This copy is a reprint which includes current pages from Changes 1 through 7.

AIR FORCE T.O.35C2-3-442-1
ARMY TM5-6115-457-12
NAVY NAVFAC P-8-627-12
MARINE CORPS TM-07464A-12

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL
MAINTENANCE MANUAL

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL

SKID MTD., 100 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP007A	UTILITY	50/60	6115-00-133-9101
MEP106A	PRECISE	50/60	6115-00-133-9102
MEP116A	PRECISE	400	6115-00-133-9103

INCLUDING OPTIONAL KITS

DOD MODELS	NOMENCLATURE	NSN
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MEPO07AWE	WINTERIZATION KIT, ELECTRIC	6115-00-463-9085
MEPO07ALM	DUMMY L0AD KIT	6115-00-463-9086
MEPO07AWM	WHEEL MOUNTING KIT	6115-00-463-9089

Consolidated Diesel Electric Company
Contract Number F04606-70-D-0192 and F04606-78-C-0363

This publication incorporates PCN numbers 1 through 1301 and 1318

Published under authority of the
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15 JUNE 1973
CHANGE 7 - 20 MAY 1982

SAFETY STATEMENTS

CAUTION

All specific cautions and warnings contained in this manual shall be strictly adhered to. Otherwise, severe injury, death and/or damage to the equipment may result.

HIGH VOLTAGE

is produced when this generator set is in operation.

DEATH

or severe burns may result if personnel fail to observe safety precautions. Do not operate this generator set until the ground terminal stud has been connected to a suitable ground. Disconnect the battery ground cable before removing and installing components on the engine or in the electrical control panel system.

Do not attempt to service or otherwise make any adjustments, connections or reconnections of wires or cables until generator set is shut-down and completely de-energized.

DANGEROUS GASES

Batteries generate explosive gas during charging; therefore, utilize extreme caution, do not smoke, or use open flame in vicinity when servicing batteries.

Exhaust discharge contains noxious and deadly fumes. Do not operate generator sets in inclosed areas unless exhaust discharge is properly vented to the outside.

DANGEROUS GASES (Cont)

When filling fuel tank, maintain metal to metal contact between filler nozzle and fuel tank. Do not smoke or use an open flame in the vicinity.

Use extreme care, should a selenium rectifier malfunction, to avoid inhalation of poisonous fumes.

LIQUIDS UNDER PRESSURE

are generated as a result of operation of the generator set. Do not expose any part of the body to a high pressure leak in the fuel or hydraulic system of the generator set.

Relieve pressure from radiator before removing radiator cap.

NOISE

operating level of this generator can cause hearing damage. Ear protectors, as recommended by the medical or safety officer, must be worn when working near this set.

CAUTION

DAMAGE

to the equipment may result if personnel fail to observe the cautions contained in this manual.

If generator set is shut-down by the operation of a safety device, do not attempt to operate the unit until the cause has been determined and eliminated.

FILING NOTE

File this page behind buff colored title page.

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Dates of issue for original and changed pages are:

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Change . . 2 . . 30 Dec 75
Change . . 3 . . 30 Jun 77
Change . . ...4.... 15 Apr 78
Change . . . . ..5 . . . ..1 Nov 79
Change . . ...6.... 16 Sep 80
Change . . . . ..7 . . ..20 May 82

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3-100	...7
3-101 - 3-110	…0
3-111	...1
3-112 - 3-122	0
3-123	...7
3-124 - 3-128	0
3-129 - 3-130	 2
3-130A	...2
3-130B Blank	2
3-130C	...2
3-130D Blank	…2
3-131 - 3-132	…2
3-132A	...2
3-132B Blank	2
3-133 - 3-135	0
3-136 Blank	…0
4-1 - 4-2	...1
4-2A	.. 1
4-2B Blank	..1
4-3 - 4-4	...1
4-4A	.. 1
4-4B Blank	..1
4-5	...1
4-6 - 4-10	...0
4-11 - 4-12	...1
4-13 - 4-14	...0
4-15 - 4-16	...1
4-17 - 4-19	...7
4-20	...7
4-21	...7
4-22	...1
4-23 - 4-25	...7
4-26 - 4-27	...0
4-28 - 4-29	...0
4-30 - 4-35	…0
4-36 - 4-37	…1
4-38 - 4-41	...0
4-42	...1
4-43 - 4-44	...0
4-45	...1
4-46- 4-48	…0
4-49	...1
4-50 - 4-51	…0
4-52 Blank	..0
5-1	...0
5-2	...1
A-1 - A-3	..0
A-4 Blank	...0
B-l - B-4	..0
B-5 - B-8	...7
C-l - C-3	..0
C-4 - C-6	...7
C-7 - C-16	...0
C-17	...7
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MEP007AWM	WHEEL MOUNTING KIT	6115-00-463-9089

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15 JUNE 1973
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viii	2
ix	0
x	2
xi	3
xii	0
1-1	4
1-2	3
1-3	0
1-4 - 1-5	1
1-6	0
1-7	1
1-8 - 1-9	0
1-10	3
1-11	4
1-12	3
1-13	1
1-14 Blank	1
1-15	1
1-16 Blank	1
1-17	3
1-18 Blank	3
1-19	3
1-20 Blank	3
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1-26 Blank	0
1-27	3
1-28 Blank	3
1-29	0
1-30 Blank	0
1-31	1
1-32 Blank	1
1-33	0
1-34	1
1-35	0
1-36 Blank	0
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1-38 Blank	0
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1-40 Blank	0
2-1	0
2-2	2
2-2A	2
2-2B Blank	2
2-3	2
2-4	3
2-5 - 2-12	0
2-13	1
2-14 - 2-16	3
2-16A Added	3
2-16B Blank Added	3
2-17	3
2-18	0
2-19 - 2-20	3
2-21	1
2-22	0
2-23 - 2-24	3
2-25	5
2-26	3
2-27	5
2-28 - 2-29	3
2-30 - 2-31	0
2-32	1
2-33 - 2-36	0
3-1	0
3-2 - 3-4	1
3-5	0
3-6 - 3-12	1
3-13	6
3-14	1
3-15	3
3-16	1
3-17 - 3-20	0
3-21 - 3-23	1
3-24	0
3-25	1
3-26 - 3-42	0
3-42A	2
3-42B	2
3-43 - 3-48	0
3-49	1
3-50	5
3-51	3
3-52	0
3-53 - 3-55	4
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3-62 - 3-65	0
3-66	1
3-67 - 3-69	0
3-70	1
3-71	0
3-72 - 3-73	3
3-74 - 3-75	0
3-76	1
3-77	4
3-78	0
3-79 - 3-80	4
3-81	3
3-82 - 3-83	4
3-84 - 3-86	0
3-87 - 3-88	3
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1-1	4
1-2	3
1-3	0
1-4 - 1-5	1
1-6	0
1-7	1
1-8 - 1-9	0
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1-40 Blank	0
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2-2	2
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2-2B Blank	2
2-3	2
2-4	3
2-5 - 2-12	0
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2-14 - 2-16	3
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2-16B Blank Added	3
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2-25	5
2-26	3
2-27	5
2-28 - 2-29	3
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2-33 - 2-36	0
3-1	0
3-2 - 3-4	1
3-5	0
3-6 - 3-14	1
3-15	3
3-16	1
3-17 - 3-20	0
3-21 - 3-23	1
3-24	0
3-25	1
3-26 - 3-42	0
3-42A	2
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3-49	1
3-50	5
3-51	5
3-52	0
3-53 - 3-55	4
3-56 - 3-51	1
3-62 - 3-65	0
3-66	1
3-67 - 3-69	0
3-70	1
3-71	0
3-72 - 3-73	3
3-74 - 3-75	0
3-76	1
3-77	4
3-78	0
3-79 - 3-80	4
3-81	1
3-82 - 3-83	4
3-84 - 3-86	0
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1-2	3
1-3	0
1-4 - 1-5	1
1-6	0
1-7	1
1-8 - 1-9	0
1-10	3
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1-30 Blank	0
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1-35	0
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1-40 Blank	0
2-1	0
2-2	2
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2-2B Blank	2
2-3	2
2-4	3
2-5 - 2-12	0
2-13	1
2-14 - 2-16	3
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2-16B Blank Added	3
2-17	3
2-18	0
2-19 - 2-20	3
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2-22	0
2-23 - 2-24	3
2-25	0
2-26	3
2-27	0
2-28 - 2-29	3
2-30 - 2-31	0
2-32	1
2-33 - 2-36	0
3-1	0
3-2 - 3-4	1
3-5	0
3-6 - 3-14	1
3-15	3
3-16	1
3-17 - 3-20	0
3-21 - 3-23	1
3-24	0
3-25	1
3-26 - 3-42	0
3-42A	2
3-42B	2
3-43 - 3-48	0
3-49	1
3-50 - 3-51	3
3-52	0
3-53 - 3-55	4
3-56 - 3-61	1
3-62 - 3-65	0
3-66	1
3-67 - 3-69	0
3-70	1
3-71	0
3-72 - 3-73	3
3-74 - 3-75	0
3-76	1
3-77	4
3-78	0
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3-82 - 3-83	4
3-84 - 3-86	0
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3-89 - 3-93	0
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3-99	4	4-15 - 4-16	1
3-100 - 3-110	0	4-17	0
3-111	1	4-18 - 4-22	1
3-112 - 3-122	0	4-23 - 4-27	0
3-123	1	4-28 - 4-29	0
3-124 - 3-128	0	4-30 - 4-35	0
3-129 - 3-130	2	4-36 - 4-37	1
3-130A	2	4-38 - 4-41	0
3-130B Blank	2	4-42	1
3-130C	2	4-43 - 4-44	0
3-130D Blank	2	4-45	1
3-131 - 3-132	2	4-46 - 4-48	0
3-132A	2	4-49	1
3-132B Blank	2	4-50 - 4-51	0
3-133 - 3-135	0	4-52 Blank	0
3-136 Blank	0	5-1	0
4-1 - 4-2	1	5-2	1
4-2A	1	A-1 - A-3	0
4-2B Blank	1	A-4 Blank	0
4-3 - 4-4	1	B-1 - B-7	0
4-4A	1	B-8	1
4-4B Blank	1	C-1 - C-30	0
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MEP007AWM	WHEEL MOUNTING KIT	6115-00-463-9089

Consolidated Diesel Electric Company
Contract Number F04606-70-D-0192
This publication incorporates PCN numbers 1 through 1069.

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15 JUNE 1973
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viii	2
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x	2
xi	3
xii	0
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3-78	0
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3-84 - 3-86	0
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3-130C	2
3-130D Blank	2
3-131 - 3-132	2
3-132A	2
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AIR FORCE	T.O. 35C2-3-442-1
ARMY	TM5-6115-457-12
NAVY	NAVFAC P-8-627-12
MARINE CORPS	TM-07464A-12

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL

SKID MTD., 100 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP007A	UTILITY	50/60	6115-00-133-9101
MEP106A	PRECISE	50/60	6115-00-133-9102
MEP116A	PRECISE	400	6115-00-133-9103

INCLUDING OPTIONAL KITS

DOD MODELS	NOMENCLATURE	NSN
MEP007AWF	WINTERIZATION KIT, FUEL BURNING	6115-00-463-9082
MEP007AWE	WINTERIZATION KIT, ELECTRIC	6115-00-463-9084
MEP007ALM	DUMMY LOAD KIT	6115-00-463-9086
MEP007AWM	WHEEL MOUNTING KIT	6115-00-463-9089

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1-26 Blank	0	3-15	2	3-124 - 3-128	0
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A-4 Blank	0
B-1 - B-7	0
B-8	1
C-1 - C-30	0
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ARMY TM5-6115-457-12
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MEP007AWE	WINTERIZATION KIT, ELECTRIC	6115-00-463-9085
MEP007ALM	DUMMY LOAD KIT	6115-00-463-9086
MEP007AWM	WHEEL MOUNTING KIT	6115-00-463-9089

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1-39	0	3-112 - 3-122	0
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SAFETY PRECAUTIONS

BEFORE OPERATION

Do not operate the generator set in an enclosed area unless the exhaust gases are piped to the outside. Inhalation of exhaust fumes may result in serious illness or death.

Do not smoke or use an open flame in the vicinity of batteries when servicing. Batteries generate hydrogen, a highly explosive gas. When removing batteries, remove both negative cables before removing positive cables.

Do not operate the generator set unless the ground terminal stud has been connected to a suitable ground. Electrical faults in the generator set, load lines, or load equipment can cause death by electrocution from contact with an ungrounded system.

When filling fuel tank, always provide metal-to-metal contact between fuel container nozzle and fuel tank to prevent sparks from static electricity.

Do not use a lifting device with a capacity of less than 10,000 pounds. Do not allow the generator set to swing while it is suspended. Failure to observe this warning may result in serious injury or death to personnel.

Before making connections for parallel operation, make sure the generator sets are not operating, or in a standby mode, and that all switches are off.

DURING OPERATION

Do not attempt to change a load connection or perform maintenance on the generator set while it is in operation. Always make sure generator set is not connected to an energized line before performing maintenance. The voltage generated by this equipment can cause death by electrocution. Under no circumstance should any person service, adjust or perform maintenance on high voltage equipment without the presence of someone who is capable of rendering aid.

AFTER OPERATION

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

If radiator cap must be removed while coolant is hot, then remove slowly with caution as hot coolant may escape causing severe burns.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. SCOPE.

a. This technical manual contains instructions for use by operation and organizational maintenance personnel maintaining the 100 KW, Diesel Engine Generator Sets, Military Models MEP007A, MEP106A, and MEP116A as allocated by the Maintenance Allocation Chart. The instructions provided cover operation, lubrication, preventive maintenance checks and services, and maintenance procedures within the scope of the operator and organizational maintenance personnel for the generator sets, their accessories, and auxiliaries.

b. THIS TECHNICAL MANUAL IS USED BY THE ARMY, AIR FORCE, NAVY, AND MARINE CORPS. THE USE OF FORMS AND COMPLIANCE WITH DIRECTIVES AS STATED HEREIN WILL BE ACCOMPLISHED ONLY BY PERSONNEL OF THE SERVICE TO WHICH THEY APPLY.

1-2. FORMS AND RECORDS.

a. Forms and records used by the Army will be only those prescribed by TM 38-750. Those used by the Marine Corps will be those prescribed by TM4700-15/1. Other Service users should refer to appropriate specifications/publications for equipment maintenance forms and records.

b. Report of errors, omissions and recommendations for improvements of this publication by the individual users is encouraged. Reports should be submitted as follows:

1. Air Force - AFTO Form 22 in accordance with T.O. 00-5-1 and direct to: Commander, Sacramento Air Logistics Center, ATTN: MMEDT, McClellan AFB, California 95652.

2. Army - DA Form 2028 direct to: Commanding General, U.S. Army Troop Support and Aviation Material Readiness Command, ATTN: DRSTS-MTP, 4300 Goodfellow Blvd., St. Louis, Missouri 63120.

3. Marine Corps - by letter direct to: Commandant, U.S. Marine Corps, ATTN: Code LME, Washington, D. C. 20380.

4. Navy - by letter direct to: Commanding Officer, U.S. Navy Ships Parts Control Center, ATTN: Code 783, Mechanicsburg, Pennsylvania 17055.

1-2A. TIME COMPLIANCE TECHNICAL ORDERS.

This technical manual incorporates the Time Compliance Technical Order (TCTO) 35C2-3-442-503; dated 15 July 1977; Modification of Generator Set DED 100 KW, 400 Hz, DOD Model ME P116A for compatability with E3A-AWACS program (EC P76CE2122).

Section II. DESCRIPTION AND DATA

1-3. DESCRIPTION.

a. Generator sets, military models: MEP007A, MEP006A and MEP116A (figures 1-1 and 1-2) are multi-purpose, portable skid-mounted, self-contained units. Each set is equipped with engine oil pan heating elements and connections

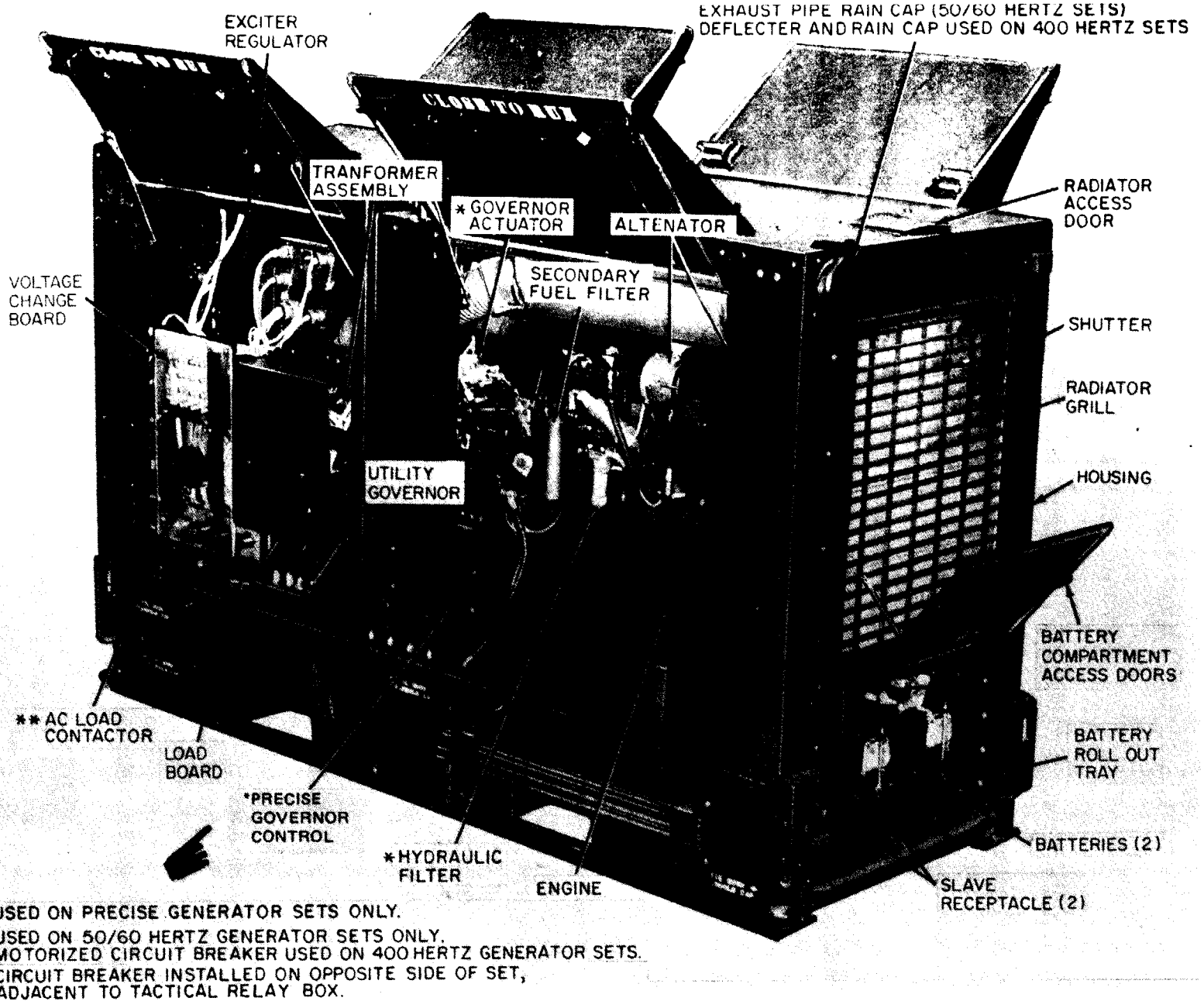


Figure 1-1. Generator set, front three-quarters view

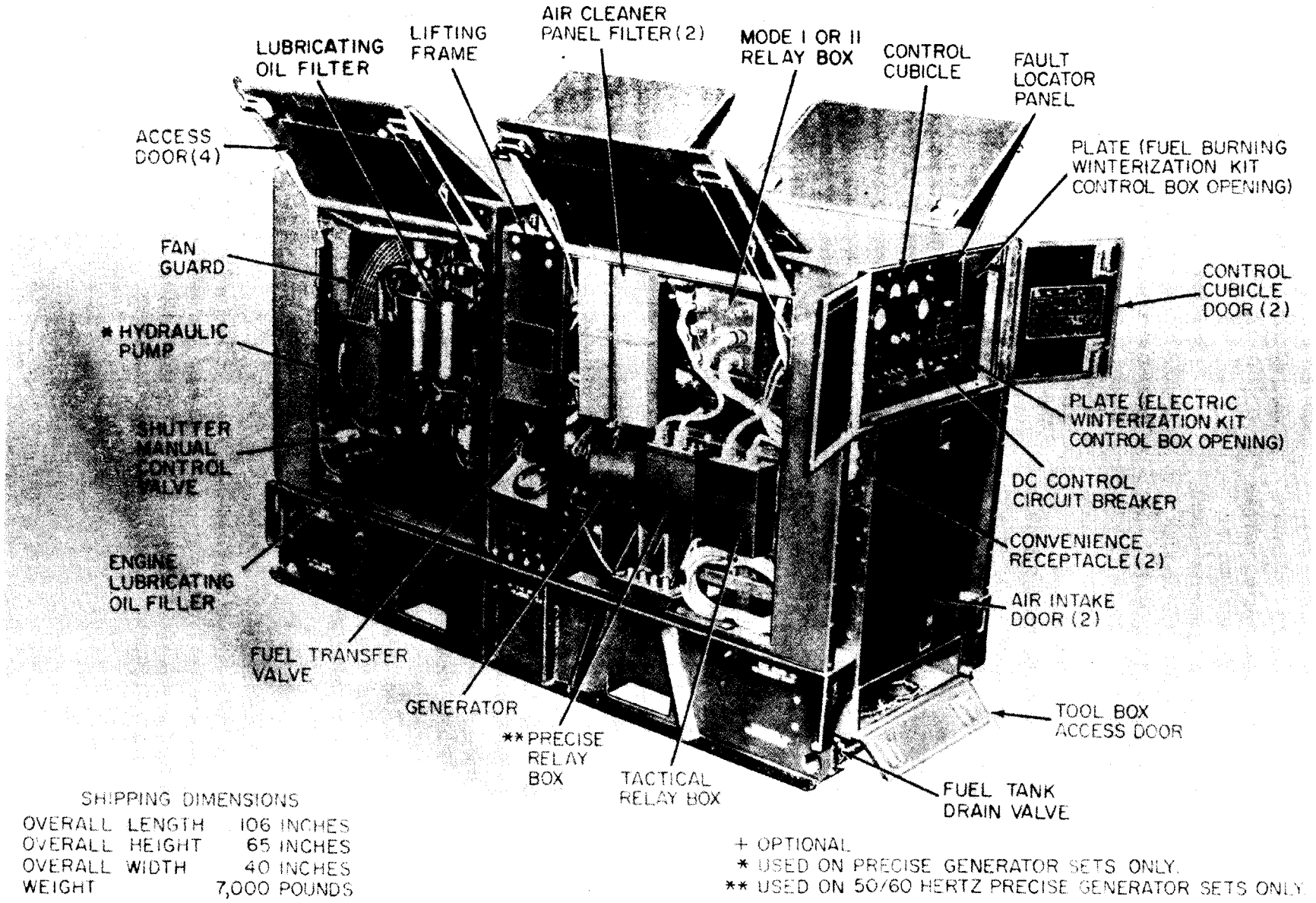


Figure 1-2. Generator set, rear three-quarters view

for field installation ofwinterization kits. The generator sets are provided with controls, instruments, and accessories necessary for operation as a single unit or for parallel operation with other generator sets of the same class and mode. These sets may be mounted on trailers or wheel mounted on kits provided.

b. In addition, the generator sets have been designed to accept a variety of kits to extend their capabilities. Automatic transfer and standby panels are available to provide the capacity to monitor primary power and to automatically start the set in the event of primary power failure. Other items available are: winterization kits, dummy load kits, remote control boxes and wheel mounting kits.

1-4. IDENTIFICATION AND TABULATED DATA.

a. IDENTIFICATION. The generator set has seven major identification or instruction plates.

1. Generator Set Identification Plate. Located on upper right side of rear housing. Specifies model number, federal stock number, serial number, registration number, technical manual number, dry weight, length, width, height, date manufactured, contract number, warranty date, inspection data, inspection stamp, and manufacturer of the generator set.

2. Generator Identification Plate. Located on generator end bell. Specifies make, model, serial number, voltage rating, kilowatt rating, kilovolt ampere rating, ampere rating, frequency rating, power factor, phase, revolutions per minute, and manufacturer of the generator.

3. Generator Set Rating Plate. Located on upper right side of rear housing. Specifies kilowatt capacity of generator set at sea level, 5000, 6000, and 8000 feet altitude; hertz rating; rated voltage and phases at each connection; voltage adjustment range; power factor; and type, class, mode, and size of generator set.

4. Operating Instruction Plate. Located on inside left control panel door. Contains complete but brief instructions for: starting, stopping, operation, and parallel operation. It also identifies types and capacities of engine lubricant and fuel, radiator coolant, and hydraulic oil (precise generator sets) for various temperature ranges.

5. Fuel System Diagram Plate. Located on inside of right control panel door. Contains a schematic diagram of the fuel system and instructions for operating from the generator set fuel tank or an auxiliary fuel supply.

6. Battery Connection Plate. Located on inside of battery compartment door. Contains a schematic diagram showing battery cable connections and instructions for removing and installing the batteries.

7. Lifting and Tiedown Instruction Plate. Located left side of lifting frame. Contains lifting and tiedown diagram and instructions.

b. TABULATED DATA

1. Generator Set Manufacturer — Consolidated Diesel Electric Company

Model	Mode	Class
MEP007A	50/60 Hertz	Utility
MEP106A	50/60 Hertz	Precise
MEP116A	400 Hertz	Precise

Operating temperature range	
without external heat	+125°F to -25°F
with external heat	+125°F to -65°F
Voltage output	120/208 volts and 240/416 volts, 3 phase, 4 wire
Voltage adjustment	60 Hz 120/208 volts 197-240 volts 240/416 volts 395-480 volts 50 Hz 120/208 volts 190-213 volts 240/416 volts 380-426 volts
Power factor	0.8
Capacities	
fuel system	90 gallons
cooling system	11 gallons
hydraulic system (precise sets only)	6.5 quarts
Dimensions and weights	
overall length	106 inches
overall width	40 inches
overall height	65 inches
net weight empty	6680 pounds
net weight filled	7500 pounds
shipping weight	6680 pounds

2. Engine

Manufacturer	Caterpillar Tractor Company
Model	D333C(T)
Type	four stroke cycle, liquid cooled, turbo charged, diesel
Number of cylinders	six
Displacement	638 cubic inches
Horsepower	170 @ 1800 RPM
Rotation	Counterclockwise from flywheel end
Lubricating oil capacity	30 quarts

3. Generator

Manufacturer	Lima Electric Motor Company
Type	synchronous, brushless alternator with integral exciter
Operating speed	
50 hertz	1500 RPM
60 hertz	1800 RPM
400 hertz	2000 RPM
Kilowatt rating (KW)	
50 hertz	83.3
60 and 400 hertz	100
Kilovolt ampere rating (KVA)	
50 hertz	104
60 and 400 hertz	.125
Amperage (3 phase)	
50 hertz	
120/208 volts	288
240/416 volts	144
60 and 400 hertz	
120/208 volts	346
240/416 volts	173

4. Exciter Regulator (Voltage)

Manufacturer	Consolidated Diesel Electric Company
Type	solid state, magnetic exciter field regulator
Voltage regulation	
precise sets	1 percent of rated voltage
utility sets	3 percent of rated voltage
Voltage stability	
short term (30 seconds)	
precise sets	within bandwidth equal to 1 percent of rated voltage
utility sets	within bandwidth equal to 2 percent of rated voltage
long term (4 hours)	
precise sets	within bandwidth equal to 2 percent of rated voltage
utility sets	within bandwidth equal to 4 percent of rated voltage

Voltage drift (8 hours)	1 percent
Transient performance (application or rejection of load)	
Resumption of steady state condition:	
precise sets	within 0.5 second
utility sets	within 3 seconds
Overshoot and undershoot	
precise sets (50/60 hertz)	15 percent of rated voltage
precise sets (400 hertz)	12 percent of rated voltage
utility sets	20 percent of rated voltage

5. Precise Governor

Manufacturer	Electromagnetic Industries, Incorporated
Type	solid state - frequency and load sensing, electronic control, hydraulic actuated
Frequency regulation	isochronous +1/4 of 1 percent
Frequency adjustment	Precise 60 Hz 58-62 Hz Precise 50 Hz 48-52 Hz 400 Hz 390-420 Hz
Frequency stability	
short term (30 sec ends)	within bandwidth equal to 1/2 to 1 percent of rated frequency
long term (4 hours)	within bandwidth equal to 1 percent of rated frequency
Frequency drift (8 hours)	1/2 of 1 percent
Transient performance (application or rejection of load)	
stable operation	within 2 seconds
undershoot	4 percent of rated frequency
overshoot	3 percent of rated frequency

6. Utility Governor

Manufacturer	Woodward Governor Company
Type	hydraulic speed droop
Frequency regulation	adjustable from 2 to 3 percent of rated frequency
Frequency stability	
short term (30 seconds)	within bandwidth equal to 2 percent of rated frequency
long term (4 hours)	within bandwidth equal to 3 percent of rated frequency

Frequency drift (8 hours)	1 percent
Transient performance (application or rejection of load)	
stable operation	within 2 seconds
overshoot	4 percent of rated frequency
undershoot	3 percent of rated frequency

7. Starter Motor

Manufacturer	The Prestolite Company
Type	heavy duty
Operating voltage	24 VDC

8. Battery Charging Alternator

Manufacturer	Motorola Automotive Product Incorporated
Type	alternator with integral voltage regulator
Rating	35 amperes at 24 VDC

9. Batteries

Military Standard	MS35000-3
Type	6TN
Quantity	2
Connection	series
Ground	negative

10. Fuel Transfer Pumps

DOD Source Cont. Drawing	72-5313
Quantity	2
Operating Voltage	24 VDC
Rating	25 GPH at 7 PSIG

11. Fuel Filters and Strainer Assembly

Manufacturer	Fram Corporation
Type	line filter
Filter element	10 micron
Strainer element	40 micron

12. Secondary Fuel Filter

Manufacturer	AC Spark Plug Company
Type	line filter
Element	5 micron

13. Engine Lubricating Oil Filter

Manufacturer	Caterpillar Tractor Company
Type	line filter
Element (two)	25 micron

14. Hydraulic Filter

Manufacturer	Bendix Filter Division
Type	line filter
Element	10 micron
Bypass valve cracking pressure	50 ± 5 PSIG

15. Air Cleaner Panel Filters (two)

Manufacturer	Donaldson Company, Inc.
Type	dry panel
Filters	10 micron

16. Fuel Burning Winterization Kit (optional)

Manufacturer	Consolidated Diesel Electric Company
Type	fuel burning, thermostatic control, coolant heating
Normal operating temperature	-25°F to -65°F
Operating voltage	24 VDC
Duty cycle	continuous
Rating	30,000 BTU/HR

17. Electric Winterization Kit (optional)

Manufacturer	Consolidated Diesel Electric Company
Type	resistive element, thermostatic control, coolant heating
Normal operating temperature	-25°F to -65°F
Operating voltage	205 to 240 volts, single phase, 50/60 or 400 hertz
Duty cycle	continuous
Rating	2500 watts

18. Dummy Load Kit (optional)

Manufacturer	Consolidated Diesel Electric Company
Type	Resistive, 3 phase, 4 wire
Voltage	120/208 and 240/416
Kilowatt rating (KW)	48
Increments of change	12 KW

19. Wheel Mounting Kit (optional)

Manufacturer	Consolidated Diesel Electric Company
Rating	8000 pounds
Towing speed	
Paved surfaces	10 MPH
Graded gravel	5 MPH
Parking brake	mechanical
Steering angle	40 degrees
Tires	
Size	7.50 x 10
Type'	Industrial Rib Tire, 10 Ply rating
Pressure	85 PSIG

c. DIAGRAMS AND TABLES.

1. Troubleshooting Diagrams 50/60 Hertz Generator Sets. Figure 1-3 is the AC system troubleshooting diagram and figure 1-4 is the DC system troubleshooting diagram for 50/60 hertz generator sets.

2. Troubleshooting Diagrams 400 Hertz Generator Sets. Figure 1-5 is the AC system troubleshooting diagram and figure 1-6 is the DC system troubleshooting diagram for 400 hertz generator sets.

3. Interconnecting Wiring Diagrams. Figure 1-7 is the interconnecting wiring diagram for 50/60 hertz generator sets and figure 1-8 is the interconnecting wiring diagram for 400 hertz generator sets.

4. Fuel System Diagram. Figure 1-9 shows the fuel system diagram for the generator sets.

5. Fuel Burning Winterization Kit Wiring Diagram. Figure 1-10 shows the wiring diagram for the fuel burning winterization kit.

6. Electric Winterization Kit Wiring Diagram. Figure 1-11 shows the wiring diagram for the electric winterization kit.

7. Dummy Load Kit Wiring Diagram. Figure 1-12 shows the wiring diagram for the dummy load kit.

8. Torque Data. Table 1-1 lists components that require special torque.

9. Maintenance and Operating Supplies. Refer to Appendix B for a complete list of Maintenance and Operating Supplies required for initial operation.

1-5. DIFFERENCE IN MODELS.

This manual covers generator sets model MEP007A, MEP106A, and MEP116A. Model MEP007A is a 50/60 hertz utility set, model MEP106A is a 50/60 hertz precise set, and model MEP116A is a 400 hertz precise set. The difference between precise and utility 50/60 hertz and 400 hertz generator sets are noted in the appropriate paragraphs throughout the manual. In brief, the differences between the sets are that precise generator sets have an additional electro-hydraulic governing system and they utilize various relay boxes depending on class and mode. In addition, the 400 hertz precise set incorporates a motorized circuit breaker in place of the contactor assembly and an additional

expanded scale voltmeter to facilitate paralleling. The following identifies the different components and the generator set with which they are utilized (see table 1-2).

NOTE

MEP007A, MEP106A and MEP116A generator sets utilize the D333C(T) engine. At time of engine replacement, the D333C(T) engine is to be used until stock of these engines is exhausted; at which point the D3306(T) engine will be used. Model MEP007A and MEP106A generator sets using the D3306(T) engine are classified MEP007B; and model MEP116A generator sets using the D3306(T) engine are classified MEP116B. Support for B model generator sets will be covered in separate technical manuals.

a. ELECTRO-HYDRAULIC GOVERNING SYSTEM. The electro-hydraulic governing system consists of a hydraulic tank, pump, filter, actuator, and electronic control unit. It provides isochronous frequency regulation to supply precise power for critical loads.

NOTE

The precise relay box must be installed in utility sets if the remote start box is installed.

b. PRECISE RELAY BOX. The precise relay box is utilized on 50/60 hertz precise generator sets. It contains under frequency, under voltage, and permissive paralleling protective devices, the frequency selector switch, and precise governor control components.

c. MODE I RELAY BOX. The mode I relay box is utilized on all 50/60 hertz generator sets. It contains voltage regulator paralleling control, and precise relay box connector and shorting plug.

d. MODE II RELAY BOX. The mode II relay box is utilized on 400 hertz generator sets. It contains under frequency, under voltage, permissive paralleling protective devices, precise governor control components and voltage regulator parallel control.

e. MOTORIZED CIRCUIT BREAKER ASSEMBLY. The motorized AC circuit breaker is utilized on 400 hertz generator sets in place of the load contactor.

f. DC CONTROL CIRCUIT BREAKER AND EXPANDED SCALE VOLTMETER. The dc control circuit breaker is packaged with an expanded scale voltmeter on 400 hertz generator sets. The expanded scale voltmeter reads generator output, voltage or bus voltage as a function of a selector switch. The meter facilitates parallel operation. The de circuit breaker configuration is the same as that used on 50/60 hertz generator sets wherein it is packaged without the voltmeter.

Table 1-1. Special Torque Data

COMPONENT	TORQUE VALUE
LUBRICATING OIL FILTER	
Drain plugs	100 ± 15 foot pounds
Valve assemblies	50 ± 15 foot pounds
ENGINE	
Mounting screws	200 foot pounds
Valve cover assembly screws	8 ± 2 foot pounds.
Alternator mounting plate nuts	17 ± 3 foot pounds
TURBO CHARGER	
Support mounting nuts	40 ± 4 foot pounds
Clamp nuts	10 foot pounds
HYDRAULIC FILTER	
Bowl	75 inch pounds
GENERATOR	
Mounting screws	600 foot pounds

Table 1-2. Model Differences

MODE L	CLASS	MODE	OUTPUT FREQUENCY	GOVERNING SYSTEM	COMPONENTS
MEP007A	Tactical Utility	I	50/60 HZ	Hydraulic	Mode I Relay Box
MEP106A	Tactical Precise	I	50/60 HZ	Electro-Hydraulic	Precise Relay Box Mode I Relay Box
MEP116A	Tactical Precise	H	400 HZ	Electro-Hydraulic	Mode H Relay Box
			400 HZ	AC Output	Motorized Circuit Breake
			400 HZ	DC Control	DC Control Circuit Breaker and Expanded Scale Voltmeter Assembly

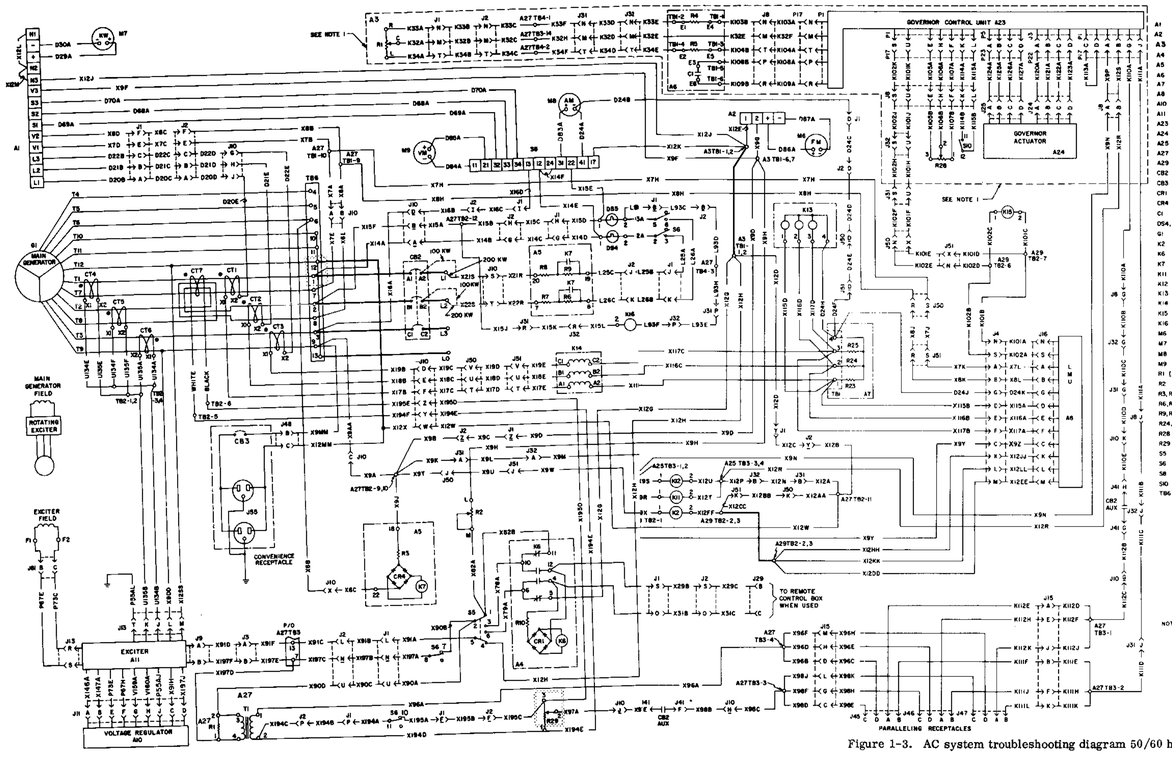


Figure 1-3. AC system troubleshooting diagram 50/60 hertz generator sets

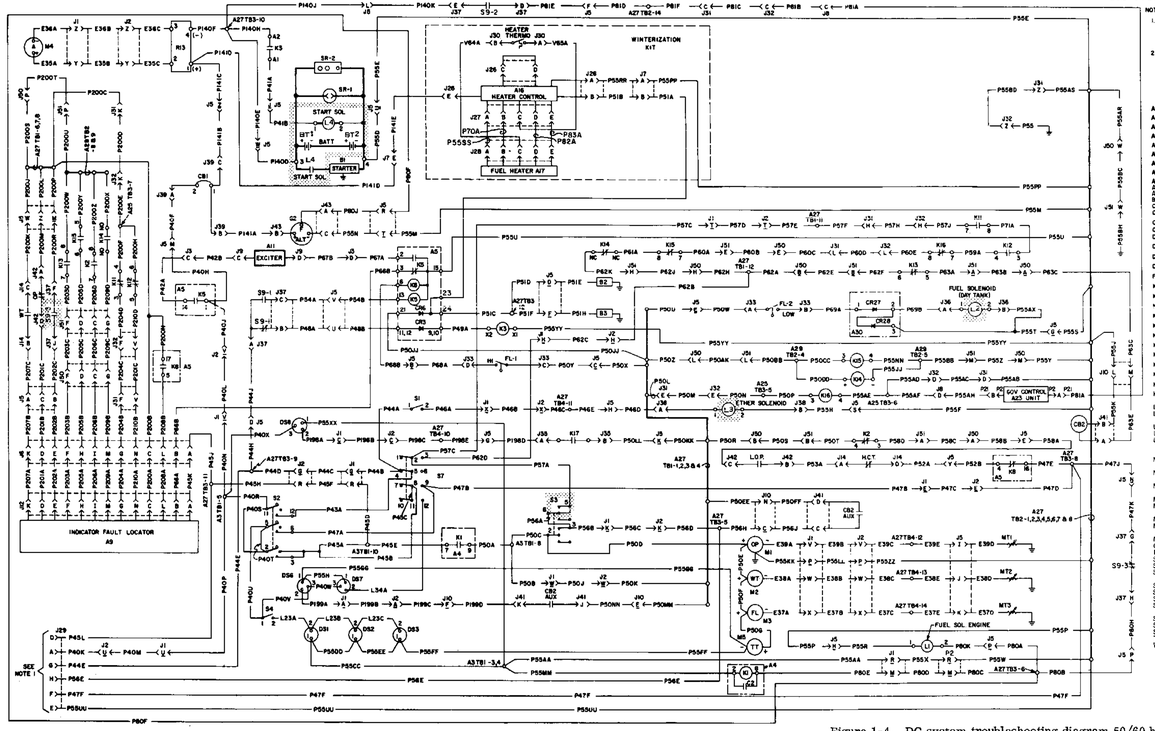


Figure 1-4. DC system troubleshooting diagram 50/60 hertz generator sets

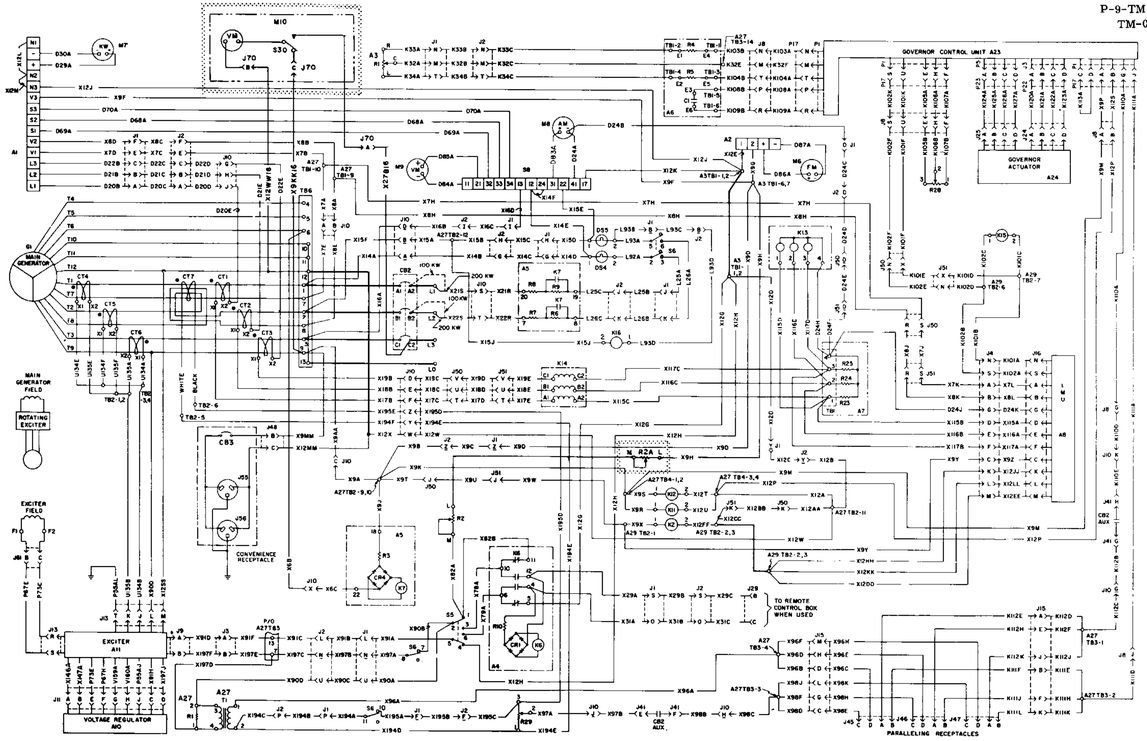


Figure 1-5. AC system troubleshooting diagram 400 hertz generator sets

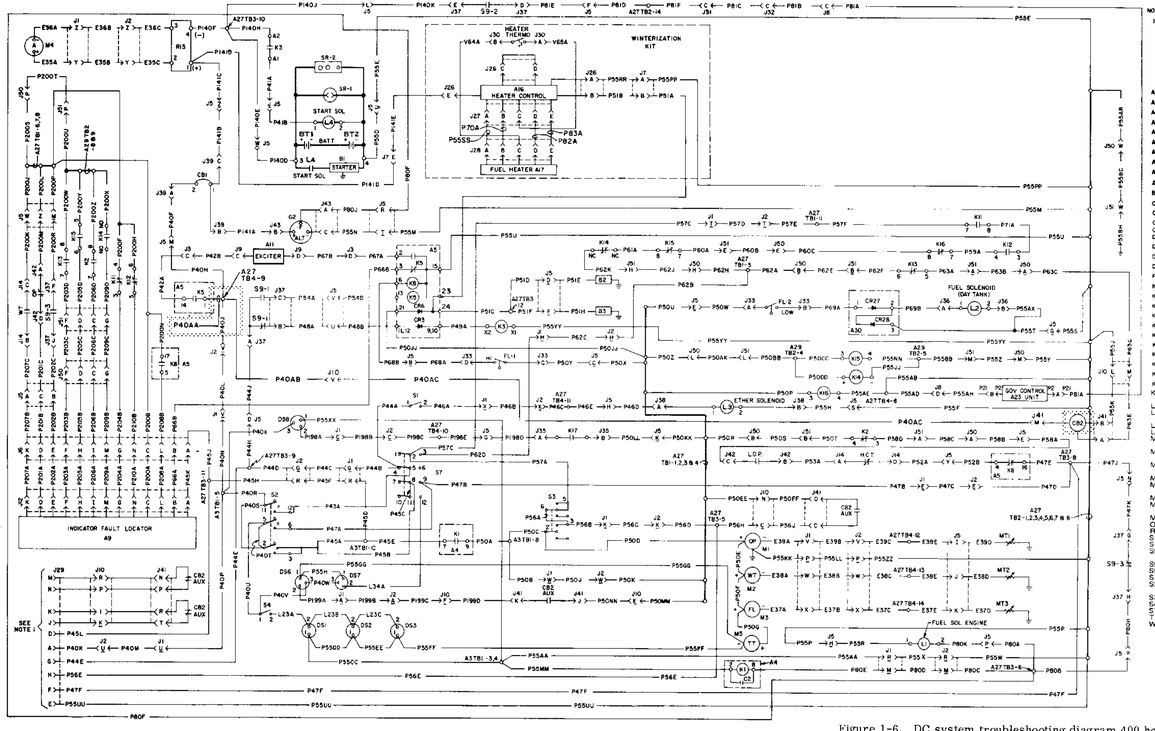


Figure 1-6. DC system troubleshooting diagram 400 hertz generator sets

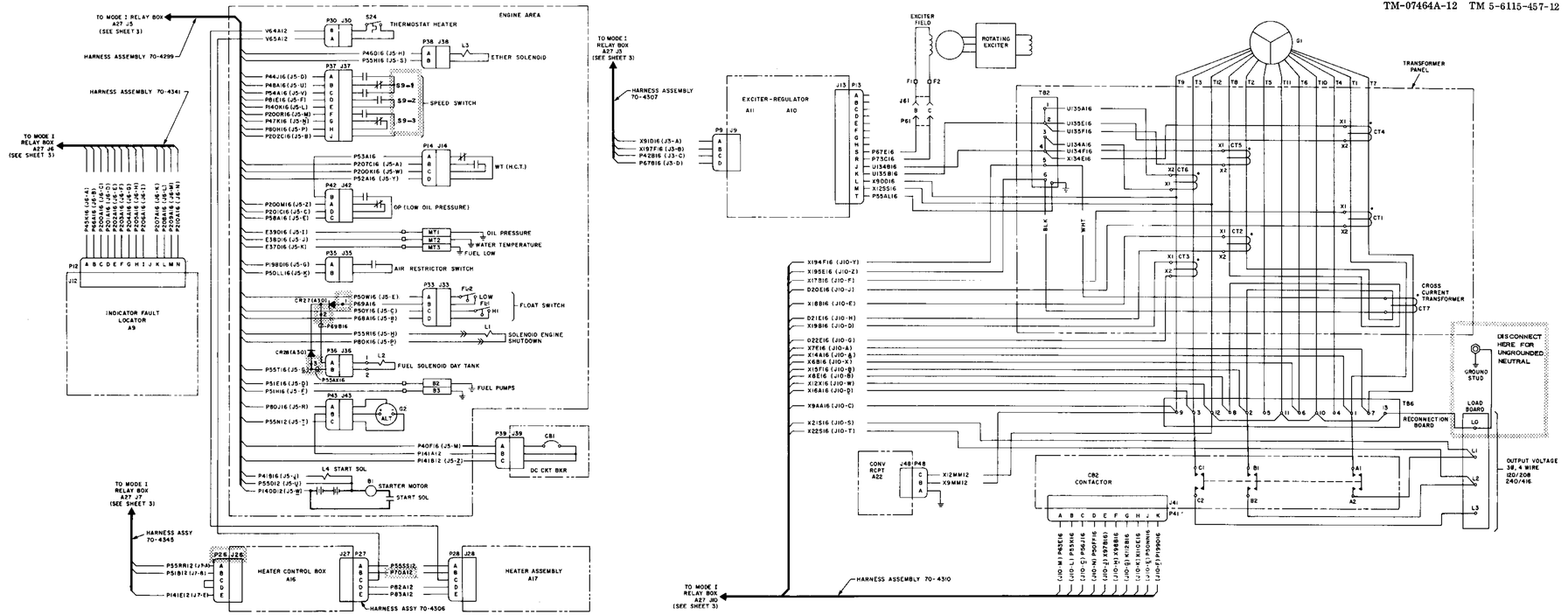


Figure 1-7. Interconnecting wiring diagram 50/60 hertz generator sets (sheet 1 of 3)

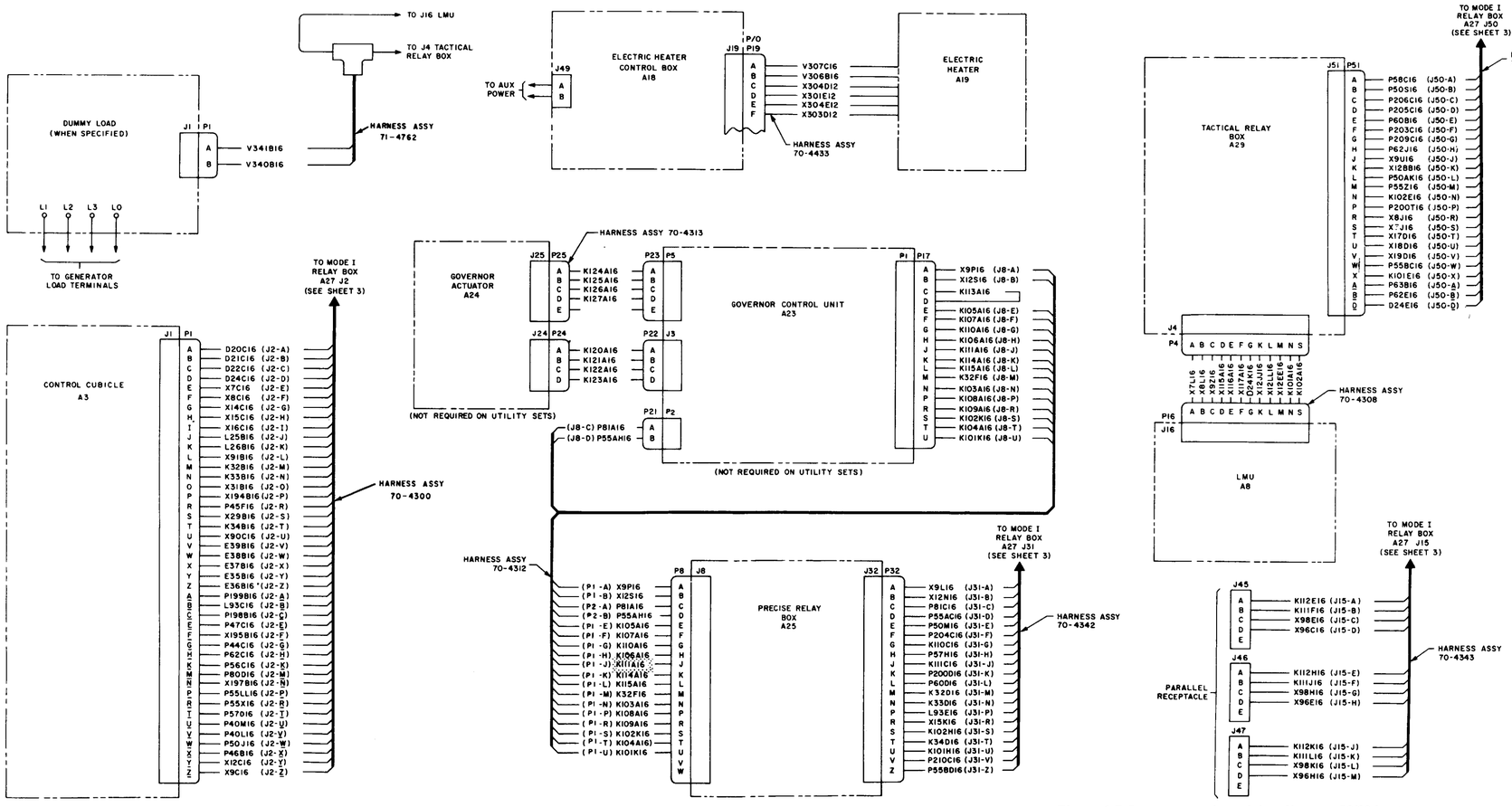


Figure 1-7. Interconnecting wiring diagram 50/60 hertz generator sets (sheet 2 of 3)

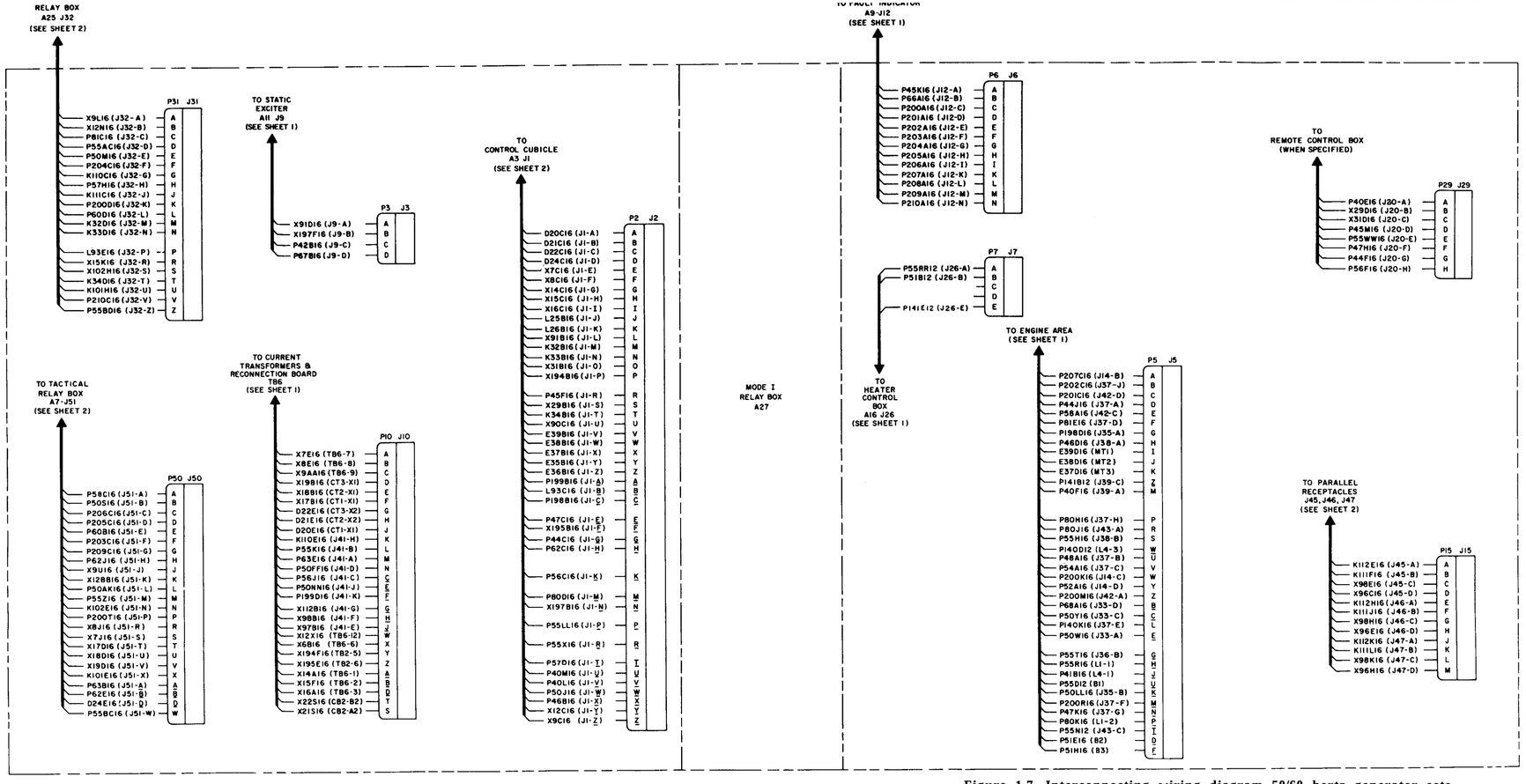
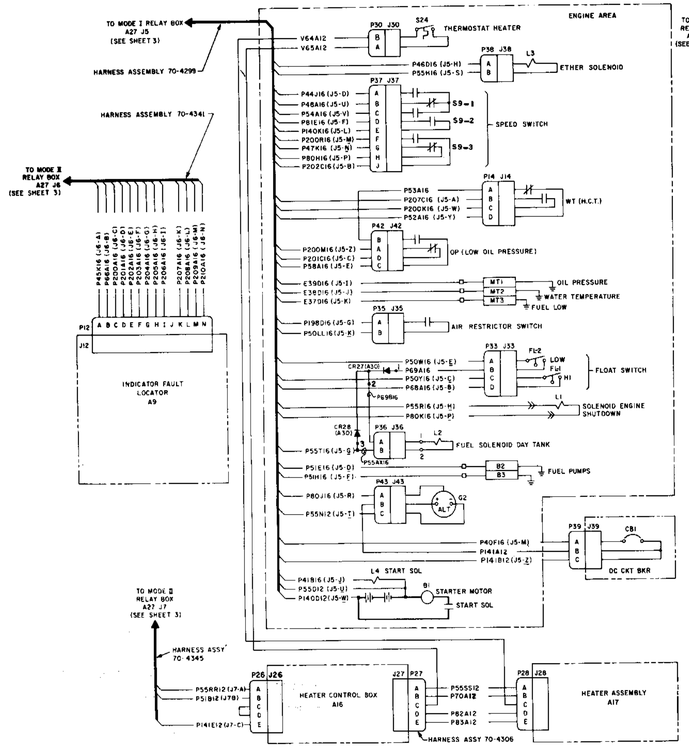


Figure 1-7. Interconnecting wiring diagram 50/60 hertz generator sets (sheet 3 of 3)



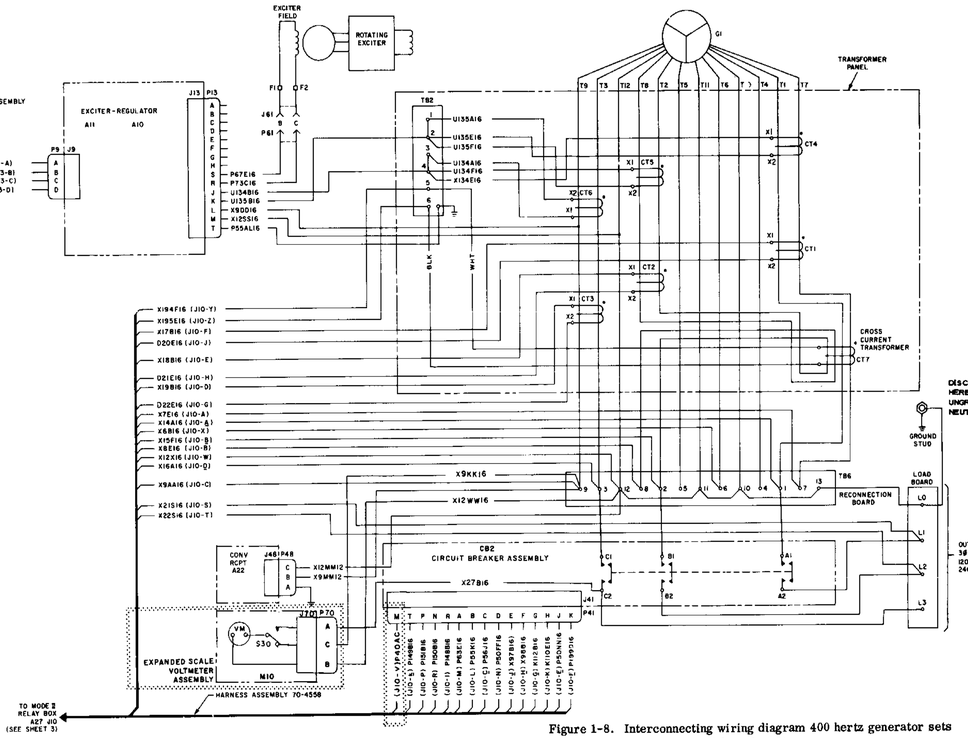


Figure 1-8. Interconnecting wiring diagram 400 hertz generator sets (sheet 1 of 3)

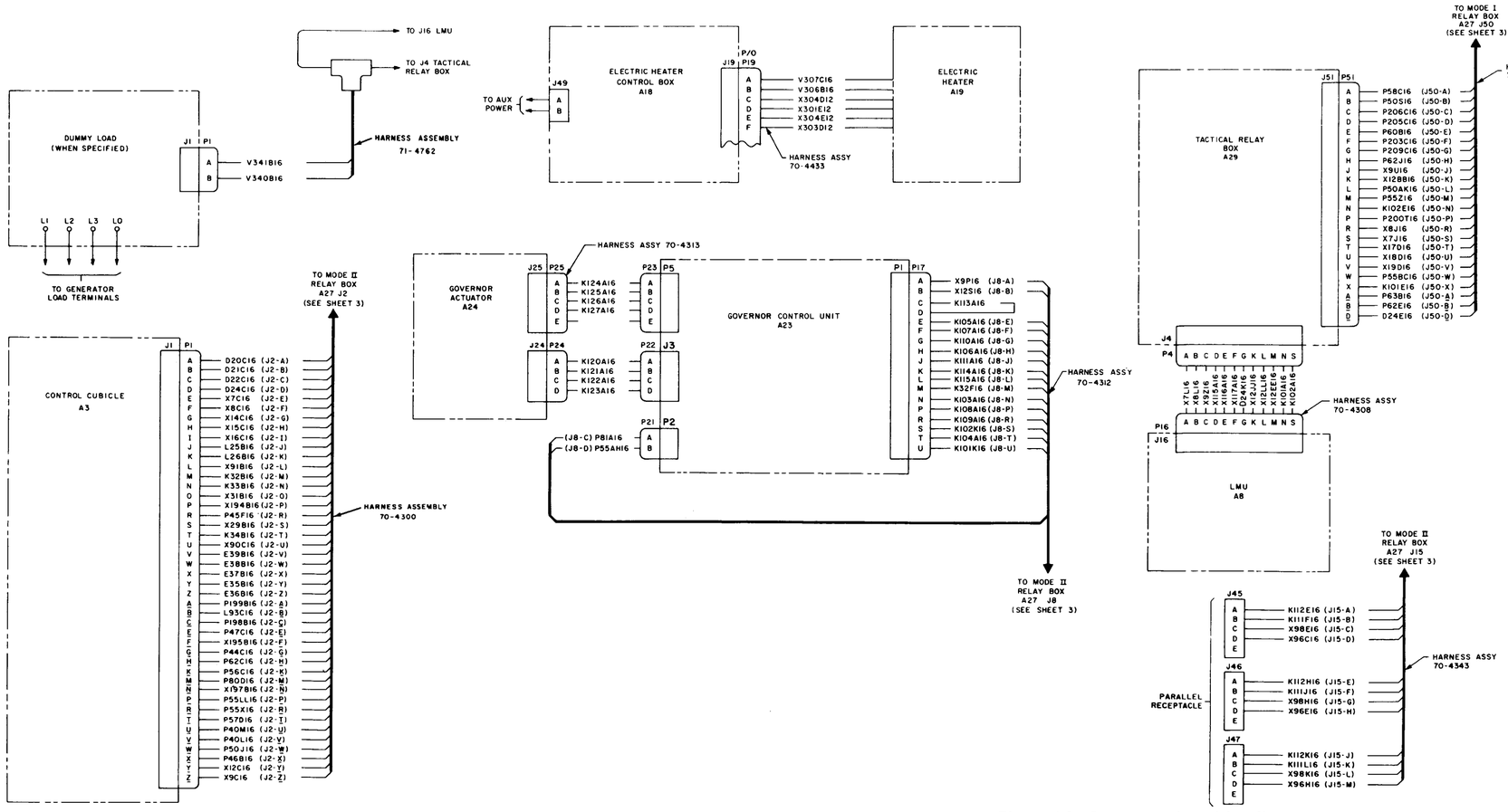


Figure 1-8. Interconnecting wiring diagram 400 hertz generator sets (sheet 2 of 3)

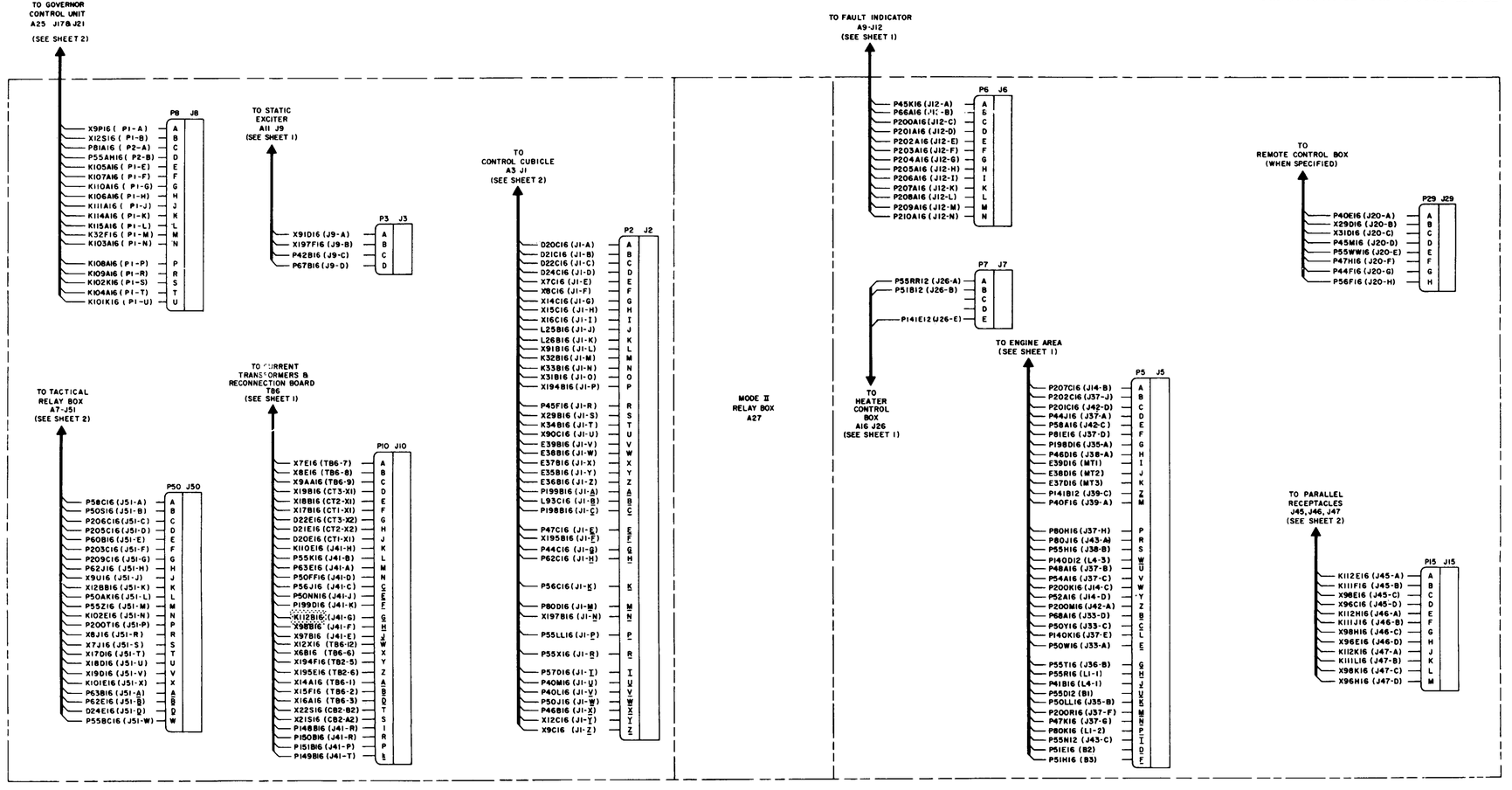


Figure 1-8. Interconnecting wiring diagram 400 hertz generator sets (sheet 3 of 3)

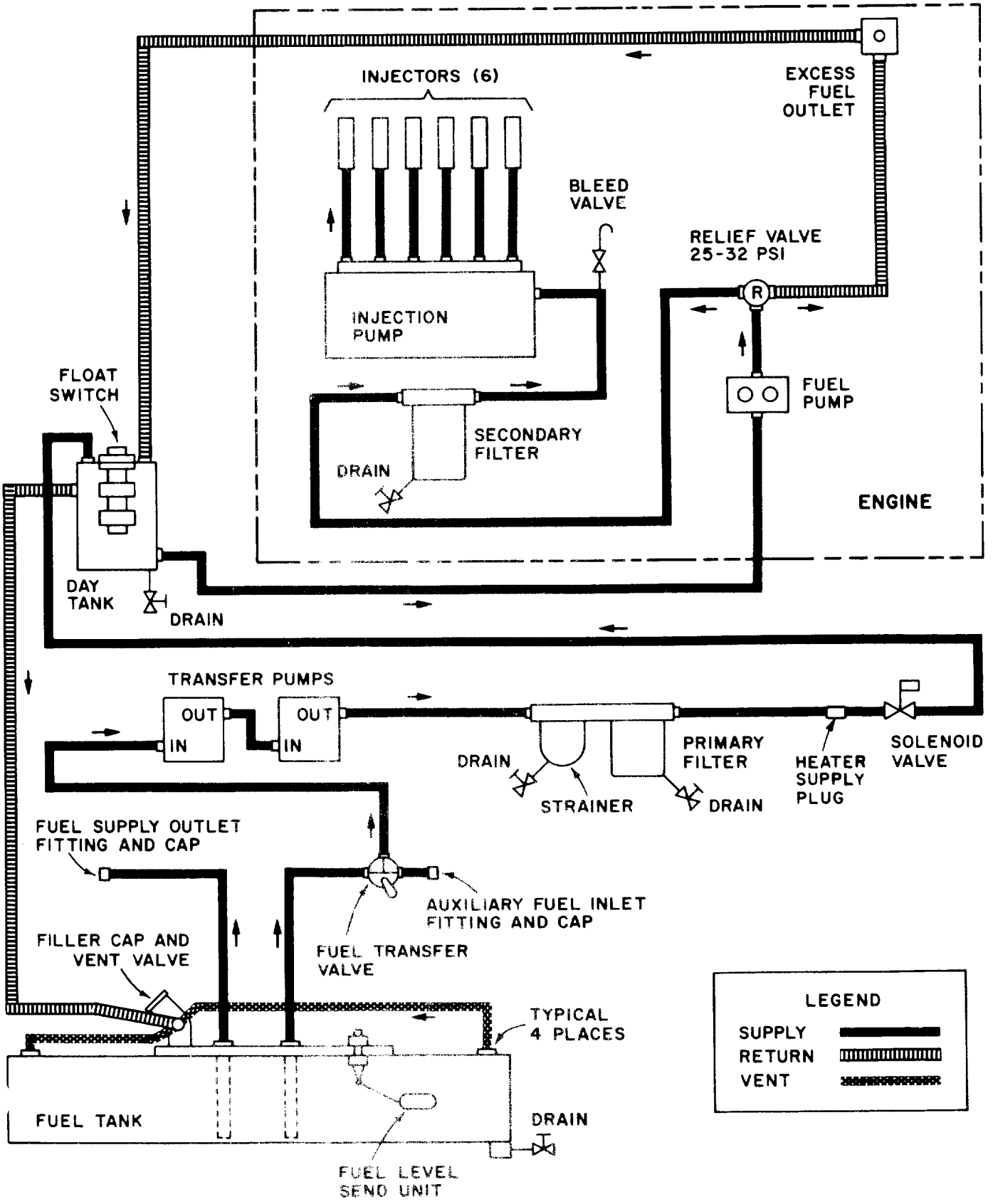


Figure 1-9. Generator set fuel system diagram

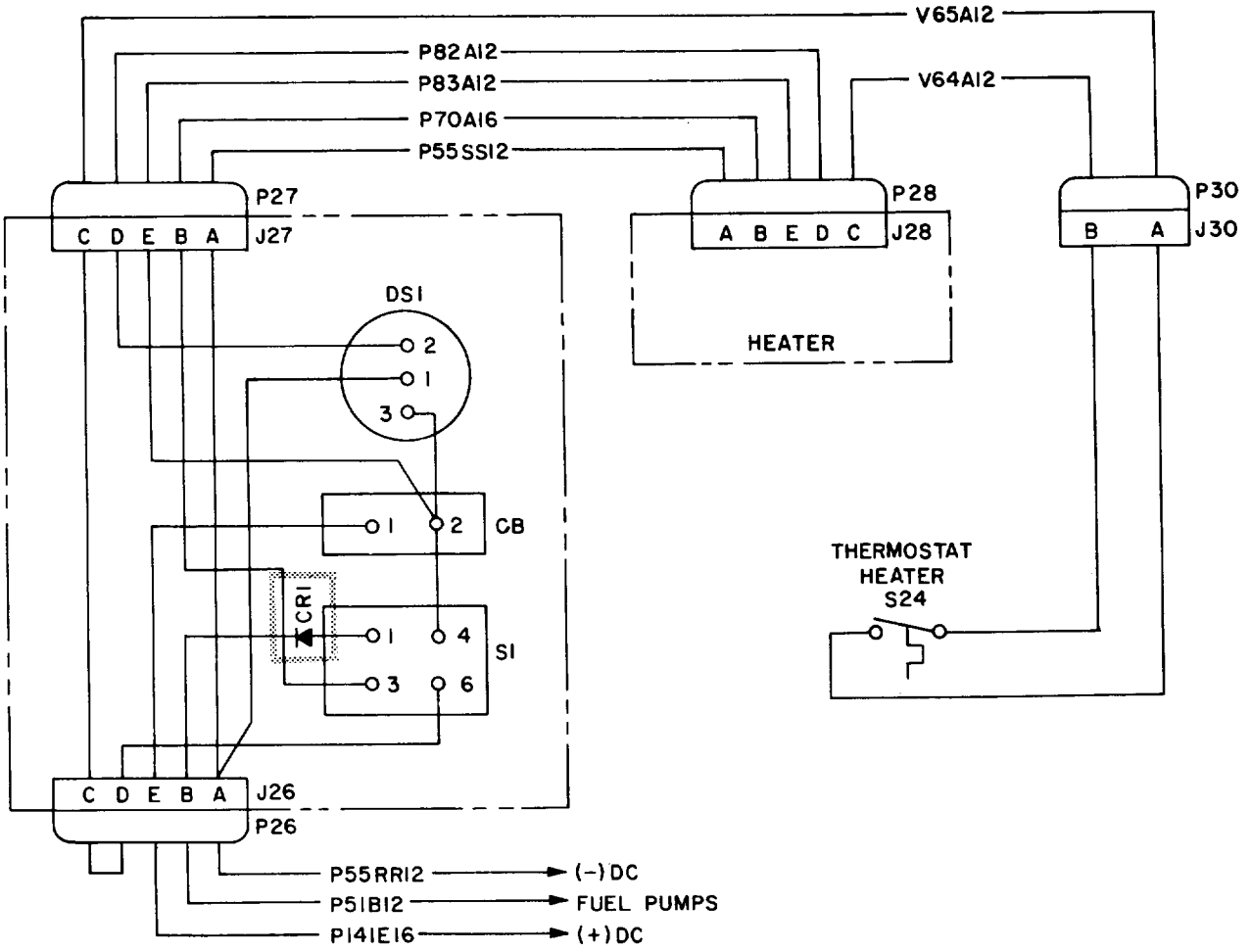


Figure 1-10. Fuel burning winterization kit wiring diagram

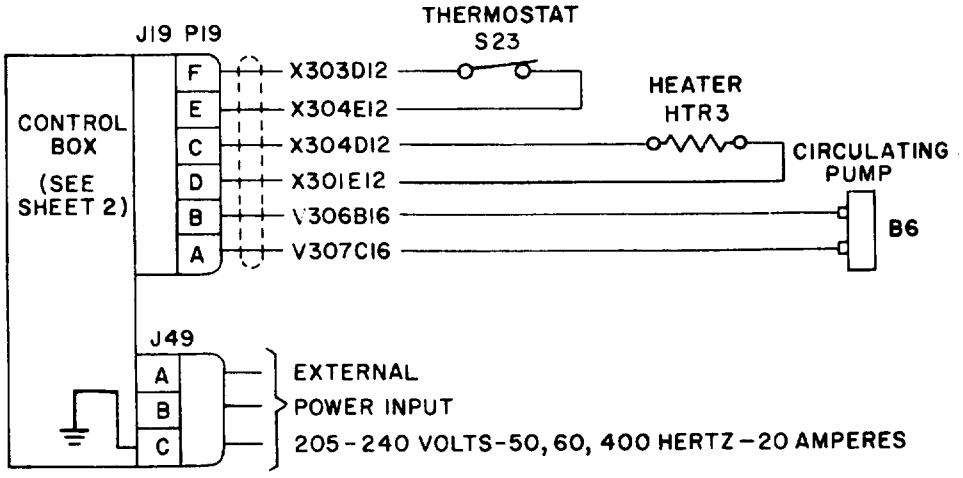


Figure 1-11. Electric winterization kit wiring diagram
(sheet 1 of 2)

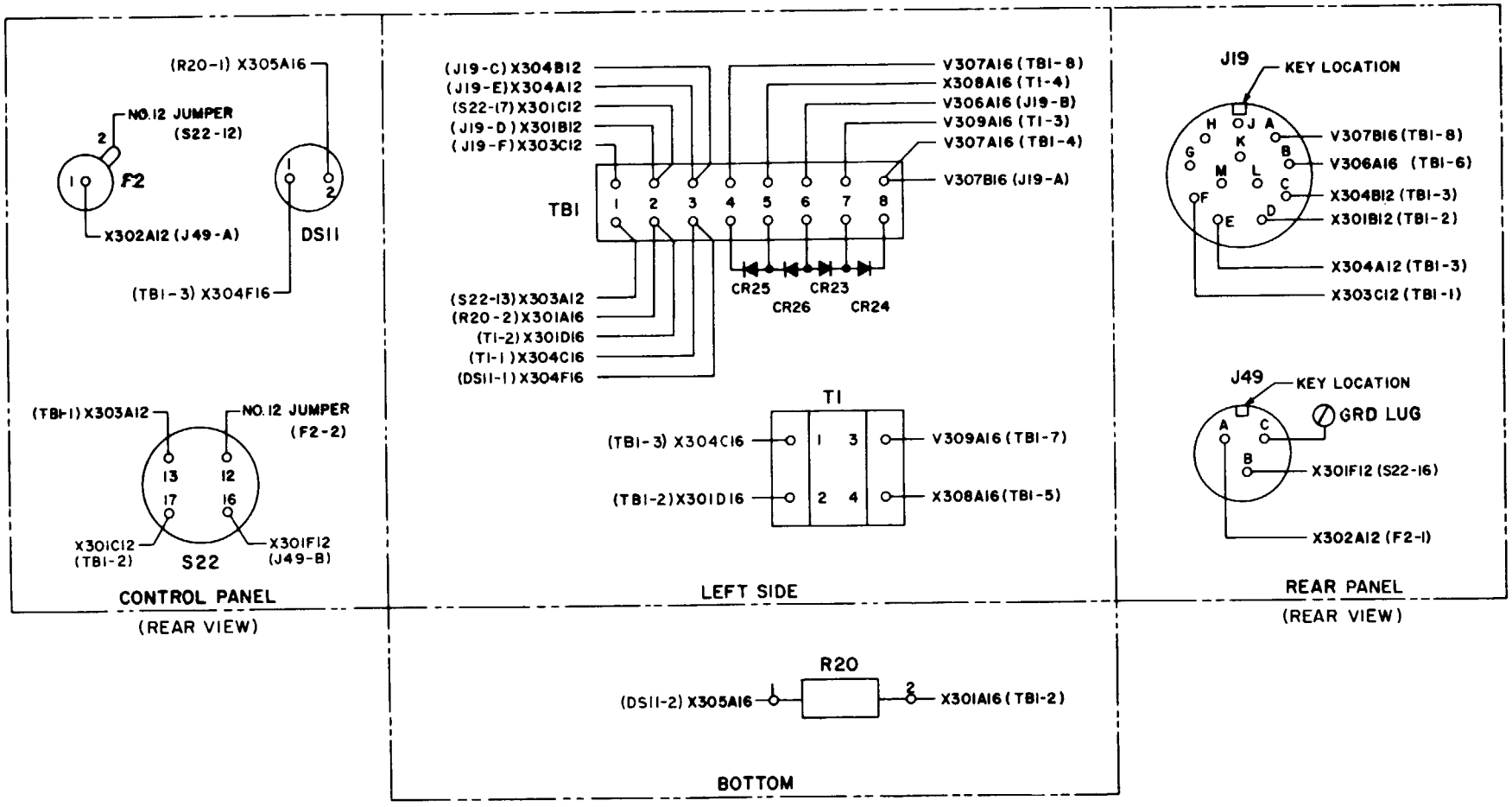


Figure 1-11. Electric winterization kit wiring diagram
(sheet 2 of 2)

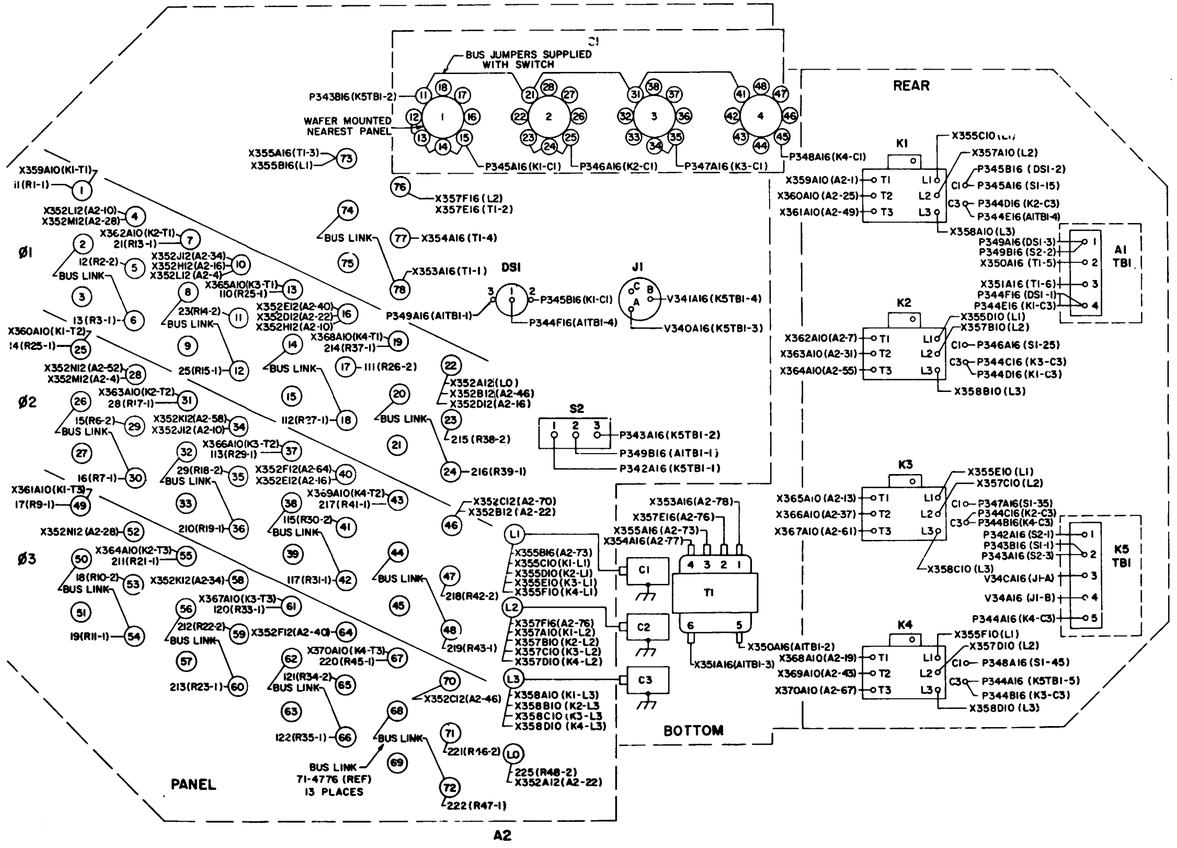


Figure 1-12. Dummy load kit wiring diagram (sheet 1 of 2)

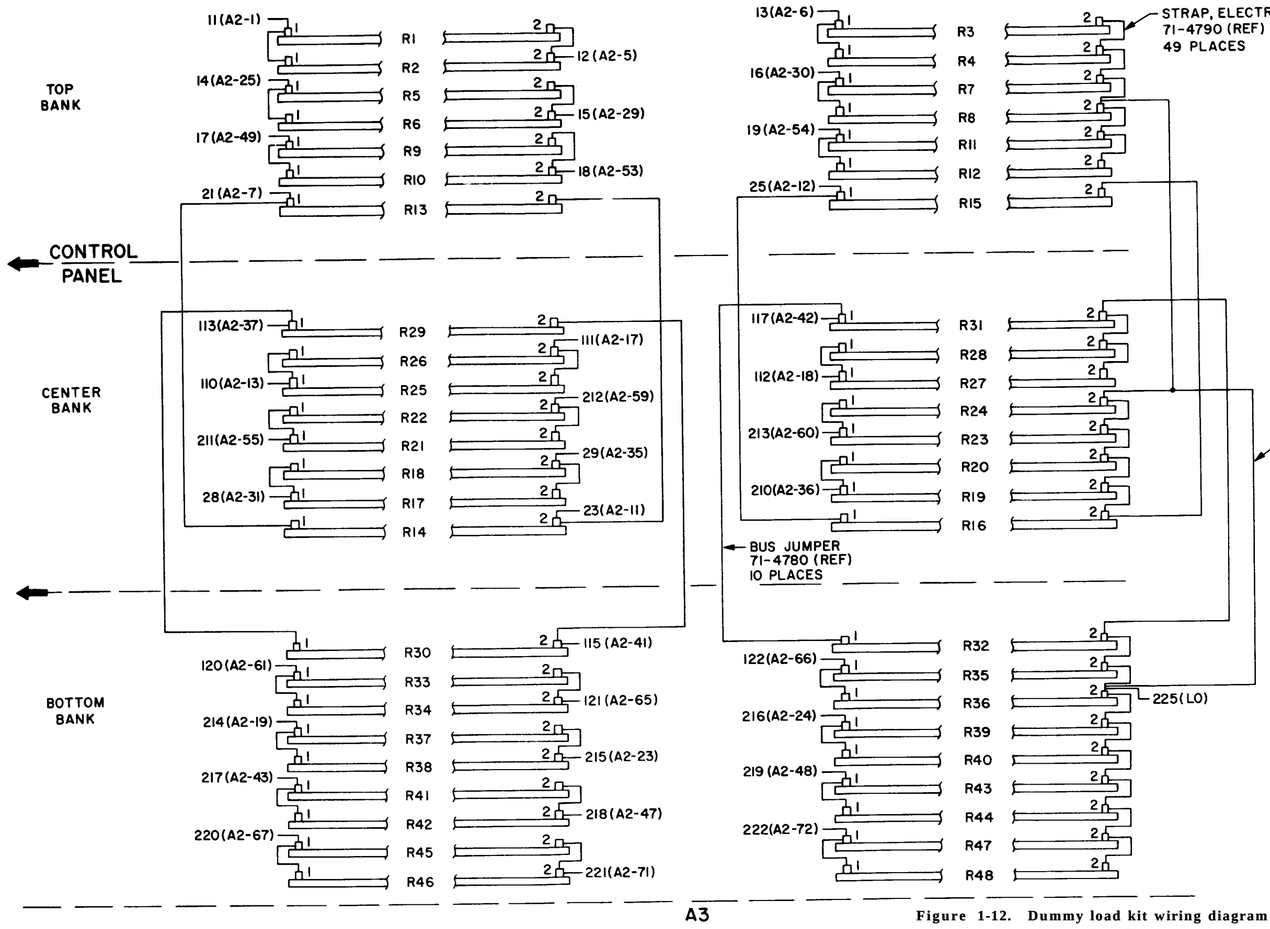


Figure 1-12. Dummy load kit wiring diagram (sheet 2 of 2)

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. UNLOADING EQUIPMENT.

