This copy is a reprint which includes current pages from Changes 1 through 18.

ARMY TM-5-6115-545-12
AIR FORCE T0-35C2-3-444-1
NAVY NAVFAC P-8-626-12
MARINE CORPS TM-00038G-12

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL

MAINTENANCE MANUAL

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL

SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

Including Optional Kits

DOD MODELS	NOMENCLATURE	FSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

10 JUNE 1973

Published under authority of the
Departments of the Air Force, the Army, and the Navy
(Including U. S. Marine Corps)

WARNING

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.

Slave receptacle is to be used when extra cranking power is required for starting unit. Other methods are not authorized, as arcing at batteries could occur.

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

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.

DANGEROUS GASES (Cont)

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.

WARNING

Hot refueling of generators while they are operating poses a safety hazard and should not be attempted. Hot engine surfaces and sparks produced from the engine and generator circuitry are possible sources of ignition. Severe injury, death, and/or damage to the equipment may result.

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.

CHANGE

NO. 18

HEADQUARTERS,
DEPARTMENTS OF THE ARMY, NAVY AND AIR FORCE
AND HEADQUARTERS U.S. MARINE CORPS
WASHINGTON, D. C., 12 February 1991

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODEL	CLASS	HERTZ	NSN
MEP-006A	UTILITY	50/60	6115-00-116-1243
MEP-105A	PRECISE	50/60	6115-00-118-1252
MEP-115A	PRECISE	400	6115-00-118-1253

INCLUDING OPTIONAL KITS

DOD MODEL	NOMENCLATURE	FSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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Remove pages	Insert pages
a/(b blank)	a/(b blank)
2–1 and 2–2	2–1 and 2–2
3–3 and 3-4	3–3 and 3–4
3-8.1 /(3-8.2 blank)	3-8.1 /(3-8.2 blank)
3–15 and 3–1 6	3–15 and 3–16
3–19 through 3-22	3–19 through 3–22
3–105 and 3–106	3–105 and 3–106
3–115 and 3–116	3–115 through 3–118

2. Retain this sheet in front of manual for reference purposes.

TM 5–6115-545-12
TO 35C2-3-444-1
NAVFAC P-8-626-12
TM 00038G-12
C18

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CHANGE

NO. 17

HEADQUARTERS,
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WASHINGTON, D.C., 10 OCTOBER 1990

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODEL	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1234
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

INCLUDING OPTIONAL KITS

DOD MODELS	NOMENCLATURE	FSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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3-29 through 3-32	3-29 through 3-32

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HEADQUARTERS,
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AND HEADQUARTERS U.S. MARINE CORPS
WASHINGTON, D.C., 22 October 1990

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

Including Optional Kits

DOD MODELS	NOMENCLATURE	NSN
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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Remove pages	Insert pages
3-115 and 3-116	3-115 and 3-116

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TM 5-6115-545-12
TO-35C22-3-444-2
NAVFAC P-8-626-34
TM-00038G-35
C 16

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WASHINGTON, D.C., 15 June 1990

Operator and Organizational Maintenance Manual

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

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

Including Optional Kits

DOD MODELS	NOMENCLATURE	NSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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Remove pages	Insert pages
i through iv	i through iv
3-72.1/3-72.2	3-72.1 and 3-72.2
-----	3-72.3/3-72.4
C-3 and C-4	C-3 and C-4
I-3 and I-4	I-3 and I-4

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TM 5-6115-545-12
TO 35C2-3-444-1
NAVFAC P-8-626-12
TM 00038G-12
C 14

CHANGE

No. 14

HEADQUARTERS
DEPARTMENTS OF THE ARMY, AIR FORCE, NAVY
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Operator and Organizational Maintenance Manual

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

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

Including Optional Kits

DOD MODELS	NOMENCLATURE	NSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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Remove pages	Insert pages
---	1-28.1/1-28.2
2-7 and 2-8	2-7 and 2-8
2-8.1 and 2-8.2	2-8.1 and 2-8.2

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TM 5-6115-545-12
TO 35C2-3-444-1
NAVFAC P-8-626-12
TM 00038G-12
C 13

CHANGE NO. 13

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY and AIR FORCE
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WASHINGTON, D.C., 29 August 1988

Operator and Organizational Maintenance Manual

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

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

Including Optional Kits

DOD MODELS	NOMENCLATURE	NSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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iii and iv	iii and iv
2-7 and 2-8	2-7 and 2-8
2-8.1 and 2-8.2	2-8.1 and 2-8.2
3-7 and 3-8	3-7 and 3-8
3-21 and 3-22	3-21 and 3-22
3-71 and 3-72	3-71 and 3-72
---	3-72.1/3-72.2
3-93 and 3-94	3-93 and 3-94
---	3-94.1/3-94.2
3-115 and 3-116	3-115 and 3-116
C-5 and C-6	C-5 and C-6

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CHANGE No. 12

HEADQUARTERS
DEPARTMENTS OF THE ARMY, NAVY and AIR FORCE
(INCLUDING U.S. MARINE CORPS)
WASHINGTON, D.C., 14 July 1987

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 COLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

Including Optional Kits

DOD MODELS	NOMENCLATURE	NSN
MEP006AWF	WINTERIZATION KIT, FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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Remove pages	Insert pages
---	a/b
1-1 and 1-2	1-1 and 1-2
1-23/1-24	1-23/1-24
1-47/1-48	1-47/1-48
1-49/1-50	1-49/1-50
2-1 and 2-2	2-1 and 2-2
---	2-8.1/2-8.2
2-13 and 2-14	2-13 and 2-14
2-17 and 2-18	2-17 and 2-18
---	2-18.1/2-18.2
2-21 and 2-22	2-21 and 2-22
2-25 and 2-26	2-25 and 2-26
---	2-26.1 through 2-26.7/2-26.8
2-27 and 2-28	2-27 and 2-28
2-31 and 2-32	2-31 and 2-32
3-1 through 3-6	3-1 through 3-6
---	3-6.1/3-6.2

Remove pages	Insert pages
3-7 and 3-8	3-7 and 3-8
---	3-8.1/3-8.2
3-11 through 3-16	3-11 through 3-16
3-21 and 3-22	3-21 and 3-22
3-89 and 3-90	3-89 and 3-90
3-93 and 3-94	3-93 and 3-94
4-29 and 4-30	4-29 and 4-30
A-1 and A-2	A-1 and A-2
B-1 and B-2	B-1 and B-2

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CHANGE No. 11

DEPARTMENTS OF THE ARMY,
THE AIR FORCE, AND THE NAVY
(INCLUDING U.S. MARINE CORPS)
WASHINGTON, D.C., 27 June 1986

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL
SKID MTD., 6C KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

TM 5-6115-545-12, TO 35C2-3-444-1, NAVFAC P-8-626-12, TM 00038G-12, 10 June 1973, are changed as follows:

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Remove pages	Insert pages
i through iv	i through iv
1-3 and 1-4	1-3 and 1-4
1-9 and 1-10	1-9 and 1-10
1-15/1-16	1-15/1-16
---	1-18.2/1-18.2
---	1-22.1/1-22.2
---	1-26.1/1-26.2
---	1-28.1/1-28.2
1-45/1-46	1-45/1-46
2-1 and 2-2	2-1 and 2-2
2-19 and 2-20	2-19 and 2-20
3-17 and 3-18	3-17 and 3-18
3-83 through 3-86	3-83 through 3-36
C-3 and C-4	C-3 and C-4
I-3 through I-8	I-3 through I-8

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Army Air Force Navy Marine Corps	TM 5-6115-545-12 TO 35C2-3-444-1 NAVFAC P-8-626-12 TM 00038G-12 C 10

CHANGE
No. 10

HEADQUARTERS DEPARTMENTS OF
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WASHINGTON, D.C., 15 May 1986

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

INCLUDING OPTIONAL KITS

DOD MODELS	NOMENCLATURE	FSN
MEP006AWF	Winterization Kit, Fuel Burning	6115-407-8314
MEP006AWE	Winterization Kit, Electric	6115-455-7693
MEP006ALM	Load Bank Kit	6115-407-8322
MEP006AWM	Wheel Mounting Kit	6115-463-9092

TM 5-6115-545-12/TO 35C2-3-444-1/NAVFAC P-8-626-12/TM 00038G-12, 10 June 1973, is changed as follows:

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Remove pages	Insert pages
3-11 and 3-12	3-11 and 3-12

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TM 5-6115-545-12
TO 35C2-3-444-1
NAVFAC P-8-626-12
TM 00038G-12
C 10

Army
Air Force
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Marine Corps

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CHANGE No. 9

DEPARTMENTS OF THE ARMY,
THE AIR FORCE, AND THE NAVY
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WASHINGTON, D.C., 16 April 1984

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

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	Remove pages	Insert pages
Table of Contents	i thru iv	i thru iv
Chapter 3	3-1 thru 3-4	3-1 thru 3-4
	3-15 and 3-16	3-15 and 3-16
	3-35 and 3-36	3-35 and 3-36
	3-75 thru 3-86	3-75 thru 3-86
	3-89 and 3-90	3-89 and 3-90
	3-93 thru 3-96	3-93 thru 3-96
	3-101 thru 3-104	3-101 thru 3-104
	3-109 and 3-110	3-109 and 3-110
	3-113 and 3-114	3-113 and 3-114

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MARINE CORPS:
MARCORPS CODE: AGC

CHANGE No. 8

Department of the Air Force,
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Washington, D.C., 14 May 1982

Operator and Organizational Maintenance Manual

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL
SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

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Remove pages	Insert pages
3-7 and 3-8	3-7 and 3-8
3-25 and 3-26	3-25 and 3-26
3-107 and 3-108	3-107 and 3-108
C-3 thru C-10	C-3 thru C-10

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Marine Corps:
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SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

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Chapter 1	1-1 and 1-2	1-1 and 1-2
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SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

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Changes in force: C1, C2, C3, C4, C5

ARMY TECHNICAL MANUAL — TM 5-6115-545-12
AIR FORCE TECHNICAL ORDER — TO 35C2-3-444-1
NAVY PUBLICATIONS — NAVFAC P-8-626-12
MARINE CORPS TECHNICAL MANUAL — TM 00038G-12
C5

CHANGE NO. 5

DEPARTMENT OF THE ARMY, THE NAVY, AND THE AIR FORCE
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WASHINGTON, DC. *31 October 1979*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	NSN
MEP006A	UTILITY	50/60	6115-00-118-1243
MEP105A	PRECISE	50/60	6115-00-118-1252
MEP115A	PRECISE	400	6115-00-118-1253

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TECHNICAL MANUAL

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OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL

SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

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4-33, 4-34	4-33, 4-34
4-39/(4-40 blank)	4-39/(4-40 blank)
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NAVY NAVFAC P-8-626-12
MARINE CORPS TM-00038G-12
C3

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OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL

SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

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1-13, 1-14	1-13, 1-14
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3-55/3-56 blank	3-55/3-56 blank
3-57/3-58 blank	3-57/3-58 blank
3-83, 3-84	3-83, 3-84
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3-107, 3-108	3-107, 3-108
3-115, 3-116	3-115, 3-116
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Marine Corps:
MARCORPS DIST: AGC

CHANGE No. 2

DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE
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WASHINGTON, DC, *24 April 1975*

Operator and Organizational Maintenance Manual
GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL
SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	FSN
MEP006A	UTILITY	50/60	6115-118-1243
MEP105A	PRECISE	50/60	6115-118-1252
MEP115A	PRECISE	400	6115-118-1253

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Marine Corps:

MARCORPS CODE AGB

DEPARTMENT OF THE ARMY TECHNICAL MANUAL
DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER
DEPARTMENT OF THE NAVY PUBLICATION
MARINE CORPS TECHNICAL MANUAL

TM-5-6115-545-12
TO-35C2-3-444-1
NAVFAC P-8-626-12
TM-00038G-12

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DEPARTMENT OF THE ARMY
WASHINGTON, 10 June 1973

TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL

MAINTENANCE MANUAL

Approved for public falease; distribution is unlimited.

GENERATOR SET, DIESEL ENGINE DRIVEN, TACTICAL

SKID MTD., 60 KW, 3 PHASE, 4 WIRE, 120/208 AND 240/416 VOLTS

DOD MODELS	CLASS	HERTZ	FSN
MEP006A	UTILITY	50/60	6115-118-1243
MEP105A	PRECISE	50/60	6115-118-1252
MEP115A	PRECISE	400	6115-118-1253

INCLUDING OPTIONAL KITS

DOD MODELS	NOMENCLATURE	FSN
MEP006AWF	WINTERIZATION KIT,FUEL BURNING	6115-407-8314
MEP006AWE	WINTERIZATION KIT, ELECTRIC	6115-455-7693
MEP006ALM	LOAD BANK KIT	6115-407-8322
MEP006AWM	WHEEL MOUNTING KIT	6115-463-9092

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. These instructions are published for use by personnel to whom the 60 KW Diesel Engine Driven Generator Sets are issued. The 50/60 Hertz (Mode I) Tactical Utility (Class 2) Set is used in application where exact frequency is not required. The 50/60 Hertz, (Mode I) Tactical Precise (Class 1) and 400 Hertz, (Mode II) Tactical Precise Sets are used in applications which demand precise frequency control. This manual provides information on the operation and organizational maintenance of the equipment. Also included are descriptions of main units and their functions in relationship to other components.

b. Demolition of material to prevent enemy use will be in accordance with the requirement of TM 750-244-3. (Procedures For Destruction of Equipment to Prevent Enemy Use for U.S. Army).

c. Preservation for shipment and storage for U. S. Air Force will be in accordance with T. O. 35-1-4. Shipment and storage for U.S. Army will be in accordance with TB 740-97-2.

1-2. Forms and Records.

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

a. Forms and Records used by the Army will be only those prescribed by DA Pam 738-750. Those used by the Marine Corps will be those prescribed by TM 4700-15/1. Other Service users should refer to appropriate specification/publications for equipment maintenance forms and records.

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

(1) Air Force-AFTO Form 22 direct to: Commander, Sacramento Air Materiel Area, McClellan Air Force Base, ATTN: MMST, California, 95652, in accordance with T0-00-5-1.

(2) Army-DA Form 2028 directly to: Commander, U. S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Good fellow Boulevard, St. Louis, MO 63120-1798.

(3) Marine Corps- NAVMC Form 10772 direct to: Commandant, U.S. Marine Corps, ATTN: Code LMO, Washington, D. C., 20380.

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

NOTE
(Army only)

Applicable Army Forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, shall be kept in manual compartment mounted on equipment.

Section II DESCRIPTION AND DATA

1-3. Description.

<u>a. General.</u> The generator sets, military models MEP105A, MEP006A and MEP115A (fig. 1-1 and 1-2), are portable skid mounted self contained units. They are provided with controls, instruments and accessories necessary for operation as a single unit or in parallel with up to two other units of the same Class and Mode. Each set is equipped with engine oil pan heating elements and necessary connections for field installation of winterization kits. The generator sets may be mounted on trailers or wheel kits if desired. In addition, to extend their capability, the sets have been designed to accept and operate with the following kits: (See chapter 4 for Items 1 thru 4.)

(1) Load Bank.

(2) Fuel Burning Winterization.

(3) Electric Winterization.

(4) Wheel Mounting.

(5) Automatic Transfer Panel 50/60 Hz. Provides a means to monitor 60 Hz primary power and automatically start and transfer the load to a standby generator set in the event of abnormal primary power fluctuation. (See Appendix A for technical manual.)

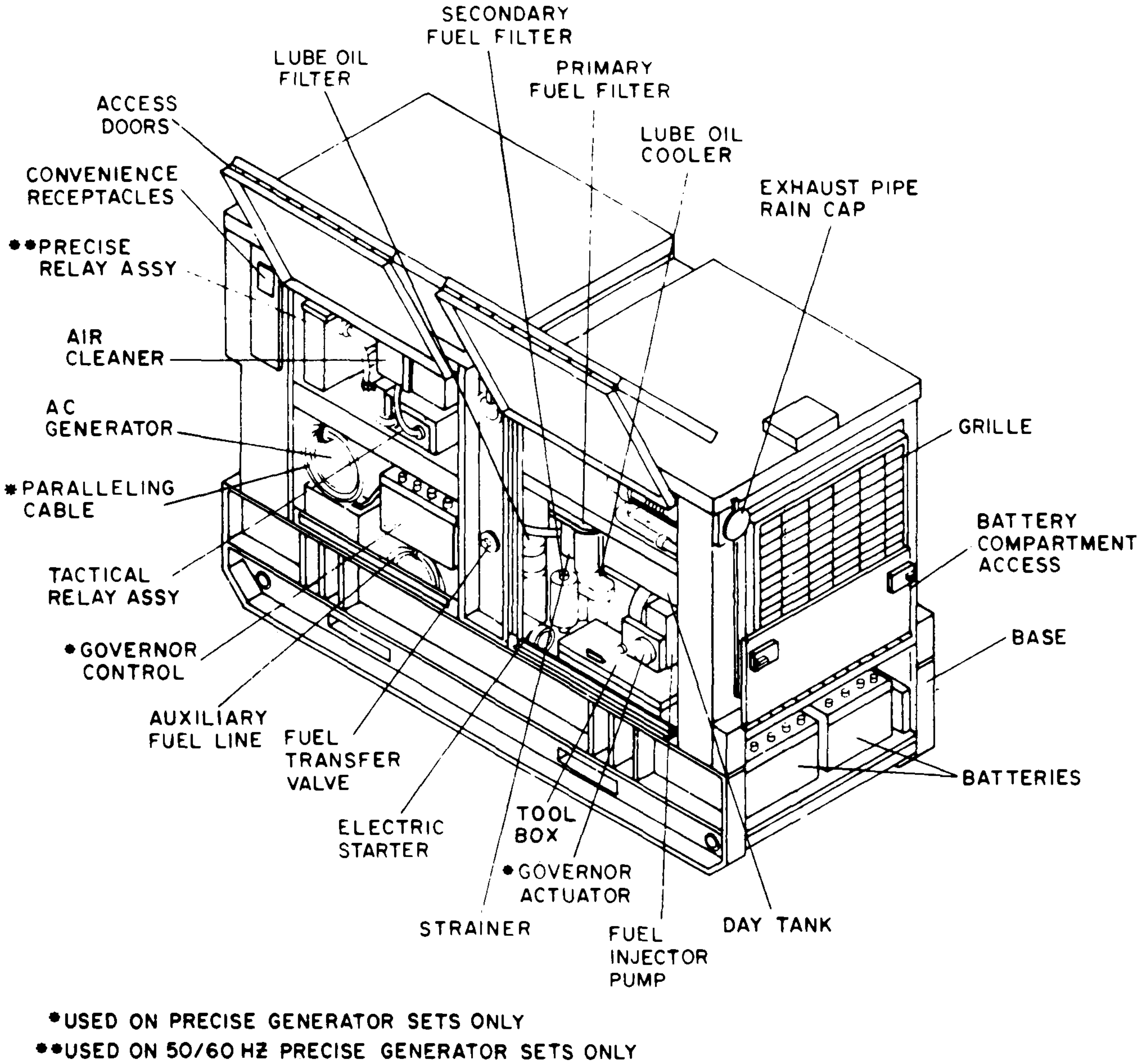


Figure 1-1. Engine Generator Set. Right Front, Three Quarter View

(6) Automatic Transfer Panel 400 Hz. Provides the capacity to start and transfer the load from an operating 400 Hz generator set to a like standby set in the event the operating sets load contactor opens due to a fault condition (See Appendix A for technical manual).

(7) Remote Control Box. Permits starting, stopping and voltage adjustment of the generator set from a remote location. (See Appendix A for technical manual).

(8) Auxiliary Fuel Burning Winterization. Provides a dependable external source of battery power for starting of generator set in ambient temperatures from -25°F. to -65°F. (See Appendix A for technical manual.)

(9) Auxiliary Electric Winterization. Provides a dependable external source of battery power for starting of generator set in ambient temperatures from -25°F. to -65°F. (See Appendix A for technical manual).

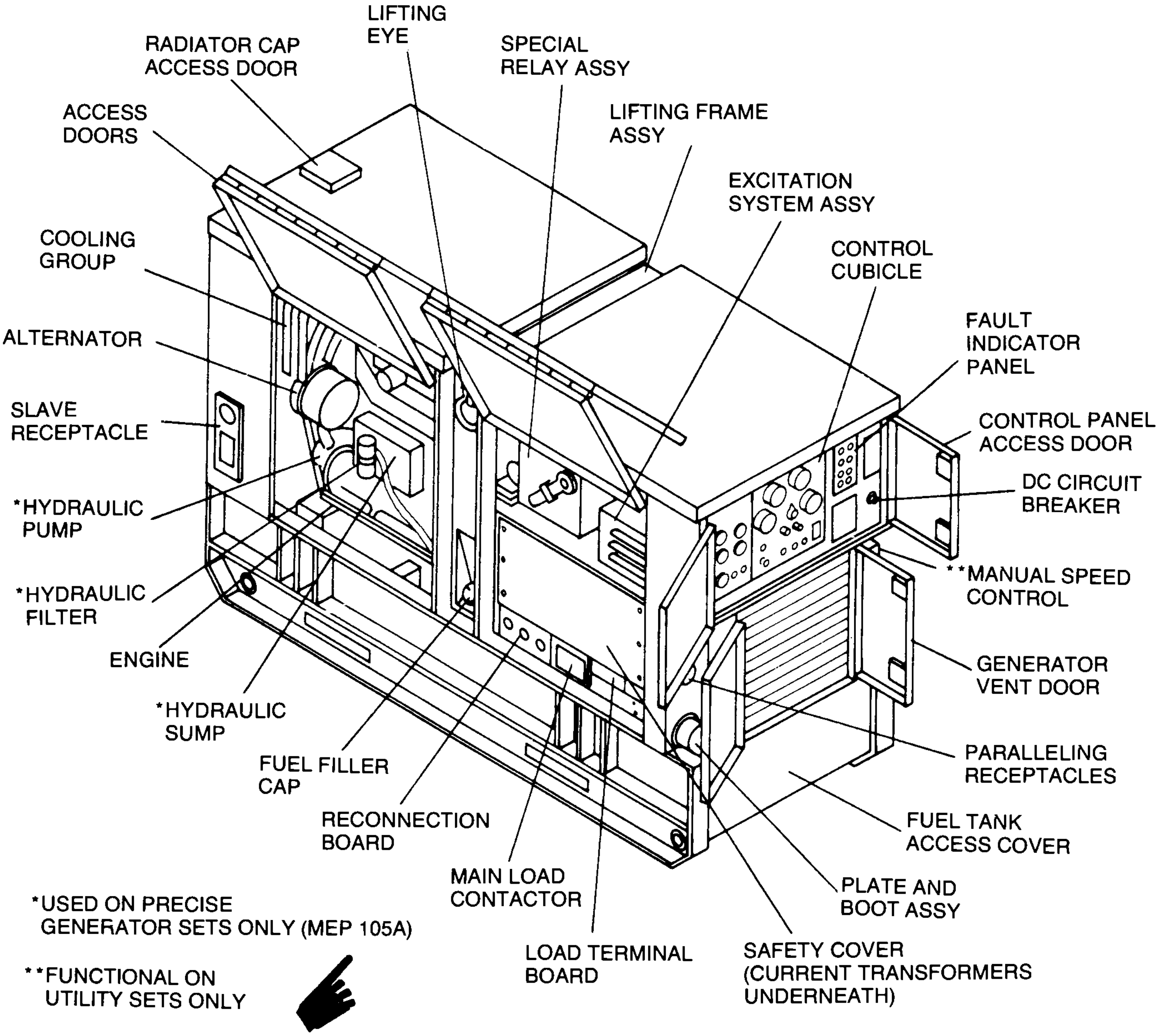


Figure 1-2. Engine Generator Set, Left Rear, Three Quarter View

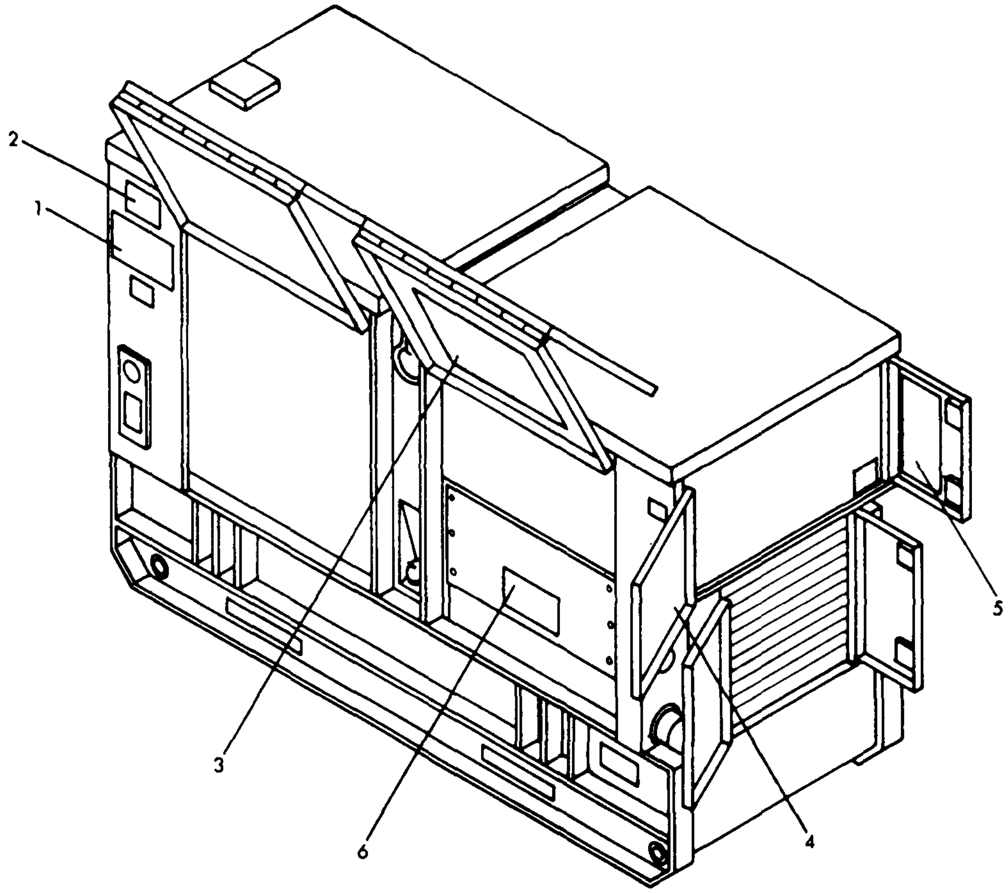
b. Engine. The engine is a liquid-cooled, 6 cylinder, valve-in-head, 4 stroke cycle, turbo-charged, diesel engine.

c. Generator. The 400 Hz generator is a 60 KW, brushless, air-cooled rotating field generator.

d. Generator. The 50/60 Hz generator is a 50/60KW, brushless, air-cooled rotating field generator.

