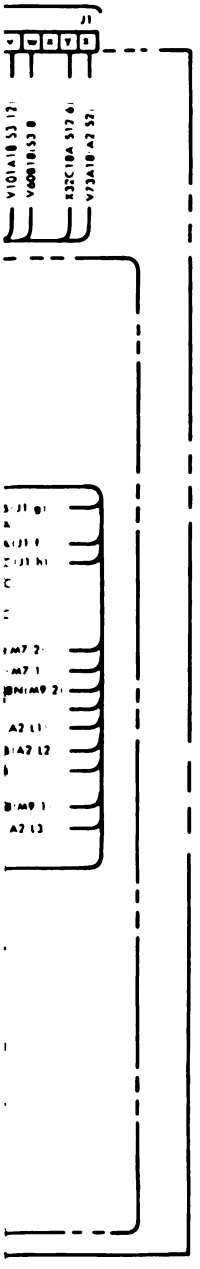
Figure FO-1. Generator set practical wiring diagram (sheet 3 of 7).

REFERENCE POINTS FROM	TO	VOLTAGE	OHMS	REMARKS CIRCUIT BREAKER REF DES	POSITION	GENERATOR SET	SWITCH REF DES	POSITION
J1-q	J1-u	0	INFINITY					
J1-r	J1-u	0	INFINITY					
J1-v	J1-u	0	INFINITY					
J1-w	J1-u	0	INFINITY					
J1-y	J1-u	0	INFINITY					
J1-z	J1-u	0	0					
J1-U	ANY OTHER	0	INFINITY					
J1-e	ANY OTHER	0	INFINITY					
J1-k	ANY OTHER	0	INFINITY					
J1-s	ANY OTHER	0	INFINITY					
J1-t	ANY OTHER	0	INFINITY					
J1-x	ANY OTHER	0	INFINITY					
J3-A	J3-V	0	INFINITY					
J3-C	J3-V	0	220					
J3-D	J3-V	0	INFINITY					
J3-E	J3-V	0	260					
J3-G	J3-V	0	220					
J3-H	J3-V	0	40					
J3-J	J3-V	0	INFINITY					
J3-K	J3-V	0	70					
J3-L	J3-V	0	70					
J3 M	J3-V	0	INFINITY					
J3-N	J3-V	0	INFINITY					
J3-P	J3-V	0	INFINITY					
J3-R	J3-V	0	INFINITY					
J3-S	J3-V	0	70					
J3-T	J3-V	0	INFINITY					
J3-U	J3-V	0	200			J1 AND J3 WITH BOTH P1 AND P3		
J3-W	J3-V	0	INFINITY			DISCONNECTED		
J3-X	J3-V	0	INFINITY					
J3-Z	J3-V	0	INFINITY					
J3-a	J3-V	0	INFINITY					
J3-b	J3-V	0	37					
J3-c	J3-V	0	INFINITY					
J3-d	J3-V	0	INFINITY					
J3-e	J3-V	0	200					
J3-g	J3-V	0	INFINITY					
J3 h	J3-V	0	INFINITY					
J3-j	J3-V	0	INFINITY					
J3-m	J3-V	0	150					
J3-n	J3-V	0	INFINITY					
J3-p	J3-V	0	INFINITY					
J3-r	J3-V	0	150					
J3-s	J3-V	0	INFINITY					
J3-B	ANY OTHER	0	INFINITY					
J3-F	ANY OTHER	0	INFINITY					
J3-f	ANY OTHER	0	INFINITY					
J3-k	ANY OTHER	0	INFINITY					
			1. CONTROL CUBICLE PLUGS					
P1-A	P1-u	0	INFINITY			WITH ALL CIRCUIT BREAKERS CLOSED AND		
P1-B	P1-u	0	INFINITY			ALL SWITCHES IN OFF OR NEUTRAL		
P1-C	P1-u	0	INFINITY			POSITION, "UNIT-PARALLEL" SWITCH IN		
P1-D	P1-u	0	INFINITY			"PARALLEL" POSITION, VOLT-AMP SELECTOR		
P1-E	P1-u	0	INFINITY			IN POSITION "C-A", BOTH P1 AND P3		
P1-F	P1-u	0	INFINITY			REMOVED		
P1-G	P1-u	0	2.1K					
P1-H	P1-u	0	INFINITY					
P1-J	P1-u	0	INFINITY					
P1-K	P1-u	0	0			ME 6115-320-12/FO-1 (4)		

Figure FO-1. Generator set practical wiring diagram (sheet 4 of 7).