A crane, forklift or similar lifting device or fabricated skids must be used to unload the equipment. The equipment must be kept in the UP position while unloading.

WARNING

Do not use a lifting device with a capacity of less than 10,000 pounds. Do not allow the generator set to swing while it is suspended. Failure to observe this warning may result in serious injury or death to personnel.

2-2. UNPACKING THE EQUIPMENT.

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

CAUTION

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

b. Remove top and then sides of crate (see figure 2-1).

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

d. If unit is to be set up as a temporary installation, do not remove wood skid base.

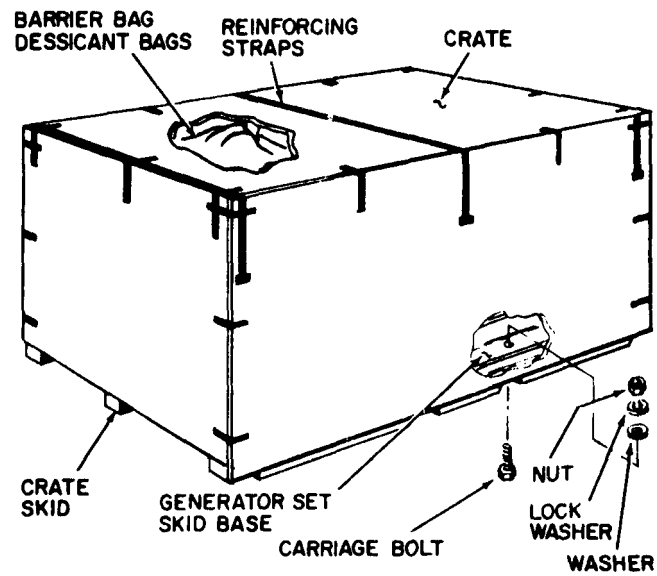


Figure 2-1. Shipping crate

The wood skid base will serve as a foundation on soft ground, mud, or snow.

2-3. INSPECTING AND SERVICING THE EQUIPMENT.

To inspect and service the equipment, open all access doors and proceed as follows:

a. Perform preventive maintenance service. Refer to paragraph 3-6 and table 3-2.

b. Refer to Appendix B and make sure all basic issue items are present and properly stowed.

c. Make a thorough visual inspection of generator set for loose or missing mounting hardware and damaged or missing parts. Report all damage or missing parts on DD form 6.

d. Remove coolant drain plug, make sure all drain cocks are closed, and other drain plugs are tight, refer to figure 3-4.

e. Activate and connect batteries, refer to paragraph 2-4.

f. Service radiator with proper coolant, refer to table 2-1 and paragraph 3-8.

g. Service engine crankcase, refer to paragraph 3-11.

h. On precise generator sets service hydraulic tank, refer to paragraph 3-16.

i. Service fuel tank, refer to paragraph 3-17.

j. Service ether starting aid, refer to paragraph 4-5.

k. After all installation or setting up instructions have been accomplished bleed fuel system, refer to paragraph 3-81. On precise generator sets bleed hydraulic system, refer to paragraph 3-92.

2-3A. INSPECTION/COMPLIANCE WITH PAINT AND MARKING REQUIREMENTS.

a. (AF only) Inspect generator for proper painting and marking (Ref AFR 35-1-3).

b. Assure that a noise level warning sign is stenciled on the top half of both rear (generator end of set) side doors (Figure 3-14, 7) as shown in Figure 2-1A.

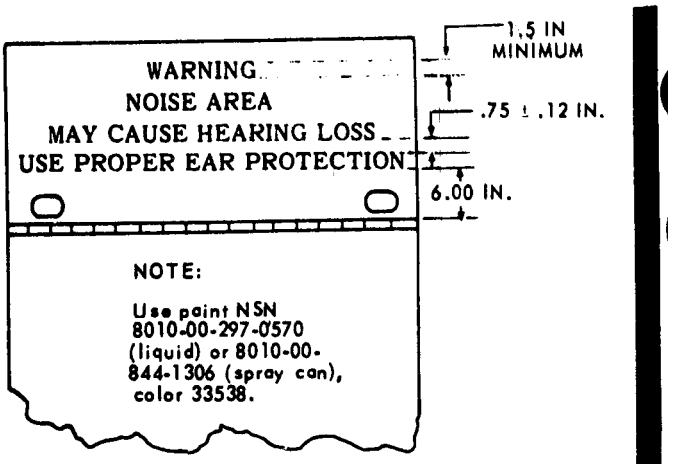


Figure 2-1A. Noise Level Warning Sign

2-4. INSTALLATION OF SEPARATELY PACKED COMPONENTS.

BATTERIES. Batteries are shipped dry. Battery electrolyte must be requisitioned separately. Refer to maintenance and operators supply list, Appendix B for required quantity of electrolyte. To activate the batteries proceed as follows:

a. Refer to figure 3-3 to gain access to batteries.

WARNING

Electrolyte is sulfuric acid diluted with water and can cause severe acid burns. When mixing to create electrolyte, always pour the sulfuric acid into the water. Pouring water into sulfuric acid rapidly frees hydrogen gas which may reach explosive proportions. Use extreme care in handling both sulfuric acid and electrolyte.

b. Fill battery cells to slots in cells with battery electrolyte undiluted provided and install filler caps.

Connect battery cables, refer to figure 3-12.

2-5. INSTALLATION OR SETTING UP INSTRUCTIONS.

a. GENERAL. The generator set should be installed on a level site, clear of obstacles, and with ample ventilation. The site must be within 25 feet of any paralleled generator set, 25 feet of any auxiliary fuel supply and 500 feet of any remote control area.

b. OUTDOOR INSTALLATION. When preparing for a permanent installation, be sure base is solid enough to support weight of unit. Refer to figure 2-2 for dimensions of base. Select a location where there will be sufficient space on all sides for servicing and operation of unit. When preparing a temporary installation move generator set as close to worksite as practical. Use suitable planks, logs, or other material for a base in an area where ground is soft.

c. INDOOR INSTALLATION. Keep the area well ventilated at all times, so that generator set will receive a maximum supply of air. Lift exhaust drain cap and install a gas-tight exhaust line (4 inch I.D. pipe) to the outside. Use as few bends in line as possible. Provide metal shields for exhaust line where it passes through flammable walls. Wrap exhaust line with heat insulating material if there is any danger of anyone touching them.

Table 2-1. Freezing Points, Composition, and Specific Gravities of Military Antifreeze Material

LOWEST EXPECTED AMBIENT TEMPERATURE °F	PINTS OF INHIBITED GLYCOL PER GAL. OF COOLANT[1]	COMPOUND ANTIFREEZE ARCTIC[2]	ETHYLENE GLYCOL COOLANT SOLUTION SPECIFIC GRAVITY AT 68°F[3]
+20	1-3/4	Issued full strength and ready mixed for 0° to -65°F temperatures for both initial installation and replenishment of losses. DO NOT DILUTE WITH WATER OR ANY OTHER SUBSTANCE.	1.022
+10	2-1/4		1.036
0	2-3/4		1.047
-10	3-1/4		1.055
-20	3-3/4		1.062
-30	4		1.067
-40	4-1/4		1.073
-50	Arctic antifreeze preferred		
-60			
-75			

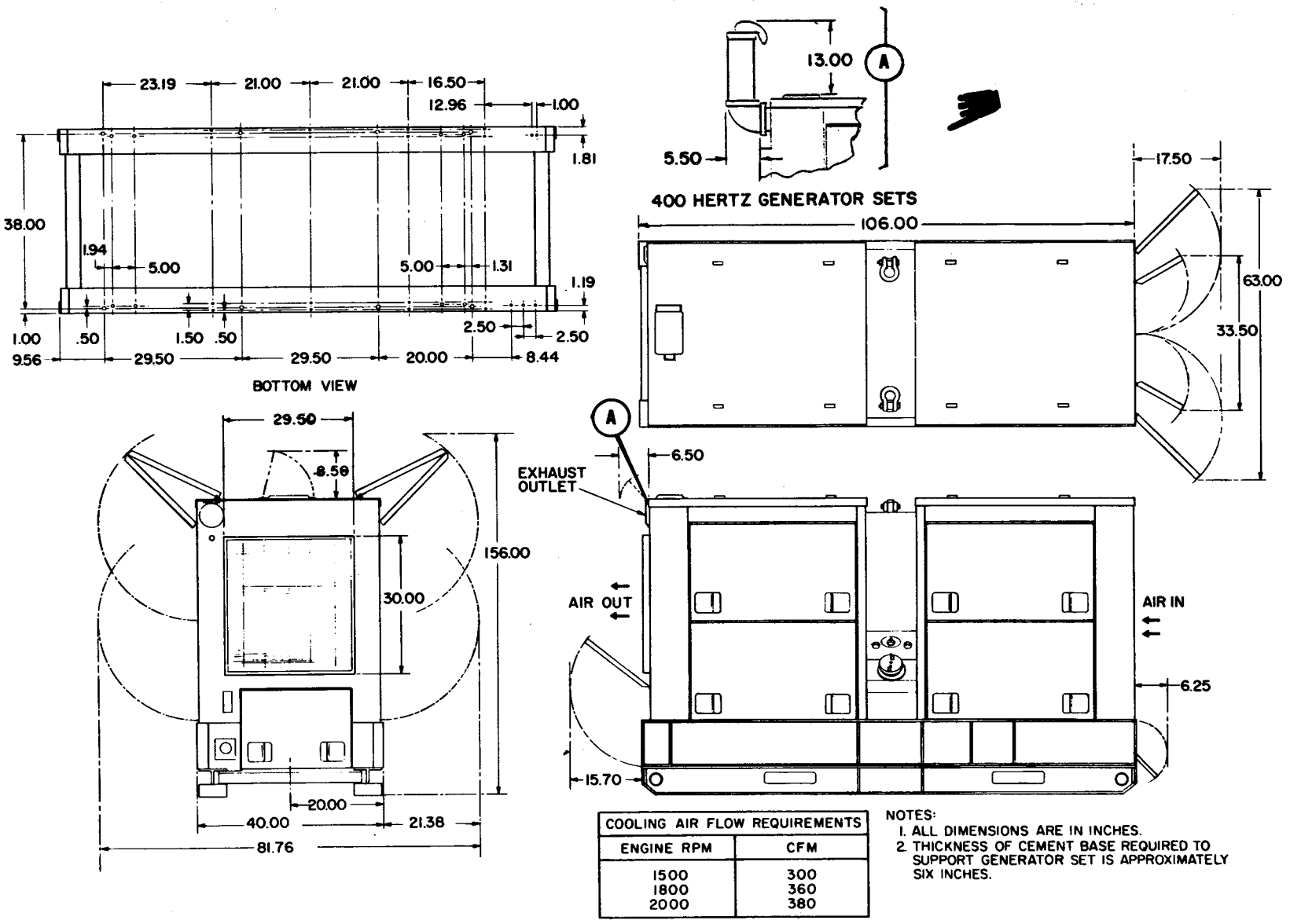
[1] Maximum protection is obtained at 68 percent by volume (5.4 pints of ethylene glycol per gallon of solution) when using MIL-A-46153 antifreeze.

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

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

NOTE

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



COOLING AIR FLOW REQUIREMENTS	
ENGINE RPM	CFM
1500	300
1800	360
2000	380

NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. THICKNESS OF CEMENT BASE REQUIRED TO SUPPORT GENERATOR SET IS APPROXIMATELY SIX INCHES.

Figure 2-2. Installation plan

WARNING

Do not operate the generator set in an enclosed area unless the exhaust gases are piped to the outside. Inhalation of exhaust fumes will result in serious injury or death.

d. LEVELING. The generator set is a portable unit and is designed to operate satisfactorily up to 15 degrees out of level. However, unit should be as level as possible during operation.

e. GROUNDING. The generator set must be grounded prior to operation. The ground can be, in order of preference, an underground metallic water piping system, a driven metal rod, or a buried metal plate. A ground rod must have a minimum diameter of 5/8 inch if solid or 3/4 inch if pipe, and must be driven to a minimum depth of 8 feet. A ground plate must have a minimum area of 9 square feet and must be buried at a minimum depth of 4 feet. The ground lead must be at least No. 6 AWG (American Wire Gauge) copper wire and must be bolted or clamped to the rod, plate, or piping system. Connect the other end of the ground lead to the generator set ground terminal stud (figure 2-3). The following procedures are to be used to install grounding rods when required.

1. Insert ground cable supplied with generator set, into slot in ground stud and tighten nut.

2. Connect coupling to ground rod and install driving stud in coupling. Make sure driving stud is bottomed on ground rod.

3. Drive ground rod into ground until coupling is just above the ground surface.

4. Connect additional ground rods, as required, by removing driving stud from coupling and installing another ground rod in coupling. Make sure new ground rod is bottomed on ground rod previously installed. Connect another coupling on new ground rod and install driving stud.

5. After ground rods have been driven into the ground, remove driving stud and top coupling.

6. Connect clamp and ground cable to top ground rod and secure by tightening screw.

WARNING

Do not operate the generator set unless ground terminal stud has been connected to a suitable ground. Electrical faults in the generator set, load lines, or load equipment can cause injury or electrocution from contact with an ungrounded system.

f. FUEL CONNECTIONS. To connect an auxiliary fuel supply to the generator set refer to figure 2-4 and perform steps 1 through 4. To utilize generator set as an auxiliary fuel supply perform steps 5 through 7.

1. Position auxiliary fuel supply within 25 feet of generator set and not more than 12 feet below the transfer pumps.

2. Remove cap from auxiliary fuel inlet fitting.

3. Remove auxiliary fuel hose from its mount at left rear side of generator. Connect hose to auxiliary fuel inlet fitting and auxiliary fuel supply.

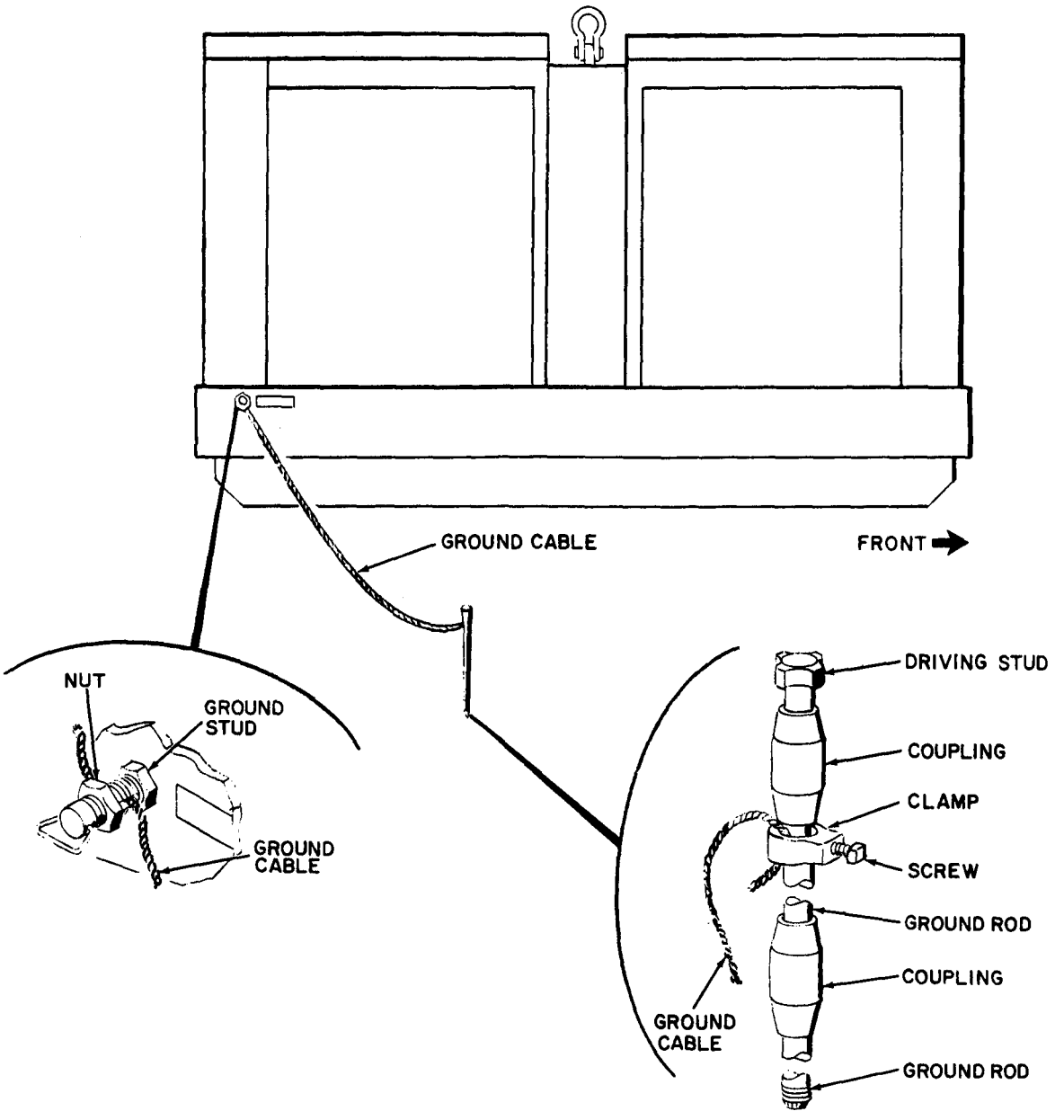


Figure 2-3. Grounding procedures

4. Position fuel transfer valve to AUXILIARY.

5. Remove cap from fuel supply outlet fitting.

6. Connect fuel hose to fuel supply outlet fitting and equipment requiring fuel.

7. Position fuel transfer valve to OFF.

g. LOAD CONNECTIONS. To connect load cables to generator set, refer to figure 2-5 and proceed as follows:

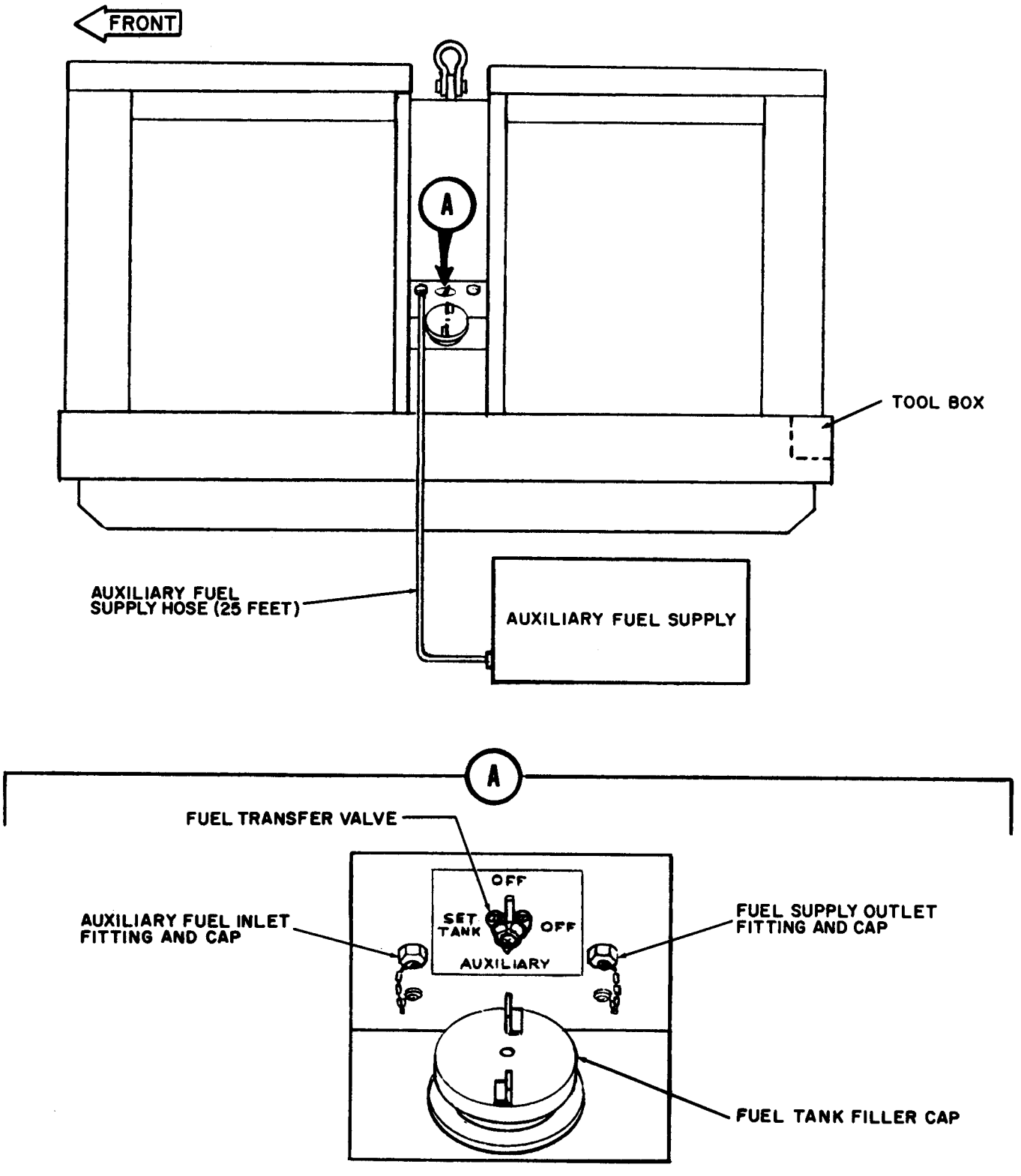


Figure 2-4. Fuel connections

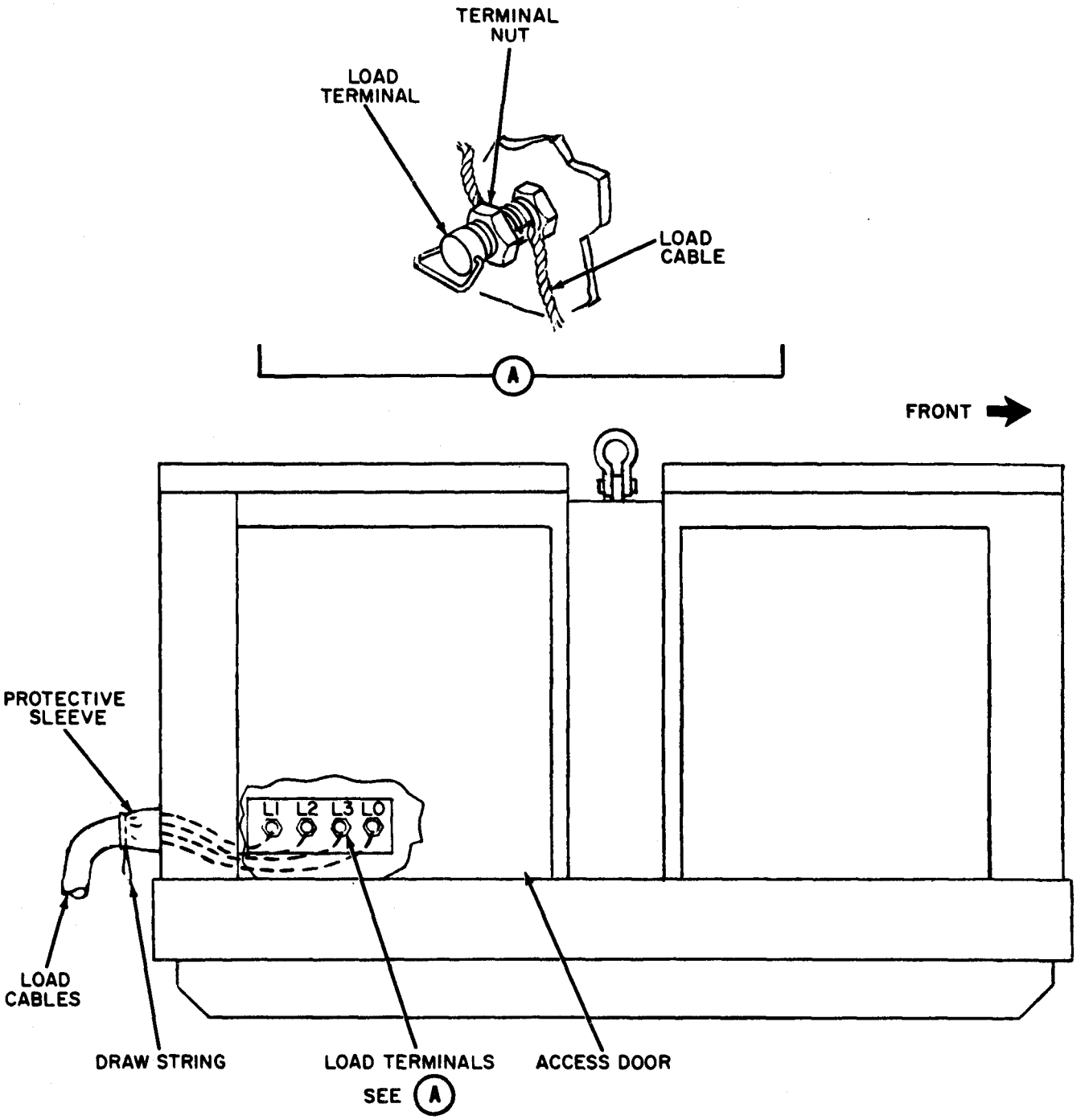


Figure 2-5. Load cable connections

WARNING

Before attempting to connect load cables, make sure generator set is not operating and there is no input to the load.

1. Open access door and disconnect transparent cover by loosening six quick-release fasteners. Remove wrench from cover.

NOTE

Make sure proper phase relationship of load cables is maintained.

2. Attach load cables in the following order: L0, L3, L2, and L1 as specified in step 3 below. The neutral cable must be connected to load terminal L0, load cable L1 to load terminal L1, load cable L2 to load terminal L2, and load cable L3 to load terminal L3.

3. Insert load cables through protective sleeve and attach cables to their respective load terminals, one cable to each terminal, by inserting cable in terminal slot and tightening terminal nut with wrench which was clipped to transparent cover. Install wrench on transparent cover and install cover.

4. Tighten drawstring on protective sleeve to preclude entry of foreign matter. Close access door.

h. CONTROL CUBICLE CONNECTION FOR REMOTE OPERATION. The control cubicle may be removed and positioned up to 500 feet from the generator set for remote operation. To connect control cubicle for remote operation refer to figure 2-6 and proceed as follows:

1. Fabricate or obtain a suitable length remote cable consisting of 40 number AWG 16 wires, 7 number AWG 12 wires, MS3106R36-7S connector, and MS3101R36-7P connector. Wire routing must be common between like pins of connectors: A to A, B to B, etc. The number 12 wires must be connected to pins t, u, v, w, x, y, and z of the connectors.

2. Open left generator compartment access door and remove electrical harness from rear of control cubicle.

3. Open upper rear doors and remove screws and washers securing control cubicle. Remove cubicle from generator set.

NOTE

Remote cable may be routed through load cable sleeve to permit closing doors.

4. Position control cubicle at desired locations. Connect remote cable to electrical harness removed from control cubicle and to control cubicle connector.

2-6. EQUIPMENT CONVERSION.

a. VOLTAGE CONVERSION. To convert generator set to 120/208 volts or 240/416 volts refer to figure 2-7, observing the following:

WARNING

Make sure generator set is not operating, in a standby mode, or connected to a parallel bus when accomplishing voltage conversion.

b. FREQUENCY CONVERSION. To convert a 50/60 hertz precise generator set to 50 or 60 hertz operation, position frequency selector switch (56, figure 2-8) to desired frequency range. On 50/60 hertz utility sets, frequency conversion is accomplished by changing engine speed using manual speed control (43).

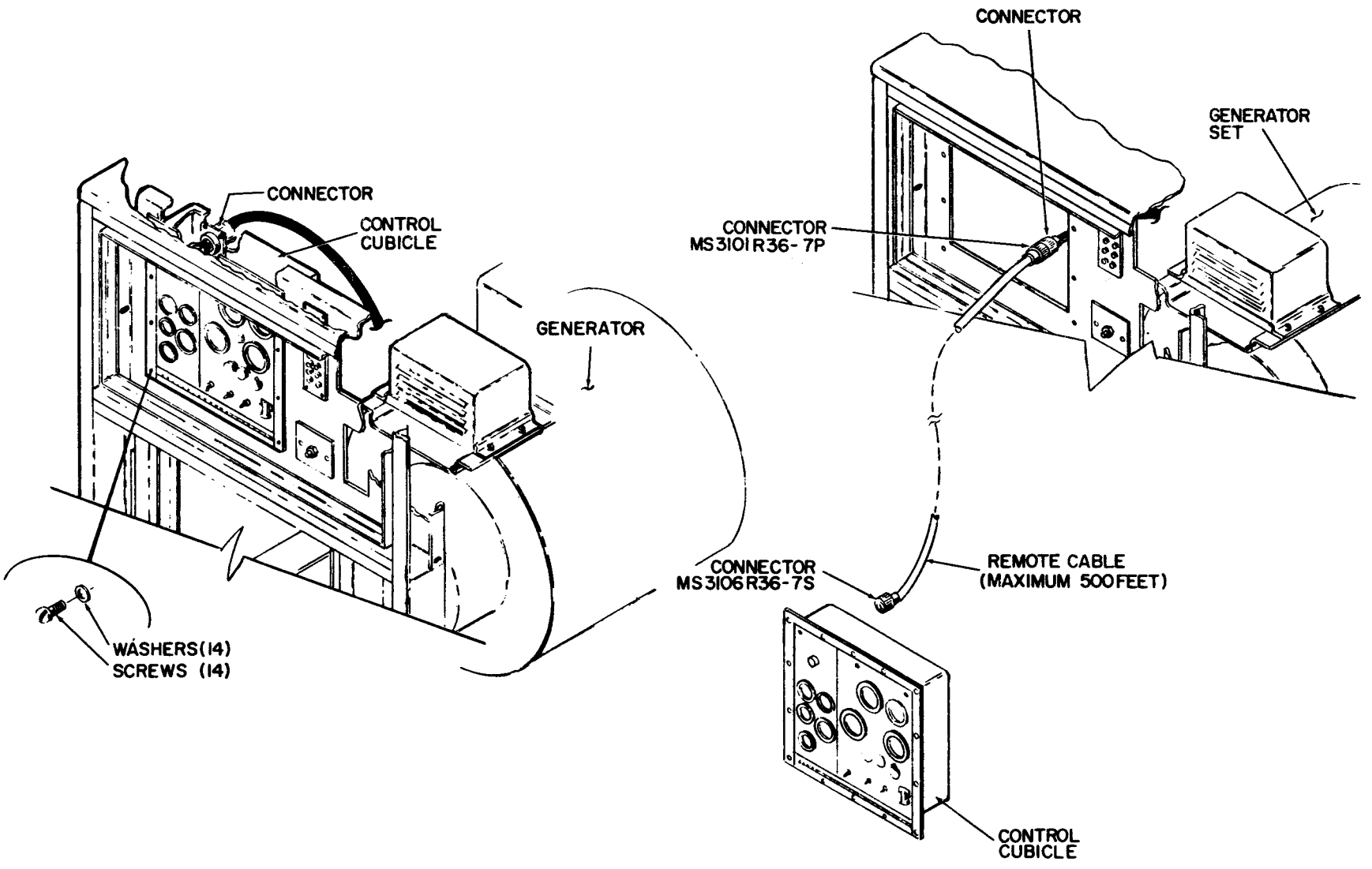
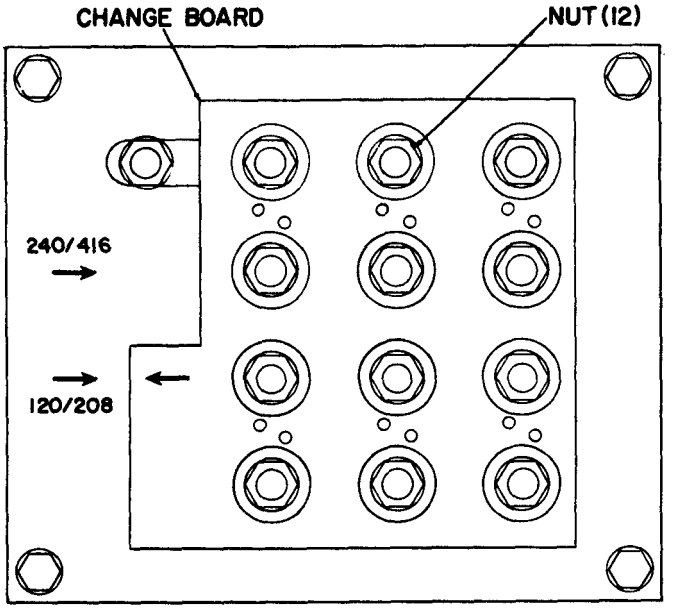


Figure 2-6. Control cubicle connection for remote operation



STEP 1
DISCONNECT TRANSPARENT COVER BY LOOSENING SIX QUICK-RELEASE FASTENERS.

STEP 2
REMOVE TWELVE NUTS. MOVE CHANGE BOARD UP OR DOWN TO ALIGN CHANGE BOARD ARROW WITH DESIRED VOLTAGE ARROW. SECURE CHANGE BOARD IN POSITION WITH NUTS.

STEP 3
POSITION AND SECURE TRANSPARENT COVER WITH SIX QUICK-RELEASE FASTENERS.

Figure 2-7. Voltage conversion

Section II. MOVEMENT TO A NEW WORK SITE

2-7. DISMANTLING FOR MOVEMENT.

a. DISMANTLING. To dismantle the generator set for movement, proceed as follows:

WARNING

Prior to disconnecting load cables, make sure generator set is not operating, in a standby mode, connected to a parallel bus.

1. Open access door, refer to figure 2-5. Disconnect transparent cover by loosening six quick-release fasteners. Remove wrench from cover. Loosen terminal nuts, using wrench provided, and remove load cables from terminals. Untie drawstring and remove load cables from generator set. Install wrench on transparent cover and install cover. Close access door.

2. Position fuel transfer valve to OFF, refer to figure 2-4. Disconnect auxiliary fuel supply hose, cap end fittings, and stow hose on its mount at left rear side of generator. Replace cap on auxiliary fuel inlet fitting.

3. Disconnect ground cable from ground stud by loosening nut, refer to figure 2-3. Disconnect ground cable from ground rod by loosening screw. Tape ends of ground cable to prevent unraveling and place cable in tool box.

4. If connected, remove parallel cable from connector coil cable and stow cable in stowage box bolted to roof above generator.

5. Disconnect any other external connections.

6. Refer to Appendix B and make sure all basic issue items are with generator set and properly stowed.

7. Close and secure all access doors and panels.

b. MOVEMENT. To move generator set to a new worksite, proceed as follows:

1. If set is to be moved only a short distance and terrain is suitable, attach a suitable towing device to towing eyes and tow generator set to new work site.

2. If terrain is unsuitable for towing, place generator set on transporter as described in paragraph 2-1 and move set to new work site.

3. For long distance movement, disconnect batteries, and tape battery cables in position to prevent movement. Drain fuel tank and coolant system. For shipping instructions refer to paragraph 5-1.

2-8. REINSTALLATION AFTER MOVEMENT.

To reinstall generator set after movement, refer to paragraph 2-5.

Section III. CONTROLS AND INSTRUMENTS

2-9. GENERAL.

This section describes the various controls and instruments and provides the operator/crew sufficient information to insure proper operation of generator set.

2-10. CONTROLS AND INSTRUMENTS.

The functions of generator set controls, instruments, and receptacles are provided in table 2-2. Their locations are illustrated in figure 2-8.

Table 2-2. Function of Controls, Instruments, and Receptacles

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
1	Manual fuel shutdown lever (located on fuel injection pump housing)	Permits manual closing of engine fuel rack to shutdown engine.
2	Speed switch reset button (located on top of speed switch)	Permits resetting of engine overspeed switch after actuation.
3	Control cubicle control panel	Contains majority of generator set operating and monitoring controls.
4	Air cleaner condition indicator light	Illuminates to indicate dirty air cleaner panel filters.
5	Frequency meter	Indicates generator set frequency of voltage in hertz. On 50/60 hertz generator sets it is calibrated from 48 to 53 hertz for 50 hertz operation and 57 to 62 hertz for 60 hertz operation with scale divisions of 1/10 hertz. On 400 hertz generator sets it is calibrated from 388 to 412 cycles with scale divisions of 1/2 cycle.
6	Kilowatt meter (percent of power meter)	Indicates generator electrical power output. It is calibrated from 0 to 133 percent of power.
7	Ammeter-voltmeter selector switch	Selects current in each phase, three line-to-line voltage, and three line-to-neutral voltage for measurement by AC voltmeter and AC ammeter.
8	AC ammeter (percent of rated current meter)	Indicates percent of rated current per phase as selected by ammeter-voltmeter selector switch. It is calibrated from 0 to 133 percent of rated current.

Table 2-2. Function of Controls, Instruments, and Receptacles (Continued)

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
9	Panel lights	Illuminate control panel.
10	AC voltmeter	Indicates line-to-line and line-to-neutral voltages as selected by ammeter-voltmeter selector switch. It is calibrated from 0 to 500 volts with scale divisions of 5 volts.
11	Voltage adjust rheostat	*Permits adjustment of generator set output voltage. Clockwise rotation increases voltage. It is rated at 0 to 250 ± 10 ohms (0 to 75 ohms ±10%, 400 Hz sets).
12	Synchronizing lights	Indicates synchronization of frequency for paralleling of generator set.
13	Battle short indicator	Illuminates when battle short switch is in ON position.
14	Battle short switch and guard	Permits bypassing of all generator set faults except engine overspeed and short circuit for emergency operation. Guard prevents accidental switch actuation.
15	Mode selector switch	Permits selection of parallel or single unit operation. In parallel operation, activates all parallel circuits and synchronizing lights.
16	Voltage sensing switch	Permits selection of voltage regulator sensing and level adjusting circuits either at the set or a remote location.
17	Panel light switch	Energizes panel lights.
18	AC load contactor indicator	Illuminates when AC load contactor/ circuit breaker assembly is closed.
		*Series connected with range adjust rheostat R2A - 400 Hz units.

Table 2-2. Function of Controls, Instruments, and Receptacles (Continued)

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
19	AC load contactor switch	Permits opening and closing of AC load contactor/circuit breaker assy.
20	Frequency adjust rheostat	Permits adjustment of generator set frequency on precise generator sets. Clockwise rotation increases frequency. It is rated at 0 to 500 ±25 ohms.
21	Start-run-stop switch	Initiates start sequence and controls generator set operation.
22	Engine primer switch	Permits actuation of either starting aid if start-run-stop switch is in START position.
23	Battery charging ammeter	Indicates battery charging current. Red indicates unsatisfactory, green satisfactory. It is calibrated from -10 to +20 amperes with scale divisions of 1 ampere.
24	Running time meter	Indicates operating time of generator set in hours and tenths up to 9999.
25	Fuel level gauge	Indicates level of fuel in fuel tank. It is calibrated from full to empty with scale divisions of 1/4 tank.
26	Coolant temperature gauge	Indicates engine coolant temperature in degrees F. Normal indication 180°F to 200°F. It is calibrated from 120°F to 240°F.
27	Oil pressure gauge	Indicates engine lubricating oil pressure in PSIG. Normal indication 40 to 60 PSIG. It is calibrated from 0 to 120 PSIG with scale divisions of 30 PSIG.

Table 2-2. Function of Controls, Instruments, and Receptacles (Continued)

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
28	Fuse	Protects components of fault locator panel.
29	Reverse power indicator	Illuminates if power flow into generator set exceeds 20 percent of rated value (50 ± 10 percent, 400 Hz sets).
30	Under voltage indicator	Illuminates instantaneously if voltage drops below 48 volts at generator coil T9-T12, or in 6 ± 2 seconds if voltage is between 65 to 99 ± 4 volts Utilized on precise generator sets only. AC voltmeter indication: 120 single phase 48 to 99 ± 4 volts.
31	Short circuit indicator	Illuminates if output current in any phase exceeds approximately 425 ± 25 percent (180 ± 25 percent, 400 Hz sets) of rated current.
32	Overspeed indicator	Illuminates if engine RPM exceeds 2425 ± 25 RPM.
33	Low oil pressure indicator	Illuminates if engine oil pressure falls below 15 ± 3 PSIG.
34	Coolant temperature high indicator	Illuminates if engine coolant temperature exceeds 222° ± 3°F.
35	No fuel indicator	Illuminates if level of fuel in day tank falls to a point which will operate the set at rated load for one minute.
36	Overload indicator	Illuminates if current in any phase exceeds 110 percent of rated current on an inverse time principle.

Table 2-2. Function of Controls, Instruments, and Receptacles (Continued)

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
37	Under frequency indicator	Illuminates if frequency drops to: 55 ± 1 hertz for 60 hertz operation, 46 ± 1 hertz for 50 hertz operation, and 370 ± 5 hertz for 400 hertz operation. Utilized on precise generator sets only.
38	Over voltage indicator	Illuminates if voltage reaches 153 ± 3 volts at generator coil T9-T12. AC voltmeter indication 120 single phase 153 ± 3 volts.

Table 2-2. Function of Controls, Instruments, and Recptacles (Continued)

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
39	Test or reset switch	Permits testing and resetting of fault locator panel indicators.
40	Plate	Covers opening provided for electric winterization kit control box.
41	Plate	Covers opening provided for fuel burning winterization kit control box.
41A	Expanded scale voltmeter	Indicates line or bus voltage as selected by voltmeter selector switch. It is calibrated from 100 to 140 volts with scale divisions of 1 volt.
41B	Voltmeter selector switch	Toggle switch spring loaded to read generator output voltage. Reads bus voltage for parallel operation.
42	DC control circuit breaker	Protects control circuits energized from batteries. Permits emergency stopping of generator set. It has a 7.5 ampere rating.
43	Manual speed control	Permits engine speed adjustment through action of utility governor. Rapid adjustment is made by depressing button and pulling out or pushing in control; pushing in on control increases speed. Fine adjustment is made by rotating vernier knob. Clockwise rotation of vernier will increase speed. Control should be in maximum fuel position on precise generator sets.

Table 2-2. Function of Controls, Instruments, and Receptacles (Continued)

FIGURE 2-8 INDEX NUMBER	CONTROL, INSTRUMENT, OR RECEPTACLE	FUNCTION
44 and 46	Parallel receptacles	Utilized to interconnect governors and exciter regulators for paralleling precise generator sets with parallel cable.
45	Shorting plug	Shorts pins C and D of parallel receptacle. Plug is removed to parallel precise generator sets and installed to parallel utility sets.
47	Protective caps	Protect receptacles from damage.
48	Plate and sleeve assembly	Covers opening provided for kit installation and entrance for load cable.
49	Plate	Covers opening provided for kit installation.
50	Circuit breaker (15 amperes)	Protects convenience receptacles.
51	Convenience receptacles	Provide 120 VAC at generator set operating frequency.
52	Air cleaner restriction indicator	Indicates dirty air cleaner panel filters when red.
53	Fuel transfer valve	Permits selection of generator set tank or auxiliary fuel supply for operation.
54 and 55	Slave receptacles (SR1 and SR2)	Permit easy connection to batteries to supply or obtain 24 VDC.
56	Frequency selector switch	Permits selection of 50 or 60 hertz operation. Utilized on 50/60 hertz precise generator sets.
57	Radiator shutter manual control handle	Permits manual opening and closing of the radiator shutter when coolant is cold. When coolant is hot handle may be used for opening of shutter only.

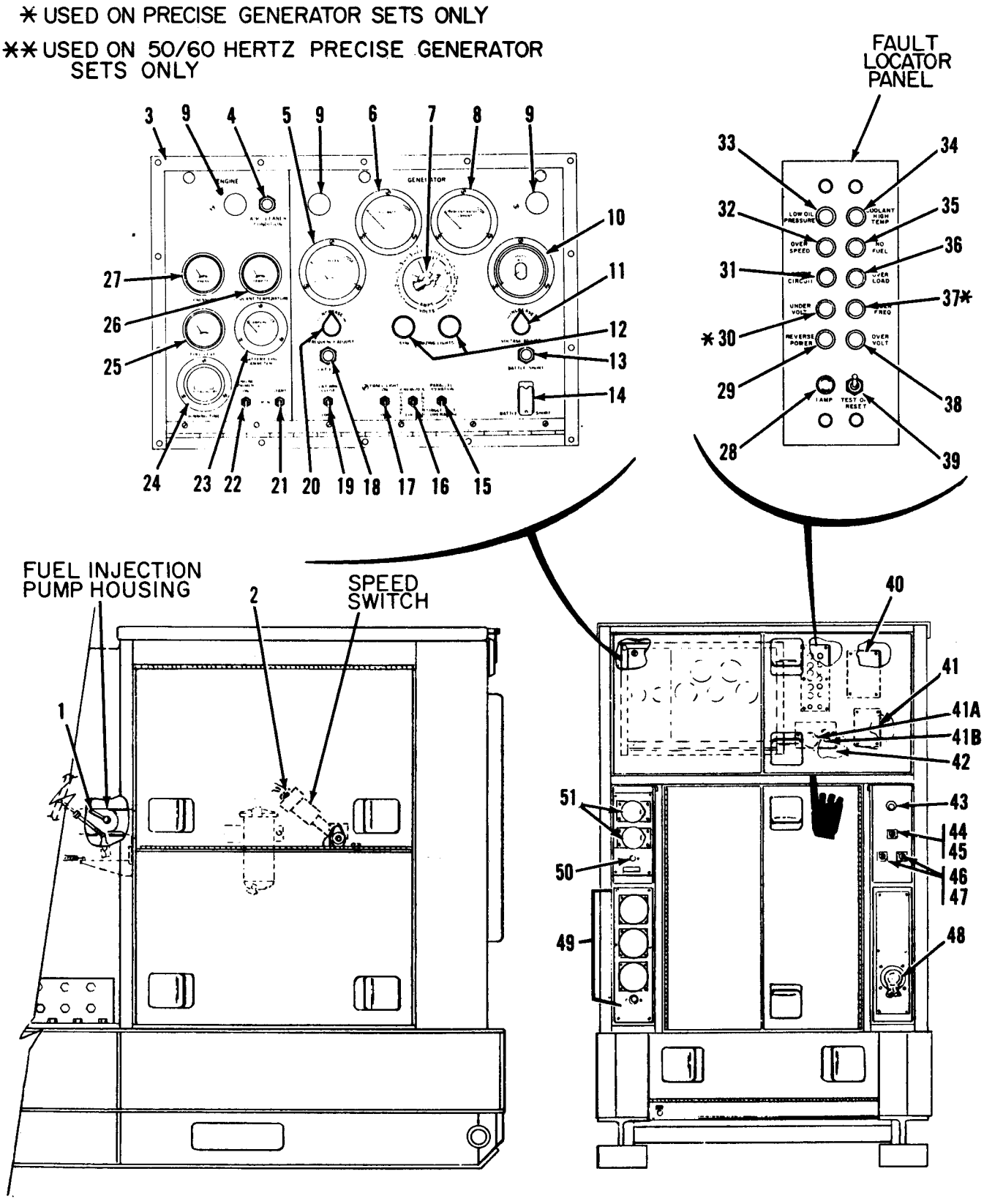


Figure 2-8. Location of controls, instruments, and receptacles (sheet 1 of 2)

Legend to figure 2-8:

1. Manual fuel shutdown lever
2. Speed switch reset button
3. Control cubicle control panel
4. Air cleaner condition indicator light
5. Frequency meter
6. Kilowatt meter (percent of power meter)
7. Ammeter-voltmeter selector switch
8. AC ammeter (percent of rated current meter)
9. Panel lights
10. AC voltmeter
11. Voltage adjust rheostat
12. Synchronizing lights
13. Battle short indicator
14. Battle short switch and guard
15. Mode selector switch
16. Voltage sensing switch
17. Panel light switch
18. AC load contactor indicator
19. AC load contactor switch
20. Frequency adjust rheostat
21. Start-run-stop switch
22. Engine primer switch
23. Battery charging ammeter
24. Running time meter
25. Fuel level gauge
26. Coolant temperature gauge
27. Oil pressure gauge
28. Fuse
29. Reverse power indicator
30. Under voltage indicator
31. Short circuit indicator
32. Overspeed indicator
33. Low oil pressure indicator
34. Coolant temperature high indicator
35. No fuel indicator
36. Overload indicator
37. Under frequency indicator
38. Over voltage indicator
39. Test or reset switch
40. Plate
41. Plate

41A. Expanded scale voltmeter (400 Hz sets only)

41B. Voltmeter selector switch (400 Hz sets only)

42. DC control circuit breaker
43. Manual speed control
44. Parallel receptacle
45. Shorting plug
46. Parallel receptacles
47. Protective cap
48. Plate and sleeve assembly
49. Plate
50. Circuit breaker
51. Convenience receptacles
52. Air cleaner condition indicator switch
53. Fuel transfer vlave
54. Slave receptacle (SR1)
55. Slave receptacle (SR2)
56. Frequency selector switch
57. Radiator shutter manual control handle

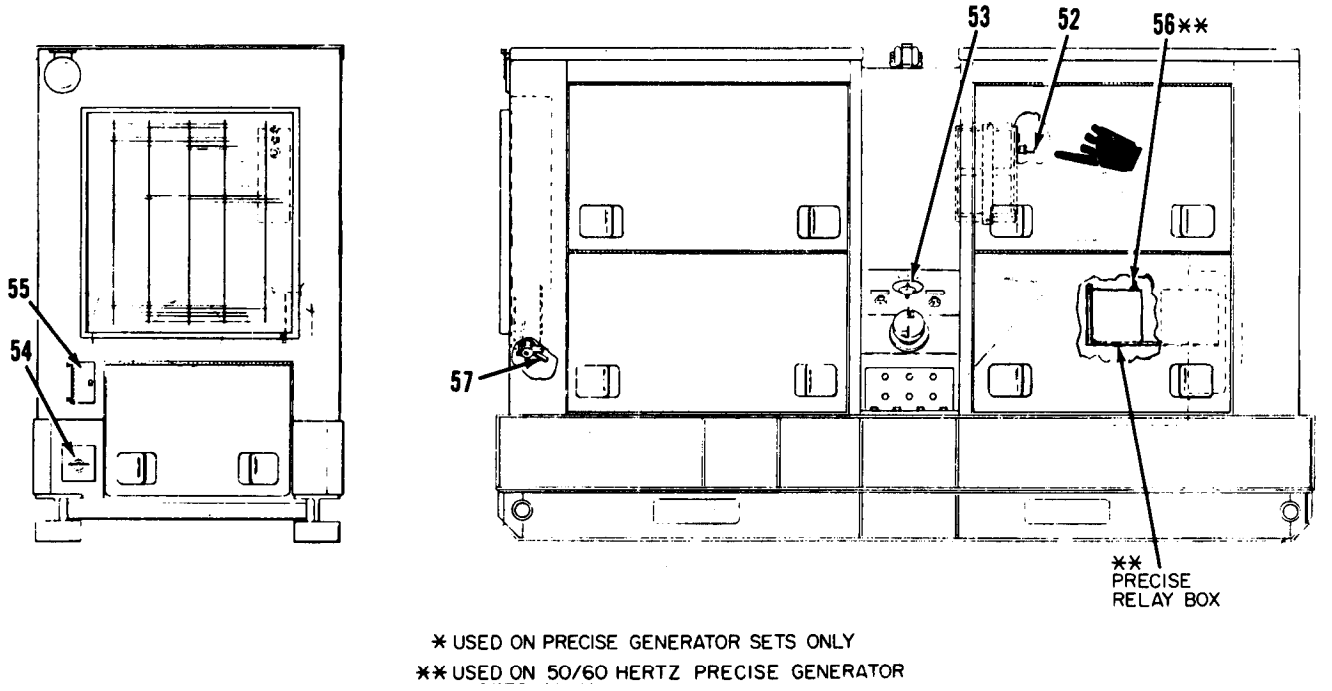


Figure 2-8. Location of controls, instruments, and receptacles (sheet 2 of 2)

Section IV. OPERATION UNDER USUAL CONDITIONS

2-11. GENERAL.

a. The instructions in this section are published 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 gives instructions on starting and stopping the generator set, operation of the generator set, and on coordinating the basic motions to perform the specific task for which the equipment is designed.

2-12. STARTING.

To start the generator set, accomplish the following:

WARNING

Do not operate the generator set unless it is properly grounded. Electrical faults in generator set, load lines, or load equipment can cause injury or electrocution from contact with an ungrounded system.

a. PREPARATION FOR STARTING.

1. Perform before operation checks and services as specified in table 3-2.

2. Open control panel and air intake doors located at the rear of the generator set. Close other doors.

3. On precise 50/60 hertz generator sets, position frequency selector switch (56, figure 2-8) to desired position.

4. Position mode selector switch to desired position and voltage sensing switch (16) to LOCAL.

5. Position voltage adjust rheostat (11) to lower half of adjustment range.

6. On precise generator sets, depress button and push in manual speed control (43) to maximum speed position. Lock manual speed control by releasing button. Manual speed control must be locked in maximum position for all precise power operations. On utility generator sets, depress button and pull out manual speed control (43) 1/4 to 1/2 way.

7. Energize DC control circuit breaker (42) and position start-run-stop switch (21) to RUN.

8. Position fault locator switch (39) to TEST or RESET, all fault locator panel indicators should illuminate; if not, check and replace defective lamp or fuse, as specified in figure 3-5. Return switch to original position, all indicators except LOW OIL PRESSURE and on precise generator sets UNDER VOLT and UNDER FREQ should go out. These indicators should go out as soon as engine is started.

(a) If NO FUEL indicated remains illuminated, day tank fuel level is below no fuel shutoff point. Lift red guard and position battle short switch (14) to ON. When day tank is full, the electric fuel transfer pumps will change pitch indicating they are bypassing fuel internally. Position battle short switch and guard to OFF position.

(b) If COOLANT HIGH TEMP indicator remains illuminated, engine coolant temperature is excessive and generator set should not be started until coolant cools off. If it is necessary to start unit with high coolant temperature, start engine as specified in paragraph 2-14, step d.

(c) If other indicators remain illuminated, report discrepancy to higher level of maintenance prior to starting.

9. Depress control cubicle indicators (4, 13, and 18, figure 2-8). Indicators should illuminate and go out when released. If indicators do not illuminate, check and replace defective lamp as specified in figure 3-5.

(a) If battle short indicator (13 remains illuminated, position battle short switch and guard to OFF position.

(b) If air cleaner condition indicator (4) remains illuminated, refer to higher level of maintenance.

(c) If AC load contactor indicator (18) remains illuminated, the ac load contactor is closed. Open load contactor. If load contactor can not be opened, refer to higher level of maintenance.

10. De-energize DC control circuit breaker and position start-run-stop switch to STOP.

b. STARTING. Refer to figure 2-9 and start generator set.

2-13. STOPPING.

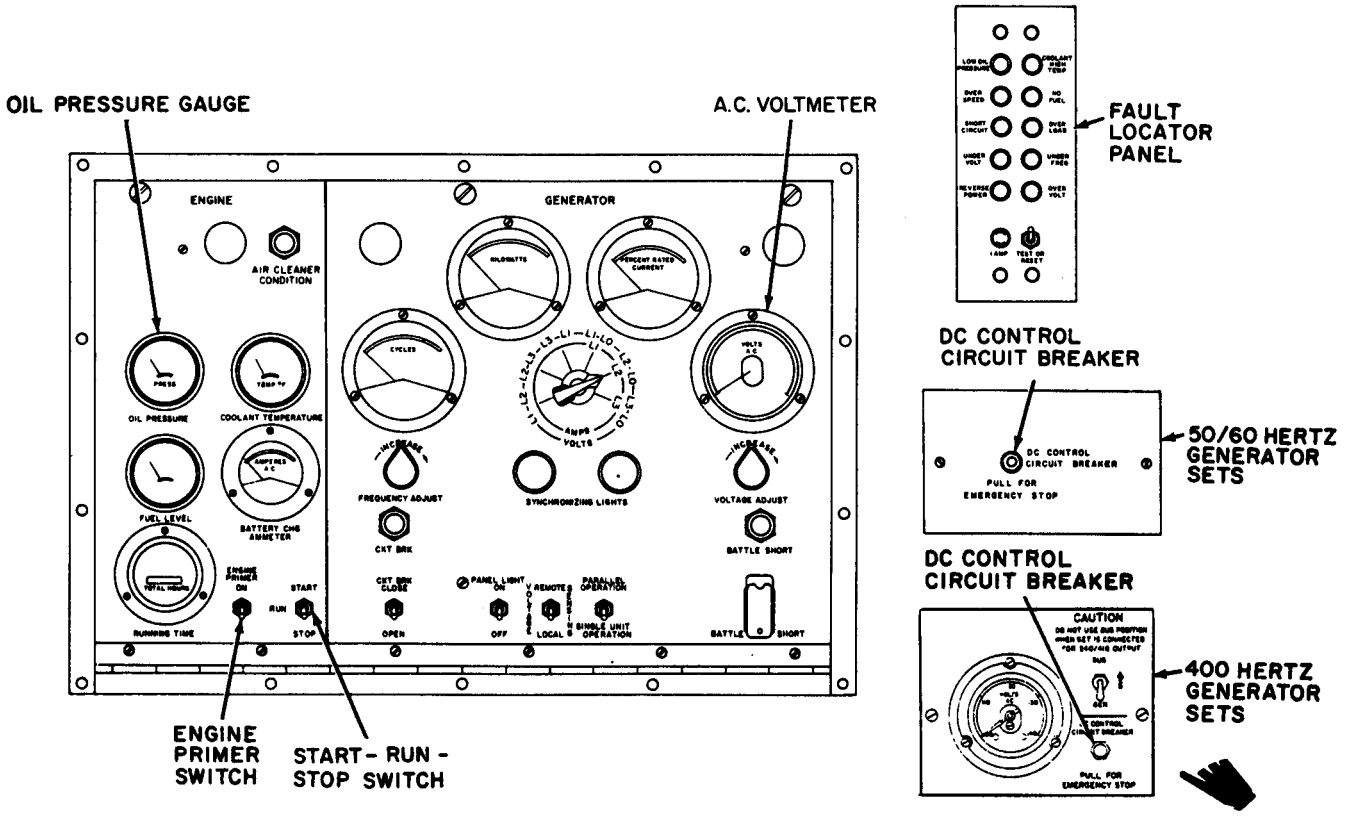
To stop generator set, accomplish the following:

a. STOPPING. Refer to figure 2-10 and stop generator set.

b. AFTER OPERATION CHECKS AND SERVICES. Perform after operational checks and services as specified in table 3-2.

2-14. OPERATION OF EQUIPMENT.

The generator set can be operated as a single unit or in parallel with other generator sets of the same class (precise or utility) and mode (50/60 or 400 hertz).



STEP 1. ENERGIZE DC CONTROL CIRCUIT BREAKER.

CAUTION

DO NOT CRANK ENGINE IN EXCESS OF 15 SECONDS AT A TIME. ALLOW STARTER TO COOL A MINIMUM OF THREE MINUTES BETWEEN CRANKINGS.

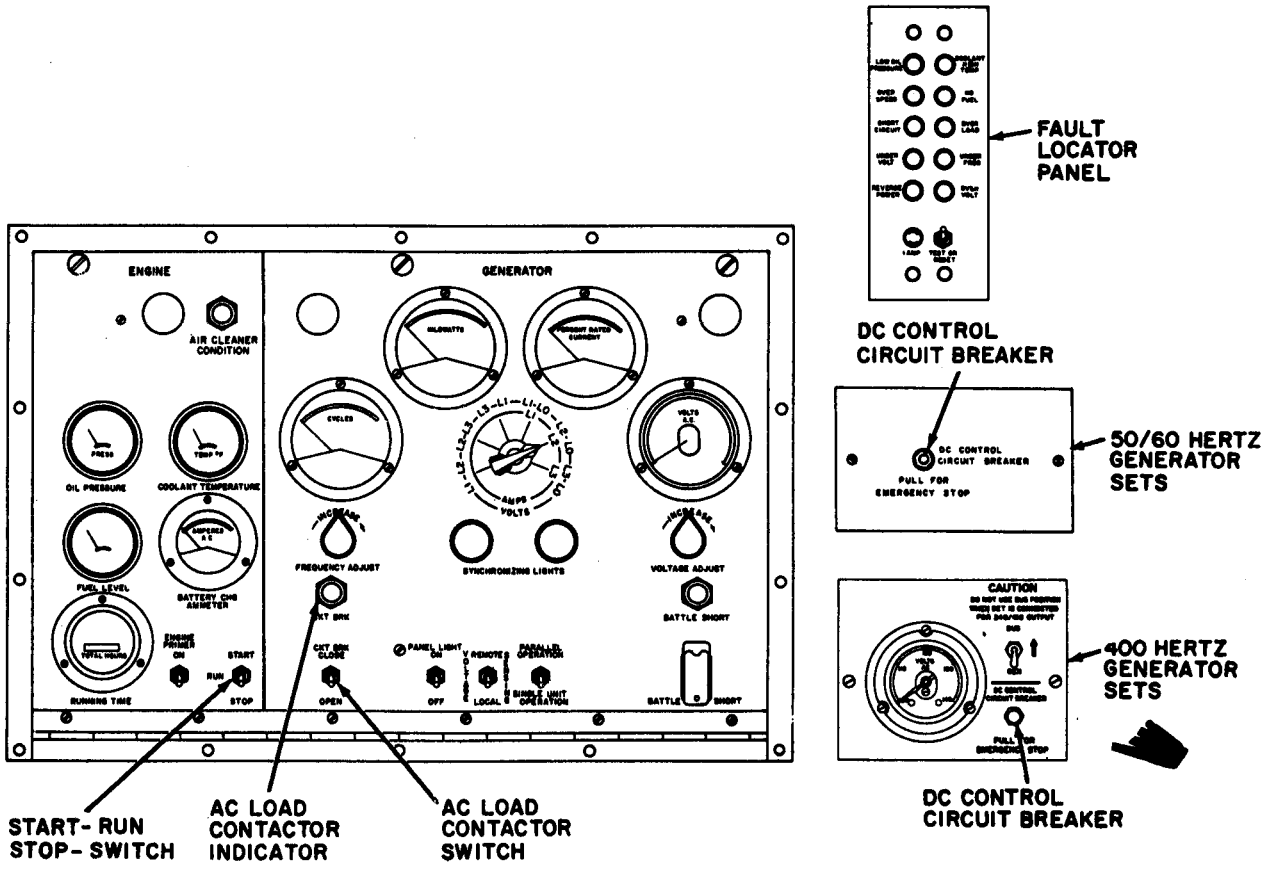
NOTE

TO ASSIST ENGINE STARTING IN COLD WEATHER UTILIZE ETHER STARTING AID. REFER TO PARAGRAPH 2-22.

STEP 2. POSITION AND HOLD START-RUN-STOP SWITCH IN START POSITION UNTIL OIL PRESSURE INCREASES TO 25 PSIG AND VOLTAGE BUILDS UP ON AC VOLTMETER

STEP 3. POSITION START-RUN-STOP SWITCH TO RUN.

Figure 2-9. Starting instructions



NOTE

IN THE EVENT OF AN EMERGENCY, THE GENERATOR SET MAY BE STOPPED BY PERFORMING STEP 4 ONLY.

STEP 1. **POSITION AND HOLD AC LOAD CONTACTOR SWITCH TO OPEN UNTIL AC LOAD CONTACTOR INDICATOR GOES OUT. RELEASE SWITCH.**

STEP 2. **PERMIT ENGINE TO OPERATE AT NO LOAD FOR APPROXIMATELY FIVE MINUTES (TO COOL DOWN).**

STEP 3. **POSITION START-RUN-STOP SWITCH TO STOP.**

STEP 4. **DE-ENERGIZE DC CONTROL CIRCUIT BREAKER.**

STEP 5. **CLOSE ALL GENERATOR SET DOORS.**

Figure 2-10. Stopping instructions

a. SINGLE UNIT OPERATION. To operate the generator set as a single unit, proceed as follows:

1. If desired, connect auxiliary fuel supply. Refer to paragraph 2-5, step f.

2. Determine load voltage requirements and position voltage change board for required voltage. Refer to paragraph 2-6.

3. Determine that load requirement is equal to or below rated capacity of generator set.

4. Connect load cables. Refer to paragraph 2-5, step g.

5. Refer to figure 2-11 and operate the generator set as a single unit.

b. PARALLEL OPERATION. To operate two or more generator sets of the same class (precise or utility) and mode (50/60 or 400 hertz) in parallel, proceed as follows:

WARNING

Lethal voltages are present on load cables, load terminals and the load side of contactor/circuit breaker when two (2) or more Generator Sets are connected in parallel load regardless of whether or not all Generator Sets are operating; DEATH MAY RESULT! Before performing maintenance on Generator Sets connected in parallel, Assure that all Generator Sets are de-energized and there is no power to the load.

1. Determine that load requirement is equal to or below combined rated capacity of generator sets to be paralleled.

2. Make sure generator sets are properly grounded.

3. Determine voltage requirements and position voltage change boards of generator sets to be paralleled to required voltage. Refer to paragraph 2-6.

WARNING

Prior to making connections for parallel operation, make sure there is no input to load, the sets are not in a standby mode, and that generator sets are not operating.

NOTE

Parallel cable is located in storage box mounted to roof above generator.

4. Connect generator sets to load observing proper phase polarity L1 to L1, L2 to L2, etc. Refer to figure 2-12.

5. On precise generator sets, remove paralleling receptacle shorting plug (45, figure 2-8) and connect paralleling cable to paralleling receptacle, refer to figure 2-12. On utility generator sets, make sure paralleling receptacle shorting plug (45, figure 2-8) is installed on paralleling receptacle.

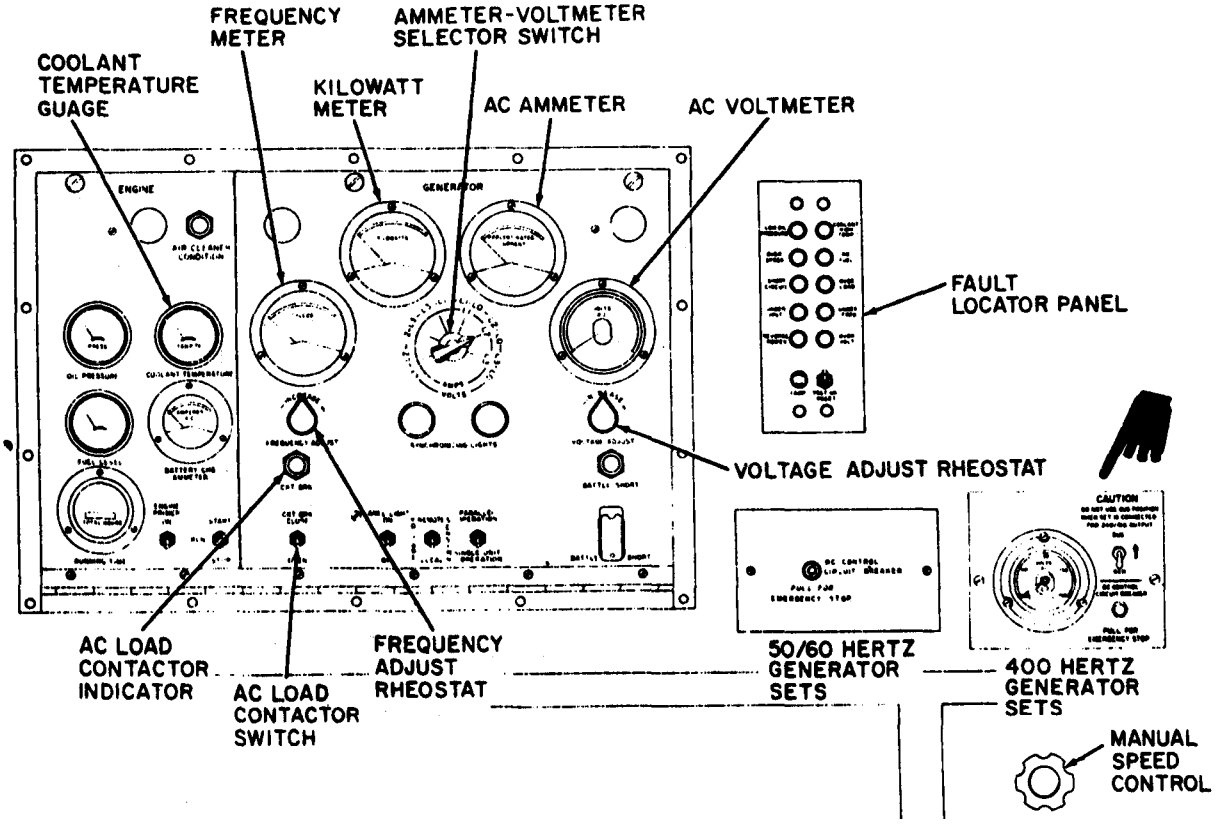
6. Refer to figure 2-13 and operate generator sets in parallel.

c. REMOVAL FROM PARALLEL OPERATION. To remove a generator set from parallel operation, refer to figure 2-14.

WARNING

If necessary to move generator set, shut-down remaining generator sets connected to the load, prior to removing load cables or ground.

d. OPERATION UNDER EMERGENCY CONDITIONS (BATTLE SHORT). The generator set protective devices may be bypassed and generator set operated under abnormal conditions. Operation under this condition will lock-out all protective devices with the exception of engine



STEP 1. START GENERATOR SET, REFER TO PARAGRAPH 2-12.

STEP 2. POSITION AMMETER-VOLTMETER SELECTOR SWITCH TO DESIRED POSITION. ROTATE VOLTAGE ADJUST RHEOSTAT TO OBTAIN DESIRED VOLTAGE AS INDICATED ON AC VOLTMETER.

STEP 3. ON PRECISE GENERATOR SETS, ROTATE FREQUENCY ADJUST RHEOSTAT TO OBTAIN RATED FREQUENCY AS INDICATED ON FREQUENCY METER. ON UTILITY GENERATOR SETS, PUSH IN MANUAL SPEED CONTROL TO OBTAIN APPROXIMATE RATED FREQUENCY AND THEN ROTATE VERNIER KNOB TO OBTAIN RATED FREQUENCY.

NOTE

IF REQUIRED LOAD MAY BE APPLIED IMMEDIATELY.

STEP 4. OPERATE ENGINE FOR A MIMINUM OF FIVE MINUTES FOR WARM-UP.

STEP 5. APPLY LOAD BY POSITIONING AND HOLDING AC LOAD CONTACTOR SWITCH TO CLOSE UNTIL AC LOAD CONTACTOR INDICATOR ILLUMINATES. RELEASE SWITCH.

STEP 6. OBSERVE AC VOLTMETER AND FREQUENCY METER. IF NECESSARY, READJUST TO *OBTAIN* DESIRED OPERATING RANGES.

STEP 7. OBSERVE KILOWATT METER. IF MORE THAN RATED KW IS INDICATED, REDUCE LOAD.

STEP 8. ROTATE AMMETER-VOLTMETER SELECTOR SWITCH TO EACH PHASE POSITION AND MONITOR AC AMMETER. IF MORE THAN RATED LOAD IS INDICATED FOR ANY PHASE POSITION, REDUCE LOAD.

STEP 9. PERFORM DURING OPERATION CHECKS AND SERVICES AS SPECIFIED IN TABLE 3-2.

Figure 2-11. Single unit operation

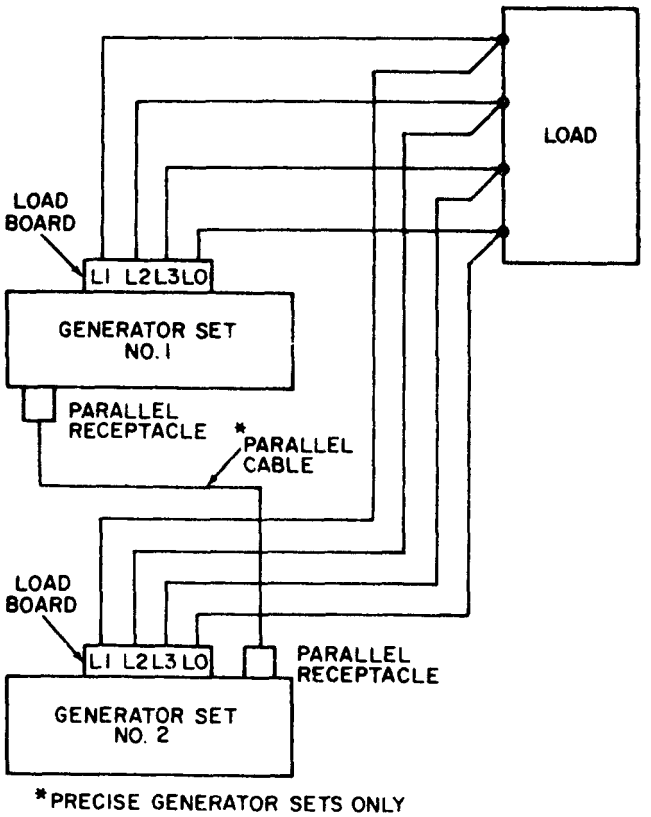


Figure 2-12. Parallel unit connection diagram

overspeed and short circuit. To operate under these conditions, proceed as follows:

NOTE

Battle short indicator (13, figure 2-8) will illuminate when battle short switch is positioned to ON and remain illuminated until switch is positioned to OFF.

1. To start and operate a generator set that has shutdown due to a fault, start generator as specified in paragraph 2-12 except as soon as engine starts, with start-run-stop switch in START position, lift red battle short switch guard (14, figure 2-8) and position battle short switch to ON. Then position start-run-stop switch to RUN.

2. To bypass a generator fault with engine still operating, lift red battle short switch guard (14) and position battle short switch to ON. Position AC load contactor switch (19) to CLOSE.

CAUTION

After operating generator set when battle short switch is used to override an activated protective device, inspect generator set for possible defects. Correct fault and any damage prior to next operation of generator set.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-15. OPERATION IN EXTREME COLD (BELOW -25°F).

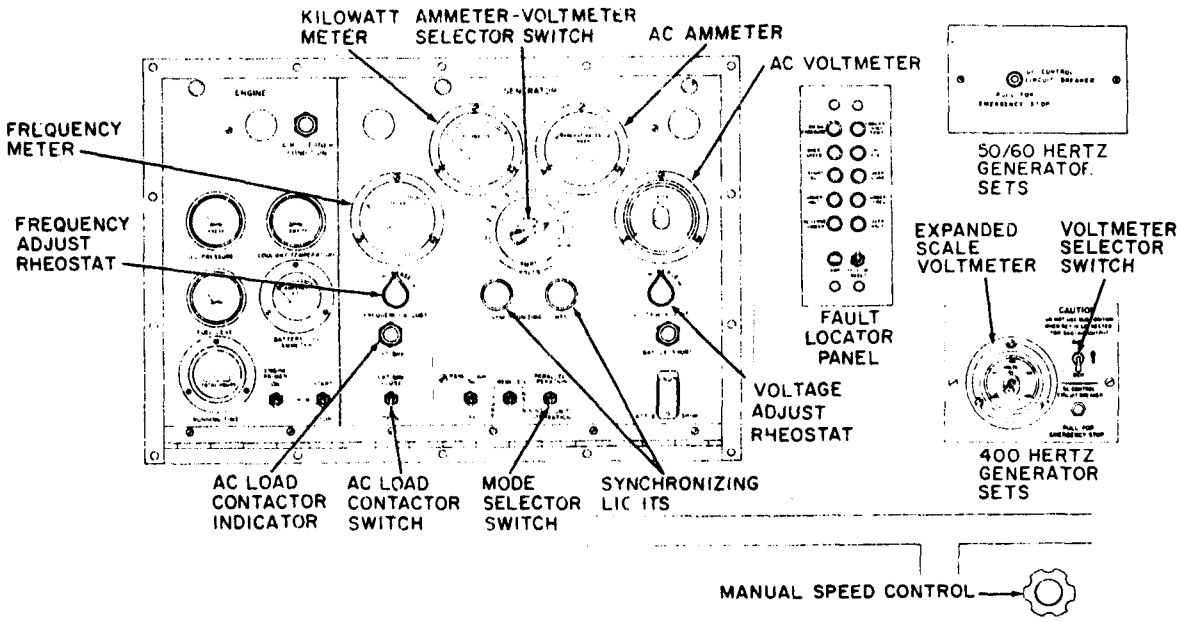
a. GENERAL. The generator set is designed to operate in temperatures of -25° F to 125°F without external heat. To operate the generator set from -25°F to -65°F winterization kits must be utilized.

(1) (AIR FORCE USE ONLY) An H-1 type heater, with a locally manufactured adapter, can be used in lieu of winterization kit. (Adapter drawing (7832970) and installation diagram are available from SM-ALC/MMIR on request.

b. FUEL SYSTEM. Keep fuel tank as full as possible to prevent condensation of moisture. Be sure to use proper grade of fuel for existing ambient temperature. Drain water and sediment from fuel system components more frequently than usual. Remove ice, snow, and moisture from area of fuel filler cap and filler neck.

CAUTION

If water is added to batteries in freezing temperatures, charge batteries or run engine for at least an hour to thoroughly mix water with electrolyte.



STEP 1. POSITION MODE SELECTOR SWITCH TO PARALLEL OPERATION ON ALL GENERATOR SETS.
STEP 2. START GENERATOR SETS, REFER TO PARAGRAPH 2-12.
STEP 3. ROTATE VOLTAGE ADJUST RHEOSTATS TO OBTAIN SAME VOLTAGE ON EACH SET.
STEP 4. ON PRECISION GENERATOR SETS, ROTATE FREQUENCY ADJUST RHEOSTAT TO OBTAIN SAME FREQUENCY ON EACH SET. ON UTILITY GENERATOR SETS, PUSH IN MANUAL SPEED CONTROLS AND THEN ROTATE VERNIER ADJUSTMENT TO OBTAIN SAME FREQUENCY ON EACH SET.

CAUTION

DO NOT CLOSE AC LOAD CONTACTOR OF OTHER GENERATOR SETS AT THIS TIME.

STEP 5. POSITION AND HOLD AC LOAD CONTACTOR SWITCH, ON GENERATOR SET NUMBER 1, TO CLOSE UNTIL AC LOAD CONTACTOR INDICATOR ILLUMINATES. RELEASE SWITCH.

CAUTION

DO NOT USE BUS POSITION OF SWITCH WHEN SET IS CONNECTED FOR 240/416 OUTPUT.

STEP 5.1 ON THE SECOND AND SUBSEQUENT UNIT, ACTUATE EXPANDED SCALE VOLTMETER SELECTOR SWITCH TO BUS POSITION. ADJUST VOLTAGE OF ONCOMING UNIT TO MATCH BUS VOLTAGE (400 HZ UNITS ONLY).

CAUTION

IF SYCHRONIZING LIGHTS DO NOT GLOW BRIGHT AND DARK IN UNISON, THE PHASING IS WRONG. SHUT DOWN GENERATOR SETS AND CORRECT PHASING.

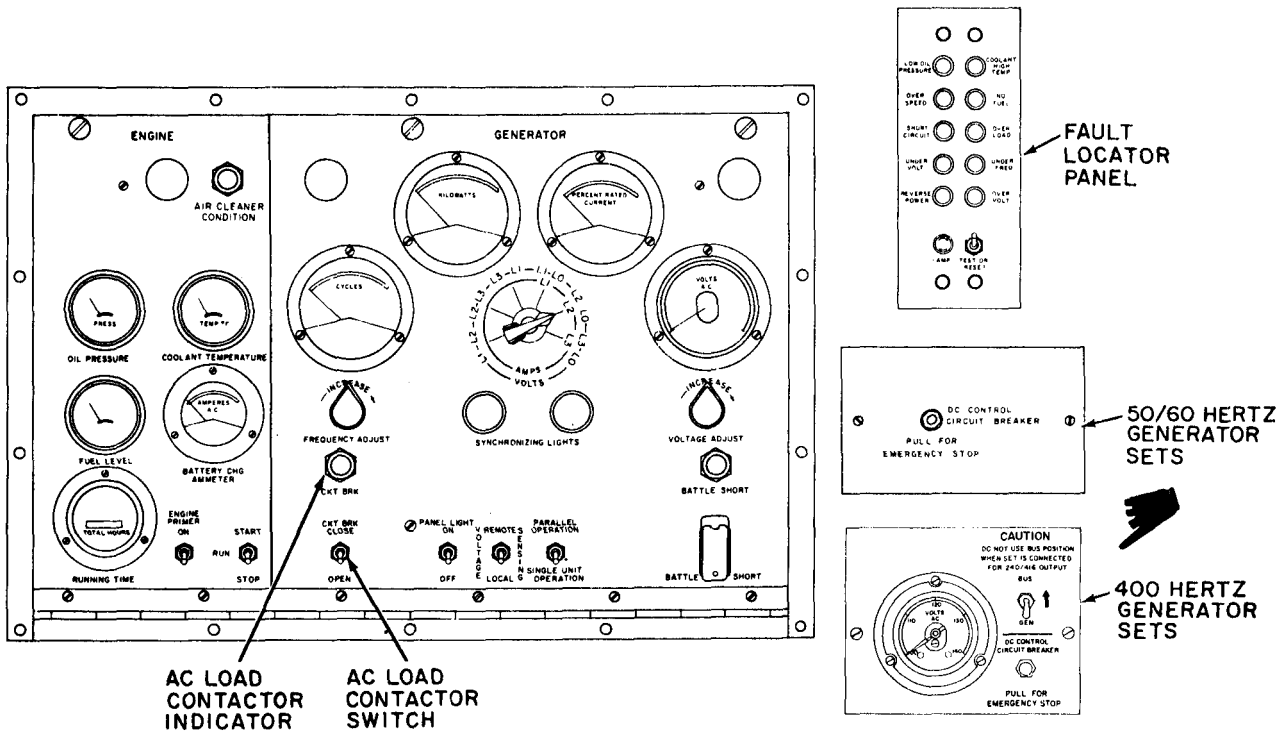
STEP 6. OBSERVE SYNCHRONIZING LIGHTS ON GENERATOR SET NUMBER 2. THE LIGHTS SHOULD BE ALTERNATELY GLOWING BRIGHT AND DARK IN UNISON.
STEP 7. ADJUST FREQUENCY OF GENERATOR SET NUMBER 2 AS REQUIRED TO CAUSE SYNCHRONIZING LIGHTS TO SLOWLY GLOW BRIGHT AND DARK IN UNISON.

NOTE

ON PRECISE GENERATOR SETS, THE PERMISSIVE PARALLELING RELAY WILL PERMIT THE AC LOAD CONTACTOR TO BE CLOSED ONLY WHEN THE SYNCHRONIZING LIGHTS ARE DARK.

STEP 8. WHEN BOTH SYNCHRONIZING LIGHTS ARE DARK, POSITION AND HOLD AC LOAD CONTACTOR SWITCH, OF GENERATOR SET NUMBER 2, TO CLOSE UNTIL AC LOAD CONTACTOR INDICATOR ILLUMINATES. RELEASE SWITCH.
STEP 9. THE GENERATOR SETS ARE NOW OPERATING IN PARALLEL AND SHOULD DIVIDE LOAD APPROXIMATELY EQUAL. IF NECESSARY, FINE TRIM LOAD SHARING BETWEEN SETS BY VARYING VOLTAGE AND FREQUENCY SETTINGS OF THE SETS.
STEP 10. IF ADDITIONAL GENERATOR SETS ARE TO BE PARALLELED, PERFORM STEPS 5.1 THROUGH 9 UTILIZING CONTROLS AND LIGHTS ON ADITIONAL GENERATOR SETS.

Figure 2-13. Parallel unit operation



CAUTION

PRIOR TO REMOVAL OF GENERATOR SET(S) FROM PARALLEL OPERATION, MAKE SURE LOAD DOES NOT EXCEED FULL LOAD RATING OF GENERATOR SET(S) REMAINING ON THE LINE.

STEP 1. POSITION AND HOLD AC LOAD CONTACTOR SWITCH TO OPEN UNTIL AC LOAD CONTACTOR INDICATOR GOES OUT.

STEP 2. STOP GENERATOR SET, REFER TO PARAGRAPH 2-13.

Figure 2-14. Removal from parallel operation

c. ENGINE ELECTRICAL SYSTEM. Clean batteries and cables. Inspect batteries for cracked or damaged cases. Make sure that battery electrolyte level is to filler slot in each cell; battery cap ventholes are open; and that battery terminals are tight and lightly greased. Keep batteries fully charged. Inspect all electrical wiring for cracks, breaks, and fraying of insulation. Tighten loose connections.

d. LUBRICATION. Lubricate generator set in accordance with paragraph 3-3.

e. COOLING SYSTEM. Inspect level of coolant in radiator. Inspect cooling system for leaks, paying particular attention to gaskets and hose connections. Make sure that antifreeze solution is correct for lowest ambient temperature expected, refer to paragraph 3-44.

f. ENGINE. Permit engine to reach normal operating temperature before applying load.

2-16. OPERATION IN EXTREME HEAT.

a. COOLING SYSTEM. Check coolant level of radiator daily and add clean fresh water as necessary. Check radiator to see that there are no obstructions in the cooling fins. Check for leaks, and if necessary, use an approved rust inhibitor to prevent formation of rust and scale. Make sure radiator shutter control valve is operating properly.

b. LUBRICATION. Lubricate engine in accordance with paragraph 3-3.

c. FUEL SYSTEM. Keep fuel tank full to prevent condensation but allow sufficient space for expansion of the fuel.

d. BATTERIES. Inspect the electrolyte level in the batteries daily. The electrolyte level should be to the slots in the filler wells. Service batteries as necessary.

e. GENERATOR. Keep the generator free of dirt and grime. Be sure that ventilating screens and louvers are free of obstructions which may restrict air flow.

f. ENGINE. After removal of load, permit engine to run at no load a minimum of 5 minutes to cool engine prior to shutdown.

2-17. OPERATION IN DUSTY OR SANDY AREAS.

a. PROTECTION. Keep all access doors and panels closed when generator set is not operating.

b. COOLING SYSTEM. Inspect cooling system for leaks. Keep radiator cap on tight. Keep radiator cooling fins clean.

c. LUBRICATION. In sandy or dusty areas, lubricating oil filters must be serviced more frequently than under normal conditions. Clean all lubrication points before and after lubrication. Be sure that all lubrication containers are tightly sealed and stored in an area as free as possible from dust and sand.

d. FUEL SYSTEM. Take all necessary precautions to keep dust, sand, and grit out of fuel tank. Service fuel filters and strainer more frequently than normally required.

2-18. OPERATION UNDER RAINY OR HUMID CONDITIONS.

a. FUEL SYSTEM. Keep fuel tank full to prevent condensation of moisture. Drain water and sediment from fuel system components more frequently than usual.

b. RUST PREVENTION. Clean generator set, refer to paragraph 3-19. Inspect painted surfaces for cracks, peeled, or blistered paint. Repair defects and repaint surfaces.

2-19. OPERATION IN SALT WATER AREAS.

a. CLEANING. Clean the generator set frequently, refer to paragraph 3-19.

b. PROTECTION. Keep all access doors and panels closed when generator set is not operating. Remove rust immediately and apply paint and/or rustproofing material as applicable.

2-20. OPERATION IN SNOW.

a. COOLING SYSTEM. Make sure radiator cooling fins and louvers are free of ice and snow before starting generator set.

b. PROTECTION. Keep all access doors and panels closed when generator set is not operating. Remove rust immediately and apply paint and/or rustproofing material as applicable. Remove snow from generator set before opening access panel and doors.

c. BEFORE STARTING. Remove snow from rear of generator set to prevent snow from being drawn into generator set.

2-21. OPERATION AT HIGH ALTITUDES.

a. GENERAL. The generator set is designed to operate at rated load at elevation up to and including 5,000 feet above sea level, 96.5 percent of rated load at 6,000 feet and 90 percent of rated load at 8,000 feet, without special adjustments.

b. VENTILATION. Make sure there is adequate cooling air flow as the engine is more likely to overheat at high altitudes.

c. COOLING SYSTEM. Inspect level of coolant in radiator and make sure that anti-freeze solution is correct for lowest ambient temperature expected, refer to paragraph 3-44.

d. FUEL SYSTEM. Keep fuel tank as full as possible to prevent condensation of moisture. Be sure to use proper grade of fuel for existing ambient temperature.

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

2-22. ETHER STARTING AID.

The ether starting aid is provided to assist in engine starting as required during cold weather. To operate the ether starting aid, refer to figure 2-15.

2-23. FIRE EXTINGUISHER (ARMY AND MARINE CORPS ONLY)

The fire extinguisher is provided to extinguish all types of fires except those involved with liquid oxygen. To operate the extinguisher, proceed as follows:

a. Remove fire extinguisher from bracket on generator set.

WARNING

Avoid breathing of smoke.

b. Pull ring pin. Point horn close to base of fire and depress trigger. Keep base of flames covered with extinguishing agent.

c. Replace cylinder immediately after using, refer to paragraph 4-8.

2-24. FUEL BURNING WINTERIZATION KIT.

a. GENERAL. The fuel burning winterization kit is utilized to pre-heat engine coolant and lubricating oil in cold weather. In ambient temperatures below -25 °F an auxiliary winterization kit is required to supply external battery power.

b. PREPARATION FOR OPERATION.

1. Perform before operation checks and services as specified in table 4-3.

2. Open coolant valves, fuel shutoff valve, and heater exhaust plate.

STEP 1. WHILE STARTING ENGINE AS SPECIFIED IN FIGURE 2-9, POSITION ENGINE PRIMER SWITCH TO ON AND OFF TO INJECT A METERED AMOUNT OF ETHER INTO ENGINE.

STEP 2. IF ENGINE DOES NOT START IMMEDIATELY OR STARTS THEN FALTERS, INJECT ADDITIONAL ETHER INTO ENGINE.

CAUTION

DO NOT INJECT ETHER INTO HOT ENGINE.