1-4. Identification and Tabulated Data.

a. Identification. The generator set has data and instructional plates located throughout the set. Figure 1-3 locates these plates, and figures 1-4 through 1-20 illustrate their content. Instruction plates for kits are located in figure 1-21, and figures 1-22 through 1-24 illustrate their content.



1. Fuel System Diagram Instruction Plate (fig. 1-4)
2. Lifting Instructions Instruction Plate (fig. 1-5)
3. AC Troubleshooting Diagram (Mode I) and Plate (fig. 1-13)
   AC Troubleshooting Diagram (Mode II) and Plate (fig. 1-14)
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10. DC Troubleshooting Diagram (Mode I) and Plate (fig. 1-15)
    DC Troubleshooting Diagram (Mode II) and Plate (fig. 1-16)
11. Battery Arrangement and Connections Instructions Plate (fig. 1-11)
12. Set I.D. Plate (fig. 1 -12)
13. Fuel Selector Valve Instruction Plate

Figure 1-3. Data Instruction Plate Locations (Sheet 1 of 2)

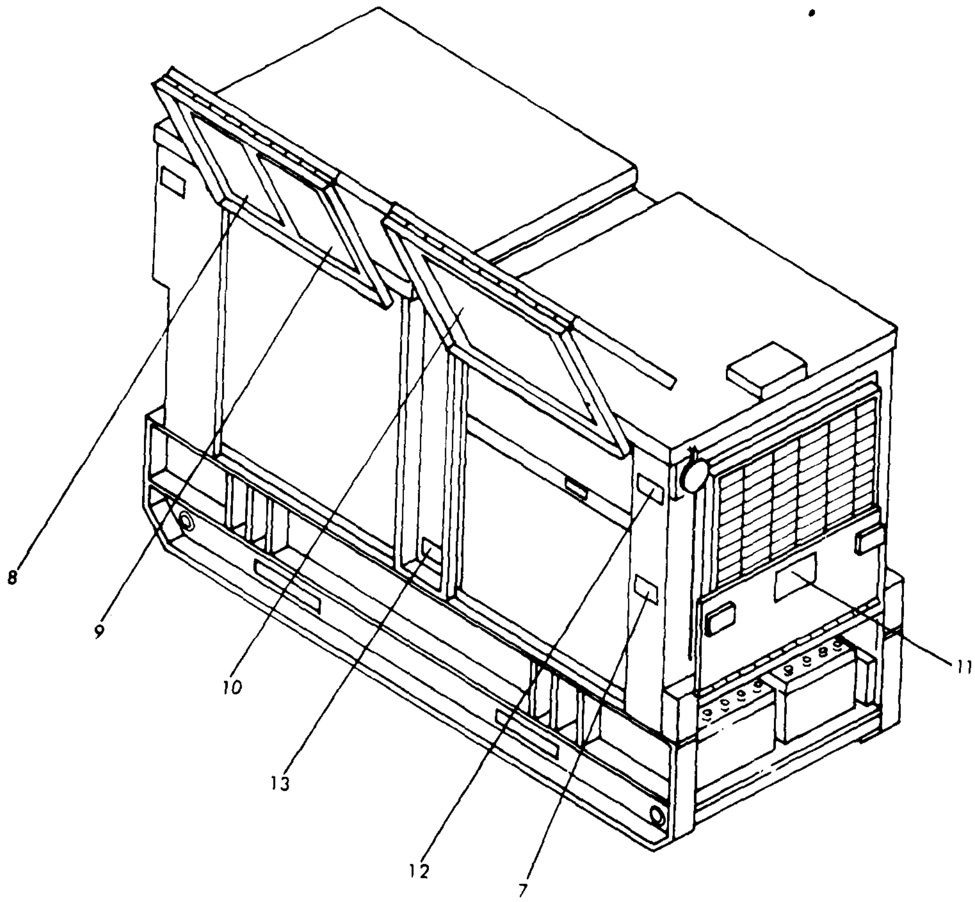


Figure 1-3. Data Instruction Plate Locations (Sheet 2 of 2)

b. Tabulated Data.

(1) Engine generator set (end item).

DOD drawing no. . . . . . . 70-0105 (50/60 Hz precise)
70-0006 (50/60 Hz utility)
70-0115 (400h Hz precise)

Models :

Model . . . . MEP105A (50/60 Hz precise)
Model . . . . MEP006A (50/60 Hz utility)
Model . . . . MEP115A (400 Hz precise)
Length . . . . 87 inches
Width . . . . 36 inches
Height . . . . 59 inches
Weight dry (less kits and optional equip.) . . . . . . 4400 lbs (400 Hz set)

Weight dry (less kits and optional equip.) . . . . . . 4300 lbs (50/60 Hz precise set)

Weight dry (less kits and optional equip.) . . . . . . 4240 lbs (50/60 Hz utility set)

Operating temperature range . . . . 125°F to -25°F (-25° to -65°F with winterization systems)

Voltage output . . . . 120/208 volts and 240/416 volts

Power factor 0.8

Size . . . . 60 KW 50 KW at 50 Hz)

b. Tabulated Data. (Cont)

(2) Engine.

COD drawing no. 70-1049

Type. 6 cylinder, turbocharged diesel

Fuel . . . . Diesel fuel W-F-800 JP-4 or JP-5

CAUTION

JP-4 and JP-5 fuel are considered emergency fuels only.

Firing order 1-5-3-6-2-4

Rotation (viewed from fan end) . . . . Clockwise

Cooling . . . . Circulating coolant

Cycle . . . . 4 stroke

Valves . . . . 2 per cylinder

Maximum permissible exhaust restriction . . . . 2 inches of mercury

Brake horsepower

1500 rpm 100
1800 rpm 120
2000 rpm 130

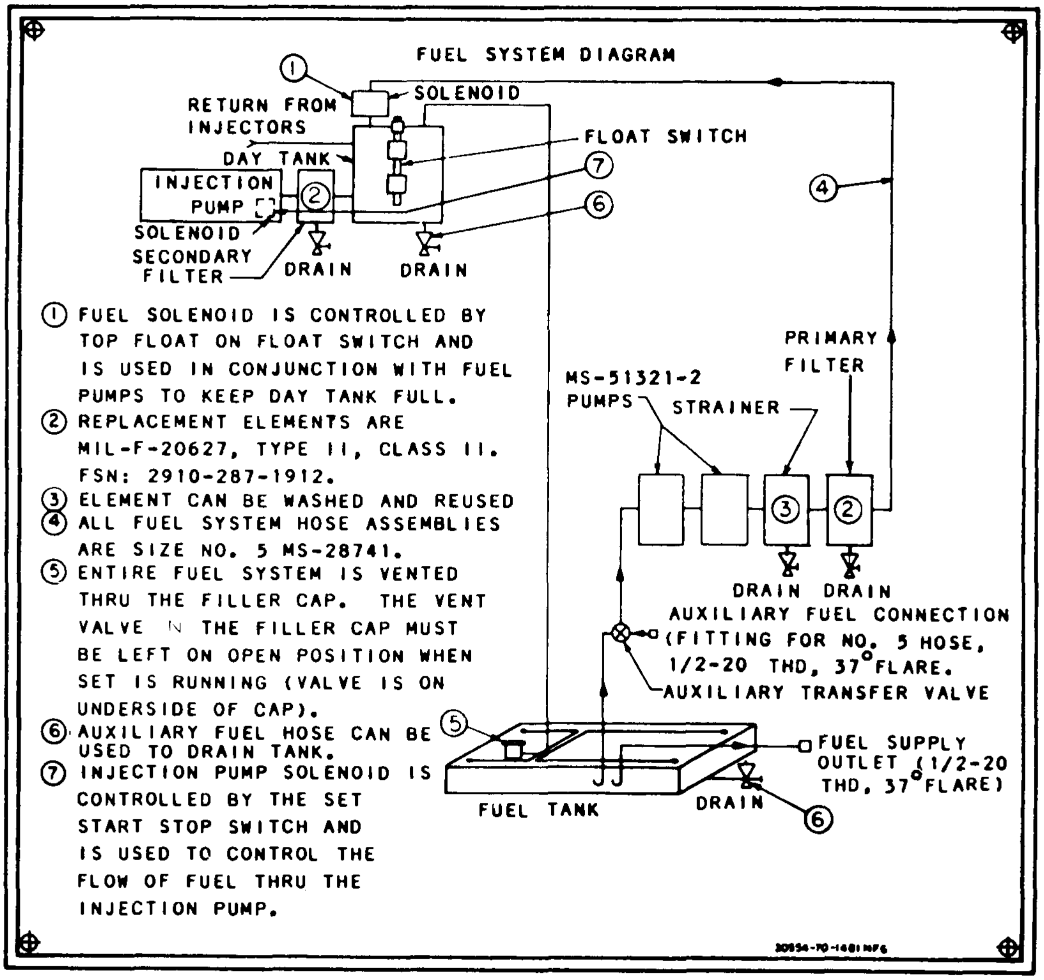


Figure 1-4. Fuel System Diagram Instruction Plate

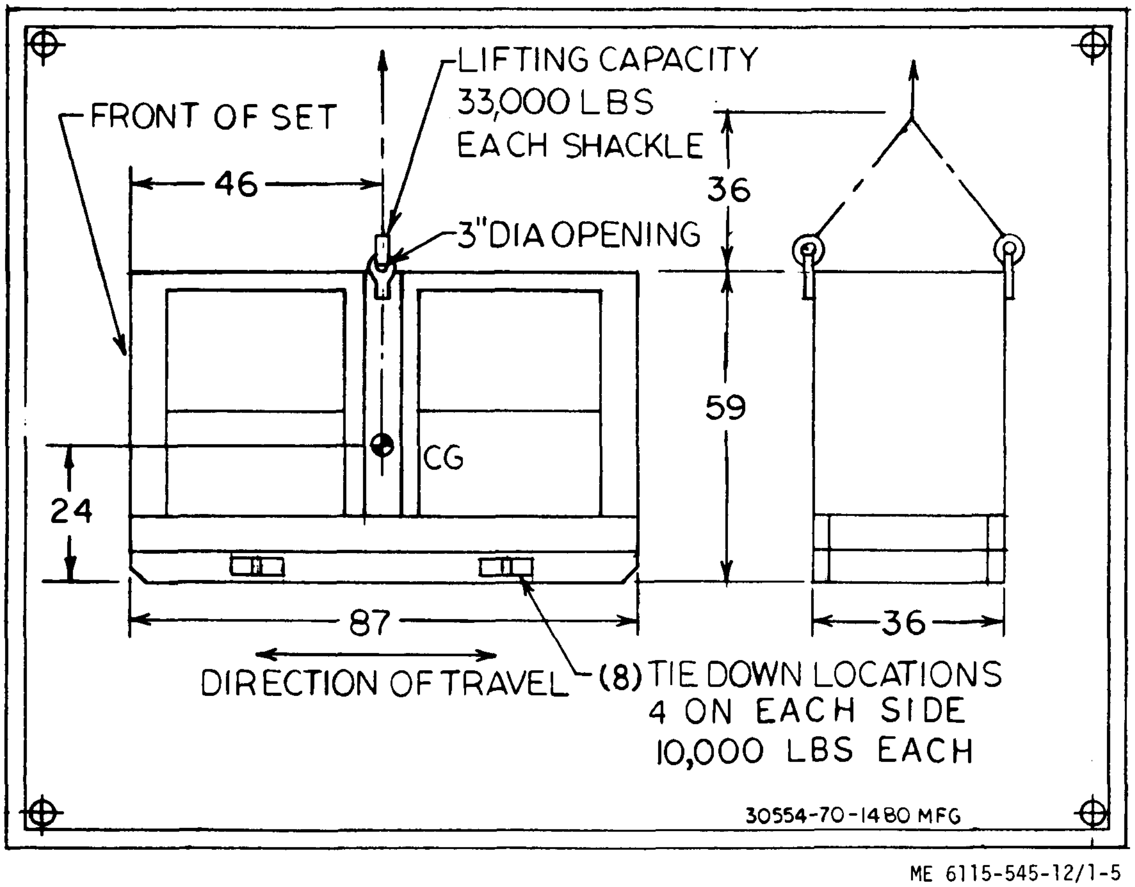


Figure 1-5. Lifting Instructions Instruction Plate

b. Tabulated Data. (Cont)

(3) Main generator (50/60 Hz tactical utility and tactical precise).

DOD drawing no. 70-1900

Type . . . . Rotating field synchronous, brushless with integral exciter

KVA (Kilovolt amperes). ..62. 5/75

KW 50/60

volts . . . . 120/208 or 240/416 (Adjustable to 197/240 or 395/480, 60 Hz fig. 1 -9)

Amperes . . . . 208/104 (173/87 at 50 Hz)

Phases 3

power factor 0.8

Hertz 50/60

Cooling . . . . Air

Degree of enclosure . . . . Drip-proof

Lubrication . . . . None required

Drive . . . . Direct

Duty classification . . . . Continuous

Operating speed. . . . . 1800 rpm for 60 Hz, 1500 rpm for 50 Hz

OPERATING INSTRUCTIONS

I PRESTART CHECKS

A. CHECK LUBRICATING OIL LEVEL.

B. CHECK ENGINE COOLANT LEVEL.

C. CHECK FUEL LEVEL BY PLACING "START-RUN" SWITCH IN "RUN" POSITION AND THE "BATTLE SHORT" SWITCH IN THE "ON" POSITION.

D. RETURN BOTH SWITCHES TO THE "STOP" AND "OFF" POSITIONS RESPECTIVELY.

E. CHECK VOLTAGE AND FREQUENCY REQUIREMENTS OF THE LOAD AGAINST THE VOLTAGE AND FREQUENCY CONNECTION OF THE SET.

F. MAKE SURE THE SHUTTERS ON THE RADIATOR END OF THE SET ARE NOT MANUALLY LOCKED OPEN.

G. CLOSE ALL DOORS EXCEPT THOSE ON CONTROL PANEL END OF SET.

H. FASTEN THE DOORS BELOW THE CONTROL PANEL IN THE OPEN POSITION.

I. **BATTERY TERMINAL MINUS (-) IS TO BE CONNECTED TO GND.**

J. WARNING: 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 INJURY OR ELECTROCUTION FROM CONTACT WITH AN UNGROUNDED SYSTEM.

K. **CHECK HYDRAULIC OIL LEVEL (PRECISE UNITS ONLY)**

II. STARTING WHEN AMBIENT AIR TEMPERATURE IS ABOVE MINUS 25°F

A. CRANK THE ENGINE BY PLACING THE STOP-RUN-START SWITCH IN THE "START" POSITION. DO NOT CRANK MORE THAN 15 SECONDS AT A TIME. ALLOW AT LEAST 15 SECONDS BETWEEN CRANKINGS.

B. WHEN THE TEMPERATURE IS BELOW PLUS 40°F THE ENGINE ETHER PRIMER MAY BE REQUIRED. TO USE THE ETHER PRIMER PUSH THE PRIMER SWITCH TO THE "ON" POSITION WHILE CRANKING THE ENGINE. EACH TIME THE SWITCH IS ACTUATED TO THE "ON" POSITION ONE METERED SHOT OF ETHER WILL BE INJECTED INTO THE ENGINE AIR INTAKE SYSTEM.

C. AFTER THE ENGINE STARTS CONTINUE TO HOLD THE STOP-RUN-START SWITCH IN THE "START" POSITION UNTIL THE LUBE OIL PRESSURE IS ABOVE 20 PSI AND THE MAIN GENERATOR VOLTAGE IS NORMAL.

D. ADJUST THE FREQUENCY AND VOLTAGE TO THE DESIRED VALUES.

E. PRIOR TO CLOSING THE CIRCUIT BREAKER RESET THE FAULT INDICATOR LIGHTS. IF NONE OF THE LIGHTS COME ON AFTER BEING RESET, PROCEED WITH THE NEXT STEP. IF A LIGHT DOES COME ON, CORRECT THE INDICATED FAULT BEFORE PROCEEDING.

F. CLOSE THE MAIN CIRCUIT BREAKER BY MOMENTARILY PLACING THE CIRCUIT BREAKER SWITCH IN THE "CLOSE" POSITION.

G. THE BREAKER CAN BE OPENED BY MOMENTARILY PLACING THE BREAKER SWITCH IN THE "OPEN" POSITION.

III. STOPPING

A. OPEN THE CIRCUIT BREAKER BY MOMENTARILY PLACING THE CIRCUIT BREAKER SWITCH IN THE OPEN POSITION

B. PLACE THE STOP-RUN-START SWITCH IN THE "STOP" POSITION 3 MINUTES AFTER STEP "A".

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

V. REFER TO THE APPLICABLE TECHNICAL MANUAL FOR THE INSTRUCTION AND USE OF THE FOLLOWING CONTROLS:

A. LOCAL REMOTE VOLTAGE SENSING

B. BATTLE SHORT SWITCH

C. UNIT PARALLEL SWITCH

D. FAULT INDICATOR SYSTEM

E. REMOTE CONTROL

VI. IF THE SET DOES NOT START BY FOLLOWING THE ABOVE INSTRUCTIONS REFER TO THE APPLICABLE TROUBLE SHOOTING GUIDE.

VII. PARALLEL OPERATION

A. LOAD CONTACTOR ON SET TO BE PARALLELED MUST BE IN THE "OPEN" POSITION.

B. PARALLELING SWITCH "S6" IS TO BE PLACED IN THE PARALLELING POSITION. (BOTH SETS)

C. SYNCHRONIZING LAMPS ON SET TO BE PARALLELED SHOULD INCREASE AND DECREASE IN INTENSITY INDICATING PHASE RELATIONSHIP BETWEEN THE TWO SETS.

D. WHEN LIGHTS ARE DARK THE SETS ARE IN PHASE, AND THE LOAD CONTACTOR OF THE SET TO BE PARALLELED CAN BE CLOSED, PLACING THE SETS IN PARALLEL.

E. EQUAL SHARING OR REACTIVE LOAD CAN BE ADJUSTED BY THE CROSS-CURRENT RHEOSTAT R29.

F. EQUAL SHARING OF REAL LOAD CAN BE ADJUSTED WITH THE LOAD SHARING RHEOSTAT R28.

30554-70-1467 MFG

Figure 1-6. Operating Instructions Instruction Plate ME 6115-545-12/1-6 C3

b. Tabulated Data. (Cont)

(4) Main generator (400 Hz, tactical precise).

DOD drawing no.	70-1901
Type	Rotating field synchronous, brushless with integral exciter
KVA (Kilovolt Amperes) . . .	75
KW	.60
Hertz	400
Volts	120/208 or 240/416 (Adjustable to 197/229 or 395 458 - fig, 1-10)
Amperes	208/104
Phases	3
Power factor	0.8
Coating	Air
Degree of enclosure	Drip-proof
Lubrication	None required
Drive	Direct
Duty classification	Continuous
Operating speed	2000 rpm

(5) Fuel level switch (day tank).

DOD drawing no.	70-1594
Type	Float
Current	3.0 amperes at 6 to 32 Vdc
Pressure	0 to 150 psi

SERVICE INSTRUCTIONS					
AMBIENT TEMPERATURE	FUEL		LUBRICATING OIL	HYDRAULIC OIL (MEP105A)	ENGINE COOLANT
	DIESEL	JP4			
-65°F TO -25°F	VV-F-800 GRADE DFA	MIL-T-5624	MIL-L-46167	MIL-H-5606	MIL-A-11755
-25°F TO 0°F	VV-F-800 GRADE DF-1	MIL-T-5624	MIL-L-46167	MIL-H-5606	MIL-A-11755
0°F TO +20°F	VV-F-800 GRADE DF-1	MIL-T-5624	MIL-L-2104	MIL-H-5606	MIL-A-11755
+20°F TO +125°F	VV-F-800 GRADE DF-2	MIL-T-5624	MIL-L-2104	MIL-H-5606	MIL-A-11755

SYSTEM CAPACITIES									
FUEL SYSTEM		LUBRICATING SYSTEM			COOLING SYSTEM			HYDRAULIC SYSTEM (MEP105A)	
		CRANK CASE						SUMP	
TANK CAPACITY	USEABLE FUEL	"F" MARK	"L" MARK	FILTERS	RADIATOR	BLOCK	HEATER	FULL TANK	SIGHT GAGE
55 GAL	50 GAL	20 QTS	16 QTS	6 QTS	20 QTS	18.5 QTS	2 QTS	9 PTS	8 PTS

30554-70-1488MFG

Figure 1-7. Service Instructions and System Capacities Instruction Plate

b. Tabulated Data. (Cont)

Switch contact data

Normal fuel level is 2.00±0.12 inches from top of tank.

Open continuity exists between connector pins A-B (upper switch) and C-D (lower switch).

When fuel level drops below 2.75±0.12 inches from top of tank-Upper switch is closed and lower switch opens.

When fuel level drops below 5.75 ± 0.12 inches from top of tank-Upper and lower switches are closed.

(6) Engine accessories.

(a) Fuel transfer pumps.