REFERENCE POINTS FROM	TO	VOLTAGE	OHMS	REMARKS: CIRCUIT BREAKER REF DES	CIRCUIT BREAKER POSITION	GENERATOR SET	SWITCH REF DES	SWITCH POSITION
P2-C	P2-Z	0	INFINITY					
P2-D	P2-Z	0	INFINITY					
P2-F	P2-Z	0	INFINITY					
P2-G	P2-Z	0	INFINITY					
P2-H	P2-Z	0	INFINITY					
P2-J	P2-Z	0	INFINITY					
P2-K	P2-Z	0	INFINITY					
P2-L	P2-Z	0	INFINITY					
P2-M	P2-Z	0	INFINITY					
P2-N	P2-Z	0	INFINITY					
P2-P	P2-Z	0	INFINITY					
P2-R	P2-Z	0	INFINITY					
P2-S	P2-Z	0	INFINITY					
P2-T	P2-Z	0	INFINITY					
P2-U	P2-Z	0	6					
P2-V	P2-Z	0	INFINITY					
P2-W	P2-Z	0	INFINITY					
P2-X	P2-Z	0	INFINITY					
P2-a	P2-Z	0	30					
P2-f	P2-Z	0	INFINITY					
P2-g	P2-Z	0	INFINITY					
P2-h	P2-Z	0	INFINITY					
P2-E	P2-Z	0	0					
P2-Q	P2-Z	0	INFINITY					
P2-Y	P2-Z	0	INFINITY					
P2-b	P2-Z	0	INFINITY					
P2-c	P2-Z	0	INFINITY					
P2-d	ANY OTHER	0	INFINITY					
P2-e	ANY OTHER	0	INFINITY					
P2-j	ANY OTHER	0	INFINITY					
P2-k	ANY OTHER	0	INFINITY					
P2-m	ANY OTHER	0	INFINITY					
P2-q	ANY OTHER	0	INFINITY					
P2-r	ANY OTHER	0	INFINITY					
P2-s	ANY OTHER	0	INFINITY					
			N. BATTERY TEMPERATURE SENSOR (S10)					
2	3		13,000.0			CONNECT NEGATIVE LEAD TO PIN 3		
2	3		13.0			CONNECT POSITIVE LEAD TO PIN 3		
1	4		220.0			CONNECT POSITIVE LEAD TO PIN 4		
1	4		INFINITY			CONNECT NEGATIVE LEAD TO PIN 4		
2	4		950.0			CONNECT NEGATIVE LEAD TO PIN 4		
2	4		675.0			CONNECT POSITIVE LEAD TO PIN 4		
3	4		9,000.0			CONNECT NEGATIVE LEAD TO PIN 4		
3	4		10,000.0			CONNECT POSITIVE LEAD TO PIN 4		

Figure FO-1. Generator set practical wiring diagram (sheet 5 of 7).