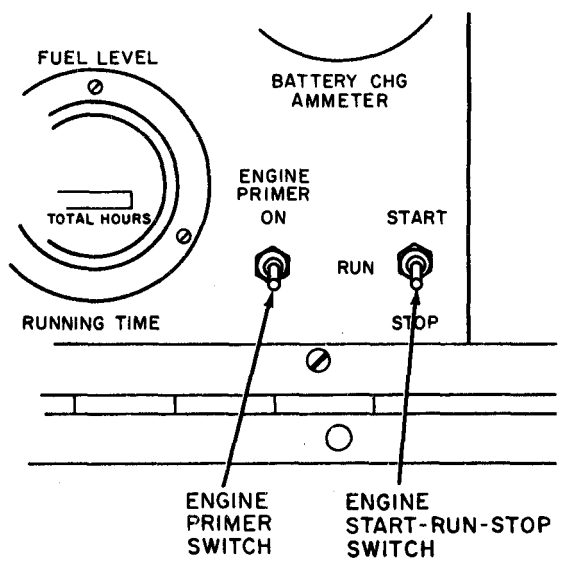


Figure 2-15. Ether starting aid, operating instructions

c. OPERATION. Refer to figure 2-16 and operate fuel burning winterization kit.

d. STANDBY OPERATION. Refer to figure 2-16, step B and operate fuel burning winterization kit in a standby mode.

2-25. ELECTRIC WINTERIZATION KIT.

a. GENERAL. The electric heater kit is primarily used to keep standby generator sets warm enough for quick starts and load assumption by maintaining the coolant and lubricating oil at 120°F. It may also be used to preheat the engine for starting in cold weather in locations where 205 to 240 volt power is available. In ambient temperatures below -25°F an auxiliary winterization kit is required to supply external battery power. Use of the electric heater kit is mandatory when the set is used in conjunction with a load transfer panel for standby operation.

b. PREPARATION FOR OPERATION.

1. Perform before operation checks and services as specified in table 4-5.

2. Connect power cable to power supply and open coolant valves.

c. OPERATION. Refer to figure 2-17 and operate electric heater kit.

d. STANDBY OPERATION. Refer to figure 2-17, step B and operate electric heater kit in a standby mode.

2-26. WHEEL MOUNTING KIT.

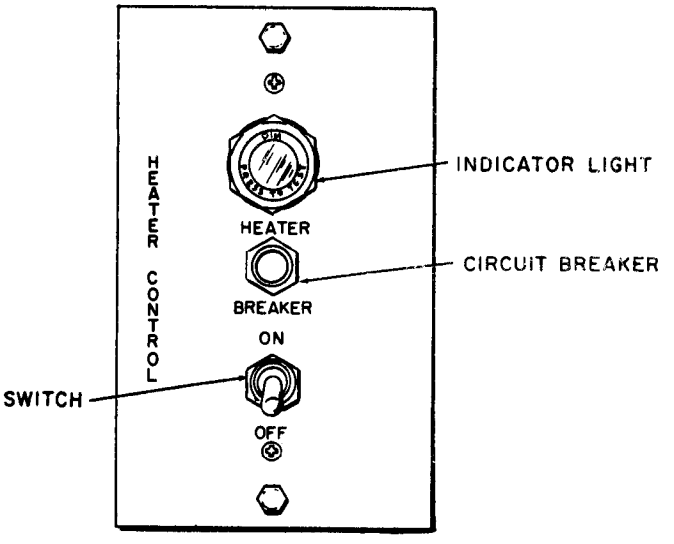
a. GENERAL. The wheel mounting kit provides a ready means of moving the generator set. When the wheel mounting kit is installed on generator set, the set may be towed a maximum of 10 MPH on paved highways and 5 MPH on graded gravel road. Kit has a ground clearance of 10 inches and front wheels turn for steering.

b. PREPARATION FOR OPERATION. Perform before operation checks and services as specified in table 4-7.

c. OPERATION. Refer to figure 2-18 for wheel mounting kit operating instructions.

2-27. DUMMY LOAD KIT.

a. GENERAL. The dummy load kit provides a means of applying a dummy load to the generator set. The kit permits changes in load from 0 to 48 percent of the generator set KW rating in increments of approximately 12.0 KW.



A. STARTING

STEP 1. ENERGIZE CIRCUIT BREAKER AND PRESS TO TEST INDICATOR LIGHT. LIGHT SHOULD ILLUMINATE WHEN PRESSED.

STEP 2. POSITION SWITCH TO ON AND OBSERVE INDICATOR LIGHT. LIGHT SHOULD ILLUMINATE WHEN HEATER GOES INTO RUN CYCLE. APPROXIMATELY 3-1/2 MINUTES.

NOTE

IF INDICATOR LIGHT DOES NOT ILLUMINATE IN APPROXIMATELY 3-1/2 MINUTES, POSITION SWITCH TO OFF. WAIT 3-1/2 MINUTES BEFORE ATTEMPTING TO RESTART HEATER. IF HEATER DOES NOT START AFTER SECOND ATTEMPT, SHUT DOWN KIT AND CORRECT MALFUNCTION.

STEP 3. PERMIT KIT TO OPERATE A MINIMUM OF ONE HOUR, OR UNTIL HEATER CYCLES AUTOMATICALLY UNDER THERMOSTAT CONTROL, INDICATED BY CYCLING OF INDICATOR LIGHT.

NOTE

BATTERY POWER MUST BE PROVIDED BY AN AUXILIARY WINTERIZATION KIT OR OTHER SUITABLE SLAVE BATTERY SOURCE IN AMBIENT TEMPERATURES OF -25° F OR BELOW.

STEP 4. START GENERATOR SET ENGINE IN ACCORDANCE WITH PARAGRAPH 2-12. SHUT DOWN KIT.

B. STANDBY OPERATION

Step 1. PERFORM STEP A.1 AND A.2. KIT IS NOW UNDER THERMOSTAT CONTROL AND WILL AUTOMATICALLY CYCLE TO MAINTAIN PROPER COOLANT TEMPERATURE.

STEP 2. WHEN REQUIRED, START GENERATOR SET ENGINE IN ACCORDANCE WITH PARAGRAPH 2-12. SHUT DOWN KIT.

C. STOPPING

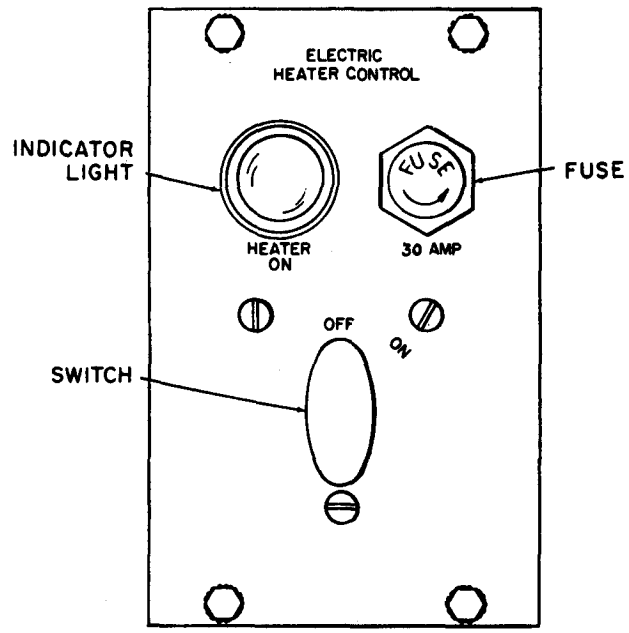
STEP 1. POSITION SWITCH TO OFF. INDICATOR LIGHT SHOULD REMAIN ILLUMINATED UNTIL HEATER FINISHES PURGE CYCLE (APPROXIMATELY 4-1/2 MINUTES).

STEP 2. AFTER INDICATOR LIGHT GOES OUT, DE-ENERGIZE CIRCUIT BREAKER.

STEP 3. PERFORM AFTER OPERATION CHECKS AND SERVICE AS SPECIFIED IN TABLE 4-3.

STEP 4. CLOSE COOLANT, FUEL SHUTOFF VALVES, AND HEATER EXHAUST PLATE.

Figure 2-16. Fuel burning winterization kit, operating instructions



A. STARTING

STEP 1. POSITION SWITCH TO ON. INDICATOR LIGHT SHOULD ILLUMINATE AND REMAIN ON WHILE HEATER IS IN OPERATION.

STEP 2. PERMIT KIT TO OPERATE A MINIMUM OF FIVE HOURS, OR UNTIL HEATER CYCLES AUTOMATICALLY UNDER THERMOSTAT CONTROL, INDICATED BY CYCLING OF INDICATOR LIGHT.

NOTE

BATTERY POWER MUST BE PROVIDED BY AN AUXILIARY WINTERIZATION KIT OR OTHER SUITABLE SLAVE BATTERY SOURCE IN AMBIENT TEMPERATURES OF -25°F OR BELOW.

STEP 3. START GENERATOR SET ENGINE IN ACCORDANCE WITH PARAGRAPH 2-12. SHUT DOWN KIT.

B. STANDBY OPERATION

STEP 1. PERFORM STEPS A.1 AND A.2. KIT IS NOW UNDER THERMOSTAT CONTROL AND WILL AUTOMATICALLY CYCLE TO MAINTAIN PROPER COOLANT TEMPERATURE .

STEP 2. WHEN REQUIRED, START GENERATOR SET ENGINE AS SPECIFIED IN PARAGRAPH 2-12. SHUT DOWN KIT.

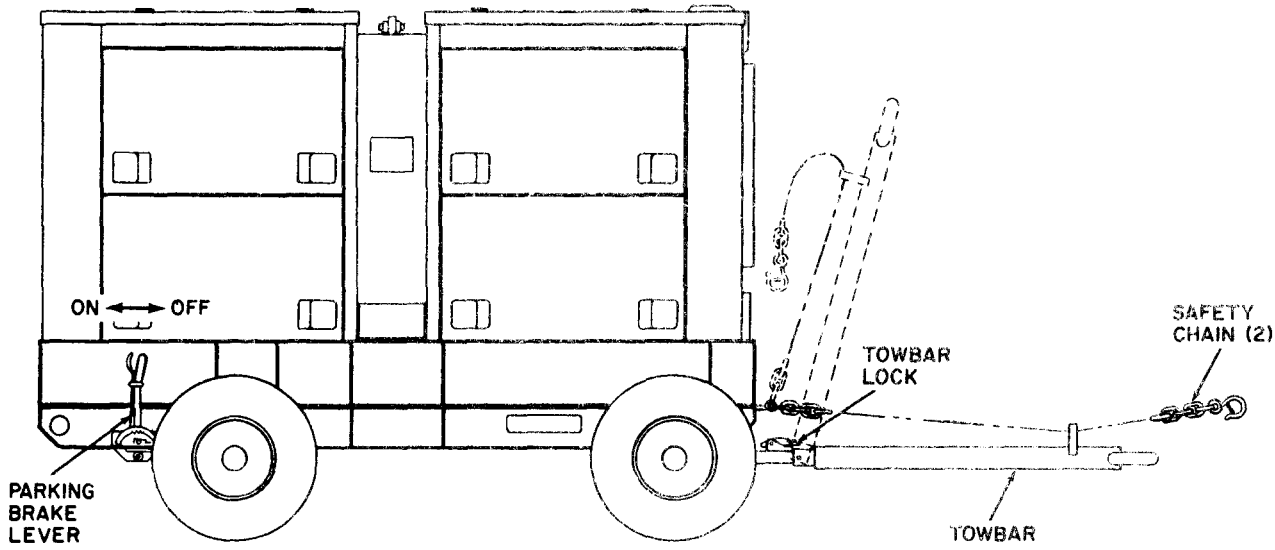
C. STOPPING

STEP 1. POSITION SWITCH TO OFF AND OBSERVE INDICATOR LIGHT. LIGHT SHOULD GO OUT.

STEP 2. PERFORM AFTER OPERATION CHECKS AND SERVICE AS SPECIFIED IN TABLE 4-5.

STEP 3. CLOSE COOLANT VALVES.

Figure 2-17. Electric winterization kit, operating instructions



STEP 1. RELEASE TOWBAR LOCK AND CONNECT TOWBAR AND SAFETY CHAINS TO TOWING VEHICLE.

STEP 2. RELEASE PARKING BRAKE HANDLE AND TOW GENERATOR SET TO DESIRED LOCATION.

STEP 3. ENGAGE PARKING BRAKE AND REMOVE TOWBAR AND SAFETY CHAINS FROM TOWING VEHICLE.

STEP 4. RAISE TOWBAR AND SAFETY CHAINS UP UNTIL TOWBAR LOCK ENGAGES THE TOWBAR.

Figure 2-18. Wheel mounting kit, operating instructions

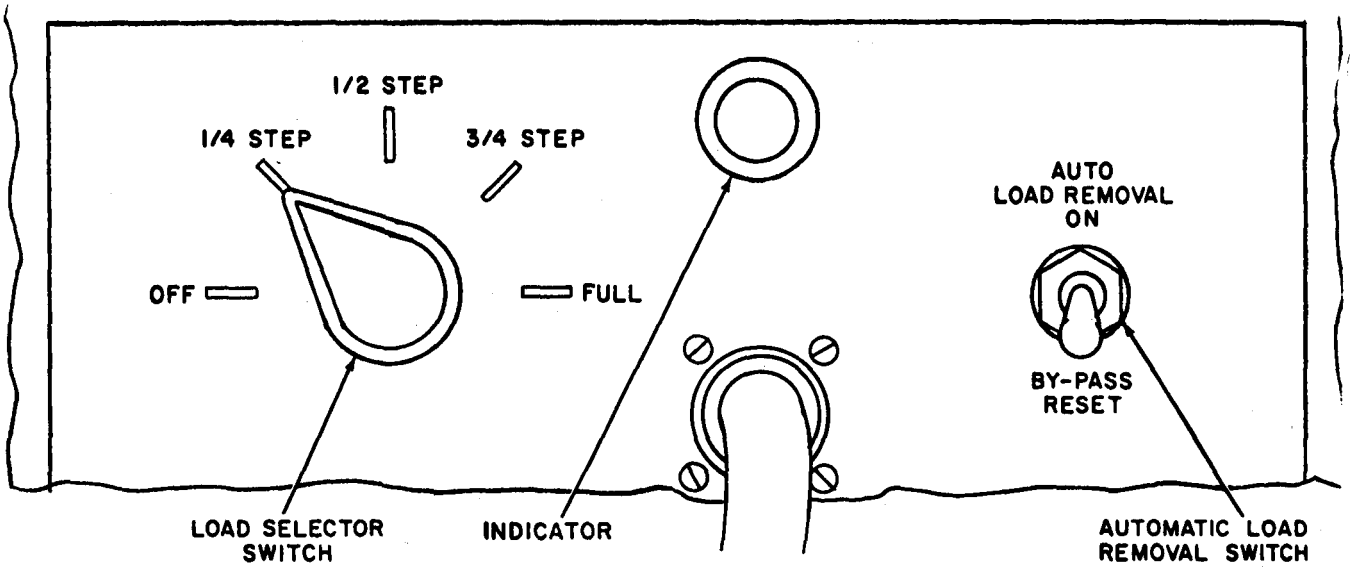
b. PREPARATION FOR OPERATION.

1. Set up dummy load kit for operation as specified in paragraph 4-42.

2. Make sure dummy load kit voltage change board is positioned for same voltage output as generator set. If not, position voltage change board for proper voltage, refer to paragraph 4-42, step c.

3. Make sure load selector switch is in OFF position.

c. OPERATION. Refer to figure 2-19 and operate dummy load kit.



STEP 1. POSITION AUTOMATIC LOAD REMOVAL SWITCH TO BY-PASS RESET.

STEP 2. OPERATE GENERATOR SET AS SPECIFIED IN PARAGRAPH 2-14. OBSERVE KILOWATT METER READING.

NOTE

EACH STEP SELECTED BY LOAD SELECTOR SWITCH PROVIDES AN APPROXIMATE 12.0 KW LOAD PROGRESSIVELY.

STEP 3. APPLY LOAD IN 1/4 LOAD STEPS AS NECESSARY BY ROTATING LOAD SELECTOR SWITCH TO DESIRED INCREMENT.

STEP 4. IF AUTOMATIC DUMMY LOAD DISCONNECT IS DESIRED WHEN GENERATOR SET LOAD EXCEEDS 48 PERCENT, POSITION AUTOMATIC LOAD REMOVAL SWITCH TO AUTO LOAD REMOVAL ON. IN THE EVENT THAT GENERATOR SET LOAD EXCEEDS 48 PERCENT, THE DUMMY LOAD WILL AUTOMATICALLY BE REMOVED AND INDICATOR WILL GO OUT.

NOTE

TO PLACE DUMMY LOAD KIT BACK IN OPERATION AFTER AUTOMATIC REMOVAL PERFORM STEP 5.

STEP 5. POSITION LOAD SELECTOR SWITCH TO OFF. POSITION AUTOMATIC LOAD REMOVAL SWITCH TO BY-PASS RESET. PERFORM STEP 3 AND STEP 4.

STEP 6. TO REMOVE DUMMY LOAD KIT FROM OPERATION, POSITION LOAD SELECTOR SWITCH TO OFF AND OBSERVE INDICATOR. INDICATOR SHOULD GO OUT.

Figure 2-19. Dummy load kit, operating instructions

CHAPTER 3

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE REPAIR PARTS, TOOLS, AND EQUIPMENT

3-1. TOOLS AND EQUIPMENT.

a. Basic issue tools and repair parts issued with or authorized for the generator set are listed in the Basic Issue Items List, Appendix B of this manual.

b. No special tools or special equipment are required by operator and organizational maintenance personnel for performing maintenance on the generator set. Table 3-1 lists recommended tools that may be utilized when performing maintenance on the generator set.

3-2. ORGANIZATIONAL MAINTENANCE REPAIR PARTS.

Organizational maintenance repair parts are listed and illustrated in Air Force T.O. 35C2-3-442-4, Army TM 5-6115-457-24P, Navy P-9-TM-457-25P, and Marine Corps SL-4-07464A.

Table 3-1. Recommended Tools

ITEM	NSN OR PART NUMBER	REFERENCE PARAGRAPH NO.	USE
Gauge, Tire Pressure	4910-00-204-3170	4-35	Check pressure of wheel mounting kit tires.
Ohmmeter	6625-00-643-1030	3-51	Test wiring and electrical components.
Tester, Battery electrolyte solution	6630-00-171-5126	3-33	Test specific gravity of battery electrolyte.
Tester, Anti-freeze solution	6630-00-247-2968	3-44	Test specific gravity of radiator coolant.
Gauge, Thickness	5210-00-221-1999	3-86	Adjust engine valve lash.
Bulb Extractor	5120-00-288-7679	3-66	Remove synchronize light bulb.

Section II. LUBRICATION

3-3. GENERAL LUBRICATION INFORMATION.

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

b. The lubrication order shown in figure 3-1 is an exact reproduction of the approved lubrication order. Refer to Army LO5-6115-457-12 and Marine Corps LO-07464A-12.

3-4. DETAILED LUBRICATION INFORMATION.

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

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

c. POINTS OF LUBRICATION. Service the lubrication points at proper intervals as illustrated in figure 3-1.

d. OES OIL.

1. The crankcase oil level must be checked frequently, as oil consumption may increase.

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

e. OIL FILTER SERVICE. Service the oil filters as illustrated in figure 3-2.

LUBRICATION ORDER

L05-6115-457-12
L0-07464A-12

GENERATOR SET, DIESEL ENGINE DRIVEN SKID MTD., 100 KW,
3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	FSN
MEP007A	UTILITY	50/60	6115-133-9101
MEP106A	PRECISE	50/60	6115-133-9102
MEP116A	PRECISE	400	6115-133-9103

Reference: C9100-IL

The lubricating intervals are based on normal hours of operation. The intervals may be adjusted when dictated by abnormal operations or severe conditions, service-peculiar directions and local operating procedures.

Clean fittings before lubricating.

Relubricate after washing.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry cleaning, or with OIL, fuel Diesel. Dry before lubricating.

Drain crankcase when hot. Fill and check level.

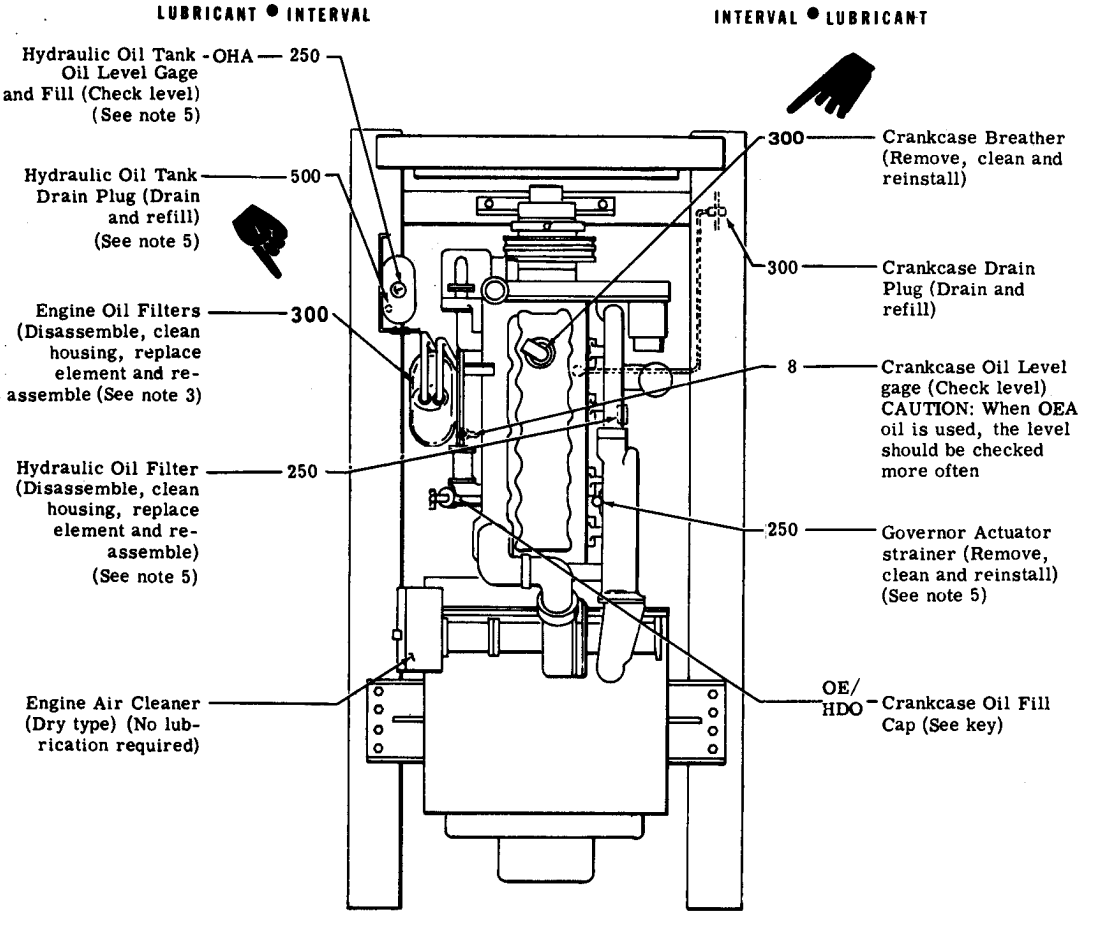


Figure 3-1. Lubrication order (sheet 1of 2)

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE/HDO-OIL, Engine, Heavy-Duty		OE/HDO 30	OE/HDO 10	OEA	Intervals given are in hours of normal operation
Crankcase W Filters	30 qt				
Oil Can Points		OE/HDO 30	OE/HDO 10		
OEA-OIL, Engine, Sub-zero					
		ALL TEMPERATURES			
Hydraulics tank, filters and lines	6.5 qt.				

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. OIL CAN POINTS. Every 50 hours lubricate hinges, latches, and all exposed adjusting threads with OE/HDO.

3. ENGINE OIL FILTER. Every 300 hours remove filter element, clean housing, install new element, fill crankcase, operate engine for 5 minutes, check for leaks, check crankcase oil level and bring to FULL mark.

NOTE

Crankcase oil level may be determined while engine is running.

4. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable specification numbers.

OE/HDO MIL-L-2104C OHA MIL-H-5606B
OEA MIL-L-46167

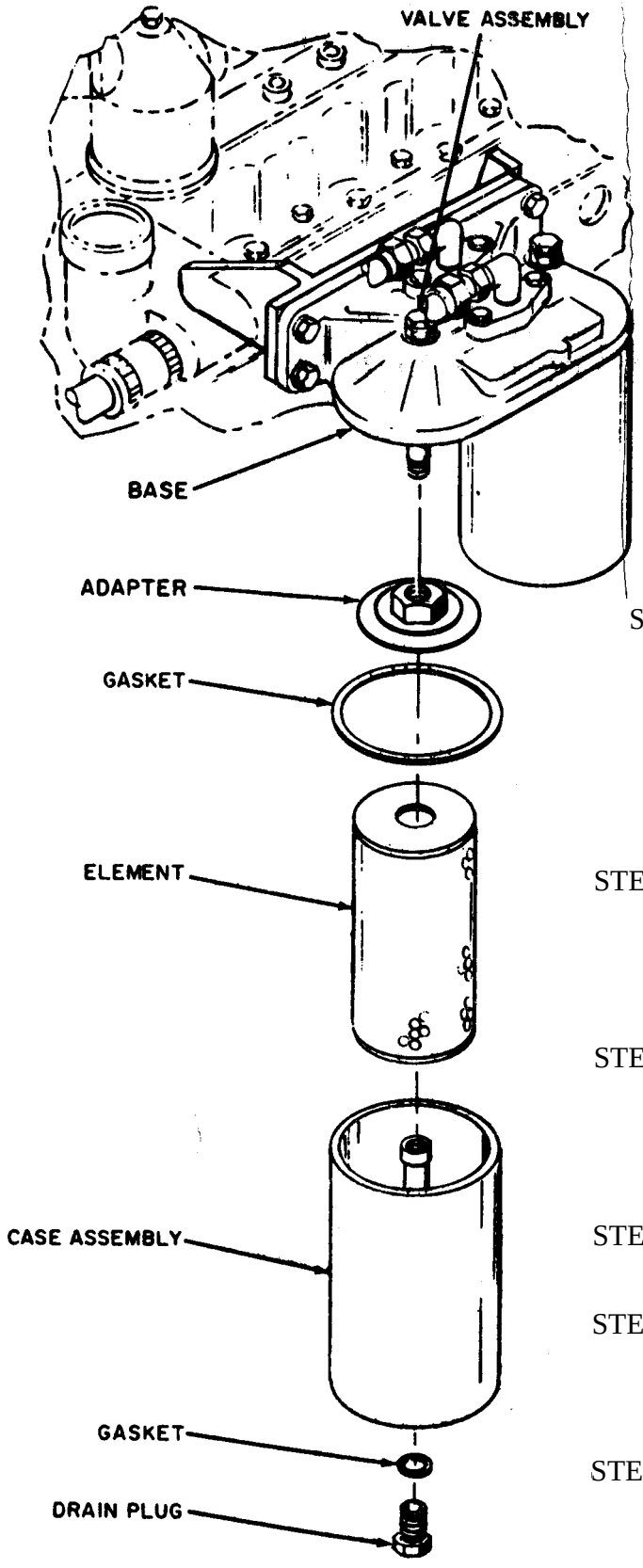
5. SET DIFFERENCES. Used on precise generator sets only.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY
FRED C. WEYAND
General, United States Army,
Chief of Staff.

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

Figure 3-1. Lubrication order (sheet 2 of 2)



STEP 1. PLACE SUITABLE CONTAINER UNDER FILTERS.

NOTE

WHEN LOOSENING VALVE ASSEMBLY, PLACE WRENCH ON HEX IMMEDIATELY ABOVE BASE.

STEP 2. HOLD CASE ASSEMBLY AND LOOSEN VALVE ASSEMBLY UNTIL CASE ASSEMBLY IS FREE. REMOVE CASE ASSEMBLY, ELEMENT, GASKET, AND ADAPTER FROM BASE.

STEP 3. DISCARD ELEMENT AND GASKETS. CLEAN CASE ASSEMBLY, DRAIN PLUG, VALVE ASSEMBLY, ADAPTER, AND BASE WITH AN APPROVED CLEANING SOLVENT.

STEP 4. LUBRICATE NEW GASKET WITH CLEAN LUBRICATING OIL.

STEP 5. POSITION ADAPTER, GASKET, ELEMENT, AND CASE ASSEMBLY ON BASE AND SECURE WITH VALVE ASSEMBLY.

STEP 6. REMOVE CONTAINER AND FILL CRANKCASE WITH PROPER GRADE OF LUBRICATING OIL.

Figure 3-2. Lubricating oil filter, servicing

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-5. GENERAL.

To insure that the engine 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. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment. All deficiencies and shortcomings shall be recorded together with the corrective action on the applicable form, at the earliest possible opportunity. Army and Navy users shall accomplish the necessary preventive maintenance services listed and described in paragraphs 3-6 and 3-6.1. Air Force users shall refer to the applicable inspec - tion manuals and work card sets in the T.O. 35C2-3 Series for periodical requirements and Table 3-2 for detailed procedures. Marine Corps users should refer to the current issue of TM 11275-15/1.

3-6. DAILY PREVENTIVE MAINTENANCE CHECKS AND SERVICES (ARMY AND NAVY)

Table 3-2 contains a tabulated listing of preventive maintenance checks and services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements.

3-6.1. WEEKLY, MONTHLY AND SEMI-ANNUAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (ARMY AND NAVY)

a. Table 3-2 contains a tabulated listing of preventive maintenance checks and services which must be performed by organizational maintenance personnel at weekly, monthly and semi-annual intervals.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to table 3-2 for the preventive maintenance services.

Table 3-2. Operator/Crew Preventive Maintenance Checks and Services

INTERVAL				B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION		
ITEM NO.	B	D	A	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
1	•			Generator Set	Visually inspect unit for oil, fuel, coolant and hydraulic leaks. Inspect for loose connections, damage, and general condition (fig. 1-1 and 1-2).	A leak is detected or damage would impair operation.
				a. Grounding connections	Look for loose or missing grounding cable (par 2-5e).	Grounding cable is missing or loose.
				b. Fire extinguisher	Check availability of and for proper pressure.	Fire extinguisher is missing or pressure is low.
				c. Oil	Check engine oil level. Add oil as required (fig. 3-1). NOTE During continuous operation, check engine oil level and for fuel, oil and coolant leaks every 8 hours. Oil level readings will be wrong if "Engine Running" side of dipstick is placed toward engine.	
2		•		Controls and Instruments	Instruments shall indicate within specified limits (table 2-2).	
				a. Air cleaner condition indicator light	Shall not be lit. To check bulb, press to test.	Indicator light remains lit.
				b. Oil pressure gage	40 to 60 psi.	Pressure is below 15 ± 3 psi.

Table 3-2. Operator/Crew Preventive Maintenance Checks and Services (Continued)

INTERVAL				B – BEFORE OPERATION D – DURING OPERATION	A – AFTER OPERATION	
ITEM NO.	B	D	A	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
				c. Coolant temperature	180 degrees to 200 degrees F.	Temperature exceeds 217 ± 3 degree F.
				d. Fuel level gage	Full or a sufficient level for continuous operation.	
				e. Battery charging ammeter	Green portion (+) side of scale.	Ammeter indicates in red (-) side of scale.
				f. Kilowatt meter	Percent of power (kw), not to exceed 100% for 60 Hz operation and not to exceed 83.3% for 50 Hz operation.	
				g. AC Ammeter	Percent of rated current per phase as selected by amps volts switch.	
				h. Frequency meter	50 and 60 Hertz.	Frequency cannot be properly adjusted.
				i. AC voltmeter	120/208 or 240/416 volts.	Voltage cannot be properly adjusted.
				j. Fault indicator panel	All indicator lights out during operation. To check bulbs, momentarily press test/reset switch. Replace defective bulbs or fuse.	Any of these lights remain lit after pressing test/reset switch.
3			•	Fuel Tank	Fill fuel tank at completion of operation (para 3-17).	

Table 3-2.1. Organizational Preventive Maintenance Checks and Services

INTERVAL					W – WEEKLY (40 HOURS) M – MONTHLY (100 HOURS)	S – SEMIANNUAL (500 HOURS) H– HOURS (AS INDICATED)	
ITEM NO.	W	M	S	H	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
1	•				Coolant System	Check coolant level. Proper level is 2 inches below filler neck (para 3-8).	
2	•				Fuel Tank	Drain water and sediment from tank (para 3-17c).	
3	•				Fuel Strainer and filters	Drain water and sediment from strainer and filters (para 3-14).	
4		•			Day Tank	Drain water and sediment from day tank (para 3-15). NOTE When draining water and sediment, close drain cocks as soon as clean fuel begins to run out. In freezing weather, drain water and sediment shortly after operation.	
5		•			Transfer Pumps	Clean strainer screens in bottom of fuel transfer pumps (para 3-76).	
6		•			Breather	Clean crankcase breather (para 3-85).	
7		•			V-Belts	Inspect all fan and alternator drive belts and check for proper tension (para 3-69e).	

Table 3-2.1. Organizational Preventive Maintenance Checks and Services (Continued)

INTERVAL					W – WEEKLY (40 HOURS) M – MONTHLY (100 HOURS) S – SEMIANNUAL (500 HOURS) H – HOURS (AS INDICATED)		
ITEM NO.	W	M	S	H	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
8		•			Batteries	Check electrolyte levels. Add distilled water if available. Prior to adding water, perform a hydrometer check. Replace battery if specific gravity readings are low after recharging (para 3-33). NOTE In freezing weather charge batteries for minimum of 30 minutes after adding water.	
9		•			Generator Set	Clean and inspect entire unit. Remove all dirt, grease, oil, and debris. Inspect bolts, nuts, screws, welds, electrical wires, connectors, hoses, and lines. Look for loose, damaged or missing parts and unusual wear or deterioration (para 3-19 and 3-31).	
10			•		Hydraulic Filter (precise generator set only)	Clean filter and replace element. Check tank for proper fluid level (para 3-16, 3-90, and 3-91). NOTE If filter indicates hydraulic fluid is contaminated, change fluid in hydraulic tank and clean actuator filter (fig. 3-1 and 3-46).	

Table 3-2.1. Organizational Preventive Maintenance Checks and Services (Continued)

INTERVAL					W – WEEKLY (40 HOURS) M – MONTHLY (100 HOURS) S – SEMIANNUAL (500 HOURS) H – HOURS (AS INDICATED)		
ITEM NO.	W	M	S	H	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
11				•	Engine oil and Filter	Clean filter, replace element, drain engine oil, and replace with new oil every 300 hours or 6 months (para 3-11b and 3-74).	
12				•	Fuel Strainer	Remove and clean fuel strainer every 300 hours (para 3-77).	
13				•	Primary Fuel Filter	Clean filter and replace element every 500 hours (para 3-77).	
14				•	Secondary Fuel Filter	Clean filter and replace element every 1000 hours (para 3-79).	
15				•	Air Filters	Clean filter elements when indicated by the air filter condition indicator light (para 3-12). NOTE This unit is equipped with an air filter condition indicating light that will indicate when filter element needs cleaning.	

NOTE: Pages 3-12 thru 3-15 Deleted

Section IV. OPERATOR'S MAINTENANCE

3-7. BATTERY SERVICING.

Service batteries as illustrated in figure 3-3, observing the following:

WARNING

Battery electrolyte contains sulfuric acid and can cause severe burns. If electrolyte comes in contact with body, eyes, or clothing, rinse immediately with clean water. Do not work alone or smoke when servicing batteries.

3-8. RADIATOR.

a. SERVICE. Refer to figure 3-4 and service radiator as follows:

WARNING

Remove radiator cap slowly to permit any pressure to escape prior to cap removal.

1. Open radiator cap access door and remove radiator cap.

2. Fill radiator with proper coolant until coolant level is two inches below filler neck.

Ambient Temperature	Coolant
125°F to 32°F	water with rust inhibitors O-I-490
32°F to -40°F	mixture of water and ethylene glycol conforming to Federal Specification O-A-548, refer to table 2-1.
0°F to -65°F	Full strength arctic antifreeze compound to Military Specification MIL-A-11755.

3. Fasten tag near radiator cap indicating type of coolant and level of protection.

b. DRAIN. Refer to figure 3-4 and drain radiator as follows:

NOTE

To drain coolant from engine open engine coolant drain valve.

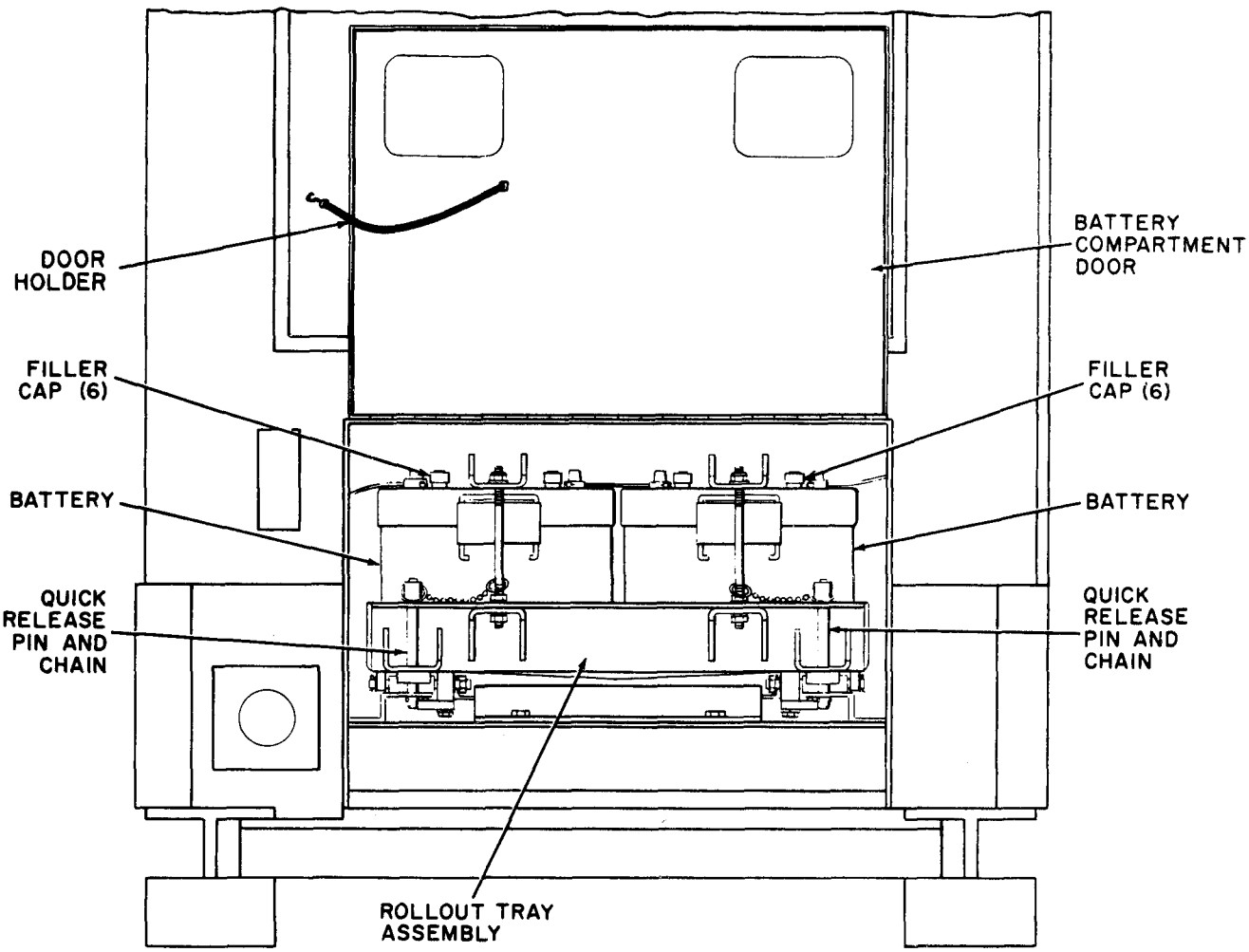
1. Place suitable container at coolant drain. Remove radiator cap.

2. Open radiator coolant drain valve and drain radiator coolant into container.

3. Close drain valve. Refill radiator or place tag on control panel stating radiator has been drained.

3-9. LAMPS AND FUSE REPLACEMENT.

Replace defective control panel and fault locator lamps and fuses as illustrated in figure 3-5.



STEP 1. OPEN BATTERY COMPARTMENT DOOR AND SECURE DOOR TO RADIATOR GRILL WITH DOOR HOLDER.

STEP 2. DEPRESS BUTTON ON QUICK RELEASE PINS, LIFT UP PINS, AND PULL ROLLOUT TRAY ASSEMBLY OUT.

STEP 3. REMOVE FILLER CAP AND ADD DISTILLED WATER (TAP WATER IF DISTILLED WATER IS NOT AVAILABLE), AS REQUIRED TO BRING ELECTROLYTE LEVEL TO SLOT IN FILLER WELLS. CLEAN VENT HOLES IN FILLER CAP AND INSTALL CAPS.

STEP 4. PUSH IN ROLLOUT TRAY ASSEMBLY AND INSTALL QUICK RELEASE PINS.

STEP 5. CLOSE AND LATCH BATTERY COMPARTMENT DOOR.

STEP 6. IF TEMPERATURE IS 32°F OR BELOW, OPERATE GENERATOR SET FOR A MINIMUM OF 30 MINUTES TO CHARGE BATTERIES.

Figure 3-3. Battery, servicing

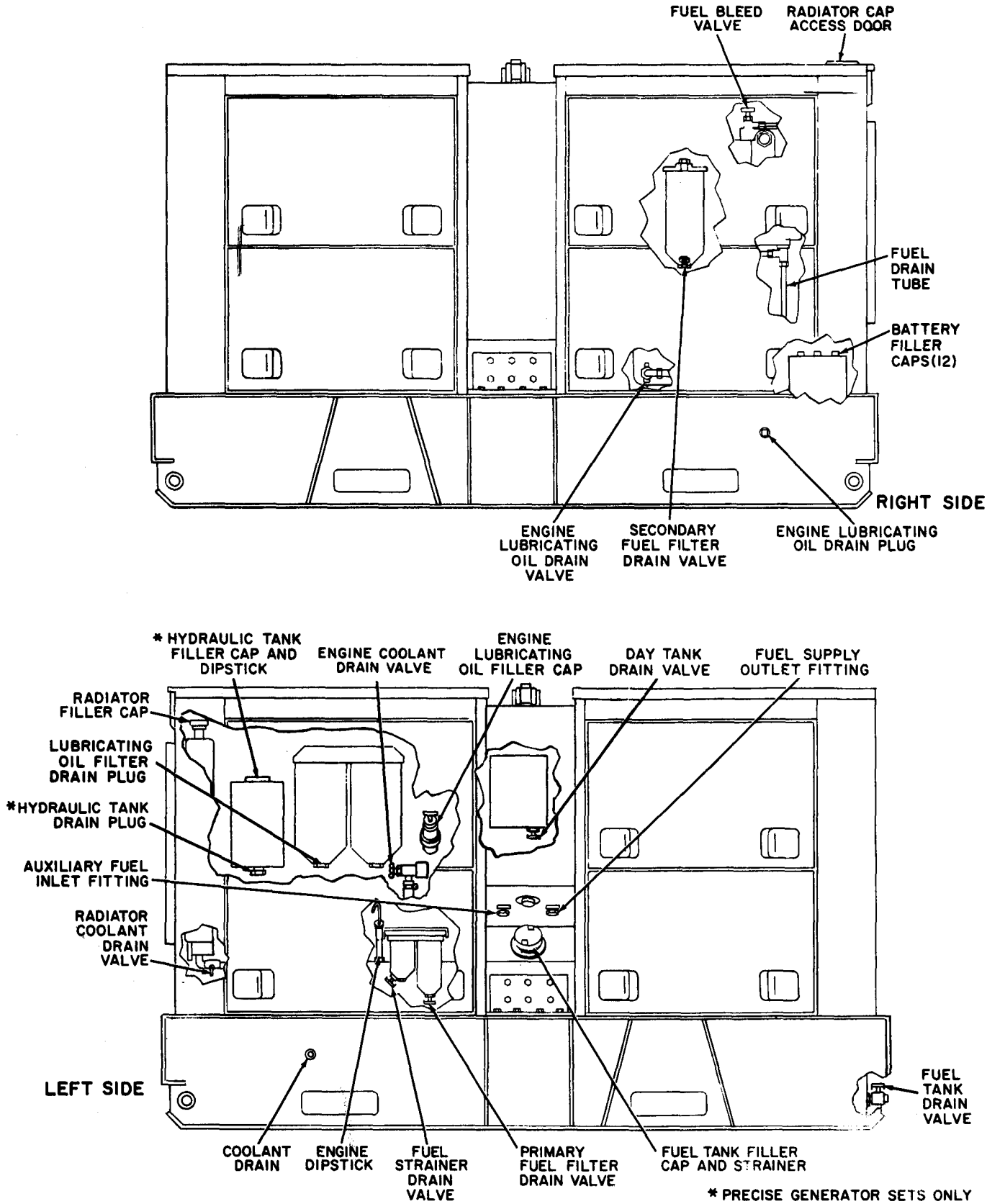
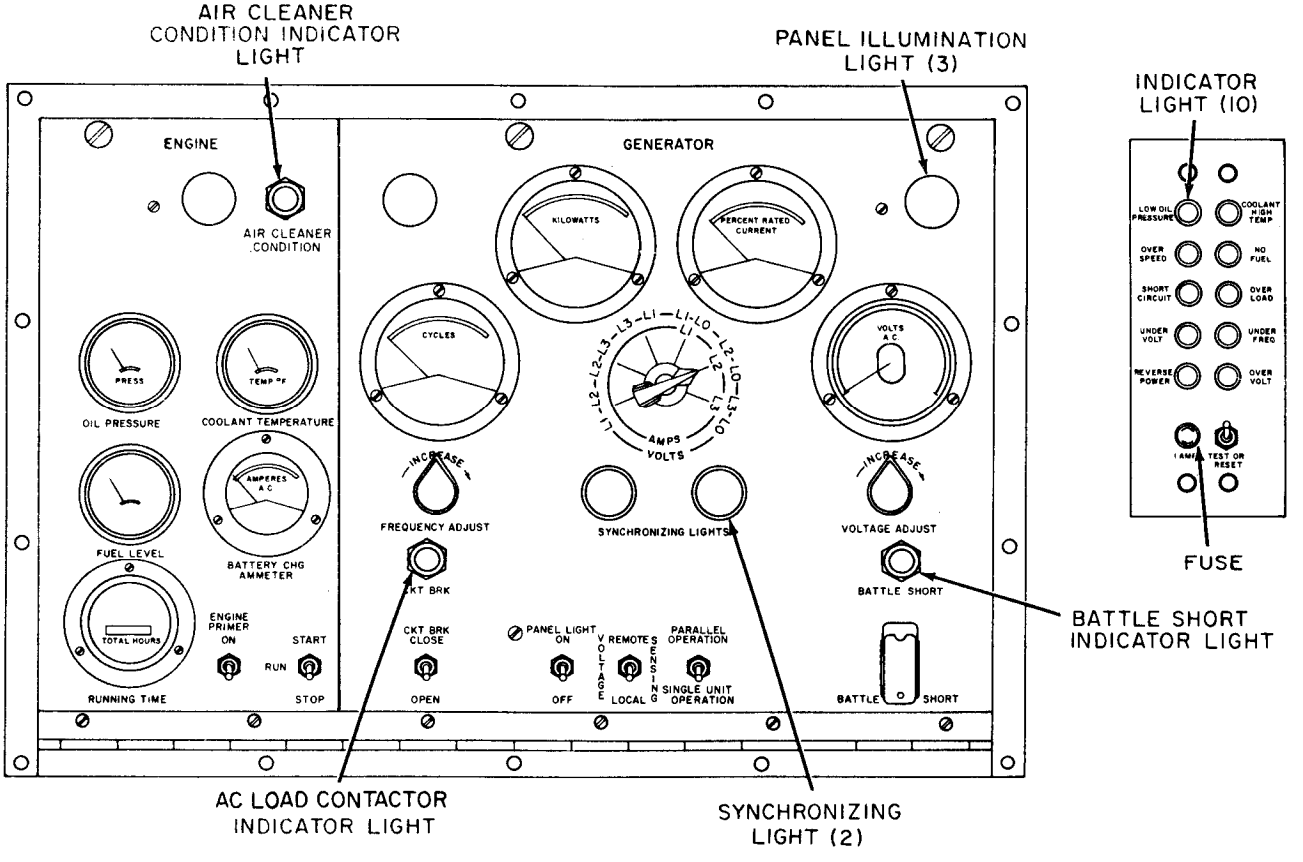


Figure 3-4. Location of fill and drain points and drain valves



STEP 1. PANEL ILLUMINATION LIGHTS. PULL OUT GUARD AND REMOVE LAMP BY PRESSING IN AND TURNING COUNTER CLOCKWISE. INSTALL NEW LAMP AND GUARD.

STEP 2. FUSE. UNSCREW CAP AND REMOVE DEFECTIVE FUSE. INSERT NEW FUSE IN CAP AND REPLACE CAP.

STEP 3. SYNCHRONIZING LIGHTS. UNSCREW LENS AND REMOVE LAMP BY PRESSING IN AND TURNING COUNTER CLOCKWISE. INSTALL NEW LAMP AND LENS.

STEP 4. INDICATOR LIGHTS. UNSCREW LENS. REMOVE LAMP FROM LENS. INSERT NEW LAMP AND INSTALL LENS.

Figure 3-5. Lamps and fuse, replacement

3-10. CONTROL PANEL METERS ZERO ADJUSTMENT.

Zero adjust frequency meter, voltmeter, AC ammeter, DC ammeter, and kilowatt meters illustrated in figure 3-6.

NOTE

Zero adjustments shall be made with generator set nonoperating and DC control circuit breaker (42, figure 2-8) de-energized.

3-11. ENGINE.

a. SERVICE. The dip stick is the shielded type which allows checking oil level while the engine is either stopped or running. The stick is stamped on both sides to indicate the two different oil levels. The engine running side is stamped: ADD, FULL, and RUNNING. The engine stopped side is stamped: ADD, FULL, and STOPPED. Refer to figure 3-4 and service engine crankcase as follows:

CAUTION

Use appropriate add and full marks dependent upon whether the engine is stopped or running. Also, insure that the appropriate side is toward the operator when inserting the gauge since the under side will be wiped in the gauge tube radius when the gauge is removed, therefore indicating a false oil level reading.

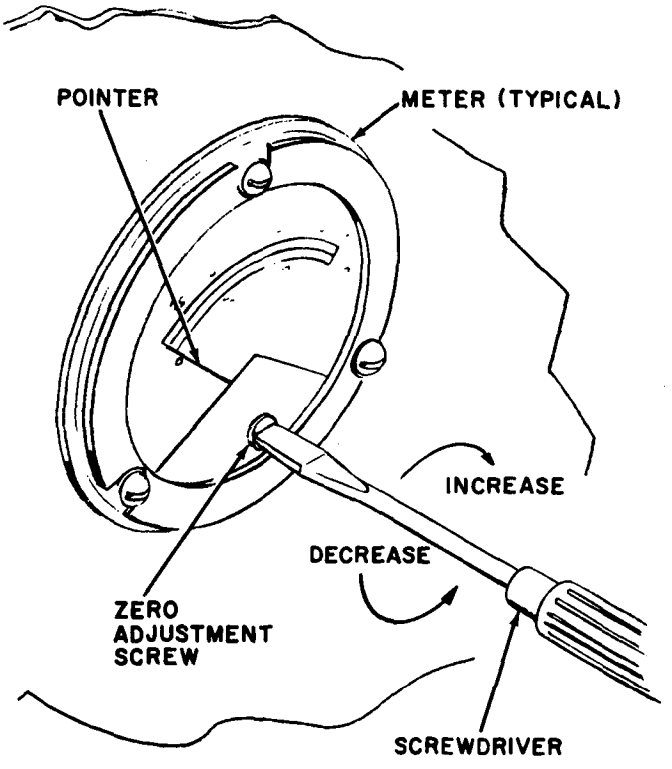
1. Check crankcase lubricating oil level using engine dip stick.

2. Remove engine lubricating oil filler cap and add oil as required to obtain full level on dip stick. Refer to figure 3-1 for proper lubricating oil.

b. DRAIN. Refer to figure 3-4 and drain engine crankcase as follows:

1. Remove engine lubricating oil drain plug and place suitable container at drain.

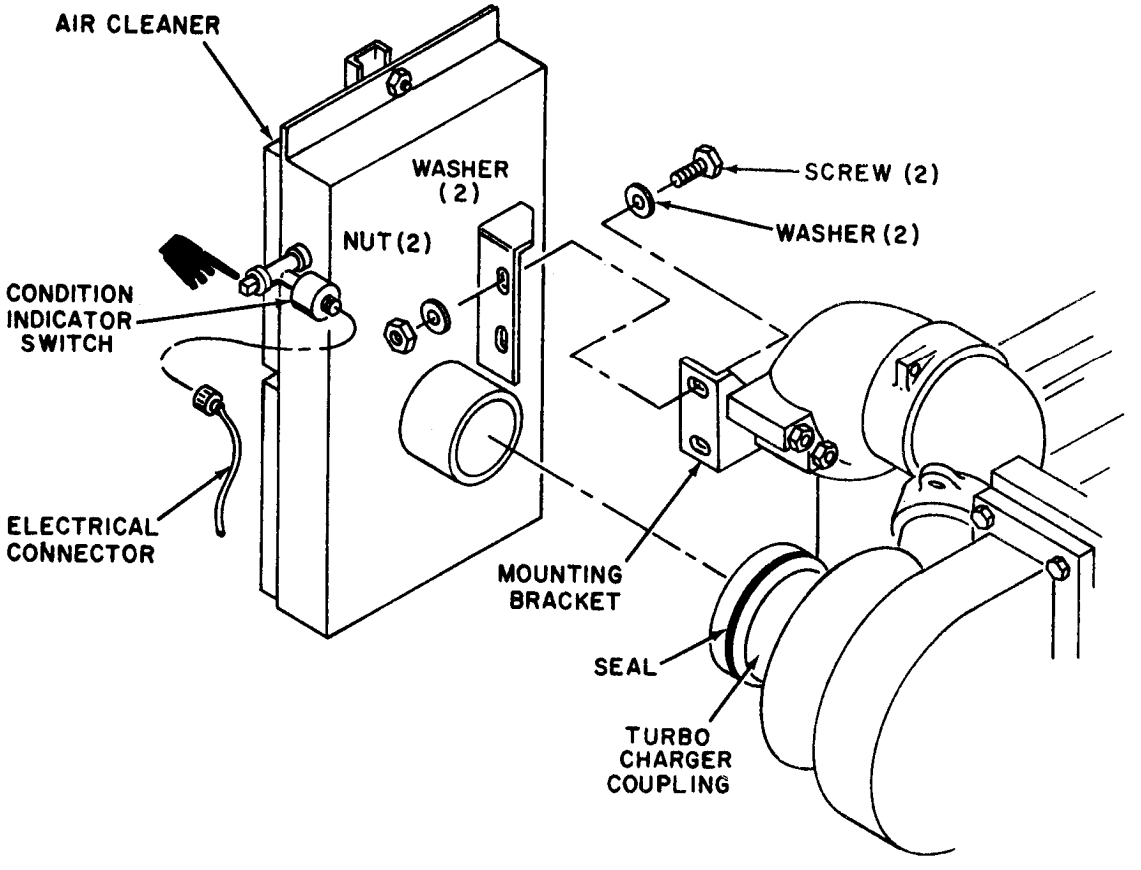
2. Open engine lubricating oil drain valve and drain oil into container.



STEP 1. INSERT SUITABLE SCREWDRIVER IN ZERO ADJUSTMENT SCREW.

STEP 2. ROTATE ADJUSTMENT SCREW TO BRING POINTER TO ZERO POSITION. CLOCKWISE ROTATION OF SCREW WILL INCREASE SCALE READING, COUNTERCLOCKWISE ROTATION WILL DECREASE SCALE READING.

Figure 3-6. Control panel meters, zero adjustment



REMOVAL

STEP 1. DISCONNECT ELECTRICAL CONNECTOR FROM CONDITION INDICATOR SWITCH.
STEP 2. REMOVE SCREWS, NUTS, AND WASHERS SECURING AIR CLEANER TO MOUNTING BRACKET.
STEP 3. ROCK AIR CLEANER BACK AND FORTH TO REMOVE AIR CLEANER FROM TURBO CHARGER COUPLING. PIVOT AIR CLEANER AS NECESSARY TO CLEAR HOUSING AND REMOVE AIR CLEANER.
STEP 4. INSPECT TURBO CHARGER COUPLING SEAL FOR CUTS AND DAMAGE. REPLACE DEFECTIVE SEAL. COVER COUPLING OPENING.

INSTALLATION

STEP 1. MAKE SURE SEAL AND TURBO CHARGER COUPLING ARE CLEAN. APPLY A THIN FLIM OF GREASE TO SEAL.
STEP 2. POSITION AIR CLEANER ON TURBO CHARGER COUPLING AND SECURE AIR CLEANER TO MOUNTING BRACKET WITH SCREWS, NUTS, AND WASHER.
STEP 3. CONNECT ELECTRICAL CONNECTOR TO CONDITION INDICATOR SWITCH.

Figure 3-7. Air cleaner, removal and installation

3. Close drain valve and install drain plug. Refill crankcase or place tag on control panel stating crankcase has been drained.

3-12. AIR CLEANER.

CAUTION

Do not start engine with air cleaner removed.

a. REMOVAL AND INSTALLATION. Remove and install air cleaner as illustrated in figure 3-7.

b. SERVICE. Service air cleaner by cleaning air cleaner panel filters as specified in paragraph 3-13.

3-13. AIR CLEANER PANEL FILTERS.

a. REMOVAL. Remove air cleaner panel filters as illustrated in figure 3-8.

CAUTION

Do not start engine when panel filters are removed.

b. CLEANING. The air cleaner panel filters shall be cleaned when air cleaner condition indicator (4, figure 2-8) illuminates. Do not use gasoline or other petroleum solvents to clean panel filters. Panel filters shall be cleaned by one of three methods: washing with mild detergent and water solution, blowing with compressed air, or washing with water alone.

WARNING

Goggles shall be worn when cleaning panel filters with compressed air.

NOTE

Wash panel filters with mild detergent and water when filters are contaminated with a combination of exhaust carbon, soot, oil, and dust. To accomplish this, perform steps 1 through 5.

1. Remove loose contaminants by blowing with compressed air (100 PSIG or less) or running water (40 PSIG or less) through panel filter in reverse air flow direction. Keep air or water nozzles at least one inch from filters.

2. Mix a solution of 5 gallons of water to one cup of mild detergent and place solution in suitable container.

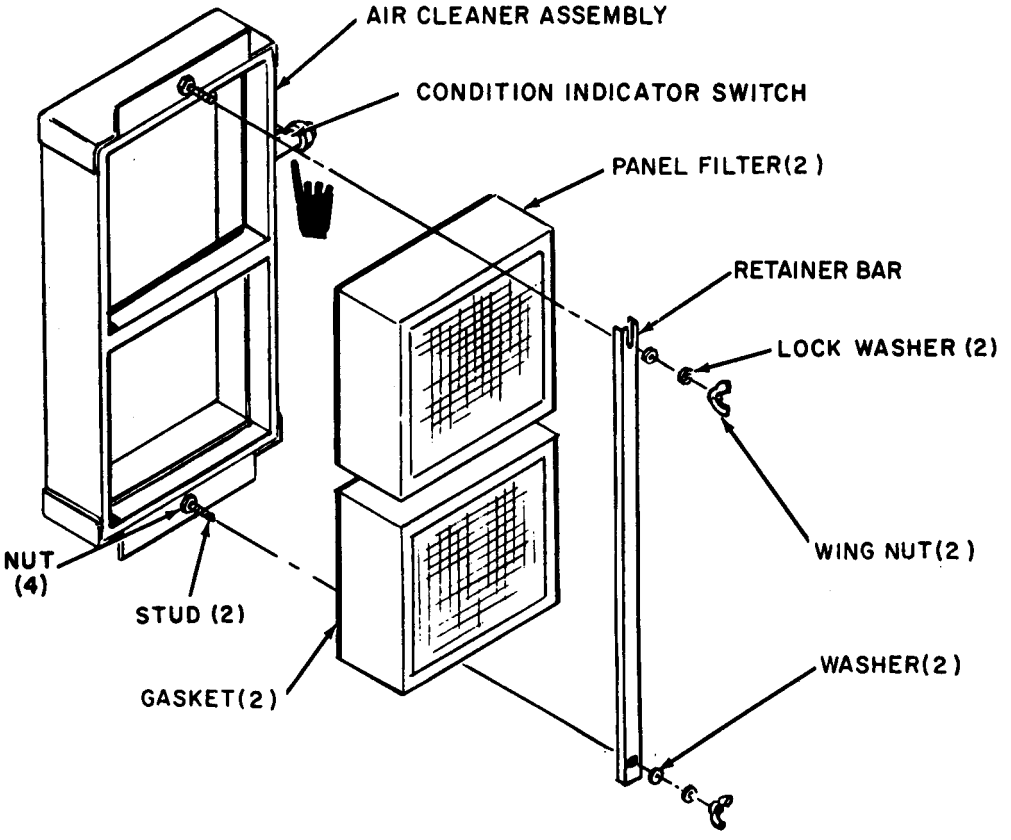
3. Place panel filter in container and soak for approximately 15 minutes. Swish filter in solution periodically.

4. Remove panel filters from solution and rinse filters with gentle stream of water (40 PSI or less) in reverse air flow direction. Rinse until water passing through filter is clear.

5. Permit panel filter to air-dry or dry filter using dryer providing a maximum of 180°F temperature with continuous air circulation.

NOTE

Clean panel filters with compressed air when filters are contaminated with dust. To accomplish this, perform steps 6 and 7.



REMOVAL

STEP 1. HOLD PANEL FILTERS IN POSITION AND LOOSEN WING NUTS. PULL DOWN ON RETAINER BAR AND PIVOT BAR TOWARD CONTROL PANEL.

STEP 2. REMOVE PANEL FILTERS EXERCISING CARE NOT TO DAMAGE GASKET OR FILTER MATERIAL.

INSTALLATION

STEP 1. MAKE SURE PANEL FILTER CONTACT AREA OF AIR CLEANER ASSEMBLY IS CLEAN AND POSITION PANEL FILTERS IN AIR CLEANER ASSEMBLY.

STEP 2. HOLD PANEL FILTERS IN POSITION AND PIVOT RETAINER BAR INTO POSITION. PUSH BAR UP ONTO STUD. TIGHTEN WING NUTS.

STEP 3. INSPECT PANEL FILTERS FOR PROPER SEATING AND INSTALL CONDITION INDICATOR SWITCH.

Figure 3-8. Air cleaner panel filters, removal and installation

6. Direct jet of compressed air (100 PSIG or less) against panel filter in reverse air flow direction. Keep air nozzle at least one inch away from filter.

7. Move jet of compressed air over entire area of panel filter until all dust is removed.

NOTE

Wash panel filters with water alone when filters are contaminated with dust and compressed air is not available. To accomplish this, perform steps 8 through 10.

8. Direct gentle stream of water (40 PSIG or less) through panel filter in reverse air flow direction.

9. Direct water through panel filter until water passing through filter is clear.

10. Permit panel filter to air-dry or dry filter using dryer providing a maximum of 180°F temperature with continuous air circulation.

c. INSPECTION. Inspection procedures shall be accomplished after cleaning as follows:

1. Position a bright light on one side of panel filter.

NOTE

If there is a dent in protective screen, check filter carefully in area of dent.

2. Look through panel filter toward light and inspect for holes and tears.

3. Inspect gasket for damage. Gasket should be smooth, flat, and straight.

4. Replace panel filters that have holes, tears, or defective gaskets.

d. INSTALLATION. Install air cleaner panel filters as illustrated in figure 3-8.

CAUTION

Make sure panel filters are completely dried prior to installation.

3-14. FUEL FILTERS AND STRAINER.

Refer to figure 3-4 and drain water and sediment from fuel filters and strainer into a suitable container as follows: Loosen filter or strainer outlet line to break suction and open drain valves. Close valves when fuel runs clear and tighten outlet line.

NOTE

In temperatures of 32°F and above, drain before operation. Below 32°F, drain after operation.

3-15. DAY TANK.

Refer to figure 3-4 and drain water and sediment from day tank as follows:

NOTE

In temperatures of 32°F and above, drain before operation. Below 32°F, drain after operation.

a. Remove cap from day tank drain valve and open valve.

b. Drain water and sediment into suitable container and close valve. Install cap on valve.

3-16. HYDRAULIC TANK (PRECISE GENERATOR SETS).

a. SERVICE. Refer to figure 3-4 and service hydraulic tank as follows:

1. Remove hydraulic tank filler cap and dip stick assembly. Check oil level; level should be to upper mark on stick.

2. Add hydraulic oil conforming to Military Specification MIL-H-5606 to obtain proper level. Replace cap assembly.

b. DRAIN. Refer to figure 3-4 and drain hydraulic tank as follows:

1. Remove drain plug and drain fluid into suitable container.

2. Refill hydraulic tank or place tag on control panel stating hydraulic tank has been drained.

3-17. FUEL TANK.

a. SERVICE. The fuel tank may be serviced with fuel conforming to Federal Specification VV-F-800, grades DF-1, DF-2, and DF-A or JP-4 and JP-5 conforming to Military Specification MIL-J-5624. If JP-4 fuel is utilized, the generator set load rating is derated 15 percent. Refer to figure 3-4 and service fuel tank as follows:

WARNING

Always maintain constant metal-to-metal contact between fuel tank filler neck and spout of fuel supply. This will prevent the possibility of sparking caused by static electricity.

1. Remove fuel tank filler cap and fill fuel tank with proper fuel as listed below:

Ambient Temperature	Fuel Grade
+125°F to +20°F	DF-2
+20°F to -25°F	DF-1
-25°F to -65°F	DF-A
+1OO°F to -65°F	JP-4, JP-5

2. Replace filler cap and wipe up any spilled fuel.

b. DRAIN. Refer to figure 3-4 and drain fuel tank as follows:

1. Remove cap from fuel tank drain valve. Connect auxiliary fuel hose or equivalent to drain valve.

2. Open drain valve and drain fuel into suitable container.

3. Close drain valve, remove hose, and install cap on valve.

c. DRAIN WATER AND SEDIMENT. Refer to figure 3-4 and drain water and sediment as follows:

1. Remove cap from fuel tank drain valve and open valve. Permit water and sediment to drain into suitable container.

2. Close drain valve when clean fuel runs out of tank. Install cap on valve.

3-18. FUEL FILLER CAP AND STRAINER.

a. REMOVAL. Remove filler cap and strainer as illustrated in figure 3-9.

b. CLEANING AND INSPECTION.

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

2. Check filler cap vent valve for proper opening and closing.

3. Inspect strainer for holes, breaks, tears.

4. Inspect parts for cracks, breaks, and other damage.

5. Replace defective parts.

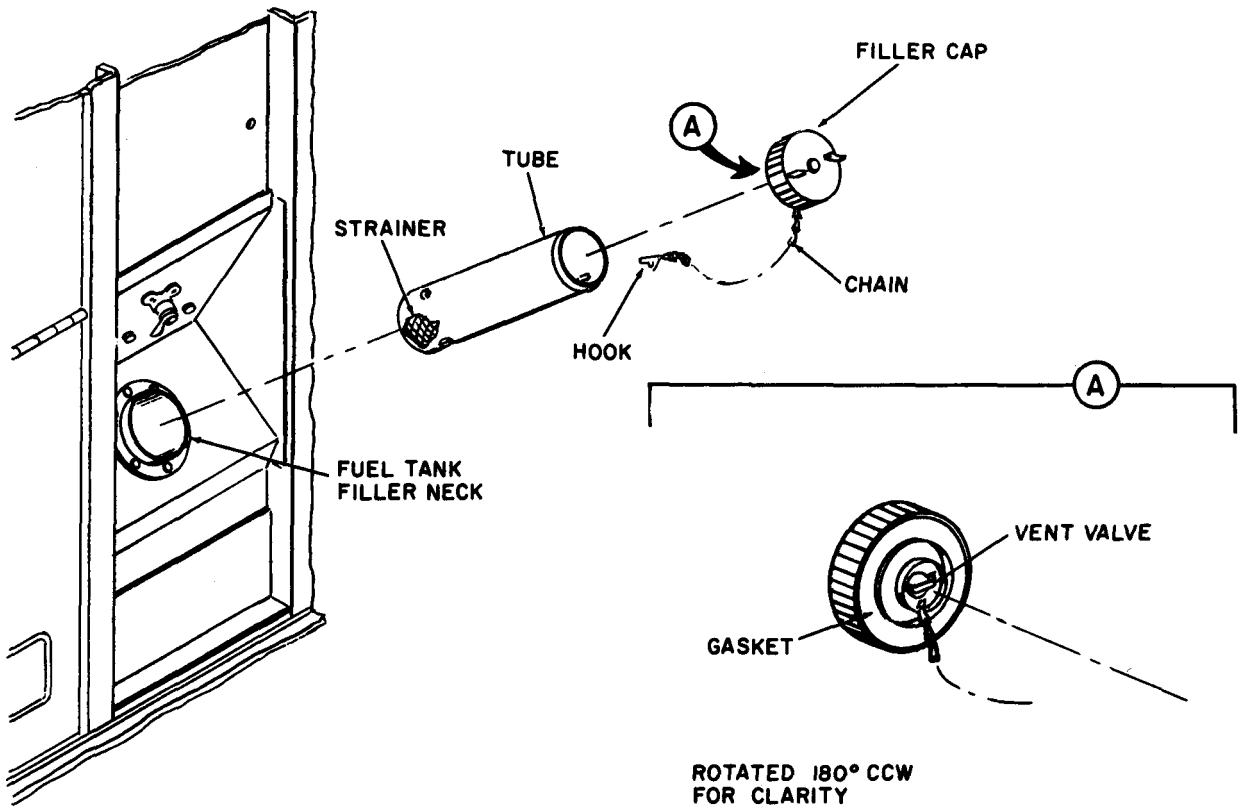
c. INSTALLATION. Install filler cap and strainer as illustrated in figure 3-9.

NOTE

Fuel tank filler cap vent valve must be in open position during operation of generator set.

3-19. GENERAL CLEANING.

To prevent buildup of contaminants which may cause damage to operating components or systems of generator set, the generator sets should be cleaned periodically. Cleaning operations shall only be performed on generator sets that are



REMOVAL

STEP 1. REMOVE FILLER CAP. PULL CHAIN AND REMOVE TUBE FROM FILLER NECK.

STEP 2. UNFASTEN CHAIN HOOK AND REMOVE CHAIN FROM TUBE.

STEP 3. COVER FUEL TANK OPENING.

INSTALLATION

STEP 1. CONNECT CHAIN TO TUBE AND FASTEN HOOK.

STEP 2. INSERT TUBE IN FILLER NECK AND INSTALL FILLER CAP.

NOTE

FILLER CAP VENT VALVE MUST BE IN OPEN POSITION DURING GENERATOR SET OPERATION.

Figure 3-9. Fuel filler cap and strainer, removal and installation

not operating, connected to a parallel bus or connected in standby mode. To clean generator set, proceed as follows:

CAUTION

Exercise care to prevent dry cleaning solvent from coming in contact with electrical components.

a. Clean radiator cooling fins and shutter bearings with compressed air.

b. Painted metal surfaces should be wiped with a clean lint-free cloth moistened with an approved cleaning solvent. Hard deposits may be scrubbed off with a bristle brush that has been dipped in solvent. Dry surfaces with clean lint-free cloth.

c. Clean linkages and control rods with an approved cleaning solvent and dry with a clean lint-free cloth.

d. Remove any dust, dirt, or sand from inside of generator set using a damp lint-free cloth.

e. Remove corrosion from battery terminals, cables, and holdown frames using a wire brush.

f. Clean battery filler cap vent holes with suitable tool.

g. Clean instrument faces using a clean lint-free cloth.

Section V. TROUBLESHOOTING

3-20. GENERAL.

a. This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the generator set and its components. Malfunctions which may occur are listed in table 3-3. Each malfunction stated is followed by a list of probable causes of trouble. The corrective action recommended is described opposite the probable cause.

b. Defective electrical wiring may be the cause of generator set malfunctions and should not be overlooked when troubleshooting. Wiring should be checked for security and continuity, refer to figures 1-3 through 1-8. Tighten loose wiring and repair or replace defective wiring.

Table 3-3. Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Engine does not turn over.	a. Batteries are run down.	a. 1. Start set by connecting 24 VDC power supply to slave receptacles SR1 or SR2.
		a. 2. Charge or replace batteries (paragraph 3-33).
	b. Defective, corroded, or loose battery cables	b. Tighten, clean, or replace cables (paragraph 3-34).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Engine does not turn over (continued)	c. Improper starting procedure.	c. Start set properly (paragraph 2-12).
	d. Defective DC control circuit breaker.	d. Test and replace circuit breaker as required (paragraph 3-68).
	e. Defective start-run-stop switch.	e. Test and replace switch as required (paragraph 3-59).
	f. Defective starter brushes.	f. Replace brushes (paragraph 3-73).
	g. Defective starter or solenoid.	g. Test starter and solenoid (paragraph 3-72).
	h. Defective speed switch.	h. Test switch (paragraph 3-70).
	i. Other causes.	i. Refer to higher level of maintenance.
2. Engine turns over but will not start or is hard to start.	a. Improper starting procedure.	a. Start set properly (paragraph 2-12).
	b. Fuel supply exhausted.	b. Service fuel tank or auxiliary fuel supply (paragraph 3-17).
	c. Batteries are run down.	c. Start set by connecting 24 VDC power supply to slave receptacle SR1 or SR2. Charge or replace batteries (paragraph 3-33).
	d. Defective, corroded or loose battery cables.	d. Tighten, clean, or replace cables (paragraph 3-34).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
2. Engine turns over but will not start or is hard to start (continued)	e. Contaminated or improper grade of fuel.	e. Drain fuel supply, service with proper grade of fuel (paragraph 3-17).
	f. Speed switch not reset after overspeed condition.	f. Reset switch, refer to (2, figure 2-8).
	g. Air in fuel system.	g. Bleed system (paragraph 3-80).
	h. Defective start-run-stop switch.	h. Test switch and replace as required (paragraph 3-59).
	i. Defective engine shutdown solenoid valve.	i. Test valve (paragraph 3-50).
	j. Dirty air cleaner panel filters.	j. Clean filters (paragraph 3-13).
	k. Clogged fuel filter and strainer elements.	k. Service filter and strainer (paragraph 3-77).
	l. Clogged secondary filter element.	l. Service filter (paragraph 3-79).
	m. Clogged fuel transfer pump screens.	m. Service pumps (paragraph 3-76).
	n. Defective day tank float switch.	n. Test switch and replace as required (paragraph 3-78).
	o. Defective fuel solenoid valve.	o. Test valve and replace as required (paragraph 3-77).
	p. Restricted fuel supply lines.	p. Clean lines.
	q. Defective turbo charger.	q. Replace turbo charger (paragraph 3-84).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
2. Engine turns over but will not start or is hard to start (continued)	r. Defective speed switch.	r. Test switch and replace as required (paragraph 3-70).
	s. Other causes.	s. Refer to higher level of maintenance.
3. Engine misses or runs erratically.	a. Contaminated or improper grade of fuel.	a. Drain fuel supply, service with proper grade of fuel (paragraph 3-17).
	b. Air in fuel system.	b. Bleed system (paragraph 3-81).
	c. Defective or partially restricted fuel supply lines.	c. Clean or replace fuel lines.
	d. Defective fuel relief valve.	d. Test valve and replace as required (paragraph 3-79).
	e. Dirty air cleaner panel filters.	e. Clean filters (paragraph 3-13).
	f. Clogged fuel filter and strainer elements.	f. Service filter and strainer (paragraph 3-77).
	g. Clogged secondary filter element.	g. Service filter (paragraph 3-79).
	h. Clogged fuel transfer pump screens.	h. Service pumps (paragraph 3-76).
	i. Defective turbo charger.	i. Replace turbo charger (paragraph 3-84).
	j. Incorrect valve lash setting.	j. Adjust valve lash (paragraph 3-86)

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
3. Engine misses or runs erratically (continued)	k. Defective speed switch (precise generator sets).	k. Test speed switch and replace as required (paragraph 3-70).
	1. Clogged hydraulic filter element (precise generator sets).	1. Service hydraulic filter (paragraph 3-90).
	m. Clogged governor actuator filter (precise generator sets).	m. Clean filter element (paragraph 3-91).
	n. Air in hydraulic system (precise generator sets).	n. Bleed hydraulic system (paragraph 3-92).
	o. Other causes.	o. Refer to higher level of maintenance.
4. Engine lacks power.	a. Dirty air cleaner panel filters.	a. Clean filters (paragraph 3-13).
	b. Clogged fuel filter and strainer elements.	b. Service filter and strainer (paragraph 3-77).
	c. Clogged secondary filter element.	c. Service filter (paragraph 3-79).
	d. Clogged fuel transfer pump screens.	d. Service pumps (paragraph 3-76).
	e. Contaminated or improper grade of fuel.	e. Drain fuel supply, service with proper grade of fuel (paragraph 3-17).
	f. Air in fuel system.	f. Bleed system (paragraph 3-81).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
4. Engine lacks power (continued)	g. Incorrect valve lash adjustment.	g. Adjust valve lash (paragraph 3-86).
	h. Defective turbo charger.	h. Replace turbo charger (paragraph 3-84).
	i. Defective fuel relief valve.	i. Test valve and replace as required (paragraph 3-79).
	j. Governor linkage not properly adjusted.	j. Adjust linkage (paragraph 3-88 or 3-89).
	k. Other causes.	k. Refer to higher level of maintenance.
5. Engine knocks, develops excessive noise, or vibration.	a. Engine oil level low.	a. Service engine (paragraph 3-11).
	b. Contaminated or improper grade of fuel.	b. Drain fuel supply, service with proper grade of fuel (paragraph 3-17).
	c. Engine or generator mounting screws loose.	c. Tighten screws (table 1-1).
	d. Incorrect valve lash setting.	d. Adjust valve lash (paragraph 3-86).
	e. Defective turbo charger.	e. Replace turbo charger (paragraph 3-84).
	f. Improperly adjusted alternator or fan belts.	f. Adjust belts (paragraph 3-69).
	g. Defective battery charging alternator.	g. Test alternator and replace as required (paragraph 3-71).
	h. Other causes.	h. Refer to higher level of maintenance.

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
6. Engine exhaust excessively black or gray.	a. Improper grade of fuel.	a. Drain fuel supply and service with proper grade of fuel (paragraph 3-17).
	b. Clogged air cleaner panel filters.	b. Clean filters (paragraph 3-13).
	c. Defective turbo charger.	c. Replace turbo charger (paragraph 3-84).
	d. Other causes.	d. Refer to higher level of maintenance.
7. Engine exhaust excessively white or blue.	a. Engine lubricating oil level too high.	a. Drain oil to proper level (paragraph 3-11).
	b. Improper grade of fuel.	b. Drain fuel supply and service with proper grade of fuel (paragraph 3-17).
	c. Engine operating temperature too high.	c. Test coolant temperature regulator and replace as required (paragraph 3-82).
	d. Air in fuel system.	d. Bleed system (paragraph 3-81).
	e. Defective fuel relief valve.	e. Test valve and replace as required (paragraph 3-79).
	f. Clogged fuel filter and strainer elements.	f. Service filter and strainer (paragraph 3-77).
	g. Clogged secondary filter element.	g. Service filter (paragraph 3-79).
	h. Clogged fuel transfer pump screens.	h. Service pumps (paragraph 3-76).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
7. Engine exhaust excessively white or blue (continued)	i. Incorrect valve lash setting.	i. Adjust valve lash (paragraph 3-86).
	j. Other causes.	j. Refer to higher level of maintenance.
8. Excessive engine oil consumption.	a. High engine crankcase pressure.	a. Clean breather (paragraph 3-85).
	b. Defective lubricating oil filter.	b. Repair or replace oil filter (paragraph 3-74).
	c. Defective oil lines.	c. Replace lines.
	d. Other causes.	d. Refer to higher level of maintenance.
9. High coolant temperature indicated on coolant temperature gauge.	a. Coolant level low.	a. Service radiator (paragraph 3-8).
	b. Engine oil level low.	b. Service engine (paragraph 3-11).
	c. Insufficient heat transfer through radiator.	c. Remove contaminants from radiator fins using compressed air (paragraph 3-19).
	d. Insufficient cooling air flow.	d. Clean air inlet louver panel (figure 1-2).
	e. Radiator shutter manual control handle interfering with shutter control handle.	e. Move handle to full up position (figure 2-8).
	f. Defective coolant temperature gauge.	f. Test gauge (paragraph 3-63).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
9. High coolant temperature indicated on coolant temperature gauge (continued)	g. Defective coolant temperature transmitter.	g. Test transmitter (paragraph 3-47).
	h. Defective or improperly adjusted fan belts.	h. Adjust or replace fan belts (paragraph 3-69).
	i. Defective coolant temperature regulator.	i. Test regulator and replace as required (paragraph 3-82).
	j. Defective or improperly adjusted radiator shutter and control assembly.	j. Adjust or replace shutter and control assembly (paragraph 3-44).
	k. Defective or improperly adjusted radiator shutter control assembly power element.	k. Adjust or replace power element (paragraph 3-42).
	l. Clogged radiator.	l. Replace radiator (paragraph 3-44).
	m. Defective water pump.	m. Replace water pump (paragraph 3-83).
	n. Engine overload.	n. Adjust load.
	o. Other causes.	o. Refer to higher level of maintenance.
10. Low or no oil pressure indicated on oil pressure gauge.	a. Engine oil level low.	a. Service engine (paragraph 3-11).
	b. Defective oil pressure gauge.	b. Test gauge (paragraph 3-61).
	c. Defective oil pressure transmitter.	c. Test transmitter (paragraph 3-45).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
10. Low or no oil pressure indicated on oil pressure gauge (continued)	d. Improper grade of lubricating oil.	d. Drain oil from engine and service with proper oil (paragraph 3-11).
	e. Other causes.	e. Refer to higher level of maintenance.
11. Battery charging ammeter shows no charge when batteries are low or discharged.	a. Blown alternator fuse.	a. Replace fuse (paragraph 3-71).
	b. Improperly adjusted alternator.	b. Adjust alternator (paragraph 3-71).
	c. Defective battery charging ammeter.	c. Test ammeter (paragraph 3-64).
	d. Defective or improperly adjusted alternator belt.	d. Adjust or replace belt (paragraph 3-69).
	e. Defective alternator.	e. Test alternator (paragraph 3-71).
	f. Other causes.	f. Refer to higher level of maintenance.
12. Battery charging ammeter indicates excessive charge rate when batteries are fully charged.	a. Defective battery charging ammeter.	a. Test ammeter (paragraph 3-71).
	b. Improperly adjusted alternator.	b. Adjust alternator (paragraph 3-71).
	c. Defective alternator.	c. Replace alternator (paragraph 3-71).
	d. Other causes.	d. Refer to higher level of maintenance.

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
13. Air cleaner condition indicator illuminates during operation.	a. Dirty air cleaner panel filters.	a. Clean filters (paragraph 3-13).
	b. Defective air cleaner indicator switch.	b. Test switch and replace as required (paragraph 3-49).
	c. Other causes.	c. Refer to higher level of maintenance.
14. Precise governor will not take control of generator set (precise generator sets).	a. Defective speed switch.	a. Test switch and replace as required (paragraph 3-70).
	b. Clogged governor actuator filter.	b. Clean filter (paragraph 3-91).
	c. No fluid in hydraulic system	c. Service hydraulic tank (paragraph 3-16).
	d. Other causes.	d. Refer to higher level of maintenance.
15. Erratic frequency indicated on frequency meter, but engine operation is stable.	a. Defective frequency meter or transducer.	a. Replace meter and transducer (paragraph 3-57).
	b. Other causes.	b. Refer to higher level of maintenance.
16. Kilowatt indication on kilowatt meter exceeds rated value.	a. Excessive load.	a. Reduce load.
	b. Defective kilowatt meter.	b. Replace meter (paragraph 3-54).
	c. Defective thermal watt converter.	c. Replace converter (paragraph 3-58).
	d. Other causes.	d. Refer to higher level of maintenance.

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
17. AC ammeter indicates more than 100%.	a. Excessive load.	a. Reduce load.
	b. Defective ammeter.	b. Replace ammeter (paragraph 3-55).
	c. Other causes.	c. Refer to higher level of maintenance.
18. Generator set shuts down, low fuel indicater illuminates, but sufficient fuel remains for operation in generator set fuel tank.	a. Defective day tank float switch.	a. Test switch and replace as required (paragraph 3-78).
	b. Defective fuel solenoid valve.	b. Test valve and replace as required (paragraph 3-77).
	c. Clogged filter or strainer elements.	c. Service filter and strainer (paragraph 3-77).
	d. Clogged fuel transfer pump screens.	d. Service screens (paragraph 3-76).
q	e. Defective fuel transfer pumps.	e. Test pumps and replace as required (paragraph 3-76).
	f. Clogged fuel supply lines.	f. Clean lines.
	g. Other causes.	g. Refer to higher level of maintenance.
19. Generator set shuts down, high coolant temperature indicator illuminates, but coolant temperature is within normal operating range.	a. Defective high coolant temperature switch.	a. Test switch (paragraph 3-48).
	b. Other causes.	b. Refer to higher level of maintenance.

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
20. Generator set shuts down low oil pressure indicator illuminates, but oil pressure is within normal operating range.	a. Defective low oil pressure switch.	a. Test switch (paragraph 3-46).
	b. Other causes.	b. Refer to higher level of maintenance.
21. Generator set shuts down, overspeed indicator illuminates, but engine speed is within proper operating range.	a. Defective speed switch.	a. Test switch and replace as required (paragraph 3-70).
	b. Other causes.	b. Refer to higher level of maintenance.
22. Generator set shuts down with no fault indicated.	a. Defective engine shutdown solenoid valve.	a. Test valve (paragraph 3-50).
	b. Clogged secondary fuel filter element.	b. Service filter (paragraph 3-79).
	c. Defective fuel relief valve.	c. Test valve and replace as required (paragraph 3-79).
	d. Other causes.	d. Refer to higher level of maintenance.
23. Generator set will not parallel properly.	a. Improper operating procedures.	a. Operate in accordance with (paragraph 2-14).
	b. Defective parallel cable (precise generator sets).	b. Repair or replace cable (paragraph 4-11).
	c. Defective mode selector switch.	c. Test switch and replace as required (paragraph 3-59).

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
23. Generator set will not parallel properly (continued)	d. Shorting plug (45, figure 2-8) not installed on parallel receptacle (utility generator sets).	d. Install plug.
	e. Other causes.	e. Refer to higher level of maintenance.
24. No generator set electrical output.	a. Improper operating procedures.	a. Operate properly (paragraph 2-14).
	b. Defective speed switch.	b. Test switch and replace as required (paragraph 3-70).
	c. Defective voltage adjust rheostat.	c. Test rheostat and replace as required (paragraph 3-56).
	d. Defective AC voltmeter.	d. Replace voltmeter (paragraph 3-53).
	e. Defective ammeter-voltmeter selector switch.	e. Test switch (paragraph 3-60).
	f. Other causes.	f. Refer to higher level of maintenance.
25. Improper generator set voltage output.	a. Voltage change board not set properly.	a. Set board properly (figure 2-7).
	b. Defective AC voltmeter.	b. Replace voltmeter (paragraph 3-53).
	c. Defective ammeter-voltmeter selector switch.	c. Test switch (paragraph 3-60).
	d. Other causes.	d. Refer to higher level of maintenance.

Table 3-3. Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
26. Improper generator set frequency output.	a. Engine not operating at rated speed (utility generator sets).	a. Adjust manual speed control to obtain proper frequency.
	b. Frequency selector switch not in proper position (50/60 hertz generator sets).	b. Position switch properly.
	c. Manual speed control not in maximum fuel position (precise generator sets).	c. Position manual speed control in maximum fuel position.
	d. Defective or improperly adjusted governor linkage.	d. Adjust or replace linkage (paragraph 3-88 or 3-89).
	e. Defective frequency meter on transducer.	e. Replace frequency meter and transducer (paragraph 3-57).
	f. Defective frequency adjust rheostat.	f. Test rheostat and replace if defective (paragraph 3-56).
	g. Other causes.	g. Refer to higher level of maintenance.

Section VI. FIELD EXPEDIENT REPAIRS

3-21. GENERAL.

Operator and organizational maintenance troubles may occur while the generator set is operating in the field where supplies and repair parts are not available and normal corrective action cannot be performed. When this condition exists, the following expedient repairs may be used in emergencies, upon the decision of the unit commander. Equipment so repaired must be removed from operation as soon as possible and properly repaired before being placed in operation again.

3-22. LOSS OF ENGINE POWER.

Trouble	Expedient Remedy
Clogged air cleaner panel filters . . .	Remove air panel filters, refer to paragraph 3-13.
Clogged fuel filters or strainer	Remove fuel filters or strainer element, refer to paragraphs 3-77 and 3-79.
Clogged fuel transfer pump screen . .	Remove fuel pump screen, refer to paragraph 3-76.

3-23. LOSS OF FUEL.

Trouble	Expedient Remedy
Cracked fuel line	Wrap line with tape.
Defective fuel transfer valve	Connect fuel source direct, bypassing valve.

3-24. ENGINE OVERHEATS.

Trouble	Expedient Remedy
Defective engine coolant temperature regulator	Remove regulator, refer to paragraph 3-82.
Defective radiator shutter power element	Open shutter utilizing manual control handle (57 figure 2-8). Tighten lock screw so that shutter vanes can be held in desired position, refer to figure 3-16.
Radiator leaking	Add approved stop-leak additive to coolant.

3-25. ENGINE OIL PRESSURE LOW.

Trouble	Expedient Remedy
Defective oil line	Wrap line with tape.
Defective lubricating oil filter case gasket	Remove gasket, turn over, and reinstall. Refer to figure 3-2.

3-25A. LOSS OF FREQUENCY CONTROL CLASS 1 SETS.

Trouble

Precise governor system fails to operate properly.

Expedient Remedy

a. Disconnect link to governor actuator. Refer to figure 3-46, Item 7.

b. Disconnect fuel rack shaft end of governor rod (fig 3-46, Item 14) and reconnect to third hole above the fuel rack shaft. Refer to figure 3-45.

c. Turn low speed stop adjustment (fig 3-45, Item 29) counterclockwise until the manual throttle control can be pulled out the maximum distance.

d. Push button on manual throttle and push in until it is approximately 1/2 inch out.

e. Start engine. Adjust engine speed with hand throttle until frequency reads 60 or 400 Hz.

f. Adjust droop for maximum frequency regulation in accordance with paragraph 8-237 of the intermediate maintenance manual. The frequency will remain stable at approximately 2% regulation.