Model (MS) MS5132-2
Volts 24dc
psi(max) 7
Delivery (max) . . . . .18 gallons per hr

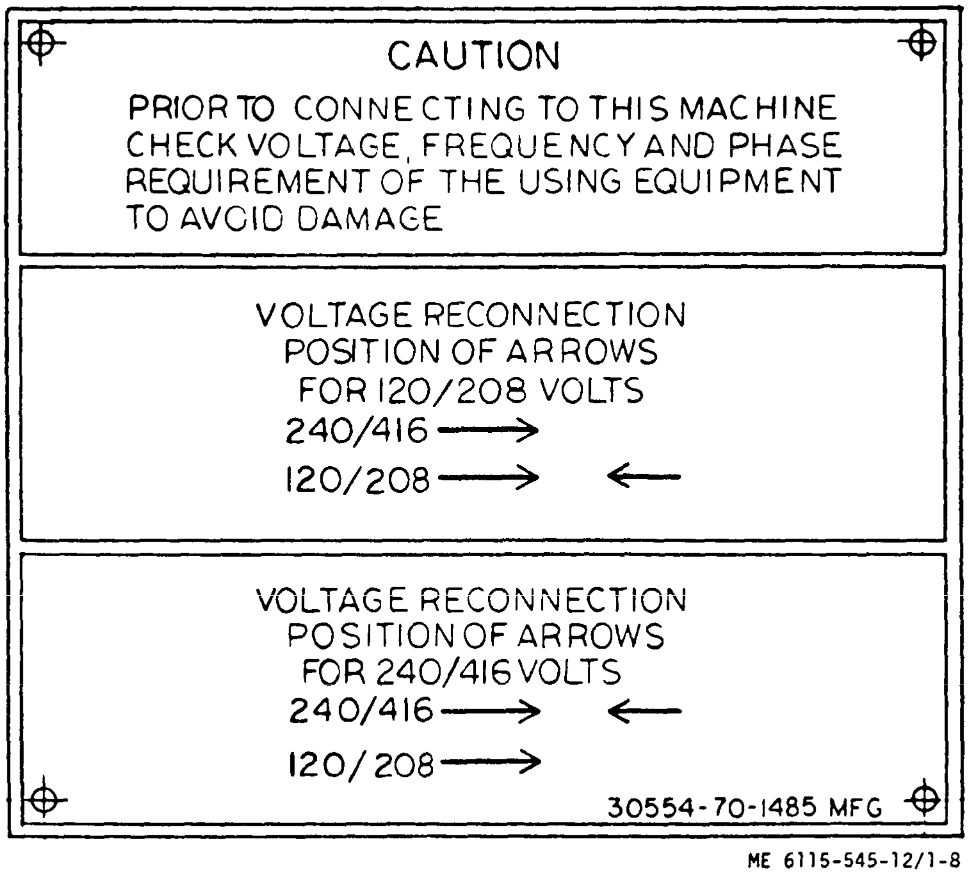


Figure 1-8. Voltage Reconnection Instruction Plate

b. Tabulated Data. (Cent)

(b) Turbocharger.

Drive	Engine exhaust
Type	Impeller

(c) Electric starter.

Service parts type no.	MS53011-1
volts	24 dc
Rotation at drive end	Clockwise
Torque	22 ft-lbs (rein) at 400 amperes, 4.0 volts
Pinion data	
Pinion teeth	12 tooth (on 13 tooth blank)
Engagement	Positive engagement indexing drive with overrunning clutch

(d) Battery charging alternator.

DOD drawing no.	69-780-2
Type drive	Belt
Rating	
volts	24
Amperes	35
Operating temperature range	-65° F to + 175° F
Charge rate	0 to 2 amperes adjustable with fully charged battery
Fuse	Style AGC40, 32 volts, 40 amperes
Current output	0 to 15 amperes, 1900-4000 rpm at rated temperature

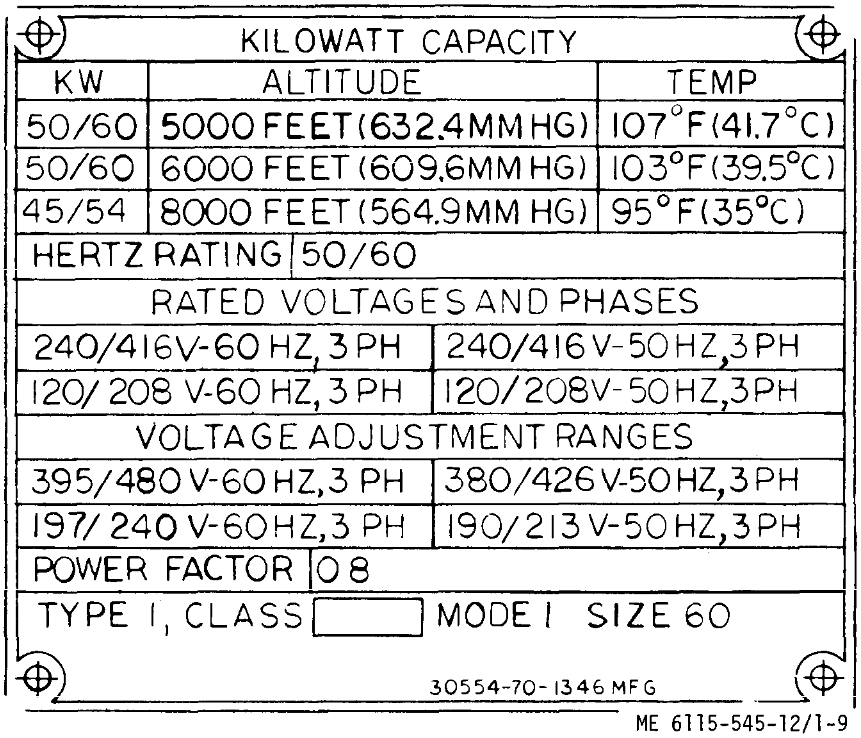


Figure 1-9. Operational Data Information Plate (Mode I)

b. Tabulated Data. (Cent)

(e) Oil cooler.

Type . . . . Permanent tubular element

(f) Radiator.

DOD drawing no . . . 70-1126

Capacity . . . . 15 quarts

Pressure. . . . . . . 7 psi

(g) Water Pump.

Type . . . . Belt driven

(h) Safety devices:

1. Low oil pressure switch.

DOD part no. 70-1309

Contact Rating

A . . . 10 amperes 28 volt dc resistive

B . . . 10 amperes 125 volt ac resistive

Switch Configuration

A . . . 1 circuit N. O.

B . . . 1 circuit N. C.

Pressure Range:

500 psi maximum

Pressure Setting

A . . . A-D circuit trip at 18-22 psi decreasing (N. O.)

B . . . B-C circuit trip at 18-22 psi decreasing (N. C.)

2. Coolant high temperature switch.

DOD drawing no. . . 69-697-3

Rating

volts . . . . 28 dc

Current . . . . 10 amperes

Trip temperature . . . . 222° F ± 3° F

3. Overspeed switch.

DOD drawing no . . . . . 70-1105-1 (400 Hz)

70-1105-2 (50/60 Hz)

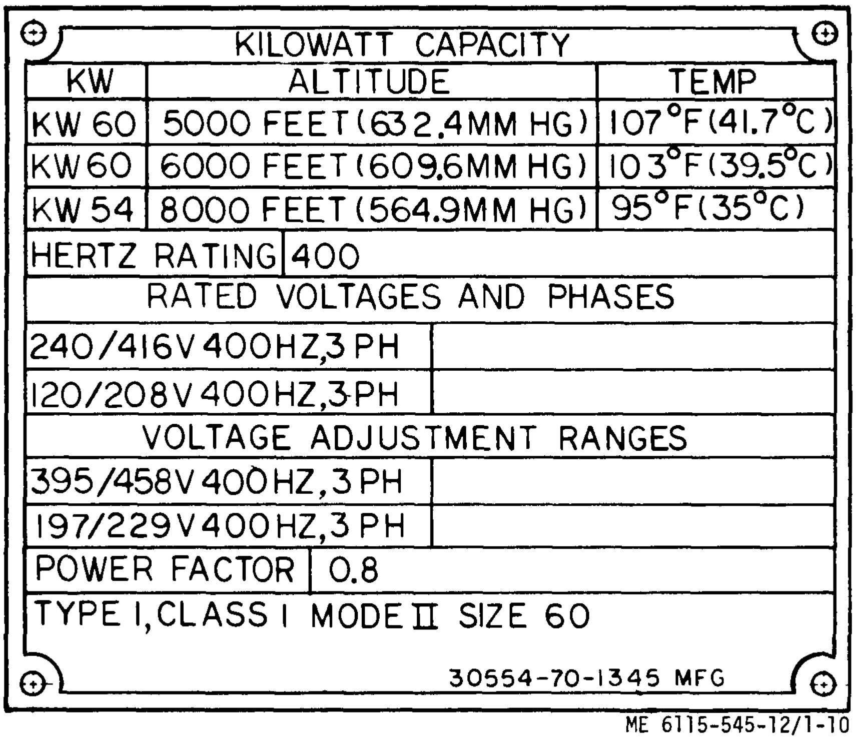


Figure 1-10. Operational Data Information Plate (Mode II)

b. Tabulated Data. (Cont)

Type. . . . . Speed sensitive, manual reset

Overspeed trip . . . . 2400 to 2450 rpm, engine speed; 1200 to 1225 rpm, switch speed

Element trip speed . . S9-1 set - 290-310 rpm, automatic reset 190-210 rpm. (all sets)

S9-2 set -825-850 (400 Hz) rpm, automatic reset 725-750 rpm. Set -590-610 rpm (50/60 Hz) automatic reset 490-510 rpm.

S9-3 set -1200-1225 rpm, manual reset. (all sets)

(i) Oil filters (2).

Type . . . . Replaceable element

(j) Batteries (2).

Service part type no. . MS35000-3

volts . . . . 12 dc

Connections . . . . . . series for 24 volts

(k) Ether solenoid.

DOD drawing no 70-1609

Volts 24dc

(1) Primary fuel filter and strainer assembly.

DOD drawing no. . . . 70-507

(m) Secondary fuel filter.

Cartridge. C-1125PL

(n) Ether tank.

DOD drawing no. . . . 70-1608

Capacity (fluid ounces, ethyl ether) 26.7

(o) Lube oil pressure transmitter.

DOD drawing no. . . . 69-779

Voltage rating . . . . . 24 Vdc

Pressure range . . . . 0-120 psi

Resistance (ohms) pressure (psi)
0.0 to 1.0 ------ 0
1.5 to 3.0 ------ 10
14.5 to 16.5 ----- 60
28.0 to 31.0 ----- 120

(p) Temperature transmitter.

DOD drawing no. . . . 69-781

Voltage rating . . . . . 24 Vdc

Temperature range . . 120° F to 280° F

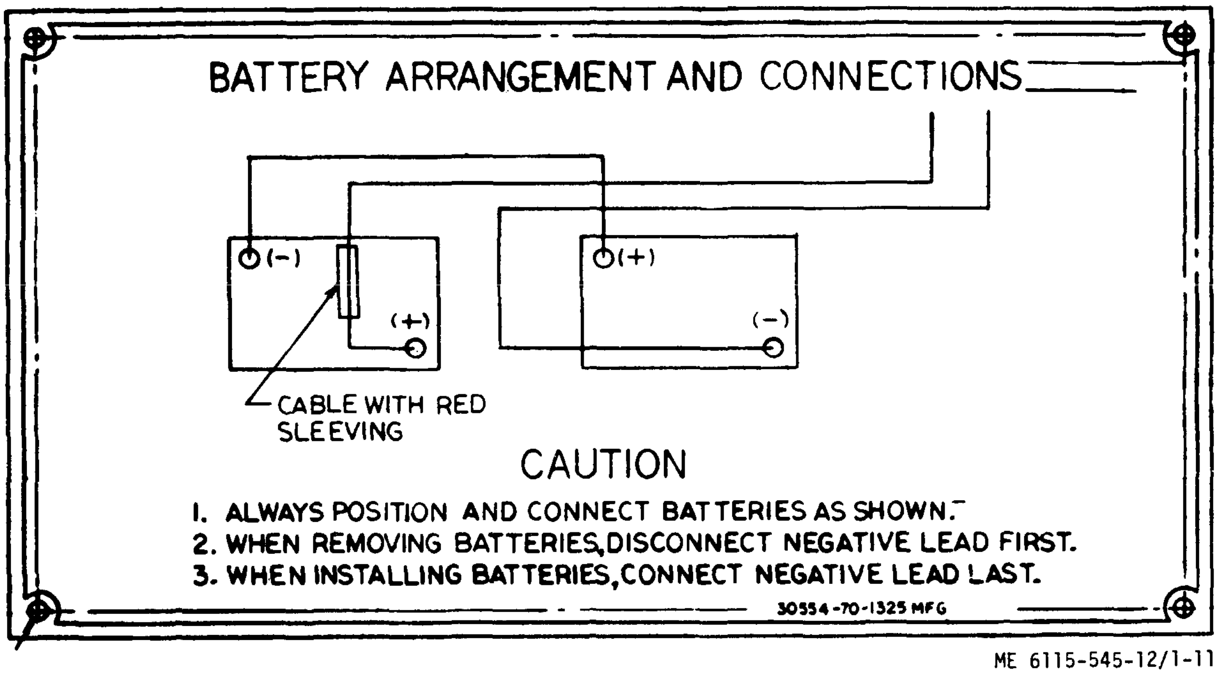


Figure 1-11. Battery Arrangement and Connections Instruction Plate

b. Tabulated Data. (Cont)

Resistance (ohms)

2360 ± 10 percent at 120° F

710 ± 5 percent at 200° F

310 ± 8 percent at 280° F

(7) Capacities.

Fuel tank . . . . 55 gallons

Usable fuel . . . .50 gallons

Engine crankcase. . . .20 quarts

Engine cooling system . . . . 33.5 quarts

Hydraulic governor system (See fig. 1-28.) . . . . 5 quarts

(8) Cooling system.

stabilized coolant temperature (minimum) . . . . . .180° F

Water pump type . . . . Centrifugal, belt driven

(9) Lubricating system.

Type system . . . . Full flow, circulating pressure

Oil pump type Gear, positive displacement

Oil pressure range, hot, at rated speed . . . . 30-55 psi

Pressure regulation governed by . . . . Regulation valve

Nominal oil capacities:

Oil change . . . . .20 quarts

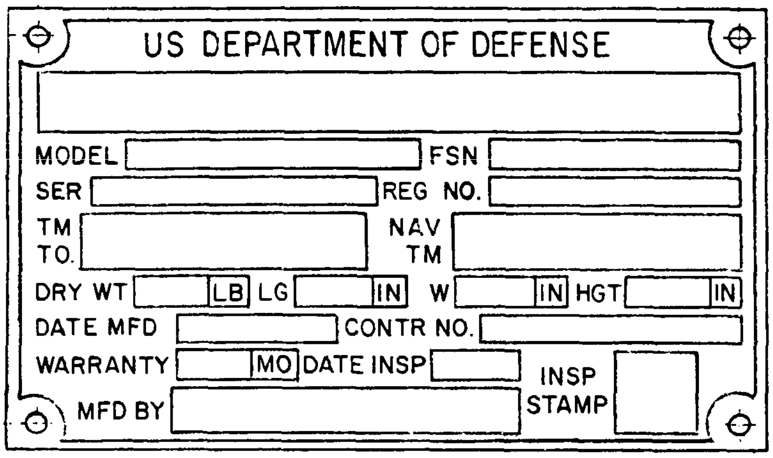
Crankcase and oil filters . . . . .26 quarts

Lubricating oil filters . . . . Dual full flow

(10) Valve data.

Valve lash adjustment.

Intake valve clearance (hot) . . 0.015 inch



ME 6115-545-12/1-12 C1

Figure 1-12. Set I. D. Plate

b. Tabulated Data. (Cont)

Intake valve
clearance (cold) . . . . 0.018 inch

Exhaust valve
clearance (hot) . . . . 0.015 inch

Exhaust valve
clearance (cold). . . . 0.018 inch

(11) Governor (mechanical).

Type . . . . Variable speed, flyball

Regulation 2-3%

(12) Torque data.

NOTE

Torque values with threads lubricated with engine oil.

Exhaust manifold screws.25 ft - lbs (12 ft lb increments)

Engine lube oil filter
assembly mounting screws . . . . . 50 ft - lbs

Intake manifold securing
capscrews . . . . .33 ft - lbs

Low oil pressure
switch . . . . .20 ft - lbs

Injector hold-down
capscrews . . . . 13 ft - lbs (6 ft lb increments)

Turbocharger locknuts . . . . 21 ft - lbs

Water pump mounting screws . . . . . 33 ft - lbs

Fan to pump mounting screws . . . . 35 ft - lbs

(13) Belt deflections.

Fan drive belt . . . . . . 9/32 inch at 12 to 14 lb force (measured at center point between pulleys)

Alternator belt . . . . . 9/64 inch at 3 to 5-1/4 lb force (measured center point between pulleys)

(14) Shipping dimensions and weights (fig. 1-25).

Length . . . . 108 inches crated
87 inches uncrated

Width . . . . .48 inches crated
36 inches uncrated

Height . . . . 72 inches crated
59 inches uncrated

Weight (50/60 Hz utility set) . . . . . 4740 lbs (approx) (crate included)

Weight (50/60 Hz precise set) . . . . 4800 lbs (approx) (crate included)

Weight (400 Hz set) . . . . 4900 lbs (approx) (crate included)

Volume . . . .216 cubic feet

(15) Optional equipment.

(a) Fuel burning winterization kit.

DOD drawing no. 70-1297

Volts 24Vdc

b. Tabulated Data. (Cont)

Amperes (above 30°F) .... Start 14.5; run 5.0

Amperes (below 30 °F) .... Start 17.5; run 7.5

Fuel consumption .... 21 -23 cc/min (70°F)

Duty cycle .... continuous

(b). Electric winterization kit.

DOD drawing no 70-1299

Input power .... 205 to 240 volts 50/60 or 400 Hz single phase

Current .... 14.6/12.5 amperes at 205/240 Vac

Temperature .... Thermostat shut-off at 150°F ±5° on at 130 °F±5°

(c) Wheel mounting kit.

DOD drawing no 70-1256

Capacity .... 5000 lbs

Max speed .... 5 mph on paved surfaces

Turn angl e .... 40 ° pivot

Tire pressure .... 60 psi

(d) Load bank.

DOD drawing no 70-1271

Rating .... 30 KW

Current .... 84/42 amperes

Input voltage .... 120/208 or 240/416, 3-phase, 4 wire

(16) Wiring diagrams. (figs. 1-13 thru 1-20: 1-29 and 1-30)

(17) 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 MEP006A, MEP105A, and ME P1 15A. Model ME P006A is a 50/60 Hz utility set (Class 2 Model MEP105A is a 50/60 Hz precise set (Class I Mode I), and model MEP115A is a 400 Hz precise set (Class I Mode II).

The difference between precise and utility 50/60 Hz and 400 Hz generator sets are noted in the appropriate paragraphs throughout the manual. Figures 1-26 and 1-27 show the harness interconnection for these models. These differences are summarized as follows:

a. The generator used on models MEP006A and MEP105A is a 50/60 Hz generator. That used in Model MEP115A is a 400 Hz generator.

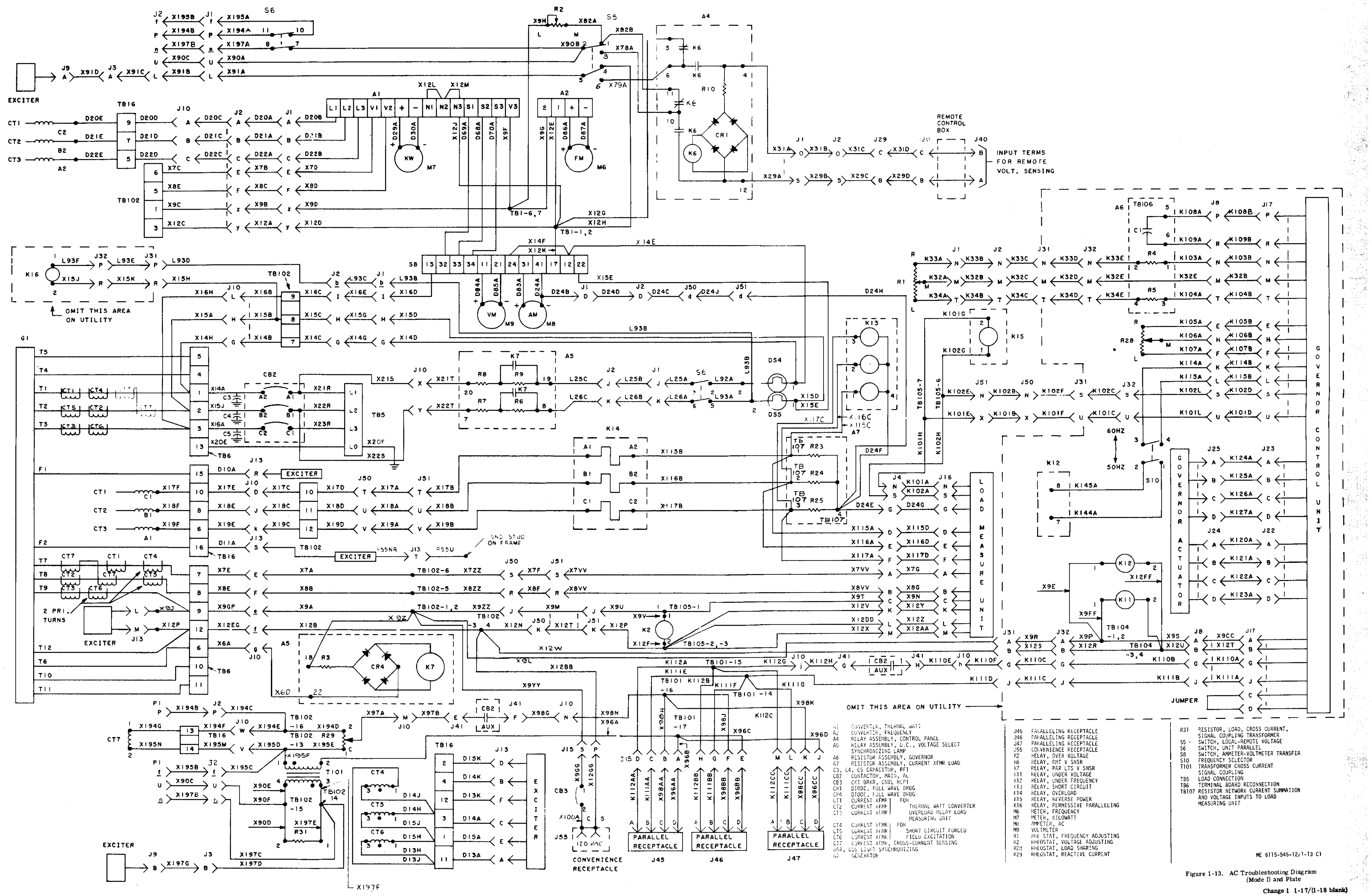
b. The governor used on model MEP105A is an electro-hydraulic governor consisting of a governor control unit, load measuring unit and hydraulic sump, filter, pump and actuator (See fig. 1-28). An electric governor is used on model MEP115A. The governor control unit on MEP105A is 50/60 Hz, and 400 Hz on MEP1 15A. The load measuring unit however is used on all models. Frequency is controlled by a rheostat on the control panel on MEP115A and MEP105A unit. The governor used on model MEP006A is a mechanical governor which is integral with the fuel injection pump. Frequency is adjusted by a manual speed control.

c. The same special relay box is used on models ME P105A and MEP006A, but model MEP105A also has a precise relay box. The precise relay box contains a frequency selector switch, under frequency relay, undervoltage relay, permissive paralleling relay, governor feedback capacitor and frequency adjust fixed resistors. The special relay box used on model MEP1 15A contains the same components as that used on models ME P006A and ME P105A, and also those contained in the precise relay box with the exception of the frequency selector switch.

d. The control cubicle contains some componets which are different on the various models.

e. The exciter regulator assembly and the cross current transformer, on the current transformer assembly, are different on model MEP1 15A to those on the other two models.

f. The differences in performance characteristics of the various models are shown in table 1-1.