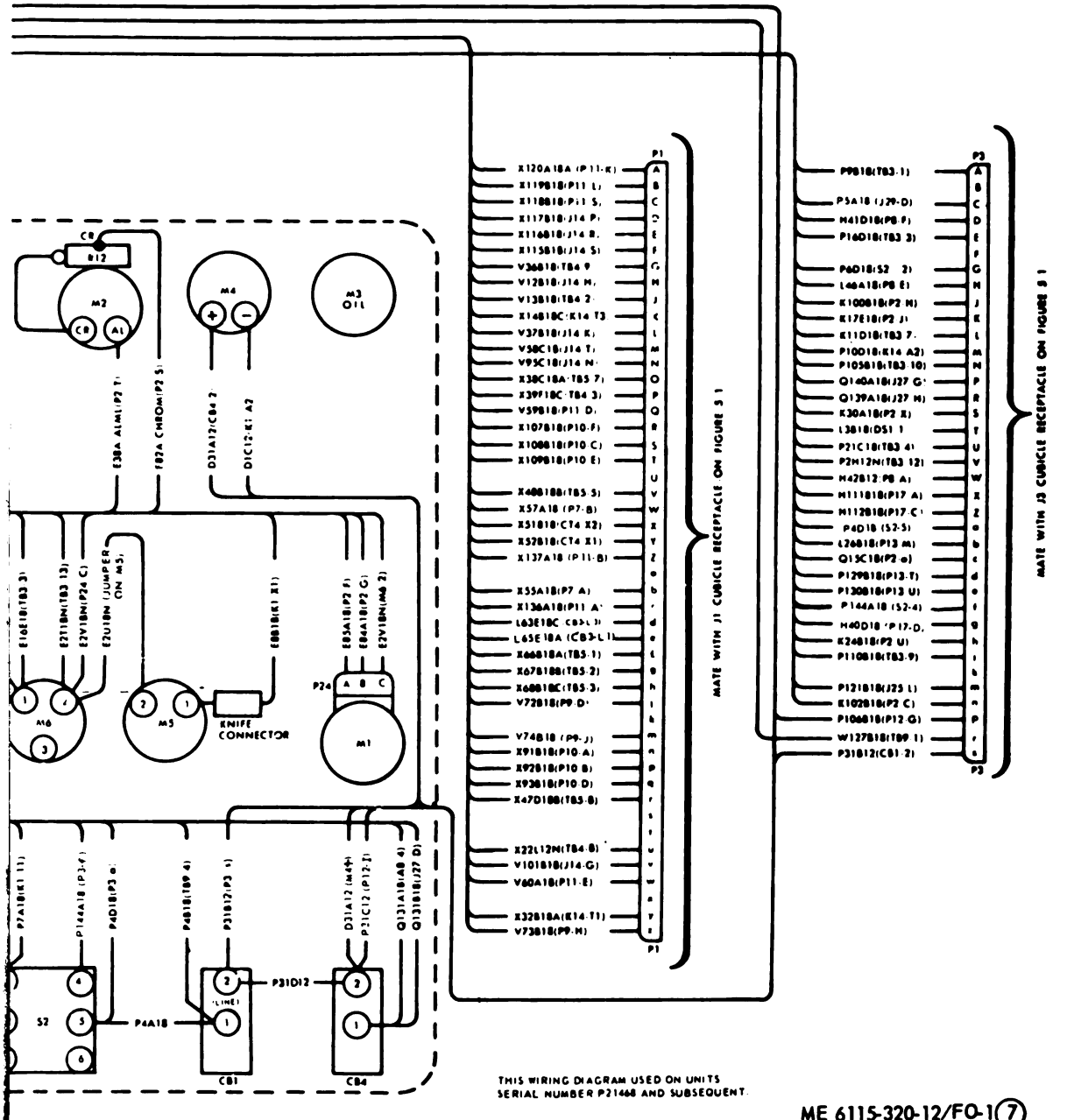


A2	Thermal Watt Converter
A4	Load Anticipator Governor Control
A5	Transformer Rectifier
A7	Battery Heater
A8	Ripple Filter Capacitor 40 MFD 75 W VDC Inductor 100 8 MHY 2 5 AMPS
B1	Starter Motor
B3	Fuel Boost Pump
B5	Heater Fuel Pump
BT1	Battery
BT2	Battery
C1	Capacitor (Radio Noise Suppression) 0 1 MFD 500 VAC DC
C2	Capacitor (Radio Noise Suppression) 0 1 MFD 500 VAC DC
C3	Capacitor (Radio Noise Suppression) 0 1 MFD 500 VAC DC
C4	Capacitor (Radio Noise Suppression) 0 1 MFD 500 VAC DC
CB1	Internal Circuit Breaker
CB2	Winterization Heater CB Circuit Breaker
CB3	Main Circuit Breaker
CB4	External Circuit Breaker (Sergeant Special)
CT1	Current Transformer (Instrumentation)
CT2	Current Transformer (Instrumentation)
CT3	Current Transformer (Instrumentation)
CT4	Current Transformer (Voltage Droop)
DS1	Panel Lights Lamp
DS2	Panel Lights Lamp
DS3	Panel Lights Lamp
DS4	Main CB Closure Lamp
DS5	Winterization Heater Lamp
DS6	Over Voltage Lamp
DS7	Syn Light Lamp
DS8	Syn Light Lamp
E1	AC DC External Ground Stud
E2	Internal Ground Stud
F1	Convenience Receptacle Fuse
G1	AC Generator
J1	Control Receptacle
J3	Control Receptacle
J14	Remote Control General J14 Receptacle
J15	24V DC Slave Receptacle J15
J18	400 Cycle Power J18 Receptacle
J19	120V 400 Cycle 15 Amp Convenience Receptacle
J25	Remote Control Special J25 Receptacle (Sergeant)
J27	External Fuel Pump J27 Receptacle (Sergeant)
J28	400 Cycle Power J28 Receptacle (Sergeant)
J29	Fuel Tank Base Receptacle
K1	Starter Relay
K2	Master Relay
K3	Holding Relay No 1
K4	Holding Relay No 2
K5	Over Voltage Hold Relay
K6	AC Reset Relay
K7	AC Voltage Relay
K8	Protection By Pass Relay
K9	Temperature Control Relay
K10	Over Voltage Relay AC
K11	Under Voltage Relay AC
K12	Generator Control Relay
K13	Fire Sensing Relay
K14	Overcurrent (Short Circuit) Relay
K15	Battery Temperature Sensing Relay
K16	Local Remote Voltage Sensing Relay
M1	Tachometer Indicator
M2	Exhaust Gas Temperature Gage
M3	Oil Pressure Gage