Section VII. RADIO INTERFERENCE SUPPRESSION

3-26. GENERAL METHODS USED TO ATTAIN A PROPER SUPPRESSION.

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

3-27. INTERFERENCE SUPPRESSION COMPONENTS.

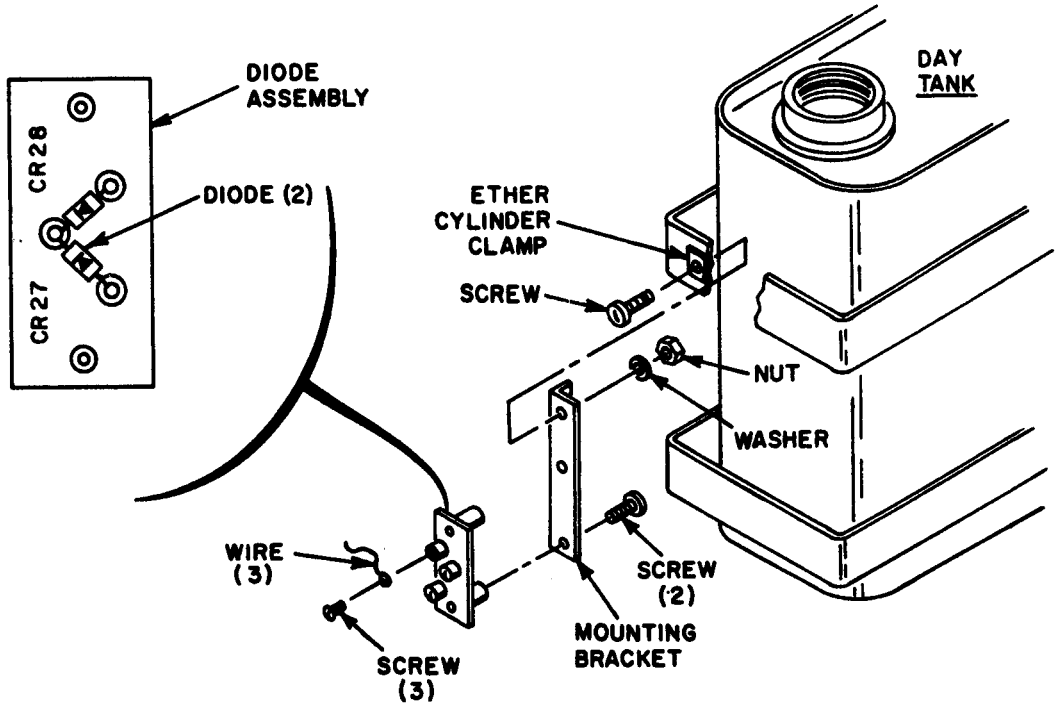
The generator set utilizes a diode assembly to suppress radio interference. The diode assembly consists of diodes CR27 and CR28 which reduce transient type interference generated in the day tank fuel solenoid valve during operation. The diode assembly is mounted to the day tank adjacent to the ether starting aid.

3-28. REPLACEMENT OF SUPPRESSION COMPONENTS.

Refer to figure 3-10 and replace the radio interference suppression components.

3-29. TESTING OF RADIO INTERFERENCE SUPPRESSION COMPONENTS.

Test diodes using a suitable diode tester; replace defective diodes. If diode tester is not available, test diodes using ohmmeter. Check forward and reverse resistance of diodes. Measure from anode (+) to cathode (-), value should be low. Reverse leads, value should be infinity. If test equipment is not available and interference is indicated, isolate the cause of interference by the trail-and-error method of replacing each diode in turn until the cause of interference is located and eliminated.



REMOVAL

STEP 1. OPEN ETHER CYLINDER CLAMP AND REMOVE ETHER CYLINDER.
STEP 2. TAG AND DISCONNECT WIRES FROM DIODE ASSEMBLY TERMINALS BY REMOVING SCREWS.
STEP 3. DISCONNECT DIODE ASSEMBLY AND MOUNTING BRACKET FROM DAY TANK BY REMOVING SCREW, NUT, AND WASHER. REMOVE DIODE ASSEMBLY FROM MOUNTING BRACKET BY REMOVING SCREWS.
STEP 4. TO REPLACE DIODES, UNSOLDER DIODES FROM TERMINALS EXERCISING CARE NOT TO APPLY EXCESSIVE HEAT.

INSTALLATION

STEP 1. POSITION DIODE ASSEMBLY ON MOUNTING BRACKET AND SECURE WITH SCREWS. CONNECT ASSEMBLED BRACKET TO DAY TANK AND SECURE WITH SCREW, NUT, AND WASHER.
STEP 2. CONNECT WIRES TO DIODE ASSEMBLY TERMINALS AND SECURE WITH SCREWS.
STEP 3. INSTALL ETHER CYLINDER IN ETHER PRIMER MAKING SURE PACKING IS PROPERLY INSTALLED BETWEEN CYLINDER AND PRIMER. TIGHTEN CYLINDER HAND TIGHT. SECURE CYLINDER WITH CLAMP.

Figure 3-10. Radio interference suppression components, removal and installation

Section VIII. ORGANIZATIONAL MAINTENANCE PROCEDURES

3-30. GENERAL.

Sections IX through XV provide maintenance instructions for the components of the generator set assembly groups, which are the responsibility of organizational maintenance personnel. Organizational maintenance responsibility is allocated by the Maintenance Allocation Chart provided in Appendix C. The sections also provide a brief description of the major components of the assembly groups in relation to the generator set.

NOTE

Limitations imposed by the title of this section and Maintenance Allocation Chart are applicable only to the Army and Marine Corps. Air Force and Navy users are authorized to perform maintenance within the scope of their capability.

3-31. GENERAL MAINTENANCE DATA.

The following data is provided to assist organizational maintenance personnel in properly accomplishing their assigned task.

WARNING

Disconnect negative battery cables prior to performing maintenance.

a. Always disconnect negative battery cables prior to performing maintenance on electrical components to prevent the possibility of short circuits.

b. Tag electrical wiring with location prior to removal.

c. Keep removed parts together in a suitable container.

d. Only use approved cleaning solvents when cleaning parts.

e. Make sure test equipment is properly calibrated prior to use.

f. Do not overlook defective wiring as the cause of malfunctions.

g. When performing electrical and continuity checks, use a suitable ohmmeter.

h. Tighten screws and bolts in accordance with standard torque chart unless special torque values are provided in the appropriate maintenance paragraphs (see table 1-1).

i. Keep all hydraulic and fuel components clean at all times. Plug all ports until components are installed in generator set.

j. Lubricate all o-rings, packing and gaskets prior to installation with lubricant utilized in component.

Section IX. BATTERIES AND RELATED COMPONENTS

3-32. GENERAL.

The generator set is equipped with two 12 volt, 100 ampere hour batteries that are mounted on a rollout tray below the radiator. The batteries are connected in series to supply 24 VDC for starting of the generator set and operation of direct current components. Connected in parallel with the batteries are two slave receptacles. These receptacles permit easy connection to the batteries to supply or obtain battery power.

3-33. BATTERIES AND ROLLOUT TRAY.

a. BATTERY TEST. Batteries should be permitted to stand a minimum of 30 minutes after operation of generator set prior to testing. Test batteries using a suitable battery electrolyte solution tester as follows:

NOTE

Do not add water to batteries prior to testing.

1. Refer to figure 3-3 for instructions to gain access to batteries and remove battery filler caps.

NOTE

Electrolyte temperature must be between 70°F and 90°F during test.

2. Test electrolyte specific gravity of each battery cell. A fully charged battery should have specific gravity of 1.280 ± 0.005. If battery electrolyte specific gravity is less than 1.250, battery should be charged. Replace battery that will not hold a charge.

CAUTION

Do not expose a battery with electrolyte specific gravity of less than 1.250 to temperature below 0°F.

b. REMOVAL AND DISASSEMBLY. Remove and disassemble batteries and rollout tray as illustrated in figure 3-11, observing the following:

1. Remove negative battery cables first.

2. Sequence of removal shall be as follows: remove battery cables, retainers, batteries, stop angle, and rollout tray.

c. CLEANING AND INSPECTION.

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

2. Clean battery posts and cable ends with a wire brush.

3. Inspect for cracks, breaks, and other damage. Replace defective parts.

4. Inspect for damaged acid-resistant paint. Repair damaged paint surfaces by applying acid-resistant black lacquer conforming to Federal Specification TT-L-54, type I.

d. REASSEMBLY AND INSTALLATION. Reassemble and install batteries and rollout tray as illustrated in figure 3-11, observing the following:

1. Apply thin film of grease conforming to Military Specification MIL-G-10924 to roller shafts prior to reassembly.

2. Sequence of installation should be as follows: rollout tray, stop angle, batteries, retainers, and battery cables. When installing batteries, place batteries

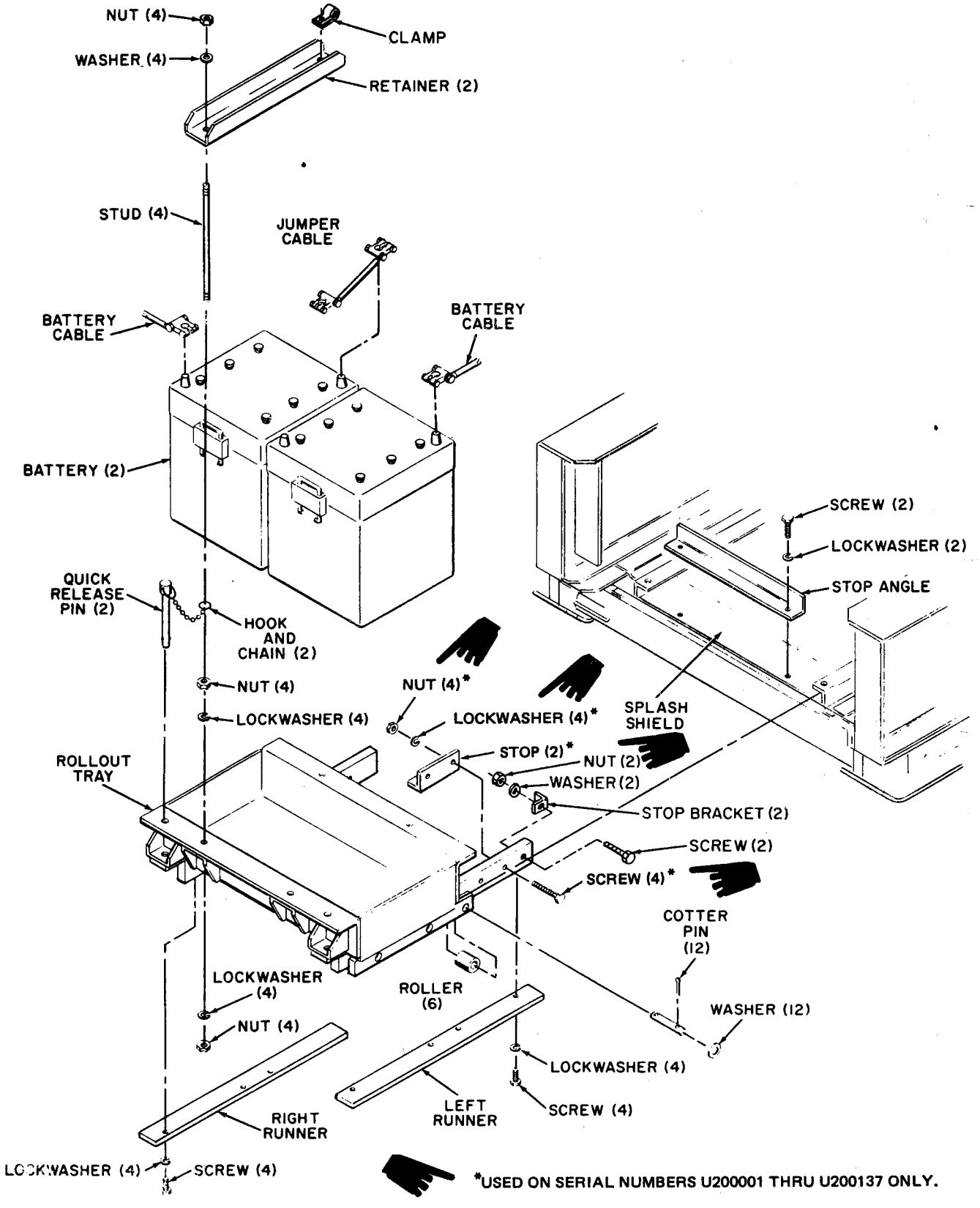


Figure 3-11. Batteries and rollout tray, exploded view

in rollout tray so that positive post are toward front of generator set. Connect negative battery cable to battery last. Refer to figure 3-12 and check battery cables for proper connection.

3. After jumper and battery cables are installed on batteries, coat battery posts and cable ends with grease to reduce corrosion.

3-34. BATTERY CABLES AND SLAVE RECEPTACLES.

a. REMOVAL. Remove battery cables and slave receptacles as illustrated in figure 3-12, removing negative cables first.

b. CLEANING AND INSPECTION.

1. Clean cable ends with a wire brush.

2. Inspect cable insulation for corrosion and deterioration.

3. Inspect slave receptacles for bent or broken pins and for cracked insulation. Replace defective parts.

c. INSTALLATION. Install battery cables and slave receptacles as illustrated in figure 3-12, observing the following:

1. Install slave receptacle SR1 with keyway up and SR2 with small pin up.

2. Connect negative cables last.

3. Coat battery posts and cable ends with grease to reduce corrosion after installation.

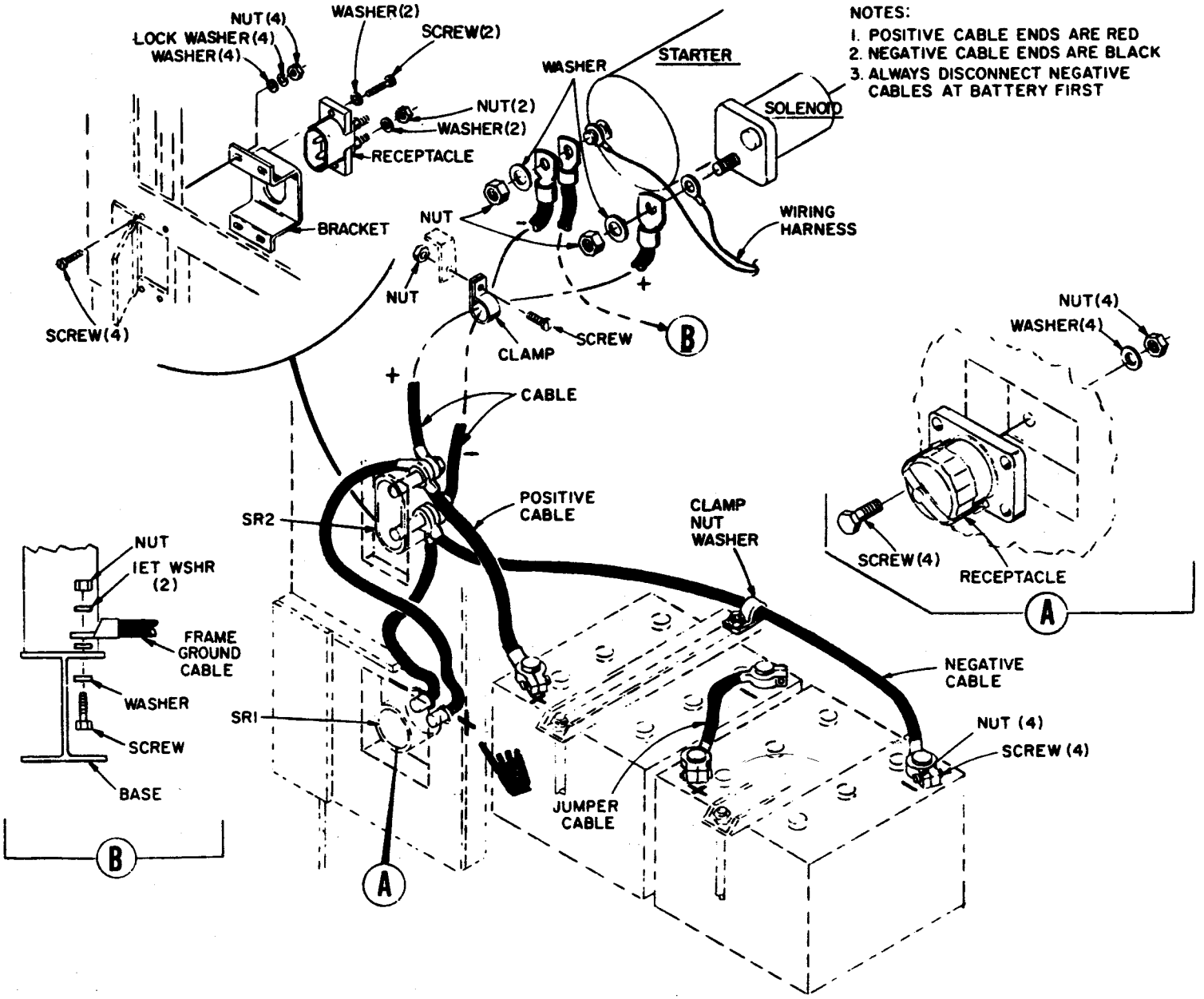


Figure 3-12. Battery cables and slave receptacles, removal and installation

Section X. MUFFLER AND PIPES

3-35. GENERAL.

a. MUFFLER AND EXHAUST PIPE. The muffler and exhaust pipe are connected to the turbo charger exhaust elbow and provide a path for engine exhaust gases to exit the generator set. The muffler reduces the noise level of the engine exhaust. The discharge opening of the muffler is covered by either a rotating or hinged rain cap to prevent water from entering the exhaust system when the generator is not operating.

b. CRANKCASE BREATHER AND HOSE. The crankcase breather tube and hose are clamped to the engine breather assembly. They provide a path for engine crankcase fumes to exit the generator set. A rain shield is provided at the tube outlet to prevent rain from entering the tube.

3-36. MUFFLER AND EXHAUST PIPE.

a. REMOVAL. Remove muffler and exhaust pipe in sequence illustrated in figure 3-13, observing the following:

1. Remove exhaust pipe (7) and gaskets (8) from muffler (14) and turbo charger exhaust elbow.

2. Remove plate (11) and gasket (12) from front housing.

3. Support weight of muffler and remove clamps (13). Remove muffler (14) and bracket (17).

4. Clean old gaskets from surfaces using suitable tools.

b. INSTALLATION. Install muffler and exhaust pipe in reverse sequence illustrated in figure 3-13, observing the following:

1. Apply antiseize compound to screw threads prior to installation.

2. Install bracket (17) loosely. Install muffler (14) and clamp (13) and tighten clamp (13).

3. Install gasket (12) and plate (11) around muffler outlet and install screws (9) and lock washer (10) finger tight.

4. Install gaskets (8) and exhaust pipe (7) and secure to turbo charger exhaust elbow and muffler (14). Tighten screws (9) and bracket (17).

3-37. CRANKCASE BREATHER TUBE AND HOSE.

a. REMOVAL. Remove crankcase breather tube and hose in sequence illustrated in figure 3-13, observing the following:

1. Unbolt tube (30) and rainshield (27) from front housing. Loosen forward clamp (28). Loosen engine breather screw to permit movement of breather.

2. Hold hose (29) stationary and twist tube (30) to remove tube from hose. Remove hose (29). Cover engine breather opening.

b. INSTALLATION. Install crankcase breather tube and hose in reverse sequence illustrated in figure 3-13, observing the following:

1. Install hose (29) on engine breather Insert breather tube (30) in hose and secure tube and rainshield (27) to front housing.

2. Tighten engine breather and then clamps (28).

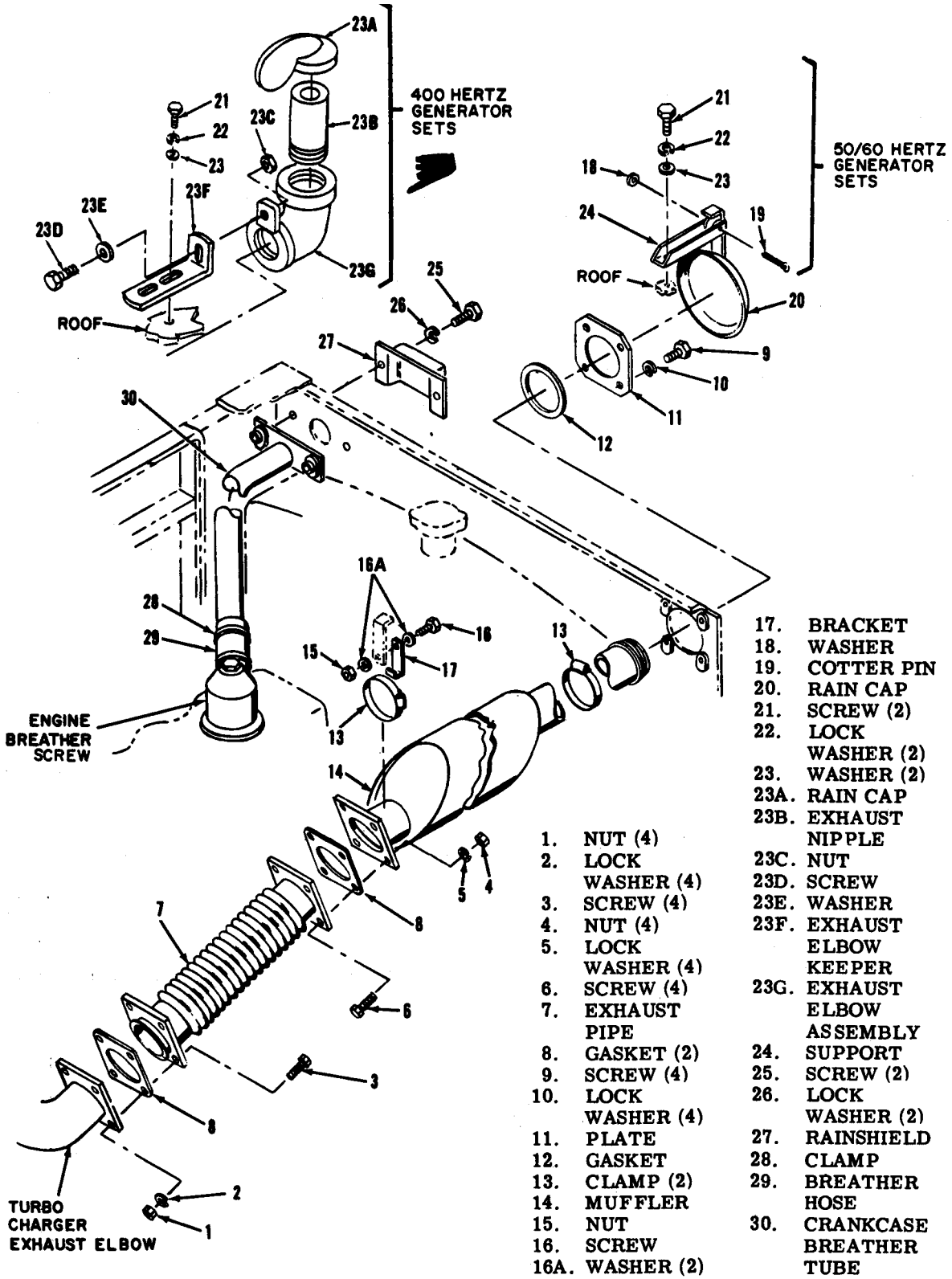


Figure 3-13. Muffler, exhaust pipe, and crankcase breather tube and hose, removal and installation

Section XI. HOUSING ASSEMBLY

3-38. GENERAL.

The housing assembly is bolted together and fully encloses the generator set. Hinged access doors are provided for access to set components. The doors close on a seal, and are provided with latches to lock the doors in the closed position. A lifting frame is located at the center of the housing and provides a means of handling the generator set during movement.

3-39. DOORS, COVERS, SEALS, AND ASSOCIATED HARDWARE.

a. REMOVAL. Remove housing doors, covers, seals, and associated hardware in sequence illustrated in figure 3-14, observing the following:

1. Prior to removing front cover (58), remove muffler clamp from roof bracket. Refer to figure 3-13.

b. CLEANING AND INSPECTION.

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

2. Inspect doors, panels, and hardware for cracks, breaks, dents, and bent corners.

3. Inspect seals for deterioration.

4. Replace defective parts.

c. INSTALLATION. Install housing doors, covers, seals, and associated hardware in reverse sequence illustrated in figure 3-14, observing the following:

1. After installing front cover (58) secure muffler to roof bracket with muffler clamp. Refer to figure 3-13.

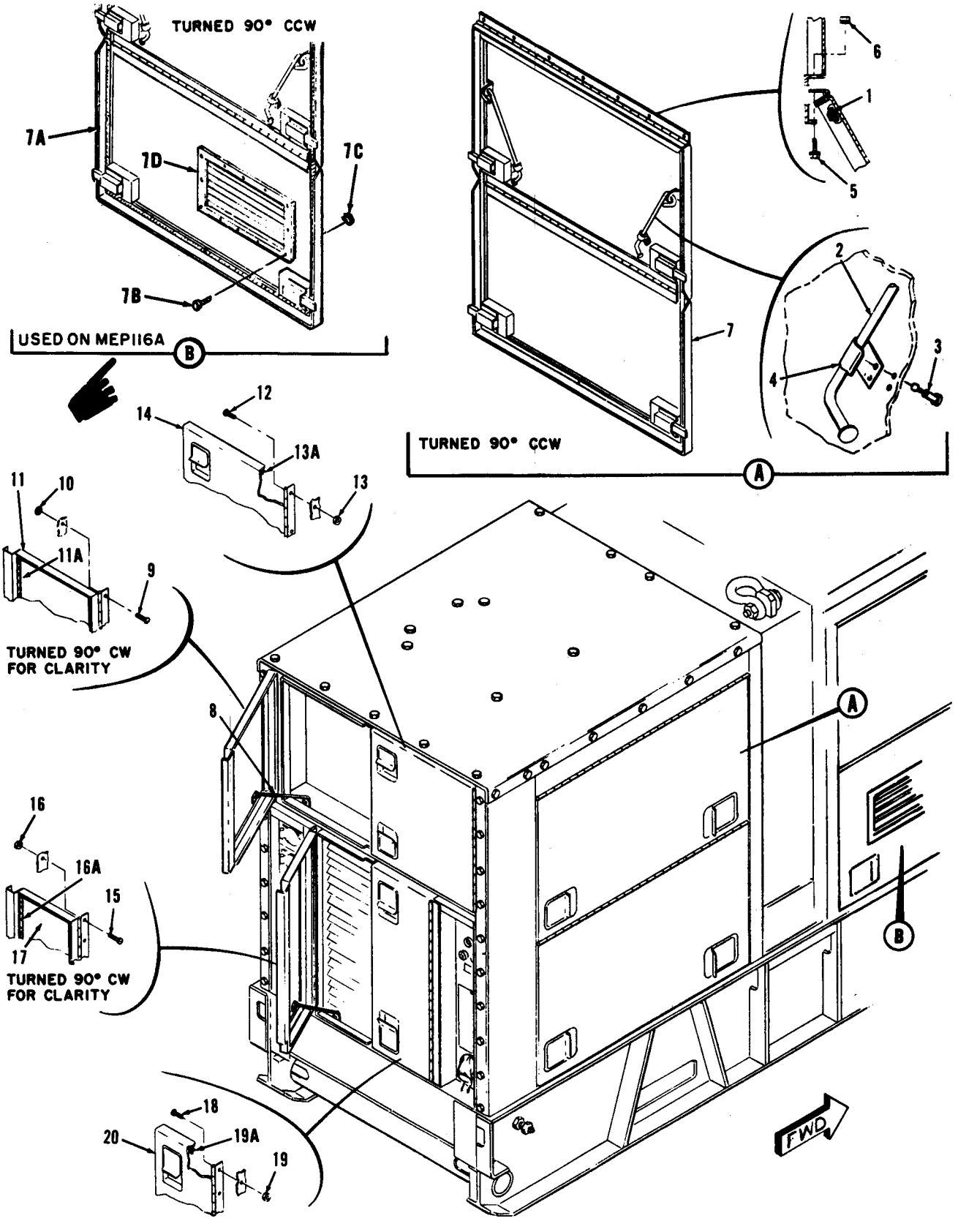


Figure 3-14. Housing, partially exploded view
(sheet 1 of 2)

Legend to figure 3-14:

1. Seal
2. Rod (8)
3. Rivet (32)
4. Clip (8)
5. Screw (28)
6. Nut (28)
*7. Access door (4)
+7. Access door (2)
+7A. Access door (2)
+7B. Screw (20)
+7C. Nut (20)
+7D. Shutter assembly (2)
8. Door holder (4)
9. Screw (5)
10. Nut (5)
11. Access door
11A. Seal
12. Screw (5)
13. Nut (5)
13A. Seal
14. Access door
15. Screw (8)
16. Nut (8)
16A. Seal
17. Access door
18. Screw (8)
19. Nut (8)
19A. Seal
20. Access door
21. Door holder
22. Screw (21)
23. Nut (21)
24. Washer (21)
25. Access cover
26. Battery access frame
27. Washer (21)
28. Nut (2)
29. Screw (2)
30. Slave receptacle access door
*31. Washer
*32. Cotter pin
*33. Rain cap
*34. Screw (2)
*35. Lock washer (2)
*36. Washer (2)
*37. Support
38. Pin
39. Stud
40. Deleted
41. Nut (3)
42. Screw (3)
43. Radiator cap access door
44. Rivet (2)
45. Receptacle
46. Screw (18)
47. Lock washer (18)
48. Washer (18)
49. Nut (4)
50. Screw (4)
51. Washer (4)
52. Nut (4)
53. Screw (4)
54. Washer (8)
55. Screw (4)
56. Lock washer (4)
57. Washer (4)
58. Front cover
59. Nut (4)
60. Screw (4)
61. Washer (8)
62. Nut (5)
63. Washer (5)
64. Screw (5)
65. Washer (5)
66. Screw (14)
67. Lock washer (14)
68. Washer (14)
69. Nut (4)
70. Screw (4)
71. Washer (8)
72. Screw (4)
73. Lock washer (4)
74. Washer (4)
75. Screw (5)
76. Lock washer (5)
77. Washer (5)
78. Rear cover
79. Nut (6)
80. Screw (6)
81. Parallel cable stowage box
82. Parallel cable
83. Nut (12)
84. Washer (12)
85. Screw (12)
86. Air Make panel
87. Cotter pin (2)
88. Nut (2)
89. Screw (2)
90. Lifting clevis (2)

* Used only on 50/60 Hertz Generator Sets.
+ Used only on 400 Hertz Generator Sets.

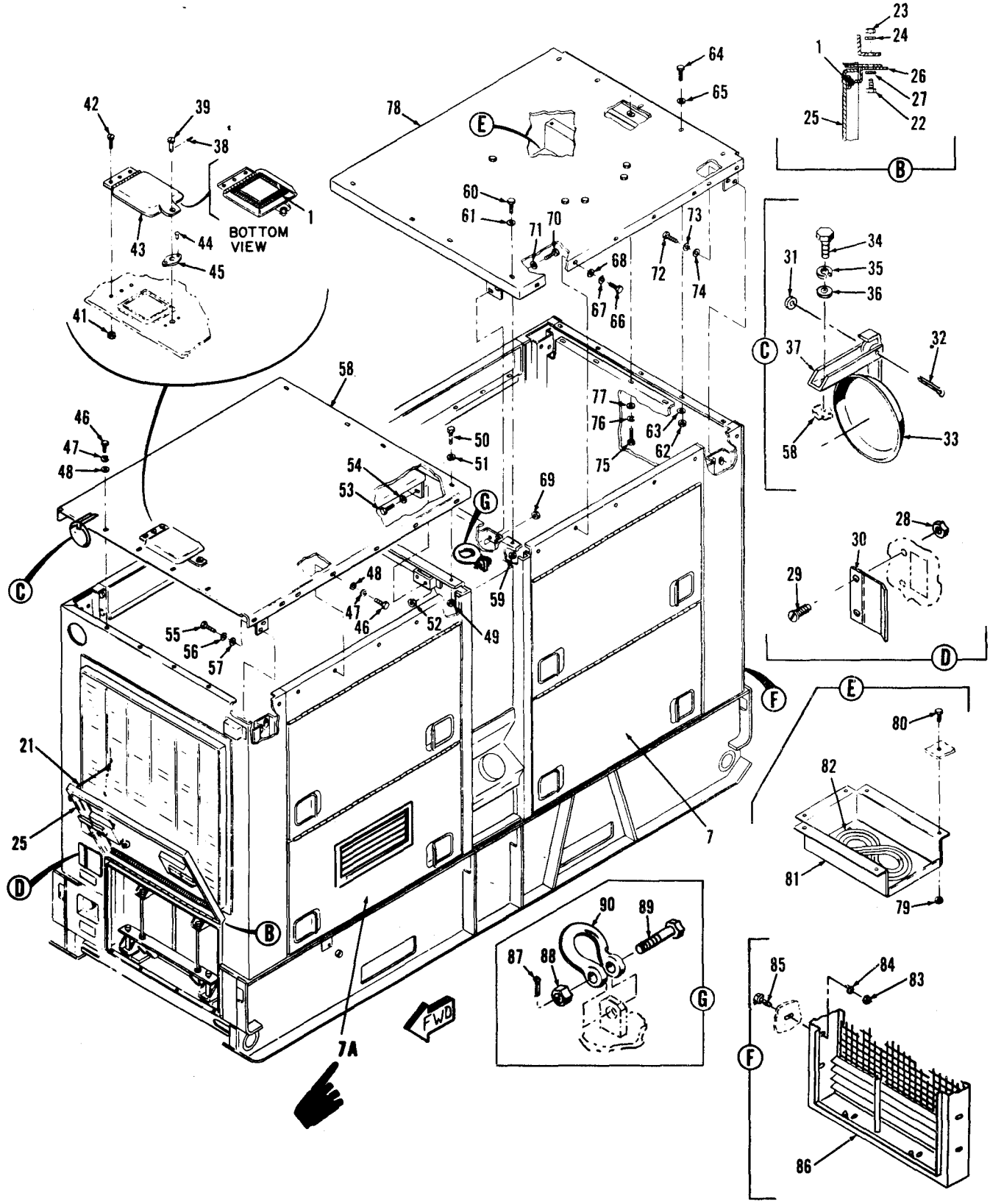


Figure 3-14. Housing, partially exploded view (sheet 2 of 2)

Section XII. RADIATOR, AND SHUTTER ASSEMBLY

3-40. GENERAL

a. The radiator assembly is mounted to the front housing panel. It consists of a grill, shutter and control assembly, radiator, and fan guards. The grill protects the shutter. The fan guards prevent personnel from coming in contact with fan.

b. SHUTTER AND CONTROL ASSEMBLY. The shutter consists of movable vanes mounted in nylon bearings which are actuated by a control rod connected to the control assembly. When engine coolant temperatures reaches 158°F, the control assembly power element starts to extend which moves the control rod opening the shutter vanes. If coolant temperature decreases, the control assembly integral return spring moves the control rod closing the shutter vanes. This modulated control automatically opens and closes the shutter vanes the amount necessary to maintain the engine at normal operating temperature. Opening and closing of the shutter vanes regulates cooling air flow through the radiator. The shutter assembly is equipped with a manual control handle to permit manual opening of the shutter vanes. The handle should be in the full up position during normal operation.

c. RADIATOR. The radiator consists of a core assembly, top and bottom tanks, upper and lower shrouds, and shroud plate. As coolant passes through the radiator core, heat is transferred from the core to the air forced through the radiator by the fan. The radiator rejects 35 BTU's of heat per minute when the engine is operating at 1500 RPM, 34 BTU's at 1800 RPM, and 37 BTU's at 2000 RPM. The radiator operates under 4 to 7 PSIG which is controlled by the radiator cap. The shrouds and shroud plate insure that air drawn by the fan is forced through the radiator when exiting the generator set.

3-41. GRILL AND FAN GUARDS.

a. REMOVAL. Refer to figure 3-15 and remove fan guards and grill as follows:

1. Fan Guards.

(a) Remove two top screws (27) and insert 1/4 x 20 UNC x 2 inch studs in their place to hold shroud plate in position.

(b) Remove screws (25 and 27), nuts (23), washers (24, 26, and 27) and fan guards (29 and 30).

2. Grill.

(a) Remove four corner screws (76) and insert 5/16 x 18 UNC x 2 inch studs in their place to hold shutter in position.

(b) Remove screws (76), washers (77), and grill (78).

b. CLEANING, INSPECTION, AND REPAIR.

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

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

3. Repair grill and guard by straightening cross members and corners. Repair cracks by welding.

c. INSTALLATION. Refer to figure 3-15 and install fan guards and grill as follows:

1. Fan Guards.

(a) Position fan guards (29 and 30) on studs. Secure fan guards together with screws (26), nuts (23), and washer (23 and 24).

(b) Install screws (27) and washer (28) finger tight. Remove studs and install remaining screws and washers.

(c) Position shroud plate (31) so that clearance between plate and each fan blade tip is equal. Tighten screws (27).

2. Grill.

(a) Position grill (78) on front housing and install screws (76) and washers (77) finger tight. Remove studs and install remaining screws and washers.

(b) Tighten screws (76) evenly to prevent distortion of shutter. Using shutter manual control handle, open and close shutter and check for binding. If binding is present, loosen screws and retighten evenly.

3-42. SHUTTER CONTROL ASSEMBLY.

a. REMOVAL AND DISASSEMBLY. Refer to figure 3-15 and remove and disassemble shutter control assembly as follows:

1. Drain coolant from radiator, refer to paragraph 3-8.

2. Open battery access door and pull out battery rollout tray, refer to figure 3-3.

3. Remove cotter pin (58, figure 3-15) and shutter control rod (59) from lever (63).

NOTE

It is not necessary to remove lever (63).

4. Remove screws (64), washers (65), housing (66), gaskets (67 and 69) and spacer plate (68) from radiator.

5. Remove screw (59C), nut (59A) and lock washer (59B) from lever (59D). Remove screw (62C), washer (62D), friction spring (62B) and nut (62A) from shutter power element housing and remove hand' lever (63).

6. Remove retainer (60) from shaft (61). Slide shaft (61) out from shutter power element housing (66) and yoke assembly (62) .

7. Remove power element (70) from shutter power element housing (66).

b. CLEANING AND INSPECTION.

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

Legend to figure 3-15:

1. Screw (2)
2. Lock washer (2)
3. Washer (2)
4. Rain cap and support
5. Screw (4)
6. Lock washer (4)
7. Plate
8. Gasket
9. Screw (2)
10. Lock washer (2)
11. Rainshield
12. Nut (4)
13. Lock washer (4)
14. Washer (4)
15. Screw (4)
16. Clamp (2)
17. Upper radiator hose
18. Lower radiator hose
19. Clamp (2)
20. Overflow drain hose
21. Clamp (2)
22. Coolant drain hose
23. Nut (3)
24. Washer (3)
25. Screw (3)
26. Washer (3)
27. Shroud plate Screw (8)
28. Washer (8)
29. Right fan guard
30. Left fan guard
31. Shroud plate
32. Screw (2)
33. Lock washer (2)
34. Washer (2)
35. Lock washer (4) Nut (11)
36. Washer (11)
37. Lock washer (11)
38. Screw (11)
39. Washer (4) Screw (5)
40. Lock washer (5)
41. Washer (5)
42. Screw (4)
43. Lock washer (4)
44. Washer (4)
45. Screw (4)
46. Lock washer (4)
47. Washer (4)
48. Nut (4)
49. Washer (4)
50. Screw (4)
51. Nut (4)
52. Screw (4)
53. Front housing
54. Elbow
55. Coolant drain valve
56. Nipple
57. Elbow
58. Cotter pin
59. Shutter control rod
59A. Nut
59B. Lock washer
59C. Screw
59D. Lever
60. Retainer
61. Shaft assembly
62. Yoke assembly
62A. Nut
62B. Friction spring
62C. Screw
62D. Washer
63. Hand lever
64. Screw (2)
65. Washer (2)
66. Shutter power element housing
67. Gasket
68. Spacer plate
69. Gasket
70. Power element
71. Power element nut
72. Packing
73. Screw (8)
74. Lock washer (8)
75. Washer (8)
76. Screw (14)
77. Washer (14)
78. Grill
79. Shutter
80. Screw (8)
81. Washer (8)
82. Angle bracket
83. Screw (4)
84. Washer (4)
85. Lower radiator shroud
86. Upper radiator shroud
87. Radiator cap
88. Radiator

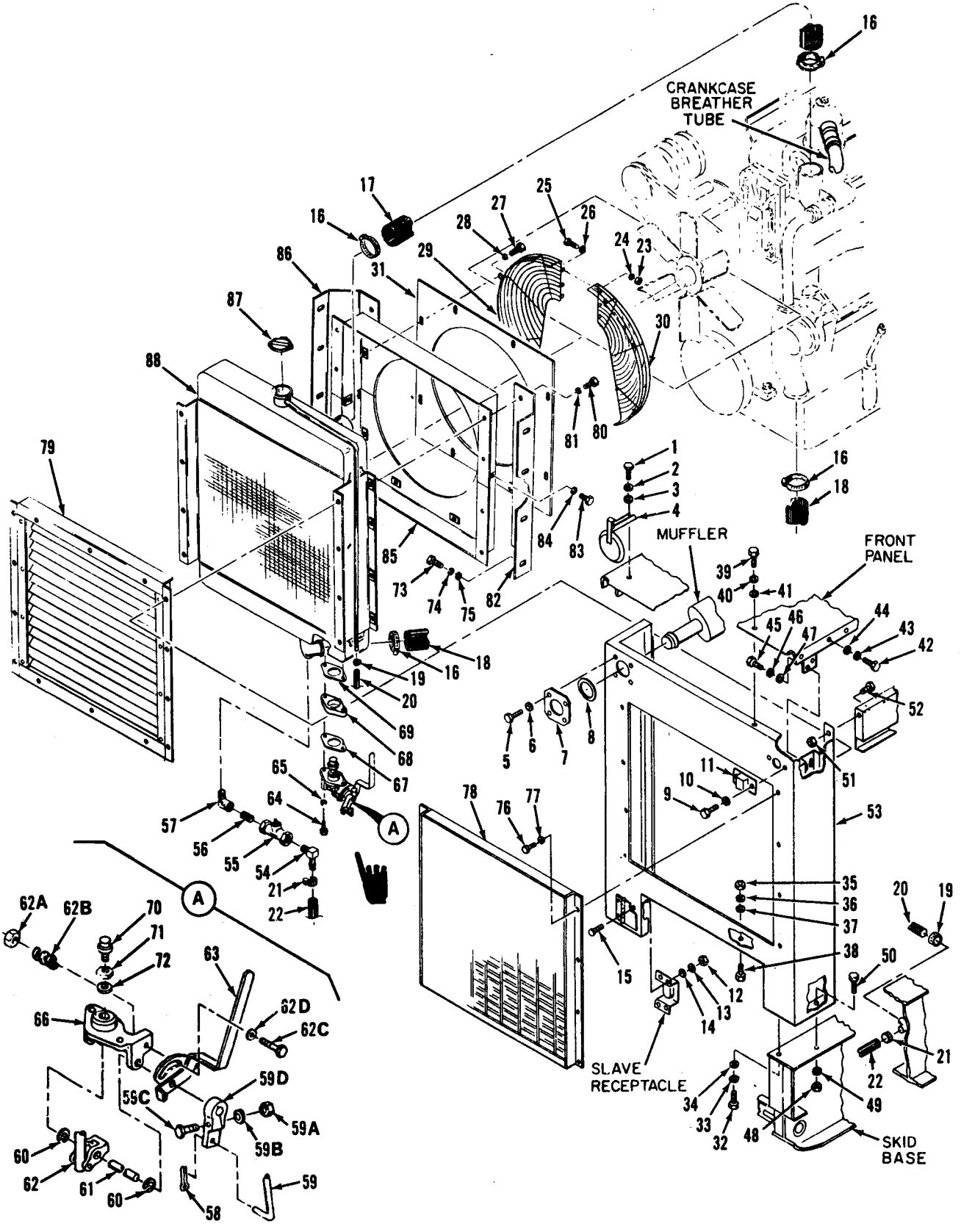


Figure 3-15. Radiator and shutter assembly, exploded view

2. Remove old gasket from control assembly housing and radiator using suitable scraper.

3. Inspect for cracks, breaks, and other damage. Replace defective parts.

c. POWER ELEMENT TEST.

1. Place power element (70, figure 3-15) and calibrate thermometer in suitable container filled with water.

2. Heat water and observe thermometer and power element.

3. Power element should start to extend at 158°F and be fully extended at 173°F.

4. Replace power element that does not operate properly.

d. REASSEMBLY AND INSTALLATION. Refer to figure 3-15 and reassemble and install shutter control assembly as follows:

1. Install packing (72), nut (71), and power element (70) in housing (66) and adjust power element to a dimensional setting of 2-3/4 inches by screwing element in or out. Tighten nut (71) after adjustment. Refer to figure 3-16.

NOTE

Shutter control assembly manual control handle lock screw should be loose enough to prevent position of manual control handle from interfering with automatic operation of shutter assembly.

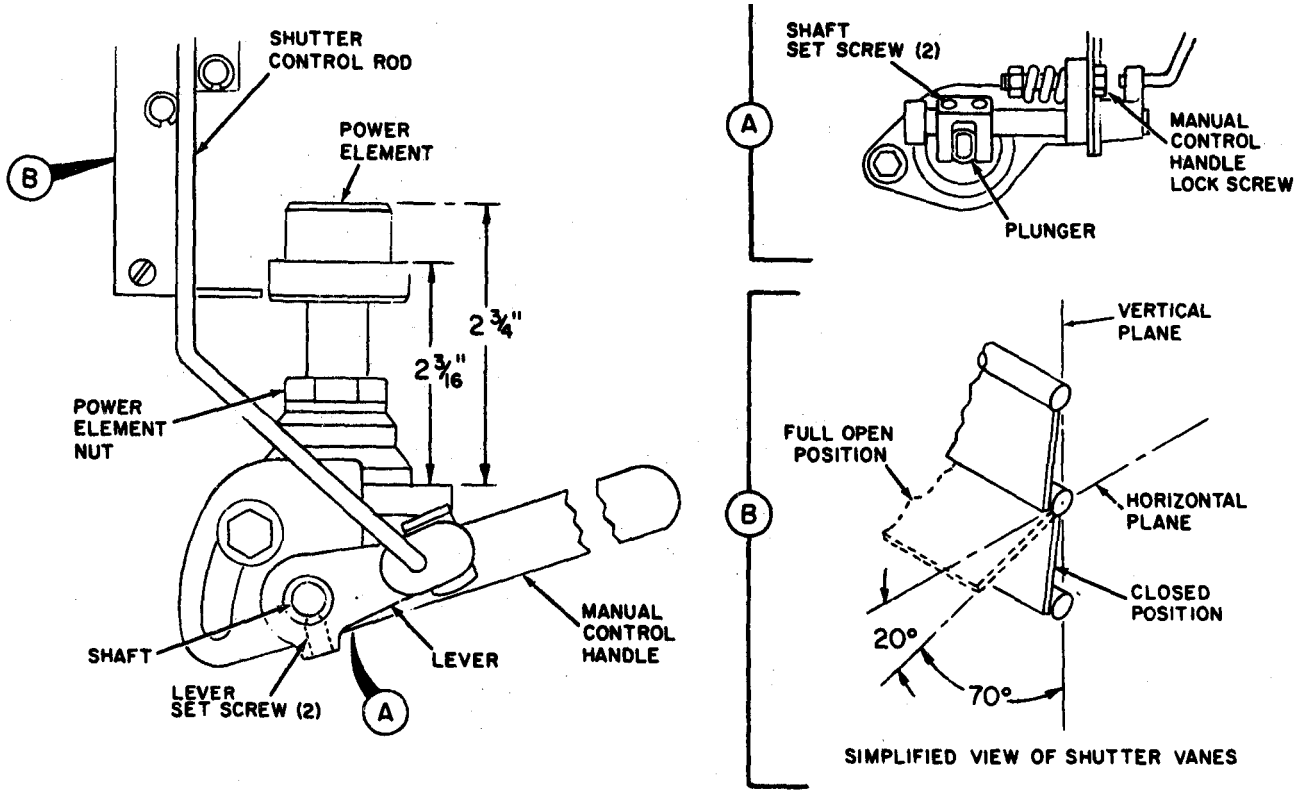


Figure 3-16. Shutter control assembly, adjustment

2. Slide shaft (61) through shutter power element housing (66) and yoke assembly (62). Fasten retainer (60) to shaft (61).

3. Install hand lever (63) to housing (66) using screw (62C), washer (62D) friction spring (62B) and nut (62A).

4. Install lever (59D) to shaft assembly (61) using screw (59 C), washer (59B) and nut (59A). Insert shutter control rod assembly (59) into lever (59D).

5. Position gaskets (67 and 69), spacer plate (68), and housing (66) on radiator and secure with screws (62 and 64) and washers (63 and 65).

6. Install battery rollout tray and close battery access door, refer to figure 3-3.

7. Service radiator, refer to paragraph 3-8.

3-43. RADIATOR HOSES.

a. REMOVAL. Refer to figure 3-15 and remove radiator hoses as follows:

1. Drain coolant from radiator, refer to paragraph 3-8.

2. Loosen clamps (16, figure 3-15) and remove hoses (17 and 18) from engine and radiator.

3. Plug engine and radiator openings hoses were removed from, using tape or suitable plugs.

b. INSTALLATION. Refer to figure 3-15 and install radiator hoses as follows:

1. Position hoses (17 and 18) on engine and radiator and secure with clamps (16).

2. Service radiator, refer to paragraph 3-8.

3-44. RADIATOR AND SHUTTER.

a. RADIATOR COOLANT TEST. Test radiator coolant solution for proper temperature range using a suitable antifreeze tester as follows:

1. Operate engine until normal engine operating temperature (180°F to 200°F) is reached. Shutdown engine.

WARNING

Cooling system is pressurized. Remove radiator cap slowly to allow pressure to escape prior to cap removal.

2. Remove radiator cap and check specific gravity of coolant. Refer to table 2-1 for specific gravity of coolant and temperature range.

b. REMOVAL. Refer to figure 3-15 and remove radiator and shutter in the order of index numbers. Pay particular attention to the following:

1. Drain coolant from radiator, refer to paragraph 3-8.

2. Remove battery access door (25, figure 3-14) from front housing (53, figure 3-15).

NOTE

It is not necessary to remove items (60 through 70) to remove radiator as an assembly. After radiator removal, if necessary, refer to paragraph 3-42 to remove and disassembly shutter control assembly.

3. Disconnect front housing (53, figure 3-15) from generator set in the order of index numbers. Remove assembled housing from generator set.

4. Plug engine openings hoses were removed from to prevent contaminants from entering cooling system. Use tape or suitable plugs.

5. Block housing to prevent it from tipping over and continue removal in the sequence of index numbers.

c. CLEANING AND INSPECTION.

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

2. Remove dirt and foreign matter from radiator core using compressed air.

3. Remove dust and dirt from shutter vane bearings using compressed air.

4. Remove old gaskets using a suitable scraper.

5. Inspect overflow tube for obstruction.

6. Inspect hoses for cracks, cuts, and deterioration.

7. Inspect for damaged threads.

8. Test shutter control assembly power element for proper operation, refer to paragraph 3-42, step c.

9. Inspect for cracks, breaks, and other damage. Replace defective parts.

d. INSTALLATION. Refer to figure 3-15 and install radiator and shutter in the reverse order of index numbers. Pay particular attention to the following:

1. If shutter control assembly was removed from radiator, install control assembly as specified in paragraph 3-42.

2. Install items (54 through 88) on front housing (53) prior to installing housing on generator set.

3. When securing grill (78), shutter (79) and radiator (88) to front housing (53), tighten screws (76) evenly. Using shutter manual control handle, open and close shutter and check for binding. If binding is present, loosen screws and retighten evenly. Repeat procedure until there is no binding.

NOTE

Shutter manual control handle lock screw should be loose enough to prevent position of manual control handle from interfering with automatic operation of shutter.

4. Position assembled front housing (53) on generator set and continue installation in the reverse order of index numbers. After front housing is bolted in position, check for binding of shutter. Loosen and retighten screws evenly if binding occurs.

5. Position shroud plate (31) so that clearance between plate and each fan blade tip is equal and then secure plate and fan guards (29 and 30) to radiator shroud.

CAUTION

Do not lubricate shutter vane bearings. Oil will collect dust and dirt which may prevent proper operation of shutter vanes.

6. Lubricate control rod and linkage with lubricating oil conforming to Military Specification MIL-L-2104.

7. Service radiator with proper coolant, refer to paragraph 3-8.

8. Adjust shutter and control assembly as specified in step e.

e. SHUTTER ADJUSTMENT. Refer to figure 3-16 and adjust shutter and control assembly as follows:

NOTE

Adjustment shall be made with coolant temperature below 150°F.

1. Loosen lever setscrews. Pull plunger in the full out position. Cutout in shaft should be next to plunger.

2. Bottom plunger in control assembly by pushing in on plunger toward power element.

3. Make sure shutter vanes are fully closed and tighten lever setscrews.

f. SHUTTER TEST. Refer to figure 3-16 and test shutter and control assembly as follows:

1. Start and operate engine until normal engine operating temperature (180°F to 200°F) is obtained, refer to paragraph 2-12.

CAUTION

Monitor coolant temperature gauge during test. Remove restriction from air intake if coolant temperature becomes excessive.

2. Restrict cooling air flow by partially closing air intake doors. Vary restriction and observe shutter. Shutter vanes should open and close to maintain engine at normal operating temperature (180°F to 200°F). Shutter vanes full open position is approximately 70 degrees. Maximum cooling air flow is attained between 60 and 70 degrees.

3. Remove restriction from air intake. Operate engine for five minutes or until engine coolant temperature returns to normal. Shut down engine.

4. Permit coolant to cool to a minimum of 150°F. Check shutter vane position by trying to insert card stock or match book cover between vanes. If shutter is properly adjusted, card stock or match book cover will not fit between vanes.

5. If shutter vanes do not open or close properly, adjust shutter as specified in step e.

Section XIII. ENGINE ELECTRICAL CONTROL ELEMENTS AND WIRING HARNESSES

3-45. OIL PRESSURE TRANSMITTER.

a. GENERAL. The oil pressure transmitter is installed in the lubricating oil system and is electrically connected to the oil pressure gauge. As engine oil pressure increases or decreases, the resistance of the transmitter increases or decreases. This varying resistance, which is proportional to engine oil pressure, is transmitted to the oil pressure gauge which converts the resistance to PSIG indications.

b. ON GENERATOR SET TEST.

1. Refer to figure 3-17 and remove lead from oil pressure transmitter.

2. Measure resistance through transmitter to ground. Resistance should be 0 to 1.0 ohms.

3. Start and operate engine until normal operating temperature is obtained. Operate engine at rated speed. Recheck resistance of transmitter, resistance should be approximately 15 ohms with engine oil pressure at 60 PSIG.

4. Shut down engine. If resistance does not vary, transmitter is defective. Replace defective transmitter and reconnect lead.

c. REMOVAL. Remove oil pressure transmitter as illustrated in figure 3-17. Plug engine opening after transmitter removal.

d. BENCH TEST.

1. Connect a suitable pressure source and gauge to pressure transmitter.

2. Apply 0 to 120 PSIG to transmitter and check resistance of transmitter as indicated below:

PSIG	Ohms
0	0 to 1.0
10	1.5 to 3.0
60	14.5 to 16.5
120	28 to 31

3. Remove test equipment from transmitter. Replace defective transmitter.

e. INSTALLATION. Install oil pressure transmitter as illustrated in figure 3-17. Apply thread sealing compound conforming to Military Specification

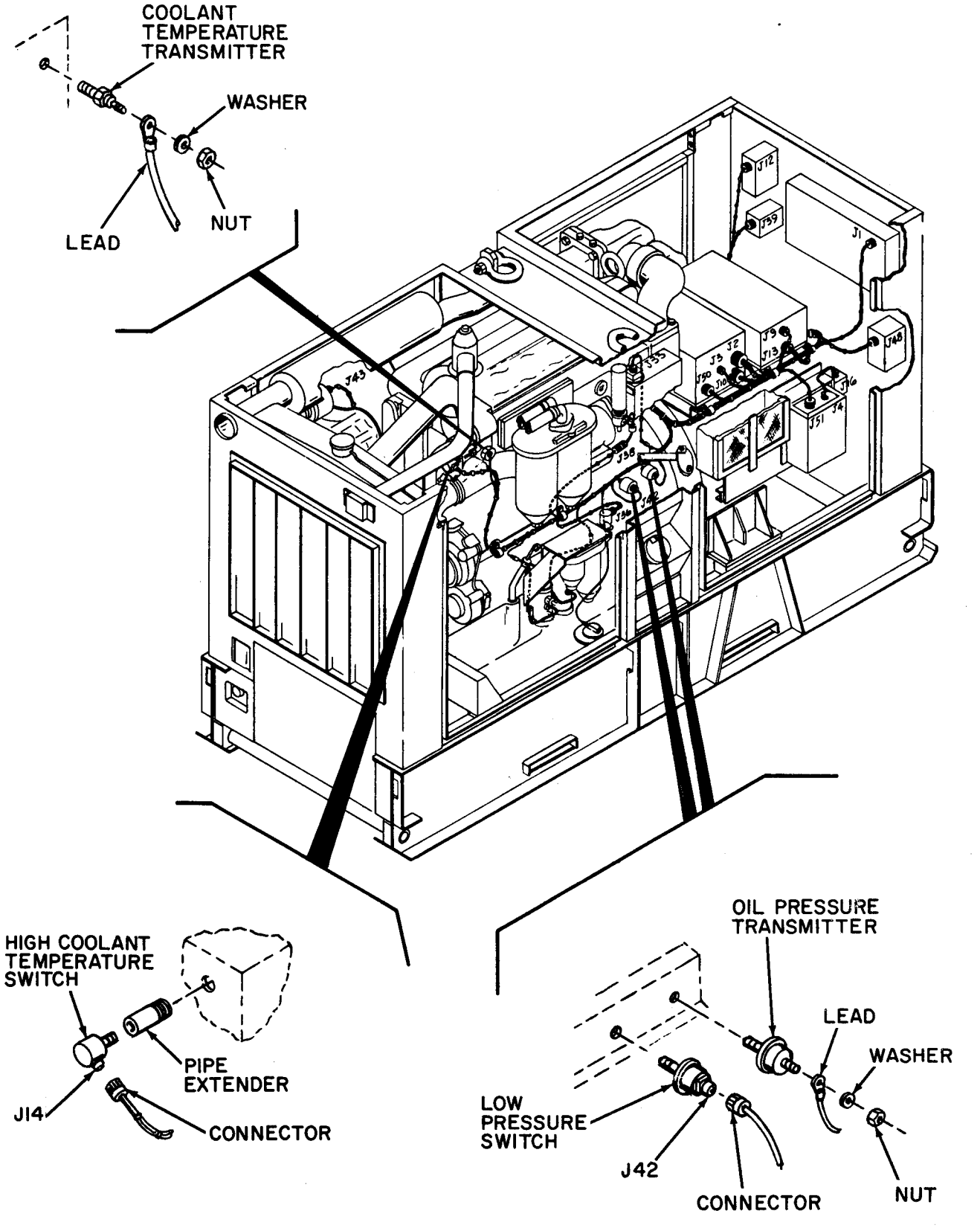


Figure 3-17. Engine electrical control elements, removal and installation (sheet 1 of 2)

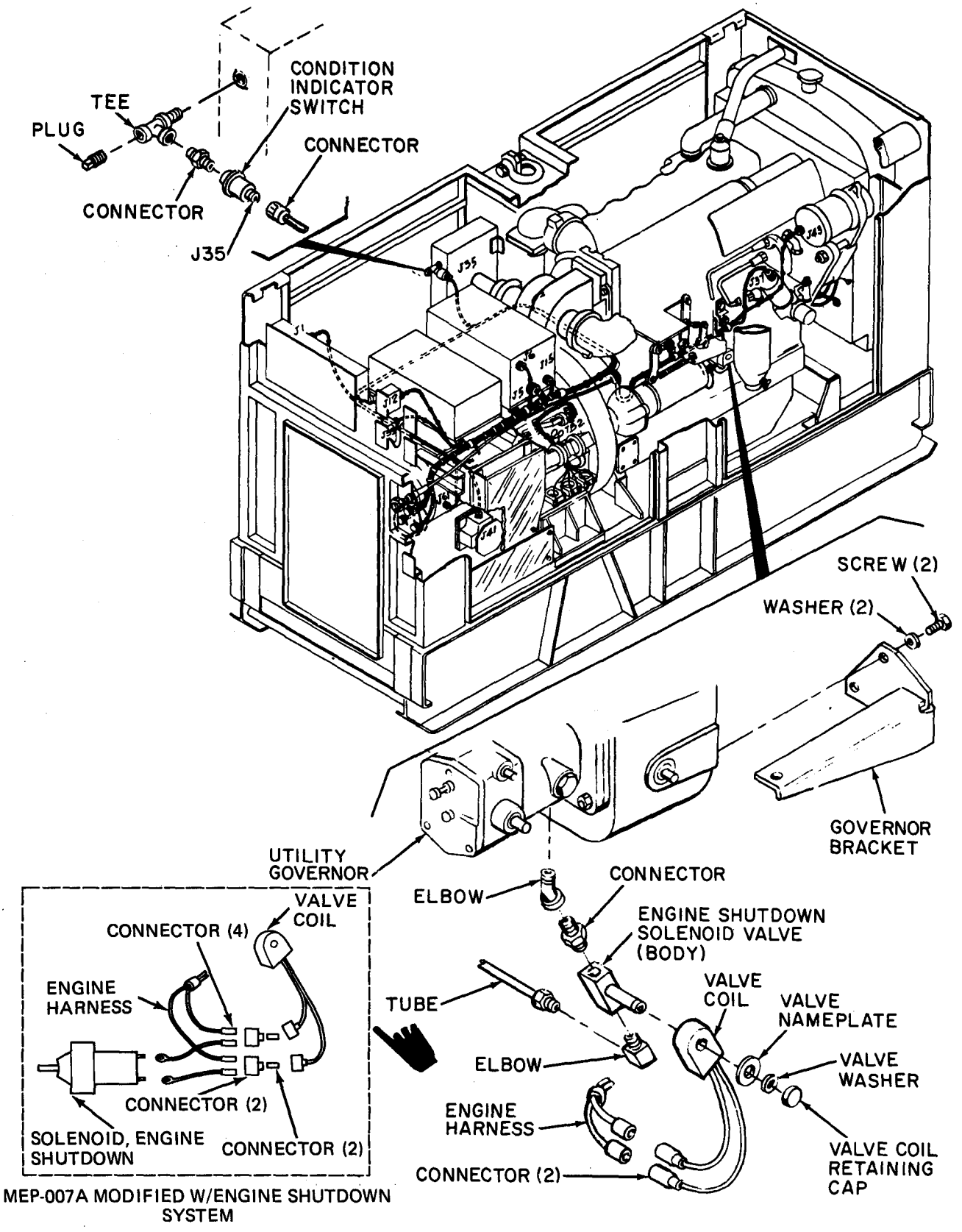


Figure 3-17. Engine electrical control elements, removal and installation (sheet 2 of 2)

MIL-S-45180, type III to pipe threads prior to installation. Make sure temperature sensing end of transmitter is free of sealing compound.

3-46. LOW OIL PRESSURE SWITCH.

a. GENERAL. The low oil pressure switch is a two independent, double breaker, circuit type. As engine oil pressure increases, circuit 1 (between pins A and D) contacts close completing circuit for normal operation and circuit 2 (between pins B and C) contacts open turning off the fault locator low oil pressure indicator. If oil pressure drops to 15 ± 3 PSIG, circuit 1 contacts open initiating shutdown sequence of the generator set and circuit 2 contacts close causing the low oil pressure indicator to illuminate.

b. ON GENERATOR SET TEST.

1. Refer to figure 3-17 and remove connector P42 from low oil pressure switch. Install a suitable jumper between connector P42 pins B and C to complete engine run circuit.

2. Check for continuity between pins A and D of low oil pressure switch, there should be continuity. Check for continuity between switch pins B and C, there should not be continuity.

3. Start engine. As oil pressure builds up to approximately 15 PSIG, switch should actuate. When switch actuates, there should not be continuity between switch pins A and D, and continuity between pins B and C.

4. Shut down engine. Remove jumper from connector P42. Replace defective switch and reconnect connector P42.

c. REMOVAL. Remove low oil pressure switch as illustrated in figure 3-17. Plug engine opening after switch removal.

d. BENCH TEST.

1. Connect a suitable pressure source, bleed valve, and gauge to pressure switch.

2. Apply 25 PSIG to switch. Decrease pressure to 15 ± 3 PSIG while checking continuity. There should be continuity between pins A and D until pressure reaches 15 ± 3 PSIG and no continuity after 15 ± 3 PSIG. There should be no continuity between pins B and C until pressure reaches 15 ± 3 PSIG and continuity after 15 ± 3 PSIG.

3. Remove test equipment from switch. Replace defective switch.

e. INSTALLATION. Install low oil pressure switch as illustrated in figure 3-17. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

3-47. COOLANT TEMPERATURE TRANSMITTER.

a. GENERAL. The coolant temperature transmitter is installed in the engine cooling system and is electrically connected to the coolant temperature gauge. As engine coolant temperature increases or decreases, the resistance of the transmitter increases or decreases. This varying resistance, which is proportional to engine coolant temperature, is transmitted to the coolant temperature gauge which converts the resistance to degrees Farenheit indications.

b. ON GENERATOR SET TEST.

NOTE

Test should be accomplished on cold engine.

1. Refer to figure 3-17 and remove lead from coolant temperature transmitter. Measure resistance through transmitter to ground, resistance should exceed 2.3K ohms.

NOTE

Observe radiator shutter to determine temperature. Shutter vanes will start to open at 158°F.

2. Start and operate engine until approximate normal operating temperature is obtained (180°F). Recheck resistance, resistance should decrease to approximately 900 ohms.

3. Shut down engine. Replace defective transmitter and reconnect lead.

c. REMOVAL. Remove coolant temperature transmitter as illustrated in figure 3-17. Plug engine opening.

d. BENCH TEST.

1. Fill a suitable container with oil and place thermometer in container. Place temperature sensing end of transmitter in oil.

2. Heat oil to 280°F and check resistance of transmitter as indicated below:

Temperature (°F)	Ohms
120	2360 ± 10
200	710 ± 5
280	310 ± 8

3. Remove test equipment and clean oil from transmitter. Replace defective transmitter.

e. INSTALLATION. Install coolant temperature transmitter as illustrated in figure 3-17. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

3-48. HIGH COOLANT TEMPERATURE SWITCH.

a. GENERAL. The high coolant temperature switch is a two independent, double breaker circuit type. Circuit 1 (between pins A and D) contacts are normally closed and circuit 2 (between pins B and C) contacts are normally open. If engine coolant temperature reaches 222°F the circuit contacts will switch. Circuit 1 contacts will open and initiate shutdown sequence of the generator set. Circuit 2 contacts will close and cause the fault locator coolant temperature high indicator to illuminate.

b. ON GENERATOR SET TEST.

NOTE

Engine coolant temperature must be lower than 222°F during test.

1. Refer to figure 3-17 and remove connector P14 from high coolant temperature switch.

2. Check for continuity between switch pins A and D, there should be continuity. Check for continuity between pins B and C, there should not be continuity. Additional testing should be accomplished with switch removed from generator set.

3. Connect connector P14 to switch.

c. REMOVAL. Remove high coolant temperature switch as illustrated in figure 3-17, observing the following:

1. Hold pipe extender stationary and unscrew high coolant temperature switch.

2. Plug engine opening.

d. BENCH TEST.

1. Fill a suitable container with oil and place thermometer in container. Place temperature sensing end of switch in oil.

2. Heat oil and check for continuity. There should be continuity between pins A and D up to 222°F and no continuity after 222°F. There should be no continuity between pins B and C up to 222°F and continuity after 222°F.

3. Remove test equipment and clean oil from switch. Replace defective switch.

e. INSTALLATION. Install high coolant temperature switch as illustrated in figure 3-17. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

3-49. AIR CLEANER RESTRICTION INDICATOR AND INDICATOR SWITCH.

a. GENERAL. The air cleaner indicator switch closes when a pressure drop across the panel filters exceeds 20 ± 1.5 inches of water. When the switch closes, it permits electrical power to illuminate the control panel air cleaner condition indicator. The switch will open automatically when the engine is shutdown and pressure equalizes.

b. ON GENERATOR SET TEST.

1. Start and operate generator set at no load.

CAUTION

Test should be accomplished with panel filters installed.

2. Slowly restrict air flow through air cleaner using a rag or suitable piece of cardboard. Slowly draw rag or cardboard across panel filters until the air cleaner condition indicator illuminates.

3. Remove cardboard or rag, air cleaner condition indicator should go out.

4. If indicator does not trip as specified, check trip point as follows:

5. Refer to figure 3-17 and remove air cleaner condition indicator switch. Connect a manometer or other suitable vacuum device to point component was removed from.

6. Perform steps 1 through 3 and record vacuum at which switch trips. Vacuum should be 20 ± 1.5 inches of water for switch.

7. Replace defective component.

c. REMOVAL. Remove air cleaner indicator switch as illustrated in figure 3-17.

d. INSTALLATION. Install air cleaner indicator switch as illustrated in figure 3-17.

3-50 ENGINE SHUTDOWN SOLENOID VALVE.

a. GENERAL. The engine shutdown solenoid valve is a normally open 24 VDC valve that is utilized to shut down the engine. When de-activated, the valve dumps lubricating oil pressure from one side of the utility governor power piston. When pressure is dumped, oil pressure on the opposite side of the power piston moves the fuel rack to the no fuel position causing the engine to shut down.

b. ON GENERATOR SET TEST.

1. Refer to figure 3-17 and remove tube from elbow. Plug tube.

2. Connect suitable hose to elbow and place open end of hose in a suitable container so that end of hose is visible.

3. Disconnect one of the valve electrical connectors from engine harness.

CAUTION

Do not crank engine in excess of 15 seconds at a time. Allow starter to cool a minimum of three minutes between crankings.

4. Using start-run-stop switch, crank engine with starter until oil appears at hose. Continue cranking engine and reconnect valve electrical connector, oil flow at hose should stop. Stop cranking engine as soon as it begins to start, oil should be discharged from hose as soon as switch is positioned to STOP.

5. If valve does not operate properly, disconnect electrical connectors from generator set harness. Check resistance of valve coil, resistance should be 36 ohms ± 20 percent.

6. Replace defective valve. Reconnect connector and tube.

c. REMOVAL. Refer to figure 3-17 and remove engine shutdown solenoid valve as follows:

1. Disconnect negative battery cable.

2. Remove three screws and washers securing starter to engine and lower starter to permit rotation of valve.

3. Disconnect governor bracket by removing screws and washers. Position bracket away from valve area.

4. Disconnect tube from elbow. Plug tube.

5. Tag and disconnect connectors from engine harness. Remove valve coil retaining cap, washer, nameplate, and coil from valve body.

6. Loosen elbow at bottom of utility governor and position elbow so that valve body and connector can be unscrewed from elbow. Reposition elbow as required. Remove connector and elbow from valve body. Remove elbow from utility governor and plug opening in governor.

d. BENCH TEST.

1. Remove valve as specified in step c.

2. Connect a suitable pressure service and gauge to valve IN port and place valve OUT port in a suitable container.

3. Start pressure source, oil should flow through valve. Apply 24 VDC to valve connectors, oil flow should stop. Increase pressure to 180 PSIG, there should be no leakage through valve. Remove voltage and check that valve opens.

4. Delete pressure and remove test equipment from valve. Replace defective valve.

e. INSTALLATION. Refer to figure 3-17 and install engine shutdown solenoid valve as follows:

1. If new valve is to be installed, remove valve coil retaining cap, washer, nameplate, and coil from valve body.

2. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

3. Install elbow in bottom of utility governor until it is tight and then backoff elbow to permit installation of solenoid valve body.

4. Install elbow and connector in valve body. Install assembled valve body in elbow, repositioning governor elbow to permit tightening of valve. Tighten governor elbow.

5. Install valve coil, nameplate, washer on valve body and secure with valve coil retaining cap. Connect connectors to engine harness.

6. Connect tube to elbow. Position governor bracket and secure bracket with screws and washers.

7. Install starter and secure with three screws and washers. Connect negative battery cable.

3-51. WIRING HARNESSES.

a. GENERAL.

NOTE

Mode I relay box is utilized on 50/60 hertz generator sets and mode II relay box is utilized on 400 hertz generator sets.

1. Relay Box To Tactical Relay Box Harness. The harness is connected to connector J51 of the tactical relay box (A29) and connector J50 of the mode I or mode II relay box (A27).

2. Relay Box To Exciter Regulator Harness. The harness is connected to connector J9 of the exciter regulator (A10 and A11) and connector J3 of the mode I or mode II relay box (A27).

3. Relay Box To Control Cubicle Harness. The harness is connected to connector J1 of the control cubicle (A3) and connector J2 of the mode I or mode II relay box (A27).

4. Relay Box To Reconnection Board Harness (50/60 Hertz Generator Sets). The harness is connected to contactor J10 of the mode I relay box (A27), connector J13 of the excitor regulator (A10 and A11), connector J41 of the load connector (CB2), connector J48 of the convenience receptacle (A22), connector J61 of generator (G1), and to terminals of the load board and terminal boards (TB2 and TB6). The harness is not utilized on 400 hertz generator sets.

5. Relay Box To Reconnection Board Harness (400 Hertz Generator Sets). The harness is connected to connector JI0 of the mode II relay box (A27), connector J13 of the exciter regulator (A10 and A11), connector J41 of the motorized circuit breaker (CB2), connector J48 of the convenience receptacle (A22), connector J61 of generator (G1), to terminals of the load board and terminal boards (TB2 and TB6). The harness is not utilized on 50/60 hertz generator sets.

6. Engine Harness. The harness is connected to connector J5 of the mode I or mode II relay box (A27), J14 of high coolant temperature switch, J33 of day tank float switch, J35 of air cleaner indicator switch, J36 of day tank solenoid valve, J37 of speed switch, J38 of ether starting aid primer, J39 of DC control circuit breaker, J42 of low oil pressure switch, J43 of alternator, and low oil pressure transmitter, coolant temperature transmitter, fuel level transmitter, fuel transfer pumps, engine shutdown solenoid valve, starter, starter solenoid, and radio suppression diode assembly.

7. Tactical Relay Box To Load Measurement Unit Harness. The harness is connected to connector J4 of the tactical relay box (A29) and connector J16 of the load measurement unit (A8).

8. Relay Box To Fault Locator Harness. The harness is connected to connector J12 of the fault locator (A9) and to connector J6 of the mode I or mode II relay box (A27).

9. Parallel Receptacle Harness. The harness is connected to connector J15 of the mode I or mode II relay box (A27). The three connectors of the harness, J45, J46, and J47 are the parallel receptacles located at the rear of the generator set.

10. Relay Box To Precise Relay Box Harness. The harness is connected to connector J32 of the precise relay box (A25) and connector J31 of the mode I relay box (A27). The harness is utilized on 50/60 hertz precise generator sets.

11. Relay Box to Governor Control Unit Harness. The harness is connected to connectors P1 and P2 of the governor control unit (A23) and connector J8 of the precise relay box (A25) on 50/60 hertz precise generator sets or connector J8 of the mode II relay box on 400 hertz generator sets. The harness is not used on utility generator sets.

12. Governor Control Unit to Governor Actuator Harness. The harness is connected to connectors J3 and P5 of the governor control unit (A23) and connectors J24 and J25 of the governor actuator (A24). The harness is not used on utility generator sets.

13. Expanded Scale Voltmeter Harness (400 Hertz Generator Sets). The harness is connected to J70 on the DC circuit breaker box to terminals of the reconnection board (TB6) and the motorized circuit breaker (CB2).

b. ON GENERATOR SET TEST.

1. Refer to figure 3-18 for 50/60 hertz generator sets or figure 3-19 for 400 hertz generator sets and disconnect applicable harness connectors from their connection points. Tag and disconnect individual harness wires from connection points.

2. Test each harness wire for continuity, shorts to connector case, and for shorts to surrounding wires, refer to figure 1-7 for 50/60 hertz generator sets or figure 1-8 for 400 hertz generator sets.

3. Repair defective or replace defective harness. Connect harness connectors and individual wires.

c. REMOVAL. Refer to figure 3-18 and remove wiring harness on 50/60 hertz generator sets or figure 3-19 and remove wiring harnesses on 400 hertz generator sets. Pay particular attention to the following:

WARNING

Disconnect negative battery cable prior to performing maintenance.

1. Disconnect negative battery cables.

2. Tag harness connectors and wires with location prior to removal.

3. Cut tiedown strips securing harnesses to each other.

4. Remove clamps and their harnesses.

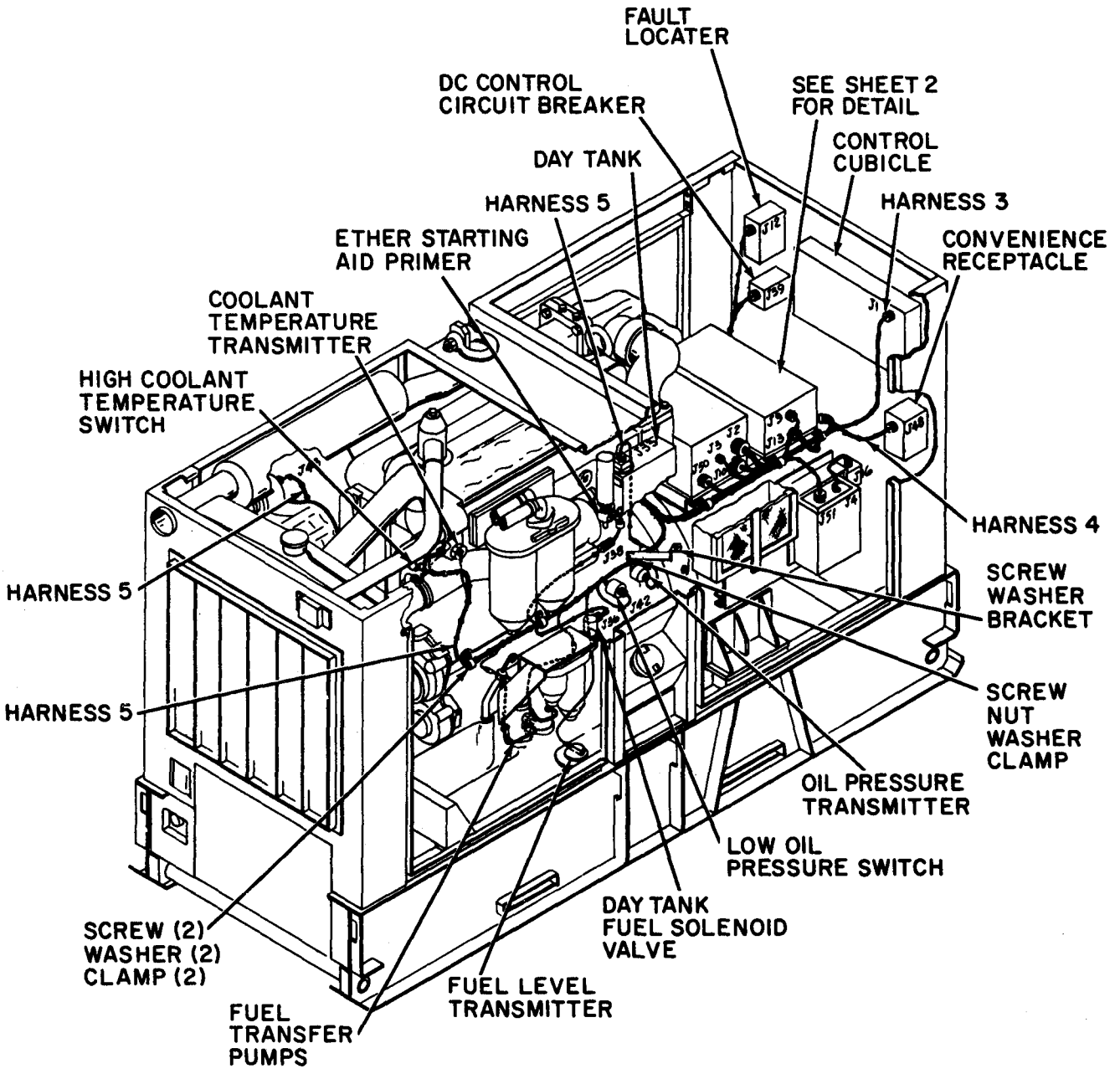
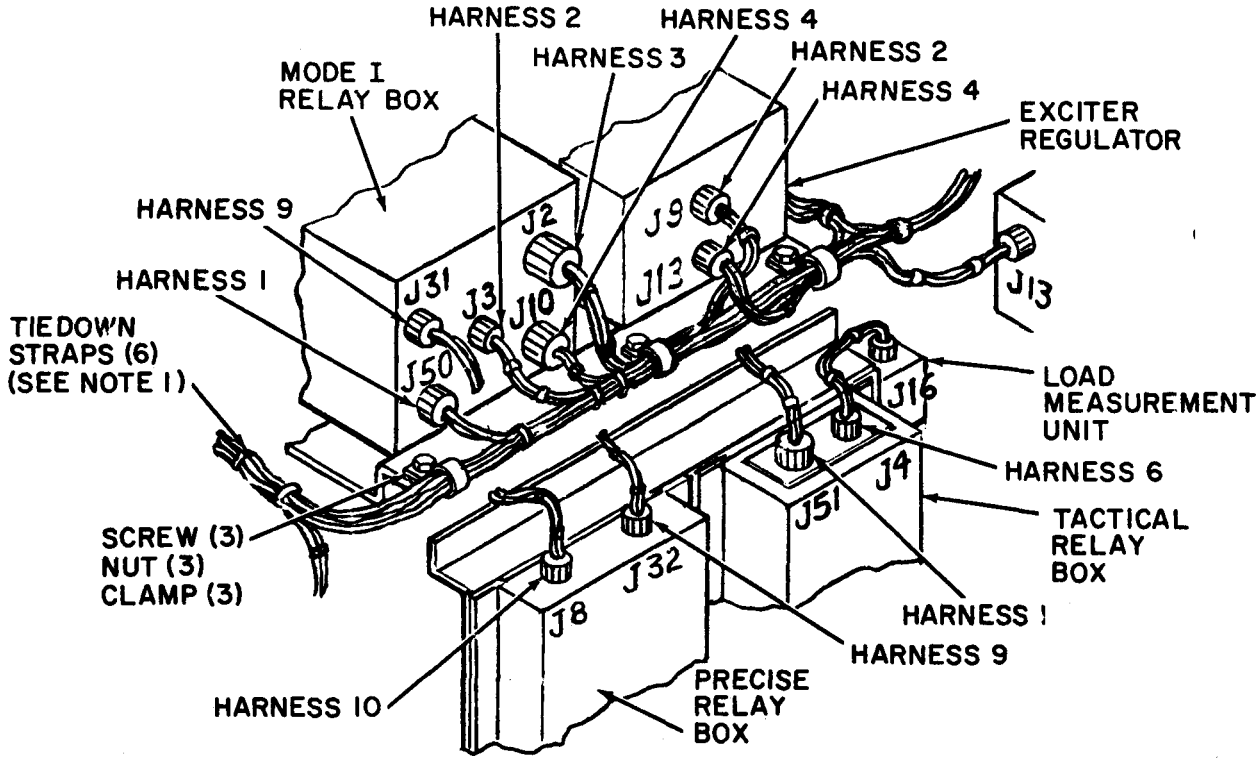


Figure 3-18. Wiring harnesses 50/60 hertz generator sets, removal and installation (sheet 1 of 5)



HARNESS NOMENCLATURE

1. RELAY BOX TO TACTICAL RELAY BOX
2. RELAY BOX TO EXCITER REGULATOR
3. RELAY BOX TO CONTROL CUBICLE
4. RELAY BOX TO RECONNECTION BOARD
5. ENGINE HARNESS
6. TACTICAL RELAY BOX TO LOAD MEASUREMENT UNIT
7. RELAY BOX TO FAULT LOCATOR
8. PARALLEL RECEPTACLE

*9. RELAY BOX TO PRECISE RELAY BOX
*10. RELAY BOX TO GOVERNOR CONTROL UNIT
*11. GOVERNOR CONTROL UNIT TO GOVERNOR ACTUATOR

* NOT USED ON UTILITY GENERATOR SETS

NOTES:

1. HARNESSES JOINING IN COMMON RUN FROM ONE SIDE OF ENGINE TO OPPOSITE SIDE TO BE BOUND TOGETHER AT SIX INCH INTERVALS WITH TIEDOWN STRAPS.
2. GENERATOR LEADS TO PASS THROUGH CURRENT TRANSFORMERS IN DIRECTION SHOWN. LEADS PASSING THROUGH CURRENT TRANSFORMERS CT4, CT5, AND CT6 TO MAKE TWO TURNS AS SHOWN.
3. NEGATIVE LEADS ARE BLACK AND POSITIVE LEADS ARE RED.