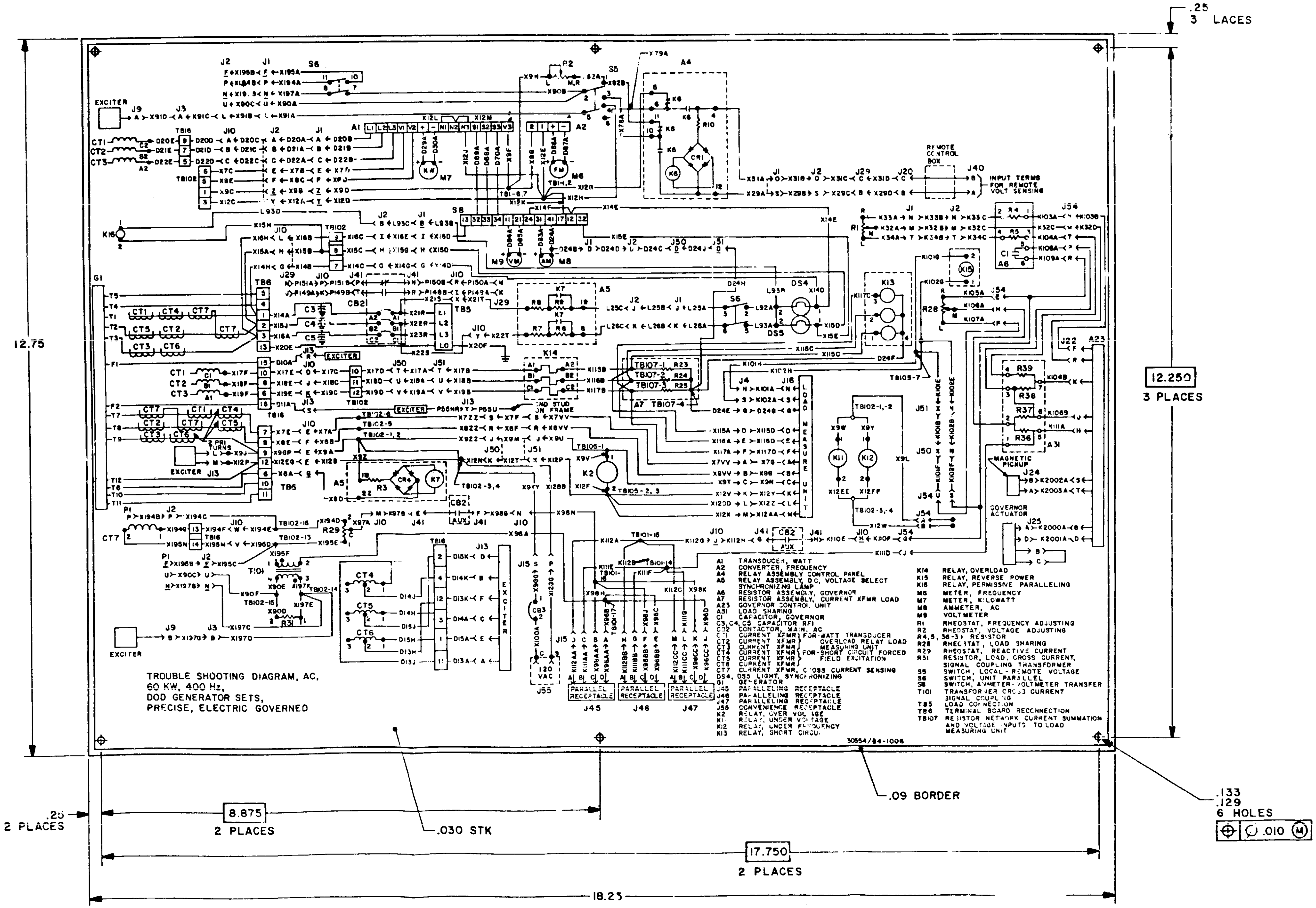
A1 CONVERTER, THERMAL WATT
A2 CONVERTER, FREQUENCY
A4 RELAY ASSEMBLY, CONTROL PANEL
A5 RELAY ASSEMBLY, D.C., VOLTAGE SELECT SYNCHRONIZING LAMP
A6 RESISTOR ASSEMBLY, GOVERNOR
A7 RESISTOR ASSEMBLY, CURRENT XFMR LOAD
C3, C4, C5 CAPACITOR, RFI
CB2 CONTACTOR, MAIN, AC
CB3 CKT BRKR, CNVL RCPT
CR1 DIODE, FULL WAVE BRDG
CR4 DIODE, FULL WAVE BRDG
CT1 CURRENT XFMR
CT2 CURRENT XFMR
CT3 CURRENT XFMR
FOR THERMAL WATT CONVERTER OVERLOAD RELAY LOAD MEASURING UNIT
CT4 CURRENT XFMR
CT5 CURRENT XFMR
CT6 CURRENT XFMR
FOR SHORT CIRCUIT FORCED FIELD EXCITATION
CT7 CURRENT XFMR, CROSS-CURRENT SENSING
DS4, DS5 LIGHT SYNCHRONIZING
G1 GENERATOR

J45 PARALLELING RECEPTACLE
J46 PARALLELING RECEPTACLE
J47 PARALLELING RECEPTACLE
J55 CONVENIENCE RECEPTACLE
K2 RELAY, OVER VOLTAGE
K6 RELAY, RMT V SNSR
K7 RELAY, PAR LTS V SNSR
K11 RELAY, UNDER VOLTAGE
K12 RELAY, UNDER FREQUENCY
K13 RELAY, SHORT CIRCUIT
K14 RELAY, OVERLOAD
K15 RELAY, REVERSE POWER
K16 RELAY, PERMISSIVE PARALLELING
M6 METER, FREQUENCY
M7 METER, KILOWATT
M8 AMMETER, AC
M9 VOLTMETER
R1 RHEOSTAT, FREQUENCY ADJUSTING
R2 RHEOSTAT, VOLTAGE ADJUSTING
R28 RHEOSTAT, LOAD SHARING
R29 RHEOSTAT, REACTIVE CURRENT

R31 RESISTOR, LOAD, CROSS CURRENT, SIGNAL COUPLING TRANSFORMER
S5 - SWITCH, LOCAL-REMOTE VOLTAGE
S6 SWITCH, UNIT PARALLEL
S8 SWITCH, AMMETER-VOLTMETER TRANSFER
S10 FREQUENCY SELECTOR
T101 TRANSFORMER CROSS CURRENT SIGNAL COUPLING
TB5 LOAD CONNECTION
TB6 TERMINAL BOARD RECONNECTION
TB107 RESISTOR NETWORK CURRENT SUMMATION AND VOLTAGE INPUTS TO LOAD MEASURING UNIT

ME 6115-545-12/1-13 C1

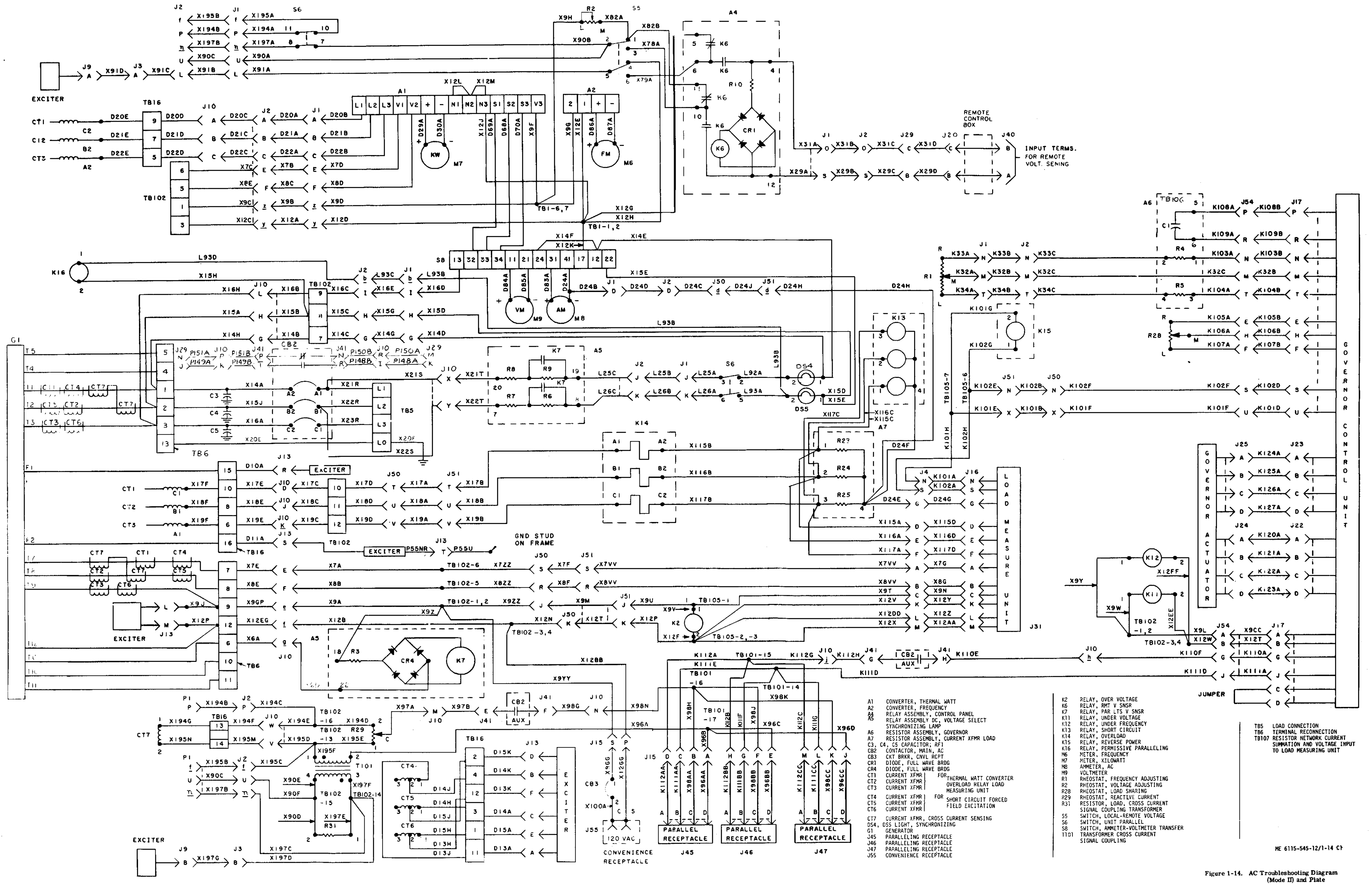
Figure 1-13. AC Troubleshooting Diagram (Mode I) and Plate



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH DOD-STD-100.
2. PLATE SHALL BE PROCESSED IN ACCORDANCE WITH 69-679 USING .032 THICK ALUMINUM ALLOY SHEET.
3. REMOVE BURRS AND BREAK SHARP EDGES.

Figure 1-13.1 Troubleshooting Diagram MEP 115A



A1 CONVERTER, THERMAL WATT
A2 CONVERTER, FREQUENCY
A4 RELAY ASSEMBLY, CONTROL PANEL
A5 RELAY ASSEMBLY DC, VOLTAGE SELECT SYNCHRONIZING LAMP
A6 RESISTOR ASSEMBLY, GOVERNOR
A7 RESISTOR ASSEMBLY, CURRENT XFMR LOAD
C3, C4, C5 CAPACITOR; RFI
CB2 CONTACTOR, MAIN, AC
CB3 CKT BRKR, CNVL RCPT
CR1 DIODE, FULL WAVE BRDG
CR4 DIODE, FULL WAVE BRDG
CT1 CURRENT XFMR
CT2 CURRENT XFMR
CT3 CURRENT XFMR
FOR THERMAL WATT CONVERTER OVERLOAD RELAY LOAD MEASURING UNIT
CT4 CURRENT XFMR
CT5 CURRENT XFMR
CT6 CURRENT XFMR
FOR SHORT CIRCUIT FORCED FIELD EXCITATION
CT7 CURRENT XFMR, CROSS CURRENT SENSING
DS4, DS5 LIGHT, SYNCHRONIZING
G1 GENERATOR
J45 PARALLELING RECEPTACLE
J46 PARALLELING RECEPTACLE
J47 PARALLELING RECEPTACLE
J55 CONVENIENCE RECEPTACLE

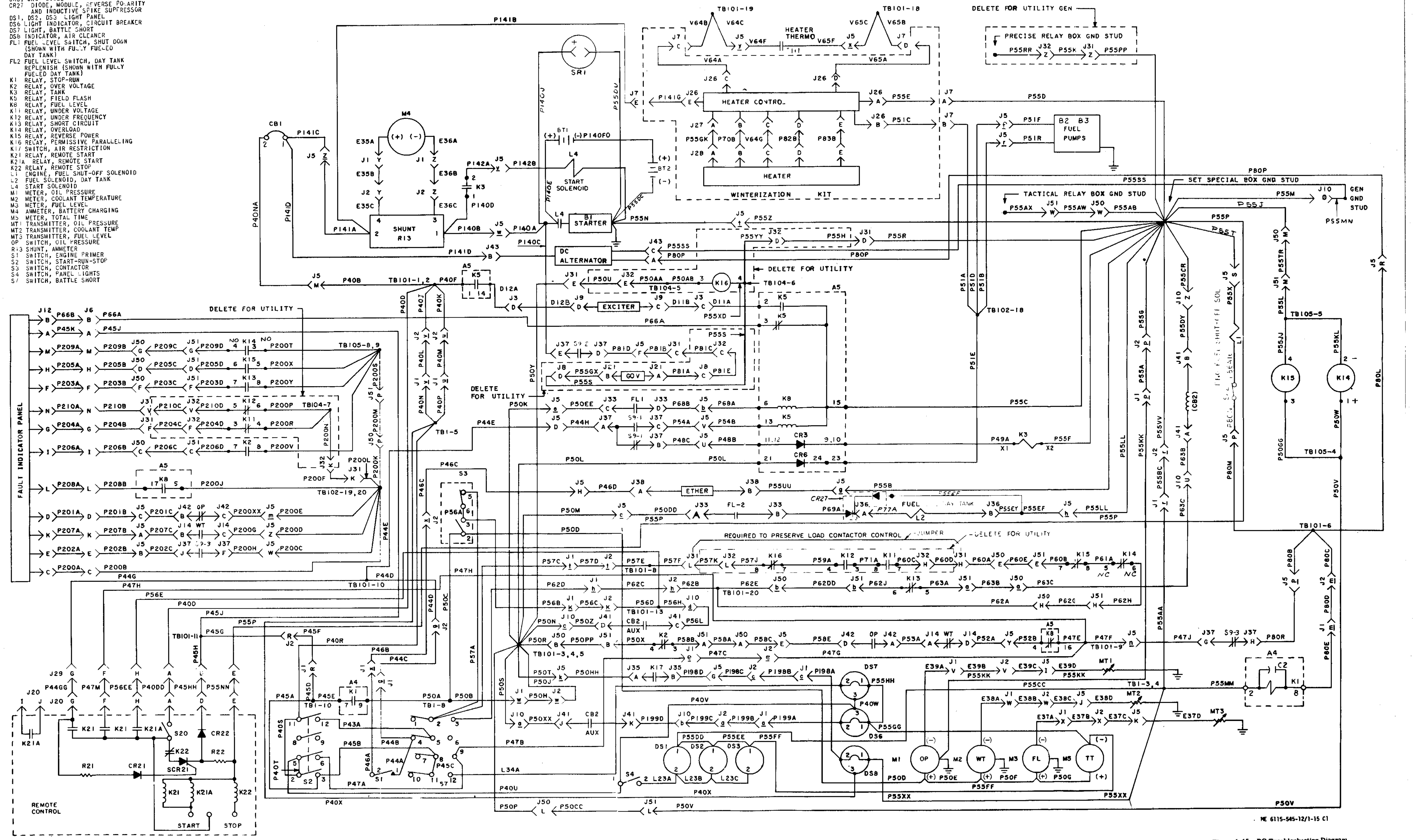
K2 RELAY, OVER VOLTAGE
K6 RELAY, RMT V SNSR
K7 RELAY, PAR LTS V SNSR
K11 RELAY, UNDER VOLTAGE
K12 RELAY, UNDER FREQUENCY
K13 RELAY, SHORT CIRCUIT
K14 RELAY, OVERLOAD
K15 RELAY, REVERSE POWER
K16 RELAY, PERMISSIVE PARALLELING
M6 METER, FREQUENCY
M7 METER, KILOWATT
M8 AMMETER, AC
M9 VOLTMETER
R1 RHEOSTAT, FREQUENCY ADJUSTING
R2 RHEOSTAT, VOLTAGE ADJUSTING
R28 RHEOSTAT, LOAD SHARING
R29 RHEOSTAT, REACTIVE CURRENT
R31 RESISTOR, LOAD, CROSS CURRENT SIGNAL COUPLING TRANSFORMER
S5 SWITCH, LOCAL-REMOTE VOLTAGE
S6 SWITCH, UNIT PARALLEL
S8 SWITCH, AMMETER-VOLTMETER TRANSFER
T101 TRANSFORMER CROSS CURRENT SIGNAL COUPLING

TB5 LOAD CONNECTION
TB6 TERMINAL RECONNECTION
TB107 RESISTOR NETWORK CURRENT SUMMATION AND VOLTAGE INPUT TO LOAD MEASURING UNIT

ME 6115-545-12/1-14 C1

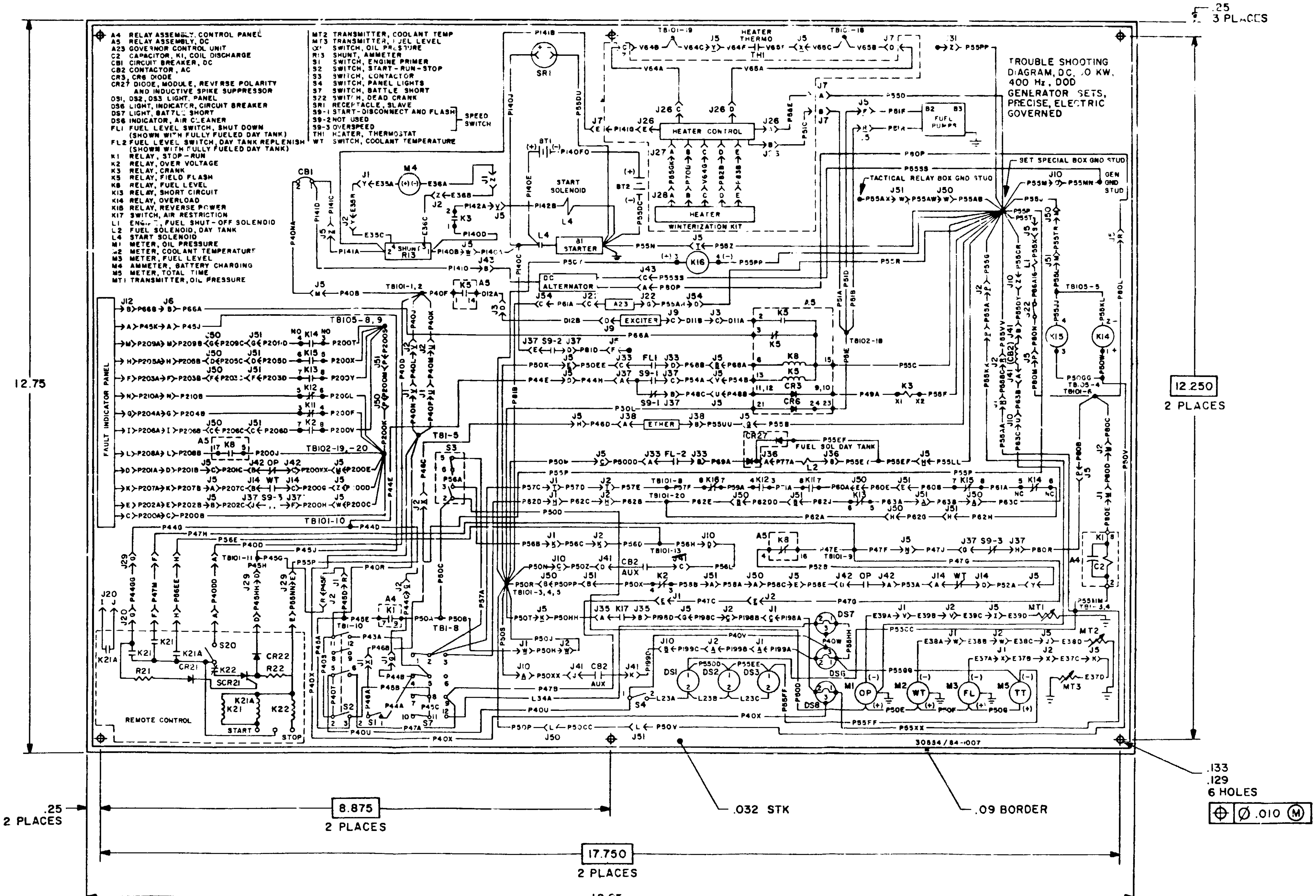
Figure 1-14. AC Troubleshooting Diagram (Mode II) and Plate

A4 RELAY ASSEMBLY, CONTROL PANEL
A5 RELAY ASSEMBLY, DC
B1 STARTER MOTOR
BT1 BATTERY
BT2 BATTERY
B2 FUEL PUMP
B3 FUEL PUMP
CB1 CIRCUIT BREAKER, DC
CB2 CONTRACTOR, AC
CR3, CR6 DIODE
CR27 DIODE, MODULE, REVERSE POLARITY AND INDUCTIVE SPIKE SUPPRESSOR
DS1, DS2, DS3 LIGHT PANEL
DS6 LIGHT INDICATOR, CIRCUIT BREAKER
DS7 LIGHT, BATTLE SHORT
DS8 INDICATOR, AIR CLEANER
FL1 FUEL LEVEL SWITCH, SHUT DOWN (SHOWN WITH FULLY FUELED DAY TANK)
FL2 FUEL LEVEL SWITCH, DAY TANK REPLENISH (SHOWN WITH FULLY FUELED DAY TANK)
K1 RELAY, STOP-RUN
K2 RELAY, OVER VOLTAGE
K3 RELAY, TANK
K5 RELAY, FIELD FLASH
K8 RELAY, FUEL LEVEL
K11 RELAY, UNDER VOLTAGE
K12 RELAY, UNDER FREQUENCY
K13 RELAY, SHORT CIRCUIT
K14 RELAY, OVERLOAD
K15 RELAY, REVERSE POWER
K16 RELAY, PERMISSIVE PARALLELING
K17 SWITCH, AIR RESTRICTION
K21 RELAY, REMOTE START
K21A RELAY, REMOTE START
K22 RELAY, REMOTE STOP
L1 ENGINE, FUEL SHUT-OFF SOLENOID
L2 FUEL SOLENOID, DAY TANK
L4 START SOLENOID
M1 METER, OIL PRESSURE
M2 METER, COOLANT TEMPERATURE
M3 METER, FUEL LEVEL
M4 AMMETER, BATTERY CHARGING
M5 METER, TOTAL TIME
MT1 TRANSMITTER, OIL PRESSURE
MT2 TRANSMITTER, COOLANT TEMP
MT3 TRANSMITTER, FUEL LEVEL
OP SWITCH, OIL PRESSURE
R13 SHUNT, AMMETER
S1 SWITCH, ENGINE PRIMER
S2 SWITCH, START-RUN-STOP
S3 SWITCH, CONTACTOR
S4 SWITCH, PANEL LIGHTS
S7 SWITCH, BATTLE SHORT
S20 SWITCH, REMOTE ON-OFF
S22 SWITCH, DEAD CRANK
SR1, SR2 RECEPTACLE, SLAVE
S9-1 START-DISCONNECT AND FLASH
S9-2 GOVERNOR, ON-OFF
S9-3 OVERSPEED
(S9-1 through S9-3: SPEED SWITCH)
TH1 HEATER, THERMOSTAT
WT SWITCH, COOLANT TEMPERATURE



ME 6115-545-12/1-15 C1

Figure 1-15. DC Troubleshooting Diagram (Mode I) and Plate



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH DOD-STD-100.
2. PLATE SHALL BE PROCESSED IN ACCORDANCE WITH 69-679 USING .032 THICK ALUMINUM ALLOY SHEET.
3. REMOVE BURRS AND BREAK SHARP EDGES.