M4	Battery Charging Ammeter
M5	Start Counter
M6	Engine Hourmeter
M7	AC Voltmeter
M8	Frequency Meter
M9	AC Ammeter
M10	Kilowatt Meter
MT	Frequency Transducer
P1	Control Plug
P2	Gas Turbine Plug
P3	Control Plug
P7	AC Generator Plug
P8	Battery Heater Plug
P9	Load Anticipator Plug
P10	Load Anticipator Plug
P11	Voltage Regulator Plug
P12	Transformer Rectifier Plug
P13	Main Circuit Breaker Plug
P14	Internally Wired Plug
P17	Battery Electrolyte Temperature Sensor Plug
P20	Fuel Boost Pump Plug
P21	Battery Heater Fuel Pump Plug
P24	Tachometer Indicator Plug
P45	Internally Wired Plug (Fuel Tank Base Receptacle)
P25	Internally Wired Plug (Sergeant)
R1	Voltage Adj Rheostat 350 Ohms 12 5 Watt
R2	Resistor Synchronizing Light) 2500 Ohms 10 Watt
R3	Resistor Synchronizing Light) 5000 Ohms 10 Watt
R4	Resistor Synchronizing Light) 2500 Ohms 10 Watt
R5	Resistor (Synchronizing Light) 5000 Ohms 10 Watt
R6	Negative Frequency Droop Rheostat 3500 Ohms 12 5 Watt
R7	Voltage Droop Rheostat 25 Ohms 25 Watt
R8	Frequency Adj Potentiometer 3500 Ohms 3 Watt
R9	Resistor 1000 Ohms 1 Watt
R10	Resistor 1000 Ohms 1 Watt
R11	Resistor 1000 Ohms 1 Watt
R12	Resistor 15 Ohms 10 Watt
S1	Panel Lights Switch
S2	Master Switch
S3	Local Remote Control Selector Switch
S4	Over Volt Reset Switch
S5	Main CB Circuit Breaker Switch
S6	Protection Bypass Switch
S8	Winterization Heater Switch
S10	Battery Electrolyte Temperature Sensor
S11	Volt Amp Selector Switch
S12	Unit Parallel Selector Switch
S13	Local Remote Sensing Voltage Selector Switch
TB1	Terminal Board
TB2	Terminal Board
TB3	Terminal Board
TB4	Terminal Board
TB5	Voltage Change Panel
TB8	Terminal Board
TB9	Terminal Board
TC1	Fire Detector
TC2	Fire Detector
TC3	Fire Detector
TC4	Fire Detector
VR1	Voltage Regulator

THIS WIRING DIAGRAM USED ON UNITS
SERIAL NUMBER P21468 AND SUBSEQUENT

ME 6115-320-12/FO-1 (6)

Figure FO-1. Generator set practical wiring diagram (sheet 6 of 7).



ME 6115-320-12/FO-1 (7)

Figure FO-1. Generator set practical wiring diagram (sheet 7 of 7).