Figure 3-18. Wiring harnesses 50/60 hertz generator sets, removal and installation (sheet 2 of 5)

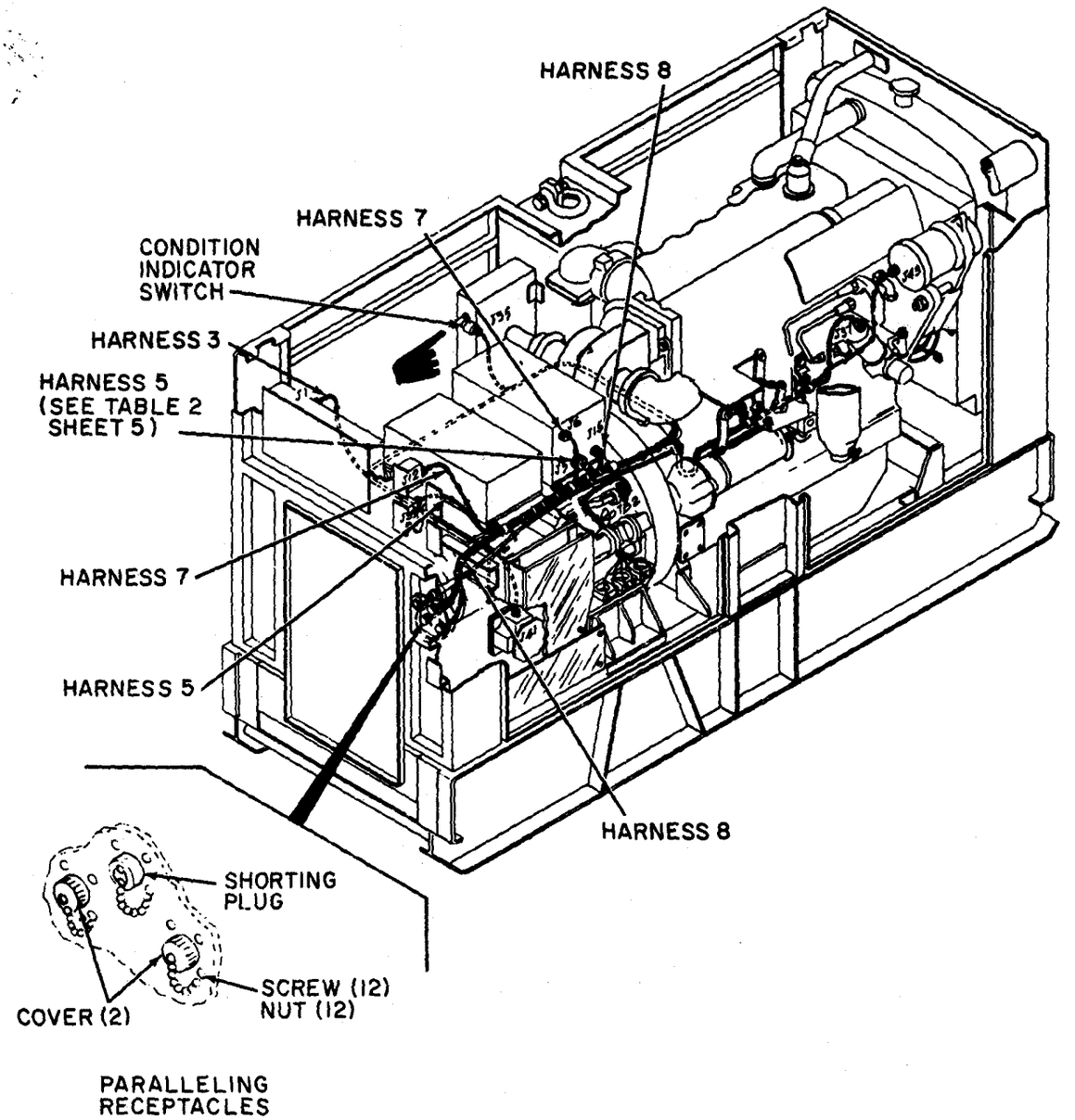


Figure 3-18. Wiring harnesses 50/60 hertz generator sets, removal and installation (sheet 3 of 5)

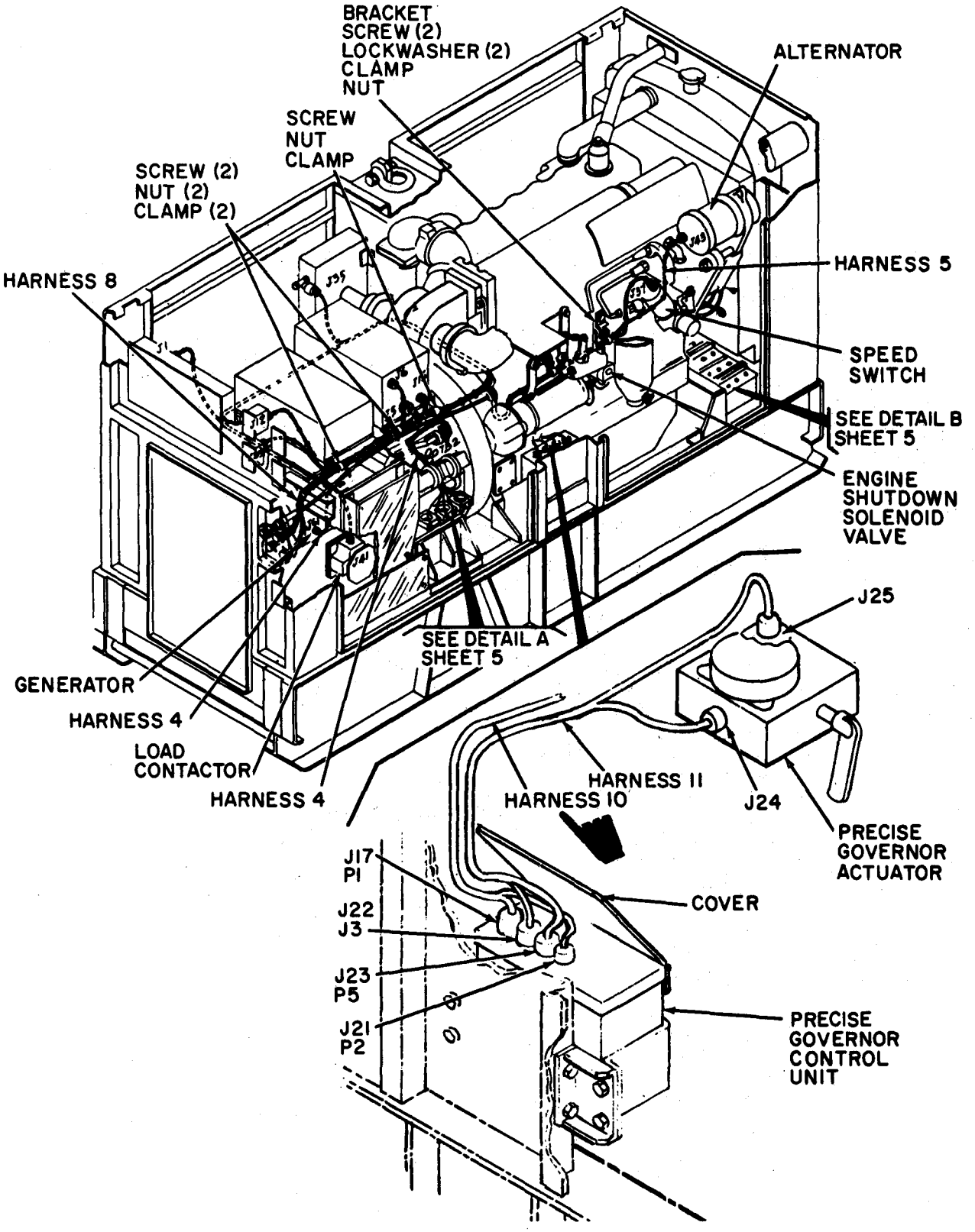


Figure 3-18. Wiring harnesses 50/60 hertz generator sets, removal and installation (sheet 4 of 5)

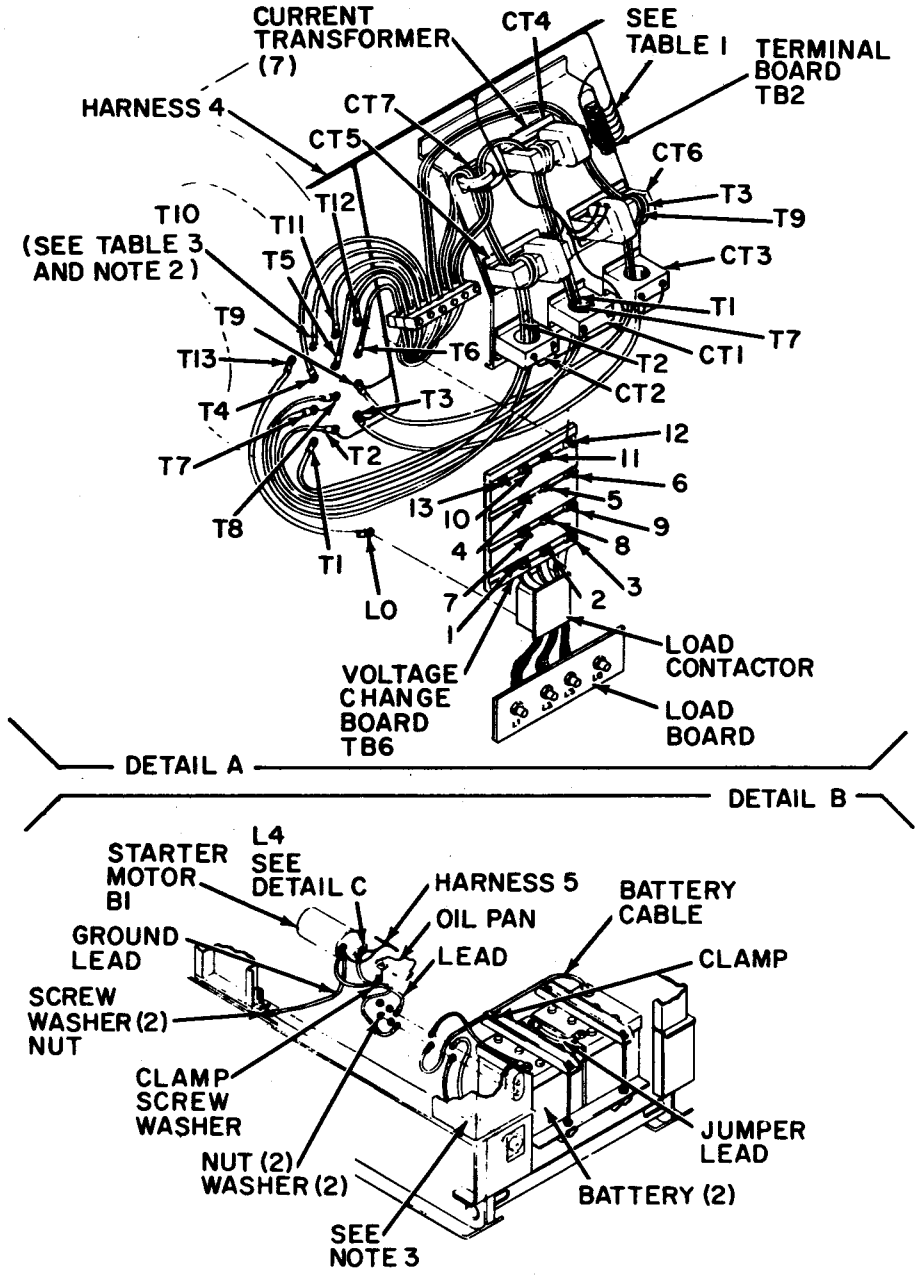


TABLE 1

HARNESS TERMINATION		
WIRE NUMBER	TERMINATION FROM	TO
U135A16	TB2-1	CT6-X2
U135E16	TB2-2	CT4-X2
U135F16	TB2-2	CT5-X2
U134A16	TB2-3	CT6-X1
U134E16	TB2-4	CT4-X1
U134F16	TB2-4	CT5-X1
X7E16	TB6-7	
X8E16	TB6-8	
X9AA16	TB6-9	
X19B16	CT3-X1	
X18B16	CT2-X1	
X17B16	CT1-X1	
D22E16	CT3-X2	
D21E16	CT2-X2	
X21S16	CB2-A2	
X22S16	CB2-B2	
X12X16	TB6-12	
X6B16	TB6-6	
X194F16	TB2-5	
X195E16	TB2-6	
X14A16	TB6-1	
X15F16	TB6-2	
X16A16	TB6-3	
U134B16	TB2-4	
U135B16	TB2-2	
X9DD16	TB6-9	
X12SS16	TB6-12	
X12MM12	TB6-12	
X9MM12	TB6-9	

TABLE 2

HARNESS 5 TERMINATION	
WIRE NUMBER	TERMINATION
E39D16	MT1
E38D16	MT2
E37D16	MT3
P55R16	L1-1
P80K16	L1-2
P41B16	L4-1
P55D12	B1
P140D12	L4-3

TABLE 3

GENERATOR LEAD & CABLE TERMINATION		
WIRE NUMBER	TERMINATION	
T1	TB6-1	
T2	TB6-2	
T3	TB6-3	
T4	TB6-4	
T5	TB6-5	
T6	TB6-6	
T7	TB6-7	
T8	TB6-8	
T9	TB6-9	
T10	TB6-10	
T11	TB6-11	
T12	TB6-12	
LO LEAD	FROM TB6-13	TO LO

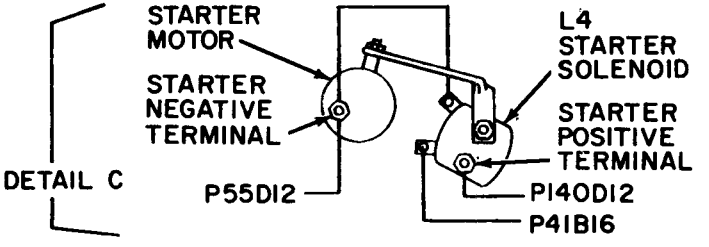


Figure 3-18. Wiring harnesses 50/60 hertz generator sets, removal and installation (sheet 5 of 5)

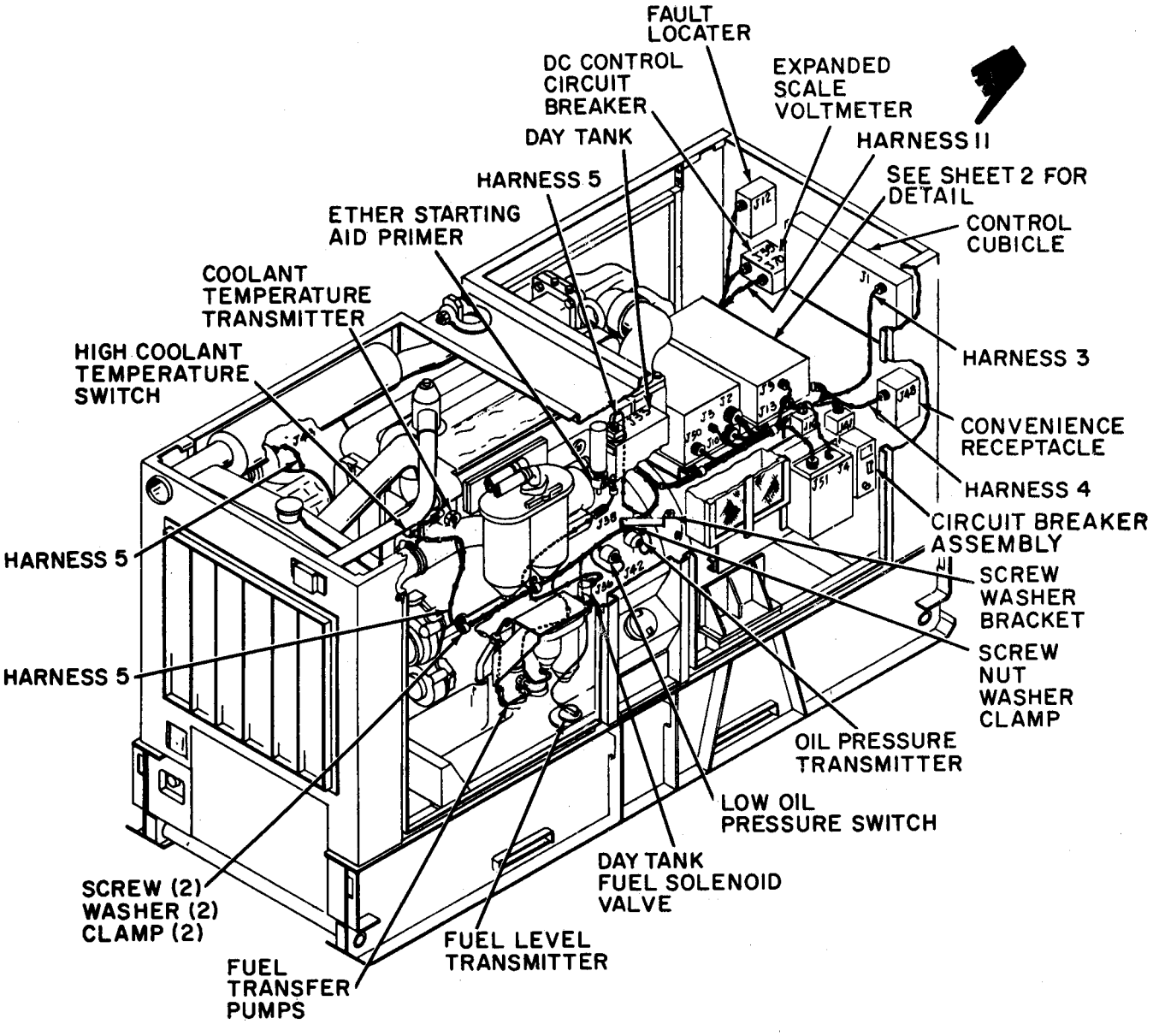
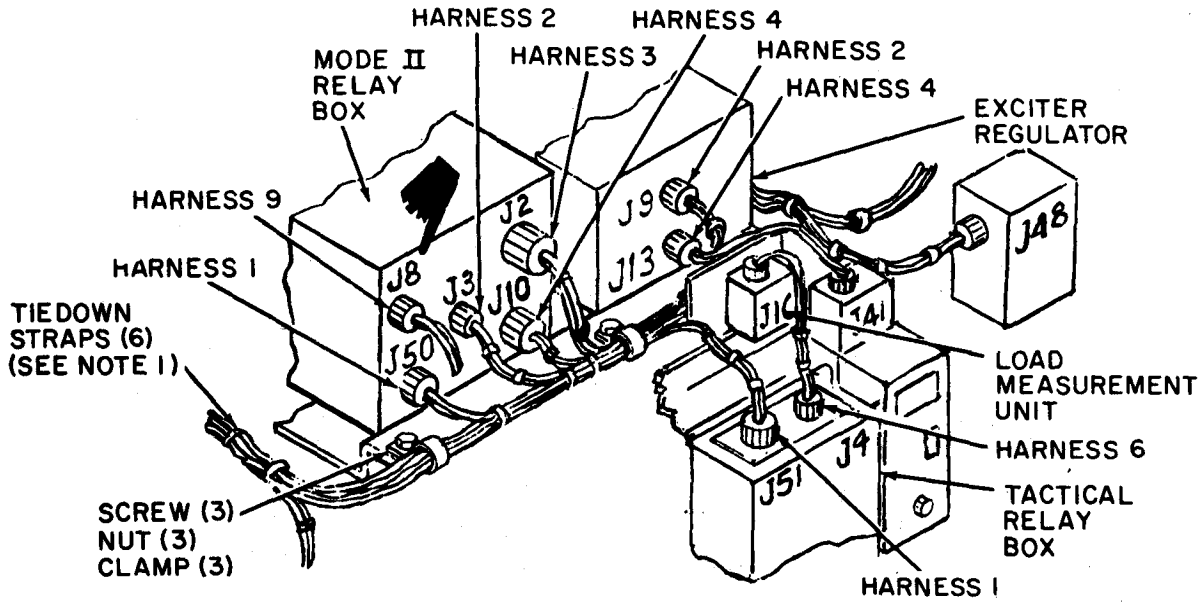


Figure 3-19. Wiring harnesses 400 hertz generator sets, removal and installation (sheet 1 of 5)



HARNESS NOMENCLATURE

1. RELAY BOX TO TACTICAL RELAY BOX
2. RELAY B0X T0 EXCITER REGULATOR
3. RELAY BOX TO CONTROL CUBICLE
4. RELAY BOX TO RECONNECTION BOARD
5. ENGINE HARNESS
6. TACTICAL RELAY BOX TO LOAD MEASUREMENT UNIT
7. RELAY BOX TO FAULT LOCATOR
8. PARALLEL RECEPTACLE
9. RELAY BOX TO GOVERNOR CONTROL UNIT
10. GOVERNOR CONTROL UNIT TO GOVERNOR ACTUATOR
11. EXPANDED SCALE VOLTMETER TO RECONNECTION BOARD

NOTES:

1. HARNESS JOINING IN COMMON RUN FROM ONE SIDE OF ENGINE TO OPPOSITE SIDE TO BE BOUND TOGETHER AT SIX INCH INTERVALS WITH TIEDOWN STRAPS.
2. GENERATOR LEADS TO PASS THROUGH CURRENT TRANSFORMERS IN DIRECTION SHOWN. LEADS PASSING THROUGH CURRENT TRANSFORMERS CT4, CT5, AND CT 6 TO MAKE TWO TURNS AS SHOWN.
3. NEGATIVE LEADS ARE BLACK AND POSITIVE LEADS ARE RED.

Figure 3-19. Wiring harnesses 400 hertz generator sets, removal and installation (sheet 2 of 5)

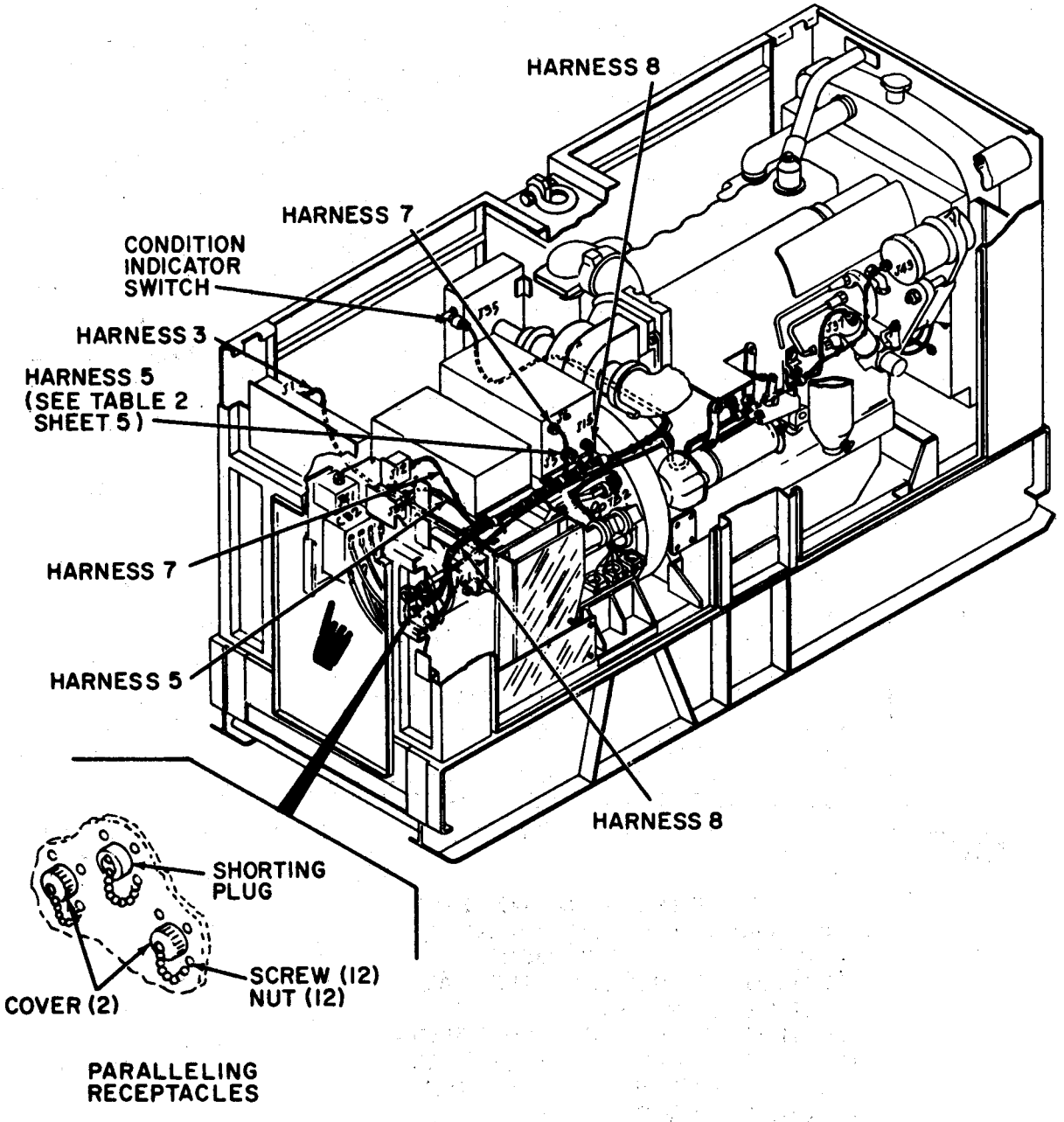


Figure 3-19. Wiring harnesses 400 hertz generator sets, removal and installation (sheet 3 of 5)

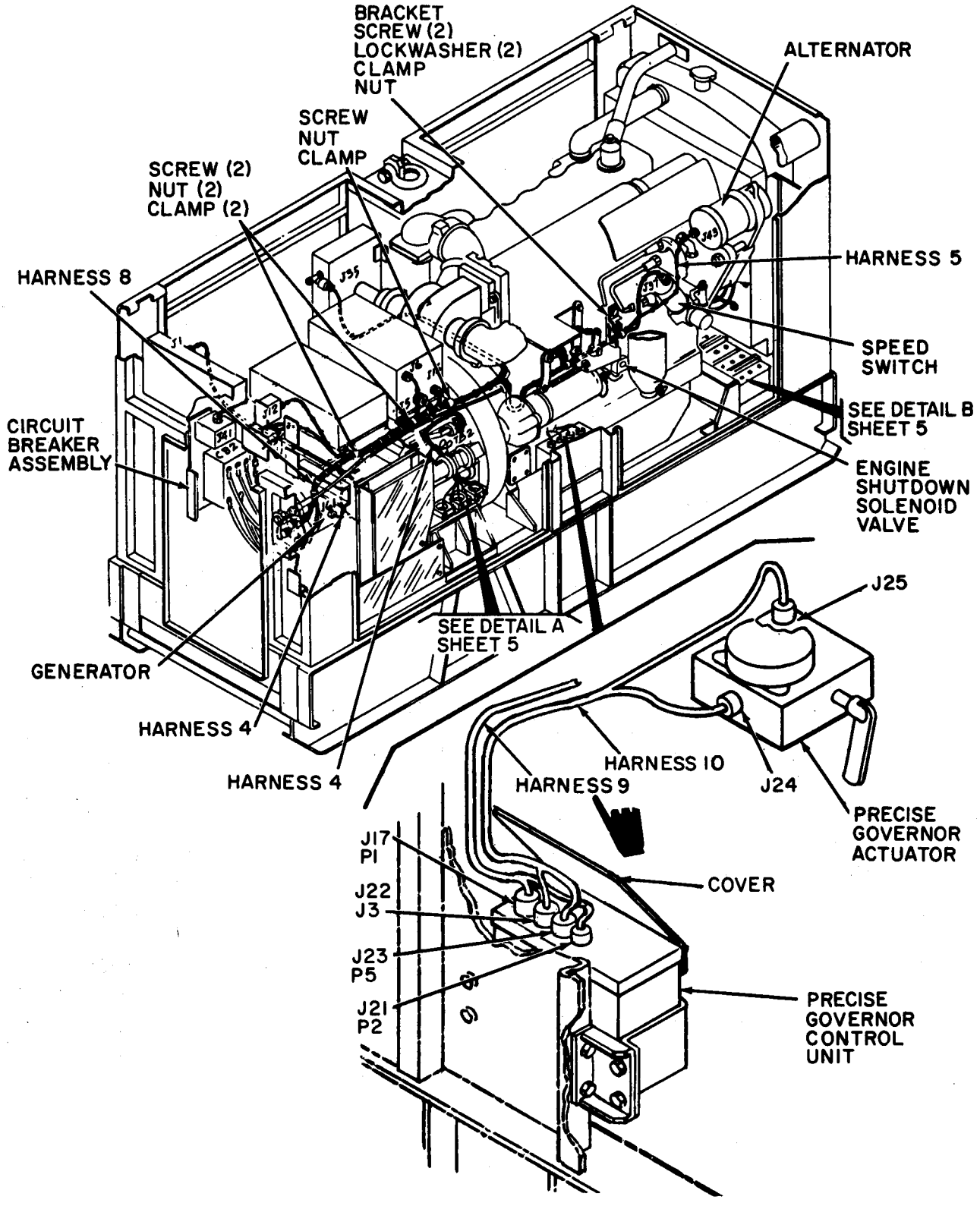


Figure 3-19. Wiring harnesses 400 hertz generator sets, removal and installation (sheet 4 of 5)

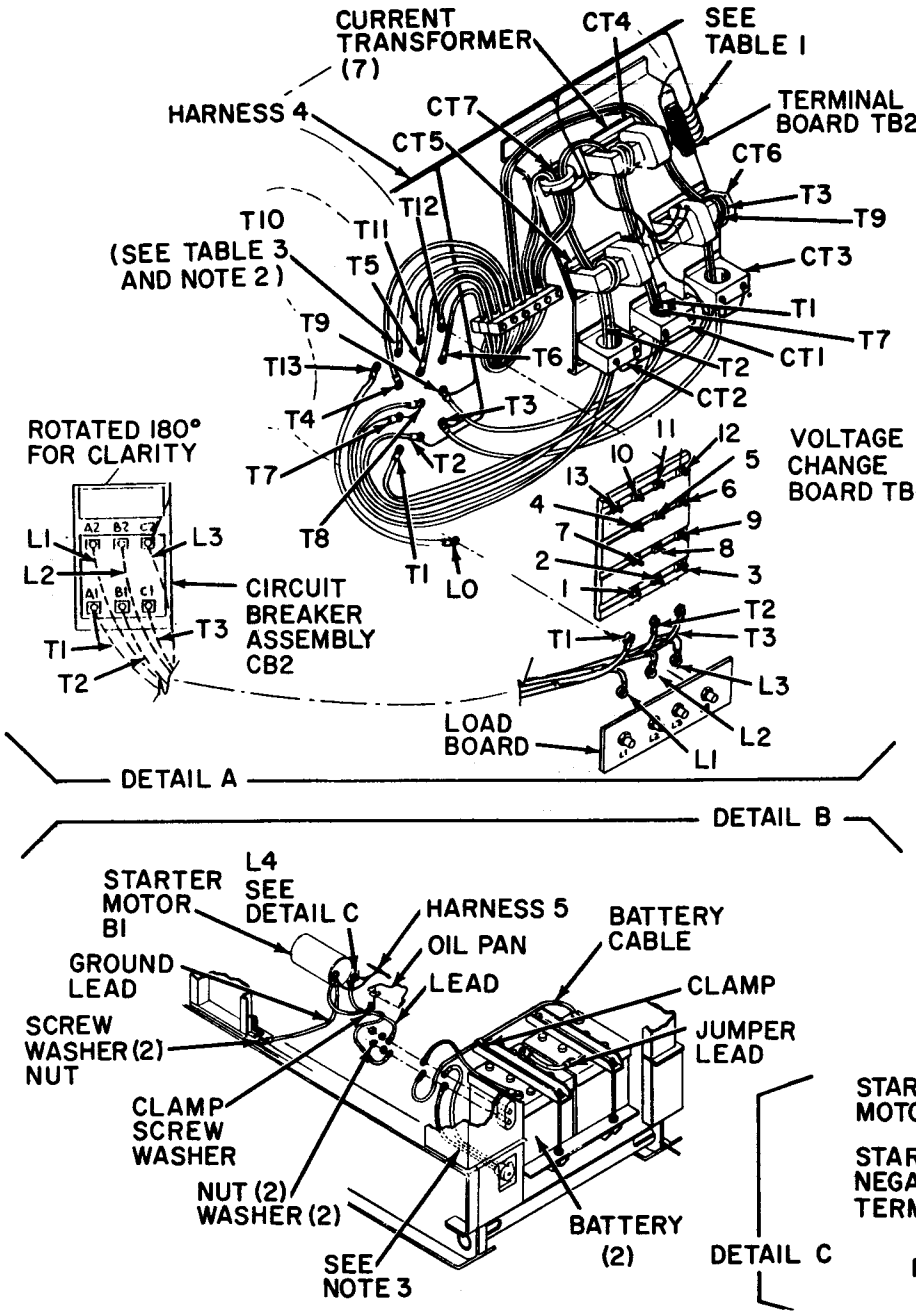


TABLE 1

HARNESS 4 TERMINATION		
WIRE NUMBER	TERMINATION FROM	TO
U135A16	TB2-1	CT6-X2
U135E16	TB2-2	CT4-X2
U135F16	TB2-2	CT5-X2
U134A16	TB2-3	CT6-X1
U134E16	TB2-4	CT4-X1
U134F16	TB2-4	CT5-X1
X7E16	TB6-7	
X8E16	TB6-8	
X9AA16	TB6-9	
X19B16	CT3-X1	
X18B16	CT2-X1	
X17B16	CT1-X1	
D22E16	CT3-X2	
D21E16	CT2-X2	
X21S16	CB2-A2	
X22S16	CB2-B2	
X12X16	TB6-12	
X6B16	TB6-6	
X194F16	TB2-5	
X195E16	TB2-6	
X14A16	TB6-1	
X15F16	TB6-2	
X16A16	TB6-3	
U134B16	TB2-4	
U135B16	TB2-2	
X9DD16	TB6-9	
X12SS16	TB6-12	
X12MM12	TB6-12	
X9MM12	TB6-9	

TABLE 2

HARNESS 5 TERMINATION	
WIRE NUMBER	TERMINATION
E39D16	MT1
E38D16	MT2
E37D16	MT3
P55R16	L1-1
P80K16	L1-2
P41B16	L4-1
P55D12	B1
P140D12	L4-3
P69A	A30-1
P69B	A30-2
P55T	A30-3
P55AX	A30-4

TABLE 3

GENERATOR LEAD & CABLE TERMINATION		
WIRE NUMBER	TERMINATION	
T1	TB6-1	
T2	TB6-2	
T3	TB6-3	
T4	TB6-4	
T5	TB6-5	
T6	TB6-6	
T7	TB6-7	
T8	TB6-8	
T9	TB6-9	
T10	TB6-10	
T11	TB6-11	
T12	TB6-12	
LO LEAD	FROM TB6-13	TO LO
CB LEAD	FROM	TO
	A1	TB6-1
	B1	TB6-2
	C1	TB6-3
	A2	L1
	B2	L2
	C2	L3

Figure 3-19. Wiring harnesses 400 hertz generator sets, removal and installation (sheet 5 of 5)

d. CLEANING.

1. Clean harnesses with a clean lint-free cloth moistened in an approved cleaning solvent and dry thoroughly.

2. Clean pins of connectors with compressed air.

e. INSPECTION.

1. Inspect connectors for damaged threads; bent, loose, or missing pins. Check each pin for shorts to core and surrounding pins.

2. Inspect terminal lugs for security and condition.

3. Inspect wiring for defective insulation.

4. Test each harness wire for continuity, refer to figure 1-7 for 50/60 hertz generator sets or figure 1-8 for 400 hertz generator sets.

f. REPAIR. Repair harnesses by accomplishing the most efficient repair procedure listed below.

NOTE

Repair procedure may be accomplished with harness installed in generator set.

1. If harness repair is to be accomplished on the generator set, disconnect negative battery cable.

2. Remove defective portion of wire and connect wire ends with a solderless wire connector.

CAUTION

Under no condition, leave bare connection exposed.

3. Remove defective portion of wire. Strip insulation back approximately 0.5 of an inch and twist wire ends together.

4. Disconnect and if possible remove defective wire. Connect new wire of same size and type, to terminals defective wire was removed from. Attach new wire to harness using tape or tiedown straps.

5. Replace defective terminal lugs or connectors.

6. If disconnected, connect negative battery cable.

g. INSTALLATION. Refer to figure 3-18 and install wiring harnesses on 50/60 hertz generator sets or figure 3-19 and install wiring harnesses on 400 hertz generator sets. Pay particular attention to the following:

1. Connect harness connectors and wires.

2. Secure harnesses with clamps.

3. Join harnesses in common run from one side of engine to opposite side at six inch intervals with tiedown straps.

4. Refer to figure 1-7 for 50/60 hertz generator sets and figure 1-8 for 400 hertz generator sets and check harnesses for proper connection.

5. Connect negative battery cable.

Section XIV. GENERATOR CONTROL ASSEMBLY

3-52. CONTROL CUBICLE WIRING HARNESS.

a. GENERAL. The control cubicle wiring harness electrically interconnects components of the control cubicle with the generator set electrical systems.

b. TEST.

1. Disconnect electrical connector from control cubicle harness connector at back of control cubicle.

2. Refer to figures 1-3 and 1-4 for 50/60 hertz generator sets or figures 1-5 and 1-6 for 400 hertz generator sets and check each harness wire for continuity. Check from connector pins to wire ends. Check for short to connector case and surrounding pins.

3. Repair or replace defective wires and connect electrical connector to control cubicle harness connector.

c. REPAIR. The control cubicle wiring harness may be repaired in the same manner as the generator set wiring harness, refer to paragraph 3-51, step f.

3-53. AC VOLTMETER.

a. GENERAL. The ac voltmeter is located on the generator portion of the generator set control panel. It indicates line-to-line and line-to-neutral generator voltage as selected by the ammeter-voltmeter selector switch, It is calibrated from 0 to 500 volts with scale divisions of five volts.

b. REMOVAL AND REPLACEMENT. Remove and replace AC voltmeter as illustrated in figure 3-20.

3-54. KILOWATT METER (PERCENT OF POWER METER).

a. GENERAL. The kilowatt (percent of power) meter is located on the generator portion of the generator set control panel. The meter works in conjunction with the thermal watt converter to sense and indicate the power output of the generator. It is calibrated from 0 to 133 percent of power, operates on direct current transmitted from the converter, and displays an indication equal to generator output.

b. REMOVAL AND REPLACEMENT. Remove and replace kilowatt meter as illustrated in figure 3-20.

3-55. AC AMMETER (PERCENT OF RATED CURRENT METER).

a. GENERAL. The ac ammeter (percent of rated current meter) is located on the generator portion of the generator set control panel. It indicates the percent of rated current in each generator phase as selected by the ammeter-voltmeter-selector switch. It is calibrated from 0 to 133 percent of rated current with scale divisions of two percent.

b. REMOVAL AND REPLACEMENT. Remove and replace ac ammeter as illustrated in figure 3-20.

3-56. ADJUST RHEOSTATS.

a. GENERAL. The rheostats are located on the generator portion of the generator set control panel.

1. Voltage Adjust Rheostat. The voltage adjust rheostat permits adjustment

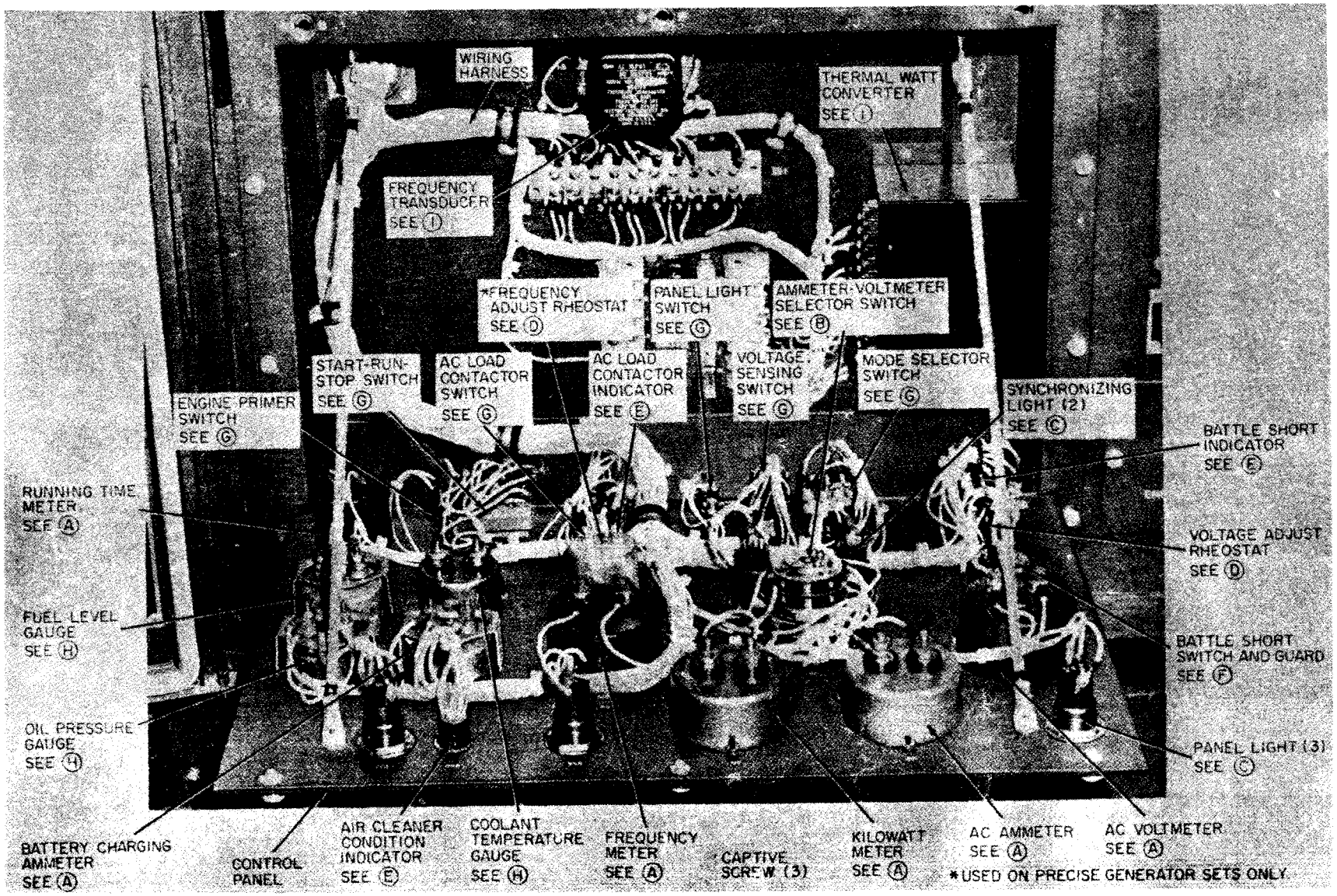
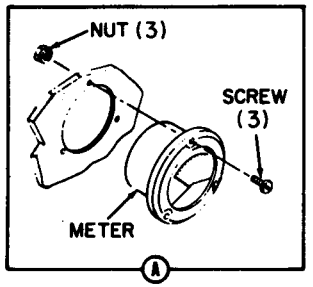
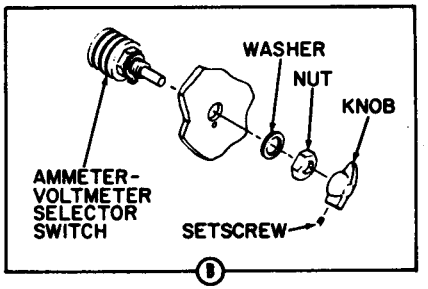
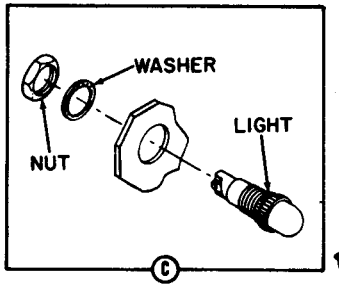
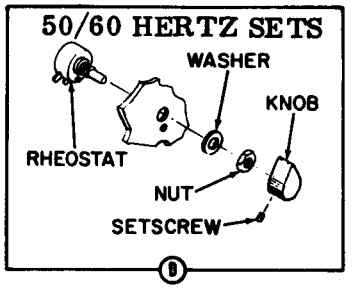


Figure 3-20. Control cubicle components, removal and installation (sheet 1 of 2)









GENERATOR

STEP 1. DISCONNECT ELECTRICAL CONNECTOR FROM CONTROL CUBICLE HARNESS CONNECTOR AT BACK OF CONTROL CUBICLE.

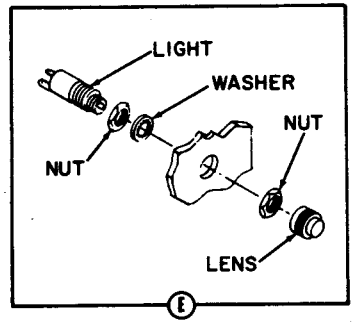
STEP 2. LOOSEN THREE CAPTIVE SCREWS AND HINGE OPEN CONTROL PANEL.

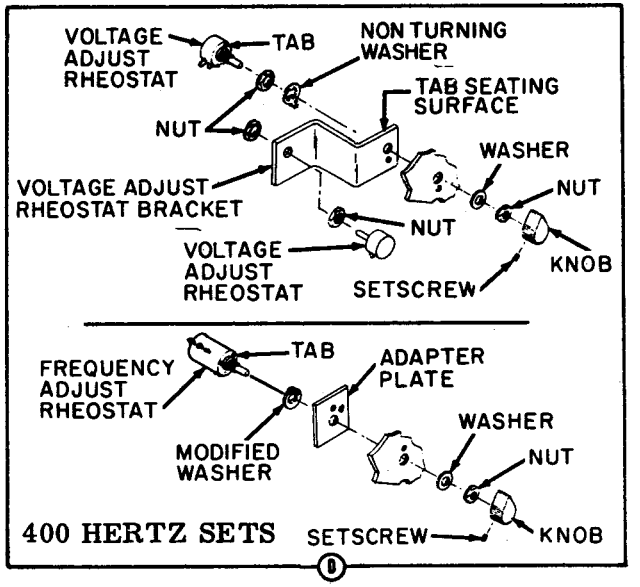
STEP 3. TAG AND DISCONNECT ELECTRICAL WIRING FROM COMPONENTS.

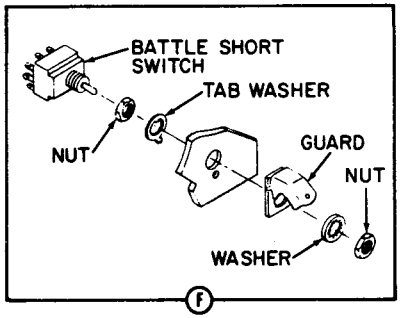
STEP 4. REMOVE COMPONENTS AS ILLUSTRATED.

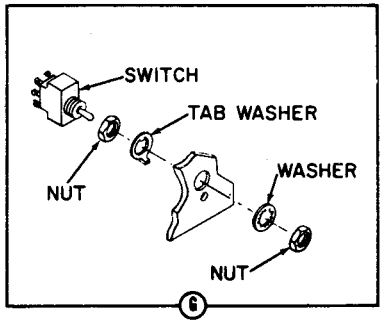
STEP 5. INSTALL COMPONENTS IN THE REVERSE SEQUENCE OF REMOVAL.

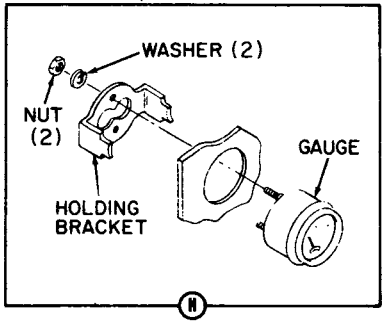
STEP 6. PRIOR TO CLOSING CONTROL PANEL, REFER TO FIGURES 1-3 OR 1-4 FOR 50/60 HERTZ GENERATOR SETS, FIGURES 1-5 OR 1-6 FOR 400 HERTZ, AND CHECK THAT WIRING IS PROPERLY CONNECTED.











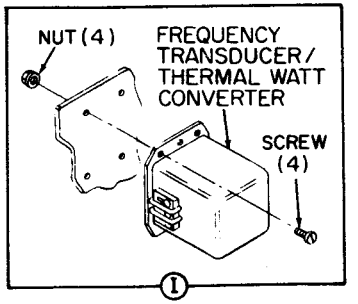


Figure 3-20. Control cubicle components, removal and installation (sheet 2 of 2)

of generator output voltage during operation. It is rated 0 to 25 ± 10 ohms (75 ± 10 ohms, 400 Hz sets). Clockwise rotation of the rheostat will increase voltage output, counterclockwise rotation will decrease output.

2. Frequency Adjust Rheostat. The frequency adjust rheostat is utilized on precise generator set only and permits adjustment of generator set frequency. It is rated at 0 to 500 ± 25 ohms. Clockwise rotation of the rheostat will increase frequency, counterclockwise rotation will decrease frequency.

b. TEST.

1. Disconnect electrical connector from control cubicle harness connector at back of control cubicle. Loosen three captive screws and hinge down control panel.

2. Connect ohmmeter to rheostats and check ohmic value while rotating rheostat knob. Voltage and frequency rheostats ohmic value should vary full range of values (para. a. preceding). Replace defective rheostats.

NOTE

Voltage adjust rheostat is series connected with range adjust rheostat R2A. If the voltage adjust rheostat is within value and unit will not properly trim, test R2A for proper value. Nominal rating is 250 ohms.

3. Close control panel and secure with captive screws. Connect electrical connector to control cubicle.

c. REMOVAL AND REPLACEMENT. Remove and replace voltage and frequency adjust rheostats as illustrated in figure 3-20.

3-57. FREQUENCY METER AND TRANSDUCER

a. GENERAL.

1. Frequency Meter. The frequency meter is mounted on the generator portion of the generator set control panel. The meter works in conjunction with the frequency transducer to sense and indicate generator set frequency of voltage in hertz. On 50/60 hertz generator sets, it is calibrated from 48 to 53 hertz for 50 hertz operation and 57 to 62 hertz for 60 hertz operation, with scale divisions of 1/10 hertz. On 400 hertz generator sets, it is calibrated from 388 to 412 hertz with scale divisions of 1/2 cycle. The meter works on direct current transmitted from the transducer which it converts to hertz indications.

2. Frequency Transducer. The frequency transducer is mounted inside the control cubicle. It transforms alternating current voltage applied to it to direct current which is proportional to the frequency of the alternating current voltage. This direct current is transmitted to the frequency meter which converts the current to hertz indications.

b. REMOVAL AND REPLACEMENT. Remove and replace frequency meter and frequency transducer as illustrated in figure 3-20.

NOTE

Frequency meter and transducer are a matched set and shall be replaced as a set.

3-58. THERMAL WATT CONVERTER.

a. GENERAL. The thermal watt converter is mounted inside the control cubicle. It sense the power output of the generator and converts it to direct current. This direct current is transmitted to the kilowatt meter which converts the current to percent of power indications.

b. REMOVAL AND REPLACEMENT. Remove and replace thermal watt converter as illustrated in figure 3-20.

3-59. TOGGLE SWITCHES.

a. GENERAL. The toggle switches are utilized to manually control generator set circuits.

1. Battle Short Switch and Guard. The switch is a sealed, four pole, toggle that permits bypassing of all generator set faults except engine overspeed and short circuit for emergency operation. Guard prevents accidental switch actuation.

2. Mode Selector Switch. The switch is a sealed, one pole, toggle that permits selection of parallel or single unit operation. In parallel operation, activates all parallel circuits and synchronizing lights.

3. Voltage Sensing Switch. The switch is a sealed, two pole, toggle that permits selection of voltage regulator sensing and level adjusting circuits either at the set or a remote location.

4. Panel Light Switch. The switch is a sealed, one pole, toggle that permits turning panel lights on and off.

5. AC Load Contactor Switch. The switch is a sealed, two pole, toggle that permits opening and closing of AC load contactor.

6. Start-Run-Stop Switch. The switch is a sealed toggle with three positions. The momentary position is utilized for starting the other positions, control generator set operation, run or stop.

7. Engine Primer Switch. The switch is a sealed, one pole, toggle that permits actuation of ether starting aid if start-run-stop switch is in START position. It is spring loaded to the OFF position.

b. TEST.

1. Disconnect electrical connector from control cubicle harness connector at back of control cubicle.

2. Loosen three captive screws and hinge open control panel, refer to figure 3-20.

3. Tag and disconnect electrical wiring from switch. Test switch for continuity, refer to figures 1-3 or 1-4 for 50/60 hertz generator sets or figures 1-5 or 1-6 for 400 hertz generator sets.

4. Replace defective switch. Connect wiring and close control panel. Secure panel with captive screws.

c. REMOVAL AND REPLACEMENT. Remove and replace toggle switches as illustrated in figure 3-20.

3-60. AMMETER-VOLTMETER SELECTOR SWITCH.

a. GENERAL. The ammeter-voltmeter selector switch is mounted on the generator portion of the generator set control panel. It is a four deck rotary switch which permits selection of current in each generator phase, three line-to-line generator voltages, or three line-to-neutral generator voltages for measurement by the AC voltmeter and AC ammeter. All switch contacts are not connected to the generator set system.

b. TEST.

1. Disconnect electrical connector from control cubicle harness connector at back of control cubicle.

2. Loosen three captive screws and hinge down control panel.

3. Tag and disconnect electrical wiring from switch. Test switch for continuity, refer to figure 3-21.

4. Connect electrical connector to control cubicle.

c. REMOVAL AND REPLACEMENT. Remove and replace ammeter-voltmeter selector switch as illustrated in figure 3-20.

3-61. OIL PRESSURE GAUGE.

a. GENERAL. The oil pressure gauge is located on the engine portion of the generator set control panel. The gauge works in conjunction with the oil pressure transmitter to display engine oil pressure in PSIG. It is calibrated from 0 to 120 PSIG with scale divisions of 30 PSIG. As engine oil pressure increases or decreases, the resistance of the transmitter increases or decreases. Transmitter varying resistance is proportional to engine oil pressure and is transmitted to the oil pressure gauge which converts the resistance to PSIG indications.

b. ON GENERATOR SET TEST.

1. Loose three captive screws and hinge open control panel, refer to figure 3-20.

WARNING

Do not touch exposed electrical connections with generator set operating.

2. Start engine and permit engine to warm up. Measure voltage at gauge IGN terminal, voltage should be 25 ± 5 VDC, if not check wiring back to source. Disconnect wire from SEND terminal and measure resistance to ground, resistance should be approximately 15 ohms. Shut down engine.

3. If above resistance values are not met, bench test or replace gauge.

4. Close control panel and secure with captive screws.

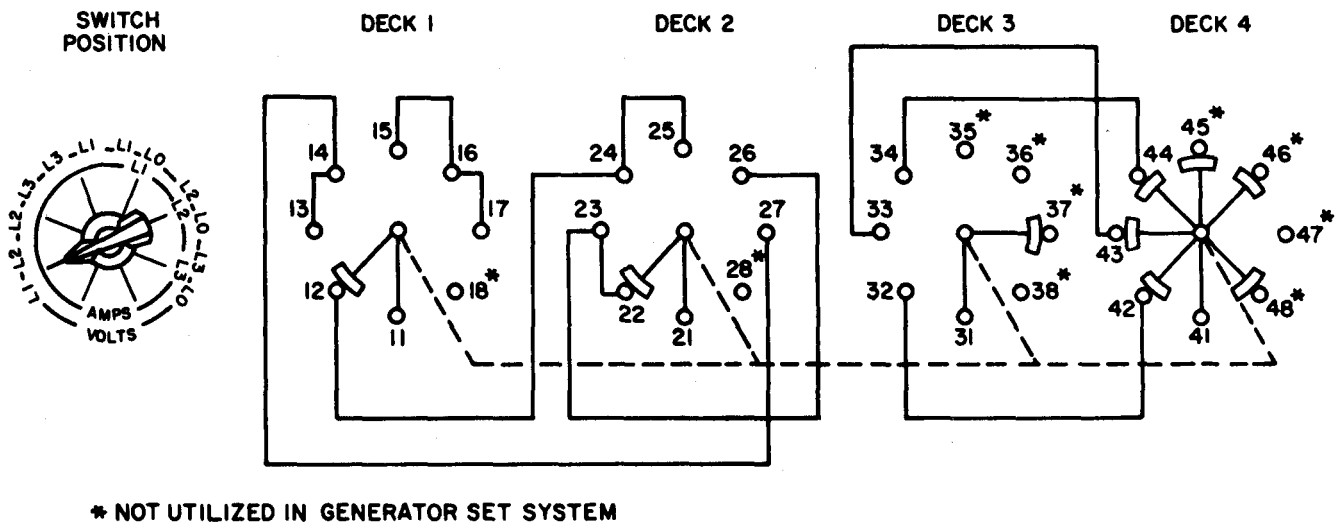


Figure 3-21. Ammeter-voltmeter selector switch, simplified schematic

c. REMOVAL AND REPLACEMENT. Remove and replace oil pressure gauge as illustrated in figure 3-20.

d. BENCH TEST. Test may be accomplished with gauge installed in control panel with gauge wiring removed or with gauge removed from control panel.

1. Connect oil pressure gauge to test equipment as illustrated in figure 3-22.

2. Apply voltage to gauge IGN terminal and adjust variable resistor so that 15 ohms is at SEND terminal for five minutes.

3. Adjust variable resistor to obtain 0, 15, and 30 ohms, respectively. Gauge should read 0, 60, 120, respectively.

4. Remove gauge from test equipment. Replace gauge if defective.

3-62. FUEL LEVEL GAUGE.

a. GENERAL. The fuel level gauge is located on the engine portion of the generator set control panel. The gauge works in conjunction with the fuel level transmitter located in the fuel tank. The gauge is calibrated from full to empty with scale divisions of 1/4 tank and indicates level of fuel in the fuel tank. As the level of fuel in the tank varies, the resistance of the transmitter varies. This varying resistance which is proportional to the level of fuel in the tank is transmitted to the fuel level gauge which converts the resistance to fuel level indications.

b. ON GENERATOR SET TEST.

1. Loose three captive screws and hinge open control panel, refer to figure 3-20.

WARNING

Do not touch exposed electrical connections when DC control circuit breaker is energized.

2. Energize DC control circuit breaker. Drain or add fuel to fuel tank until gauge indicates 1/2 or FULL.

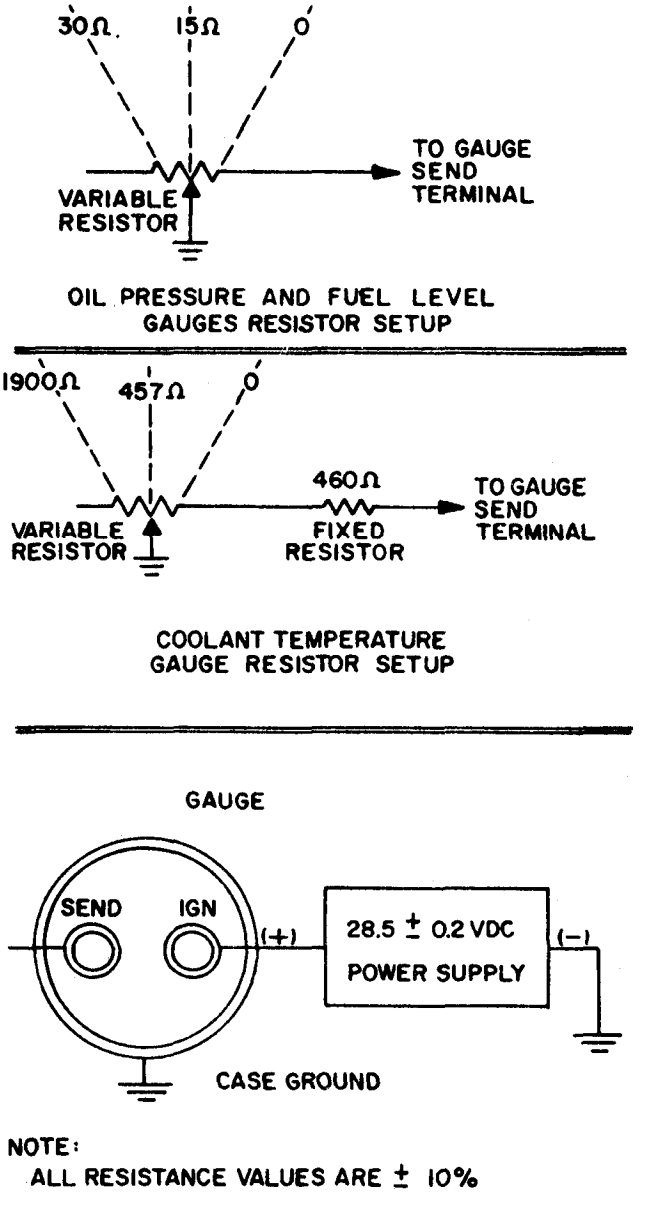


Figure 3-22. Gauge, test setup

Measure voltage at gauge IGN terminal, voltage should be 25 ± 5 VDC, if not, check wiring back to source. Disconnect wire from SEND terminal and measure resistance to ground, resistance should be approximately 30 ohms if tank is full or 15 ohms if tank is half full. De-energize DC control circuit breaker.

3. If above resistance values are not met, bench test or replace gauge.

4. Close control panel and secure with captive screws.

c. REMOVAL AND REPLACEMENT. Remove and replace fuel level gauge as illustrated in figure 3-20.

d. BENCH TEST. Test may be accomplished with gauge installed in control panel with gauge wiring removed or with gauge removed from control panel.

1. Connect fuel level gauge to test equipment as illustrated in figure 3-22.

2. Apply voltage to gauge IGN terminal and adjust variable resistor so that 15 ohms is at SEND terminal for five minutes.

3. Adjust variable resistor to obtain 30, 15, and 0 ohms, respectively. Gauge should read FULL, 1/2, and EMPTY, respectively.

4. Remove gauge from test equipment. Replace defective gauge.

3-63. COOLANT TEMPERATURE GAUGE.

a. GENERAL. The coolant temperature gauge is located on the engine portion of the generator set control panel. The gauge works in conjunction with the coolant temperature transmitter to display engine coolant temperature in degrees Farenheit. It is calibrated from 120°F to 240°F. As engine coolant temperature increases or decreases, the resistance of the transmitter increases or decreases. This varying resistance which is proportional to engine coolant temperature, is transmitted to the coolant temperature gauge which converts the resistance to degrees Farenheit indications.

b. ON GENERATOR SET TEST.

1. Loose three captive screws and hinge open control panel, refer to figure 3-20.

2. Remove harness wire from gauge SEND terminal and measure resistance between lead and ground, resistance should be greater than 23K ohms. Reconnect wire.

WARNING

Do not touch exposed electrical connections with generator set operating.

3. Start engine and permit engine to Warm up to normal operating temperature. Measure voltage at gauge IGN terminal and ground, voltage should be 25 ± 5 VDC, if not, check wiring back to sources. Shut Down Engine. Disconnect wire from SEND terminal of gauge and measure resistance between lead and ground. Resistance should be approximately 917 ohms.

4. If above resistance values are not met, bench test or replace gauge.

5. Close control panel and secure with captive screws.

c. REMOVAL AND REPLACEMENT. Remove and replace coolant temperature gauge as illustrated in figure 3-20.

d. BENCH TEST. Test may be accomplished with gauge installed in control panel with gauge wiring removed or with gauge removed from control panel.

1. Connect coolant temperature gauge to test equipment as illustrated in figure 3-22.

2. Apply voltage to gauge IGN terminal and adjust variable resistor so that 900 ohms is at SEND terminal for five minutes.

3. Adjust variable resistor to obtain 2360, 917 and 460 ohms, respectively. Gauge should read 120, 180, and 240, respectively.

4. Remove gauge from test equipment. Replace defective gauge.

3-64. BATTERY CHARGING AMMETER.

a. GENERAL. The battery charging ammeter is located on the engine portion of the generator set control panel. The ammeter indicates battery charging current. It is calibrated from -10 to +20 amperes with scale divisions of 1 ampere. The scale is color coded red and green, red indicating unsatisfactory operation, green satisfactory.

b. TEST.

1. Connect a calibrated master ammeter in parallel with battery charging ammeter.

2. Start and operate engine at rated speed.

3. Monitor ammeters during starting and operation. Ammeter readings should be the same.

4. Remove master ammeter. Replace defective battery charging ammeter.

c. REMOVAL AND REPLACEMENT. Remove and replace battery charging ammeter as illustrated in figure 3-20.

3-65. INDICATOR LIGHTS.

a. GENERAL. The indicator lights are press-to-test indicators.

1. Air Cleaner Condition Indicator. The indicator is actuated by the air cleaner indicator switch and illuminates to indicate dirty air cleaner panel filters.

2. Battle Short Indicator. The indicator illuminates when battle short switch is in ON position. It will remain illuminated until the switch is positioned to OFF.

3. AC Load Contactor Indicator. The indicator illuminates when the AC load contactor is in the closed position.

b. REMOVAL AND REPLACEMENT. Remove and replace air cleaner condition, battle short, and AC load contactor indicator lights as illustrated in figure 3-20.

3-66. PANEL AND SYNCHRONIZING LIGHTS.

a. GENERAL.

1. Panel Lights. The panel lights are utilized to illuminate the control panel for night operation. The lights are energized by the panel lights switch.

2. Synchronizing Lights. The synchronizing lights are utilized during parallel operation. The light glow light and

dark to indicate synchronization of generator set frequency as the sets are being placed in parallel operation.

b. Remove and replace panel and synchronizing light assemblies as illustrated in figure 3-20. Synchronizing light bulb replacement can be facilitated with use of a suitable bulb extractor.

3-67. RUNNING TIME METER.

a. GENERAL. The running time meter is located on the engine portion of the generator set control panel. The meter records the operating time of the generator set in hours and tenths up to 9999.

b. TEST.

1. Operate generator at rated speed for approximately three minutes.

2. Utilize a suitable watch, note indication on running time meter, and operate generator set for 30 minutes. Compare lapsed time on running time meter and watch, they should be the same.

3. Shut down generator set. Replace defective meter.

c. REMOVAL AND REPLACEMENT. Remove and replace running time meter as illustrated in figure 3-20.

3-68. DC CONTROL CIRCUIT BREAKER.

a. GENERAL. The DC control circuit breaker is located in the control cubicle adjacent to the generator set control panel. It is the main protective device for the direct current components of the generator set. It is rated at 7.5 amperes and performs the function of a master power switch as well as a protective device. Prior to generator set operation, the circuit breaker must be energized, the generator set may be stopped, deenergizing the circuit breaker.

NOTE

The DC control circuit breaker used in the 400 Hz Generator Set incorporates an expanded scale voltmeter which is used to facilitate parallel operations.

b. REMOVAL. Remove DC control circuit breaker as illustrated in figure 3-23.

c. TEST. The DC control circuit breaker may be tested while installed in the generator set or after it has been removed.

NOTE

Perform steps 1 and 2 on generator set test and just step 2 if the circuit breaker has been removed. Perform step 3 on 400 Hertz units only.

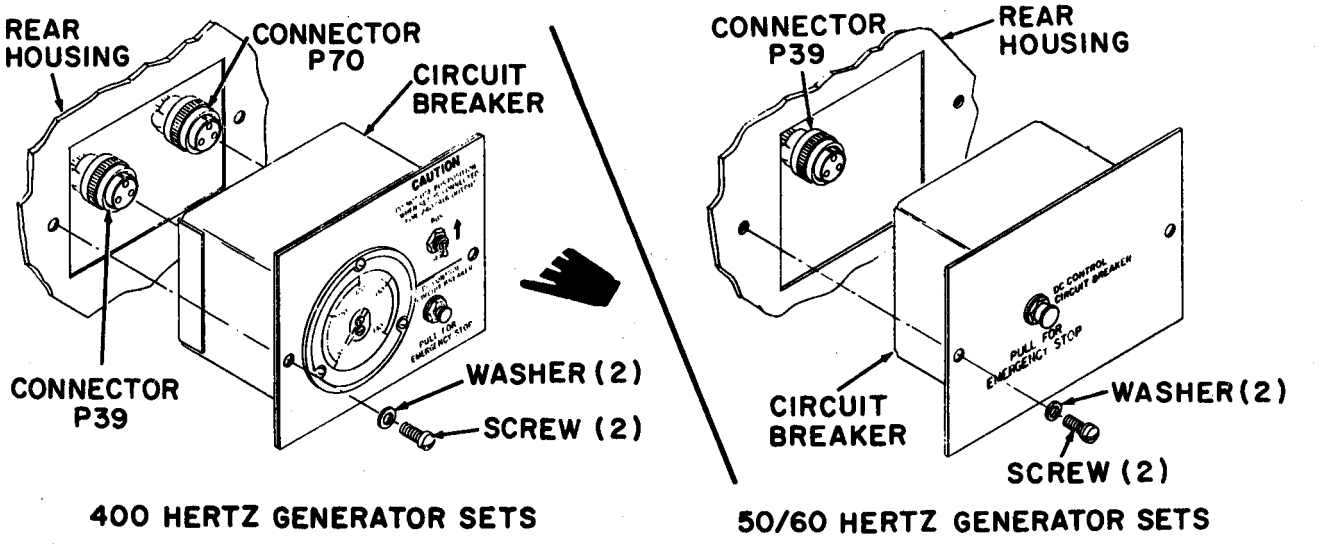


Figure 3-23. DC control circuit breaker, removal and installation

1. Disconnect harness from circuit breaker connector from inside generator compartment. Connect harness after test.

2. Test circuit breaker for continuity at connector J39. There should be continuity between connector pins A, B, and C when circuit breaker is energized and when de-energized between pins B and C. Replace defective circuit breaker.

3. Test voltmeter and switch for continuity at connector J70. There should be continuity between pins B and C when switch is in the GEN position and A and C in the BUS position.

d. REPLACEMENT. Replace DC control circuit breaker as illustrated in figure 3-23.

Section XV. ENGINE ASSEMBLY AND COMPONENTS

3-69. ALTERNATOR BELT AND FAN BELTS.

a. GENERAL. The fan is driven by two belts which are powered by the crankshaft pulley. The alternator is driven by a single belt which is powered by the fan pulley.

b. REMOVAL. To remove alternator and fan belts, refer to figure 3-24 and proceed as follows:

1. Remove fan guards, refer to paragraph 3-41.

2. Remove alternator guard bolts and washers (figure 3-24). Loosen alternator bolt and pivot alternator fan guard away from alternator.

3. Loosen adjusting rod bolt. Back-off lower adjusting rod nut until alternator belt can be removed from alternator.

4. Loosen fan bracket bolts. Rotate fan bracket adjusting bolt and lower fan bracket until it bottoms and then remove adjusting bolt.

5. Open battery compartment access door and pull out batteries and roll-out tray, refer to figure 3-3.

CAUTION

Exercise care to prevent damaging radiator with fan during removal.

6. Support weight of fan assemby and remove fan bracket bolts, washer, and lock washers.

7. Move fan bracket away from engine until it can be rotated. Rotate bracket 180 degrees so that short end is even with top of fan pulley. Remove alternator and fan belts from fan pulley and from fan bracket. Remove belts from alternator and crankshaft pulley.

c. CLEANING AND INSPECTION.

1. Clean pulleys with an approved cleaning solvent and dry thoroughly.

2. Inspect pulleys and fan mounting bracket for cracks, breaks,= and other damage.

3. Inspect belts for deterioration, cuts, and tears.

NOTE

Fan belts are a matched set and shall be replaced as a set.

4. Replace defective parts.

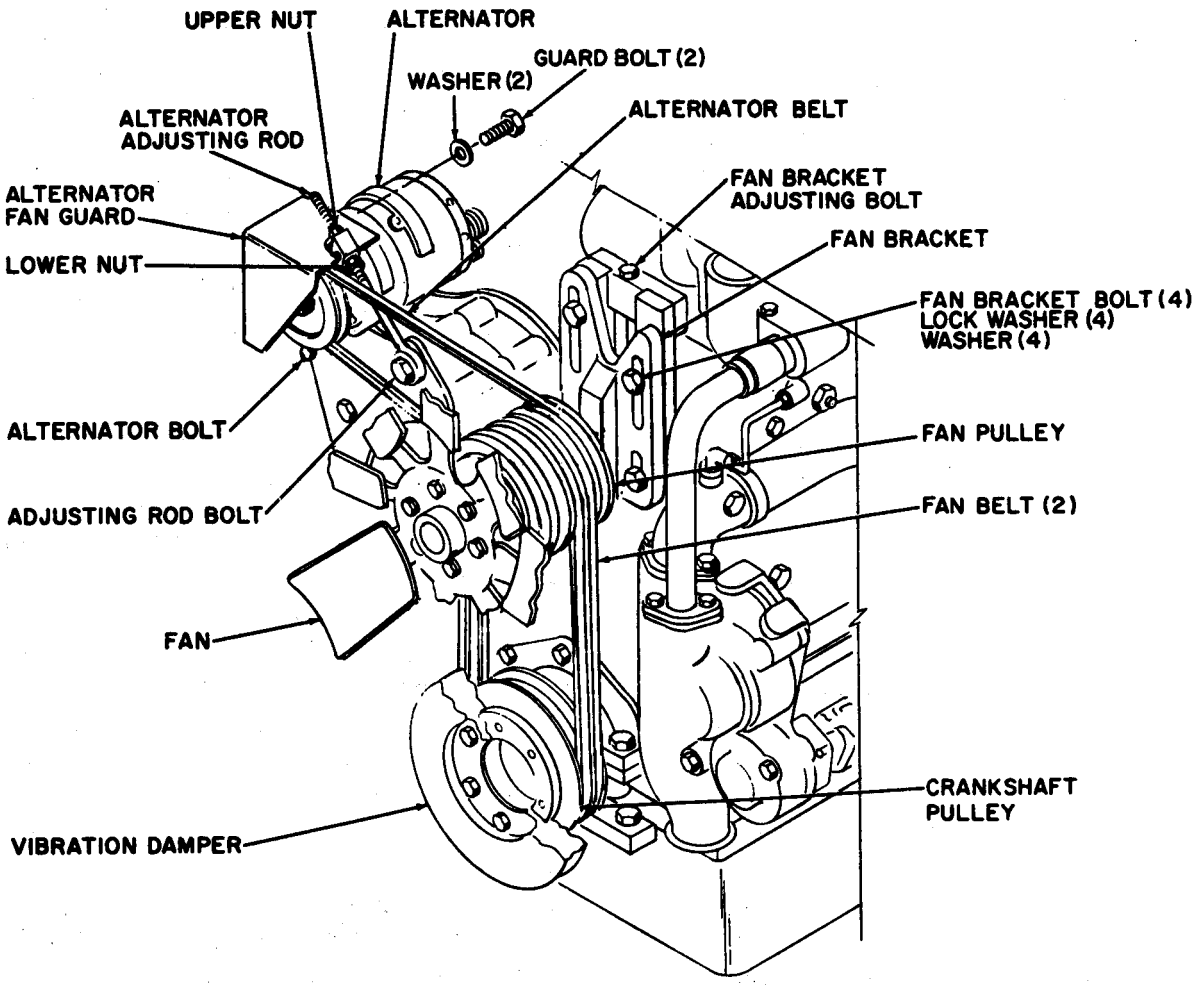


Figure 3-24. Alternator belts and fan belts, removal and installation

d. INSTALLATION. To install alternator and fan belts, refer to figure 3-24 and proceed as follows:

1. Position fan belts on crankshaft pulley.

NOTE

Alternator belt should be positioned in rear fan pulley groove and fan belts in two grooves forward of the alternator belt.

2. With fan mounting bracket, short end even with top of fan pulley, position fan belts and then alternator belt on fan pulley from fan bracket end. Alternator belt should be in rear fan pulley groove.

3. Rotate fan bracket to normal mounting position and secure bracket to engine with fan bracket bolts, washers, and lock washers.

4. Install fan bracket adjusting bolt.

5. Position alternator belt on alternator.

6. Adjust belts. Pivot alternator fan guard into position and secure with guard bolts and washers. Tighten alternator bolt.

CAUTION

Make sure shroud plate is properly adjusted.

7. Install fan guards, refer to paragraph 3-41.

8. Install and lock batteries and rollout tray, refer to figure 3-3.

e. ADJUSTMENT. To adjust alternator and fan belts, refer to figure 3-24 and proceed as follows:

NOTE

Alternator belt must be adjusted when fan belts are adjusted. Fan belt adjustment should always be accomplished first.

1. Remove fan guards, refer to paragraph 3-41.

2. Loosen fan bracket bolts (figure 3-24). Rotate fan bracket adjusting bolt until a 25 pound force applied to belt, midway between crankshaft and fan pulleys, provides a belt deflection of 1/2 of an inch. Tighten fan bracket bolts.

3. Check deflection of other fan belt. Deflection should be approximately equal, if not, replace fan belts.

4. Position radiator shroud plate so that clearance between plate and each fan blade tip is equal. Tighten plate screws.

5. Loosen alternator and adjusting rod bolts. Back-off upper alternator adjusting rod nut. Tighten lower nut until a 25 pound force applied to belt, midway between alternator and fan pulley, provides a belt deflection of 9/16 to 13/16 of an inch. Tighten upper nut and recheck belt defelection.

6. Tighten alternator and adjusting rod bolts. Install fan guards, refer to paragraph 3-41.

3-70. SPEED SWITCH.

a. GENERAL. The speed switch is mounted on the tachometer drive and operates at one half engine speed due to tachometer drive gear reduction. It is a three element switch. Element 1, disconnects starter at 285-315 RPM (570-630 engine RPM) and initiates field flashing of generator. Element 2, permits 24 VDC to energize precise governor at 580-620 RPM (1160-1240 engine RPM). Element 3, initiates shutdown sequence of generator set in the event speed increases to 1200-1250 RPM (2400-2500 engine RPM).

b. REMOVAL. Remove speed switch as illustrated in figure 3-25.

c. TEST

1. Perform a continuity check between speed switch connector pins.

(a) Continuity between pins A and B, G and H.

(b) Open circuit between pins A and C, D and E, F and J.

2. Replace the switch if any portion of the test results in failure.

3. Reduce speed to 1190 RPM and depress manual reset button. Check that element 3 has reset.

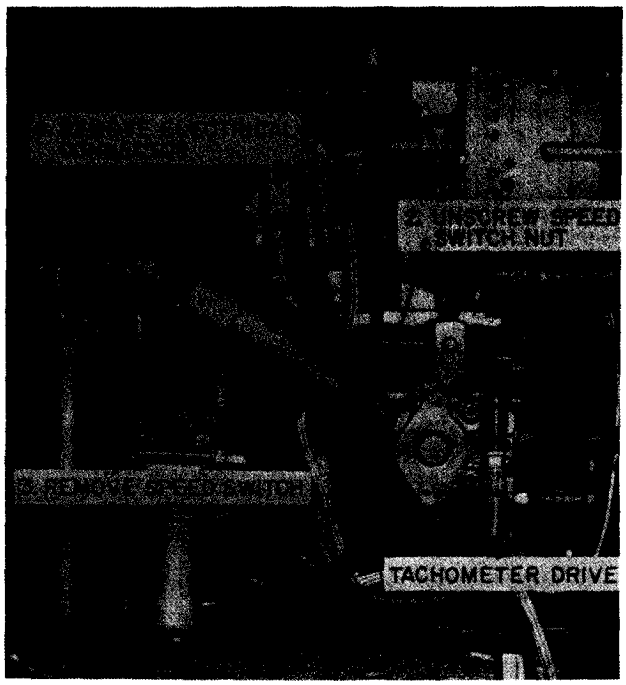


Figure 3-25. Speed switch, removal and installation

4. Reduce speed to 100 RPM below trip speed of element 1 and 2, respectively. Check for automatic reset of elements.

5. Remove speed switch from test equipment. Replace defective switch.

d. INSTALLATION. Install speed switch in reverse sequence illustrated in figure 3-25.

3-71. BATTERY CHARGING ALTERNATOR AND MOUNTING GROUP.

a. GENERAL. The alternator is a belt driven electro-mechanical device that converts mechanical and magnetic energy to alternating current and voltage. This alternating current and voltage is then changed to direct current and voltage when it is passed through an integral, three phase, full wave rectifier system. The DC voltage regulator is an integral part of the alternator. The alternator provides power for charging the batteries and operation of direct current components of the generator set. The mounting group provides a connection point for the alternator on the engine.

b. ALTERNATOR FUSE REPLACEMENT. Replace alternator fuse as illustrated in detail A of figure 3-27.

c. TEST AND ADJUSTMENT. To test and adjust battery charging alternator, proceed as follows:

CAUTION

When rear cover is disconnected from alternator, make sure wiring is not shorted to alternator. Use insulating material if required.

1. Remove fuse and disconnect rear cover from alternator as illustrated in detail A of figure 3-27. Do not remove harness connector. Position rear cover (wiring connected) so that test equipment can be connected to alternator terminals. Insulate wiring to prevent short circuit.

2. Connect test equipment to alternator as illustrated in figure 3-28. Make sure switch S1 is open.

3. Start engine as specified in paragraph 2-12, and run engine a minimum of five minutes for warm-up.

4. Operate engine at rated speed. Close switch S1 and slowly adjust carbon pile (rheostat) until ammeter indicates maximum charging rate of 20 to 25 amperes at 75°F.

5. Observe voltmeter indication, voltmeter should indicate voltage of 26 to 30 VDC at 75°F. If not, adjust alternator by rotating adjustment screw. Clockwise rotation of

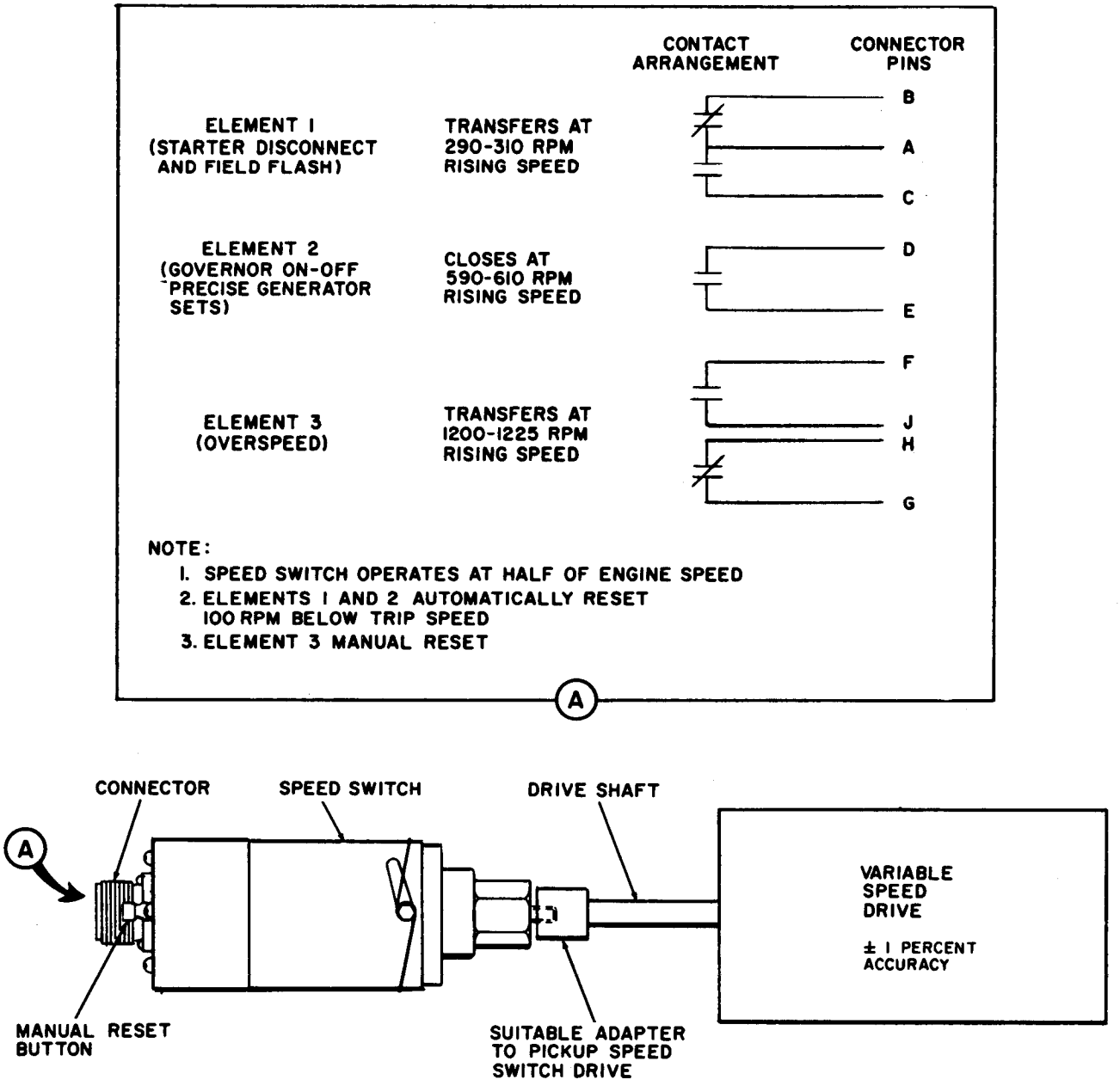


Figure 3-26. Speed switch, test setup

adjustment screw increases alternator output, counterclockwise rotation decreases output.

6. If proper voltage and amperage reading are not obtained, open switch S1 and shut down engine. Check alternator belt deflection, refer to paragraph 3-68. Adjust belt if necessary, perform steps 3 through 5.

7. Open switch S1. Shut down engine. Remove test equipment from alternator and install rear cover and fuse.

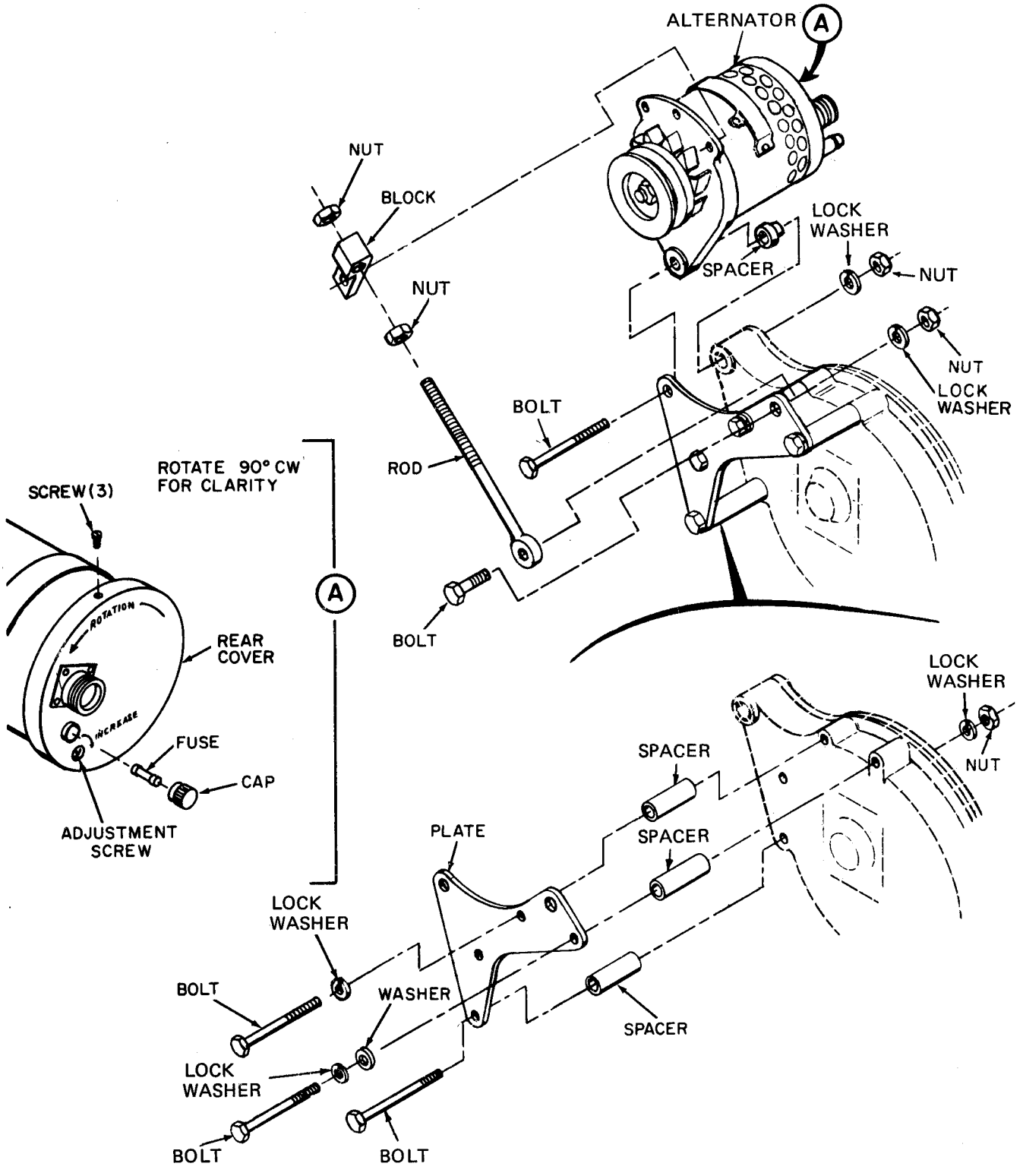


Figure 3-27. Battery charging alternator and mounting group, removal and installation

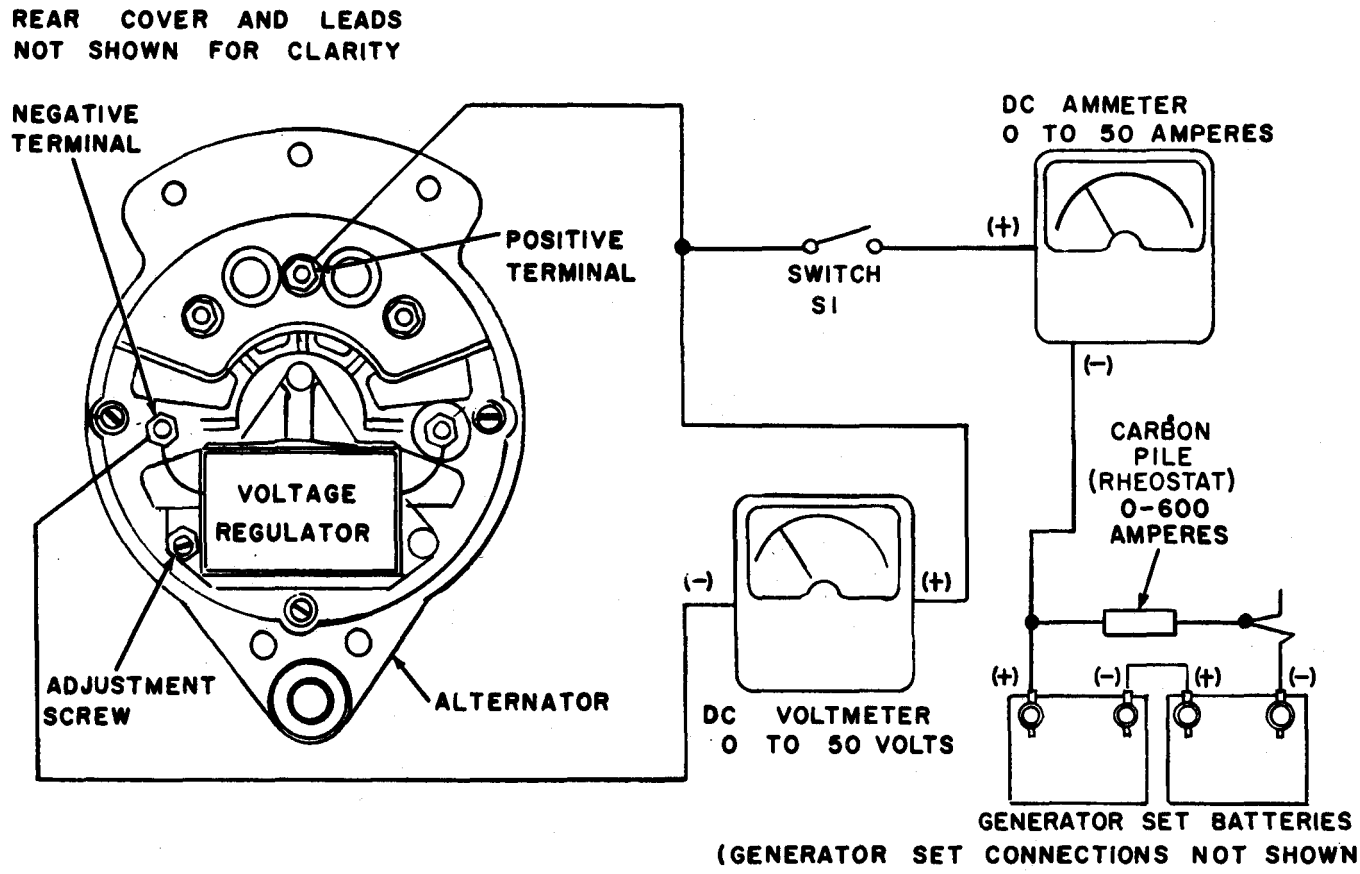


Figure 3-28. Battery charging alternator, test and adjustment

8. Replace alternator if specified voltage and current output cannot be obtained.

d. REMOVAL. Remove alternator and mounting group as illustrated in figure 3-27, observing the following:

1. Remove alternator belt from alternator, refer to paragraph 3-69.

e. CLEANING AND INSPECTION.

1. Clean alternator with a clean, dry cloth.

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

3. Inspect for cracks, breaks, and defective threads. Replace defective parts.

f. INSTALLATION. Install alternator and mounting group as illustrated in figure 3-27, observing the following:

1. Tighten plate mounting nuts to 17 ± 3 foot pounds torque.

2. Install alternator belt and adjust belt, refer to paragraph 3-69.

3-72. STARTER AND SOLENOID.

a. GENERAL. The starter is a 24 VDC, heavy duty, insulated, waterproof, fungus resistant motor with piggy-back mounted solenoid. When electrical power energizes the solenoid, the solenoid plunger shifts the starter pinion to engage the flywheel and permits the starter to turn the engine. When the engine reaches a predetermined speed, the pinion is automatically disengaged from the flywheel.

b. TEST. Test starter and solenoid as specified in figure 3-29.

WARNING

Disconnect negative battery cables prior to performing maintenance.

c. REMOVAL. Remove starter, and solenoid as illustrated in figure 3-30, observing the following:

1. Remove starter and solenoid from engine and then solenoid from starter.

2. To disconnect self-locking nut from solenoid shaft, place a suitable deep 1/2 inch socket on nut and place a 5/32 inch allen wrench through socket drive into shaft. Hold shaft stationary with allen wrench and remove nut by turning socket. Count number of turns to remove nut from shaft.

d. INSTALLATION. Install starter and solenoid as illustrated in figure 3-30, observing the following:

1. Install solenoid on starter making sure rubber boot is on inside of yoke cover and over outside edge of solenoid case for proper seal.

2. To connect self-locking nut to solenoid shaft, hold shaft with 5/32 inch allen wrench and tighten nut same number of turns on shaft required for removal. Do not install plug and gasket at this time.

3. Adjust drive assembly pinion clearance by performing steps 4 through 7.

4. Connect a 12 volt battery to starter and solenoid as shown in A of figure 3-31.

CAUTION

Do not keep jumper connected for more than 15 seconds at a time. Wait approximately three minutes before reconnecting jumper lead.