Figure 1-15.1 Troubleshooting Diagram, MEP115A

A4	RELAY ASSEMBLY
A5	RELAY ASSEMBLY
B1	STARTER MOTOR
B2	FUEL PUMP
B3	FUEL PUMP
BT1	BATTERY
BT2	BATTERY
CB1	CIRCUIT BREAKER, DC
CB2	CONTRACTOR, AC
CR3, CR6	DIODE
CR27	DIODE MODULE REVERSE POLARITY AND INDUCTIVE SPIKE SUPPRESSOR
DS1, DS2, DS3	LIGHT, PANEL
DS6	LIGHT INDICATOR, CIRCUIT BREAKER
DS7	LIGHT, BATTLE SHORT
DS8	INDICATOR, AIR CLEANER
FL1	FUEL LEVEL SWITCH SHUT DOWN (SHOWN WITH FULLY FUELED DAY TANK)
FL2	FUEL LEVEL SWITCH DAY TANK REPLENISH (SHOWN WITH FULLY FUELED DAY TANK)
K1	RELAY, STOP-RUN
K2	RELAY, OVER VOLTAGE
K3	RELAY, CRANK
K5	RELAY, FIELD FLASH
K8	RELAY, FUEL LEVEL
K11	RELAY, UNDER VOLTAGE
K12	RELAY, UNDER FREQUENCY
K13	RELAY, SHORT CIRCUIT
K14	RELAY, OVERLOAD
K15	RELAY, REVERSE POWER
K16	RELAY, PERMISSIVE PARALLELING
K17	SWITCH, AIR RESTRICTION
K21	RELAY, REMOTE START
K21A	RELAY, REMOTE START
K22	RELAY, REMOTE STOP
L1	ENGINE, FUEL SHUT-OFF SOLENOID
L2	FUEL SOLENOID, DAY TANK
L4	START SOLENOID
M1	METER, OIL PRESSURE
M2	METER, COOLANT TEMPERATURE
M3	METER, FUEL LEVEL
M4	AMMETER, BATTERY CHARGING
M5	METER, TOTAL TIME
MT1	TRANSMITTER, OIL PRESSURE
MT2	TRANSMITTER, COOLANT TEMPERATURE
MT3	TRANSMITTER, FUEL LEVEL
OP	SWITCH, OIL PRESSURE
R13	SHUNT, AMMETER
S1	SWITCH, ENGINE PRIMER
S2	SWITCH, START-RUN-STOP
S3	SWITCH, CONTACTOR
S4	SWITCH, PANEL LIGHTS
S7	SWITCH, BATTLE SHORT
S20	SWITCH, REMOTE ON-OFF
S22	SWITCH, DEAD CRANK
SR1, SR2	RECEPTACLE, SLAVE
SS1	START DISCONNECT AND FLASH (SPEED SWITCH)
SS2	GOVERNOR, ON-OFF (SPEED SWITCH)
SS3	OVERSPEED (SPEED SWITCH)
TH1	HEATER, THERMOSTAT
WT	SWITCH, COOLANT TEMPERATURE

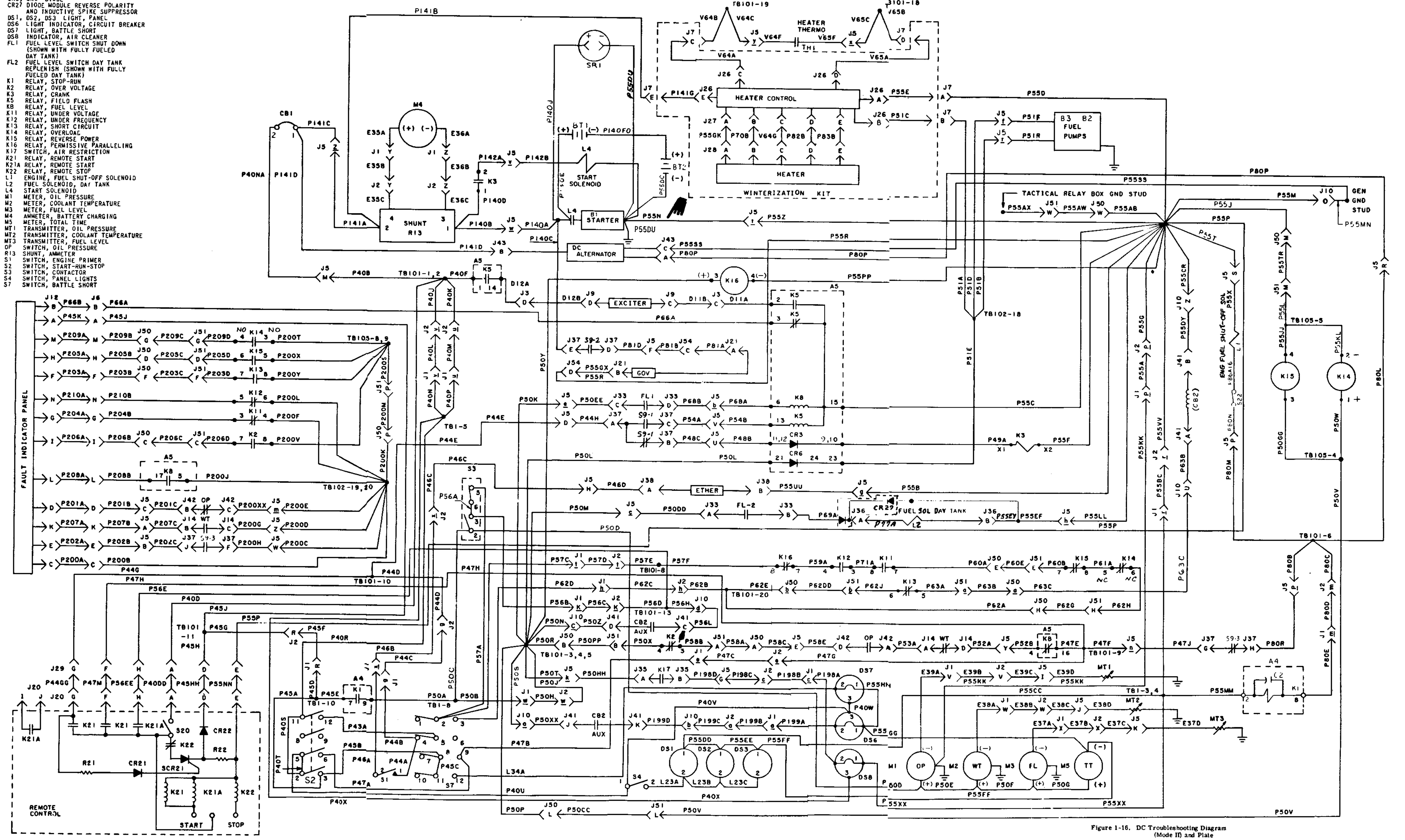
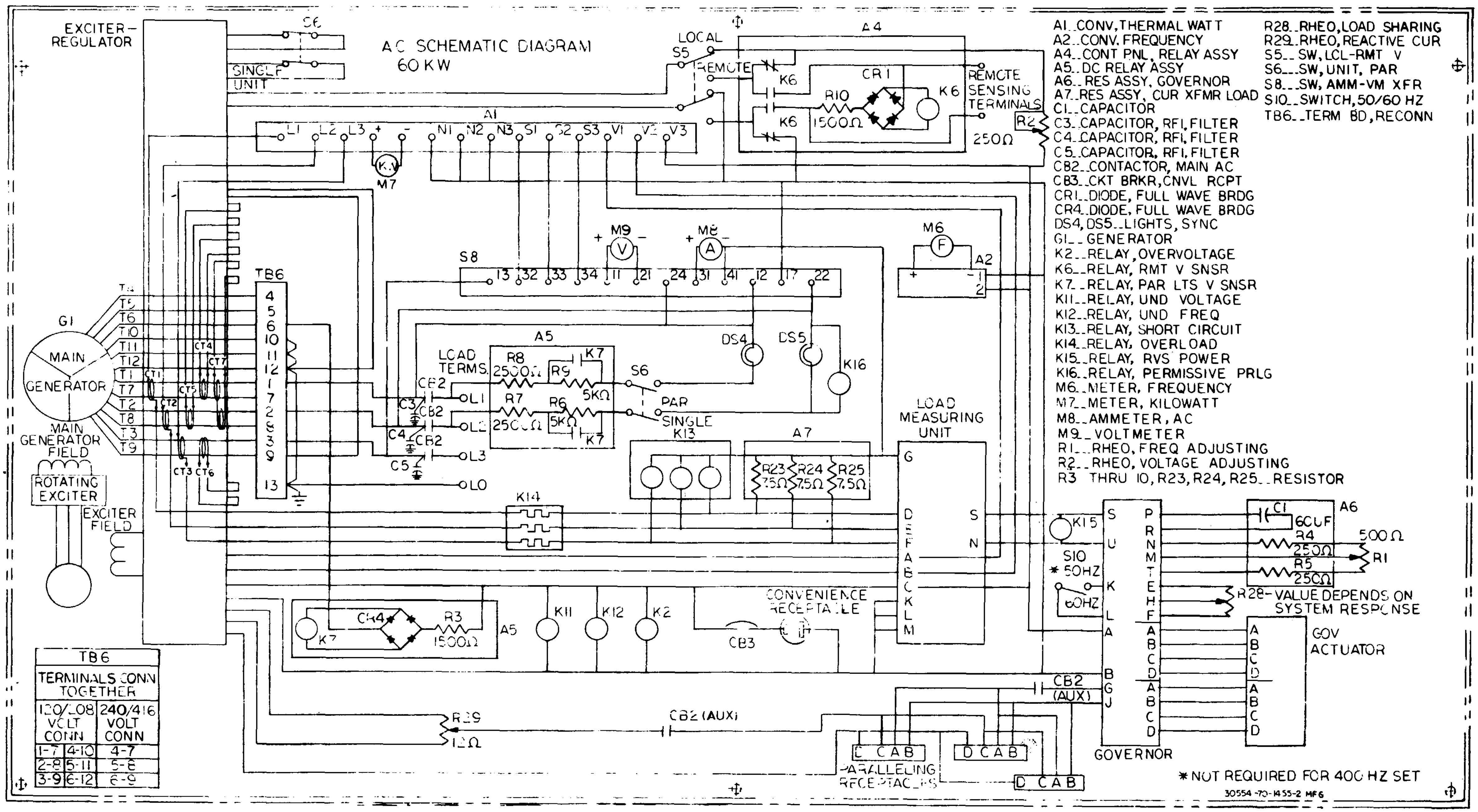
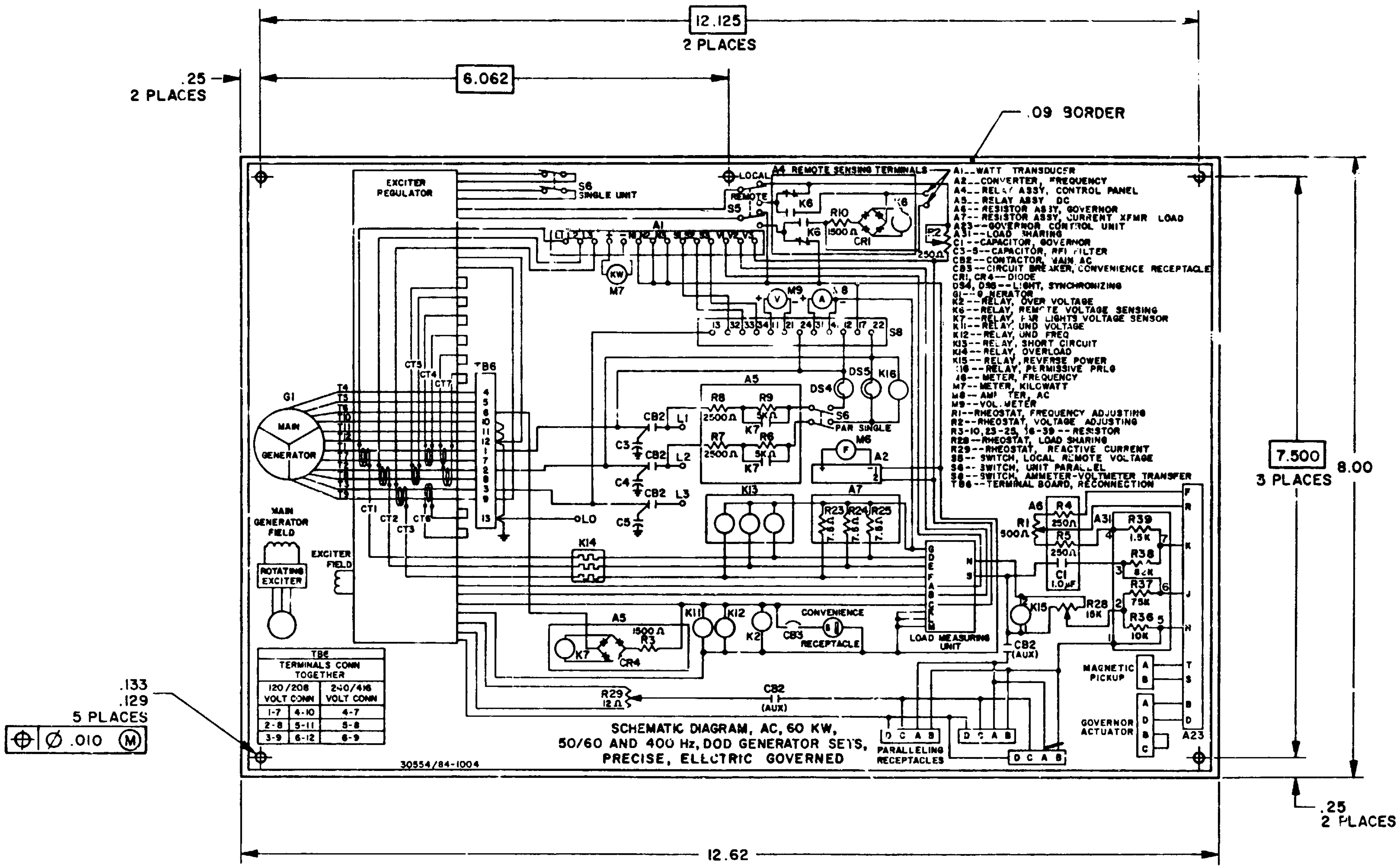


Figure 1-16. DC Troubleshooting Diagram (Mode II) and Plate



ME 6115-545-12/1-17 C1

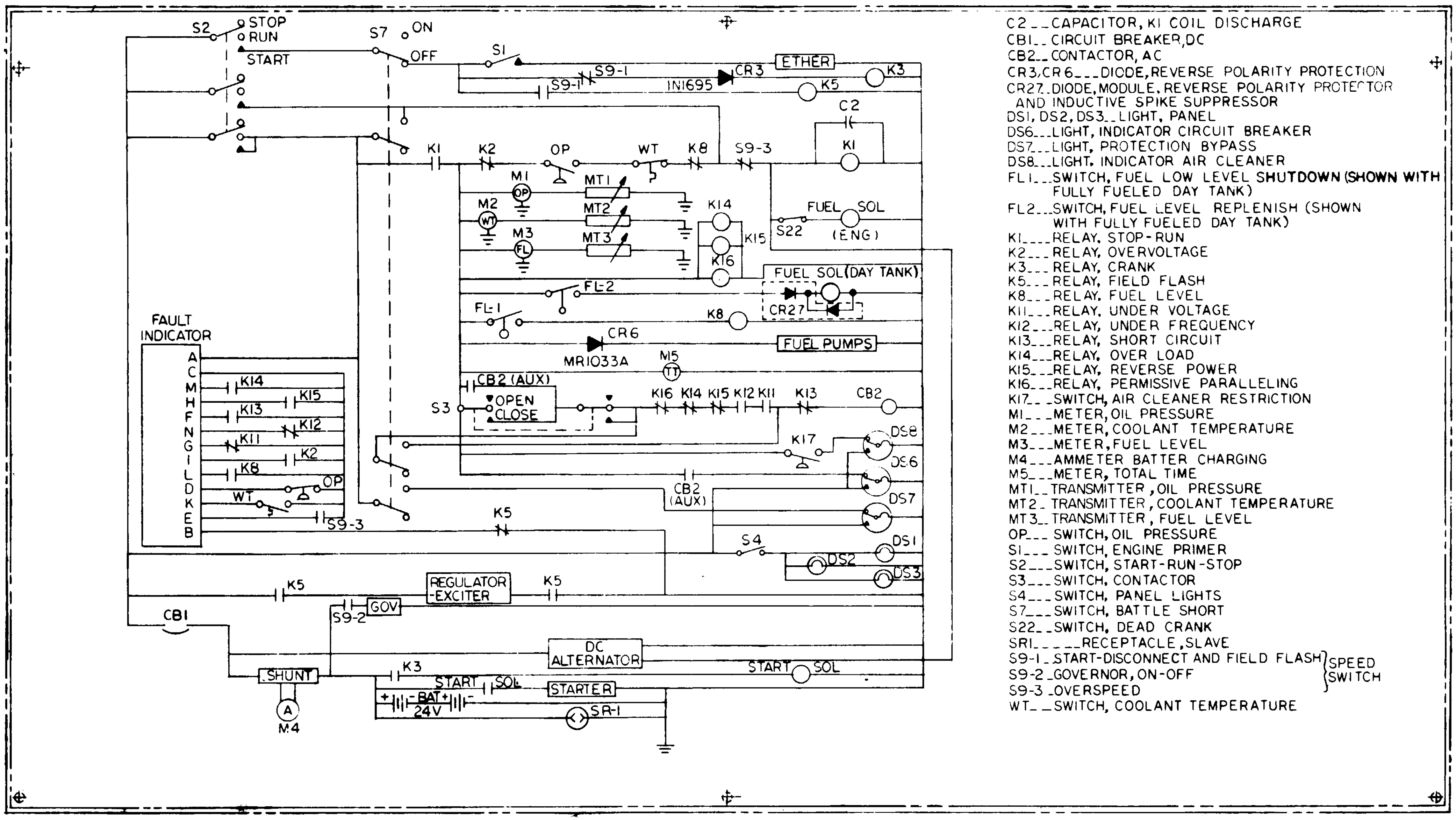
Figure 1-17. Schematic Wiring Diagram Class 1, AC and Plate



NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH DOD-STD-100.
2. PLATE SHALL BE PROCESSED IN ACCORDANCE WITH 69-679 USING .032 THICK ALUMINUM ALLOY SHEET.
3. REMOVE BURRS AND BREAK SHARP EDGES.

Figure 1-17.1 Schematic Wiring Diagram, MEP 115A



ME 6115-545-12/1-18 C1

Figure 1-18. Schematic Wiring Diagram Class 1, DC and Plate

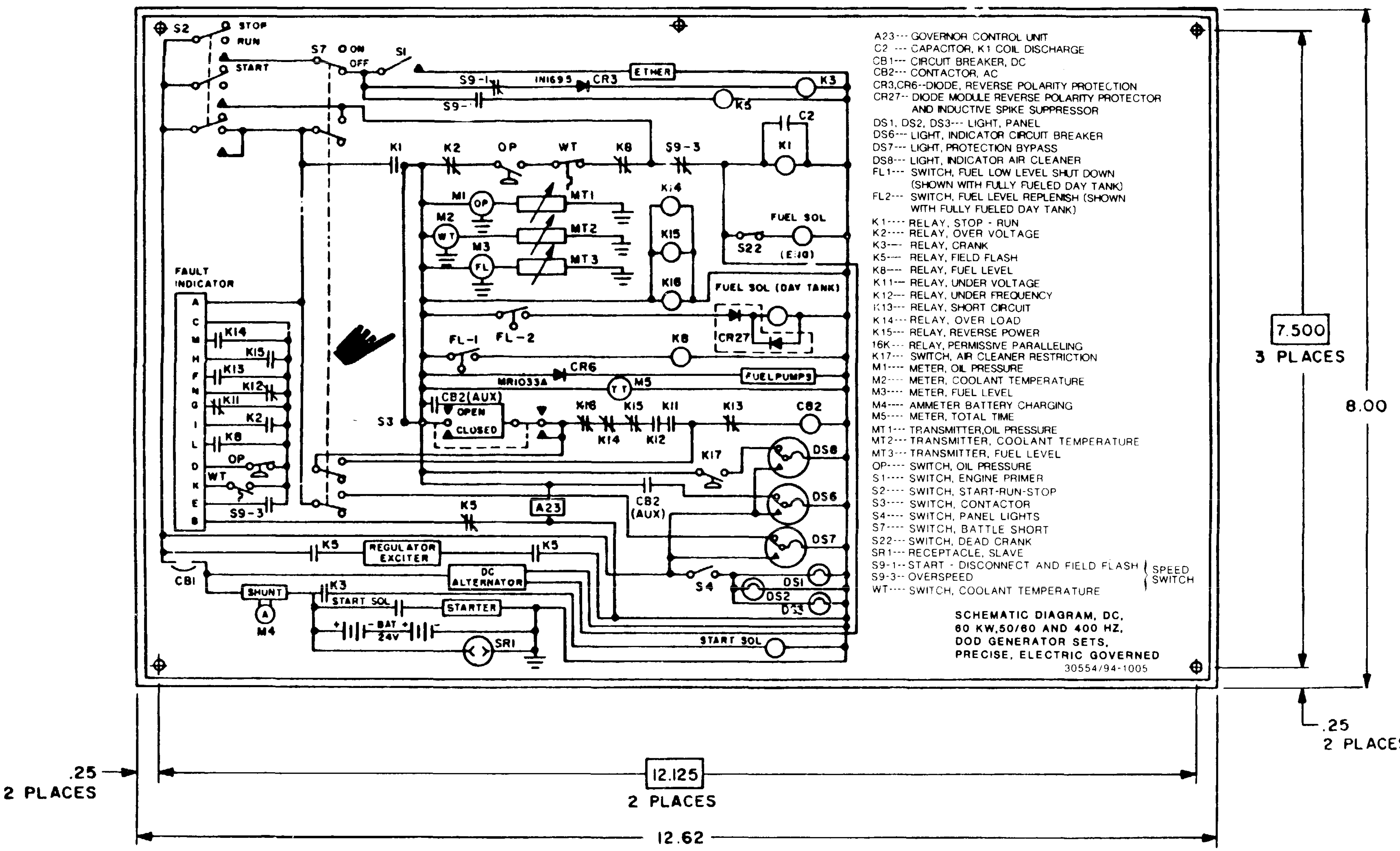
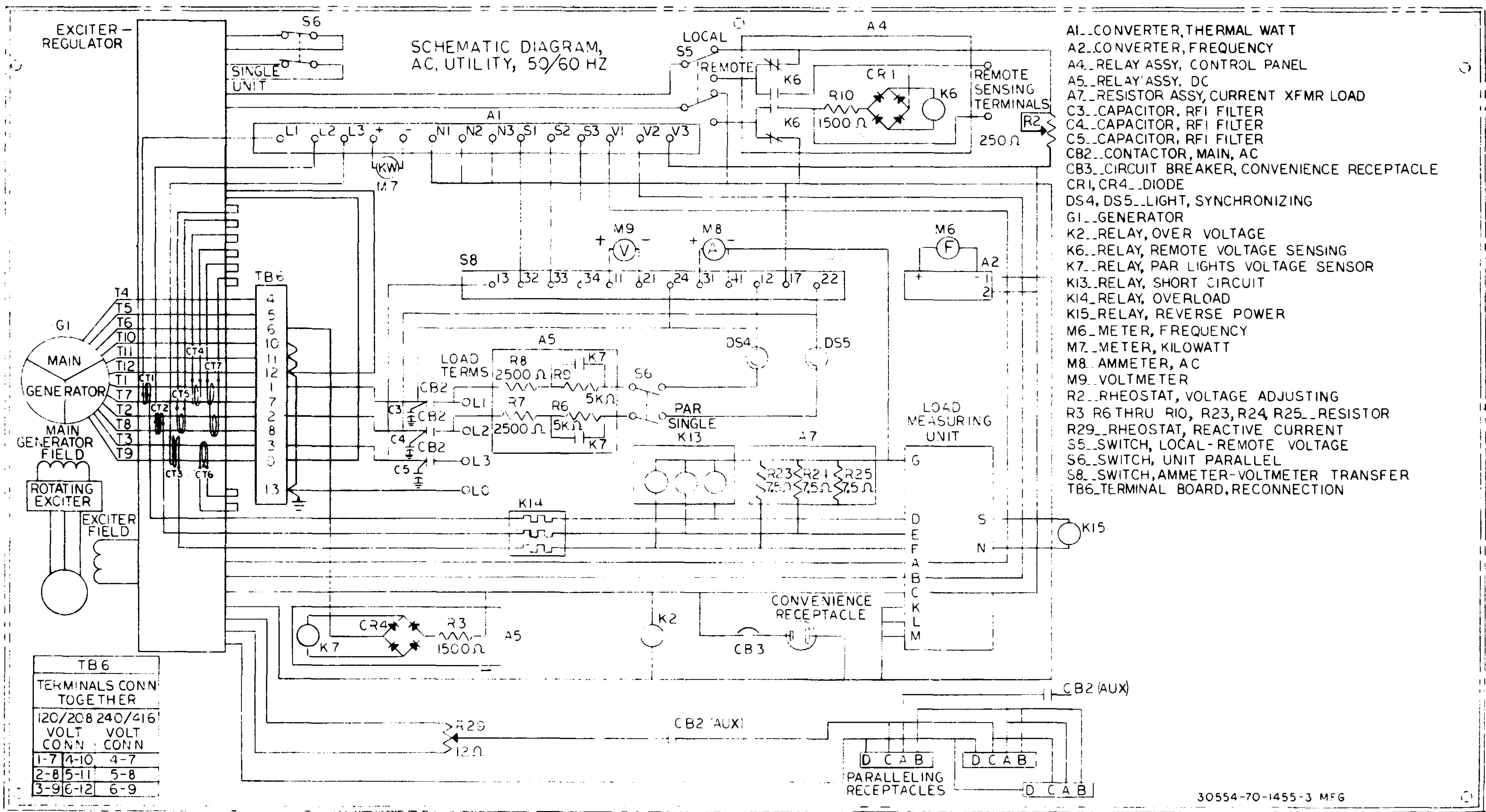
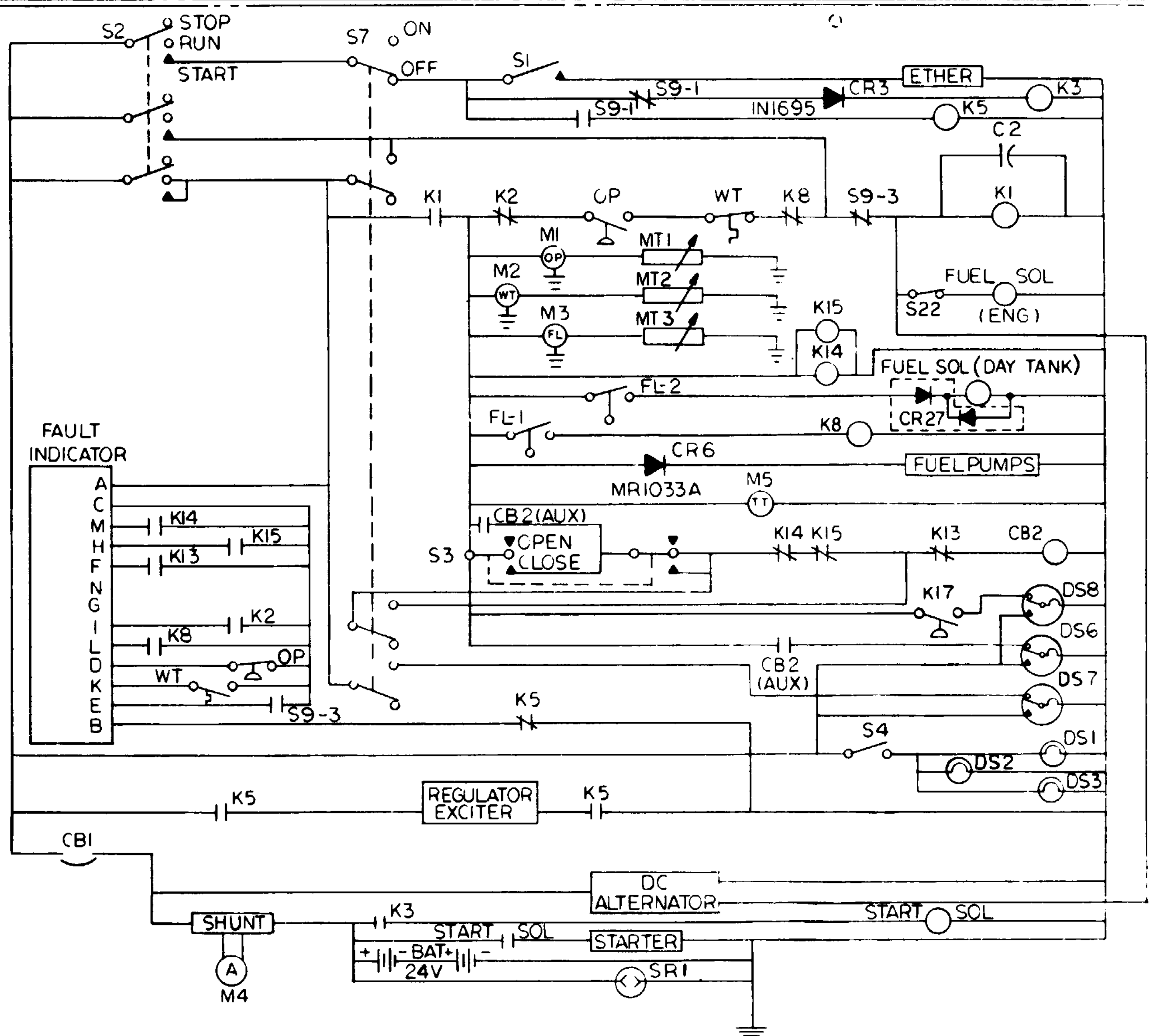