A2	Thermal Watt Converter
A4	Load Anticipator
A5	Battery Charger
A7	Battery Heater
A8	Ripple Filter Capacitor 40 MFD 75 W VDC Inductor 100 8 MHY 2.5 AMPS.
B1	Starter Motor
B3	Fuel Boost Pump
B5	Heater Fuel Pump
BT1	Battery
BT2	Battery
C1	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C2	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C3	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C4	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
CB1	Internal Circuit Breaker
CB2	Winterization Heater CB Circuit Breaker
CB3	Main Circuit Breaker
CB4	External Circuit Breaker (Sergeant Special)
CT1	Current Transformer (Instrumentation)
CT2	Current Transformer (Instrumentation)
CT3	Current Transformer (Instrumentation)
CT4	Current Transformer (Voltage Droop)
DS1	Panel Lights Lamp
DS2	Panel Lights Lamp
DS3	Panel Lights Lamp
DS4	Main CB Closure Lamp
DS5	Winterization Heater Lamp
DS6	Over Voltage Lamp
DS7	Syn Light Lamp
DS8	Syn Light Lamp
E1	AC-DC External Ground Stud
E2	Internal Ground Stud
F1	Convenience Receptacle Fuse
G1	AC Generator
J1	Control Receptacle
J3	Control Receptacle
J14	Remote Control General J14 Receptacle
J15	24V DC Slave Receptacle J15
J18	400 Cycle Power J18 Receptacle
J19	120V-400 Cycle-15 Amp Convenience Receptacle
J25	Remote Control Special J25 Receptacle (Sergeant)
J27	External Fuel Pump J27 Receptacle (Sergeant)
J28	400 Cycle Power J28 Receptacle (Sergeant)
J29	Fuel Tank Base Receptacle
K1	Starter Relay
K2	Master Relay
K3	Holding Relay No. 1
K4	Holding Relay No. 2
K5	Over Voltage Hold Relay
K6	AC Reset Relay
K7	AC Voltage Relay
K8	Protection By-Pass Relay
K9	Temperature Control Relay
K10	Over Voltage Relay
K11	Under Voltage Relay AC
K12	Generator Control Relay
K13	Fire Sensing Relay
K14	Overcurrent (Short Circuit) Relay
K15	Battery Temperature Sensing Relay
K16	Local-Remote Voltage Sensing Relay
M1	Tachometer Indicator
M2	Exhaust Gas Temperature Gage
M3	Oil Pressure Gage
M4	Battery Charging Ammeter
M5	Start Counter
M6	Engine Hourmeter
M7	AC Voltmeter
M8	Frequency Meter
M9	AC Ammeter
M10	Kilowatt Meter
MT	Frequency Transducer
P1	Control Plug
P2	Gas Turbine Plug
P3	Control Plug
P7	AC Generator Plug
P8	Battery Heater Plug
P9	Load Anticipator Plug
P10	Load Anticipator Plug.
P11	Voltage Regulator Plug
P12	Battery Charger Plug
P13	Main Circuit Breaker Plug
P14	Internally Wired Plug
P17	Battery Electrolyte Temperature Sensor Plug
P20	Fuel Boost Pump Plug
P21	Battery Heater Fuel Pump Plug
P24	Tachometer Indicator Plug
P25	Internally Wired Plug (Sergeant)
R1	Voltage Adj Rheostat 350 Ohms 12.5 Watt
R2	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R3	Resistor (Synchronizing Light) 5000 Ohms 10 Watt
R4	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R5	Resistor (Synchronizing Light) 5000 Ohms 10 Watt
R6	Frequency Droop Rheostat 3500 Ohms 12.5 Watt
R7	Voltage Droop Rheostat 25 Ohms 25 Watt
R8	Frequency Adj Potentiometer 3500 Ohms 3 Watt
R9	Resistor 1000 Ohms 1 Watt
R10	Resistor 1000 Ohms 1 Watt
R11	Resistor 1000 Ohms 1 Watt
R12	Resistor 15 Ohms 10 Watt
S1	Panel Lights Switch
S2	Master Switch
S3	Local Remote Control Selector Switch
S4	Over Volt Reset Switch
S5	Main CB Circuit Breaker Switch
S6	Protection Bypass Switch
S8	Winterization Heater Switch
S10	Battery Electrolyte Temperature Sensor
S11	Volt-Amp Selector-Switch
S12	Unit-Parallel Selector Switch
S13	Local Remote Sensing Voltage Selector Switch
TB1	Terminal Board
TB2	Terminal Board
TB3	Terminal Board
TB4	Terminal Board
TB5	Voltage Change Panel
TB7	AC Power Output Terminal Board
TB8	Terminal Board
TB9	Terminal Board
TC1	Fire Detector
TC2	Fire Detector
TC3	Fire Detector
TC4	Fire Detector
VR1	Voltage Regulator

ME 6115-320-12/FO-2 (1)

Figure FO-2. Generator set schematic wiring diagram (sheet 1 of 2).