5. Momentarily touch jumper between terminal stud of solenoid and terminal stud in commutator end head as shown in A of figure 3-31. This will shift solenoid and drive assembly into cranking position.

6. Push drive assembly toward commutator end of starter to eliminate any slack in linkage.

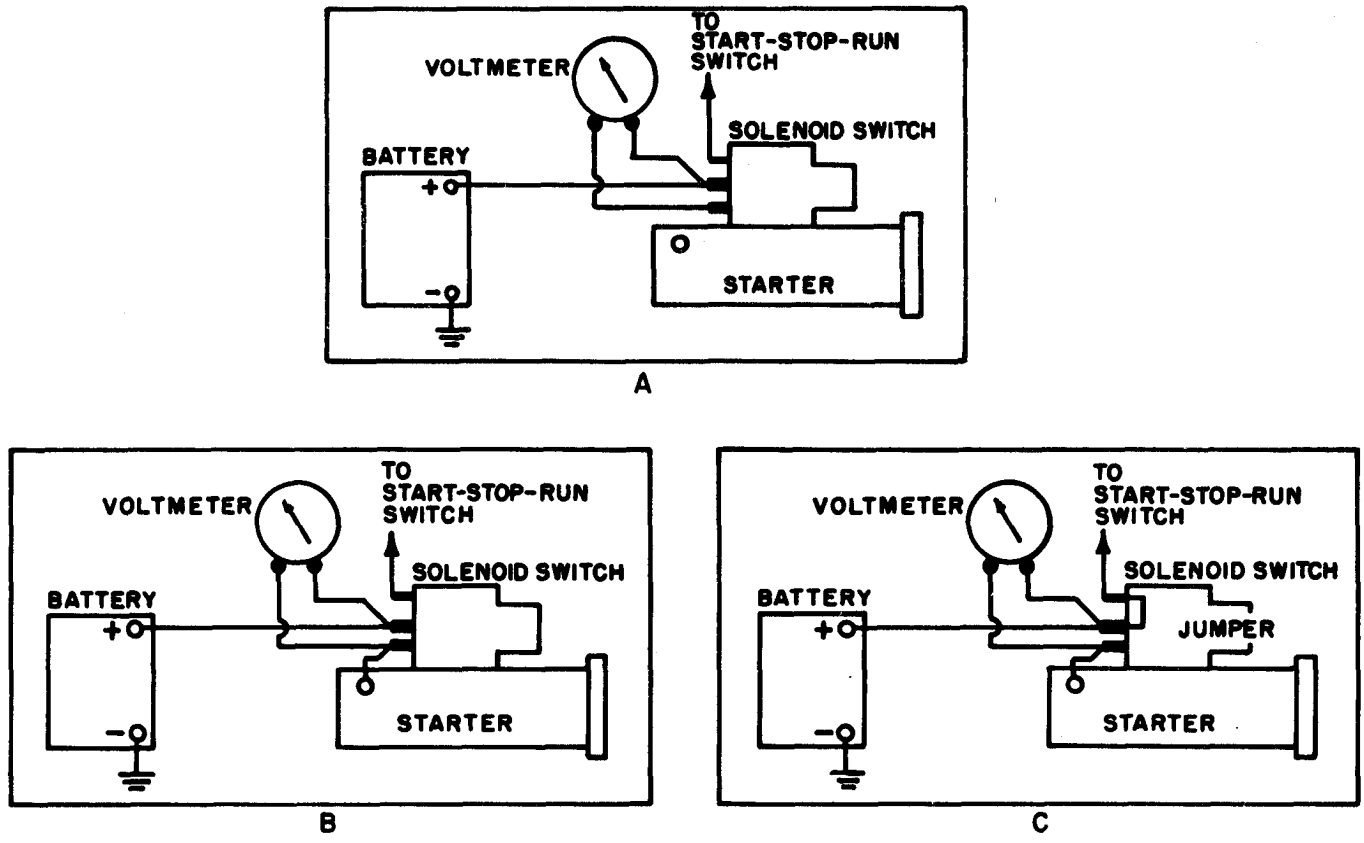
7. Measure distance between outside edge of drive sleeve and thrust washer as shown in B of figure 3-31. This distance should be 0.020 to 0.050 of an inch. If measurement is not correct, adjust self-locking nut as required to obtain proper distance. Remove test equipment.

8. Install plug and gasket in yoke cover, figure 3-30.

9. Install starter and solenoid on engine.

3-73. STARTER BRUSHES.

a. GENERAL. The starter is equipped with four brushes sets, each consisting of



STEP 1

DETERMINE THAT BATTERIES ARE FULLY CHARGED AND THAT ALL BATTERY AND STARTER CABLES ARE SERVICEABLE AND PROPERLY INSTALLED.

STEP 2

REMOVE SOLENOID-TO-STARTER CONNECTOR AND CONNECT VOLTMETER AS SHOWN IN A ABOVE. IF VOLTAGE IS INDICATED, SOLENOID SWITCH IS DEFECTIVE AND MUST BE REPLACED.

STEP 3

INSTALL THE SOLENOID-TO-STARTER CONNECTOR.

STEP 4

CONNECT VOLTMETER AS SHOWN IN B ABOVE. IF BATTERY VOLTAGE (24 VOLTS) IS NOT INDICATED, THE STARTER IS DEFECTIVE AND MUST BE REPLACED.

STEP 5

MOMENTARILY CONNECT A JUMPER AS SHOWN IN C ABOVE. THE VOLTMETER READING SHOULD DROP TO ZERO AND STARTER SHOULD CRANK ENGINE. IF VOLTMETER READING DOES NOT DROP TO ZERO, SOLENOID SWITCH IS DEFECTIVE AND MUST BE REPLACED. IF VOLTMETER READING DROPS TO ZERO BUT STARTER FAILS TO CRANK ENGINE, STARTER IS DEFECTIVE AND MUST BE REPLACED.

Figure 3-29. Starter and solenoid, test

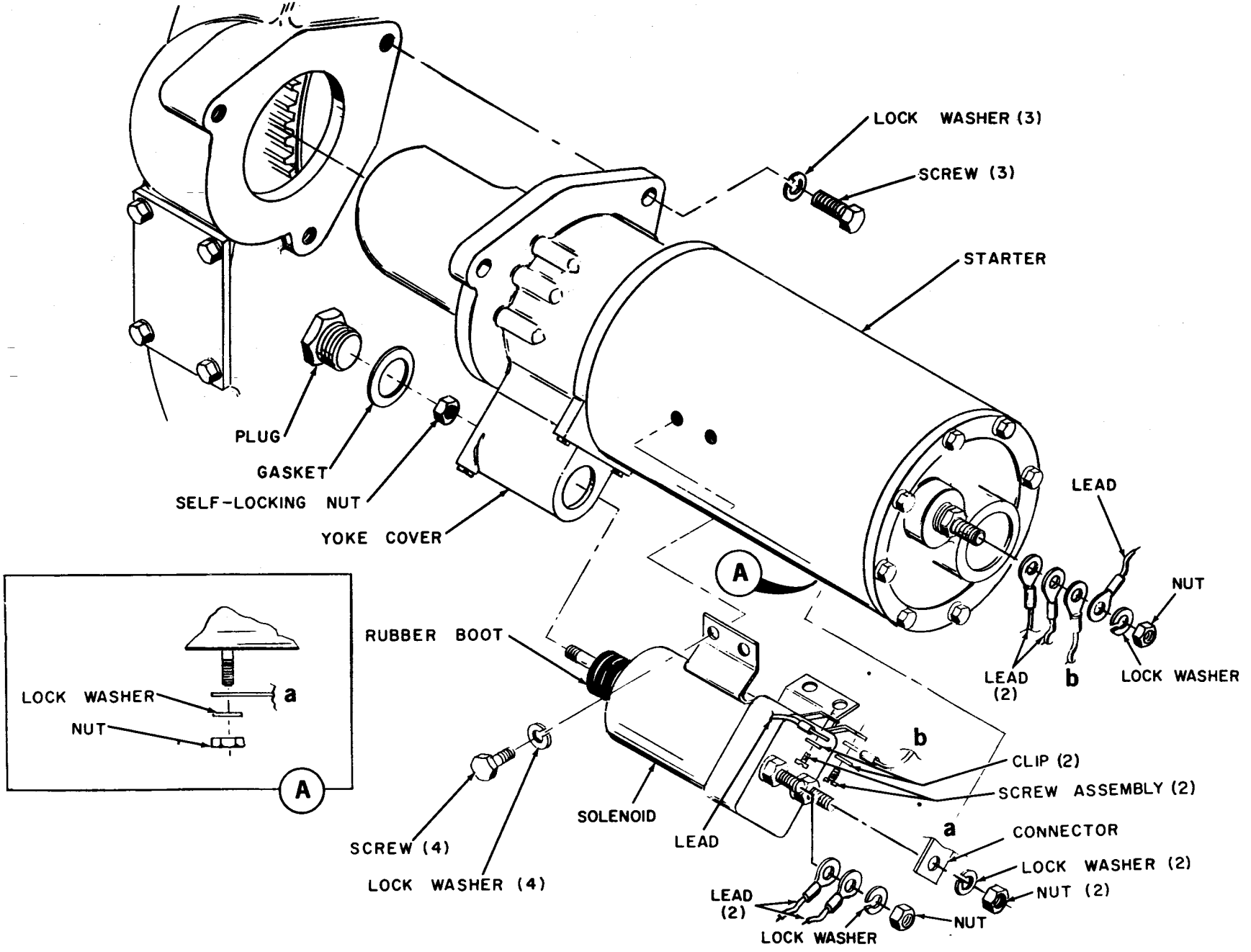


Figure 3-30. Starter and solenoid, removal and installation

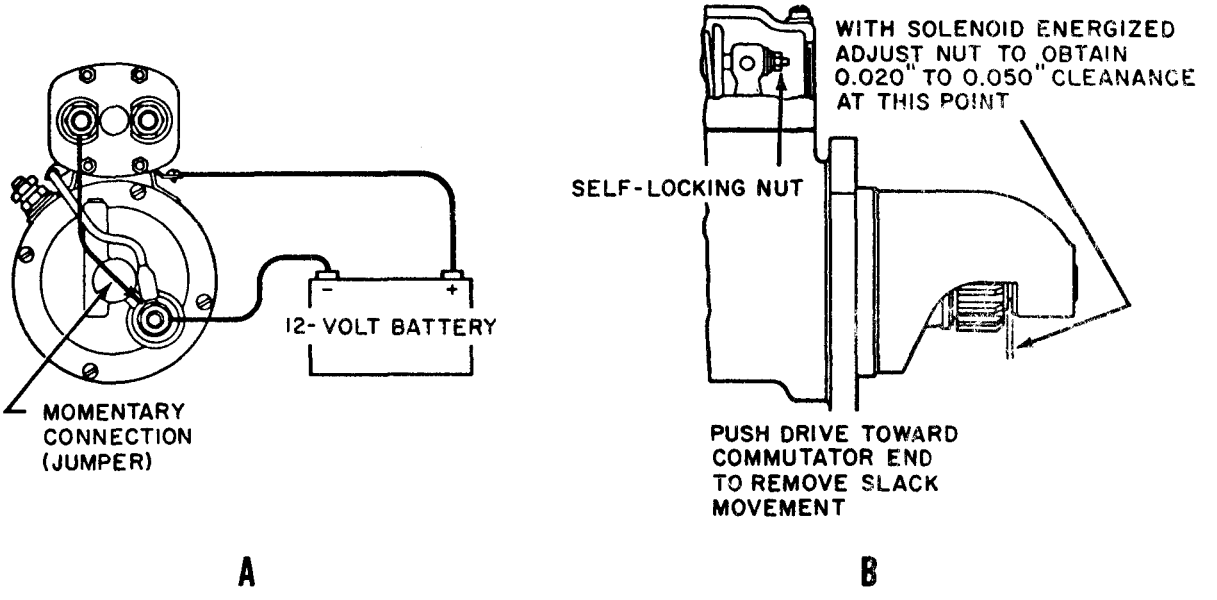


Figure 3-31. Starter drive assembly pinion clearance adjustment

two brushes. The brushes should be checked periodically for wear and all brushes should be replaced if any brush is worn below tolerance.

WARNING

Disconnect negative battery cables prior to performing maintenance.

b. REMOVAL. Remove starter brushes as illustrated in figure 3-32, observing the following:

1. Scribe alignment mark on head and frame prior to removal to assure proper alignment during installation.

2. Guide brush holder over terminal stud to prevent damage to component.

c. CLEANING AND INSPECTION.

1. Clean part with clean lint-free cloth.

2. Check brush spring tension using suitable spring scale. Spring tension should be 50 to 65 ounces.

NOTE

All brushes shall be replaced if any brush is worn below tolerance.

3. Measure brush length. Brushes shall be replaced if they are 3/8 of an inch or less in length.

4. Inspect for cracks, breaks, and other damage. Replace head gasket and defective parts.

d. INSTALLATION. Install starter brushes as illustrated in figure 3-32, observing the following:

1. Lightly coat packings and gasket with medium grade general purpose grease prior to installation.

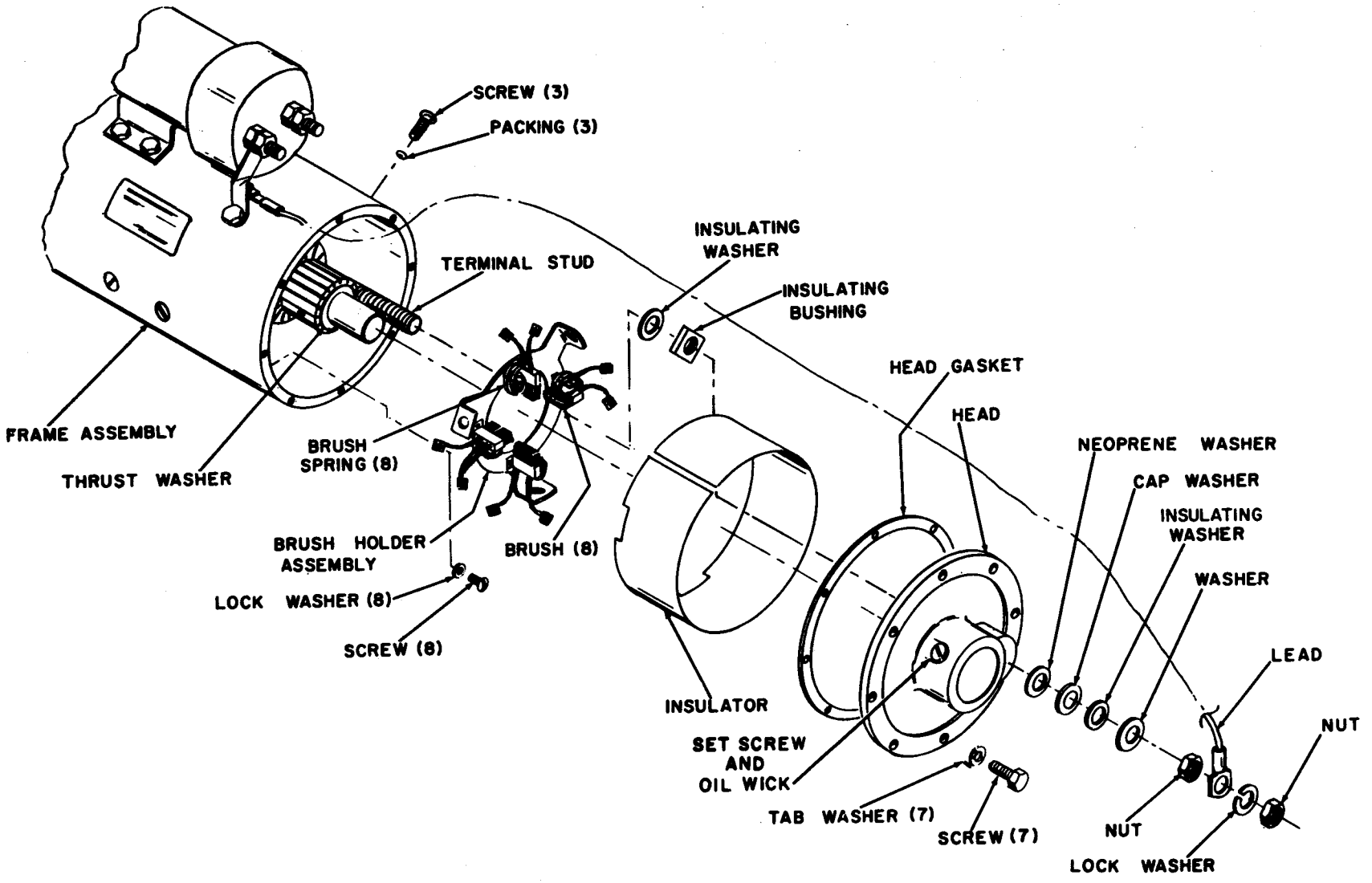


Figure 3-32. Starter brushes, removal and installation

2. Prior to installing head, cut a strip of 2/0 sandpaper the width of the commutator. Install sandpaper on commutator with sand side out by raising brushes and slipping sandpaper between commutator and brushes. Brushes must lie flat against sandpaper on commutator to obtain desired brush seat contour.

3. Align alignment marks on frame and head and install head.

4. Carefully rotate armature in a counterclockwise direction three to five revolutions to properly seat all brushes.

5. Remove head. Lift all brushes and inspect seat contour to determine whether or not sanding operation is satisfactory. Brush contact should be a minimum of 85 percent length and width.

6. Lift brushes and remove sandpaper from commutator. Lubricate head felt washer with OE 10 oil and reinstall head.

3-74. LUBRICATING OIL FILTER GROUP.

a. GENERAL. The lubricating oil filter group is mounted on the left side of the engine. The lubricating oil filter consists of two replaceable elements mounted to a common head. The filter removes particles of 25 microns and larger from the engine lubricating oil.

b. LUBRICATING OIL FILTER SERVICE. To service lubricating oil filter, refer to figure 3-2.

c. REMOVAL AND DISASSEMBLY. Remove and disassemble lubricating oil filter group as illustrated in figure 3-33, observing the following:

1. Remove plugs and drain oil into suitable container prior to removal.

2. When removing valve assemblies, place wrench on hex immediately above base.

3. Plug openings in engine after hose removal.

4. Keep components of valve assembly together so that they are installed in same body during reassembly.

d. CLEANING AND INSPECTION.

1. Clean old gaskets from component surfaces using a suitable scraper.

2. Clean parts with an approved cleaning solvent and dry thoroughly.

3. Inspect valve springs for distortion and broken ends. Check spring for spring rate 2.48 pounds per inch and a free length of 1.9375 inches.

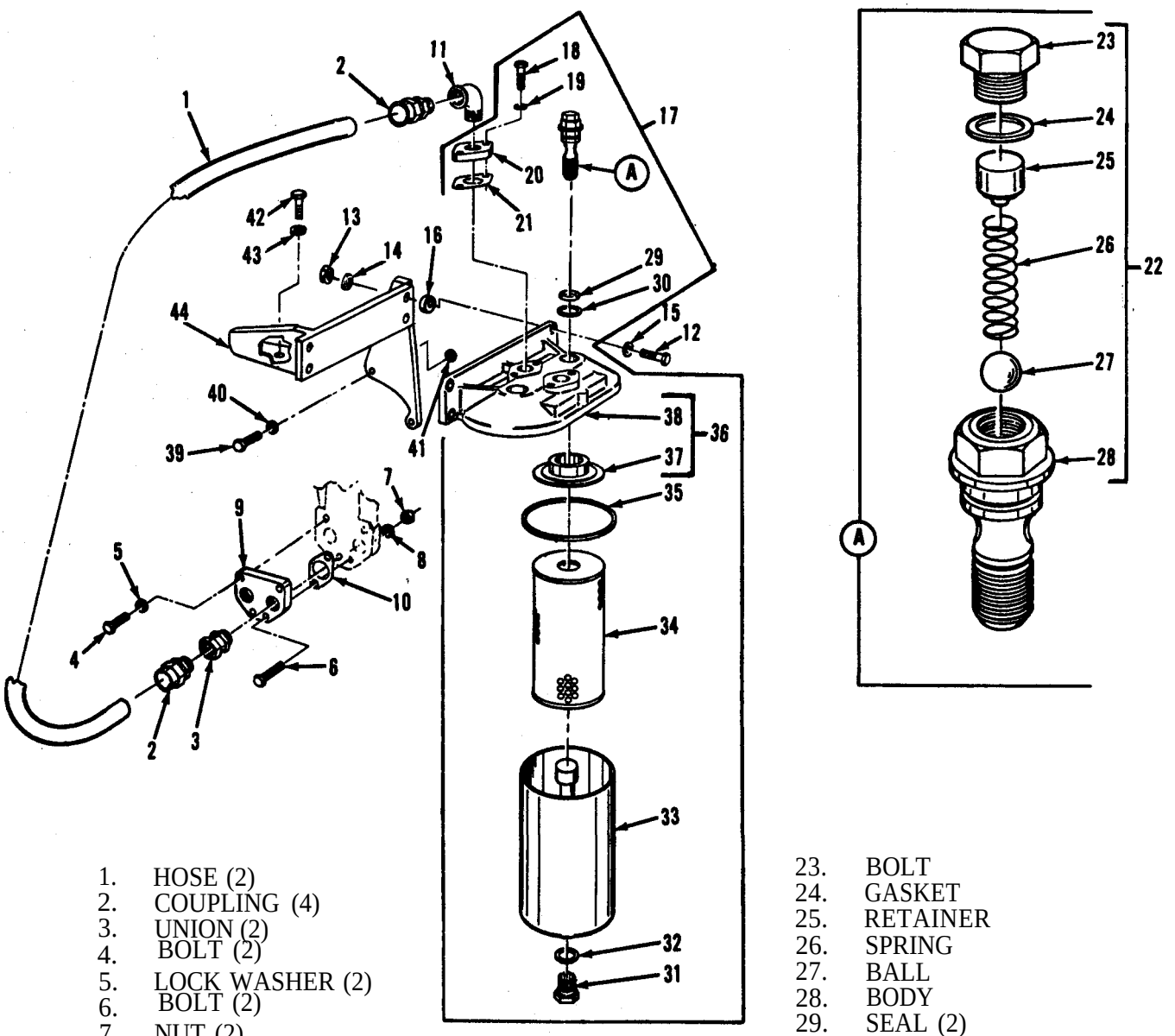
4. Check valve balls and ball seats for nicks and scores.

5. Inspect for cracks, breaks, and other damage. Replace defective parts, gaskets, seals, and elements.

e. REASSEMBLY AND INSTALLATION. Reassemble and install lubricating oil filter group as illustrated in figure 3-33, observing the following:

1. Lubricate all seals and gaskets with clean lubricating oil prior to reassembly.

2. Tighten plugs to 100 ± 15 foot pounds torque.



1. HOSE (2)
2. COUPLING (4)
3. UNION (2)
4. BOLT (2)
5. LOCK WASHER (2)
6. BOLT (2)
7. NUT (2)
8. LOCK WASHER (2)
9. ADAPTER
10. GASKET (2)
11. ELBOW (2)
12. BOLT (4)
13. NUT (4)
14. LOCK WASHER
15. WASHER (4)
16. SPACER (4)
17. FILTER ASSEMBLY
18. BOLT (4)
19. LOCK WASHER (4)
20. FLANGE (2)
21. GASKET (2)
22. RELIEF VALVE ASSEMBLY
23. BOLT
24. GASKET
25. RETAINER
26. SPRING
27. BALL
28. BODY
29. SEAL (2)
30. WASHER (2)
31. PLUG (2)
32. GASKET (2)
33. CASE ASSEMBLY (2)
34. ELEMENT (2)
35. GASKET (2)
36. BASE ASSEMBLY
37. ADAPTER (2)
38. BASE
39. BOLT (2)
40. LOCK WASHER (2)
41. WASHER (2)
42. BOLT (2)
43. LOCK WASHER (2)
44. BRACKET ASSEMBLY

Figure 3-33. Lubricating oil filter group, exploded view

3. Tighten valve assembly bolts to 50 ± 15 foot pounds torque using hex immediately above base.

4. Service engine, refer to paragraph 3-11.

3-75. FUEL TRANSFER VALVE, AUXILIARY FUEL INLET FITTING, AND FUEL SUPPLY OUTLET FITTING.

a. GENERAL. The fuel transfer valve, auxiliary fuel inlet fitting, and fuel supply outlet fitting are located adjacent to the fuel filler cap. The auxiliary fuel inlet fitting permits connection of an auxiliary fuel supply to the fuel transfer valve. The fuel supply outlet fittings permits connection to the fuel tank so it may be utilized as an auxiliary fuel supply. The fuel transfer valve is a mechanically operated three-way valve. It permits selection of fuel from the generator set fuel tank or an auxiliary fuel supply.

b. REMOVAL. Remove fuel transfer valve, auxiliary fuel inlet fitting, and fuel supply outlet fitting in sequence illustrated in figure 3-34, observing the following:

1. Tag hoses with location and note position of elbows prior to removal to insure proper installation.

2. Install suitable plugs in hoses.

c. CLEANING AND INSPECTION.

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

2. Remove sealant from pipe threads using wire brush.

3. Inspect for cracks, breaks, and other damage. Replace defective parts.

d. INSTALLATION. Install fuel transfer valve, auxiliary fuel inlet fitting and fuel supply outlet fitting in reverse sequence illustrated in figure 3-34, observing the following:

1. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

3-76. FUEL TRANSFER PUMPS.

a. GENERAL. The fuel transfer pumps are 24 VDC pumps that provide a flow of 25 GPH. The pumps draw fuel from the fuel tank or auxiliary fuel supply and pump the fuel to the day tank at approximately 7 PSIG, if the fuel solenoid is open. If the fuel solenoid valve is closed, the pumps bypass fuel internally. The pumps are connected in parallel electrically and fuel connection is in series.

b. SERVICE. To service fuel transfer pumps, refer to figure 3-35 and proceed as follows:

1. Twist and remove cover and gasket from pump body.

2. Carefully remove screen and magnet from body.

3. Wash screen and magnet with an approved cleaning solvent and dry thoroughly.

4. Inspect screen and gasket for tears. Replace defective screen or gasket.

5. Position magnet, screen, and gasket in pump body and secure with cover.

c. REMOVAL. Remove fuel transfer pumps as illustrated in figure 3-35.

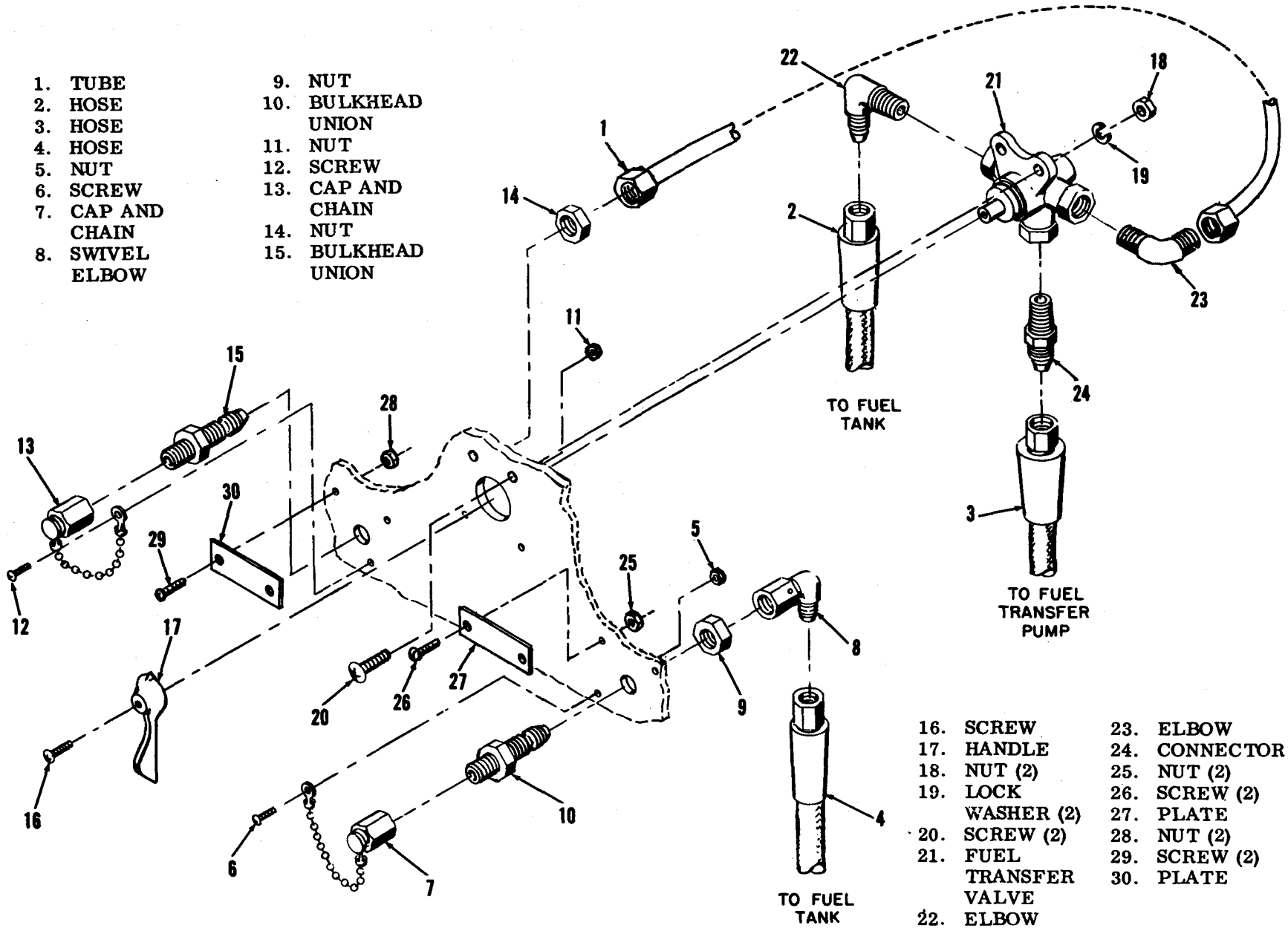


Figure 3-34. Fuel transfer valve, auxiliary fuel inlet fitting, and fuel supply outlet fitting, removal and installation

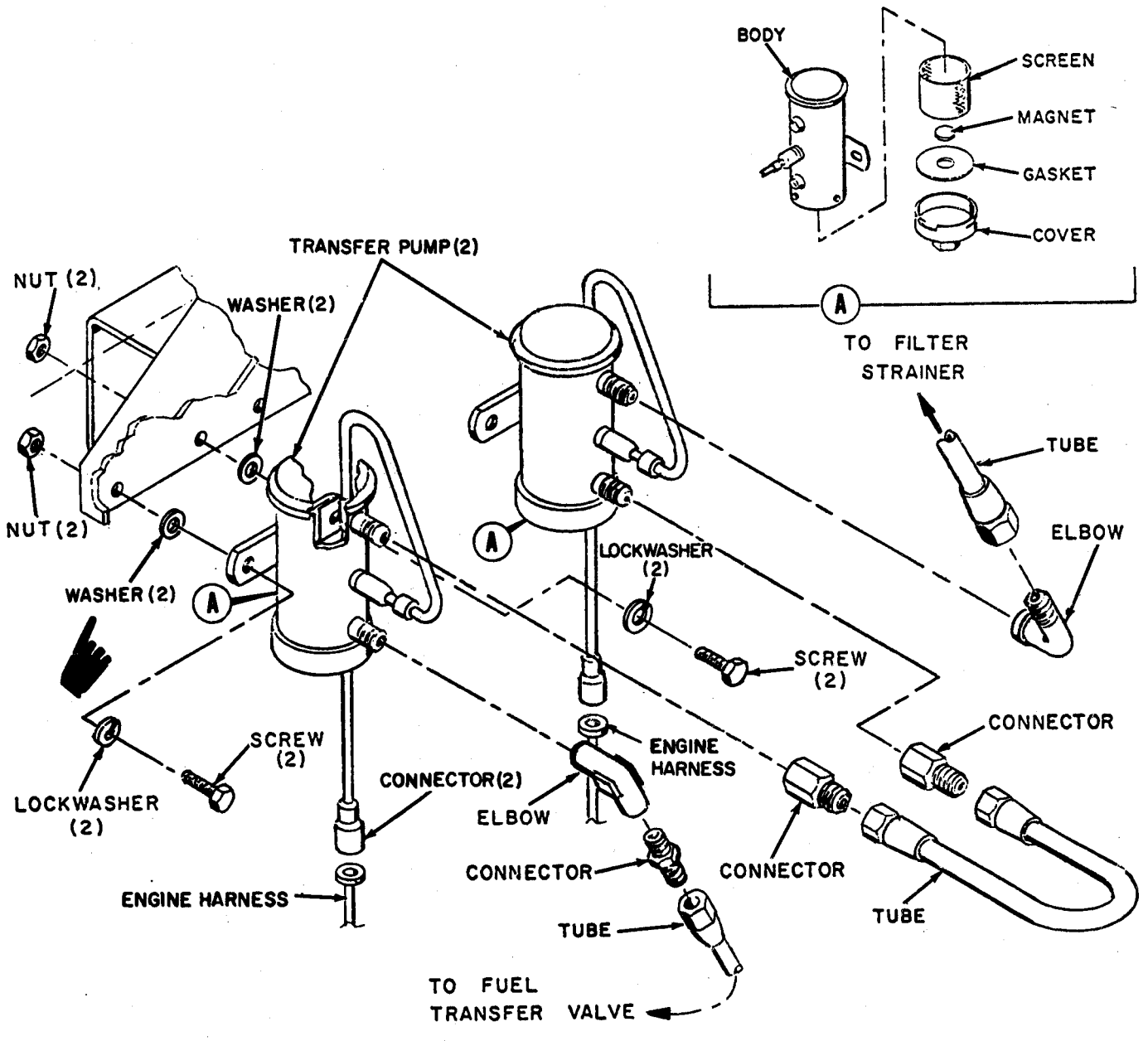


Figure 3-35. Electric fuel transfer pumps, exploded view

d. TEST.

1. Connect fuel supply to IN port of fuel pump. Connect tube and suitable 10 PSIG gauge to OUT port.

2. Bleed air from pump, tube, and gauge.

3. Apply 24 VDC to fuel pump and monitor gauge. Pressure should be 7 PSI +1/4 -1/2 PSIG and there shall be no external leakage at pump.

e. INSTALLATION. Install fuel transfer pumps as illustrated in figure 3-35, observing the following:

1. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

3-77. FUEL FILTER AND STRAINER ASSEMBLY AND FUEL SOLENOID VALVE.

a. GENERAL.

1. Fuel Filter and Strainer Assembly. The filter and strainer assembly is the initial filtration device in the fuel system. The strainer element is reusable after cleaning but the filter element must be replaced.

2. Fuel Solenoid Valve. The fuel solenoid valve is an electrically operated shutoff valve that opens and closes to maintain a predetermined fuel level in the day tank. When the day tank fuel level is decreased, the day tank float switch completes a circuit directing electrical power to open the solenoid valve. Opening of the valve permits fuel to flow to the day tank until the predetermined level is reached. Electrical power is then removed from the solenoid valve by the float switch, closing the valve.

b. FUEL FILTER AND STRAINER SERVICE. To service fuel filter and strainer assembly, refer to figure 3-36 and proceed as follows:

1. Open drain cocks and catch fuel in suitable container.

2. Hold strainer bowl and remove nut and gasket. Remove bowl and gasket from head. Remove retainer and strainer element from stud.

3. Hold filter bowl and remove bolt and washer. Remove filter and gasket from head and filter element from bowl.

4. Wash bowls and head with an approved cleaning solvent and dry thoroughly.

5. Wash strainer element with clean fuel oil. Inspect element for damage.

6. Replace gaskets, filter element, and defective parts.

7. Apply thin coat of fuel to gaskets. Close drain cocks and position gaskets on head.

8. Install strainer element and retainer on stud. Position strainer bowl to head and install gasket and stud.

9. Position filter element in filter bowl and assembled bowl to head. Secure bowl to head with bolt and washer.

c. REMOVAL AND DISASSEMBLY. Remove fuel solenoid valve and remove and disassemble fuel filter and strainer as illustrated in figure 3-36, observing the following:

1. Open filter and strainer assembly drain cocks and catch fuel in suitable container prior to removal.

2. Note position of elbows, tee, and solenoid valve prior to removal.

3. Remove elbow installed in fuel solenoid valve prior to valve removal.

4. Install suitable plugs in hoses.

d. CLEANING AND INSPECTION.

1. Wash strainer element with clean fuel oil.

2. Wash parts with an approved cleaning solvent and dry thoroughly.

3. Clean old sealant from pipe threads using wire brush.

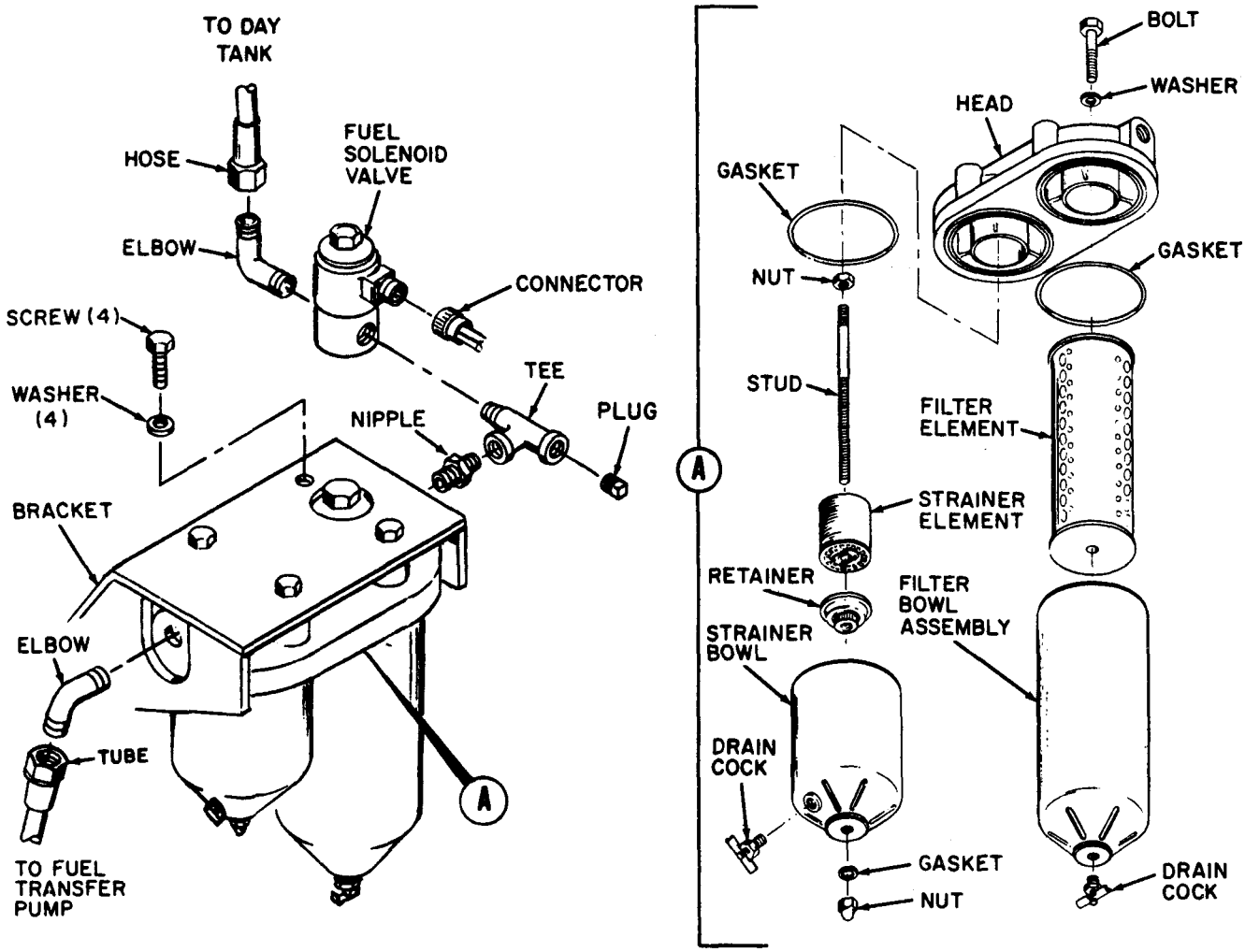


Figure 3-36. Fuel filter and strainer assembly and fuel solenoid valve, exploded view

4. Inspect for cracks, breaks, and other damage.

5. Inspect strainer element for damage.

6. Replace filter element, gaskets, and defective parts.

e. REASSEMBLY AND INSTALLATION. Reassemble and install filter and strainer assembly and install fuel solenoid valve as illustrated in figure 3-36, observing the following:

1. Apply thin coat of fuel oil to gaskets prior to reassembly.

2. Apply thread sealing compound conforming to Military Specification MIL-S-46180, type III to pipe threads prior to installation.

3. Install drain cocks in bowls and close drain cocks. Fill bowls approximately half way with clean fuel oil prior to installation.

3-78. DAY TANK.

a. GENERAL. The day tank has a fuel capacity to permit engine operation for a minimum of five minutes. It provides a settling point for contaminants, to prevent their entry into the engine, and supplies fuel to the engine fuel pump. The tank contains a dual type float switch. The upper float operates in conjunction with the fuel solenoid valve to maintain a predetermined fuel level in the tank. The lower float initiates an engine shutdown sequence in the event that the fuel level in the tank will permit operation of the generator set, at rated load, for only one minute.

b. REMOVAL AND DISASSEMBLY. Remove and disassemble day tank in the sequence illustrated in figure 3-37, observing the following:

1. Prior to day tank removal, remove radio suppression diode assembly as illustrated in figure 3-10 and ether starting aid as specified in paragraph 4-5.

2. Remove cap (16, figure 3-37) from drain valve (15), open valve, and drain fuel into suitable container prior to removal.

3. Tag hoses (2, 3, 4, and 5) with location and note position of elbows. Install suitable plugs in hoses and elbows.

c. CLEANING AND INSPECTION.

1. Clean parts with an approved cleaning solvent and dry thoroughly. Clean old sealant from pipe threads using wire brush.

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

3. Check float switch to make sure there is no fuel in floats.

4. Replace defective parts.

d. FLOAT SWITCH TEST. With float switch in vertical position (electrical connector on top), test switch as follows:

1. Connect ohmmeter between connector pins C and D, meter should indicate continuity. Raise lower float to upper limit, meter should not indicate continuity.

2. Connect ohmmeter between pins A and B, meter should indicate continuity. Raise upper float to upper limit, meter should not indicate continuity.

e. REASSEMBLY AND INSTALLATION. Reassemble and install day tank in the reverse sequence illustrated in figure 3-37, observing the following:

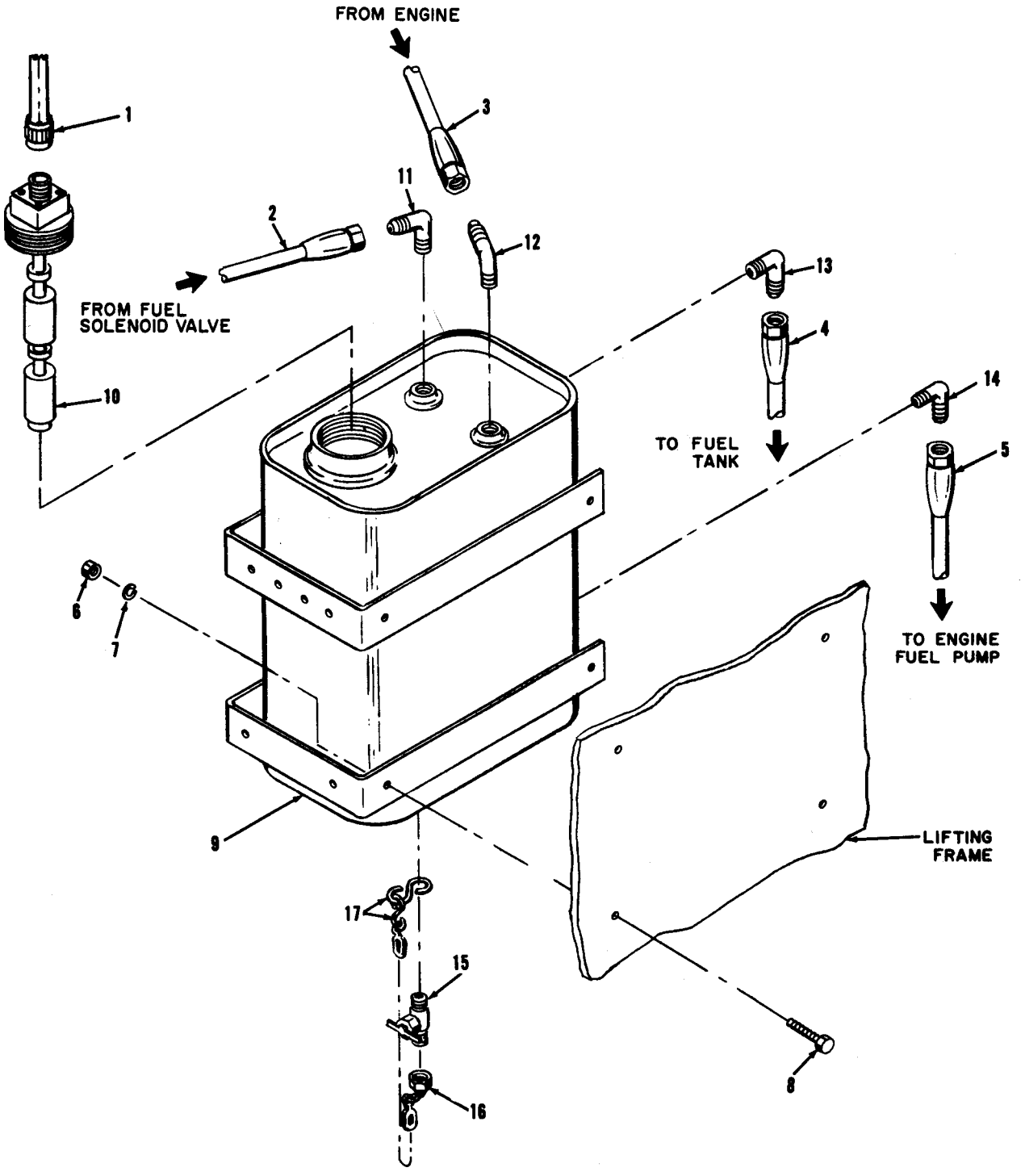
1. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

2. Install radio suppression diode assembly as illustrated in figure 3-10 and ether starting aid as specified in paragraph 4-5.

3. After tank installation, energize DC control circuit breaker, position start-run-stop switch to RUN and battle short switch to ON to fill day tank. Listen to fuel transfer pumps, pumps will change pitch and bypass fuel internally when tanks are full. Position battle short switch to OFF, start-run-stop switch to STOP, and de-energize DC control circuit breaker. Check day tank for leakage.

3-79. SECONDARY FUEL FILTER AND RELIEF VALVE GROUP

a. GENERAL. The secondary fuel filter and relief valve group is mounted on the right side of the engine. The secondary fuel filter is the final filtration device in



1. ELECTRICAL CONNECTOR
2. HOSE
3. HOSE
4. HOSE
5. HOSE
6. NUT (4)
7. WASHER (4)
8. SCREW (4)
9. DAY TANK
10. FLOAT SWITCH
11. ELBOW
12. ELBOW
13. ELBOW
14. ELBOW
15. DRAIN VALVE
16. CHAIN AND CAP
17. CHAIN HOOK

Figure 3-37. Day tank, exploded view

the fuel system. It removes contaminate particles of 5 micron and larger from the fuel. The fuel relief valve limits maximum fuel pressure supplied to the fuel injection pump. When fuel pressure reaches 25 to 32 PSIG, the relief valve plunger opens routing fuel back to the day tank.

b. SECONDARY FUEL FILTER SERVICE. To service secondary fuel filter, refer to figure 3-38, and proceed as follows:

1. Open drain cock (16) and catch fuel in suitable container.

2. Hold body (19) and remove bolt (17) and washer (18).

3. Remove body (19), gasket (21), and element (20) from head (23). Discard gasket and element.

4. Wash body with an approved cleaning solvent and dry thoroughly.

5. Soak new element (20) in clean fuel to remove entrapped air. Apply thin coat of fuel to gasket (21).

6. Close drain cock (16). Position element (20) in body (19). Fill body with clean fuel. Position gasket (21) and bowl on head (23) and secure with bolt (17) and washer (18).

c. REMOVAL AND DISASSEMBLY. Remove and disassemble secondary fuel filter and relief valve group in sequence illustrated in figure 3-38, observing the following:

1. Open drain cock (16) and catch fuel in suitable container prior to removal.

2. Install suitable plugs in tubes, hoses, and fuel injector pump openings.

Legend to figure 3-38:

1 Tube
2 Tube
3 Fitting (2)
4 Fitting (2)
5 Tube
6 Bleed valve
7 Bolt
8 Lock washer
9 Clip
10 Tube
11 Tee
12 Bolt (2)
13 Nut (2)
14 Lock washer (2)
15 Filter assembly
16 Drain cock
17 Bolt
18 Gasket
19 Gasket body
20 Element
21 Gasket
22 Plug (2)
23 Head
24 Bolt (2)
25 Lock washer (2)
26 Bolt
27 Lock washer
28 Nut
29 Lock washer
30 Washer (4)
31 Bracket
32 Fitting
33 Gasket
34 Stop
35 Spring
36 Plunger
37 Sleeve
38 Seal (2)
39 Bolt
40 Lock washer
41 Washer
42 Bolt (3)
43 Lock washer (3)
44 Washer (3)
45 Bolt
46 Lock washer
47 Top Tank
48 Gasket
49 Bolt (2)
50 Lock washer (2)
51 Washer (2)
52 Bottom tank
53 Seal
54 Plug

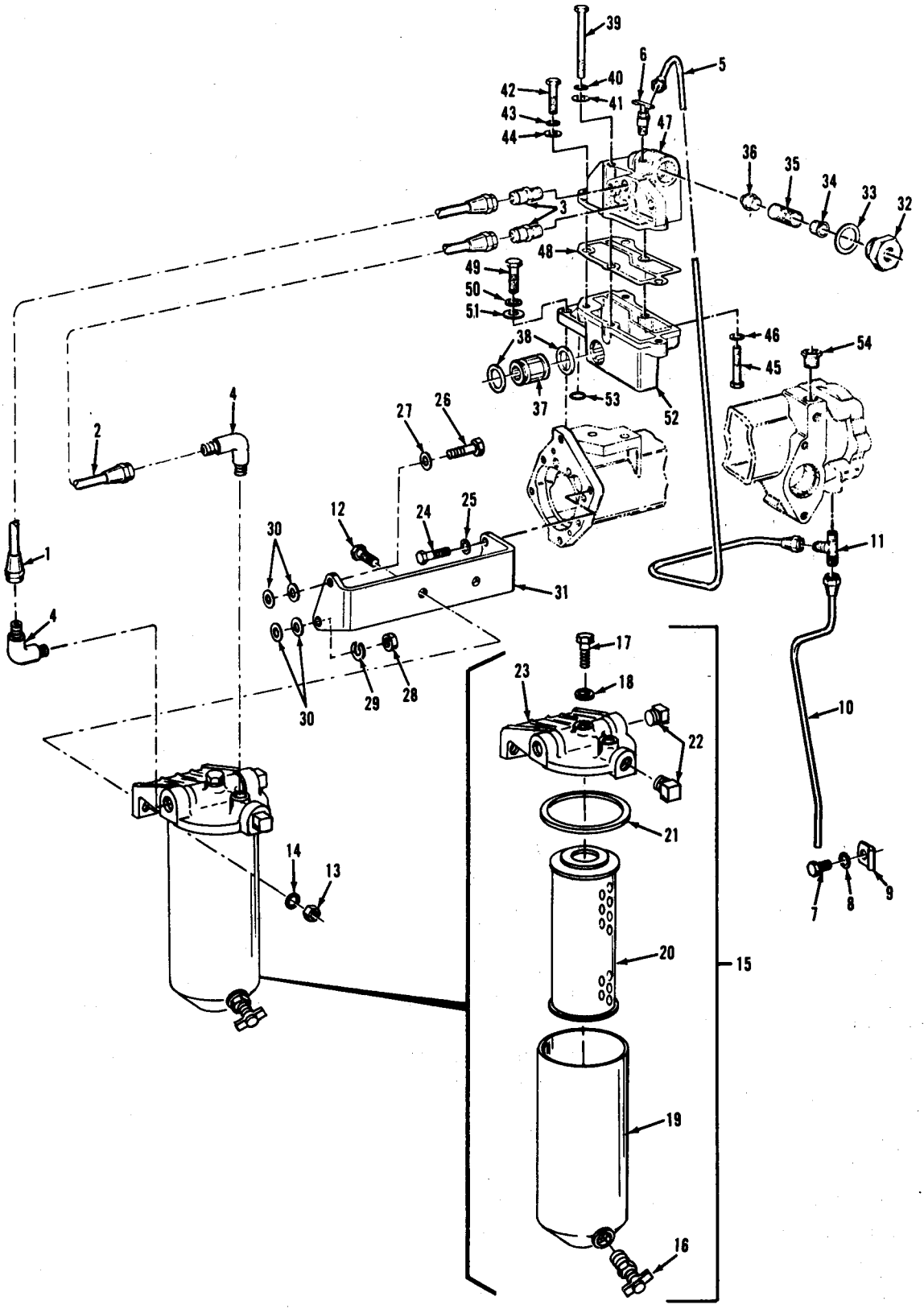


Figure 3-38. Secondary fuel filter and relief valve group, exploded view

d. CLEANING AND INSPECTION.

1. Clean parts with approved cleaning solvent and dry thoroughly.

2. Clean old sealant from pipe threads using wire brush.

3. Inspect for cracks, breaks, and other damage.

4. Inspect relief valve spring (35) for distortion and broken ends. Check spring for proper spring rate of 3.74 pounds per inch and a free length of 1.88 inches.

5. Replace element (20), gaskets (18, 21, 33, and 48), seals (38 and 53), and defective parts.

e. REASSEMBLY AND INSTALLATION. Reassemble and install secondary fuel filter and relief valve group in reverse sequence illustrated in figure 3-38, observing the following:

1. Soak filter element (20) in clean fuel to remove entrapped air and apply thin coat of fuel to gaskets and seals prior to installation.

2. Fill body (19) with clean fuel prior to installation.

3. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

4. Bleed fuel system, refer to paragraph 3-81.

3-80. FUEL LINES

a. GENERAL. The fuel lines provide a path for fuel to flow to the components of the fuel system.

b. REMOVAL. Refer to figure 1-9 for fuel system diagram. Remove lines by disconnecting them from their connection points. Install suitable caps on connection points.

c. CLEANING AND INSPECTION.

1. Clean lines with an approved cleaning solvent and dry thoroughly using compressed air.

2. Inspect lines for blockage and fittings for condition.

CAUTION

If hose blockage is due to deterioration of internal portion of hose, hose shall be replaced.

3. Replace defective parts.

d. INSTALLATION. Refer to figure 1-9 and connect lines to their connection points.

3-81. FUEL SYSTEM BLEEDING.

a. GENERAL. The fuel system should be bled after maintenance has been performed on components of the fuel system located after the day tank or whenever air is trapped in the fuel system.

b. BLEEDING PROCEDURE. Refer to figure 3-4 and bleed fuel system as follows:

1. Place suitable container under fuel drain tube and open fuel bleed valve.

CAUTION

Do not crank engine in excess of 15 seconds at a time. Allow starter to cool a minimum of three minutes between crankings.

2. Start engine as specified in paragraph 2-12.

3. Observe fuel coming out of drain tube. When air-free fuel is flowing from drain tube, close bleed valve.

4. Remove container from under drain tube.

3-82. COOLANT TEMPERATURE REGULATOR.

a. GENERAL. The coolant temperature regulator regulates the flow of engine coolant pumped through the engine by the water pump. When engine coolant temperature reaches approximately 180 °F, the regulator starts to open and permits coolant (in addition to normal bypass) to flow through the engine. If coolant temperature continues to increase, the regulator opening increases, if temperature decreases, the regulator opening decreases. This automatic opening and closing maintains the engine at normal operating temperature.

b. REMOVAL. Remove coolant temperature regulator in sequence illustrated in figure 3-39, observing the following:

1. Drain coolant from radiator prior to regulator removal, refer to paragraph 3-8.

c. CLEANING. Clean gasket from cylinder head and housing assembly using suitable tool. Exercise care to prevent gouging of surfaces.

d. TEST.

1. Place coolant temperature regulator and calibrated thermometer in a suitable container filled with water.

2. Heat water and observe thermometer and regulator.

3. Regulator should start to open at 180°F ± 1°F and be fully open at 200°F ± 5°F.

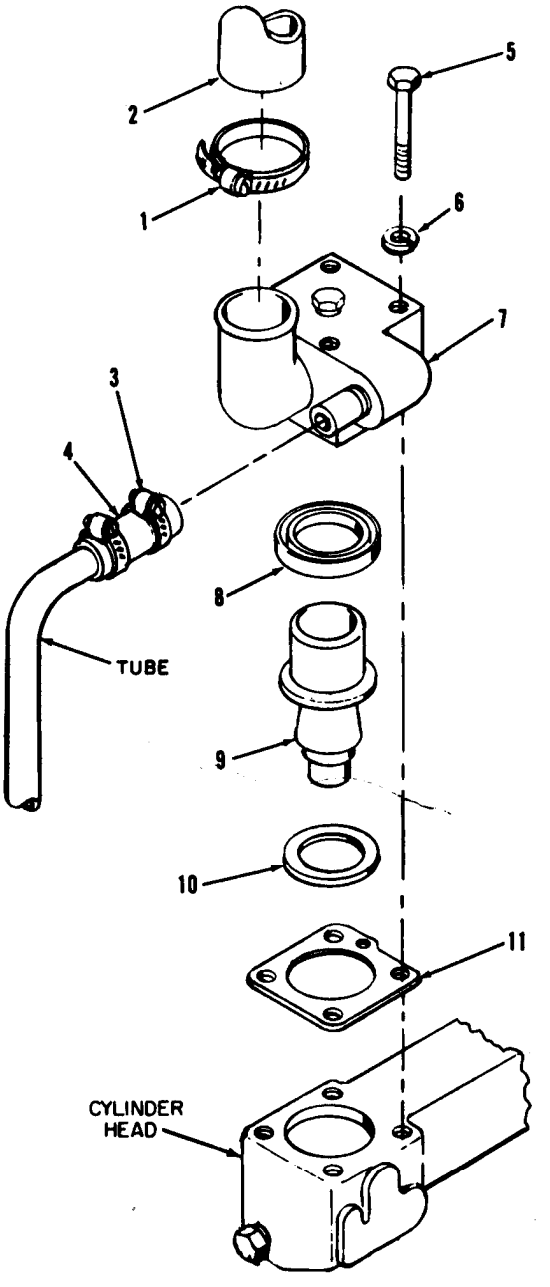


Figure 3-39. Coolant temperature regulator, removal and installation

Legend to figure 3-39:

1 Clamp	7 Housing
2 Hose	8 Seal
3 Clamp (2)	9 Temperature regulator
4 Hose	
5 Bolt (4)	10 Washer
6 Lock washer (4)	11 Gasket

4. Replace regulator that does not operate properly.

e. INSTALLATION. Install coolant temperature regulator in reverse sequence illustrated in figure 3-39, observing the following:

1. Service radiator with proper coolant, refer to paragraph 3-8.

3-83. WATER PUMP.

a. GENERAL. The water pump is mounted on the left front side of the engine. It is driven by the camshaft gear and pumps engine coolant through the engine and radiator.

b. REMOVAL. Remove water pump in sequence illustrated in figure 3-40, observing the following:

1. Drain coolant from radiator prior to pump removal, refer to paragraph 3-8.

2. On precise generator sets, disconnect hydraulic oil tank from thread spacers by removing two screws and lock washers. Carefully move tank away from water pump and block tank in position with filler cap up.

c. CLEANING. Clean gaskets from engine plate, tube flange, and elbow flange using a suitable tool. Exercise care to prevent gouging of surfaces.

d. INSTALLATION. Install water pump in reverse sequence illustrated in figure 3-40, observing the following:

1. Service radiator with proper coolant, refer to paragraph 3-8.

2. On precise generator sets, make sure hydraulic tank hoses are not kinked after tank installation.

3-84. TURBO CHARGER.

a. GENERAL. The turbo charger supercharges the engine to provide greater engine power output. It is driven by engine exhaust gases. The turbo charger draws in ambient air, compresses the air, and directs the compressed air into the engine intake manifold.

b. REMOVAL. Remove turbo charger in sequence illustrated in figure 3-41, observing the following:

1. Remove air cleaner, refer to figure 3-7.

2. Remove ether starting aid tube, nozzle, and bushing from intake elbow (4, figure 3-41) prior to elbow removal. Refer to figure 4-1.

3. Plug engine intake opening when turbo charger is removed.

c. CLEANING AND INSPECTION.

1. Clean old gasket from exhaust pipe, exhaust elbow, exhaust manifold, tube assembly, and strainer assembly using suitable tool.

2. Inspect seals (6, 8, 9, 11, and 38, figure 3-41) and rings (21 and 23) for condition.

3. Replace defective rings, seals, and all gaskets.

d. INSTALLATION. Install turbo charger in reverse sequence illustrated in figure 3-41, observing the following:

1. Fill turbo charger supply tube cavity a couple of times with engine lubricating oil prior to installation.

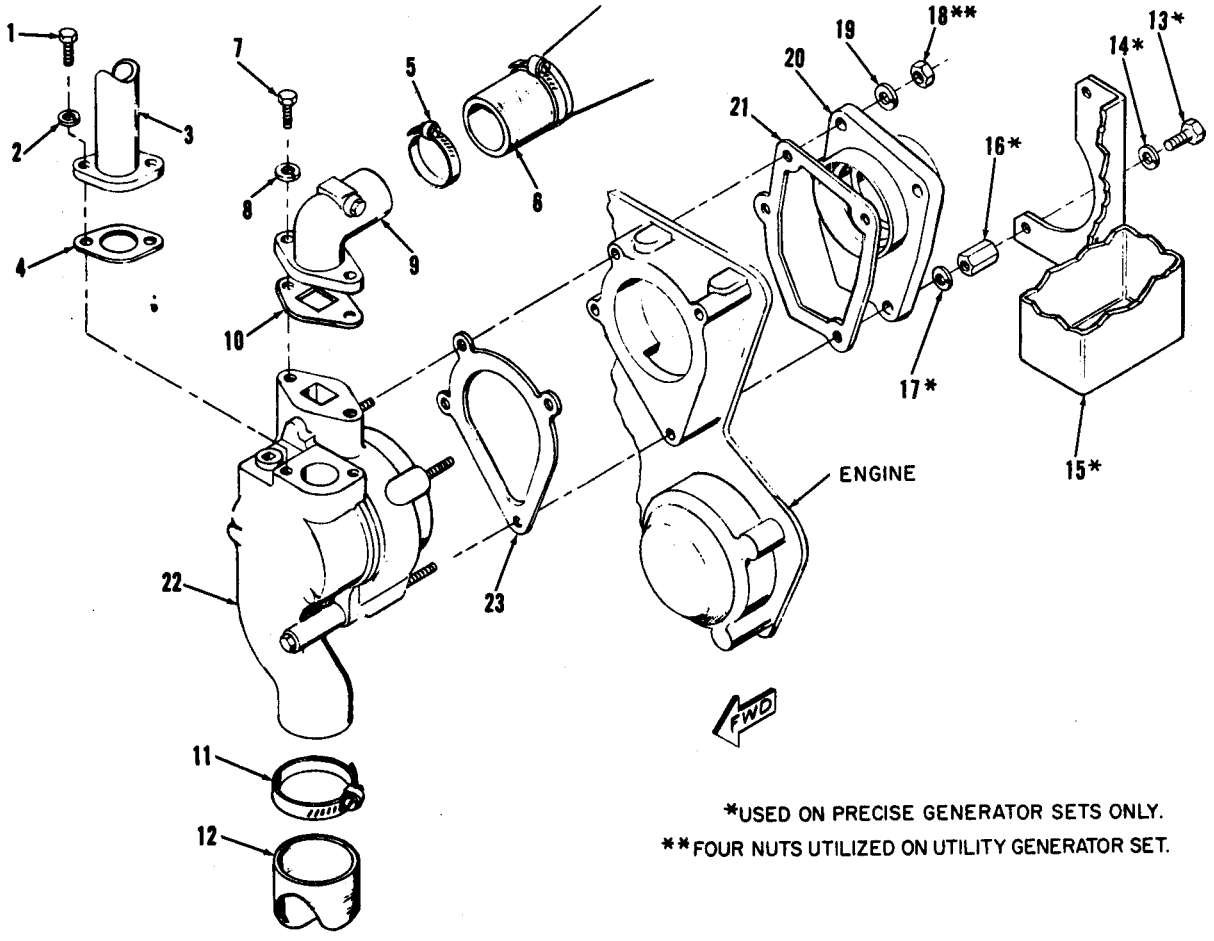


Figure 3-40. Water pump, removal and installation

Legend to figure 3-40:

1 Bolt (2)
2 Lock washer (2)
3 Tube
4 Gasket
5 Clamp
6 Hose
7 Bolt (2)
8 Lock washer (2)
9 Elbow
10 Gasket
11 Clamp
12 Hose
13 Screw (2)
14 Lock washer (2)
15 Hydraulic oil tank
16 Threaded spacer (2)
17 Lock washer (2)
18 Nut (2)
19 Lock washer (4)
20 Cover
21 Gasket
22 Water pump
23 Gasket

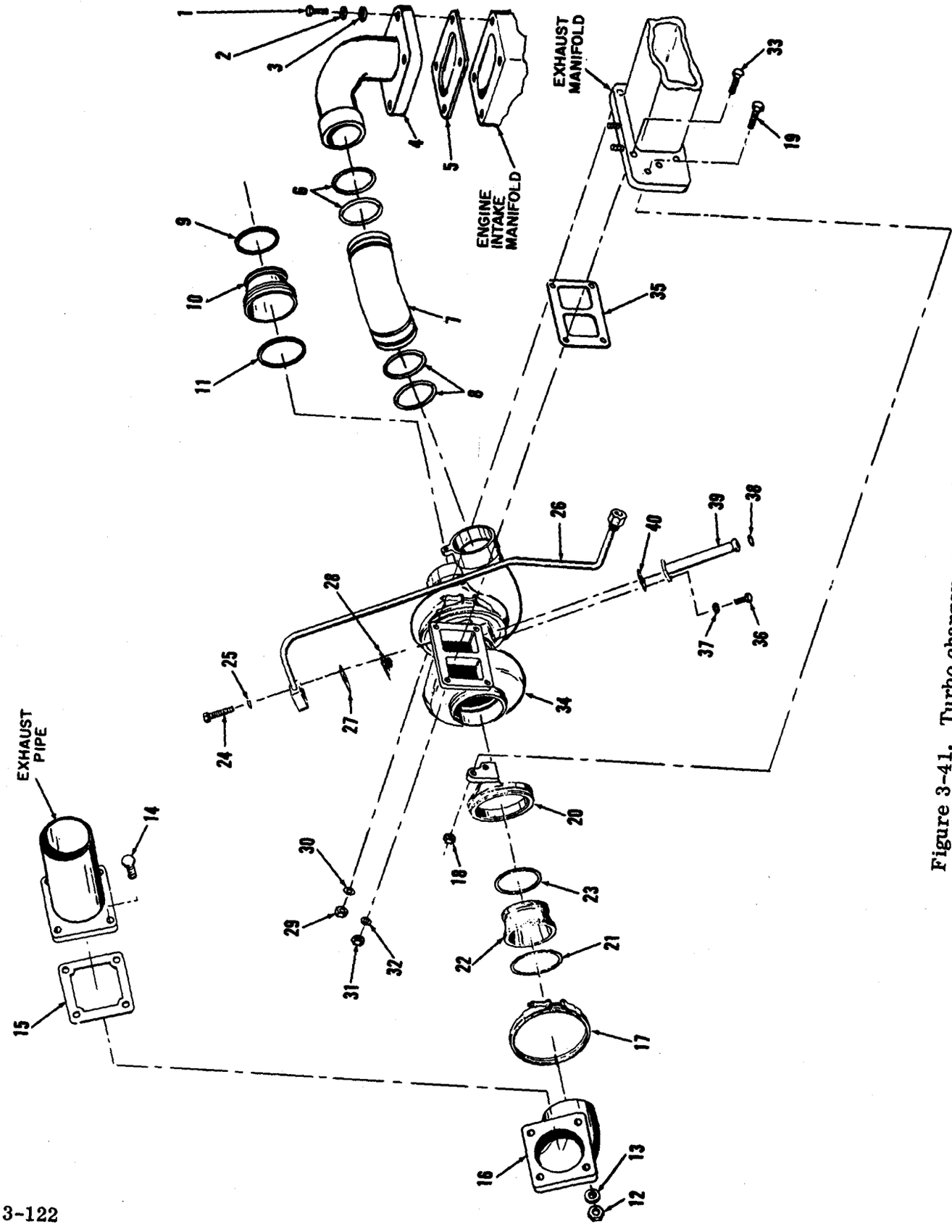


Figure 3-41. Turbo charger, removal and installation

Legend to figure 3-41:

1. Screw (4)
2. Lock washer (4)
3. Washer (4)
4. Intake elbow
5. Gasket
6. Seal (2)
7. Pipe
8. Seal (2)
9. Seal
10. Coupling
11. Seal
12. Nut (4)
13. Washer (4)
14. Bolt (4)
15. Gasket
16. Exhaust elbow
17. Clamp
18. Nut (2)
19. Screw (2)
20. Support
21. Ring
22. Coupling
23. Ring
24. Bolt (2)
25. Lock washer (2)
26. Tube
27. Gasket
28. Strainer
29. Nut (2)
30. Washer (2)
31. Nut (2)
32. Washer (2)
33. Bolt (2)
34. Turbo charger
35. Gasket
36. Bolt (2)
37. Lock washer (2)
38. Seal
39. Tube
40. Gasket

2. Apply antiseize compound to threads of turbo charger mounting bolts, studs, support bolts, and exhaust elbow bolts prior to installation.

3. Tighten turbo charger and support mounting nuts (18, 29, and 31) to 40 ± 4 foot pounds torque.

4. Tighten clamp (17) nut to 10 foot pounds torque.

5. Install ether starting aid bushing, nozzle, and tube in exhaust elbow (4). Refer to figure 4-1.

6. Install air cleaner, refer to figure 3-7.

3-85. BREATHER ASSEMBLY.

a. GENERAL. The engine breather assembly is located on the top of the valve cover assembly. The breather removes oil vapor from air inside the engine prior to it being vented to atmosphere.

b. REMOVAL. Remove breather assembly as illustrated in figure 3-42.

c. CLEANING AND INSPECTION.

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

2. Place breather assembly in clean container and permit cleaning solvent to drain from element.

3. Inspect for cracks, breaks, and other damage. Replace defective parts.

d. INSTALLATION. Install breather assembly as illustrated in figure 3-42.

CAUTION

Make sure cleaning solvent is completely drained from element prior to installation.

3-86. VALVE LASH ADJUSTMENT.

a. GENERAL. Engine valve lash should be adjusted when valves become noisy. Valve lash should be checked at 500 hours and then every 2000 hours of engine operation thereafter.

b. ADJUSTMENT PROCEDURE. Refer to figure 3-43 and adjust valve lash as follows:

NOTE

Cylinders are numbered consecutively from front to rear. Inlet valves are first valves at each cylinder as viewed from front of engine.

1. Remove flywheel housing cover as illustrated in A, figure 3-43.

2. Clean around valve cover assembly. Remove cover assembly and gasket as illustrated in B, figure 3-43.

NOTE

When number one piston is at top dead center on compression stroke, inlet and exhaust valves for the cylinder are closed. Rocker arms for each valve are free to move the amount of the valve lash setting.

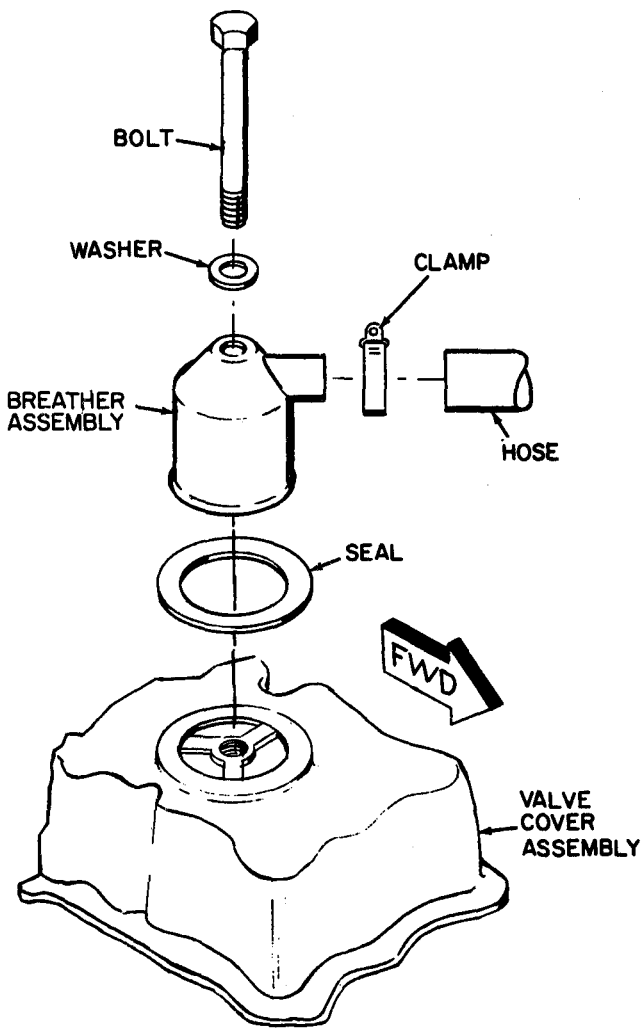


Figure 3-42. Breather assembly, removal and installation

3. Rotate engine until TC1, 6CYL marks on flywheel are aligned with timing pointer and number one piston is at top dead center on compression stroke.

CAUTION

Valve lash adjustment shall be accomplished on a cold engine.

4. Adjust inlet valves of cylinders number one, two, and four to 0.015 of an inch and exhaust valves of cylinders number one, three, and five to 0.025 of an inch as follows:

(a) Insert feeler gauge as shown in C, figure 3-43. Loosen locknut and rotate adjusting screw until proper clearance is obtained.

(b) Hold adjusting screw and tighten lock nut. Recheck clearance.

5. Rotate engine 360 degrees and align TC1, 6CYL marks with timing pointer. Number six piston should be at top dead center on compression stroke.

6. Adjust inlet valves of cylinders number three, five, and six to 0.015 of an inch and exhaust valves of cylinders number two, four, and six to 0.025 of an inch. Repeat to step 4(a) and 4(b) above.

7. Start engine and observe valves. Valves should rotate slightly with each opening.

8. Inspect valve cover gasket, replace if necessary. Install valve cover assembly and gasket. Tighten valve cover assembly bolts to 8 ± 2 foot pounds in the sequence illustrated in D, figure 3-43.

9. Install flywheel housing cover

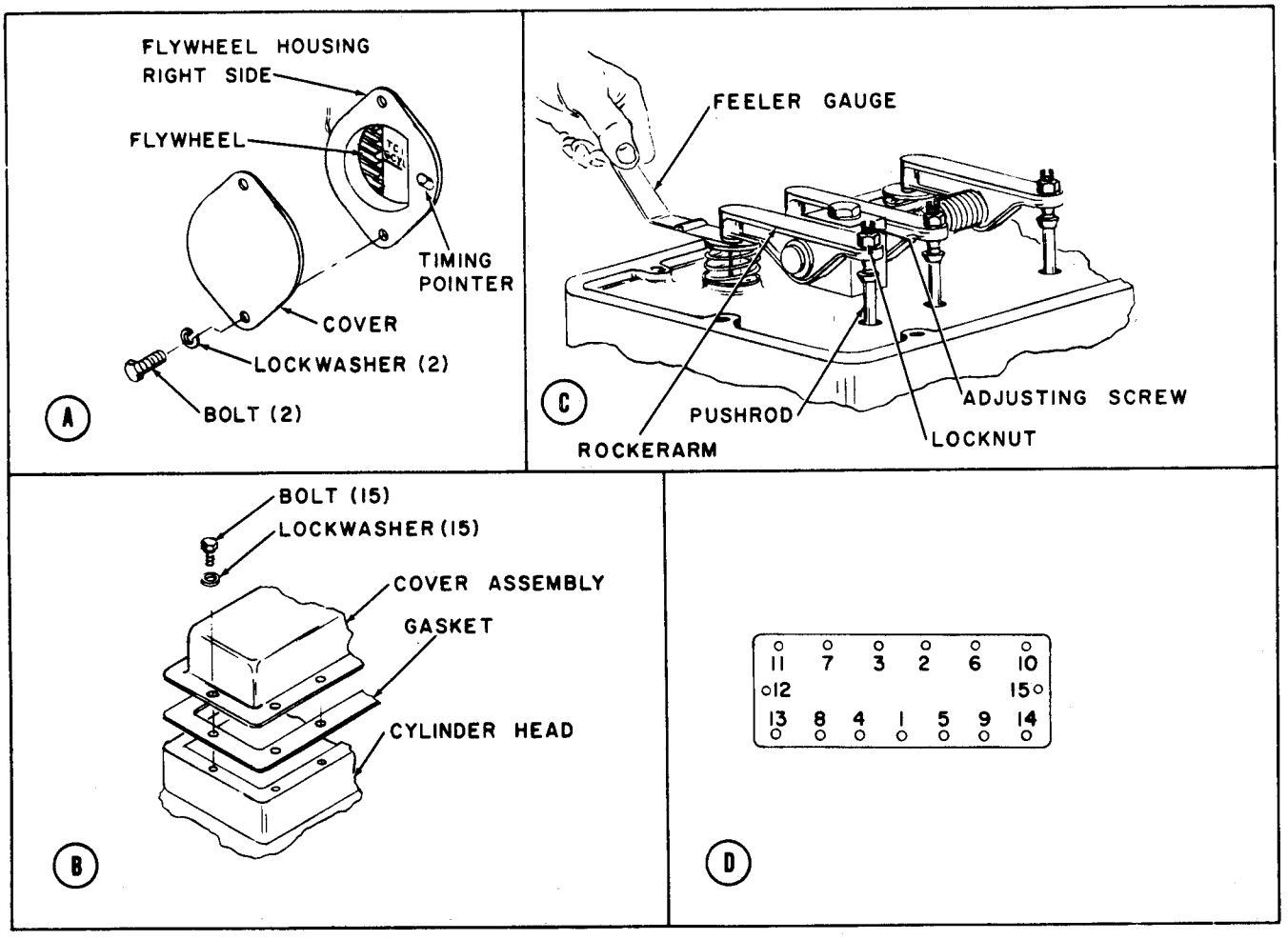


Figure 3-43. Valve lash, adjustment

3-87. MANUAL SPEED CONTROL.

a. GENERAL. The manual speed control permits engine speed adjustment through action of the utility governor. Rapid engine speed adjustment is made by depressing button and pulling out or pushing in control; pushing in on control increases speed. Fine adjustment is made by rotating vernier knob. Clockwise rotation of vernier will increase speed. The control is locked in the maximum fuel position on precise generator sets.

b. REMOVAL. Refer to figure 3-44 and remove manual speed control in the order of index numbers.

c. CLEANING AND INSPECTION.

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

2. Inspect for cracks, breaks, and other damage. Replace defective parts.

Legend to figure 3-44:

1. Screw
2. Nut
3. Rod end
4. Nut
5. Screw
6. Nut
7. Washer
8. Spacer
9. Screw
10. Washer
11. Nut
12. Speed control lever
13. Screw
14. Nut
15. Washer
16. Male rod end
17. Nut
18. Rod end
19. Screw
20. Washer
21. Speed control arm
22. Setscrew (2)
23. Shaft extender
24. Screw (2)
25. Nut (2)
26. Washer (2)
27. Plate
28. Screw (2)
29. Nut (2)
30. Washer (2)
31. Bracket
32. Cable support bracket
33. Nut
34. Washer
35. Washer
36. Nut
37. Nut
38. Washer
39. Push-pull control

d. INSTALLATION. Refer to figure 3-44 and install manual speed control in the reverse order of index numbers. Observe the following:

1. Position push-pull control (39) in housing and secure with nut (37) and washer (38).

2. Position push-pull control (39) in cable support bracket (32) as shown in detail C.

3. When securing brackets (31 and 32) to lifting frame make sure that elongated holes in bracket (31) are centered on mounting screws.

NOTE

Do not connect speed control arm (21) to shaft extender (23) at this time.

4. Adjust length of rod ends (16 and 18) to obtain a dimension of two inches center-to-center of rod end holes. Tighten nut (17).

NOTE

Do not tighten nut (4) at this time.

5. Screw rod end (3) on push-pull control (39) so that approximately ten threads of control are exposed.

6. Adjust manual speed control as specified in step e.

e. ADJUSTMENT. To adjust manual speed control, refer to figure 3-44 and proceed as follows:

1. Depress push-pull control button and pull out knob approximately 1/4 inch, as shown in detail A.

2. Manually rotate governor input shaft to full counterclockwise position. Position speed control arm (21) on shaft extender (23) and tighten screw (19).

3. Depress push-pull control button and move control in and out. Check for any binding. Correct cause of binding before continuing adjustment.

4. Start engine as specified in paragraph 2-12 and permit engine to warm up.

CAUTION

When adjusting rod end (3), make sure a minimum of 1/4 inch of push-pull control is threaded into rod end.

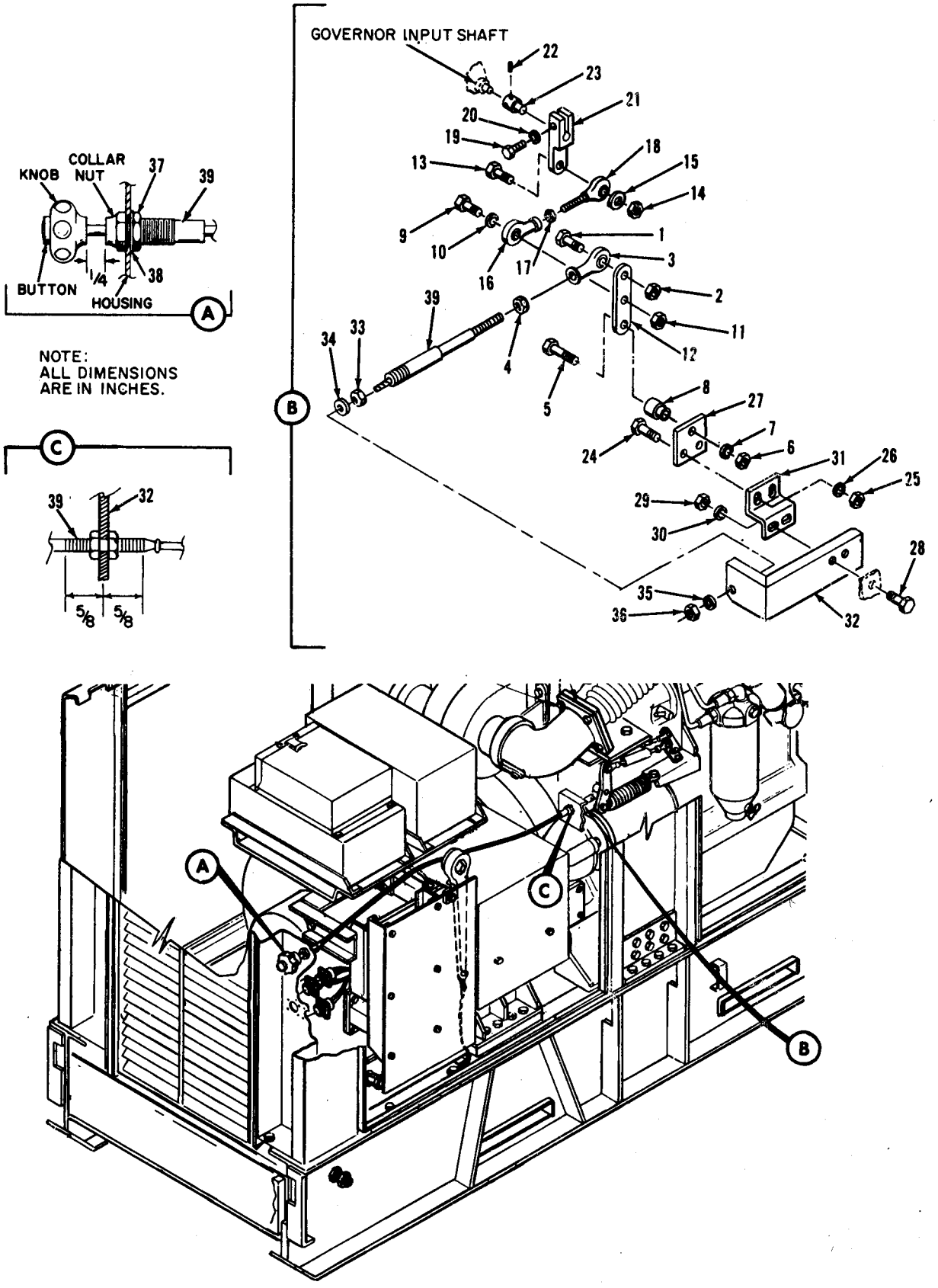


Figure 3-44. Manual speed control, removal and installation

NOTE

Use a suitable strobe for determining engine speed.

5. Depress push-pull control button and push control all the way in while observing engine speed. Do not exceed engine speed of 2250 RPM. If engine speed exceeds 2250 RPM, the governor high speed stop is improperly adjusted. Refer to higher level of maintenance for corrective action. If engine speed does not reach 2250RPM, shut down engine, remove screw (1), and turn rod end (3) counterclockwise, to extend length of control. Connect rod end (3) to speed control arm (12).

NOTE

If 2250 RPM engine speed can not be obtained after performing adjustments in step 6, the governor high speed stop is improperly adjusted. Refer to higher level of maintenance for corrective action.

6. Start engine and recheck speed setting. Repeat adjustment procedure in step 5 until 2250 RPM is obtained. If engine speed of 2250 RPM is not obtained with a minimum of 1/4 inch of push-pull control (39) in rod end (3), turn nuts (33 and 36) clockwise to extend length of push-pull control. Adjust rod end (3) and nuts (33 and 36) until 2250 RPM is obtained. If adjustment can not be obtained, loosen screws (28) and reposition bracket (31) to extend length of push-pull control. Repeat above procedure to obtain 2250 RPM.

7. Tighten nuts (4, 33, and 36). Recheck speed setting.

8. Depress push-pull control button and pull control all the way out. Engine speed should not be less than 800 RPM. If engine speed is less than 800 RPM, governor low speed stop is improperly adjusted. Refer to higher level of maintenance for corrective action.

3-88. GOVERNOR LINKAGE UTILITY GENERATOR SETS.

a. GENERAL. The linkage is connected to the utility governor output shaft and engine fuel rack shaft. The linkage transmits utility governor signal to the fuel rack via levers and a rod to increase or decrease engine speed. If the rod assembly becomes disconnected from the levers, the return spring will move the fuel rack to the no fuel position. The spring assembly provides a constant pressure on the linkage to insure positive response to the utility governor signal.

b. REMOVAL. On utility generator sets, remove governor linkage in sequence illustrated in figure 3-45, observing the following:

1. Only loosening of screw (10) and setscrew (26) is necessary to remove rack lever (13) and governor output lever (27).

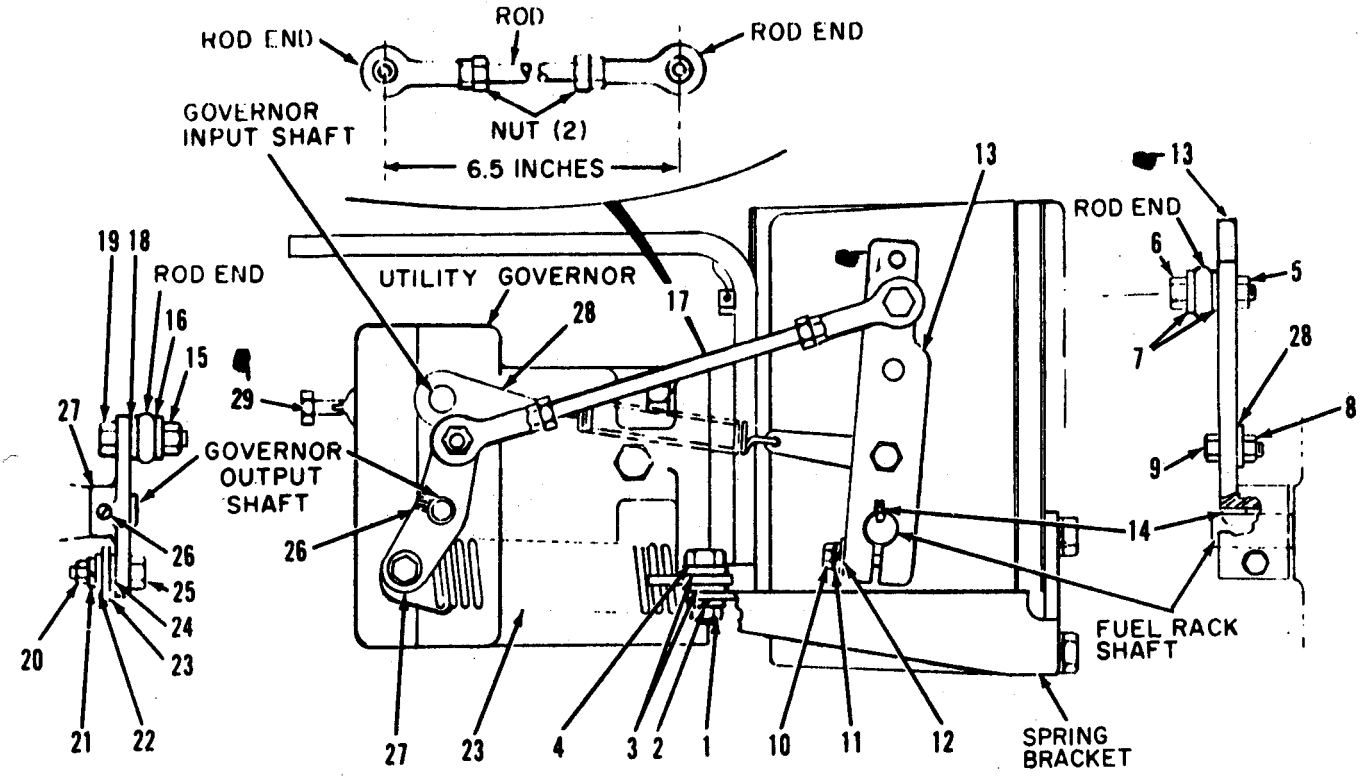


Figure 3-45. Governor linkage utility generator sets, removal, installation, and adjustment

Legend to figure 3-45:

1. Nut
2. Lock washer
3. Washer (2)
4. Screw
5. Nut
6. Screw
7. Washer (2)
8. Nut
9. Screw
10. Screw
11. Lock washer
12. Washer
13. Rack lever
14. Key
15. Nut
16. Washer
17. Rod assembly
18. Washer
19. Screw
20. Nut
21. Lock washer
22. Washer
23. Spring assembly
24. Washer
25. Screw
26. Setscrew
27. Governor output lever
28. Return spring
29. Low speed adjustment

2. Remove return spring from governor input shaft as follows:

(a) Mark alignment marks on shaft extender (23, figure 3-44) and utility governor input shaft.