Figure 1-18.1 Schematic Wiring Diagram, MEP 115A



ME 6115-545-12/1-19 C1

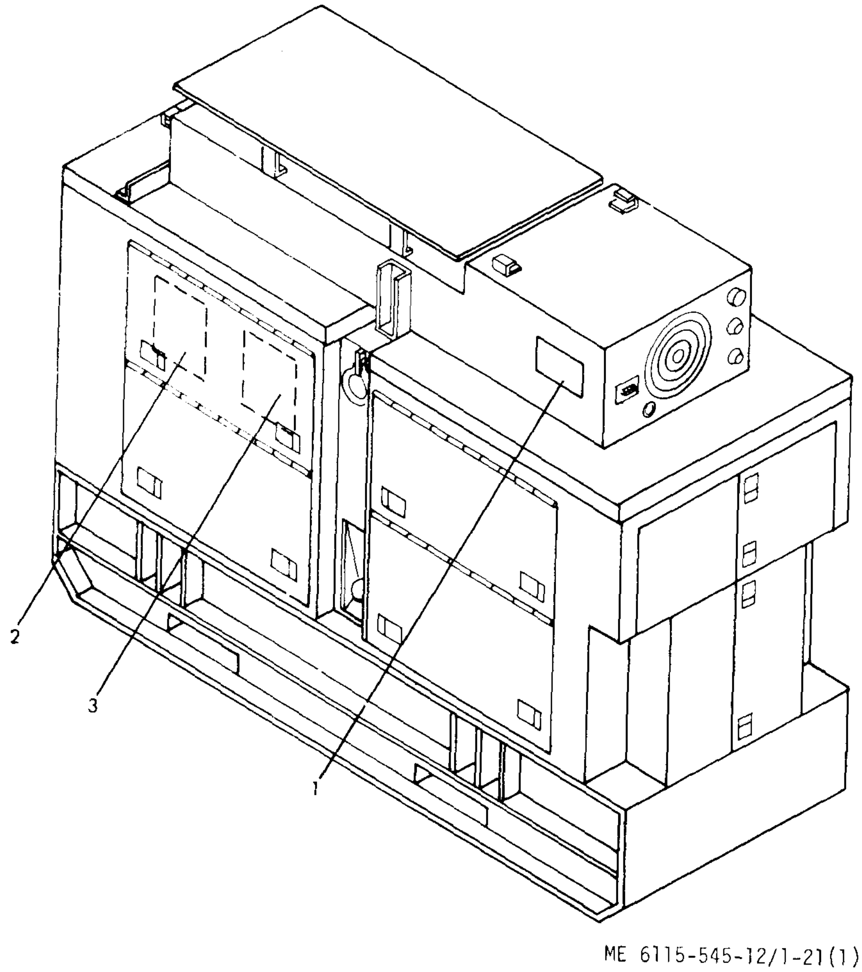
Figure 1-19. Schematic Wiring Diagram Class 2, AC and plate



C2--CAPACITOR, K1 COIL DISCHARGE
CB1-CIRCUIT BREAKER,DC
CB2-CONTACTOR,AC
CR3,CR6-DIODE,REVERSE POLARITY PROTECTION
CR27--DIODE MODULE,REVERSE POLARITY PROTECTOR AND INDUCTIVE SPIKE SUPPRESSOR
DS1,DS2,DS3---LIGHT,PANEL
DS6---LIGHT,INDICATOR CIRCUIT BREAKER
DS7---LIGHT,PROTECTION BY-PASS
DS8---LIGHT,INDICATOR AIR CLEANER
FL1---SWITCH,FUEL LOW LEVEL SHUT DOWN (SHOWN WITH FULLY FUELED DAY TANK)
FL2---SWITCH,FUEL LEVEL REPLENISH (SHOWN WITH FULLY FUELED DAY TANK)
K1----RELAY,STOP-RUN
K2----RELAY,OVER VOLTAGE
K3----RELAY,CRANK
K5----RELAY,FIELD FLASH
K8----RELAY,FUEL LEVEL
K13---RELAY,SHORT CIRCUIT
K14---RELAY,OVER LOAD
K15---RELAY,REVERSE POWER
K17---SWITCH,AIR CLEANER RESTRICTION
M1----METER,OIL PRESSURE
M2----METER,COOLANT TEMPERATURE
M3----METER,FUEL LEVEL
M4----AMMETER,BATTERY CHARGING
M5----METER,TOTAL TIME
MT1---TRANSMITTER,OIL PRESSURE
MT2---TRANSMITTER,COOLANT TEMPERATURE
MT3---TRANSMITTER,FUEL LEVEL
OP----SWITCH,OIL PRESSURE
S1----SWITCH,ENGINE PRIMER
S2----SWITCH,START-RUN-STOP
S3----SWITCH,CONTACTOR
S4----SWITCH,PANEL LIGHTS
S7----SWITCH,BATTLE SHORT
S22---SWITCH,DEAD CRANK
SR1,SR2--RECEPTACLE,SLAVE
S9-1--START-DISCONNECT AND FIELD FLASH } SPEED SWITCH
S9-3--OVERSPEED
WT---SWITCH,COOLANT TEMPERATURE

ME 6115-545-12/1-20 C1

Figure 1-20. Schematic Wiring Diagram Class 2, DC and Plate



1. Load Bank Connection and Operation Instruction Plate (fig. 1-24).
2. Electric Winterization System Diagram and Electric Heater Control Schematic Diagram Instruction Plate (fig. 1-23).
3. Fuel Burning Winterization System Diagram and Heater Control Schematic Diagram Instruction Plate (fig. 1-22).
4. Remote Operation Instruction Plate.

Figure 1-21. Kit Data and Instruction Plate Location (Sheet 1 of 2)

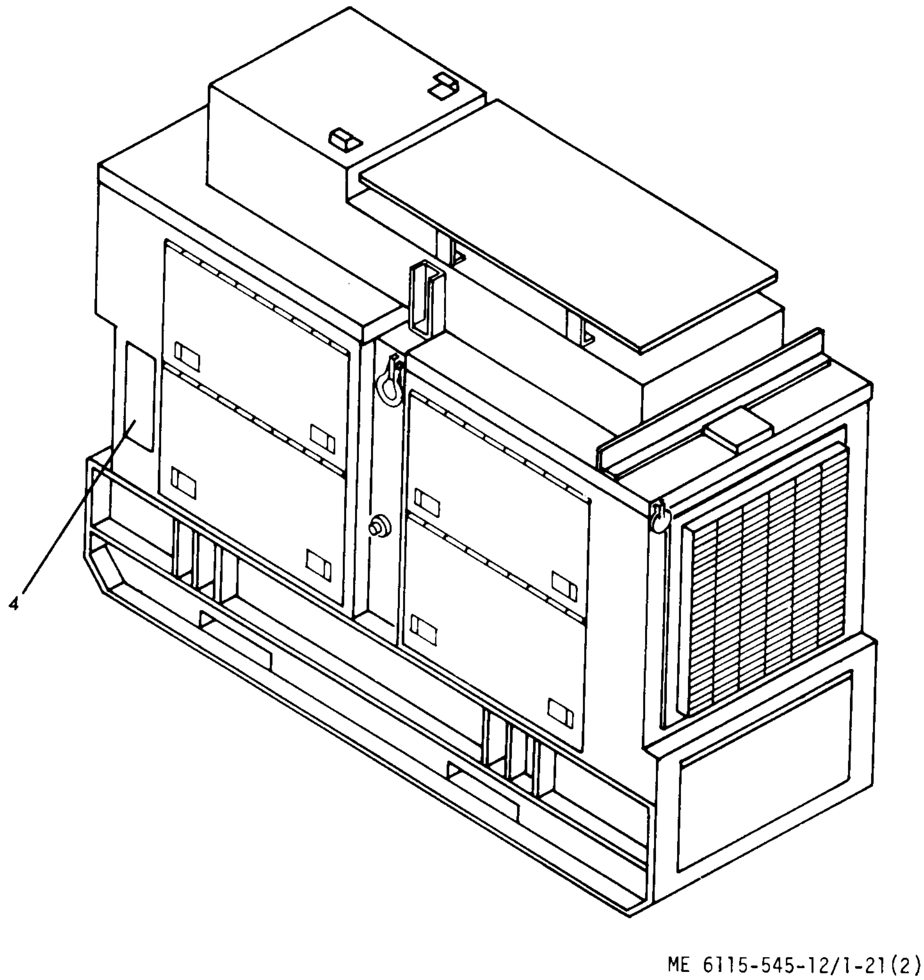


Figure 1-21. Kit Data and Instruction Plate Location (Sheet 2 of 2)

30554-70-1486 MFG

INSTALLATION OF WINTERIZATION SYSTEM

1. UNPACK AND VERIFY PACKING LIST.
2. REMOVE THREE 1/2 PIPE PLUGS. TWO FROM LUBE OIL SUMP AND ONE FROM THERMOSTAT HOUSING.
3. INSTALL PIPE FITTINGS, VALVES AND HOSE CONNECTORS AS ILLUSTRATED ON DIAGRAM USING PIPE SEALANT.
4. INSTALL HEATER WITH BRACKET ON INSIDE OF SKID BASE.
5. INSERT EXHAUST PIPE WITH WEATHER CAP THRU SKID BASE INTO HEATER EXHAUST ELBOW. POSITION WEATHER CAP HINGE UP AND TIGHTEN HOSE CLAMP.
6. INSTALL COOLANT AND FUEL HOSES AS ILLUSTRATED.
7. REMOVE COVER PLATE FROM REAR END PANEL AND INSTALL HEATER CONTROL.
8. INSTALL SHORTER CABLE ASSEMBLY BETWEEN HEATER CONTROL AND RELAY BOX. INSTALL OTHER CABLE ASSEMBLY BETWEEN HEATER CONTROL AND HEATER.
9. INSTALL HEATER THERMOSTAT IN ENGINE THERMOSTAT HOUSING AS ILLUSTRATED AND MATE CONNECTIONS.

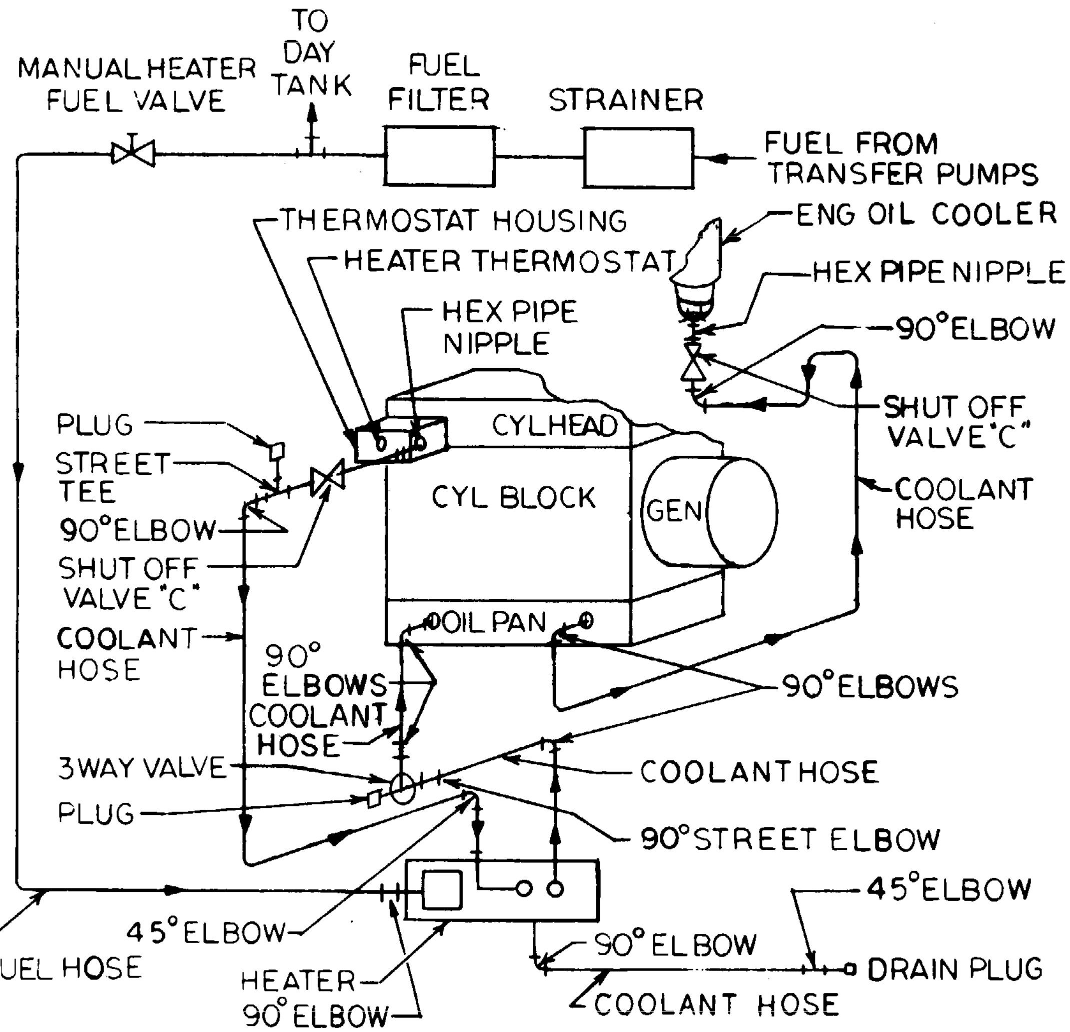
HEATER OPERATING INSTRUCTIONS

1. CHECK FUEL SUPPLY AND TURN MANUAL HEATER FUEL VALVE TO "ON" POSITION.
2. OPEN BOTH SHUT OFF VALVES ON ENGINE CYL HEAD ITEM "C" ON DIAGRAM.
3. TURN 3-WAY VALVE HANDLE SO THAT POINTER IS AT THE 3 O'CLOCK POSITION.
4. TURN HEATER SWITCH "S1" ON CONTROL PANEL TO "ON" POSITION. INDICATOR LIGHT ON CONTROL PANEL WILL LIGHT WHEN HEATER IS BURNING FUEL. IF THIS DOES NOT OCCUR WITHIN FOUR MINUTES REFER TO THE TROUBLE SHOOTING GUIDE IN APPLICABLE TM.
5. CONTINUE HEATING FOR FIFTY MINUTES OR UNTIL CYCLIC OPERATION OF THE HEATER OCCURS, THEN FOLLOW NO 11 IN ENGINE OPERATING INSTRUCTIONS FOR STARTING PROCEDURE.
6. AFTER THE ENGINE STARTS, TURN HEATER SWITCH ON CONTROL PANEL TO "OFF," TURN MANUAL HEATER FUEL VALVE TO "OFF" AND 3-WAY VALVE POINTER TO 9 O'CLOCK POSITION.

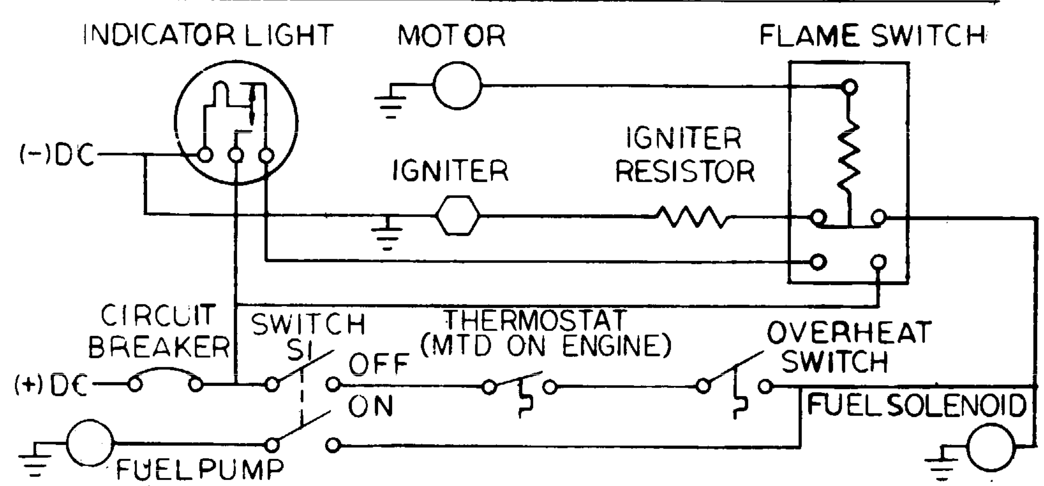
CAUTION

1. DO NOT RESTART THE HEATER UNTIL THE INDICATOR LAMP ON THE CONTROL PANEL IS OFF.
2. COMBUSTION BLOWER WILL CONTINUE AFTER HEATER SHUTDOWN TO CLEAR COMBUSTION CHAMBER OF FUEL.