A2	Thermal Watt Converter
A4	Load Anticipator
A5	Battery Charger
A7	Battery Heater
A8	Ripple Filter Capacitor 40 MFD 75 W VDC Inductor 100 8 MHY 2.5 AMPS.
B1	Starter Motor
B3	Fuel Boost Pump
B5	Heater Fuel Pump
BT1	Battery
BT2	Battery
C1	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C2	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C3	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
C4	Capacitor (Radio Noise Suppression) 0.1 MFD 500 VAC-DC
CB1	Internal Circuit Breaker
CB2	Winterization Heater CB Circuit Breaker
CB3	Main Circuit Breaker
CB4	External Circuit Breaker (Sergeant Special)
CT1	Current Transformer (Instrumentation)
CT2	Current Transformer (Instrumentation)
CT3	Current Transformer (Instrumentation)
CT4	Current Transformer (Voltage Droop)
DS1	Panel Lights Lamp
DS2	Panel Lights Lamp
DS3	Panel Lights Lamp
DS4	Main CB Closure Lamp
DS5	Winterization Heater Lamp
DS6	Over Voltage Lamp
DS7	Syn Light Lamp
DS8	Syn Light Lamp
E1	AC-DC External Ground Stud
E2	Internal Ground Stud
F1	Convenience Receptacle Fuse
G1	AC Generator
J1	Control Receptacle
J3	Control Receptacle
J14	Remote Control General J14 Receptacle
J15	24V DC Slave Receptacle J15
J18	400 Cycle Power J18 Receptacle
J19	120V-400 Cycle-15 Amp Convenience Receptacle
J25	Remote Control Special J25 Receptacle (Sergeant)
J27	External Fuel Pump J27 Receptacle (Sergeant)
J28	400 Cycle Power J28 Receptacle (Sergeant)
J29	Fuel Tank Base Receptacle
K1	Starter Relay
K2	Master Relay
K3	Holding Relay No. 1
K4	Holding Relay No. 2
K5	Over Voltage Hold Relay
K6	AC Reset Relay
K7	AC Voltage Relay
K8	Protection By-Pass Relay
K9	Temperature Control Relay
K10	Over Voltage Relay
K11	Under Voltage Relay AC
K12	Generator Control Relay
K13	Fire Sensing Relay
K14	Overcurrent (Short Circuit) Relay
K15	Battery Temperature Sensing Relay
K16	Local-Remote Voltage Sensing Relay
M1	Tachometer Indicator