(b) Loosen setscrews (22) and remove shaft extender (23) from input shaft.

(c) Remove return spring from shaft.

c. CLEANING AND INSPECTION.

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

2. Inspect parts for cracks, breaks, and other damage. Replace defective parts.

d. INSTALLATION AND ADJUSTMENT. Refer to figure 3-45 and install and adjust governor linkage on utility generator sets as follows:

1. Position key (14) in fuel rack shaft and install rack lever (13). Tighten screw (10).

2. Connect return spring (28) to rack lever (13) and secure with screw (9) and nut (8).

NOTE

Amount of rod threaded into each rod end should be approximately equal.

3. Adjust length of rod assembly (17) to approximately 6.5 inches as illustrated by loosening nuts and rotating rod ends. Tighten nuts after adjustment is made.

4. Connect rod assembly (7) to rack lever (13) and secure with screw (6), nut (5), and washer (7).

5. Position return spring (28) on governor input shaft.

6. Align alignment marks on shaft extender (23, figure 3-44) and governor input shaft. Secure shaft extender with setscrew (22).

7. Make sure governor output shaft is in no fuel position (full counterclockwise looking at shaft). Position governor output lever (27, figure 3-45) on governor output shaft so that when a horizontal line is drawn through center of shaft, center of spring assembly hole is 6 degrees ±5 degrees forward of shaft center line. Tighten setscrew (26).

8. Position rack lever (13) and governor output lever (27) in no fuel position (toward rear of generator set). If necessary loosen rod end nut and adjust rod end until screw holes in governor output lever (27) and rod assembly (17) are aligned. Tighten rod end nut. Secure rod assembly to governor output shaft with screw (9), nut (15), and washers (16 and 18).

9. Connect spring assembly (23) to governor output lever (27) and spring bracket as follows:

(a) The left-hand extremity should be mounted on the governor output lever (27) so that the end of the spring that is against the extremity (three spring coils visible) is facing inboard toward the governor (Ref. Fig. 3-45A). Insert centering washers (22 & 24) on each side of the extremity and mount the spring assembly (23) on the governor lever (27) by installing hardware (20, 21, 25). Do not tighten hardware at this time.

(b) Place a centering washer (2) on each side of the right-hand extremity and place bolt (4) through the extremity and washers. Grasp the spring body and pull until the bolt and extremity can be mounted on the spring brackets. The end of the spring that is against the extremity (3 spring coils visible) should be facing up (Ref. Fig. 3-45A). Install hardware (1, 2) making sure that the right-hand extremity is mounted flat against the bracket. The spring may have to be rotationally torqued in order to install the extremity flat on the bracket.

(c) The extremities should be approximately 90° to each other.

Tighten all hardware. Check to see that both spring extremities move freely within their centering washers.

3-89. GOVERNOR LINKAGE PRECISE GENERATOR SETS.

a. GENERAL. The linkage interconnects the output shaft of the utility governor, fuel rack shaft, and the precise governor actuator output shaft. The utility governor is locked in the maximum fuel which in turn positions the engine fuel rack into its maximum fuel position. When the engine is started, it increases speed due to position of the utility governor and fuel rack. When the engine reaches approximately 1180 to 1220 RPM the speed switch energizes the precise governor system which in turn energizes the precise governor actuator. The precise actuator output of approximately 70 pounds force overrides the utility governor setting and maintains control of the engine speed via the governor linkage as signalled by the precise governor control system.

b. REMOVAL. On precise generator sets, remove governor linkage in sequence illustrated in figure 3-46, observing the following:

1. Only loosen screw (15) and setscrew (35) to remove rack lever (17) and governor output lever (36).

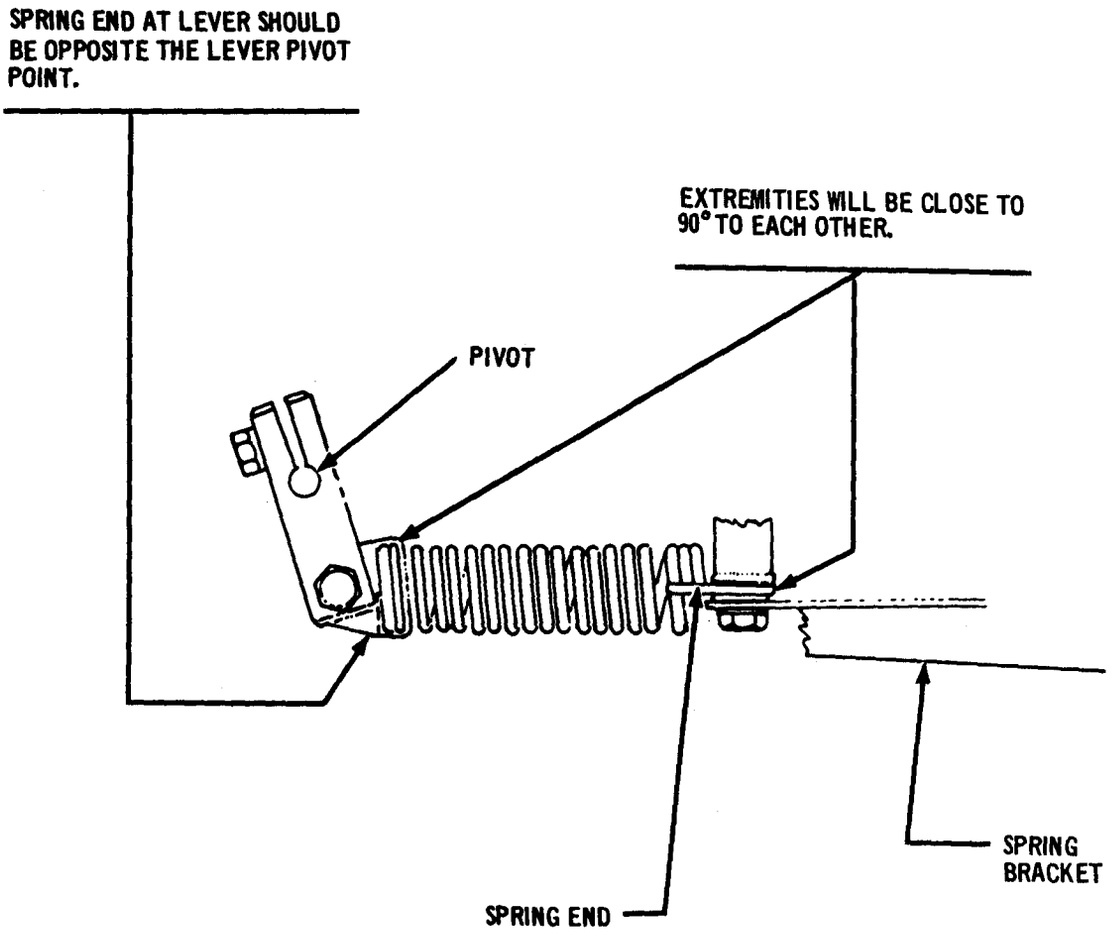


Figure 3-45A. Governor Spring Installation,Proper Alignment

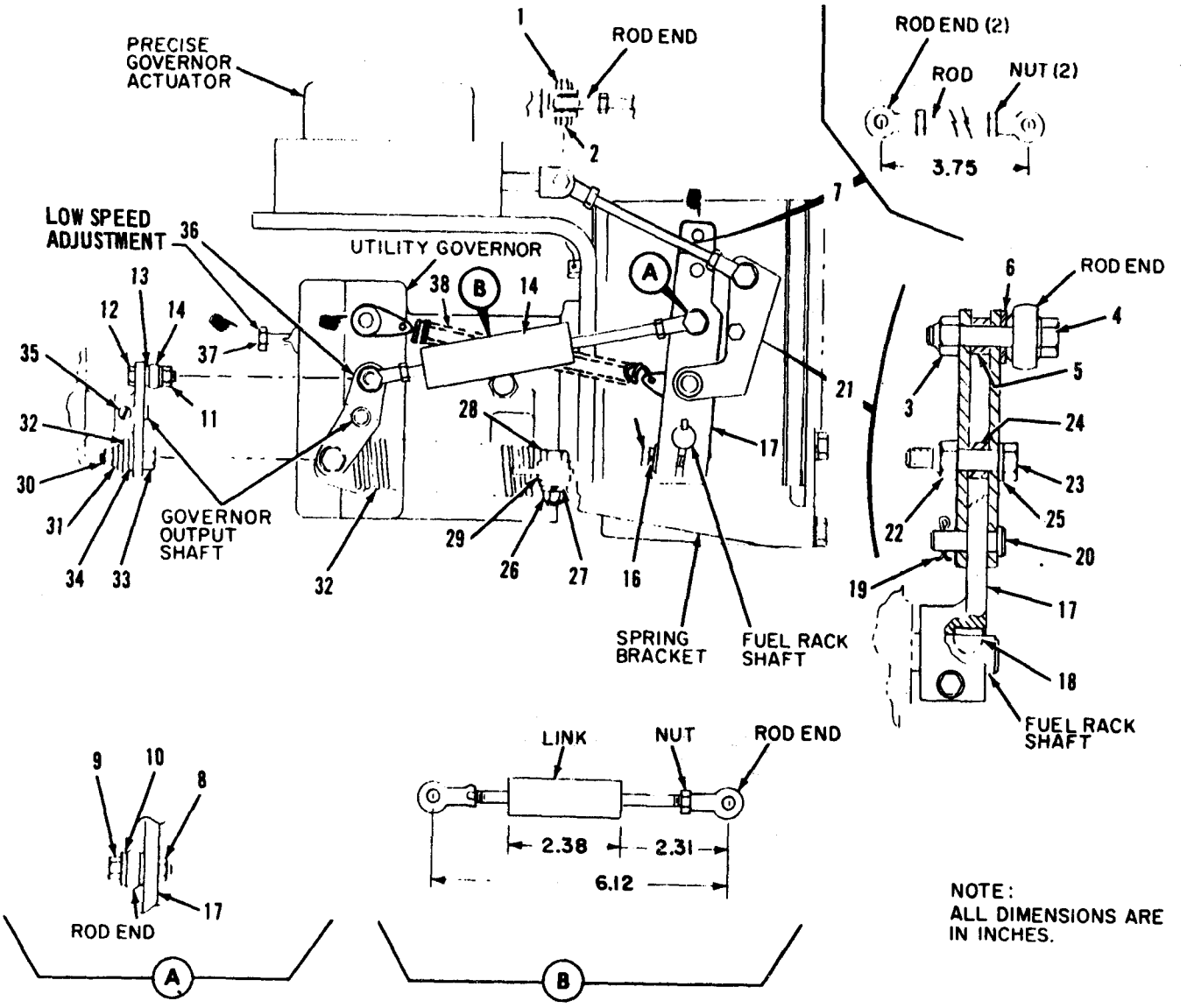


Figure 3-46. Governor linkage precise generator sets, removal, installation, and adjustment

Legend to figure 3-46:

1. Nut
2. Screw
3. Nut
4. Screw
5. Spacer
6. Washer
7. Rod assembly
8. Nut
9. Screw
10. Washer
11. Nut
12. Screw
13. Washer
14. Link assembly
15. Screw
16. Lock washer
17. Rack lever
18. Key
19. Cotter pin
20. Pin
21. Rack lever extension
22. Nut
23. Screw
24. Spacer
25. Washer
26. Nut
27. Lock washer
28. Screw
29. Washer (2)
30. Nut
31. Lock washer
32. Spring assembly
33. Screw
34. Washer (2)
35. Setscrew
36. Governor output lever
37. Low speed adjustment
38. Return spring

c. CLEANING AND INSPECTION.

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

2. Inspect parts for cracks, breaks, and other damage. Replace defective parts.

d. INSTALLATION AND ADJUSTMENT. Refer to figure 3-46 and install and adjust governor linkage on precise generator sets as follows:

1. Position rack lever extension (31) on rack lever (17) and secure with pin (20) and cotter pin (19).

2. Position key (18) in fuel rack shaft and install rack lever (17). Tighten screw (15).

NOTE

Amount of rod threaded in each rod end should be approximately equal.

3. Adjust link assembly (14) to approximately 6.12 inches and rod assembly (7) to approximately 3.75 inches by loosening nuts and rotating rod ends. Tighten nuts.

4. Connect rod assembly (7) to rack lever extension (21) and link assembly (14) to rack lever (17).

Insert a 0.020 feeler gauge between the rack lever extension (21) and rack lever (17) in line with link assembly (14) rod end.

CAUTION

Do not exceed the fuel rack stop when positioning the fuel rack to full fuel position. Resistance in movement of lever will be felt when stop position is reached.

6. Position precise governor actuator shaft and rack lever (17) in the full fuel position (toward front of generator set). If necessary loosen rod end and adjust rod end until screw holes in the precise governor actuator and rod assembly (7) are aligned. Make sure feeler gauge is in position and tighten rod end nut. Secure rod assembly to precise governor actuator with screw (2) and nut (1). Remove feeler gauge.

7. Make sure governor output shaft is in no fuel position (full counterclockwise looking at shaft). Position governor output lever (36) on governor output shaft so that when a horizontal line is drawn through center of shaft, center of spring assembly (32) hole is 6 degrees ±5 degrees forward of shaft center line. Tighten setscrew (35).

8. Position rack lever (17) and governor output lever (36) in no fuel position (toward rear of generator sets). If necessary loosen rod end nut and adjust rod end until screw holes in governor output lever (36) and link assembly (14) are aligned. Tighten rod end nut. Secure rod assembly to governor output shaft with screw (12), nut (11), and washer (13).

9. Connect spring assembly (32) to governor output lever (36) and spring bracket as follows:

(a) The left-hand extremity should be mounted on the governor output lever (36) so that the end of the spring that is against the extremity (three spring coils visible) is facing inboard toward the governor (ref. fig. 3-45A). Insert centering washers (34) on each side of the extremity and mount the spring assembly (36) on the governor lever (36) by installing hardware (30, 31, 33). Do not tighten hardware

at this time.

(b) Place a centering washer (29) on each side of the right-hand extremity and place bolt (28) through the extremity and washers. Grasp the spring body and pull until the bolt and extremity can be mounted on the spring bracket. The end of the spring that is against the extremity (3 spring coils visible) should be facing up (ref. fig. 3-45A). Install hardware (26, 27) making sure that the right hand extremity is mounted flat against the bracket. The spring may have to be rotationally torqued in order to install the extremity flat on the bracket.

(c) The extremities should be approximately 90° to each other. Tighten all hardware. Check to see that both spring extremities move freely within their centering washers.

3-90. HYDRAULIC FILTER (PRECISE GENERATOR SETS).

a. GENERAL. The hydraulic filter is located on the right side of the engine. It

Legend to figure 3-47:

1. Hose	6. Screw (2)	11. Nut	16. Bowl	21. Plug
2. Hose	7. Bracket	12. Elbow	17. Element	22. Packing
3. Nut (2)	8. Elbow	13. Gasket	18. Backup ring	23. Spring
4. Screw (2)	9. Gasket	14. Washer	19. Packing	24. Relief valve poppet
5. Nut (2)	10. Washer	15. Nut	20. Backup ring	25. Head

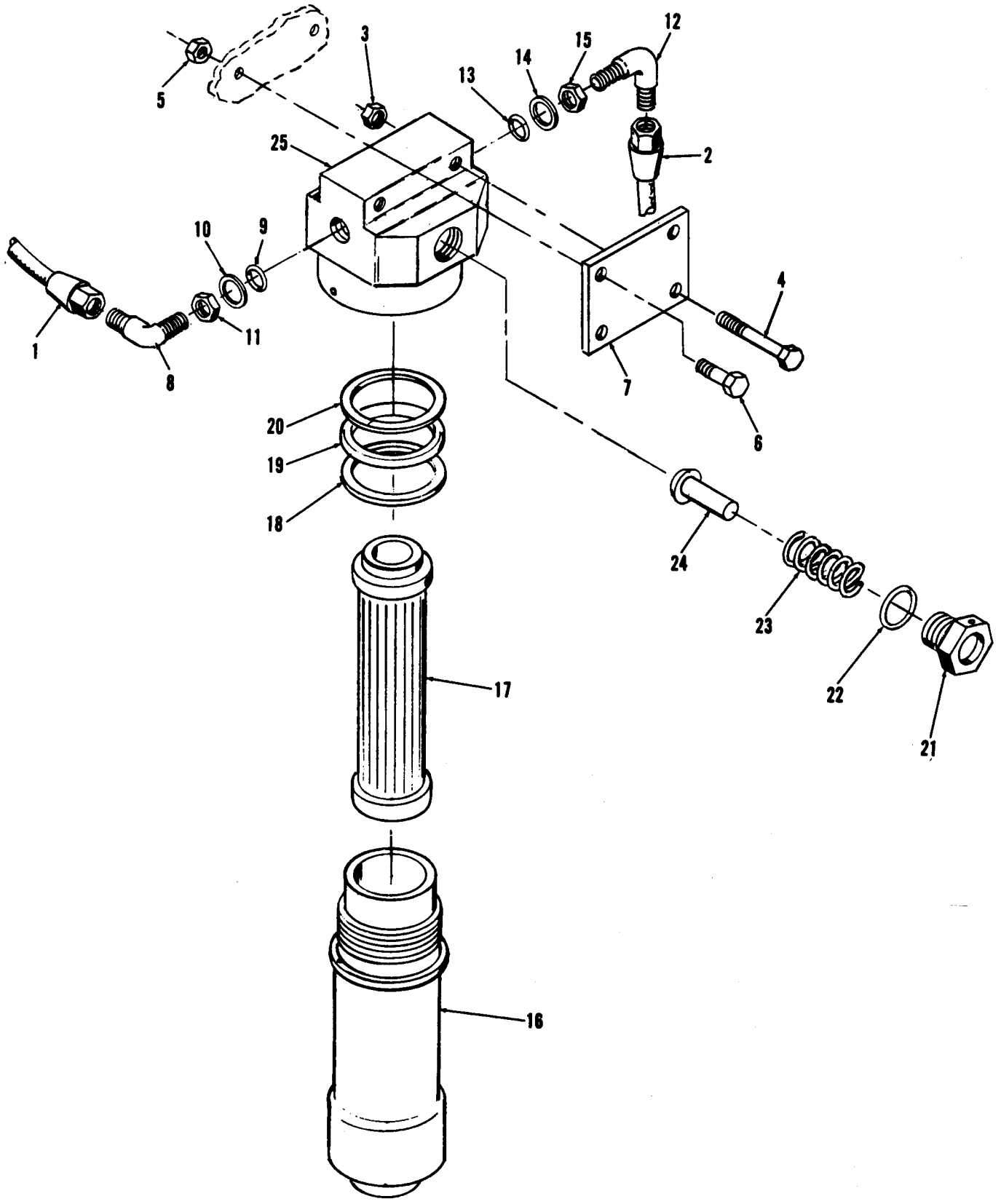


Figure 3-47. Hydraulic filter (precise generator sets), exploded view

removes particles of 10 micron and larger from the hydraulic fluid. It is equipped with an integral bypass valve that opens in the event that a pressure differential of 50 ± 5 PSIG exists in the filter. The relief valve assures operation of the hydraulic system in the event of a clogged filter element.

b. SERVICE. To service hydraulic filter, refer to figure 3-47 and proceed as follows:

1. Cut lockwire. Remove bowl (16) and element (17). Discard element.

2. Clean bowl with an approved cleaning solvent and dry thoroughly.

3. Soak new element in clean hydraulic fluid conforming to Military Specification MIL-H-5606 to remove air trapped in filter material.

4. Apply a light coat of hydraulic fluid to packing (19) and backup rings (18 and 20) in head (25) and threads of bowl (16).

5. Install element in bowl and fill bowl with clean hydraulic fluid. Install bowl in head and tighten bowl to 75 inch pounds torque. Lockwire bowl to head.

c. REMOVAL AND DISASSEMBLY. Remove and disassemble hydraulic filter in sequence illustrated in figure 3-47, observing the following:

1. Note location of IN and OUT ports to insure proper installation.

2. Install suitable plugs in hoses when filter is removed.

d. CLEANING AND INSPECTION.

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

2. Inspect for cracks, breaks, and other damage. Replace defective parts, element, gaskets, backup rings, and packings.

e. REASSEMBLY AND INSTALLATION. Reassemble and install hydraulic filter in reverse sequence illustrated in figure 3-47, observing the following:

1. Install backup rings (18 and 20) so that smooth hair side of backup rings are against packing (19).

2. Perform steps b. 3. through b. 5.

3. Lockwire plug (21) to head (25).

4. If necessary, bleed hydraulic system, refer to paragraph 3-92.

3-91. PRECISE GOVERNOR ACTUATOR FILTER (PRECISE GENERATOR SETS).

a. GENERAL. The precise governor actuator is utilized on precise generator sets and is mounted above the utility governor. The actuator is equipped with a filter in its hydraulic fluid supply port to remove particles from the fluid that may have passed through the hydraulic filter.

b. REMOVAL. Remove governor actuator filter in sequence illustrated in figure 3-48, observing the following:

1. Install suitable plug in supply hose (17) and opening in governor actuator when filter (7) is removed.

c. CLEANING AND INSPECTION.

1. Clean filter with an approved cleaning solvent and dry thoroughly.

2. Inspect filter for cuts, tears, and holes.

3. Replace gasket and defective filter.

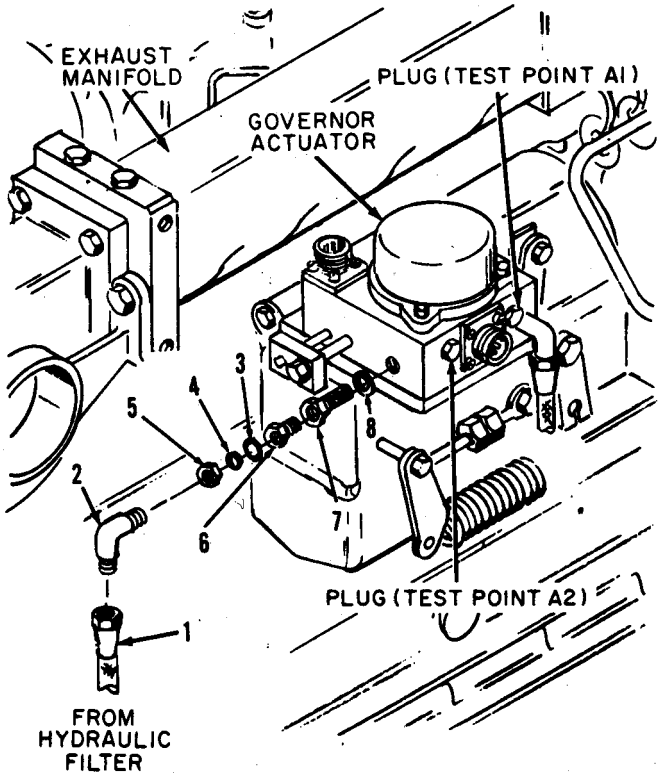


Figure 3-48. Precise governor actuator filter servicing and test points (precise generator sets)

Legend to figure 3-48:

1. Supply hose	5. Nut
2. Elbow	6. Reducer
3. Gasket	7. Filter
4. Washer	8. Gasket

d. INSTALLATION. Install governor actuator filter in reverse sequence illustrated in figure 3-48, observing the following:

Bleed hydraulic system after filter installation, refer to paragraph 3-92.

3-92. HYDRAULIC SYSTEM BLEEDING (PRECISE GENERATOR SETS)

a. GENERAL. The hydraulic system should be bled whenever maintenance has been performed on hydraulic system components or whenever air is trapped in the hydraulic system.

b. BLEEDING PROCEDURE. Refer to figure 3-48 and bleed hydraulic system at governor actuator as follows:

1. Start engine as specified in paragraph 2-12.

WARNING

Hydraulic system operates at approximately 320 PSIG. Keep eyes and body away from air-fluid spray when bleeding system.

2. Loosen supply hose (a maximum of one half turn) until air-free fluid flows from hose. Tighten hose.

CAUTION

Check hydraulic tank fluid level periodically. Service as required, refer to paragraph 3-16.

3. Loosen plugs at test points A1 and A2 until air-free fluid flows from plugs. Do not loosen plugs more than two turns. Tighten plugs.

4. Vary engine speed utilizing frequency adjust rheostat (20, figure 2-8).

5. Repeat steps b. through d. until air-free fluid is at bleed points.

6. Stop engine, refer to paragraph 2-13. Service hydraulic tank, refer to paragraph 3-16.

CHAPTER 4

MATERIEL USED IN CONJUNCTION WITH MAJOR ITEM

Section I. GENERAL

4-1. SCOPE.

This chapter contains maintenance instructions within the scope of the operator and organizational maintenance personnel for materiel used in conjunction with the generator set, as allocated by the maintenance allocation chart provided in Appendix C. It also provides a brief description of the materiel and their functions relative to the components of the generator set.

4-2. SERVICE UPON RECEIPT OF MATERIEL.

Upon receipt of materiel, components shall be removed from shipping containers, placed in a clean work area, and the following performed:

a. Check to see that all components are present.

b. Remove corrosion preventive compounds using suitable cleaning solvent.

c. Perform a visual inspection of components for obvious deficiencies, such as loose or missing bolts, nuts, and pins and for bent, cracked, or broken parts.

d. Inspect wires and terminals for damage and loose connections.

Section II. ETHER STARTING AID

4-3. GENERAL.

The ether starting aid is provided to aid in engine starting during cold weather operation. The aid consists of an ether cylinder, primer, atomizer, tube, wiring, and engine primer switch. When the engine primer switch is positioned to ON, with the start-run-stop switch in the START position, electrical power energizes the ether primer which momentarily off-seats the ether cylinder check valve. Off-seating of the check valve permits a metered amount of ether to flow through the atomizer. Ether passing through the atomizer is atomized and mixed with engine inlet air increasing the combustibility of the air-fuel mixture in the engine cylinders.

Either of two ether solenoid valve assemblies and cylinder clamps may be installed on the generator set. The solenoid valves are interchangeable but must utilize their respective cylinder clamps. Before disassembling the solenoid valve assembly, locate the respective valve in figure 4-1 and utilize the disassembly procedure for that valve assembly only.

4-4. TROUBLESHOOTING.

Table 4-1 provides information useful in diagnosing and correcting unsatis-

Table 4-1. Ether Starting Aid Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
Ether is not injected into engine when engine primer switch is positioned to ON.	a. Improper operating procedures.	a. Operate properly (paragraph 2-22).
	b. Ether cylinder not installed.	b. Install cylinder (paragraph 4-5).
	c. Ether supply exhausted.	c. Install new cylinder (paragraph 4-5).
	d. Battle short switch in ON position.	d. Position switch to OFF.
	e. Defective engine primer switch.	e. Replace switch (paragraph 3-59).
	f. Defective start-run-stop switch.	f. Replace switch (paragraph 3-59).
	g. Defective battle short switch.	g. Replace switch (paragraph 3-59).
	h. Defective wiring.	h. Repair or replace wiring (figure 1-7 for 50/60 hertz generator sets or figure 1-8 for 400 hertz generator sets).
	i. Defective ether primer.	i. Repair or replace primer (paragraph 4-5).
	j. Clogged or defective ether supply tube	j. Clean or replace tube (paragraph 4-5).
	k. Clogged atomizer.	k. Clean or replace atomizer (paragraph 4-5).

factory operation or failure of the ether starting aid.

4-5. ETHER STARTING AID.

a. REMOVAL. Remove components of ether starting aid in sequence illustrated in figure 4-1, observing the following:

1. Hold radio suppression diode assembly in position when removing cylinder clamp. After clamp removal, reinstall clamp screw and nut finger tight to hold diode assembly in position. Refer to figure 3-10.

b. ETHER PRIMER DISASSEMBLY. SOLENOID VALVE ASSEMBLY. (17, Figure 4-1)

NOTE

Disassemble primer only if defective.

1. Remove connector (1, figure 4-1) from wiring. Loosen screw (20) and remove nut (21).

2. Remove cover (22). Push wires through grommet (24) as coil (23) is removed. Remove valve (25) from bracket (26).

Legend to figure 4-1

1. Connector
2. Tube
3. Atomizer
4. Bushing
5. Cylinder bracket
6. Ether cylinder
7. Nut (2)
8. Lock washer (2)
9. Screw (2)
10. Cylinder clamp
11. Clamp bracket
12. Nut (2)
13. Lock washer (2)
14. Screw (2)
15. Clamp
16. Elbow
17. Ether solenoid valve assembly
18. Cap assembly
19. Preformed packing
20. Screw
21. Nut
22. Cover
23. Coil
24. Grommet
25. Valve
26. Bracket
27. Ether solenoid valve assembly
28. Cap assembly
29. Preformed packing
30. Body assembly
31. Nut
32. Bumper washer
33. Seal
34. Preformed packing
35. Armature
36. Preformed packing
37. Coil cover
38. Coil housing
39. Coil
40. Bracket

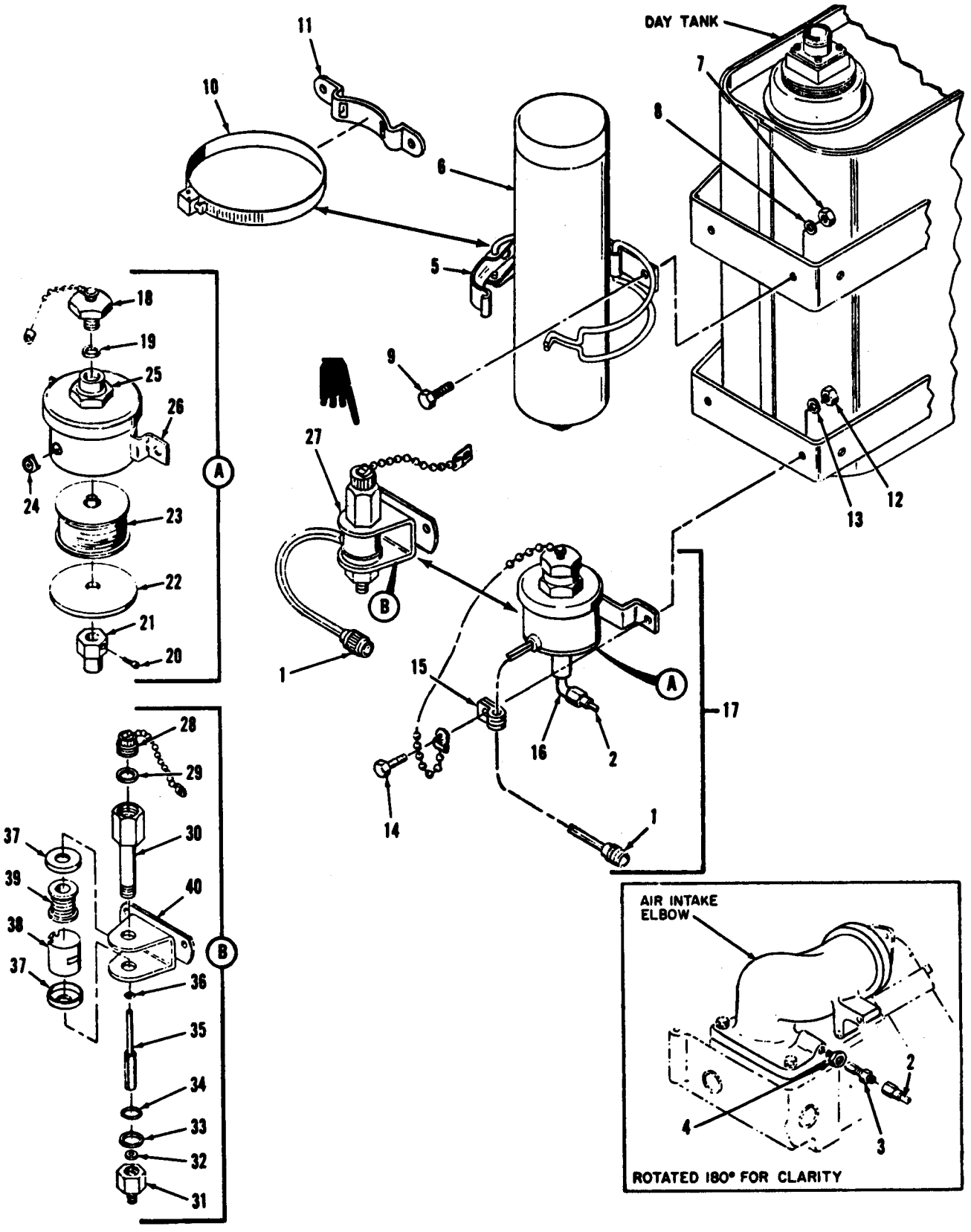


Figure 4-1. Ether starting aid, exploded view

c. CLEANING.

1. Clean wiring, coil, and valve body with a clean lint-free cloth.

2. Clean tube and atomizer by forcing filtered compressed air through them in the reverse ether flow direction.

3. Clean remaining parts with an approved cleaning solvent and dry thoroughly.

d. INSPECTION.

1. Inspect metal parts for cracks and distortion.

2. Check cylinder condition by weighing cylinder on suitable scale. Full cylinder weighs 37 ounces; an empty cylinder weighs 17 ounces.

3. Inspect wiring insulation for cracks, breaks, and connector for damage.

4. Check coil for resistance with ohmmeter. Resistance should be 3.2 ohms at 77°F.

5. Replace defective parts and empty cylinder.

e. ETHER PRIMER REASSEMBLY.

1. Install grommet (24) in bracket (26) and insert coil (23) wires through grommet.

2. Insert coil (23) in valve while pulling wires through grommet. Install valve (25) in bracket.

3. Install cover (22) so that tab is in alignment with grommet opening. Install nut (21) and tighten screw (20).

f. INSTALLATION. Install components of ether starting aid in reverse sequence illustrated in figure 4-1, observing the following:

1. Remove clamp screw and nut holding radio suppression diode assembly. Install clamp (5) and secure clamp and diode assembly to day tank.

2. For initial installation of cylinder, remove protective cap from primer prior to installing cylinder (6).

3. Lubricate cylinder (6) threads with one drop of OE 30 oil prior to installation. Tighten cylinder hand tight.

g. ETHER PRIMER ASSEMBLY. SOLENOID VALVE ASSEMBLY, (28, figure 4-1).

1. Remove connector (1, figure 4-1) from wiring. Loosen nut (31) and carefully remove from valve assembly.

2. Remove armature (35), preformed packings (34) and (36), seal (33) and bumper washer (32). Withdraw body assembly (30) and preformed packing (29) from bracket (40).

3. Remove coil housing (39), coil covers (38) and coil (40) from bracket (41).

h. CLEANING.

1. Clean wiring, coil, and valve body with a clean lint-free cloth.

2. Clean tube and atomizer by forcing filtered compressed air through them in the reverse ether flow direction.

3. Clean remaining parts with an approved cleaning solvent and dry thoroughly.

i. INSPECTION

1. Inspect metal parts for cracks and distortion.

2. Check cylinder condition by weighing cylinder on suitable scale. Full cylinder weighs 37 ounces; an empty cylinder weighs 17 ounces.

3. Inspect wiring insulation for cracks, breaks, and connector for damage.

4. Check coil for resistance with ohmmeter. Resistance should be 3.2 ohms at 77°F.

5. Replace defective parts and empty cylinder.

j. ETHER PRIMER REASSEMBLY

1. Place coil (39) within coil housing (38) and place coil covers (37) on top and bottom. Place the above components into the bracket (40).

2. Place preformed packing (29) into top of body assembly (30) and slide body assembly (30) through bracket (40). Insert armature (35) preformed packings (34 and 36), seal (33) and bumper washer (32 into body assembly (30). Install and tighten nut (31).

k. INSTALLATION. Install components of ether starting aid in reverse sequence illustrated in figure 4-1, observing the following:

1. Remove clamp screw and nut holding radio suppression diode assembly. Install clamp (5 or 10 and 11) and secure clamp and diode assembly to day tank.

2. For initial installation of cylinder, remove protective cap from primer prior to installing cylinder (6).

3. Lubricate cylinder (6) threads with one drop of OE 30 oil prior to installation. Tighten cylinder hand tight.

Section III. FIRE EXTINGUISHER

4-6. GENERAL (ARMY AND MARINE CORPS ONLY).

The generator set is equipped with a monobromotrifluoromethane type fire extinguisher with a disposable cylinder. It is suitable for use on all types of fires except those involved with liquid oxygen.

4-7. PREVENTIVE MAINTENANCE (ARMY AND MARINE CORPS ONLY).

Table 4-2 contains a tabulated listing of preventive maintenance checks and services that shall be performed on the fire extinguisher by operator and organizational maintenance personnel.

Table 4-2. Fire Extinguisher Preventive Maintenance Checks and Services

B - BEFORE OPERATION W - WEEKLY (40 HRS)
D - DURING OPERATION M - MONTHLY (100 HRS)
A - AFTER OPERATION S - SEMI ANNUAL (500 HRS)

ITEM NO.	INTERVAL						ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
	OPERATOR			ORG.					
	DAILY								
	B	D	A	w	M	s			
1	*					*	Seal wire	Inspect seal wire for condition and proper installation.	
2	*					*	Horn	Inspect horn for obstructions and security.	
3					*		Cylinder	Check cylinder for security.	
4						*	Fire Extinguisher	Weigh fire extinguisher. If gross weight has decreased four ounces or more, replace cylinder.	

4-8. FIRE EXTINGUISHER (ARMY AND MARINE CORPS ONLY).

a. CYLINDER REMOVAL.

WARNING

Make sure all pressure is released from used cylinder prior to removal.

1. If extinguisher has been used, remove safety pin and depress trigger to release remaining extinguishing agent.

2. Loosen swivel nut and remove cylinder.

3. Remove instruction plate from used cylinder.

b. CYLINDER INSTALLATION.

1. Install safety pin in valve assembly. Seal safety pin into valve assembly using breakable sealing wire.

2. Lubricate cylinder threads with one drop of OE 30 oil. Install cylinder in swivel nut.

3. Install instruction plate on new cylinder and adjust plate so that when extinguisher is installed instruction will be visible.

Section IV. PARALLEL CABLE (PRECISE GENERATOR SETS)

4-9. GENERAL.

The parallel cable is a 25 foot, four conductor, flexible heat and oil resistant cable. It is utilized to interconnect governor and voltage regulator paralleling circuits of precise generator sets operating in parallel. The cable is stowed in a stowage box bolted to the generator set roof above the generator.

4-10. TEST.

Test each parallel cable wire for continuity, making sure wire is not shorted to connectors or adjacent wires. Wire routing is common between like pins of connectors: A to A, B to B, etc.

4-11. REPAIR.

The parallel cable may be repaired by replacement of defective connectors.

a. Loosen two screws securing cable adapter saddle clamp to cable and unscrew adapter from connector.

b. Tag wires with pin designation and unsolder wires from connector pins. Remove cable adapter from cable.

c. Install new cable adapter on cable. Solder wire to new connector pins in accordance with tagged designations.

d. Secure cable adapter to connector and tighten saddle clamp screws.

Section V. FUEL BURNING WINTERIZATION KIT

4-12. GENERAL.

The fuel burning winterization kit is utilized to preheat the engine coolant and lubricating oil for ease of generator set starting in ambient temperatures down to -65°F. The kit is integrally mounted in the generator set and consists of a 24 volt, fuel fired, coolant heater with integral coolant pump, control box, thermostat switch, manual shutoff valves, wiring, lines, and fittings. Heated coolant is circulated through the engine cooling system and oil pan heat exchanger by the heater coolant pump. Automatic heater cycling is controlled by the thermostat switch to prevent excessive coolant temperature. The heater is designed to operate on the same fuels as the generator set engine. The heater is mounted in the right engine compartment.

4-13. INITIAL INSTALLATION.

To perform initial installation of fuel burning winterization kit, proceed as follows:

a. Disconnect plate (41, figure 2-8) by removing two screws and washers. Retain screws and washers for installing kit control box.

b. Remove protective cover from receptacle J7 of mode I relay box on 50/60 hertz generator sets or mode II relay box on 400 hertz generator sets. The relay boxes are mounted on top of the generator with receptacle J7 on the right side.

c. Drain radiator, refer to paragraph 3-8.

d. Remove plugs from engine block and water pump tube.

e. Remove plugs from engine oil pan heat exchanger tubes.

f. Disconnect exhaust plate by removing two screws, washers, and nuts. Retain exhaust plate, screws, and washers for installing exhaust tube (51, figure 4-2).

g. Remove screw, nut, and lock washer from front of water pump cover. Retain nut and lock washer.

h. Remove right rear corner oil pan screw and retain for securing clamp (14).

i. Remove plug from fuel filter and strainer tee.

j. Refer to figure 4-2 and install fuel burning winterization kit in the reverse order of index numbers. Observe the following:

1. Position system diagram plate (64) inside right air intake door. Transfer drill six 0.125 inch diameter holes. Secure plate with screws (63), nuts (61), and washer (62).

2. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type II, to pipe threads prior to installation.

3. Connect control box (19) to control cubicle with screws (17) and washers (18) removed with plate.

4. Connect harness (15) plug P7 to receptacle J7 on mode I or mode II relay box.

5. Position nameplate (2) along side exhaust hole and transfer drill two 0.125 inch diameter holes. Secure plate (2) with rivets (1).

6. Connect exhaust tube (51) to skid base and secure with exhaust plate (5), screws (3), and washers (4) removed from base.

7. Connect clamps (11 and 12) with bolt (4), washer (9), and nut (8) removed from water pump cover. Connect clamp (14) with rear corner oil pan screw (13).

8. Close coolant drain valve (40) and open coolant valves (26 and 36).

k. Service radiator with arctic antifreeze compound conforming to Military Specification MIL-A-11755, refer to paragraph 3-8.

4-14. PREVENTIVE MAINTENANCE.

Table 4-3 contains a tabulated listing of preventive maintenance checks and services that shall be performed on the fuel burning winterization kit by operator and organizational maintenance personnel.

4-15. TROUBLESHOOTING.

Table 4-4 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the fuel burning winterization kit.

4-16. FUEL BURNING WINTERIZATION KIT.

a. REMOVAL. Refer to figure 4-2 and remove fuel burning winterization kit in the order of index numbers. Observe the following:

1. Close heater fuel shutoff valve (46).

Legend to figure 4-2:

1. Rivet (2)
2. Nameplate
3. Screw (2)
4. Washer (2)
5. Exhaust plate
6. Electrical connector
7. Thermostat switch
8. Nut
9. Lock washer
10. Screw
11. Clamp
12. Clamp
13. Screw
14. Clamp
15. Harness
16. Harness
17. Screw (2)
18. Washer (2)
19. Control box
20. Hose
21. Connector
22. Elbow
23. Plug
24. Tee
25. Reducer nipple
26. Coolant valve
27. Nipple
28. Reducing bushing
29. Hose
30. Elbow
31. Relief valve
32. Tee
33. Reducing bushing
34. Hose
35. Connector
36. Coolant valve
37. Bushing
38. Hose
39. Elbow
40. Coolant drain valve
41. Plug
42. Tee
43. Compression fitting (2)
44. Hose
45. Connector
46. Fuel shutoff valve
47. Connector
48. Rivet
49. Instruction plate
50. Clamp
51. Exhaust tube
52. Screw (2)
53. Nut (2)
54. Screw (2)
55. Nut (2)
56. Heater
57. Screw (2)
58. Nut (2)
59. Washer (2)
60. Bracket
61. Nut (6)
62. Washer (6)
63. Screw (6)
64. System diagram plate

2. Drain coolant by placing suitable container at coolant drain and opening coolant drain valve (40).

3. Install suitable plugs in engine openings after kit removal.

b. CLEANING AND INSPECTION.

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

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

3. Inspect hoses for fraying.

4. Replace defective parts.

c. INSTALLATION. Refer to figure 4-2 and install fuel burning winterization kit in the reverse order of index numbers. Observe the following:

1. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

2. Close coolant drain valve (40) and service radiator with proper coolant, refer to paragraph 3-8.

4-17. CONTROL BOX.

a. LAMP REPLACEMENT. Replace control box lamp as illustrated in figure 4-3.

b. TEST. Test control box as follows:

1. Remove electrical connectors from control box.

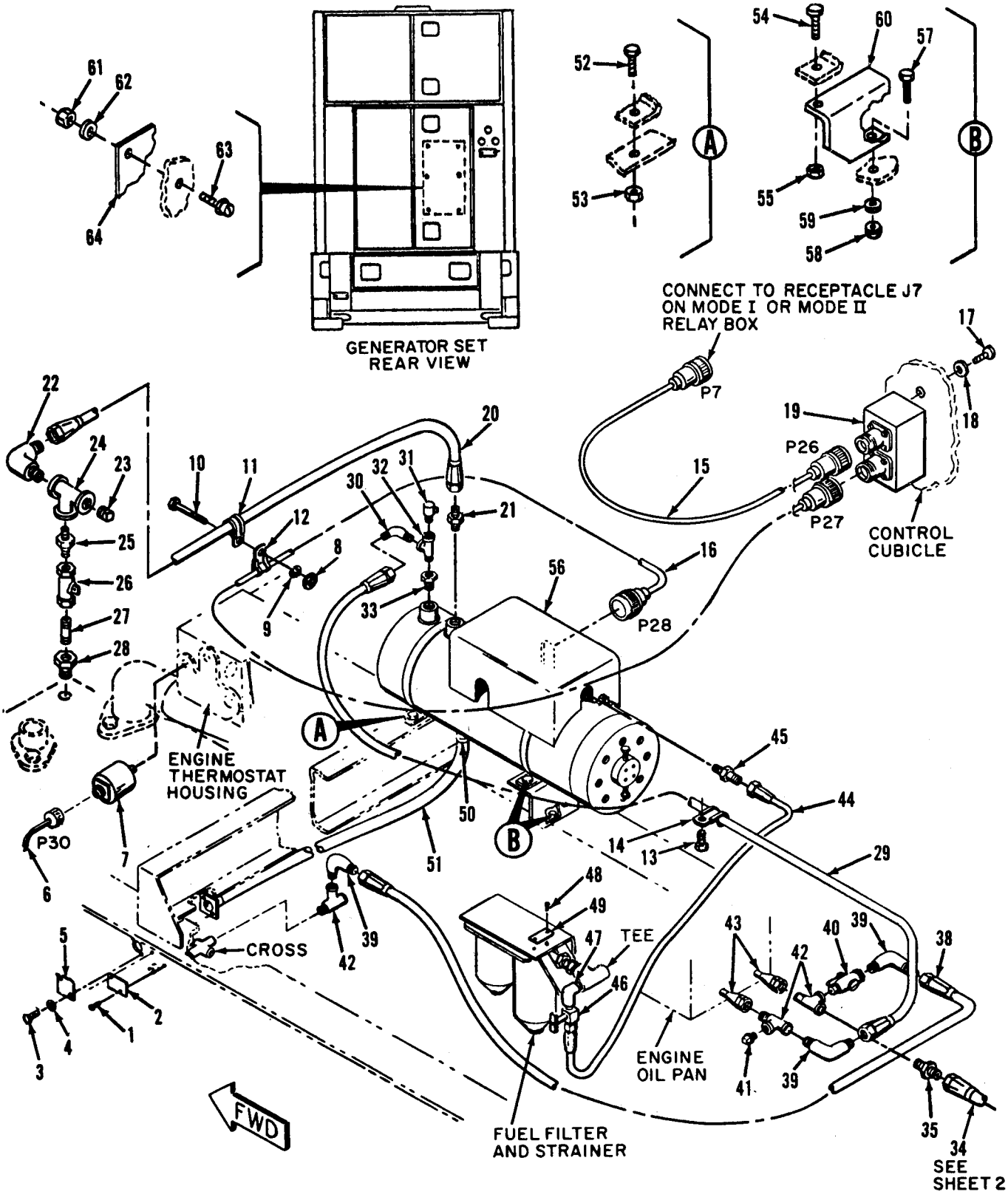


Figure 4-2. Fuel burning winterization kit, removal and installation (sheet 1 of 2)

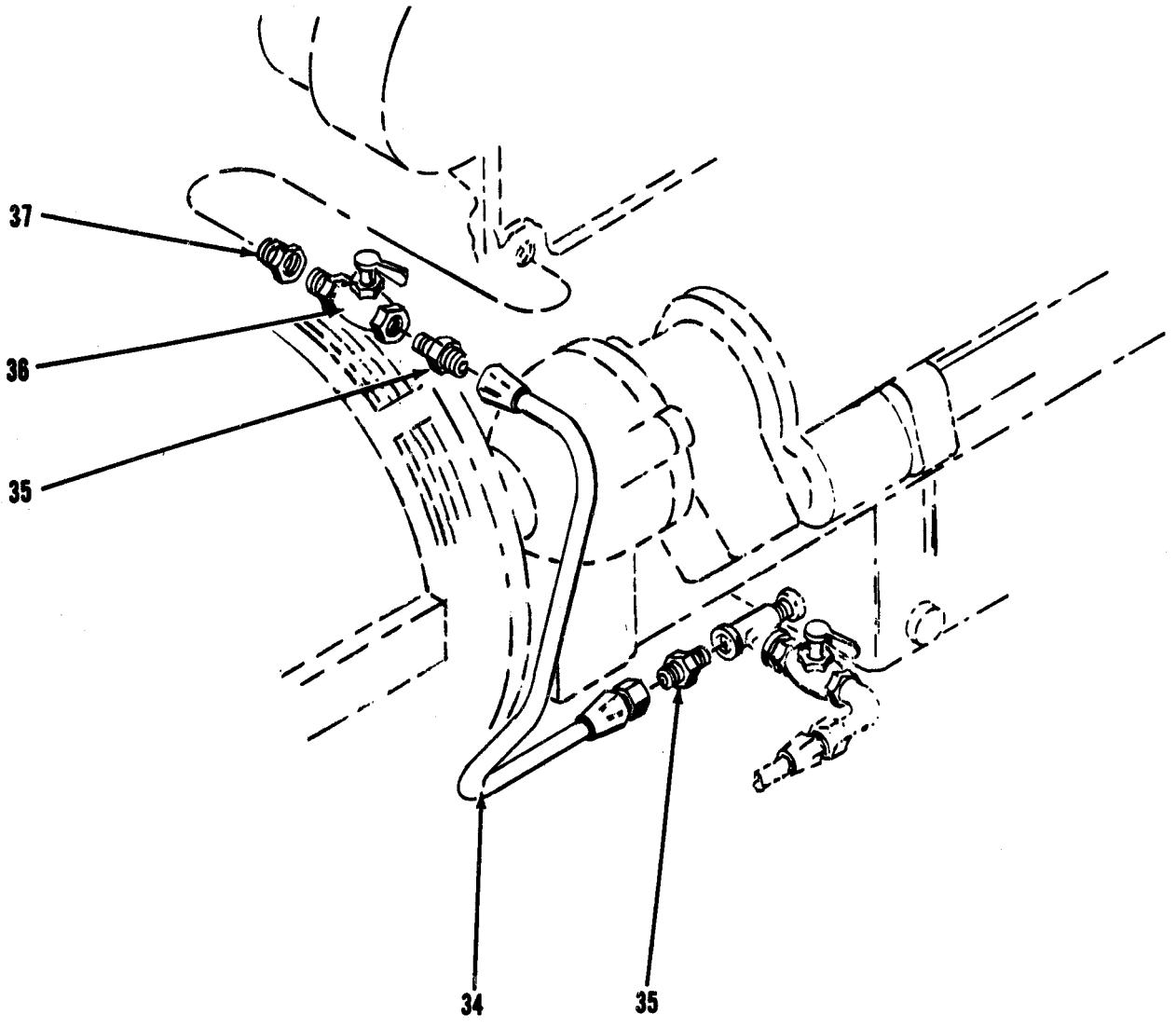


Figure 4-2. Fuel burning winterization kit, removal and installation (sheet 2 of 2)

2. Refer to figure 4-4 and check control box for continuity with switch and circuit breaker in each functional position. Replace defective control box.

3. Install electrical connectors on control box.

4-18. HEATER IGNITER.

a. REMOVAL. Disconnect harness from heater and remove heater igniter as illustrated in figure 4-5.

b. TEST. Test heater igniter as follows:

1. Check igniter for proper resistance, using a suitable ohmmeter. Resistance should be 1 ohm with igniter cold.

WARNING

Do not touch igniter during test and allow enough time for it to return to ambient temperature before removing test equipment, to prevent burns.

Table 4-3. Fuel Burning Winterization Kit Preventive Maintenance Checks and Services

B - BEFORE OPERATION W - WEEKLY (40 HRS)
D - DURING OPERATION M - MONTHLY (100 HRS)
A - AFTER OPERATION S - SEMI ANNUAL (500 HRS)

ITEM NO.	INTERVAL						ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
	OPERATOR			ORG.					
	DAILY								
	B	D	A	W	M	S			
1	*						Heater fuel shutoff and coolant valves	Inspect valves for leakage.	figure 4-2
2	*						Heater exhaust	Inspect for leakage and damage.	figure 4-2
3	*						Generator set radiator	Check for proper coolant level.	paragraph 3-8
4	*						Generator set doors	Inspect door seals for proper sealing.	figure 3-14
5	*						Generator set fuel transfer pumps	Check fuel transfer pumps for leakage.	figure 3-35
6		*				*	Fuel and coolant lines	Check for leakage.	

Table 4-3. Fuel Burning Winterization Kit Preventive Maintenance Checks and Services (Continued)

ITEM NO.	INTERVAL OPERATOR DAILY B	D	A	ORG. w	M	S	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
	B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION			W - WEEKLY (40 HRS) M - MONTHLY (100 HRS) S - SEMI ANNUAL (500 HRS)					
7						*	Coolant and fuel lines	Tighten lines and check condition.	figure 4-2
8						*	Attaching hardware	Tighten hardware.	figure 4-2
9						*	Wiring	Inspect for frayed insulation and security of terminal lugs and connectors.	figure 4-2
10						*	Coolant pump	Test pump for proper operation.	paragraph 4-19
11						*	Thermostat switch	Test switch for proper operation.	paragraph 4-20

2. Connect 24 VDC power source and an ammeter to igniter terminal. Ground igniter. Apply 24 VDC to igniter. The igniter should draw 10.5 amperes and heat to a bright red color in a few seconds.

3. Replace defective igniter.

c. INSTALLATION. Install heater. igniter as illustrated in figure 4-5 and connect harness to heater.

4-19. HEATER COOLANT PUMP TEST.

Refer to figure 4-2 and test heater coolant pump; proceed as follows:

a. Close coolant valves (26 and 36). Remove coolant hose from elbow (30), Connect suitable 0 to 50 PSIG gauge, manual shutoff valve, and 0 to 100 GPH flow meter to elbow in sequence specified. Connect OUT port of flow meter to coolant hose removed from elbow. Remove relief

Table 4-4. Fuel Burning Winterization Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Press to test light does not illuminate when pressed.	a. Circuit breaker not energized.	a. Energize circuit breaker (figure 2-16).
	b. Defective lamp.	b. Replace lamp (paragraph 4-17).
	c. Defective wiring.	c. Repair or replace wiring (figure 1-10).
	d. Defective control box.	d. Test and replace if defective (paragraph 4-17).
2. Switch positioned to ON and nothing happens.	a. Circuit breaker not energized.	a. Energize circuit breaker (figure 2-16).
	b. Dead generator set batteries.	b. Charge or replace batteries (paragraph 3-33).
	c. Defective wiring.	c. Repsir or replace wiring (figure 1-10).
	d. Defective control box.	d. Test and replace if defective (paragraph 4-17).
	e. Defective heater.	e. Replace heater (paragraph 4-16).
	f. Other causes.	f. Refer to higher level of maintenance.
3. Heater starts but will not ignite.	a. Heater fuel shutoff valve not open.	a. Open valve (figure 4-2).
	b. Generator set fuel supply exhausted.	b. Service fuel tank (paragraph 3-17).
	c. Restriction in fuel supply line.	c. Remove restriction (figure 4-2).

Table 4-4. Fuel Burning Winterization Kit Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
3. Heater starts but will not ignite (continued)	d. Defective generator set fuel transfer pumps.	d. Refer to paragraph 3-76.
	e. Defective heater igniter.	e. Test and replace if defective (paragraph 4-18).
	f. Heater overheat switch tripped.	f. Permit heater to cool and restart (figure 2-16).
	g. Defective heater.	g. Replace heater (paragraph 4-16).
	h. Defective thermostat switch.	h. Test snd replace if defective (paragraph 4-20).
	i. Other causes.	i. Refer to higher level of maintenance.
4. Heater combustion surges.	a. Restriction in fuel supply line.	a. Remove restriction (figure 4-2).
	b. Defective generator set fuel transfer pumps.	b. Refer to paragraph 3-76.
	c. Low or erratic voltage to heater.	c. Correct cause of improper voltage (figure 4-4).
	d. Defective igniter.	d. Test and replace if defective (paragraph 4-18).
	e. Other causes.	e. Refer to higher level of maintenance.
5. Heater will not shut-off when switch is positioned to OFF (after purge cycle).	s. Defective control box.	a. Test and replace if defective (paragraph 4-17).
	b. Defective wiring.	b. Repair or replace wiring (figure 1-10).

Table 4-4. Fuel Burning Winterization Kit Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
5. Heater will not shut-off when switch is positioned to OFF (after purge cycle) (continued).	c. Defective heater.	c. Replace heater (paragraph 4-16).
	d. Other causes	d. Refer to higher level of maintenance.
6. Coolant pump has low or no output.	a. Coolant valves not open.	a. Open valves (figure 4-2).
	b. Restriction in coolant lines.	b. Remove restriction (figure 4-2).
	c. Defective coolant pump.	c. Test and replace heater if defective (paragraph 4-19).
	d. Other causes.	d. Refer to higher level of maintenance.
7. Heater will not shut off when engine is running.	Defective diode CR1	Replace diode.

valve (31) and install 1/4 inch pipe plug in its place. Open manual shutoff valve and coolant valves.

b. Place kit in operation, refer to paragraph 2-24. Permit kit to operate approximately 15 minutes.

CAUTION

Do not close shutoff valve if pressure exceeds 35 PSIG.

c. Slowly close manual shutoff valve and observe gauge readings. Gauge should indicate 30 to 35 PSIG. Open and close valve two additional times and check for gauge reading consistency.

d. Adjust manual shutoff valve to obtain a 2 PSIG indication on gauge. Check flow indication on flow meter. Flow meter should indicate a minimum of 80 GPH.

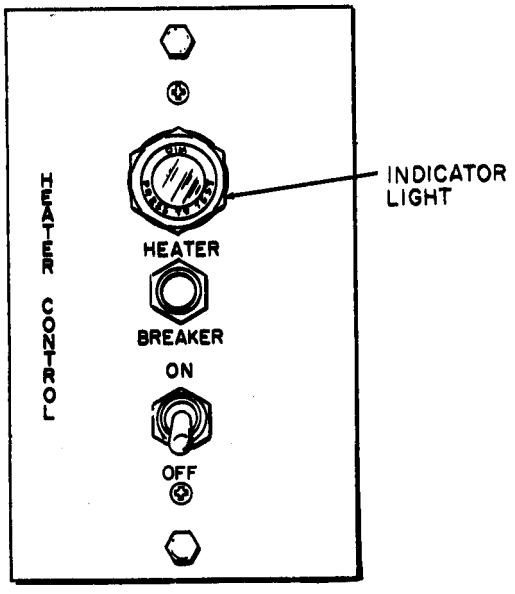
e. Shut down kit, refer to figure 2-16.

f. Close coolant valves and install relief valves. Open coolant valve.

g. Start kit and slowly close manual shutoff valve unil relief valve opens. Relief valve should open at 20 ± 5 PSIG. Open and close valve two additional times and check relief valve opening.

h. Shut down kit.

i. Remove test equipment and properly connect kit. Replace heater if coolant pump pressure exceeds 35 PSIG or a minimum of 80 GPH is not obtained when operating at 2 PSIG. Replace relief valve if valve does not open at 20 ± 5 PSIG.



STEP 1. UNSCREW LENS AND REMOVE LAMP BY PRESSING IN AND TURNING COUNTERCLOCKWISE.

STEP 2. INSTALL NEW LAMP AND LENS.

STEP 3. ENERGIZE CIRCUIT BREAKER BY PRESSING IN ON BUTTON AND PRESS TO TEST INDICATOR. INDICATOR SHOULD ILLUMINATE WHEN PRESSED. DE-ENERGIZE CIRCUIT BREAKER.

Figure 4-3. Fuel burning winterization kit control box lamp replacement

4-20. THERMOSTAT SWITCH TEST.

To test thermostat switch, proceed as follows:

a. Remove switch as illustrated in figure 4-2 and plug engine opening.

b. Fill a suitable container with water and place thermometer in container. Place temperature sensing end of switch in water.

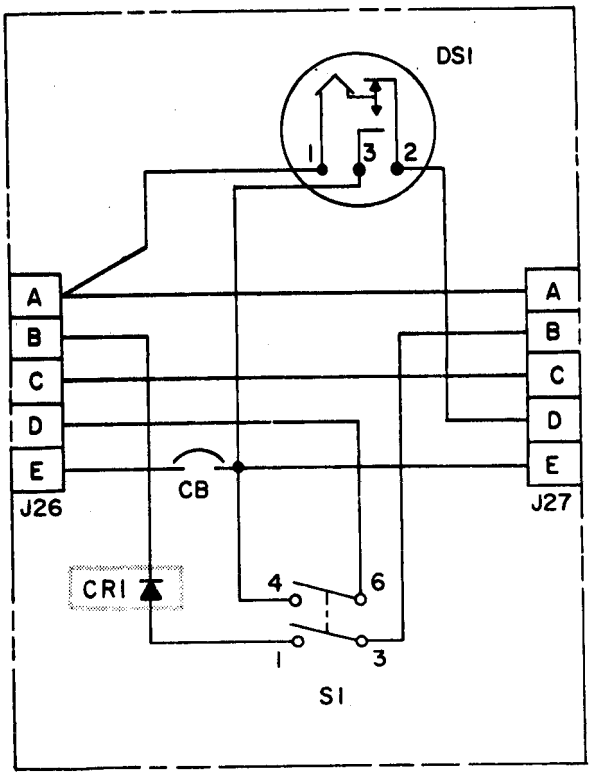


Figure 4-4. Fuel burning winterization kit control box schematic

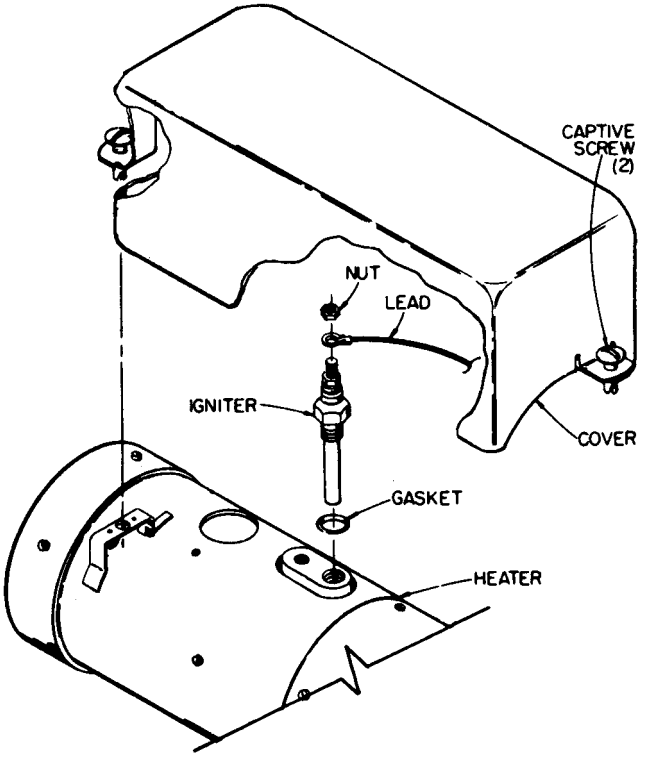


Figure 4-5. Fuel burning winterization kit heater igniter, removal and installation

c. Heat water and check for continuity. There should be continuity between pins A and B up to 125 ± 5°F and no continuity after 125 ± 5°F. Permit water to cool, contacts should switch at 50 ± 5°F.

d. Remove test equipment. Replace defective switch.

e. Install switch, refer to figure 4-2.

Section VI. ELECTRIC HEATER KIT

4-21. GENERAL.

The electric heater kit is utilized to preheat engine coolant and lubricating oil for ease of generator set starting in ambient temperatures down to -65°F. The kit is integrally mounted in the generator set and consists of an electric coolant heater, control box, coolant pump, thermostat, coolant and drain valves, wiring, lines and coolant. Heated coolant is circulated through the engine cooling system and oil pan heat exchanger by the coolant pump. Automatic heater cycling is controlled by the thermostat to prevent excessive coolant temperature. The heater, coolant pump, and thermostat are located in the left engine compartment. Power for kit operation may be obtained from any power source that supplies 205 to 240 volts, 50, 60, or 400 hertz, single phase power.

4-22. INITIAL INSTALLATION.

To perform initial installation of electric winterization kit, proceed as follows:

a. Disconnect plate (40, figure 2-8) by removing four screws and washers. Retain screws and washers for installing kit control box.

b. Drain radiator, refer to paragraph 3-8.

c. Remove plugs from engine and engine oil pan heat exchanger tubes.

d. Refer to figure 4-6 and install kit in the reverse order of index numbers. Observe the following:

1. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

2. Connect control box (59) to control cubicle with screws (57) and washers (58) removed with plate.

3. Position instruction plate (61) inside right air intake door. Transfer drill six 0.125 inch diameter holes. Secure plate with rivets (60).

4. After kit is installed, remove protective cover from control box (59). Connect a suitable power cable to control box receptacle J49 and 205 to 240 volts, 50/60 or 400 hertz single phase power supply.

e. Service radiator with proper coolant, refer to paragraph 3-8.

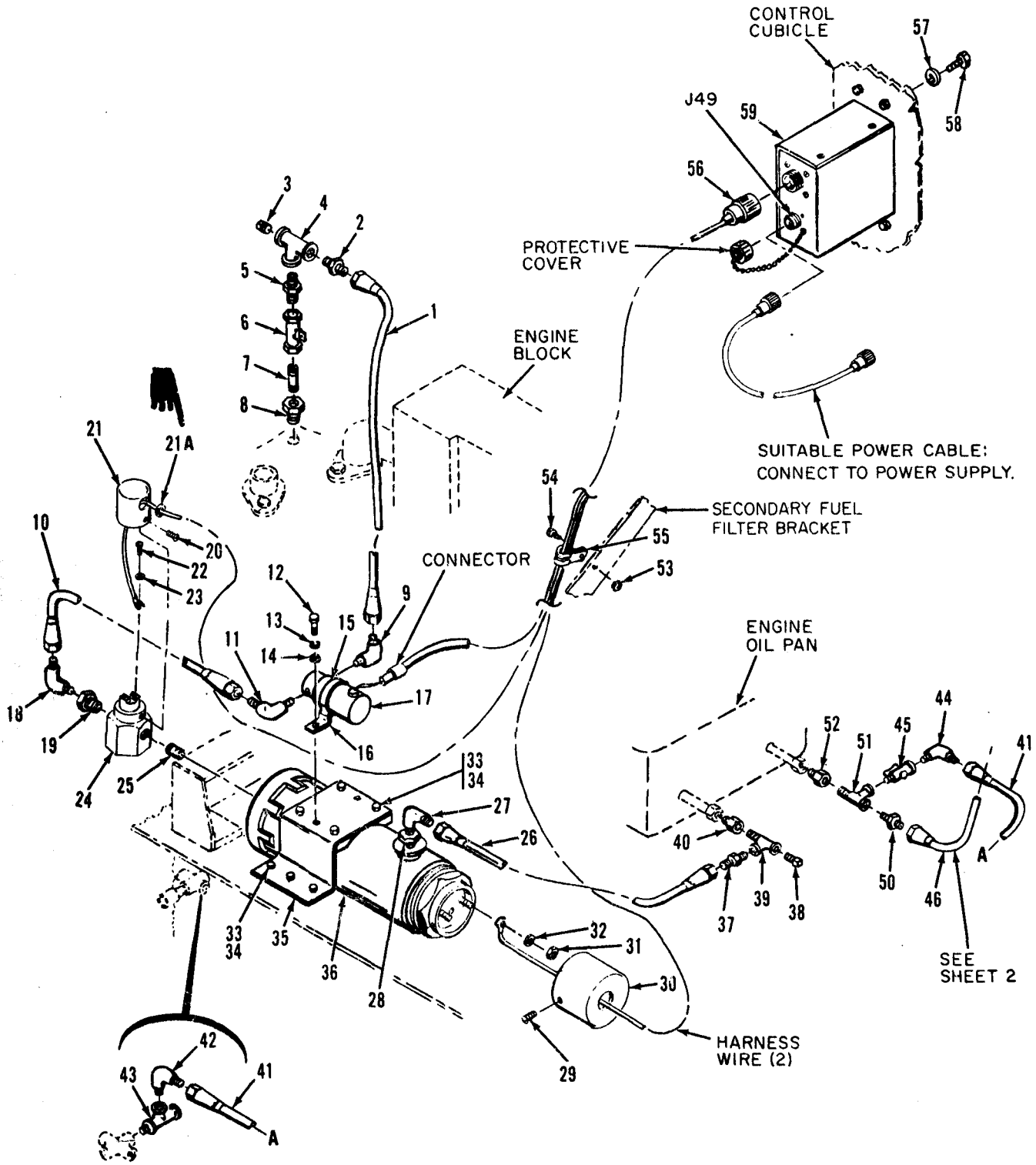


Figure 4-6. Electric heater kit, removal and installation
(sheet 1 of 2)

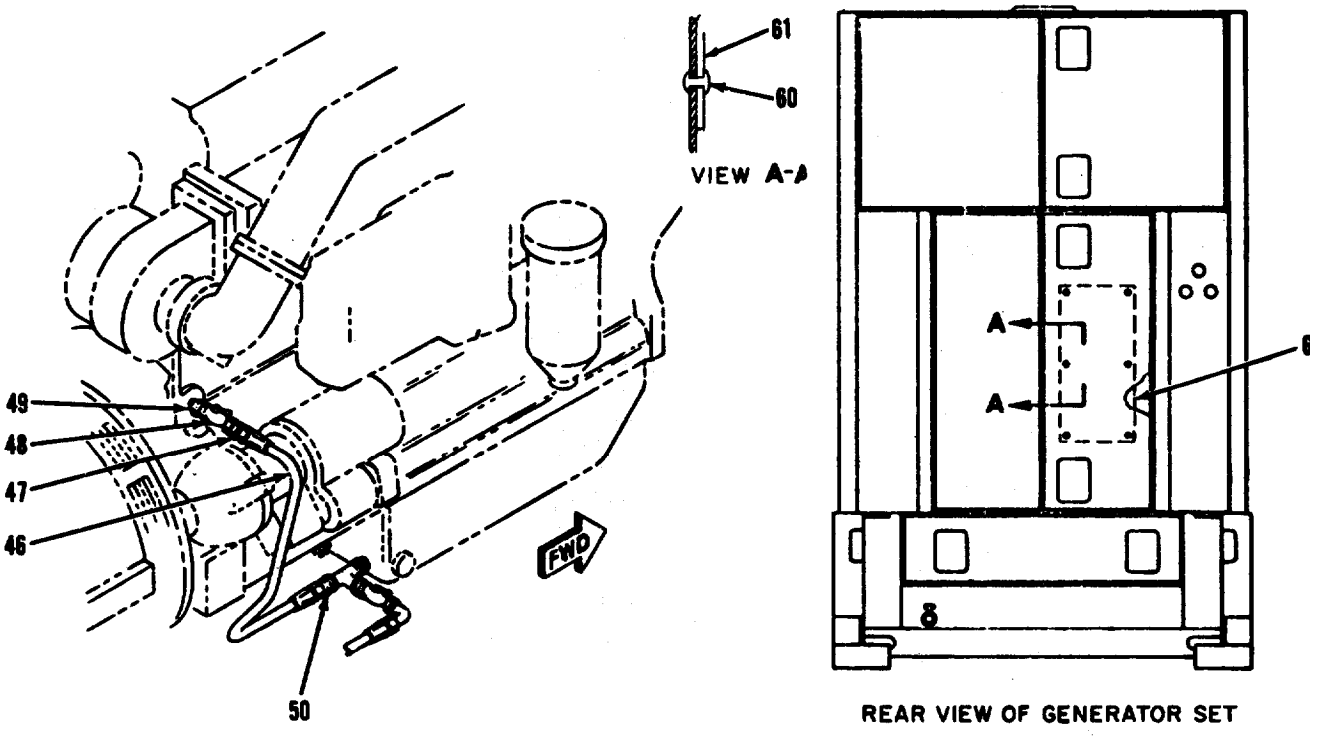


Figure 4-6. Electric heater kit, removal and installation
(sheet 2 of 2)

Legend to figure 4-6:

1. Hose
2. Connector
3. Plug
4. Tee
5. Reducing nipple
6. Coolant 'valve
7. Nipple
8. Reducing bushing
9. Elbow
10. Hose
11. Elbow
12. Screw (2)
13, Lock washer (2)
14. Washer (2)
15. clamp
16. Bracket
17. Coolant pump
18. Elbow
19. Reducer
20. Screw
21. Cwer

21A. Grommett
22. Screw (2)
23. Washer (2)
24. Thermostat
25. Nipple
26. Hose
27. Elbow
28. Reducer
29. Screw
30. Cover
31. Nut (2)
32. Washer (2)
33. Screw (7)
34. Washer (7)
35. Mounting bracket
36. Heater
37. Connector
38. Plug
39. Tee
40. Connector
41. Hose

42. Elbow
43. Tee
44. Elbow
45. Coolant drain valve
46. Hose
47. Connector
48. Coolant valve
49. Reducing bushing
50. Connector
51. Tee
52. Connector
53. Nut
54. Screw
55. Clamp
56. Harness
57. Screw (4)
58. Washer (4)
59. Control box
60. Rivet (6)
61. Instruction plate

4-23. PREVENTIVE MAINTENANCE.

Table 4-5 contains a tabulated listing of preventive maintenance checks and services that shall be performed on the electric winterization kit by operator and organizational maintenance personnel.

4-24. TROUBLESHOOTING.

Table 4-6 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the electric winterization kit.

4-25. ELECTRIC HEATER KIT.

a. REMOVAL. Refer to figure 4-6 and remove electric heater kit in order of index numbers. Observe the following:

1. Remove power cable from power supply prior to starting removal procedures.

2. Drain coolant by placing suitable container at coolant drain and opening coolant drain valve (45).

3. Install suitable plugs in engine openings after kit removal.

b. INSPECTION AND REPAIR.

1. Inspect metal parts for cracks, breaks, and other damage.

2. Inspect hoses for cuts and deterioration.

3. Check wiring for defective terminal lugs and connectors for missing pins. Check each harness wire for continuity, refer to figure 1-11.

4. If necessary, repair wiring harness in the same manner as the generator set wiring harnesses, refer to paragraph 3-51, step f.

5. Replace defective parts.

c. INSTALLATION. Refer to figure 4-6 and install electric winterization kit in the reverse order of index numbers. Observe the following:

1. Apply thread sealing compound conforming to Military Specification MIL-S-45180, type III to pipe threads prior to installation.

2. Close coolant drain valve (45) and service radiator with proper coolant, refer to paragraph 3-8.

3. Connect power cable to power supply and control box (59) receptacle J49.

4-26. CONTROL BOX.

a. INDICATOR LAMP REPLACEMENT. To replace indicator lamp, refer to figure 4-7 and proceed as follows:

1. Unscrew lens (17) and remove lamp (18) by pressing in and turning counterclockwise.

2. Install new lamp and lens.

b. FUSE REPLACEMENT. To replace fuse, refer to figure 4-7 and proceed as follows:

1. Unscrew cap (11) and remove fuse (12) from cap.

2. Insert new fuse in cap and replace cap.

c. COMPONENT REPLACEMENT. To replace control box components, refer

Table 4-5. Electric Heater Kit Preventive Maintenance Checks and Service

B - BEFORE OPERATION W - WEEKLY (40 HRS)
D - DURING OPERATION M - MONTHLY (100 HRS)
A - AFTER OPERATION S - SEMI ANNUAL (500 HRS)

ITEM NO.	INTERVAL: OPERATOR DAILY B	D	A	ORG. W	M	S	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
1	*						Power cable	Check cable for frayed insulation and damaged receptacle.	figure 4-6
2	*						Coolant valves	Check valves for leakage.	figure 4-6
3	*						Generator set radiator	Check for proper coolant level.	paragraph 3-8
4	*						Generator set doors	Check doors for proper sealing.	figure 3-14
5		*				*	Coolant lines	Check for leakage.	figure 4-6
6			*				Coolant valve	Check valves for leakage.	figure 4-6
7			*				Power cable	Remove from power source.	
8						*	Coolant lines	Replace leaking or frayed lines	figure 4-6
9						*	Attaching hardware	Tighten hardware.	figure 4-6
10						*	Wiring	Inspect for frayed insulation and security of terminal lugs and connectors.	figure 4-6

Table 4-5. Electric Heater Kit Preventive Maintenance Checks and Services (Continued)

ITEM NO.	INTERVAL: OPERATOR DAILY B	D	A	ORG. W	M	S	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
	B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION			W - WEEKLY (40 HRS) M - MONTHLY (100 HRS) S - SEMI ANNUAL (500 HRS)					
11						*	Coolant pump	Test for proper operation.	paragraph 4-27
12						*	Thermostat	Test for proper operation.	paragraph 4-28
13						*	Heater	Test heater.	paragraph 4-29

to figure 4-6, remove control box, and proceed as follows:

NOTE

Control box should be disassembled only to the extent necessary to replace a defective indicator light, fuse holder, switch, resistor, or wiring harness. Components should be tested in place and removed only if defective.

1. Remove cover (2, figure 4-7).

2. Test resistor (6, figure 4-7) for proper ohmic value. Value should be 2.49K ohms, 10 watts, ±1 percent.

3. Test switch (10), fuse holder (16), and light (21) for continuity.

4. Test each harness wire for continuity, refer to figure 1-11.

5. If necessary, repair wiring harness in the same manner as the generator set wiring harness, refer to paragraph 3-51, step f.

6. Replace defective control box components as illustrated in figure 4-7. Prior to component removal, tag and disconnect wires from defective component. Replace cover (2).

7. Install control box as illustrated in figure 4-6.

4-27. COOLANT PUMP TEST.

To test coolant pump, proceed as follows:

NOTE

Pump ports are identified on front plate.

Table 4-26. Electric Heater Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Switch positioned to ON and nothing happens.	a. Power cable not connected to power supply.	a. Connect power cable (figure 4-6).
	b. Blown fuse.	b. Replace fuse (paragraph 4-26).
	c. Defective switch.	c. Replace switch (paragraph 4-26).
	d. Defective wiring.	d. Repair or replace wiring (figure 1-11).
	e. Defective thermostat.	e. Test and replace if defective (paragraph 4-28).
	f. Other causes.	f. Refer to higher level of maintenance.
2. Indicator light does not illuminate.	a. Defective lamp.	a. Replace lamp (paragraph 4-26).
	b. Defective light.	b. Replace light (paragraph 4-26).
	c. Defective heater.	c. Test and replace if defective (paragraph 4-29).
	d. Defective wiring.	d. Repair or replace wiring (figure 1-11).
	e. Other causes.	e. Refer to higher level of maintenance.
3. Heater cycling is erratic.	a. Defective thermostat.	a. Test and replace if defective (paragraph 4-28).
	b. Defective coolant pump.	b. Test and replace if defective (paragraph 4-27).
	c. Defective heater.	c. Test and replace if defective (paragraph 4-29).

Table 4-26. Electric Heater Kit Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
3. Heater cycling is erratic (continued)	d. Defective wiring.	d. Repair or replace wiring (figure 1-11).
	e. Other causes.	e. Refer to higher level of maintenance.
4. Heated coolant is not circulated through cooling system.	a. Coolant valves not open.	a. Open valves (figure 4-6).
	b. Restriction in coolant lines.	b. Remove restriction (figure 4-6).
	c. Defective coolant pump.	c. Test and replace if defective (paragraph 4-27).
	d. Other causes.	d. Refer to higher level of maintenance.

a. Close coolant valves. Remove coolant hose from pump OUT port. Connect a suitable 0 to 50 PSIG gauge, manual shutoff valve, and 0 to 100 GPH flow meter to OUT port in sequence specified. Connect OUT port of flow meter to coolant hose removed from pump OUT port. Open manual shutoff valve and coolant valves.

b. Place kit in operation, refer to paragraph 2-25. Permit kit to operate approximately 15 minutes.

CAUTION

Do not close shutoff valve if pressure exceeds 35 PSIG.

Legend to figure 4-7:

1. Screw (6)
2. Cover
3. Screw (6)
4. Nut (2)
5. Washer (2)
6. Resistor
7. Set screw
8. Knob
9. Screw (3)
10. Switch
11. Cap
12. Fuse (30 amperes)
13. Screw (2)
14. Plate
15. Nut (2)
16. Fuse holder
17. Lens
18. Lamp
19. Nut
20. Washer
21. Light
22. Screw (4)
23. Nut (4)
24. Protective cover and chain
25. Screw (4)
26. Nut (4)
27. Harness
28. Chassis

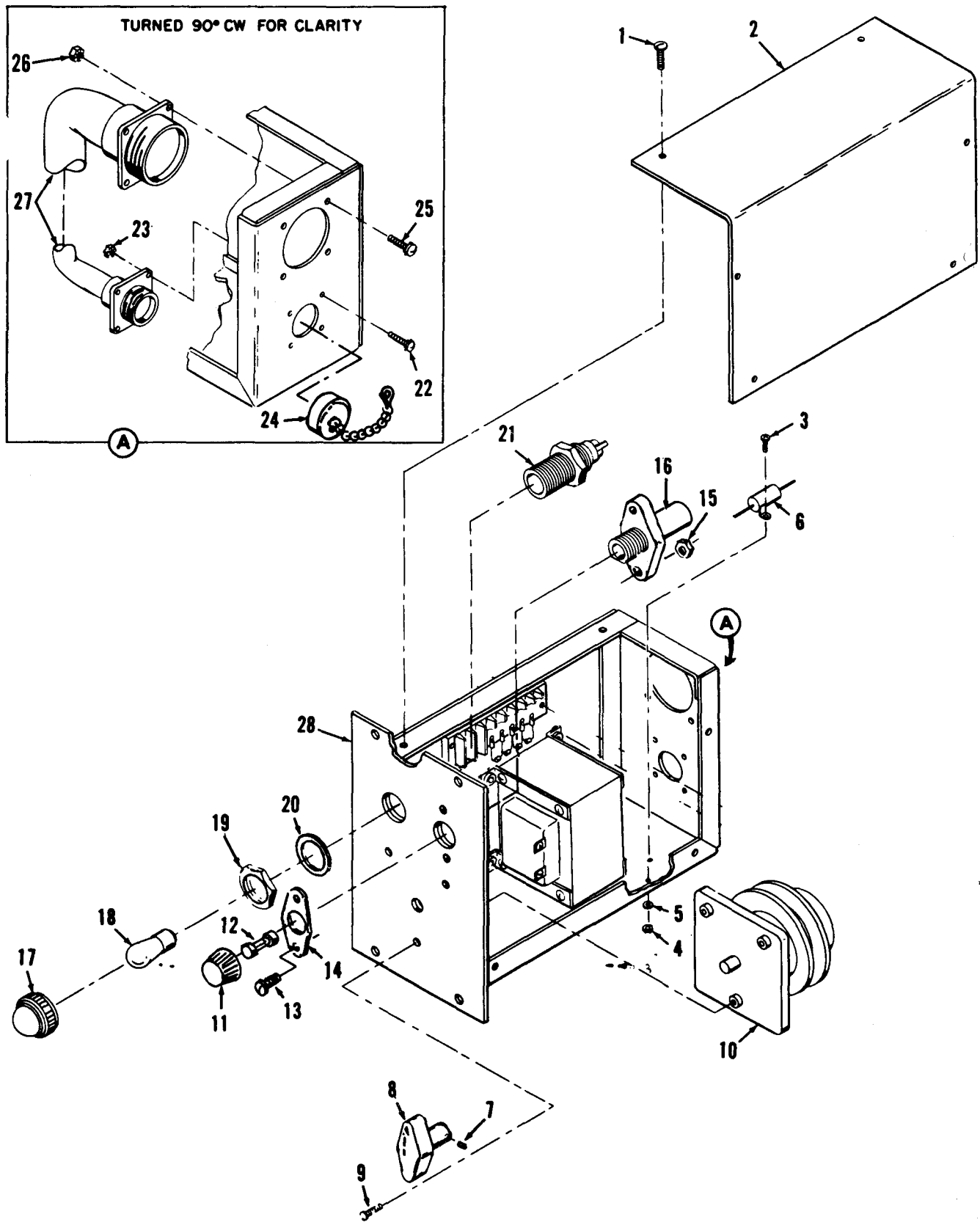


Figure 4-7. Electric heater kit control box, partially exploded view

c. Slowly close manual shutoff valve and observe gauge reading. Gauge should indicate 30 to 35 PSIG. Open and close valve two additional times and check for gauge reading consistency.

d. Adjust manual shutoff valve to obtain a 2 PSIG indication on gauge. Check flow indication on flow meter. Flow meter should indicate a minimum of 80 GPH.

e. Shut down kit, refer to figure 2-17.

f. Remove test equipment from coolant pump and connect hose to pump. Replace pump if pressure exceeds 35 PSIG or a minimum of 80 GPH is not obtained when operating at 2 PSIG.

4-28. THERMOSTAT TEST.

To test thermostat, disconnect kit power cable from power supply and proceed as follows:

a. Place a suitable container at coolant drain. Close coolant valves (6 and 48, figure 4-6) and open coolant drain valve (45) to drain kit. Close coolant drain valve. Remove thermostat (24) as illustrated in figure 4-6.

b. Fill a suitable container with water and place thermometer in container. Place temperature sensing end of thermostat in water.

c. Heat water and check for continuity. There should be continuity between terminals up to 120°F and no continuity after 120°F. Permit water to cool, contacts should close and indicate continuity at 100°F.

d. Remove test equipment. Replace defective thermostat.

e. Install thermostat as illustrated in figure 4-6. Open coolant valves and service radiator, refer to paragraph 3-8. Connect power cable to power supply.

4-29. HEATER TEST.

To test heater, proceed as follows:

WARNING

Make sure kit power cable is removed from power supply.

a. Disconnect heater cover (30, figure 4-6) by removing screw (29).

b. Disconnect harness wires from heater terminal studs by removing nuts (31) and washers (32).

c. Connect single phase 230 volts, 50, 60, or 400 hertz power supply to heater. Connect suitable ammeter and wattmeter in series with heater and power supply.

d. Apply 230 VAC and observe ammeter and wattmeter. Heater should draw 10.8 amperes and 2500 watts.

e. Remove test equipment from heater. If heater does not meet specification in step d., replace heater.

f. Connect harness wires to heater terminal studs and secure with nuts (31) and washers (32).

g. Position heater cover (30) on heater and secure with screws (29).

Section VII. WHEEL MOUNTING KIT

4-30. GENERAL.

The wheel mounting kit consists of two detachable wheel-axle assemblies, parking brake, safety chains, pintle, and towbar. The front axle wheels are free to pivot up to 40 degrees for steering. The parking brake locks all four wheels against rotation and is actuated by a hand lever located at the right rear of the kit.

4-31. PREVENTIVE MAINTENANCE.

Table 4-7 contains a tabulated listing of preventive maintenance checks and services that shall be performed on the wheel mounting kit by operator and organizational maintenance personnel.

4-32. TROUBLESHOOTING.

Table 4-8 contains information useful in diagnosing and correcting unsatisfactory operation of the wheel mounting kit.

4-33. LUBRICATION.

Lubricate steering linkages and pivot points monthly and wheel bearing quarterly, refer to figure 4-8.

NOTE

Clean lubrication points before and after lubrication.

4-34. JACKING INSTRUCTIONS.

To jack generator set when wheel mounting kit is installed, proceed as follows:

WARNING

If parking brakes must be released to perform maintenance when generator set is jacked, release brakes prior to jacking.

a. Block wheels to prevent movement when generator set is jacked.

WARNING

Do not perform maintenance on a jacked generator set unless it is properly blocked.

b. Place suitable jack under skid base of generator set and jack wheels off ground. Place suitable blocks under skid base and lower skid base on blocks.

4-35. WHEELS AND TIRES.

a. TIRE SERVICING. Check tires for proper air pressure using a suitable tire pressure gauge. Tire pressure should be 85 PSIG. Service with compressed air as required.

b. REMOVAL. Remove wheels and tires as illustrated in figure 4-9, observing the following:

1. Jack generator set as specified in paragraph 4-34.

2. Remove nuts, lock washer, and wheel and tire from kit.

Table 4-7. Wheel Mounting Kit Preventive Maintenance Checks and Services

ITEM NO.	INTERVAL						ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
	OPERATOR				ORG.				
	DAILY								
	B	D	A	w	M	Q			
1	*					*	Tires	Inspect tires for cuts, breaks, and blisters.	
2					*		Tires	Service tires.	paragraph 4-35
3	*				*		Safety chain	Inspect safety chain for condition and proper connection.	
4					*		Steering linkages and pivot points	Lubricate steering linkage and pivot points.	paragraph 4-33
5						*	Wheel bearings	Clean, inspect, and lubricate.	paragraph 4-36
6						*	Attaching hardware	Tighten hardware. NOTE Following items shall be checked yearly.	
7							Wheel brakes	Inspect linings for wear and adjust brakes.	paragraph 4-37
8							Front axle	Check for proper toe-in.	paragraph 4-38

B - BEFORE OPERATION
D - DURING OPERATION
A - AFTER OPERATION
w - WEEKLY
M - MONTHLY
Q - QUARTERLY

Table 4-7. Wheel Mounting Kit Preventive Maintenance Checks and Services (Continued)

ITEM NO.	INTERVAL						B - BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION W - WEEKLY (40 HRS) M - MONTHLY (100 HRS) S - SEMI ANNUAL (500 HRS)		
	OPERATOR			ORG.					
	DAILY								
	B	D	A	w	M	s	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
9							Kingpins	Check for excessive wear by jacking front wheels off ground. Apply pressure from side of tire at top and bottom and try to move tire in and out. Replace kingpins if movement is at kingpin and it is excessive.	paragraph 4-38

c. DISASSEMBLY. Disassemble wheels and tires as illustrated in figure 4-9, observing the following:

WARNING

Do not disassemble wheels and tires unless all air pressure has been released.