FUEL BURNING WINTERIZATION SYSTEM DIAGRAM



HEATER AND HEATER CONTROL SCHEMATIC DIAGRAM



ME 6115-545-12/1-22 C1

Figure 1-22. Fuel Burning Winterization System Diagram and Heater Control Schematic Diagram Instruction Plate

30554-70-1487 MFG

INSTALLATION OF WINTERIZATION SYSTEM

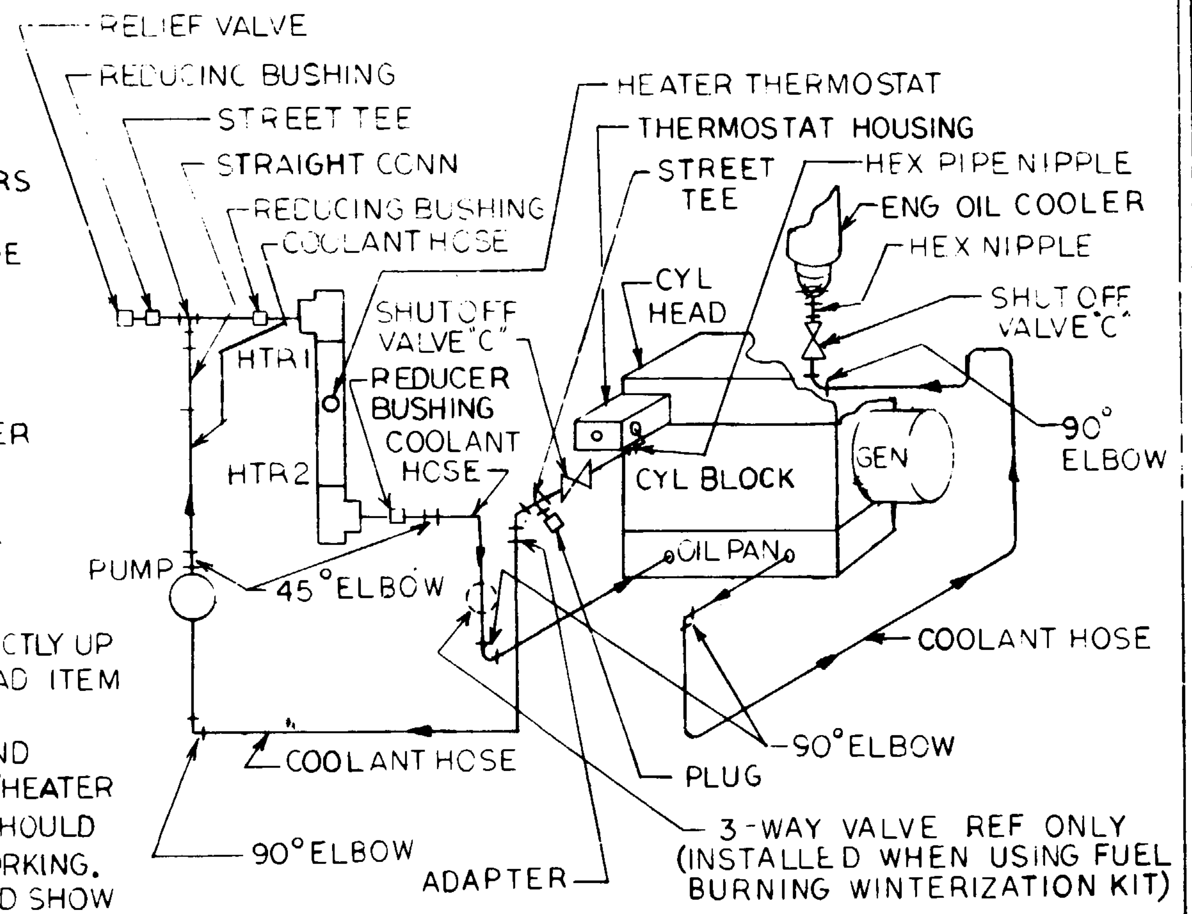
1. UNPACK AND VERIFY PACKING LIST
2. REMOVE TWO 1/2 PIPE PLUGS FROM LUBE OIL SUMP.
3. INSTALL PIPE FITTINGS, VALVES AND HOSE CONNECTORS AS ILLUSTRATED ON DIAGRAM USING PIPE SEALANT
4. INSTALL HEATER AND PUMP WITH BRACKETS ON INSIDE OF SKID BASE
5. INSTALL COOLANT HOSES AS ILLUSTRATED
6. REMOVE COVER PLATE FROM REAR END PANEL AND INSTALL HEATER CONTROL
7. INSTALL SHORTER CABLE ASSEMBLY BETWEEN HEATER CONTROL AND RELAY BOX. INSTALL OTHER CABLE ASSEMBLY BETWEEN HEATER CONTROL AND HEATER
8. INSTALL HEATER THERMOSTAT IN HEAT EXCHANGER HOUSING AS ILLUSTRATED AND MATE CONNECTIONS

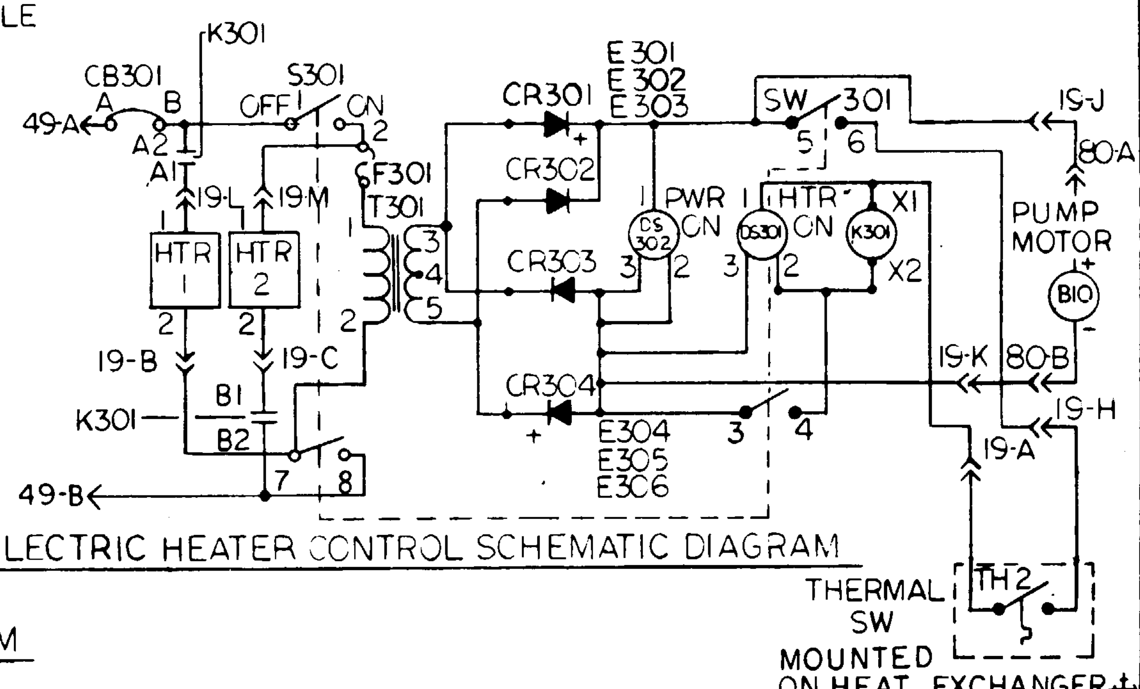
HEATER OPERATING INSTRUCTIONS

1. TURN 3-WAY VALVE HANDLE SO THAT POINTER IS DIRECTLY UP
2. OPEN BOTH SHUT OFF VALVES ON THE ENGINE CYL HEAD ITEM "C" ON DIAGRAM.
3. CLOSE CIRCUIT BREAKER ON FRONT OF CONTROL BOX AND TURN SWITCH "S 301" TO "ON" POSITION, "POWER ON" AND "HEATER ON" LIGHTS SHOULD BOTH BE ILLUMINATED. HEATERS SHOULD NOW BE HEATING COOLANT, AND PUMP SHOULD BE WORKING. AFTER ONE-HALF HOUR TEMPERATURE GAUGE SHOULD SHOW A READING ABOVE THE AMBIENT, IF NOT REFER TO TROUBLE SHOOTING GUIDE IN APPLICABLE TM.
4. AFTER 5-HOURS TURN SWITCH S301 TO "OFF" AND TURN CIRCUIT BREAKER TO "OFF"
5. TURN 3-WAY VALVE HANDLE SO THAT POINTER IS AT THE 9 O'CLOCK POSITION
6. REFER TO INSTRUCTIONS FOR STARTING ENGINE

CAUTION

1. SWITCH 301 MUST BE OFF WHEN ENGINE IS RUNNING
2. DO NOT RUN ELECTRIC HEATER WHEN FUEL BURNING HEATER IS ON





ELECTRIC HEATER CONTROL SCHEMATIC DIAGRAM

ELECTRIC WINTERIZATION SYSTEM DIAGRAM

ME 6115-545-12/1-23

Figure 1-23. Electric Winterization System Diagram and Electric Heater Control Schematic Diagram Instruction Plate

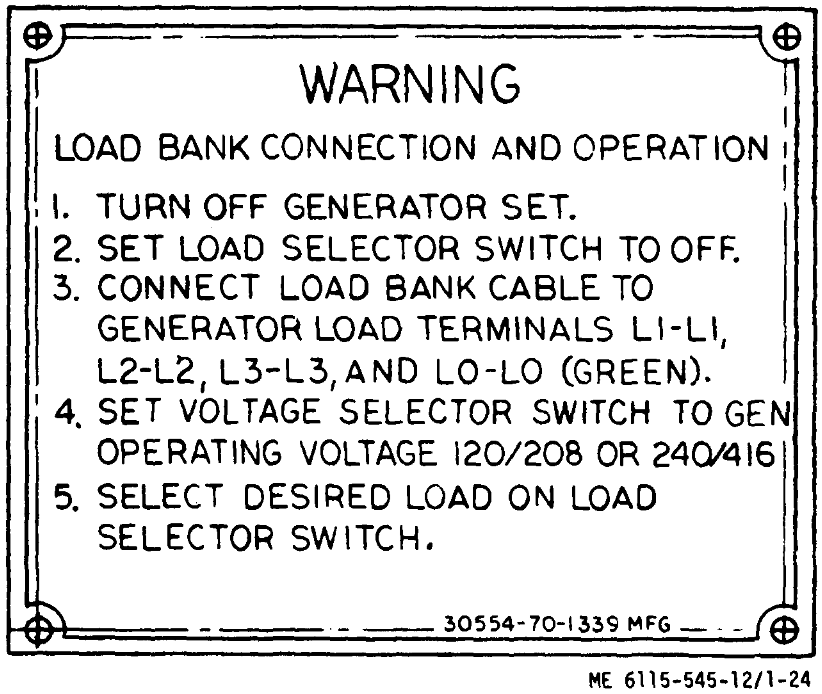


Figure 1-24. Load Bank Connection and Operation Instruction Plate

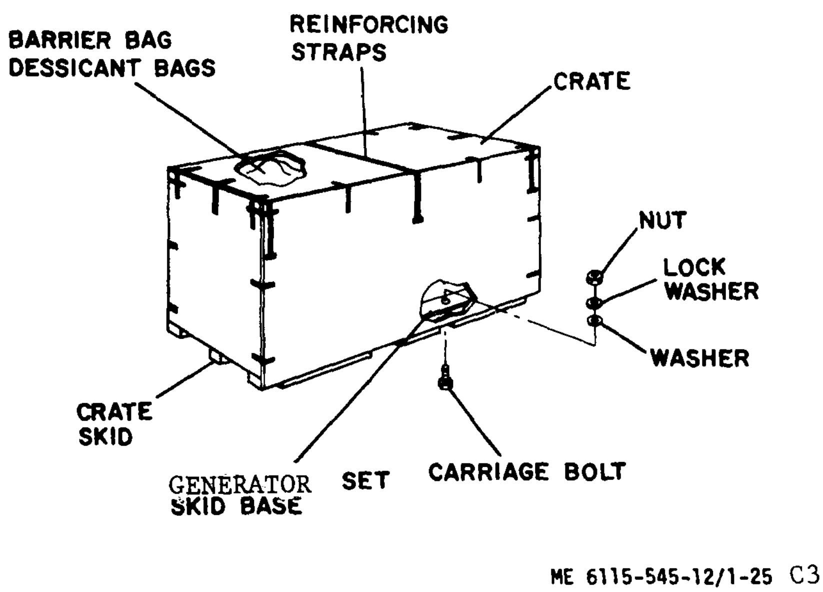
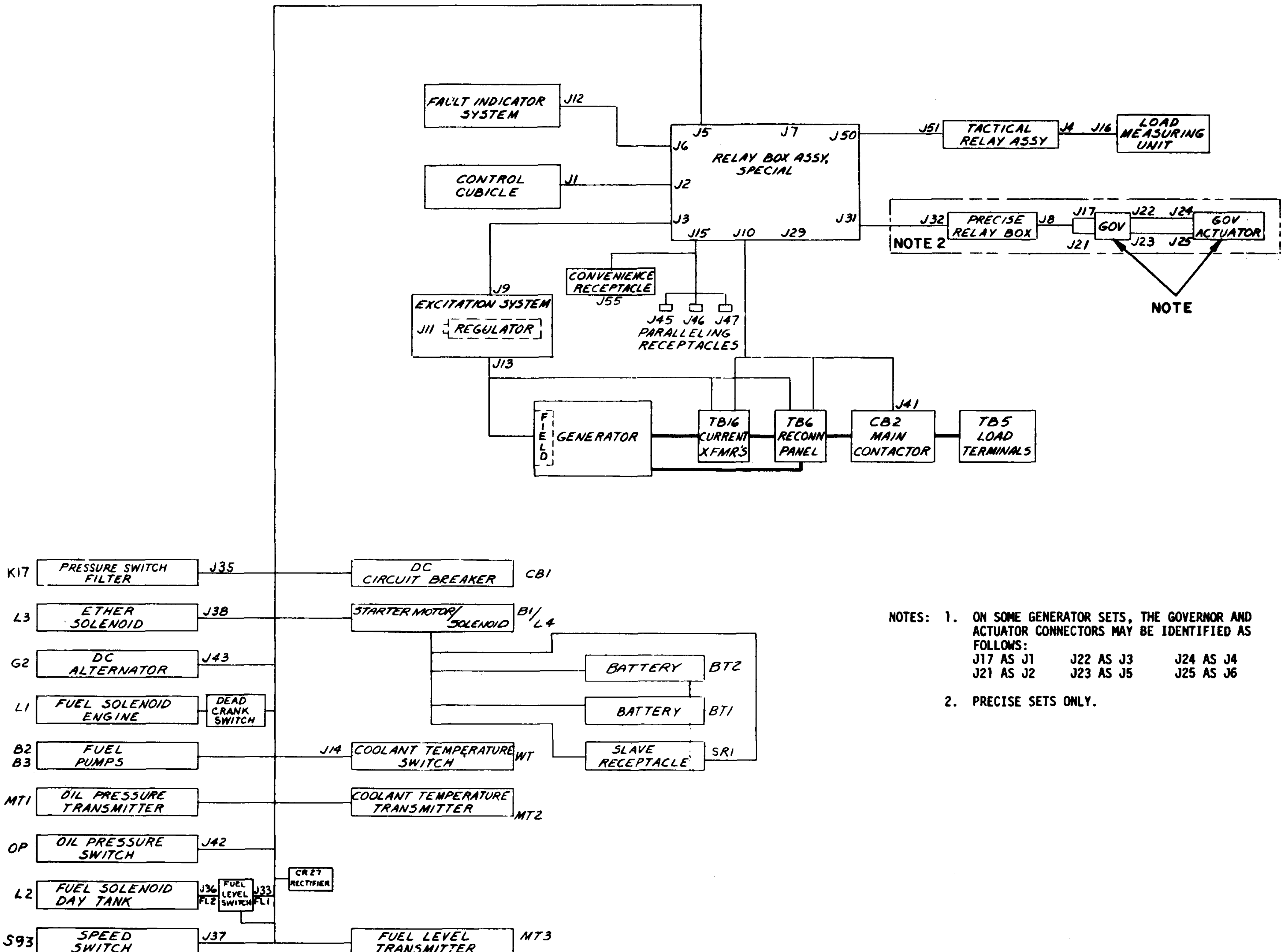


Figure 1-25. Shipping Crate

Table 1-1. Differences in Performance Characteristics

	MEP006A	MEP105A	MEP115A
1. Voltage			
(a) Dip with application of rated load.	20% max.	15% max.	12% max.
(b) Rise with rejection of rated load.	20% max.	15% max.	12% max.
(c) Dip or rise with application of simulated motor load.	40% max.	30% max.	25% max.
(d) Adjustment range	50 Hz +2.5% -10% 60Hz +15% -5%	50 Hz +2.5% -10% 60Hz +15% -5%	400 Hz +10% -5%
2. Frequency			
(a) Regulation.	2 to 3%	Within ± 0. 25%	Within ±0.25%
(b) Short term steady state stability.	Within 2% bandwidth	Within 0.5% bandwidth	Within 0.5% bandwidth
(c) Long term steady state stability.	Within 3% bandwidth	Within 1% bandwidth	Within 1% bandwidth
(d) Undershoot with application of rated load.	3% max.	1.5% max.	1.5% max.
(e) Recovery after application of rated load.	Within 3 seconds	Within 1 second	Within 1 second
(f) Overshoot with rejection of rated load.	4% max.	1.5% max.	1.5% max.
(g) Recovery after rejection of rated load.	Within 3 seconds	Within 1 second	Within 1 second
(h) Drift (60° F change).	1%	0.5%	0.5%
(i) Adjustment range	45-65 Hz (Manual)	50 Hz 48 to 52 Hz 60 Hz 58 to 62 Hz	390 to 420 Hz



NOTES:
1. ON SOME GENERATOR SETS, THE GOVERNOR AND ACTUATOR CONNECTORS MAY BE IDENTIFIED AS FOLLOWS:

J17 AS J1	J22 AS J3	J24 AS J4
J21 AS J2	J23 AS J5	J25 AS J6

2. PRECISE SETS ONLY.

ME 6115-545-12/1-26 C1

Figure 1-26. 50/60 Hz Precise and Utility Interconnecting Diagram

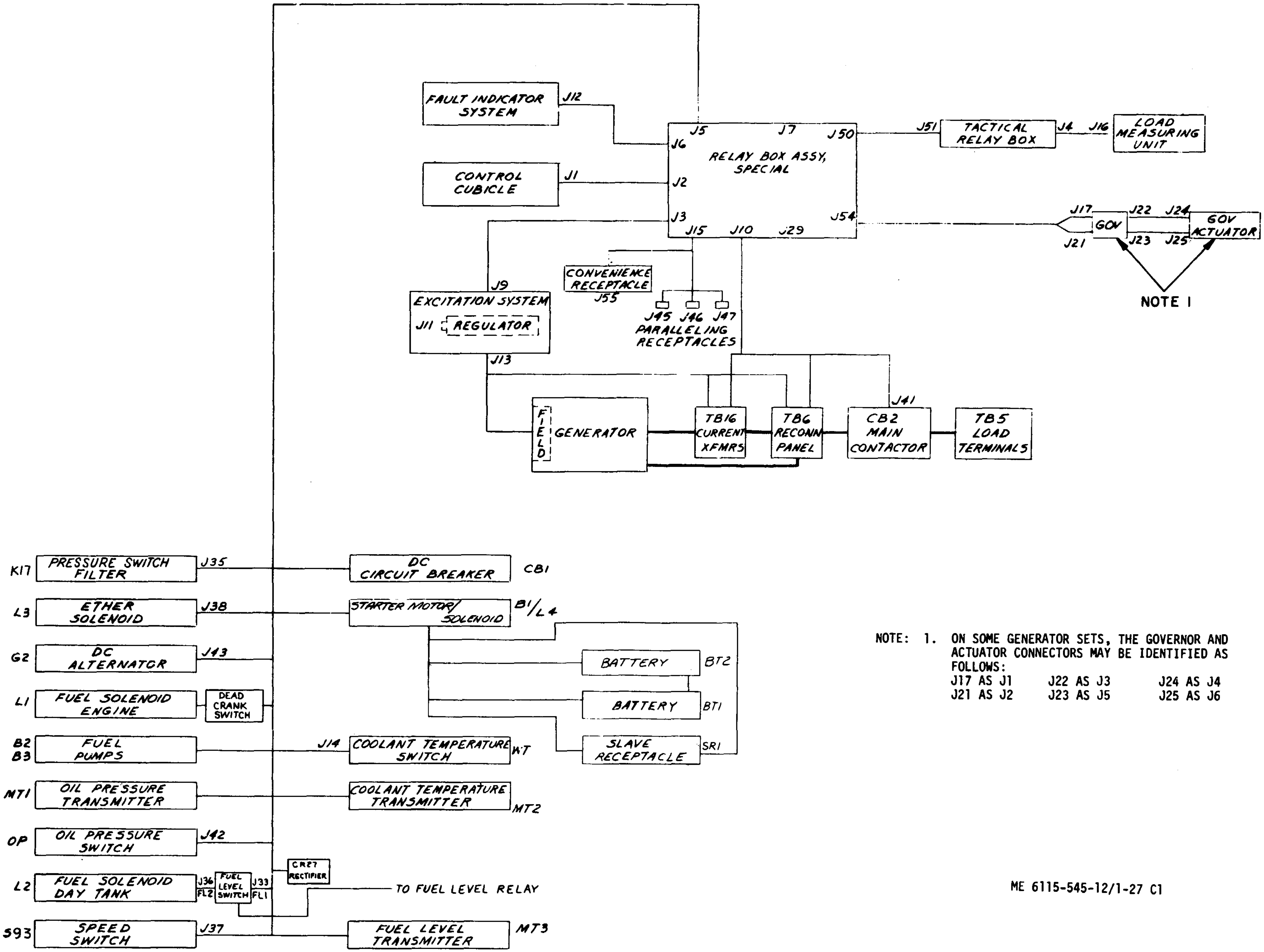
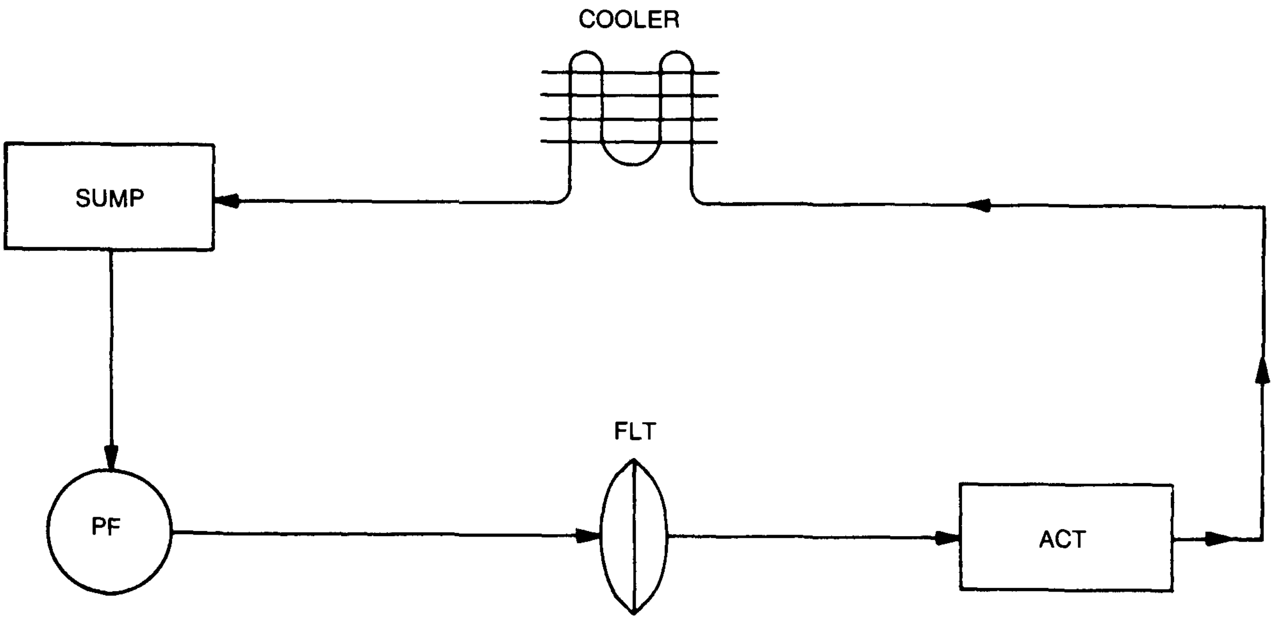
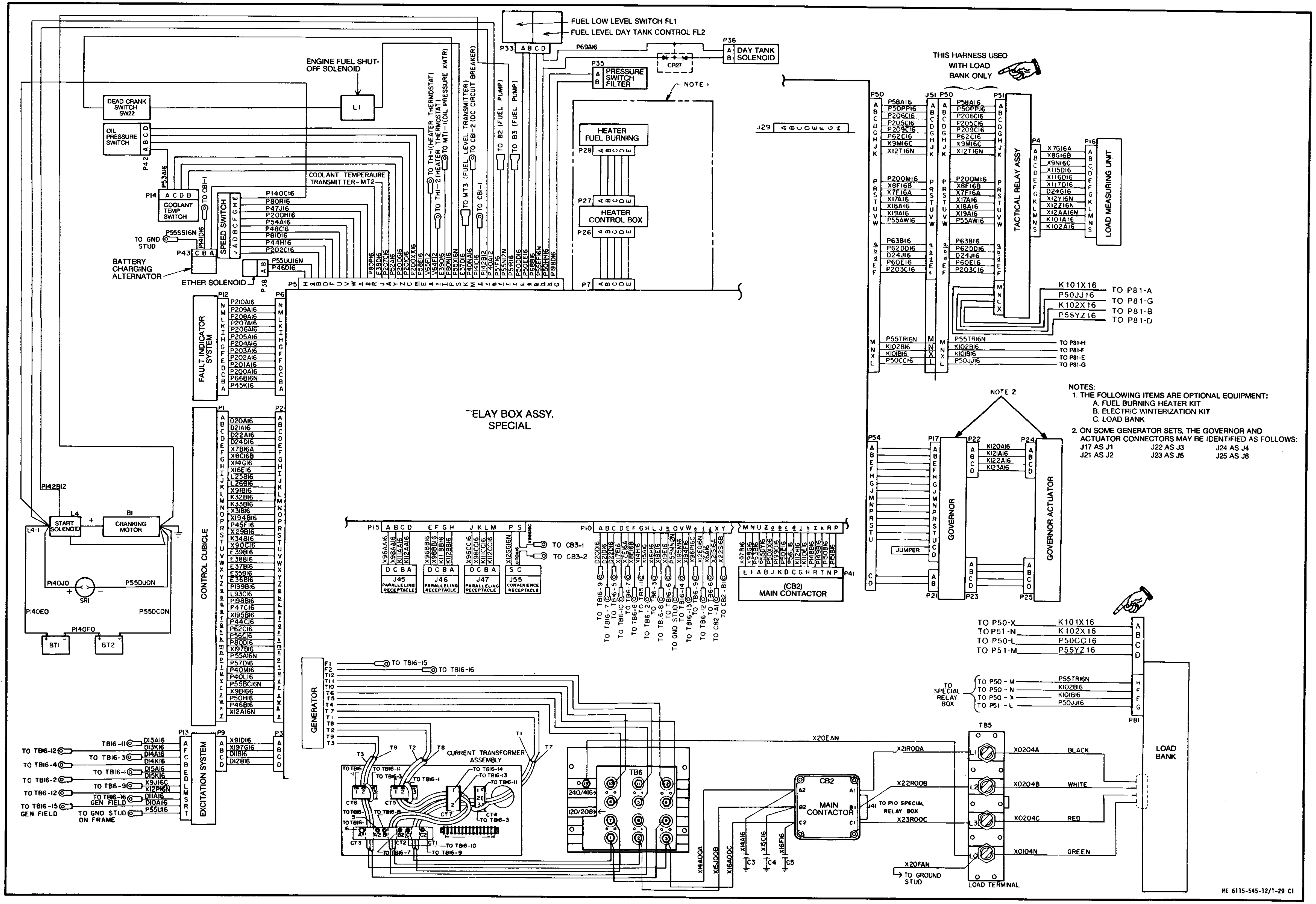