M2	Exhaust Gas Temperature Gage
M3	Oil Pressure Gage
M4	Battery Charging Ammeter
M5	Start Counter
M6	Engine Hourmeter
M7	AC Voltmeter
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M10	Kilowatt Meter
MT	Frequency Transducer
P1	Control Plug
P2	Gas Turbine Plug
P3	Control Plug
P7	AC Generator Plug
P8	Battery Heater Plug
P9	Load Anticipator Plug
P10	Load Anticipator Plug
P11	Voltage Regulator Plug
P12	Battery Charger Plug
P13	Main Circuit Breaker Plug
P14	Internally Wired Plug
P17	Battery Electrolyte Temperature Sensor Plug
P20	Fuel Boost Pump Plug
P21	Battery Heater Fuel Pump Plug
P24	Tachometer Indicator Plug
P25	Internally Wired Plug (Sergeant)
R1	Voltage Adj Rheostat 350 Ohms 12.5 Watt
R2	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R3	Resistor (Synchronizing Light) 5000 Ohms 10 Watt
R4	Resistor (Synchronizing Light) 2500 Ohms 10 Watt
R5	Resistor (Synchronizing Light) 5000 Ohms 10 Watt
R6	Frequency Droop Rheostat 3500 Ohms 12.5 Watt
R7	Voltage Droop Rheostat 25 Ohms 25 Watt
R8	Frequency Adj Potentiometer 3500 Ohms 3 Watt
R9	Resistor 1000 Ohms 1 Watt
R10	Resistor 1000 Ohms 1 Watt
R11	Resistor 1000 Ohms 1 Watt
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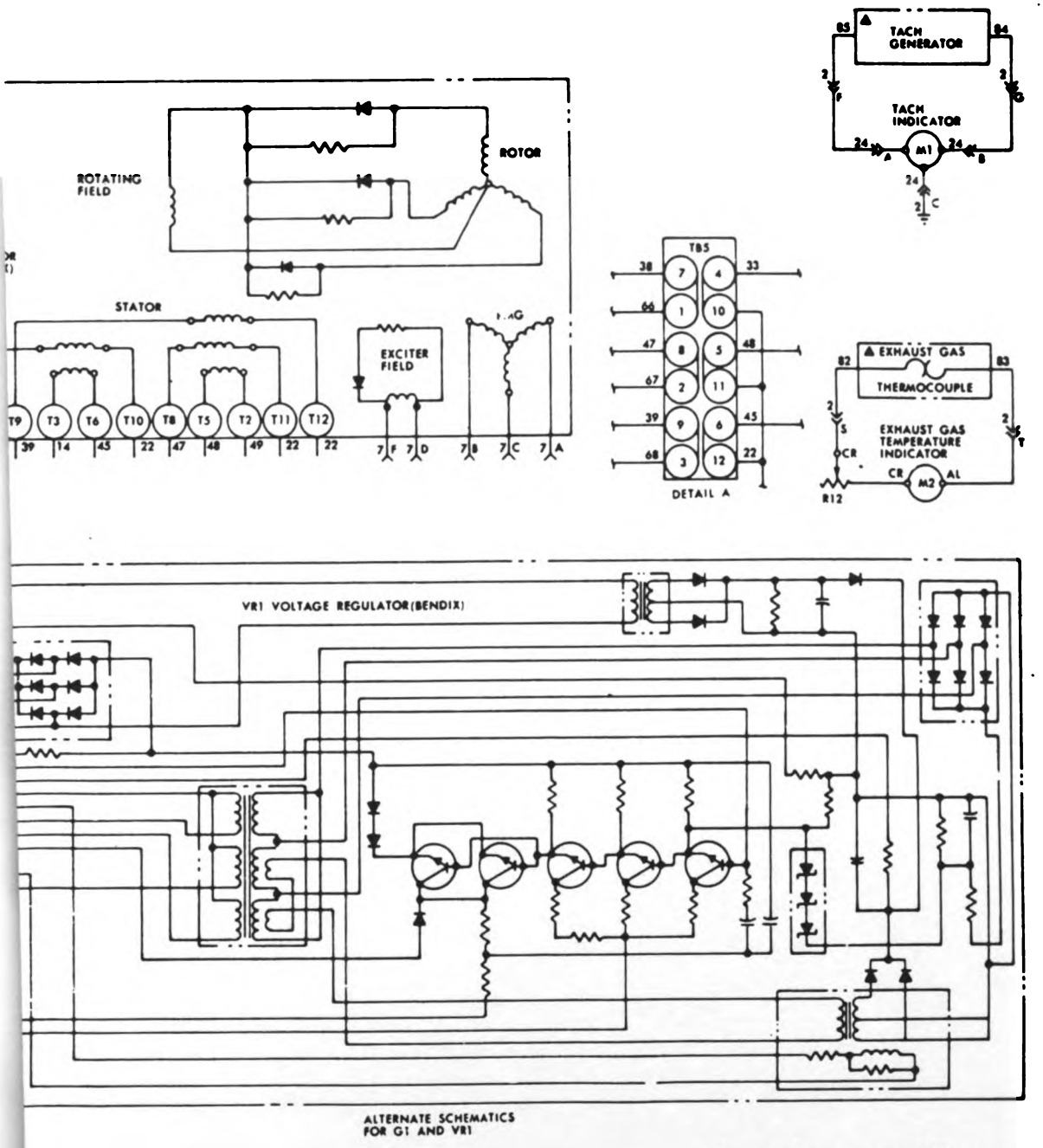
S8	Winterization Heater Switch
S10	Battery Electrolyte Temperature Sensor
S11	Volt-Amp Selector-Switch
S12	Unit-Parallel Selector Switch
S13	Local Remote Sensing Voltage Selector Switch
TB1	Terminal Board
TB2	Terminal Board
TB3	Terminal Board
TB4	Terminal Board
TB5	Voltage Change Panel
TB7	AC Power Output Terminal Board
TB8	Terminal Board
TB9	Terminal Board
TC1	Fire Detector
TC2	Fire Detector
TC3	Fire Detector
TC4	Fire Detector
VR1	Voltage Regulator

ME 6115-320-12/FO-2 (1)

Figure FO-2. Generator set schematic wiring diagram (sheet 1 of 2).



ME 6115-320-12/FO-2 (2)

Figure FO-2. Generator set schematic wiring diagram (sheet 2 of 2).