1. Remove valve core from valve and delete all air pressure.

2. Remove bolts, nuts, and lock washers securing wheel disc. Remove disc from tire.

3. Remove flap and tube from tire.

d. CLEANING, INSPECTION, AND REPAIR.

1. Clean metal parts in an approved cleaning solvent and dry thoroughly.

2. Inspect metal parts for cracks and distortion.

3. Inspect tire and tubes for holes, inbeded objects, and excessive wear.

4. Inspect threads for damage.

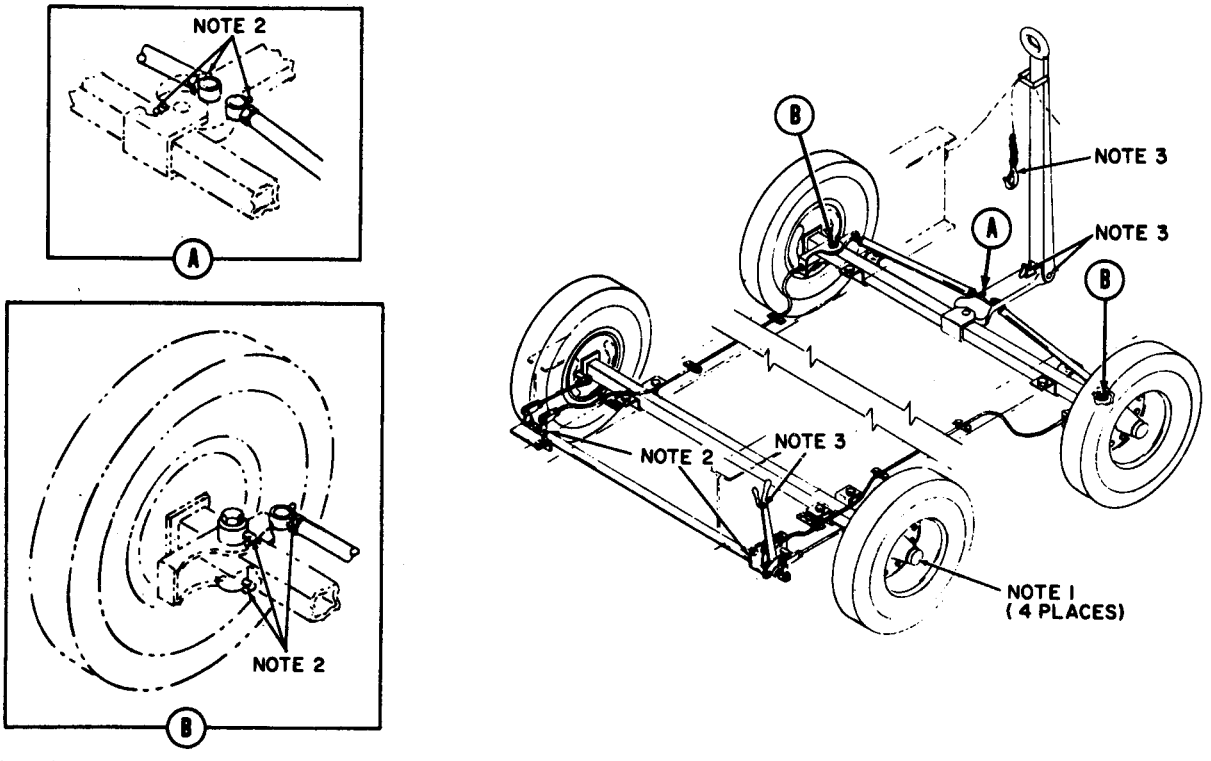
5. Refer to Appendix A for listing of applicable service manual for repair of wheels and tires.

Table 4-8. Wheel Mounting Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Abnormal tire wear.	a. Improper tire pressure.	a. Correct tire pressure (paragraph 4-35).
	b. Axle assemblies mounting hardware loose.	b. Tighten hardware.
	c. Improper toe-in on front wheels.	c. Adjust toe-in (paragraph 4-38).
2. Wheel wobbles.	a. Lug nuts loose.	a. Tighten lug nuts (paragraph 4-35).
	b. Defective or improperly adjusted wheel bearings.	b. Adjust or replace wheel bearings (paragraph 4-36).
9. Kit pulls to one side.	a. Improper tire pressure.	a. Correct tire pressure (paragraph 4-35).
	b. Wheel brake dragging.	b. Adjust brakes (paragraph 4-37).
	c. Bent tie rod on front axle.	c. Replace tie rod (paragraph 4-38).
	d. Improper toe-in adjustment of front axle.	d. Adjust toe-in (paragraph 4-35).
	e. Defective wheel bearing.	e. Replace wheel bearing (paragraph 4-37).
4. Kit tends to wander.	a. Improper tire pressure.	a. Correct tire pressure (paragraph 4-35).

Table 4-8. Wheel Mounting Kit Troubleshooting (Continued)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
4. Kit tends to wander (continued)	b. Axle assemblies mounting hardware loose.	b. Tighten hardware.
	c. Loose wheel bearing nut.	c. Tighten nut (paragraph 4-37).



NOTES:

1. WHEEL BEARINGS. PACK BEARINGS WITH GREASE, FEDERAL SPECIFICATION VV-G-632, TYPE A, GRADE 2, REFER TO PARAGRAPH 4-36.

2. GREASE FITTINGS. LUBRICATE WITH GREASE GUN USING MULTI-PURPOSE GREASE, MILITARY SPECIFICATION MIL-G-10924, GRADE 1.

3. PIVOT POINTS. APPLY LUBRICATING OIL CONFORMING TO FEDERAL SPECIFICATION VV-L-820.

Figure 4-8. Wheel mounting kit, lubrication data

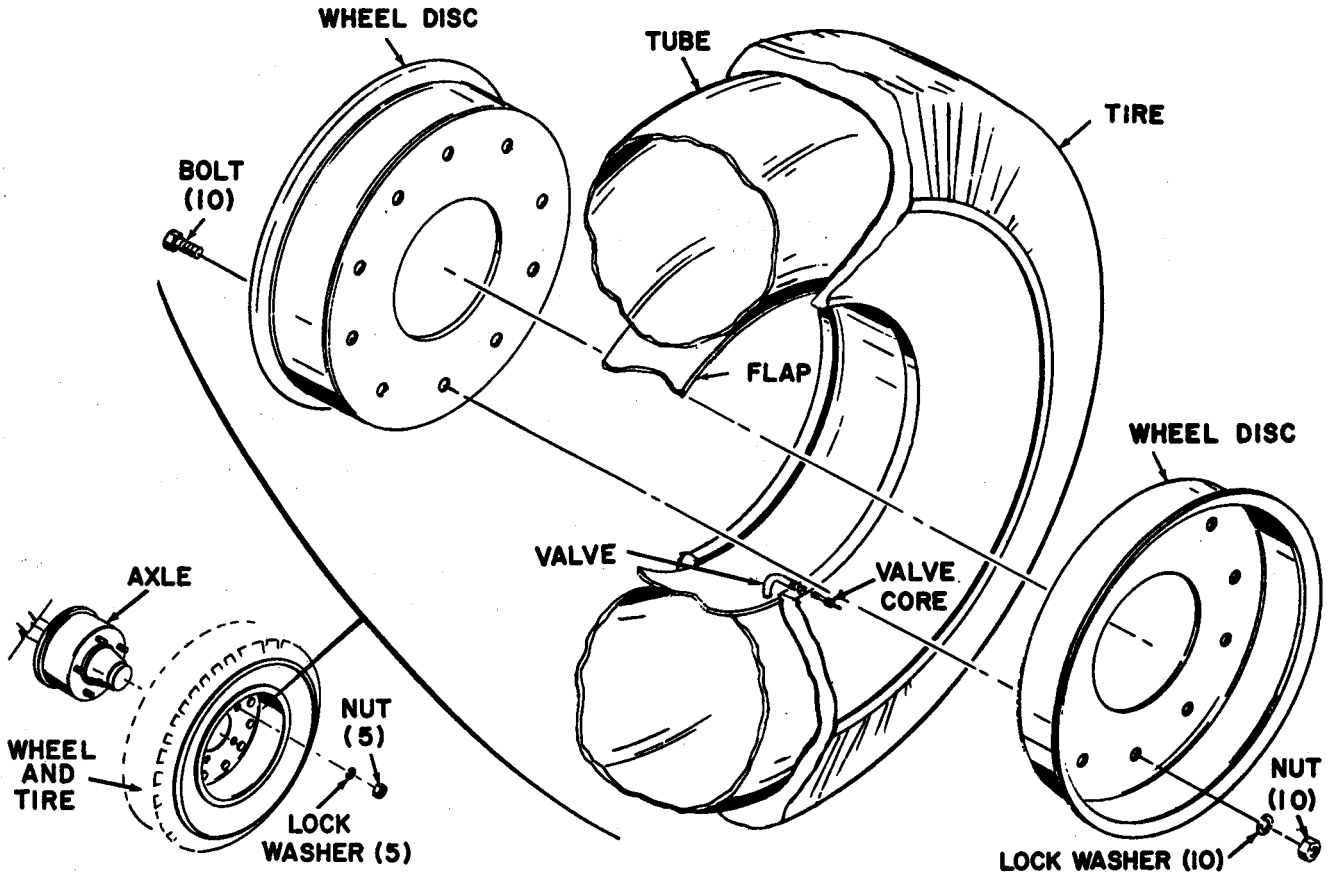


Figure 4-9. Wheel mounting kit wheels and tires, removal and installation

e. REASSEMBLY. Reassemble wheels and tires as illustrated in figure 4-9, observing the following:

1. Position tube in tire, make sure valve is straight. Install flap.

2. Insert tube valve in disc and bolt disc together.

3. Service tires with 85 PSIG of compressed air. Check tires for leakage.

f. INSTALLATION. Install wheels and tires as illustrated in figure 4-9, observing the following:

1. Position wheel and tire on axle and receive with nuts and lock washers. Tighten nuts evenly.

2. Lower generator set until tire touches ground and retighten nuts.

3. Lower generator set and remove jack.

4-36. WHEEL BEARINGS.

a. REMOVAL. Remove wheel bearings as illustrated in figure 4-10, observing the following:

1. Jack generator set as specified in paragraph 4-34.

2. Remove wheel bearings and assembled wheel and tire.

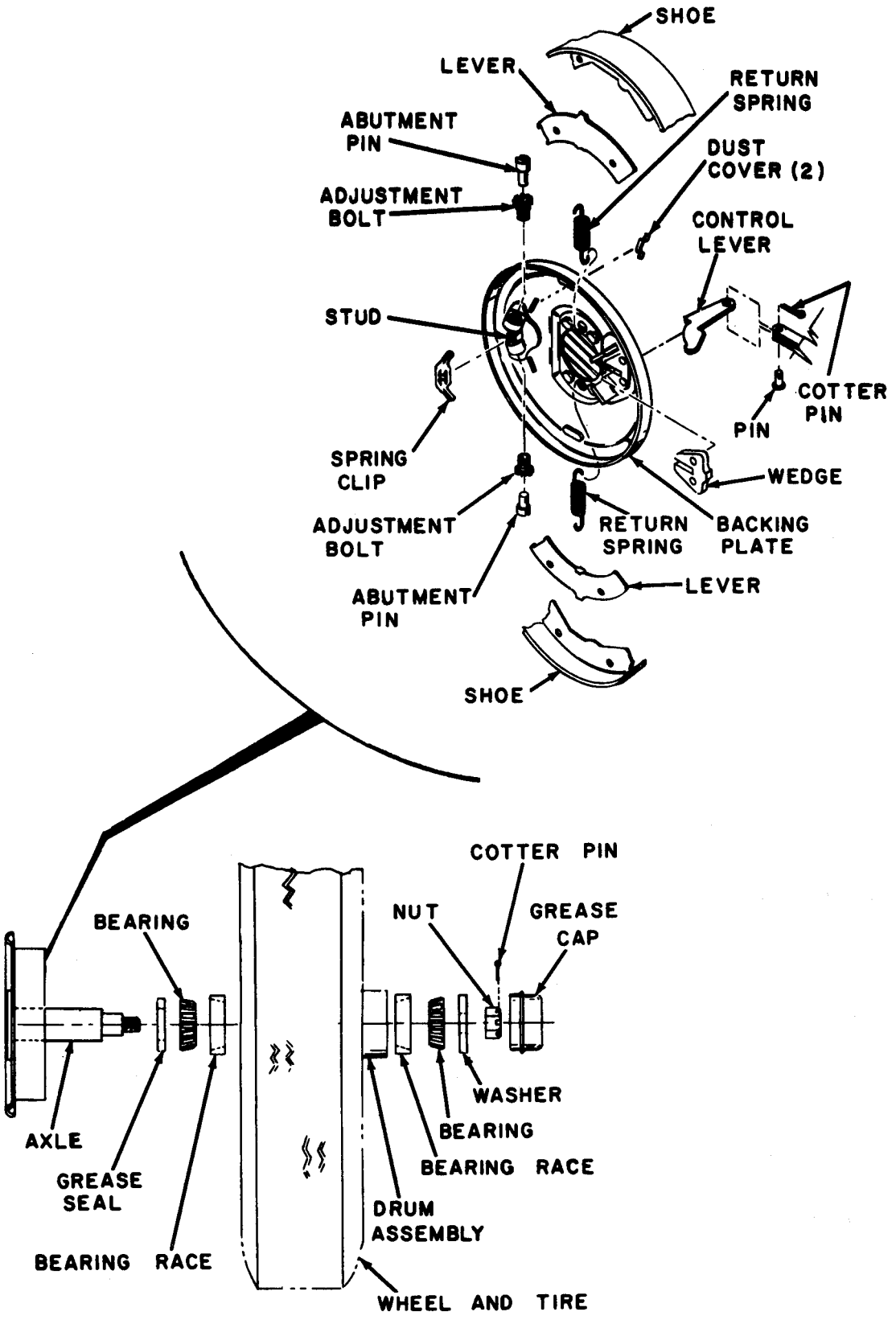


Figure 4-10. Wheel bearings and brakes, exploded view

3. Do not remove bearing races from drum assembly unless they are found to be defective at time of inspection. Tap races from drum using suitable drift and hammer.

b. CLEANING AND INSPECTION.

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

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

3. Inspect bearings for smoothness of rotation and races for pitting.

4. Replace defective parts. Bearing and races are matched sets and shall be replaced as sets.

c. LUBRICATION. Pack bearings with grease conforming to Federal Specification VV-G-632, type A, grade 2. Apply light film of grease to running surfaces of bearing races, outside and inside diameter of grease seal, and axle.

d. INSTALLATION. Install wheel bearings as illustrated in figure 4-10, observing the following:

1. Make sure brake linings and drums are free of grease prior to installation.

2. Install bearing races and grease seal using sleeves the same diameter as races and seal.

3. Adjust wheel bearings as specified in step e. prior to installing cotter pin and grease cap.

4. Lower generator set and remove jack.

e. ADJUSTMENT. Refer to figure 4-10 and adjust wheel bearings as follows:

1. Jack generator set as specified in paragraph 4-34.

2. Tighten nut until it is snug. Back off nut until next cutout in nut is aligned with cotter pin hole in axle.

3. Spin wheel to make sure it is free to rotate and bearings are not binding.

4. Install new cotter pin and grease cap.

5. Lower generator set and remove jack.

4-37. WHEEL BRAKES.

a. REMOVAL. Remove components of wheel brakes as illustrated in figure 4-10, observing the following:

1. Jack generator set as specified in paragraph 4-34.

2. Remove assembled wheel and drum assembly as illustrated.

3. Using a suitable tool, pry spring clip off stud before attempting to remove adjustment bolts.

b. CLEANING, INSPECTION, AND REPAIR.

1. Clean parts, except brake shoes, with an approved cleaning solvent and dry thoroughly. Clean shoes with clean lint-free cloth.

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

3. Inspect linings for wear, if brake lining thickness is 1/16 of an inch or less, brake shoes shall be replaced.

4. Inspect brake drum for grooves, cracks, and excessive wear. A new brake drum inside diameter is 7.125 inches, maximum allowable wear is 0.060 inch.

5. Repair brake drum by turning drum down on a suitable lathe to remove imperfections from drum.

6. After turn down, measure brake drum to make sure it is within limits.

7. Replace defective parts.

c. LUBRICATION.

1. Apply thin film of grease, conforming to Military Specification MIL-G-10924, to backing plate brake shoe contact areas.

2. Apply film of lubricating oil, conforming to Military Specification MIL-L-15016 to threads of adjustment bolts and side slots in wedge.

d. INSTALLATION. Install components of wheel brakes as illustrated in figure 4-10, observing the following:

1. When installing spring clip, use suitable hollow punch to tap spring clip onto stud.

2. Make sure brake shoes and drums are free of grease prior to installation.

3. Install assembled wheel and drum assembly as illustrated in figure 4-10.

4. Adjust wheel bearings, refer to paragraph 4-36, step e.

5. Adjust wheel brakes, refer to step e.

6. Lower generator set and remove jack.

e. ADJUSTMENT. Adjust wheel brakes as follows:

1. Jack generator set as specified in paragraph 4-34.

2. Remove dust covers from backing plate, refer to figure 4-10. Adjust each wheel brake using a suitable brake adjusting tool.

NOTE

Each brake shoe must be adjusted individually.

3. Rotate adjustment bolt counterclockwise until shoe is snug against drum. Back-off adjustment bolt six ratchet clicks, clockwise. This will provide approximately 0.010 of an inch running clearance between shoe and drum.

4. Apply and release brakes, refer to figure 2-18. Rotate wheels to make sure they turn freely.

5. Lower generator set and remove jack.

4-38. FRONT AXLE ASSEMBLY.

a. COMPONENT REMOVAL. Refer to figure 4-11 and remove components from front axle in the sequence of index numbers. Pay particular attention to the following:

1. Jack generator set as specified in paragraph 4-34.

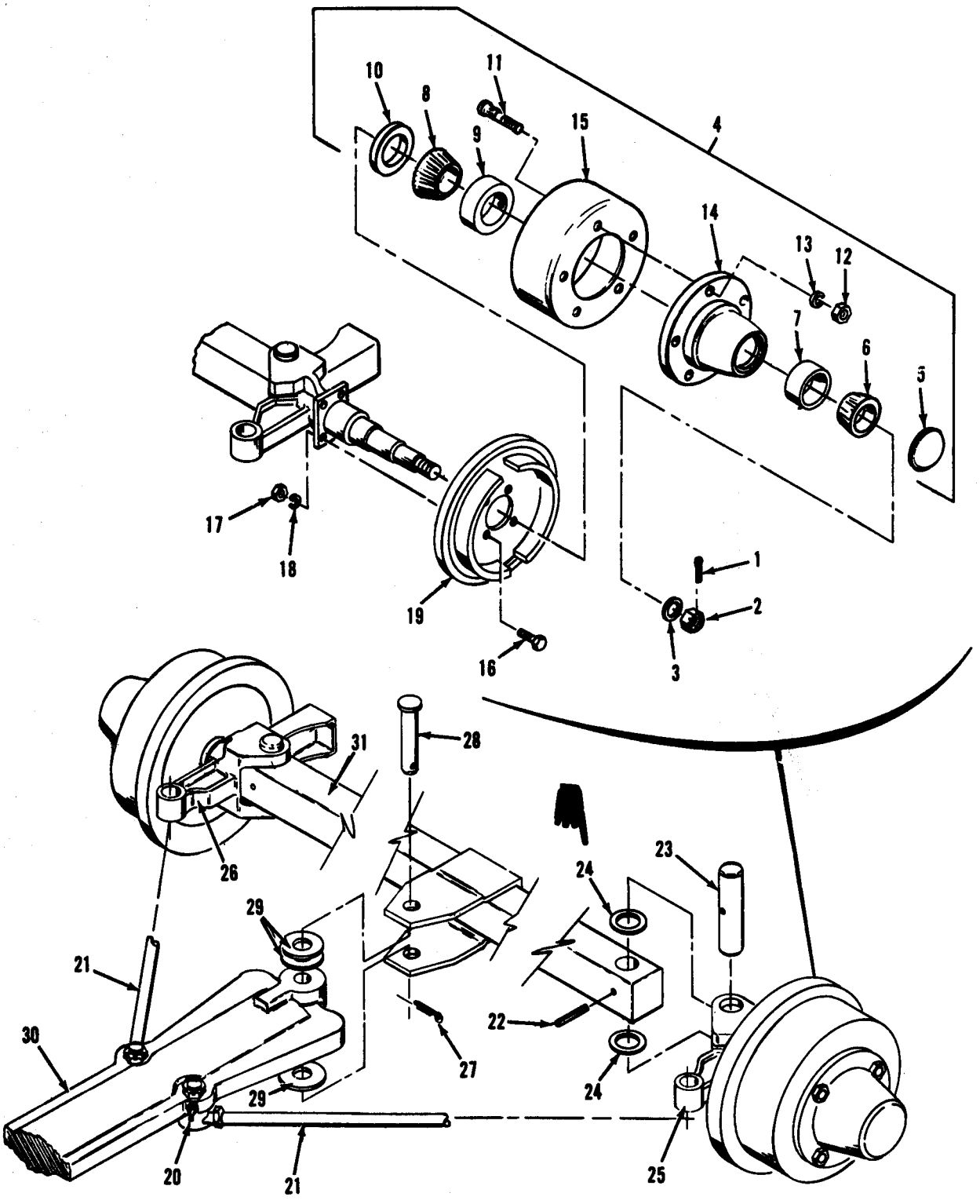


Figure 4-11. Front axle assembly, exploded view

Legend to figure 4-11:

1. Cotter pin (2)
2. Nut (2)
3. Washer (2)
4. Hub and drum assembly (2)
5. Cup (2)
6. Bearing (2)
7. Bearing race (2)
8. Bearing (2)
9. Bearing race (2)
10. Seal (2)
11. Stud (10)
12. Nut (10)
13. Lock washer (10)
14. Hub (2)
15. Brake drum (2)
16. Bolt (8)
17. Nut (8)
18. Washer (8)
19. Brake backing plate (2)
20. Lube fittings (9)
21. Tie rod assembly (2)
22. Pin (2)
23. King pin (2)
24. Washer (4)
25. Spindle and knuckle
26. Spindle and knuckle
27. Pin
28. Pin
29. Spacer (3)
30. Arm and latch assembly
31. Axle beam

2. Remove wheels and tires as specified in paragraph 4-35.

3. Remove brake components as specified in paragraph 4-37.

4. Remove wheel bearing races as specified in paragraph 4-36.

5. Use a suitable press to remove studs (11).

6. Use a suitable punch to remove pins (22) and king pins (23).

b. CLEANING, INSPECTION, AND REPAIR.

1. Clean parts, except brake shoes, with an approved cleaning solvent and dry thoroughly. Clean shoes with clean lint-free cloth.

2. Inspect parts for cracks, breaks, and distortion.

3. Inspect for damaged threads.

4. Inspect linings for wear, if brake lining thickness is 1/16 of an inch or less, brake shoes shall be replaced.

5. Inspect bearings for smoothness of rotation and races for pitting.

6. Replace defective parts. Bearings and races are matched sets and shall be replaced as sets.

7. Using a suitable reamer, ream king pin (23, figure 4-11) bushing until king pin is a thumb press fit.

c. LUBRICATION.

1. Apply thin film of grease, conforming to Military Specification MIL-G-10924, to backing plate brake shoe contact areas.

2. Apply film of lubricating oil, conforming to Military Specification MIL-L-15016 to threads of adjustment bolts and side slots in wedge.

3. Pack bearings with grease conforming to Federal Specification VV-G-632,

type A, grade 2. Apply light film of grease to running surfaces of bearing races, outside and inside diameter of grease seal, and axle.

d. COMPONENT INSTALLATION. Refer to figure 4-11 and install components in the reverse order of index numbers assigned. Pay particular attention to the following:

1. Reassemble and adjust wheel brakes as specified in paragraph 4-37.

2. Install wheel bearing races and seal (10) as specified in paragraph 4-36.

3. Adjust wheel bearings as specified in paragraph 4-36 prior to installing pin (1) and cup (5).

4. Install wheels and tires as specified in paragraph 4-35.

5. Lower generator set and remove jack.

6. Adjust tie rod assembly as specified in step e.

e. ADJUSTMENT. Refer to figure 4-11 and adjust tie rod assembly as follows:

1. Check wheel toe-in with a toe-in gauge. The toe-in should be 0.06 to 0.12 inch.

2. If adjustment is required, place wheels in straight ahead position, and disconnect the left tie rod assembly end from the arm and latch assembly.

3. Turn tie rod assembly in the direction necessary to bring the toe-in within specifications. (Shorten the tie rod assembly to decrease toe-in, and lengthen the tie rod assembly to increase toe-in.)

4. Connect the left tie rod assembly end to the arm and latch assembly.

4-39. REAR AXLE ASSEMBLY.

a. COMPONENT REMOVAL. Refer to figure 4-12 and remove components from the rear axle in the order of index numbers assigned. Pay particular attention to the following:

1. Jack generator set as specified in paragraph 4-34.

2. Remove wheels and tires as specified in paragraph 4-35.

3. Remove brake components as specified in paragraph 4-37.

4. Remove wheel bearing races as specified in paragraph 4-36.

5. Use a suitable press to remove studs (11).

b. CLEANING, INSPECTION AND REPAIR.

1. Clean parts, except brake shoes, with an approved cleaning solvent and dry thoroughly. Clean shoes with clean lint-free cloth.

2. Inspect parts for cracks, breaks, and distortion.

3. Inspect for damaged threads.

4. Inspect linings for wear, if brake lining thickness is 1/16 of an inch or less, brake shoes shall be replaced.

5. Inspect bearings for smoothness of rotation and races for pitting.

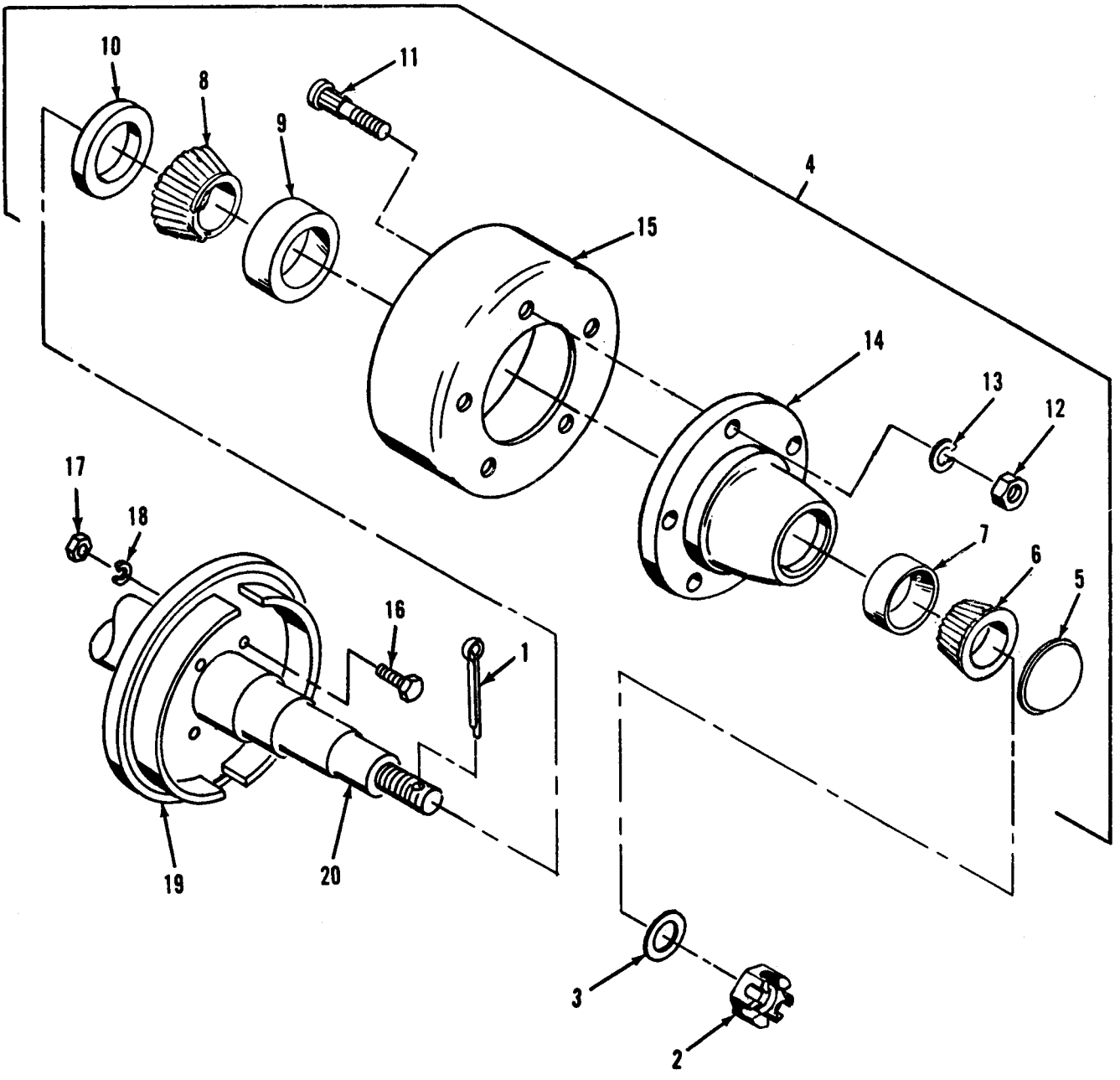


Figure 4-12. Rear axle assembly, exploded view

Legend to figure 4-12:

1. Cotter pin (2)
2. Nut (2)
3. Washer (2)
4. Hub and drum assembly (2)
5. Cup (2)
6. Bearing (2)
7. Bearing race (2)
8. Bearing (2)
9. Bearing race (2)
10. Seal (2)
11. Stud (10)
12. Nut (10)
13. Lock washer (10)
14. Hub (2)
15. Brake drum (2)
16. Bolt (8)
17. Nut (8)
18. Washer (8)
19. Brake assembly (2)
20. Axle beam

6. Replace defective parts. Bearings and races are matched sets and shall be replaced as sets.

c. LUBRICATION.

1. Apply thin film of grease, conforming to Military Specification MIL-G-10924, to backing plate brake shoe contact areas.

2. Apply film of lubricating oil, conforming to Military Specification MIL-L-15016 to threads of adjustment bolts and side slots in wedge.

3. Pack bearings with grease conforming to Federal Specification VV-G-632, type A, grade 2. Apply light film of grease to running surfaces of bearing races, outside and inside diameter of grease seal, and axle.

d. COMPONENT INSTALLATION. Refer to figure 4-12 and install components in the reverse order of index numbers assigned. Pay particular attention to the following:

1. Reassemble and adjust wheel brakes as specified in paragraph 4-37.

2. Install wheel bearing races and seal (10) as specified in paragraph 4-36.

3. Adjust wheel bearings as specified in paragraph 4-36, prior to installing pin (1) and cup (5).

4. Install wheels and tires as specified in paragraph 4-35.

5. Lower generator set and remove jack.

4-40. BRAKE LINKAGES AND CABLES.

a. REMOVAL. Refer to figure 4-13 and remove components in the order of index numbers assigned. Pay particular attention to the following:

1. Jack generator set as specified in paragraph 4-34.

Legend to figure 4-13:

1. Screw (2)
2. Nut (2)
3. Bracket cable guide (2)
4. Screw (8)
5. Nut (8)
6. Cable clamp (4)
7. Screw (4)
8. Nut (4)
9. Plate (2)
10. Cable and conduit assembly (2)
11. Screw (2)
12. Lock washer (2)
13. Cotter pin (8)
14. Pin (8)
15. Yoke (6)
16. Nut (6)
17. Threaded stud (2)
18. Screw (2)
19. Nut (2)
20. Cross shaft bracket
21. Screw (2)
22. Lock washer (2)
23. Screw (5)
24. Nut (5)
25. Hand brake bracket
26. Hand brake and shaft assembly
27. Nut (2)
28. Safety chain assembly (2)
29. Drawbar assembly

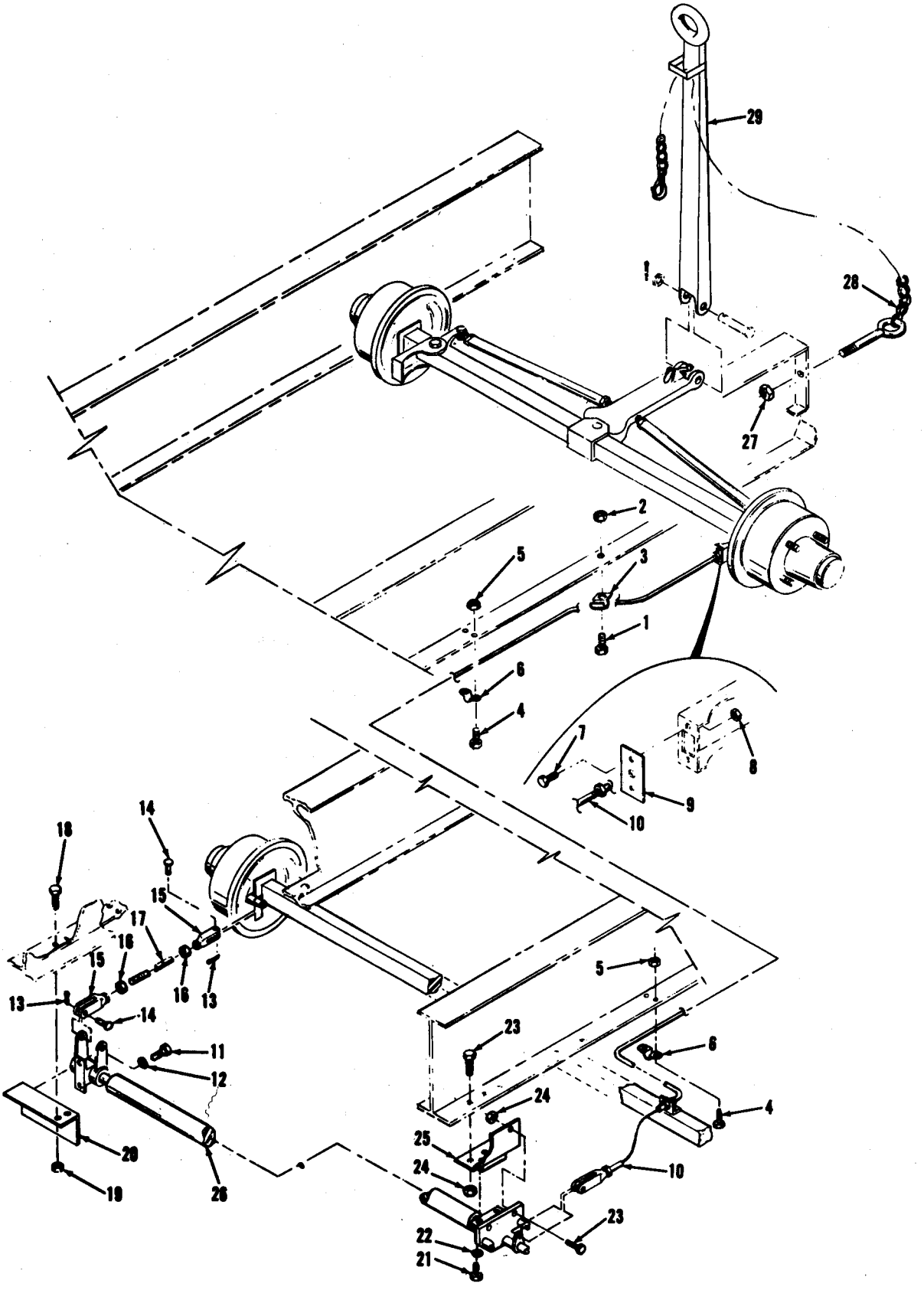


Figure 4-13. Brake linkages and cables, exploded view

b. CLEANING AND INSPECTION.

1. Clean components with an approved cleaning solvent and dry thoroughly.

2. Inspect components for cracks, breaks, and distortion.

3. Inspect for damaged threads.

4. Replace defective parts.

c. INSTALLATION. Refer to figure 4-13 and install components in the reverse order of index numbers assigned. Pay particular attention to the following:

1. After all components have been installed, adjust hand brake as specified in step d.

2. Lower generator set and remove jack.

d. ADJUSTMENT. Refer to figure 4-13 and adjust hand brake as follows:

1. Jack generator set as specified in paragraph 4-34.

2. Place hand brake in the released position and rotate wheels, by hand, and check for binding (spot binding may be caused by high spots on brake shoes).

3. Place hand brake in the engaged position. This should be 1/2 to 3/4 way on hand brake ratchet. Rotate wheels by hand, wheels should be locked.

4. Brake adjustment is accomplished on each wheel by removing cotter pin, pin, and yoke from hand brake shaft assembly and loosening jam nut on cable assembly.

5. Screw yoke inward on cable assembly to increase cable tension, and outward to decrease cable tension. Tighten jam nut and install cable assembly yoke with pin and secure with cotter pin.

6. Lower generator set and remove jack.

Section VIII. DUMMY LOAD KIT

4-41. GENERAL.

The dummy load kit is a balanced three phase, four-wire, resistive type with an approximate 50 KW rating. It is equipped with a voltage change board that permits operation at 120/208 or 240/416 volts. Incorporated in the dummy load kit is an automatic load removal circuit that will automatically remove the dummy load from the generator set if generator set output exceeds approximately 50 KW. The automatic load removal circuit may be utilized or bypassed by placing automatic load removal switch to the desired position. The dummy load kit is provided with a load selector switch that permits application of the approximate 50 KW load in increments of approximately 12.5 KW.

4-42. INSTALLATION AND SETTING UP INSTRUCTIONS.

a. INSTALLATION. To install dummy load kit, proceed as follows:

1. Drill mounting holes in generator roof as shown in figure 4-14.

2. Remove three center generator set rear cover screws, nuts, and washers. Discard screws. Position nuts (24, figure ure 4-15) on screws (23) so that nuts are approximately one half inch from screw head. Install screws and nuts, washers (25 and 26), and nuts (27) generator set rear cover.

3. Position suitable cables in dummy load kit lifting eyes and overhead lifting device hook. Position kit on generator set roof so that control box is at generator set control cubicle end.

4. Align mounting holes in generator set roof prior to removing lifting device.

5. Secure dummy load kit to generator set with screws (6), nuts (5), and washers (4).

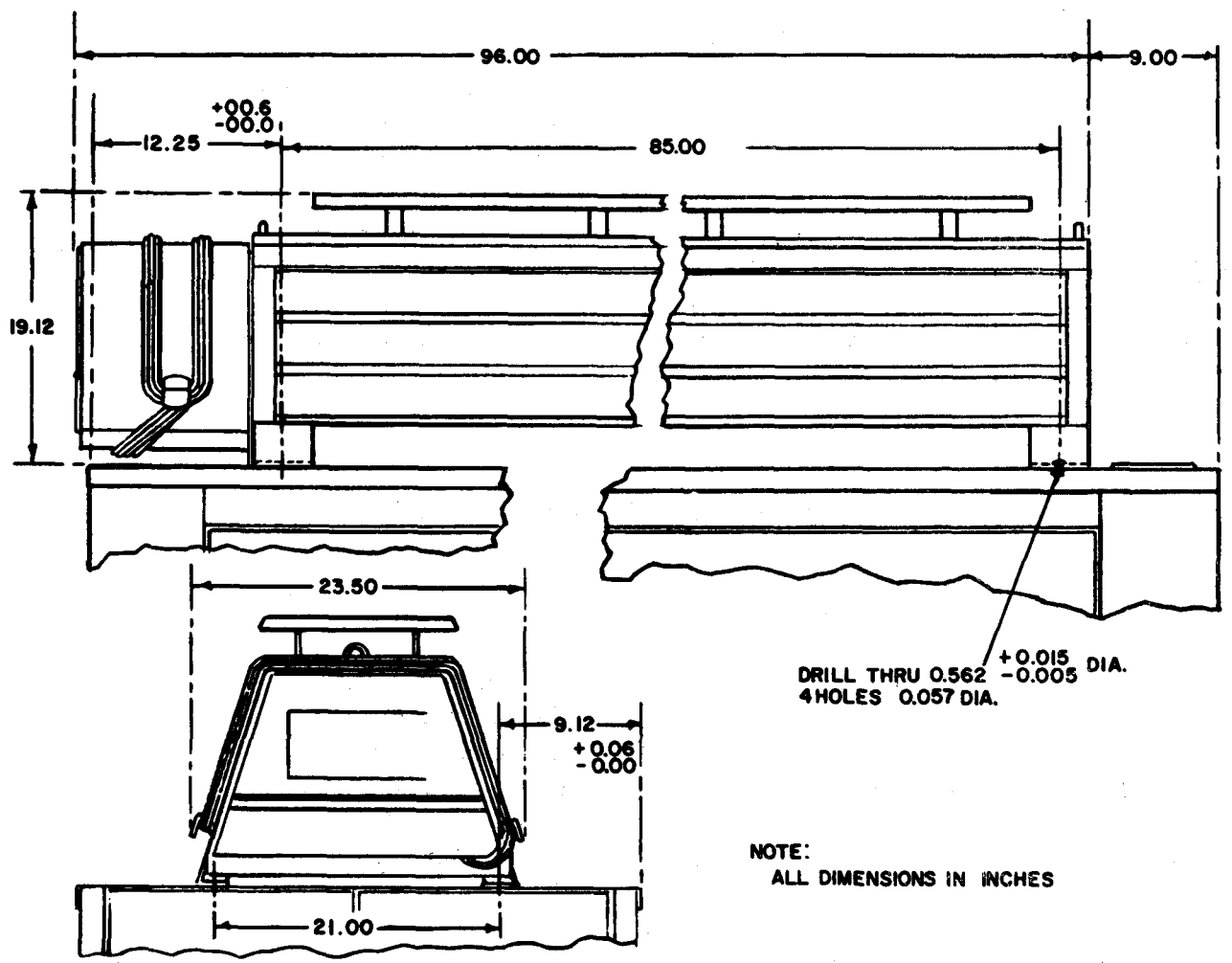


Figure 4-14. Dummy load kit drilling diagram

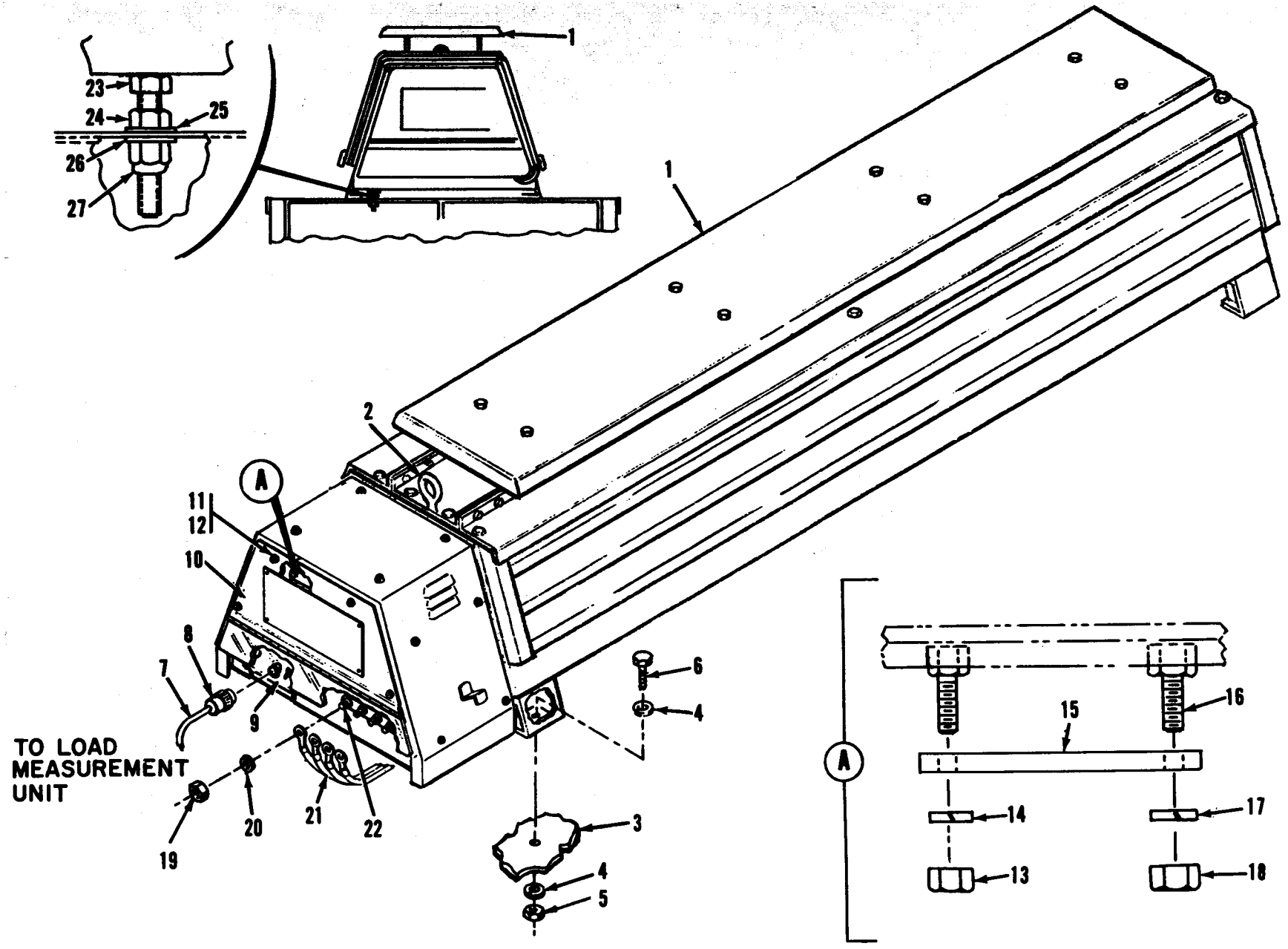


Figure 4-15. Dummy load kit

Legend to figure 4-15:

1. Dummy load kit
2. Lifting eye (2)
3. Generator set roof
4. Washer (8)
5. Nut (4)
6. Screw (4)
7. Load sensing cable
8. Connector J1
9. Control box
10. Transparent cover
11. Screw (6)
12. Washer (6)
13. Nut
14. Washer
15. Voltage change strip
16. Terminal
17. Washer
18. Nut
19. Nut
20. Washer
21. Load cable
22. Load terminal
23. Screw (3)
24. Nut (3)
25. Washer (3)
26. Washer (3)
27. Nut (3)

6. Hold screws (23) stationary and adjust nuts (24 and 27) so that screws contact dummy load kit supporting kit weight. Tighten nuts to lock screws in position.

b. LOAD CONNECTIONS. To connect load cables, refer to figure 4-15 and proceed as follows:

1. Hinge up transparent cover (10) and remove nuts (19) and washers (20) from load terminals (22).

2. Position load cables (21) on load terminals (22) and secure with nuts (19) and washers (20). Make sure neutral cable is connected to LO terminal.

3. Connect load cables to generator set, refer to paragraph 2-5, step g.

4. Disconnect plug P1 from load measurement unit (located in left rear side of generator set). Connect adapter plug (furnished with dummy load connector harness) to receptacle J1 of load measurement unit. Connect dummy load harness and plug P1 to adapter plug. Remove cover from control panel connector and connect dummy load kit harness.

c. VOLTAGE CONVERSION. To convert dummy load kit to 120/208 volts or 240/416 volts, refer to figure 4-15 and proceed as follows:

1. Disconnect transparent cover (10) by removing screws (11) and washers (12).

2. Remove nuts (13 and 18) and washers (14 and 17) and position voltage change strips (15) so that right end of strips are in alignment with desired voltage.

3. Secure strips with nuts and washers.

4. Position transparent cover on kit and secure with screws and washers.

4-43. TROUBLESHOOTING.

Table 4-9 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the dummy load kit.

Table 4-9. Dummy Load Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Dummy load kit does not apply load to generator set.	a. Defective load selector switch.	a. Replace switch (paragraph 4-45).
	b. Defective wiring.	b. Repair or replace wiring (figure 1-12).
	c. Other causes.	c. Refer to higher level of maintenance.
2. Indicator does not illuminate when dummy load kit is in operation.	a. Defective lamp.	a. Replace lamp (paragraph 4-45).
	b. Defective light.	b. Replace light (paragraph 4-45).
	c. Defective wiring.	c. Repair or replace wiring (figure 1-12).
	d. Other causes.	d. Refer to higher level of maintenance.
3. Dummy load kit load is not removed from generator set when load reaches approximately 50 KW.	a. Automatic load removal switch in bypass position.	a. Position switch to ON.
	b. Defective automatic load removal switch.	b. Replace switch (paragraph 4-45).
	c. Defective wiring.	c. Repair or replace wiring (figure 1-12).
	d. Other causes.	d. Refer to higher level of maintenance.
4. Uneven output at dummy load kit load terminals.	a. Voltage change strips not properly positioned.	a. Position strips properly (paragraph 4-42).
	b. Defective heater element.	b. Test and replace if defective (paragraph 4-46).
	c. Defective wiring.	c. Repair or replace wiring (figure 1-12).
	d. Other causes.	d. Refer to higher level of maintenance.

4-44. DUMMY LOAD KIT.

a. TEST. Test dummy load kit as follows:

1. Operate generator set with a 20 KW load as specified in paragraph 2-14.

2. Operate dummy load kit as specified in figure 2-19 with load selector switch in 1/2 STEP position and automatic load removal switch in ON position.

3. Increase load while observing generator set kilowatt meter. Dummy load kit load should automatically be removed when load reaches approximately 50 KW.

4. Reduce load and place dummy load kit back in operation.

5. Repeat procedure varying generator set load and dummy load kit load. Check that dummy load kit load is automatically removed when generator set load reaches approximately 50 KW.

b. REMOVAL. Remove dummy load kit as illustrated in figure 4-15, observing the following:

WARNING

Make sure generator set is not operating, in a standby mode, or connected to a parallel bus prior to removal of load cables.

1. Disconnect load and load sensing cables.

2. Remove screws (6), nuts (5), and washers (4).

3. Use suitable cables and overhead lifting device when removing dummy load kit from generator set.

c. INSTALLATION. Install dummy load kit as specified in paragraph 4-42.

4-45. CONTROL PANEL.

a. INDICATOR LAMP REPLACEMENT. To replace indicator lamp, refer to figure 4-16 and proceed as follows:

1. Unscrew lens and remove lamp by pressing in and turning counterclockwise.

2. Install new lamp and lens.

b. COMPONENT REPLACEMENT. Replace control panel components as illustrated in figure 4-16, observing the following:

1. Remove twelve screws and washers securing control box cover to control box and remove cover.

2. Remove six screws, washers, and four nuts securing control panel to dummy load kit and move panel away from kit.

NOTE

Components should be tested in place and removed only if defective.

3. Test switches and indicator for continuity.

4. Test each harness wire for continuity, refer to figure 1-12.

5. If necessary, repair wiring harness in the same manner as the generator set wiring harnesses, refer to paragraph 3-51.

6. Prior to component replacement, tag and disconnect electrical

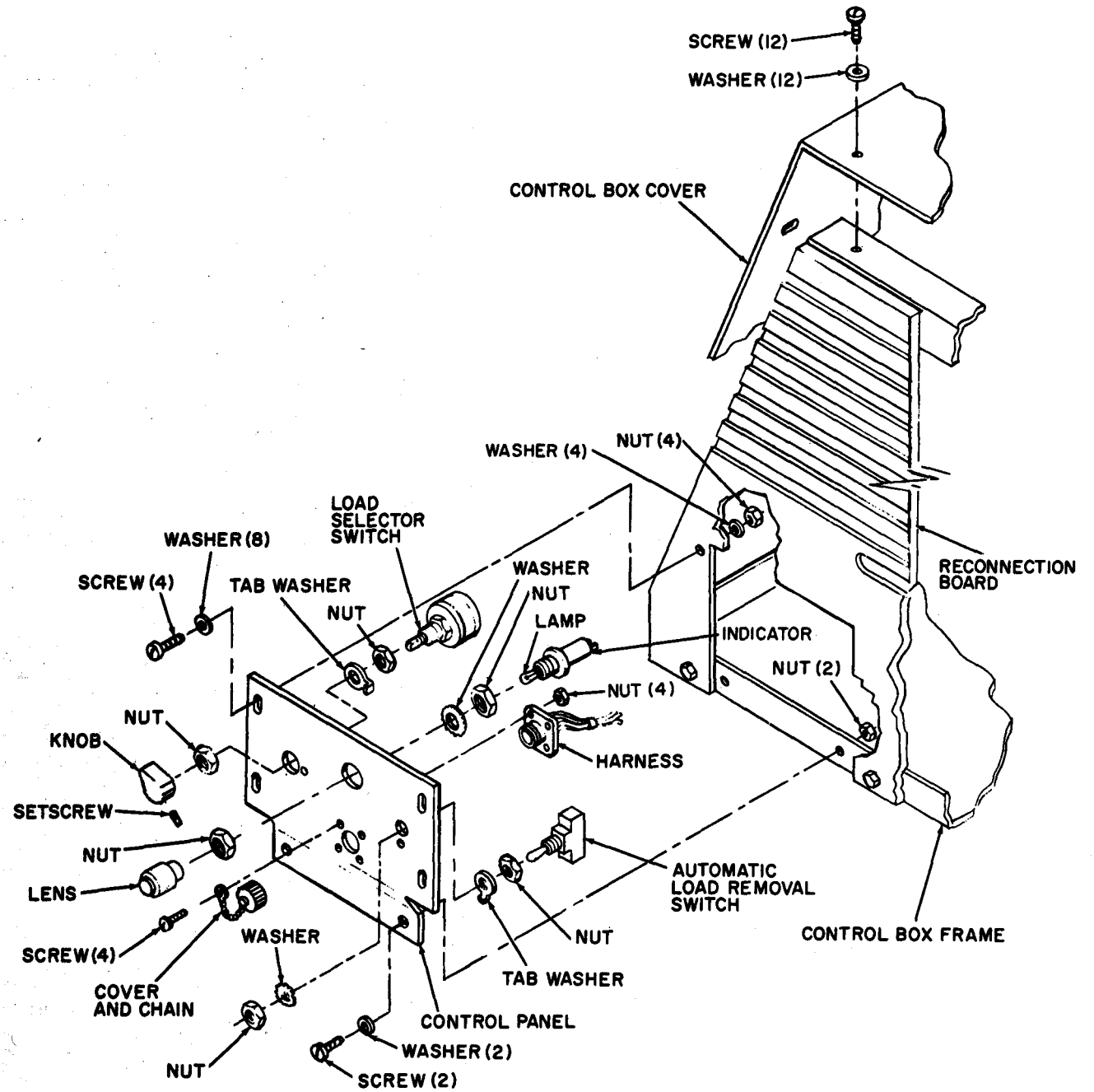


Figure 4-16. Dummy load kit control panel and components, removal and installation

wiring. Replace component and reconnect wiring. Refer to figure 1-12 and check wiring for proper connection.

7. Position and secure control panel with screws, washers and nuts.

8. Install control box cover and secure with screws and washers.

4-46. HEATER ELEMENTS.

a. REMOVAL. Remove heater elements as illustrated in figure 4-17, observing the following:

1. Disconnect load cables from generator set prior to cover and panel removal.

2. Remove lifting eyes (1), cover assembly (4), side panels (8), and channels (9).

WARNING

Make sure heater elements are cold prior to removal.

3. Tag and disconnect leads (12) and straps (13) from heater elements (17).

4. Remove heating elements (17) from heater supports (18).

b. TEST. Test each heater element for proper resistance. Resistance should be 11 to 14 ohms. Replace defective heater element.

c. INSTALLATION. Install heater elements as illustrated in figure 4-17, observing the following:

1. Install heater elements (17) on heater supports (18) and secure with screws (16), nuts (14), and lock washers (15). Leave screws (16) at center frame loose to permit expansion and travel of heater elements (17).

2. Connect leads (12) and straps (13) on heater elements. Refer to figure 1-12 and check wiring for proper connections.

3. Install channels (9), side panels (8), cover assembly (4), and lifting eyes (1).

4-47. RADIO SUPPRESSION CAPACITORS.

a. REMOVAL. Remove radio suppression capacitors as illustrated in figure 4-17, observing the following:

1. Remove cover (22). Tag and disconnect lead (25) from capacitors (29).

2. Remove capacitors (29) from control box.

b. TEST. Test capacitor for opens and shorts.

c. INSTALLATION. Install radio suppression capacitors as illustrated in figure 4-17, observing the following:

1. Connect capacitors (29) to control box with terminal towards load studs.

2. Secure leads to capacitors and install cover (22).

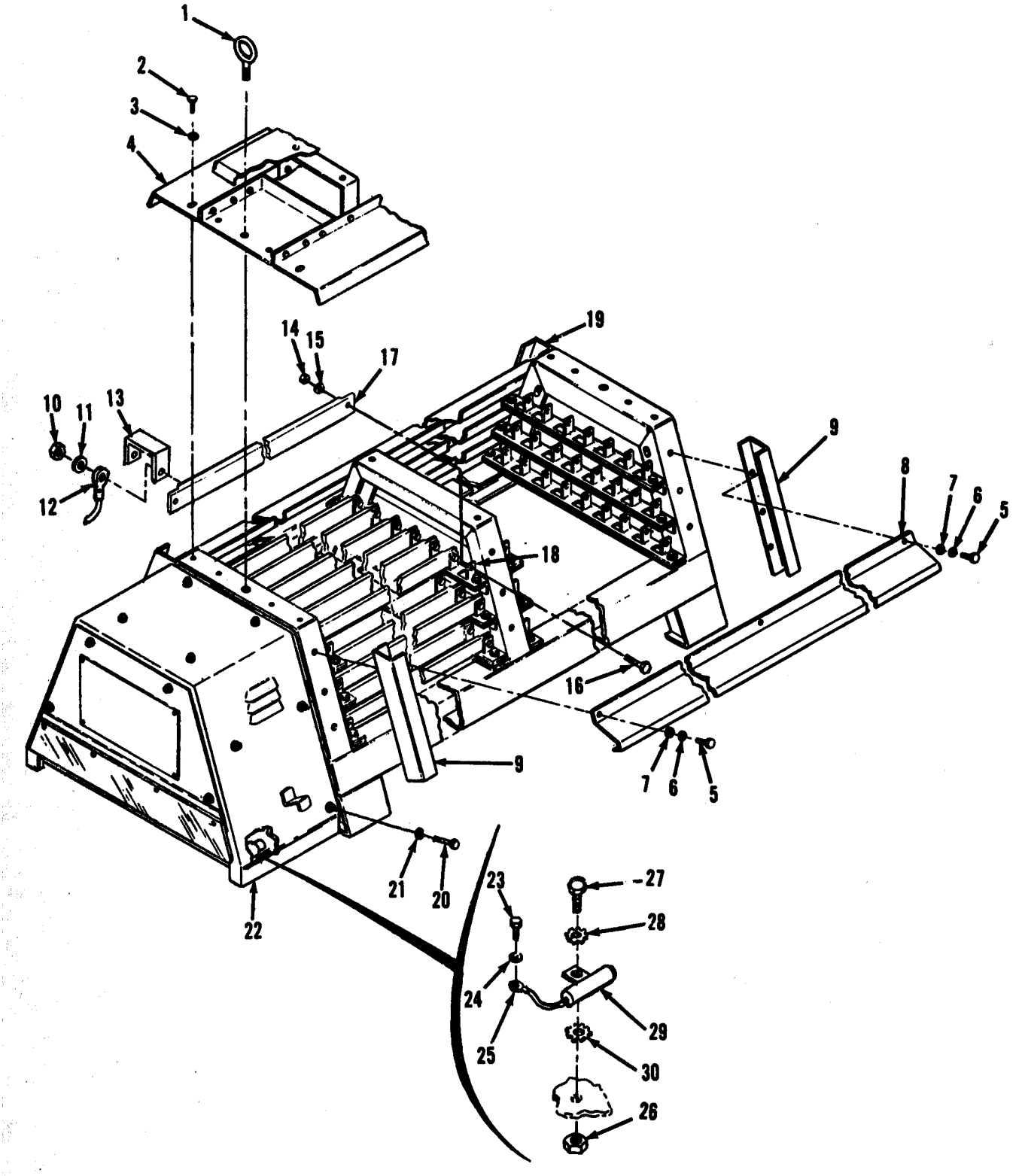


Figure 4-17. Dummy load kit, partially exploded view

Legend to figure 4-17:

1. Lifting eye (2)
2. Screw (6)
3. Lock washer (6)
4. Cover assembly
5. Screw (18)
6. Lock washer (18)
7. Washer (18)
8. Side panel (6)
9. Channel (4)
10. Nut (96)
11. Washer (96)
12. Lead (10)
13. Strap (49)
14. Nut (96)
15. Lock washer (96)
16. Screw (96)
17. Heater element (48)
18. Heater support (12)
19. Frame
20. Screw (12)
21. Washer (12)
22. Cover
23. Screw (3)
24. Washer (3)
25. Lead (3)
26. Nut (3)
27. Screw (3)
28. Washer (3)
29. Capacitor (3)
30. Washer (3)

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

5-1. PREPARATION FOR SHIPMENT.

This paragraph provides instructions for the preparation of the generator set for domestic shipment. Procedures shall be accomplished in sequence that will not require operation of previously preserved components.

a. CLEANING. Clean generator set as specified in paragraph 3-19.

b. INSPECTION. Inspect generator set for damaged components, rust, accumulation of water, and pilferage. Perform quarterly preventive maintenance checks and services, refer to table 3-2.

c. BASIC ISSUE ITEMS. Check that all basic issue items are present and properly stowed, refer to Appendix B.

d. EXPOSED METAL SURFACES. Repair all damaged painted surfaces. Coat unpainted ferrous metal surface with preservative conforming to Military Specification MIL-C-16173, grade 3.

e. LUBRICATION. Lubricate generator set in accordance with figure 3-1.

NOTE

Engine operation required for steps f., g., and h. should be accomplished at the same time and in accordance with paragraphs 2-12 and 2-13.

f. COOLING SYSTEM. Service radiator with coolant for lowest expected ambient temperature, refer to paragraph 3-8. Operate engine until normal operating temperature is reached.

g. LUBRICATING OIL SYSTEM. Change engine lubricating oil, refer to paragraph 3-11. Service lubricating oil filter, refer to figure 3-2.

h. FUEL SYSTEM. Drain majority of fuel from fuel and day tanks, refer to paragraphs 3-15 and 3-17. Add approximately one gallon of preservative oil conforming to Military Specification MIL-L-21260, grade 2 to fuel tank. Operate engine until normal operating temperature is reached. Drain fuel and day tanks after operation, refer to paragraphs 3-15 and 3-17.

i. BATTERIES. Remove batteries, refer to paragraph 3-33. Secure battery cables with tape conforming to Federal Specification PP-T-60, class 1.

j. SEALING OF OPENINGS. Seal any opening, that will permit entry of water or dirt into components, with tape conforming to Federal Specification PP-T-60, class 1.

k. MARKING. Mark generator set in accordance with Military Standard MIL-STD-129.

5-2. LOADING EQUIPMENT FOR SHIPMENT.

Refer to paragraph 2-1 and load generator set on transporter. Block and tie set to transporter to assure that it will not move during transit.

5-3. PREPARATION FOR LIMITED STORAGE.

Limited storage is defined as storage not to exceed six months. To prepare the generator set for limited storage proceed as follows:

a. The generator set shall be prepared for limited storage by performing the procedures specified in paragraph 5-1, preparation for shipment, except as follows:

Batteries. Service batteries, refer to paragraph 3-7. Remove battery cables and secure them, to prevent contact with batteries, with tape conforming to Federal Specification PP-T-60, class 1. Fully charge batteries.

b. Every effort should be made to provide covered storage for generator set. If this is impossible, select a firm, level, well-drained, storage location which is protected from prevailing winds. Position generator set on heavy planking.

5-4. INSPECTION AND MAINTENANCE OF EQUIPMENT IN LIMITED STORAGE.

Generator sets that are in limited storage shall be inspected and operated every 90 days.

a. INSPECTION. Perform quarterly preventive maintenance checks and services, refer to table 3-2.

b. OPERATION. Operate engine as specified in paragraph 2-12 until it reaches normal operating temperature. Shutdown engine, refer to paragraph 2-13.

c. REPRESERVATION. Place generator set back in limited storage, refer to paragraph 5-3.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

5-5. GENERAL (ARMY ONLY).

When capture or abandonment of a generator set to an enemy is imminent, the responsible unit commander shall make the decision either to destroy or render the generator set inoperative. For procedures to destroy or render the generator set inoperative to prevent enemy use, refer to TM 750-244-3.

APPENDIX A

REFERENCES

A-1. FIRE PROTECTION

TB 5-4200-200-10	Hand Portable Fire Extinguisher Approved for Army Users

A-2. LUBRICATION

C91OO1L	Fuels, Lubricants, Oils and Waxes
LO5-6115-457-12	End Item lubrication Order

A-3. PAINTING

T.O. 35-1-3	Painting and Marking of USAF Aerospace Ground Equipment
TM 9-213	Painting Instructions for Field Use

A-4. RADIO SUPPRESSION

MIL-STD-461	Radio Interference Suppression
TM 11-483	Radio Interference Suppression

A-5. MAINTENANCE

T.O. 00-25-225	Repair of External Power Cables, Aerospace Ground Equipment
T.O. 00-25-234	General Shop Practice Requirements for the Repair, Maintenance and Test of Electronic Equipment
T.O. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1A-14	Installation Practices for Aircraft Electric and Electronic Wiring
T.O. 31-1-75	General Maintenance Practices
T.O. 35-1-11	Organization, Intermediate and Depot Level Maintenance for FSC 6115 Non-Airborne Equipment
T.O. 35-1-12	Compounds and procedures for Cleaning Aerospace Ground Equipment
T.O. 35-1-26	Repair/Replacement Criteria for FSC 6115 Aerospace Ground Equipment

T.O. 35-1-524	USAF Equipment Registration Number System Applicable to FSC 6115 Equipment
TM 9-1870-1	Care and Maintenance of Pneumatic Tires
TB ORD 651	Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems
TM 38-750	The Army Maintenance Management System
TM 5-6115-457-12	Operator and Organizational Maintenance Manual
TM 5-6115-457-35	Intermediate (Field) (Direct and General Support) and Depot Maintenance Manual
TM 5-6115-457-25P	Organizational, Intermediate (Field) (Direct Support and General Support) and Depot Maintenance Repair Parts and Special Tools Lists
TM 9-6140-200-15	Operation and Organizational Field and Depot Maintenance Storage Batteries, Lead Acid Type
TM 5-764	Electric Motor and Generator Repair.
MIL-HDBK-705	Military Standardization Handbook, Generator Sets, Electrical Measurements and Instruments.
MIL-I-6868	Inspection Process, Magnetic Particle
MIL-I-25135	Inspection Materials, Penetrant
MIL-STD-120	Gauge Inspection
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-705	Generator Sets, Engine-Driven Methods of Test and Instructions
MIL-STD-1261(MR)	Welding Procedures for Construction Steels
MIL-T-27730	Tape, Antiseize, Polytetrafluoroethylene, with Dispenser
MS 33540	Safety Wiring and Cotter Pinning, General Practices for

A-6. SHIPMENT AND STORAGE

T.O. 35-1-4	Processing and Inspection of Aerospace Ground Equipment for Storage and Shipment
T.O. 38-l-5	Processing and Inspection of Non-Mounted Non-Aircraft Gasoline and Diesel Engines for Storage and Shipment
TB 740-90-1	Administrative Storage of Equipment
TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage

TM 38-230	Preservation, Packaging and Packing of Military Supplies and Equipment
MIL-S-207	Sulfuric Acid, Electrolyte: Packaging, Packing, and Marking for Shipment and Storage of

A-7. DESTRUCTION OF MATERIEL

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists items which accompany the generator set or are required for installation, operation, or operator's maintenance.

B-2. GENERAL.

This Basic Issue Items List is divided into the following sections:

a. BASIC ISSUE ITEMS - SECTION II. A list of items which accompany the generator set and are required by the operator/ crew for installation, operation, or maintenance.

b. MAINTENANCE AND OPERATING SUPPLIES - SECTION III. A listing of maintenance and operating supplies required for initial operation.

B-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. SOURCE, MAINTENANCE, AND RECOVERABILITY CODES (SMR):

1. Source code, indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts which are stocked in or supplies from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
P (cont)	
P2	Repair parts 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 which are not procured or stocked, but are to be manufactured in 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 which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The require-

Code	Explanation
X1 (cont)	ment for such items will be filled by use of the next higher assembly or component.
X2	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization. Where such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.
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 GS and DS level, or returned to depot supply level.

2. Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
c	Operator/crew

3. Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Repair parts (assemblies and components) which are considered economically reparable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are 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 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 uneconomically reparable they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.
U	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, or high dollar value 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 applicable five-digit Federal supply code for manufacturers in parenthesis. 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.

B-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 EIGHT HOURS OPERATION. This column indicates the estimated quantities required for an average eight hours of operation.

f. NOTES. This column indicates informative notes keyed to data appearing in a preceding column.

B-5. SPECIAL INFORMATION.

Identifications of the usable on codes included in column 3 of this publication are:

Code	Used on

B-6. ABBREVIATIONS.

Abbreviation	Explanation

B-7. FEDERAL SUPPLY CODE FOR MANUFACTURERS.

Code	Manufacturer

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) QTY FURN WITH EQUIP	(7) ILLUSTRATION (a) FIGURE NO.	(7) ILLUSTRATION (b) ITEM NO.
		GROUP I Basic Issue Items Manufacture or Depot Installed					
PC	7510-899-3494	Binder Log Book	ea		1		
PC	7520-559-9618	Case, Maintenance and Operational Manuals, Cotton Duck Water Repellent, Mildew Resistent	ea		1		
		Lubrication Order LO 5-6115-457-12	ea		2		
		Department of The Army Operator and Organizational Maintenance Manual TM 5-6115-457-12	ea		2		
		Department of The Army Direct and General Support and Depot Maintenance Manual TM 5-6115-457-35	ea		2		
		Department of The Army Organizational Direct and General Support and Depot Maintenance Repair Parts and Special Tool List Manual TM 5-6115-457-25P	ea		2		

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) QTY FURN WITH EQUIP	(7) ILLUSTRATION (a) FIGURE NO.	(7) ILLUSTRATION (b) ITEM NO.
		GROUP II Basic Issue Items Troop Installed or Authorized					
PAO	5975-878-3791	Rod, Ground, Assembled	ea		*		
PAO	4210-555-8837	Fire Extinguisher, Monobromotifluoromethane: 2.75 lbs w/bracket for use from 25°F and up (charged replacement cylinder ONLY FSN 4210-708-0031) GE	ea		*		
PAO	4210-881-0531	Fire Extinguisher, Dry chemical, 2-1/2 lbs, w/bracket for use down to -40°F (charged replacement cylinder ONLY FSN 4210-889-2222) see NOTE: For applications are generally lower than +20°F and extinguisher FSN 4210-555-8837 is authorized, requisitions should be placed for extinguisher FSN 4210-881-0531					
PAO	4720-021-3320	Hose, Auxiliary, FUEL (FMC97403) ERDL No. 13211E6770, 25 ft. lg.	ea		*		
PAO	6150-00-123-0108	Cable, Slave, to connect aux. source of DC power to slave receptacle for starting.	ea				

(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QTY REQUIRED FOR INITIAL OPERATION	(5) QTY REQUIRED FOR 8 HOURS OPERATION	(6) NOTES
Tank, Fuel	9130-256-8613	JP-4, MIL-J-5624, Bulk			
		FUEL OIL, DIESEL as follows:			
	9140-286-5294	Regular Grade, DF2			
	9140-286-5286	Winter Grade, DF1			
	9140-286-5283	Arctic Grade, DFA			
Crankcase		OIL, LUBRICATING five gallon pail as follows:			
	9150-265-9435	Grade OE 30			
	9150-265-9428	Grade OE 10			
	9150-00-407-0972	Grade OEA			
Governor		OIL HYDRAULIC one gallon cans			
	9150-223-4134	OHA-MIL-H-5606			

(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QTY REQUIRED FOR INITIAL OPERATION	(5) QTY REQUIRED FOR 8 HOURS OPERATION	(6) NOTES
Radiator		Water			
	6850-00-181-7933	1 gal. can			
	6850-00-181-7940	55 gal. drum			
	6850-174-1806	Antifreeze, compound arctic			
Radiator	O-I-490 6850-753-4967	Inhibitor, anti-rust			
Battery	6810-00-249-9354	1 gallon bottle	2 gal.		
	6810-00-843-1640	5 gallon bottle	2 gal.		

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. GENERAL

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. EXPLANATION OF COLUMNS IN SECTION II

a. GROUP NUMBER. COLUMN 1. The 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 material maintenance. It consists of restoring equipment as nearly as possible to new conditions 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. SYMBOLS. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

e. TOOLS AND EQUIPMENT. COLUMN 4. This column is provided for referencing by code the special tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

f. REMARKS. COLUMN 5. This column is provided for referencing by code the remarks (Section IV) pertinent to the maintenance functions.

C-3. EXPLANATION OF COLUMNS IN SECTION III

a. REFERENCE CODE. This column consists of a number and a letter separated by a dash. The number references the T and 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.

C-4. EXPLANATION OF COLUMNS IN SECTION IV

a. REFERENCE CODE. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. REMARKS. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

Note: Manhours are shown in hours and tenths of hours.

(1) GROUP NO.	(2) FUNCTIONAL 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	BATTERIES	C 0.1	O 0.1	C 0.2					O 3.2				1-B	A-A, B-B
02	MUFFLER & PIPES	C 0.1							O 0.5					A-A
03	HOUSING GENERATOR SET													
	DOORS	C 0.1		C 0.1					O 0.4	F 0.4				C-C, D-I -I
	COVERS	C							O 0.2	F 0.1				D-I
	PANELS	C 0.1							O 0.7	F 1.8				
	ASSOCIATED HARDWARE	C 0.1							O 0.5					
04	RADIATOR ASSEMBLY													
	GRILL	C 0.1							O 0.4	O 0.8				
	SHUTTER THERMO-STAT		O						O 0.2					E-B

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
	SHUTTERS ASSEMBLY	C 0.1	O 0.1		O				O 8.0	F 1.0				F-B
	RADIATOR	C 0.1	O 1.0	C					O 0.5	F 1.0			3-B	G-B
	CORE RADIATOR													
05	ENGINE WIRING AND ELECTRICAL CONTROL ELEMENTS													
	WIRING HARNESSES	C 0.2	O 0.3						F 1.8	O 0.5		F	4-B	H-B, I-I and J
	SENDING UNITS	C	O 0.3						O 1.0				4-B	H-B
	SOLENOID, SHUT DOWN	O 0.1	O 0.2						O 0.4					J-B
	ENGINE SAFETY SWITCHES	O 0.1	O 0.2		F 2.0				O 2.0				4-B, 5-D, 6-D	H-B, K-D
06	GENERATOR CONTROL ASSEMBLY	O	F		F				F	H	H	D		
	WIRING HARNESS GEN	C	O						H	O		D	4-B	O-K

(1) GROUP NO.	(2) FUNCTIONAL 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		
	GENERATOR CONTROL PANEL	O	O						F	O				P-I
	VOLTMETER AC	C	C		C				O					Q-B, R-D
	WATTMETER AC	C	F		C				O					Q-B, R-D
	CURRENT METER AC	C	F		C				O					Q-B, R-D
	RHEOSTATS/POTENTIOMETER	O	O						O				4-B	S-B
	FREQUENCY METER	C	F		C				O					Q-B, R-D
	FREQUENCY TRANSDUCER	O	F						O					
	THERMAL WATT CONVERTER	O	F						O					
	ENGINE CONTROL PANEL	C	O						F	O				
	SWITCHES	C	O						O				4-B	U-B
	GAUGES	C	O						O					V-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
	HOUR METER	C	O						O					V-B
	METER AMP	C	O						O					V-B
	RELAYS AND CONTROLS DEVICES	O	F		F				F	H	H		4-B	AB-A, B, D, H I, J
	GOVERNOR, ELECTRIC CONTROL	O	F		F				F	F	D	D		W-J&K, X-B&D
	VOLTAGE REGULATOR	F	F		F				F	H	H	D	4-B	Y-B, Z-D
	TRANSFORMERS	O	F						F				4-B	AA-B
07	GENERATOR ASSEMBLY	O	F						F	F	H	D		
	BEARING	O							F					AC-A
	RECTIFIER ROTATING	F	F						F	F	H		4-B	AD-B
	FAN GENERATOR	F							H					

(1) GROUP NO.	(2) FUNCTIONAL 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		
	ROTOR ASSEMBLY	F	F						F	H	D	D	5-B 4-B	AE-B AF-K
	ROTOR EXCITER	F	F						F	H	H	D	5-B 4-B	AE-B AF-K
	ROTOR GENERATOR	F	F						F	H	H	D	5-B 4-B	AE-B AF-K
	STATORS ASSEMBLY	F	F						F	H	D	D	5-B 4-B	AE-B AG-K
	STATOR EXCITER	F	F						F	H	H	D	5-B 4-B	AE-B AG-K
	STATOR GENERATOR	F	F						F	H	H	D	5-B 4-B	AE-B AG-K
08	ENGINE ASSEMBLY & COMPONENTS	C	O	C	O				F	F	H	D		
	TANK HYDRAULIC OIL	C		C					F	F				

(1) GROUP NO.	(2) FUNCTIONAL 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		
	PUMP OIL HYDRAULIC	C	F		F				F	F	H	D	8-B&D	
	BELTS FAN	C			O				O					AH-D
	FAN ASSEMBLY	C							F	F				AI-H
	GENERATOR/BATTERY CHARGING	C	O		O				O	F	H	D	4-B	
	DIODES	F	F						F				4-B	AD-B
	ARMATURE	F	F						F	H	H		4-B, 6-I	AL-B, AM-I
	FIELD ASSEMBLY	F	F						F	H	H		4-B, 5-B	AN-B
	VOLTAGE REGULATOR (DC)	F	F						F	F			4-B	
	PUMP FUEL TRANSFER	C	O	O					O	F			4-B	AW-B, AX-C
	FILTER ASSEMBLY FUEL	C	O	C					O					AT-C

(1) GROUP NO.	(2) FUNCTIONAL 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		
	ELEMENT, FUEL FILTER								O					
	DAY TANK FUEL	C	O		F				O	F				AT-C, AU-D
	AIR FILTER ASSEMBLY	C		C					C					
	GOVERNOR OVERSPEED	C	O		F				O	F	H	D	4-B	AJ-B, AK-D
	FILTER ASSEMBLIES OIL, LUBE/HYDRAULIC	C		O					O					AS-C
	STARTER ASSEMBLY	C	O						O	F	H	D		
	BRUSHES	O							O					AO-A
	SOLENOID STARTER		O						O	F				AP-B
	ARMATURE STARTER		F						F	F	H		4-B 6-I 6-J	AQ-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
	DRIVE STARTER	F							F	F				
	FIELD ASSEMBLY	F	F						F	F			4-B, 5-B	AR-B
	THROTTLE & GOVERNOR LINKAGE	C			O				O	F				AY-D
	ACTUATOR, ELECTRO HYDRAULIC	O	F	O	F				F	F	H	D	8-B&D	AZ-D
	TURBO CHARGER	O							O	H	H	D		BF-A
	MANIFOLD INTAKE	O O							F					
	PUMP WATER	C							O	F				BD-A
	TIMING SYSTEM & RELATED PARTS													

(1) GROUP NO.	(2) FUNCTIONAL 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		
	PULLEY CRANKSHAFT	O							H				11-H	BA-A
	DAMPENER VIBRATION	O							H					BA-A
	HOUSING TIMER GEAR	F							H					BA-A
	GEARS TIMING	H							H				11-H	BA-A
	INJECTORS FUEL	O	F		F				F	H	H	D	7-B&D	AV-D
	PUMP, FUEL INJECTION	C	F		F				F	H	H	D	9-D	AV-D
	OIL PAN	C		C					F	F				
	PUMP OIL		H						H	H				BB-B
	ENGINE WATER THERMOSTATS		O						O					BG-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
	CYLINDER HEAD ASSEMBLY	F							F	F	H	D		
	ROCKER ARM ASSEMBLY	O							F	F			13-I	BH-I
	TAPPETS, VALVE	O			O				F				12-K	
	RODS PUSH	F							F					
	CYLINDER HEAD	F							F	F	H	D		BI-J
	VALVES INT & EX	F	F						F	F			13-I	BJ-I
	SPRINGS VALVE		F						F				14-B	
	SEATS INT & EXH VALVES	F							H	H			15-I	BJ-I
	GUIDES VALVE	F							H					

(1) GROUP NO.	(2) FUNCTIONAL 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		
	FLYWHEEL ASSEMBLY	H							H					BA-A
	FLYWHEEL	H							H					BA-A
	RING GEAR FLYWHEEL	H							H					BA-A
	HOUSING FLYWHEEL	H							H					BA-A
	CAMSHAFT	H							H				10-A	BA-A
	BEARINGS CAMSHAFT	H							H					BA-A
	BEARING ROD	H							H				10-A	BA-A
	PISTON ASSEMBLY	H							H				10-A	BA-A
	PISTON PINS	H							H				10-A	BA-A
	PISTON RODS	H							H				10-A	BA-A

(1) GROUP NO.	(2) FUNCTIONAL 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		
	PISTON RINGS	H							H					BA-A
	BEARING MAIN	H							H					BA-A
	CRANKSHAFT	H							H			D	10-A	BC-K
	CYLINDER BLOCK	H							H	H	H	D	10-A	BK-K
	CYLINDER SLEEVES	H							H				10-A	BA-A
09	WINTERIZATION KIT FUEL BURNING (REGULAR)	C						O	O	F	H			
	HEATER CONTROL ASSEMBLY	O							O	F			4-B	
	VALVE	F							F					
	NOZZLE	F							F					
	TEE ASSEMBLY	O							O					

(1) GROUP NO.	(2) FUNCTIONAL 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		
	TERMINAL BOARD	O							F					
	SWITCH	O	O						F				4-B	BL-B
	BURNER ASSEMBLY	O							F	F				
	IGNITOR ASSEMBLY	O							O				4-B	
	HEAD ASSEMBLY	F							F					
	WICK	O							O					
	SWITCH	F	F						F				4-B	BL-B
	BLOWER ASSEMBLY	O							F	F				
	FAN MOTOR ASSEMBLY	O							F	F			4-B	
	FAN	O							F					
	MOTOR	O							F				4-B	
	PUMP COOLANT	C	O						F	F				BM-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
10	SUB BASE ASSEMBLY	O							H	F				BN-I
	TANK FUEL MAIN	C		C					F	F				
	TRANSMITTER FUEL		F						F				4-B	BO-B

Note: Page C-18 deleted.

(1) GROUP NO.	(2) FUNCTIONAL 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		
12	HEATERS WINTERIZATION ELECTRIC							O	O	O	H	D		BS-K
	HEATER ASSEMBLY	C	O	C	O				F	F	H		4-B	BT-D
	PUMP COOLANT	C	O						F	F				BO-B
	HEATING ELEMENTS	O	O						O				4-B, 5-B	BL-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
	HEAT (COIL) EXCHANGER	F	F						F	F				BO-B
	ELEMENTS SENSING ELECTRIC	O	O						O					BO-B
	HOSES LINES FITTING DUCTS	C							O	O				
	ELECTRIC WIRING CABLES & HARNESS	C	O						O	O			4-B	BU-K
	TRANSFORMERS	O	F						F				4-B	AA-B
	SEMI CONDUCTORS	F	F						F				4-B	BL-B
	RESISTORS	O	O						O				4-B	BV-B
	SWITCHES TOGGLE	C	O						O				4-B	BL-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
	LIGHT ASSEMBLY INDICATING	C	O						O	O			4-B	BL-B
	LAMPS	C	C						C					BO-B

Note: Pages C-22 and C-23 deleted.

(1) GROUP NO.	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIP-MENT	(5) REMARKS
		A INSPECT	B TEST	C SERVICE	D ADJUST	E ALIGN	F CALIBRATE	G INSTALL	H REPLACE	I REPAIR	J OVERHAUL	K REBUILD		
16	KIT WHEEL MTG	C	C	C				F	F	O				
	WHEELS & TIRES	C	C	C					O	O			16-B	BX-B
	BEARINGS WHEEL	O		O					O					
	BRAKES	O			O				O	O				
17	DUMMY LOAD KIT	O	O					O	O	F	H			
	WIRING HARNESS	C	O						O	O		D	4-B	BU-K
	SWITCHES TOGGLE	C	O						O				4-B	BL-B
	SWITCHES ROTARY	C	O						O				4-B	BL-B
	SEMI CONDUCTORS	F	F						F				4-B	BL-B
	TRANSFORMERS	O	F						F				4-B	AA-B
	MOTORS ELECTRIC	O	O	O					O	F	H		4-B	BO-B

(1) GROUP NO.	(2) FUNCTIONAL 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		
	CAPACITORS	O	O						O				4-B	BL-B
	RELAYS	O	F						F					BO-B
	HEATER ELEMENTS	O	O						O				4-B	BL-B
	BREAKERS CIRCUIT	O	O	F					O			D		BW-C
	LIGHT ASSEMBLY INDICATING	C	O						O				4-B	BL-B
	LAMPS	C	C						C					BO-B

Section III. TOOLS, TEST AND SUPPORT EQUIPMENT REQUIREMENTS

REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	TOOL NUMBER
1-B	0	Tester, Battery, Electrolyte solution	6630-171-5126
2-B	0	Tester, Antifreeze solution	6630-247-2968
3-B	F	Tester, Radiator Pressure	
4-B	F	Multimeter	6625-553-0142
5-B	0	Ohmmeter	6625-581-2466
6-I	H	Test Set, armature	6625-238-1459
6-J	H	Undercutter Armature	4940-204-0319
7-B & D	F	Tool, Test Set, Diesel Injector	4910-317-8265
8 - B & D	F	Test Stand, Hydraulic	under develop
9-D	F	Test Stand, Diesel Injector Pump	4910-443-0976
10-A	H	Micrometers, Inside & outside	
11-H	H	Puller Kit, universal	5180-701-8046
12-D	0	Gage, thickness	5210-221-1999
13-I	F	Grinding machine, valve face	4910-540-4679
14-B	F	Test Stand, Valve Spring	
15-I	F	Grinding Kit, Valve seat	4910-473-6437
16-B	C	Gage, Tire pressure	

Section IV. REMARKS

REFERENCE CODE	REMARKS
A-A	Visual inspection
B-B	Hydrometer Test
C-A	Visual inspection
D-C	Lubricate hinges and latches
E-I	Welding and straighten
F-B	Hydrometer Test
G-B	Operational Test
H-B	Pressure Test after repair
I-B	Continuity Test
J-K	Fabricate new harness
K-B	Continuity Test
L-B	Remove one wire, apply 24 volt DC
M-B	Continuity Test
N-D	Mechanical overspeed only
O-K	Fabricate new harness
P-I	Repair by replacement of components
Q-B	Operational Test
R-D	Zero adjustment
S-B	Continuity Test
U-B	Continuity Test
V-B	Operational Test

REFERENCE CODE	REMARKS
W-J & K	Require depotting
X-B & D	In accordance with published procedures
Y-B	Operational Test
Z-D	Adjust after repair, overhaul or rebuild
AA-B	Test for known voltages at terminals
AB-A, B, D, H, I, J	Includes other control devices not listed elsewhere.
AC-A	Visual, audible and physical heat detection
AD-B	Continuity Test
AE-B	Insulation breakdown and continuity
AF-K	Rewind and Balance
AG-K	Rewind and Machining
AH-D	Adjust to Manufacturer's specification
AI-H	Repair by replacement of hub bearing only
AJ-B	Operational Test
AK-D	Adjust after replacement of micro switch
AL-B	Test continuity between slip rings
AM-I	Clean slip rings
AN-B	Continuity Test
AO-A	Inspect for minimum length
AP-B	Operational Test
AQ-B	Growler Test
AR-B	Continuity Test

REFERENCE CODE	REMARKS
AS-C	Replace element
AT-C	Drain condensation
AU-D	Float control
AV-D	only for the engines as appropriate
AW-B	Operational Test
AX-C	Clean filter
AY-D	Adjust after replacement
AZ-D	Adjust after replacement or repair
BA-A	Visual inspection
BB-B	Operational Test
BC-K	Turn to acceptable undersize or metalize and turn to standard, Manufacturer's recommendations
BD-A	Visual and audible
BE-B	Audible Test
BF-A	Visual and audible, smoking exhaust, noisy bearings
BG-B	Visual
BH-I	Includes regrinding
BI-J	Includes replacing valve guides
BJ-I	Grinding
BK-K	Includes replacement of sleeves
BL-B	Continuity Test
BM-B	Operational Test
BN-I	Minor welding and straightening

REFERENCE CODE	REMARKS
BO-B	Operational Test
BP-K	Fabricate new harness
BQ-B	Hydrometer Test
BR-D	Zero adjustment
BS-K	Applies only to auxiliary heater
BT-D	Adjust Battery charging unit
BU-K	Fabricate new harness
BV-B	Resistance Test
BW-C	Burnish contacts
BX-B	Pressure

ALPHABETICAL INDEX

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By Order of the Secretaries of the Army, the Navy, and the Air Force:

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

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

A. R. MARSCHALL
Rear Admiral, CEC, USN
Commander, Naval Facilities
Engineering Command

JOHN D. RYAN, General, USAF
Chief of Staff

Official:
DWIGHT W. COVELL, Colonel, USAF
Director of Administration

Distribution

Army:

To be distributed in accordance with DA Form 12-25D, direct and general support maintenance requirements for Generator Sets: 60KW, 60 HZ Precise Power, 60 KW, 400 HZ Precise Power, 60 KW, 60 HZ Utility.

MARCORPS CODE:
AGC