Figure 1-27. 400 Hz Precise Interconnecting Diagram



ACT	HYDRAULIC ACTUATOR
FLT	FILTER
PF	PUMP, SINGLE FIXED DISPLACEMENT

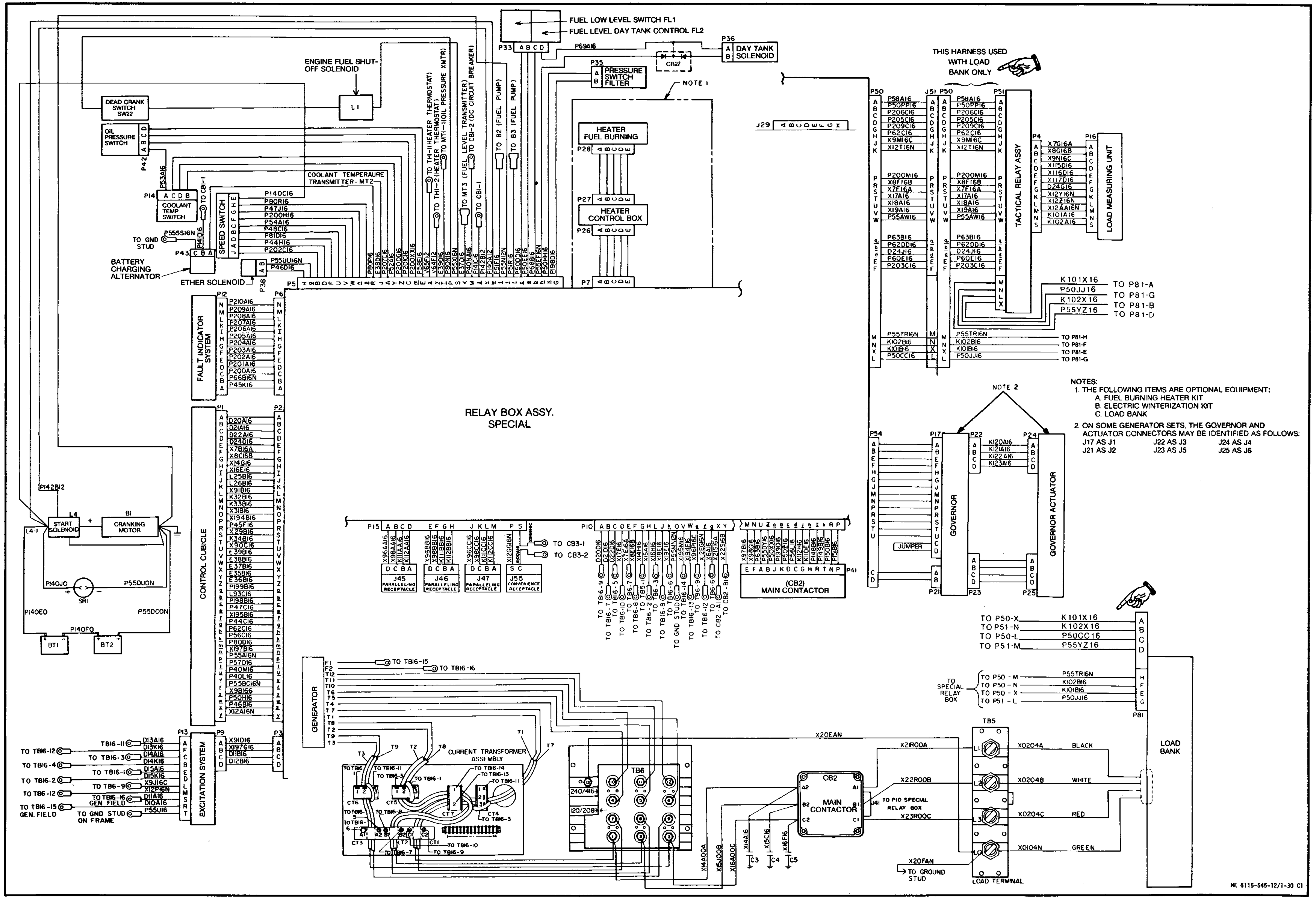
Figure 1-28. Hydraulic Flow Diagram (MEP105A)



NOTES:
1. THE FOLLOWING ITEMS ARE OPTIONAL EQUIPMENT:
   A. FUEL BURNING HEATER KIT
   B. ELECTRIC WINTERIZATION KIT
   C. LOAD BANK
2. ON SOME GENERATOR SETS, THE GOVERNOR AND ACTUATOR CONNECTORS MAY BE IDENTIFIED AS FOLLOWS:

J17 AS J1	J22 AS J3	J24 AS J4
J21 AS J2	J23 AS J5	J25 AS J6

Figure 1-29 Interconnection Wiring Diagram, 50/60 Hz Precise and Utility



CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. Unloading Equipment.

The dry weight of the engine generator set is 4240 pounds (50/60 Hz utility set), 4300 pounds (50/60 Hz precise set) or 4400 pounds (400 Hz set). A crane, fork lift 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 6,000 pounds. Do not allow the crated 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 the engine generator set 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 the unit to avoid damaging the equipment.

b. Remove the top and then the sides of the crate (fig. 1-25).

c. Remove barrier bag, dessicant bags, and shipping material from engine generator set.

d. Disconnect engine generator set from crate skid by removing carriage bolts, nuts, washers, and lift set off of skid crate.

2-3. Inspecting and Servicing the Equipment.

a. Preparation. Prepare the engine generator set for inspection and operation as outlined in the following paragraphs. For Army users refer to DA Form 2258.

b. Inspection. Inspection is to be performed as follows:

(1) Inspect radiator for damage and foreign material (table 3-l).

(2) Inspect all air cleaner connections for tightness and damage.

(3) Check fan belts and alternator drive belt for correct adjustment (table 3-1)

(4) Check engine intake (fig. 3-5) and exhaust systems (fig. 3-12) to make certain they are unobstructed by foreign material.

(5) Inspect the fuel, water and coolant lines for cracks, leaks, or other damage (table 3-l).

(6) If cooling system shutoff cock (21, fig. 3-29) and/or crankcase drain plug (11, fig. 3-50) have been removed, install them properly. Check that these drain cocks are closed. Check that oil cooler drain plug is installed.

(7) Check that main fuel tank drain cock (fig. 3-7) and day tank drain cock (36, fig. 3-27) are closed.

(8) Make a thorough visual inspection of the entire engine generator set for loose or missing mounting hardware, or damaged or missing parts. Report all damaged or missing parts on DD Form 6.

(9) (AF Only) Assure that the noise level warning sign is stenciled on the top half of both rear (generator end of set) side doors as shown on fig. 2-1 A.

c. Servicing. Servicing of the equipment is to be performed as follows:

WARNING

Do not smoke or use an open flame in the vicinity when filling fuel tank.

WARNING

Hot refueling of generators while they are operating poses a safety hazard and shall not be attempted. Hot engine surfaces and sparks produced from the engine and generator circuitry are possible sources of ignition. Severe injury, death and/or damage to equipment may result.

(1) Fill fuel tank with appropriate fuel through filler neck and set FUEL SELECTOR VALVE (A, fig. 2-5) to SET TANK position to connect main fuel tank to electrical fuel pumps. If an auxiliary source of fuel is to be used in operating the engine generator set, connect fuel hose to AUXILIARY FUEL CONNECTION and set FUEL SELECTOR VALVE to AUXILIARY position.

(2) Fill radiator with arctic antifreeze solution, the standard coolant for this engine generator set, in accordance with table 2-1. In case of emergency, water with rust inhibitor can be used. Depreservation of the cooling system includes draining the cooling system (para 3-41) and cleaning the system with low pressure steam or, if steam is not available, with hot water. Depreservation requires that the coolant in the lube oil cooler also be drained and refilled (para 3-199).

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

Lowest expected ambient temperature °F	Pints of inhibited glycol per gallons of coolant	Compound, antifreeze Arctic[2]	Ethylene glycol coolant solution specific gravity 68°F3
+20	1½	Issued full strength	1.022
+10	2	and ready mixed for	1.036
0	2¾	0° to -65°F temperatures	1.047
-10	3¼	for both initial	1.055
-20	3½	installation and	1.062
-30	4	replenishment of	1.067
-40	4¼	losses.	1.073
-50	Arctic	DO NOT DILUTE	
-60	antifreeze	WITH WATER OR	
-75	preferred	ANY OTHER SUBSTANCE	

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

[2]Military Specification MI L-A-11755 Arctic type, nonvolatile antifreeze 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 -75°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. Fasten a tag near the radiator tiler cap indicating the type antifreeze,

WARNING

- Do not smoke or use an open flame in the vi. cinity when servicing batteries. Batteries generate hydrogen, a highly explosive gas. Electrolyte contains sulfuric acid and can cause severe burns. Handle it with care. If the solution comes in contact with the body, eyes or clothing, rinse immediately with clean water. Avoid spilling electrolyte on painted surfaces.

- Slave receptacle is to be used when extra cranking power is required for starting unit. Other methods are not authorized, as arcing at batteries could occur.

(3) Batteries are shipped in a dry state. Battery electrolyte must be requisitioned separately. To activate the battery remove cell caps and fill battery cells with electrolyte. Make sure vent holes in cell caps are open, and replace caps.

The electrolyte level must be rechecked approximately 30 minutes after initial filling as the plates and separators will absorb the solution, thus, resulting in a low level. If the battery is not used within 12 hours after initial filling,it should be put on a charger and brought up to the correct specific gravity. Test batteries as described in paragraph 8-82b. for the ambient temperature in effect.

(4) Check crankcase oil level (para3-3c.) and add oil as necessary (para 3-4c.) in accordance with the lubrication order (fig. 3-l). Depreservation requires that the crankcase be drained and refilled (para 3-46).

(4a) Class 1 sets only. (MEP105A). Check hydraulic oil level and add oil as necessary in accordance with the lubrication order (fig. 3-1).

(5) Perform the before operation preventive maintenance services specified in table 3-1.

2-4. Installation of Separately Packed Components.

No separately packed components are shipped with generator sets.

2-5. Installation and Setting-up Instructions.

a. General. The engine 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 the base is solid enough to support the weight of the unit. See figure 2-1 for dimensions of the base. Select a location where there will be sufficient space on all sides for servicing and operation of the engine generator set. When preparing a temporary installation, move the engine generator set as close to the worksite as practical. Use suitable planks, logs, or other material for a base in an area where the ground is soft .

c. Indoor Installation. Keep the area well ventilated at all times, so that the engine generator set will receive a maximum supply of air. If a free supply of fresh air is not available, provide duct work, with an opening at least as large as the radiator, to the outside of the installation. If louvers are used at the air entrance, increase the duct work size by 25 to 50 percent. Loosen the screw and nut which secure the weather cap to the exhaust outlet and remove the weather cap. Install a gas-tight metal pipe exhaust from the exhaust outlet to the outside of the installation. The termination of the exhaust pipe shall be such that hot gases or sparks will be discharged harmlessly and will not be directed against combustible material or into an area containing flammable gases or vapors. Use as few bends in the pipe and as short a pipe as possible. The exhaust pipe should include a low point with suitable means for draining of condensate. Provide metal shields, 12 inches larger in diameter than the exhaust pipe where the line passes through flammable walls. Wrap the exhaust pipe with asbestos if there is any danger of anyone touching it. Refer to figure 2-1 for dimensions, air flow requirements and floor loading requirements.

WARNING

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

d. Leveling, The engine generator set is a portable unit and is designed to operate satisfactorily up to 15° out-of-level. Set up the unit as level as possible and keep it as level as possible during operation.

e. Grounding. The engine generator set must be grounded prior to operation. The ground can be, in order of preference, (1) an underground metallic water piping system, (2) a driven metal rod or (3) a buried metal plate (fig. 2-2). If the effectively grounded portion of the buried metallic water pipe is less than 10 feet due to insulated sections or joints, this preferred grounding method must be supplemented by an additional driven metal rod ground or a buried metal plate **ground.** A driven metal ground rod must have a minimum diameter of 5/8 inch if solid or 3/4 inch if pipe, and driven to a minimum depth of 8 feet. A buried metal ground plate must have a minimum area of 9 square feet, minimum thickness of 1/4 inch, and be buried at a minimum depth of 4 feet. The ground lead must be at least No. 6 AWG (American Wire Gauge) copper wire. Ground rods are available as optional equipment. The procedures for making a ground connection are shown in figure 2-2.

f. Generator Load Connections. Instructions for making the required generator load connections are designated in figure 2-3.

2-6. Equipment Conversion.

a. Conversion instructions for equipment operation at 120/208 Vac or 240/416 Vac are given in figure 2-4.

b. Conversion instructions for equipment operation of 50 or 60 Hz are given in figure 2-6.

c. Conversion instructions for remote operation by removal and relocation of the control cubicle are given in paragraph 2-23.

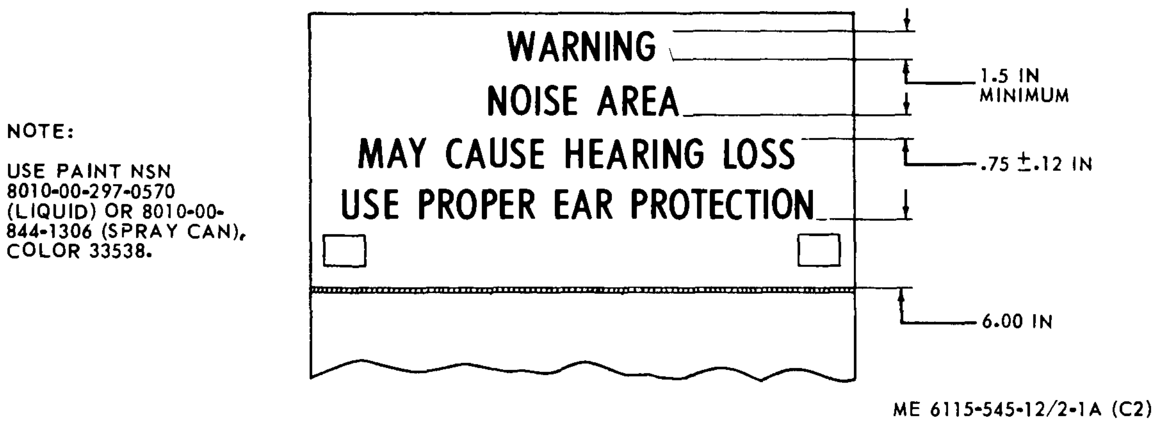
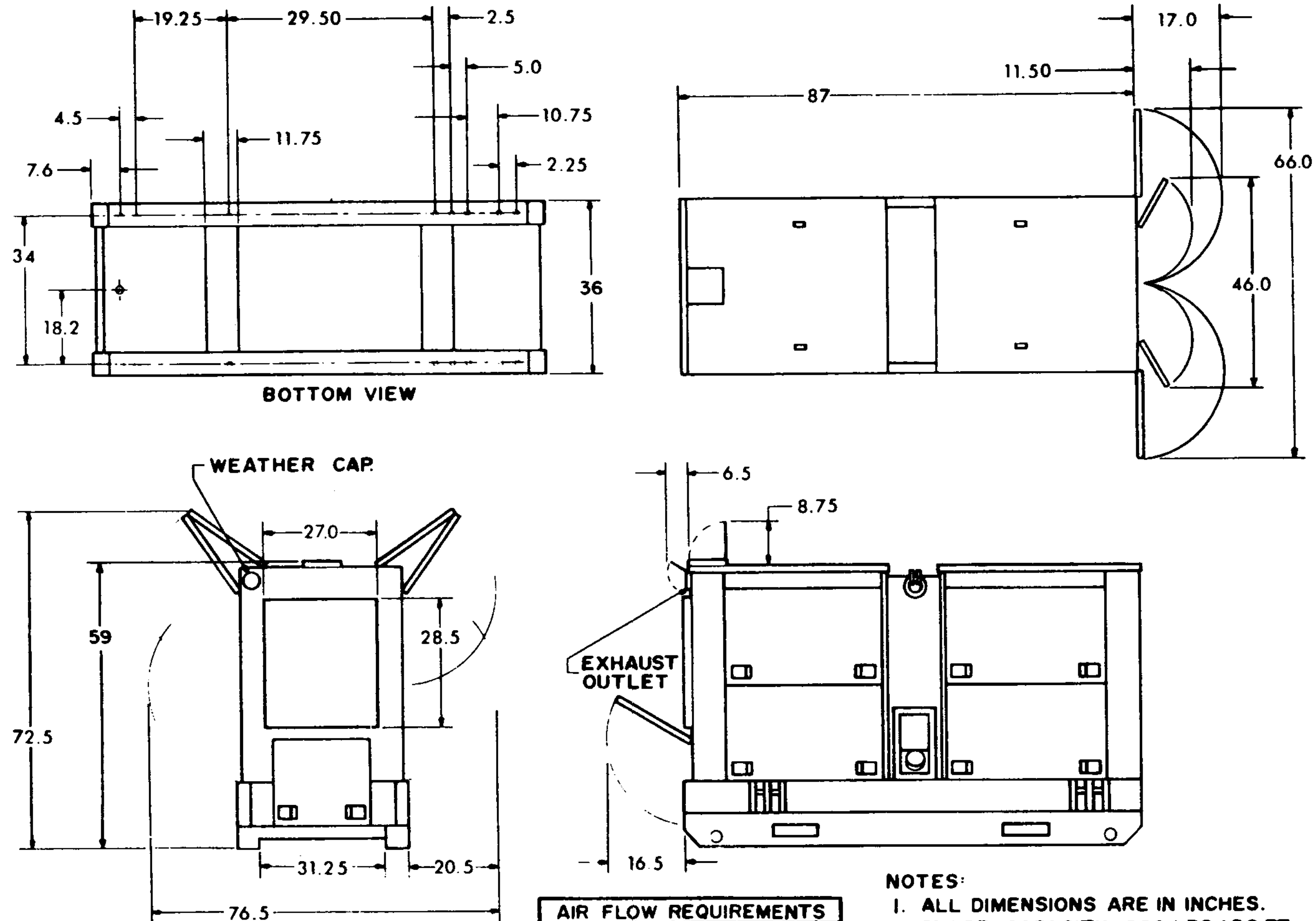


Figure 2-1A. Noise level warning.



AIR FLOW REQUIREMENTS	
ENGINE RPM	CFM
1500	7800
1800	10200
2000	12300

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. FLOOR CAPACITY 220 LBS/SQ FT.
3. EXHAUST (3 IN. ID) MUST NOT HAVE MORE THAN ONE 90° BEND.
4. ENGINE COMBUSTION AIR 320 CU FT/MIN.

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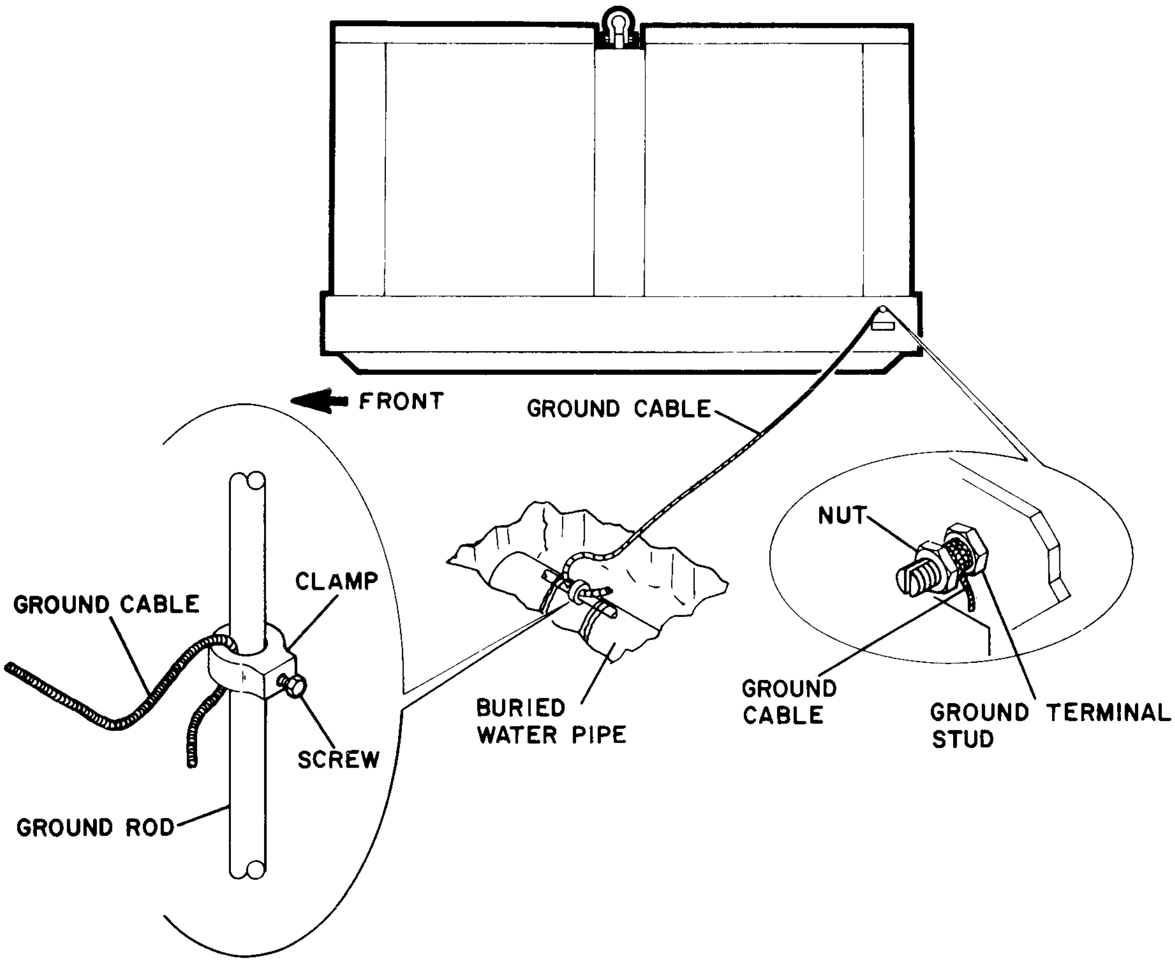
Figure 2-1. Installation Plan



WARNING

DO NOT OPERATE ENGINE 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.

STEP 1. INSERT GROUND CABLE INTO SLOT IN GROUND TERMINAL STUD AND TIGHTEN NUT.

STEP 2. PERFORM EXCAVATION TO EXPOSE WATER PIPE FOR AT LEAST 10 FEET AS SHOWN, AND CHECK THAT NO INSULATED SECTION APPEARS WITHIN THE 10 FEET. IF INSULATED SECTIONS EXIST, PROCEDURE OF SHEET 2 OR 3 MUST ALSO BE PERFORMED.

STEP 3. ATTACH GROUND CABLE TO GROUND ROD USING GROUND ROD AND CLAMP AS SHOWN, BY TIGHTENING SCREW ON CLAMP.

STEP 4. SECURE GROUND ROD TO WATER PIPE AND CHECK THAT A GOOD ELECTRICAL BOND IS ACHIEVED.

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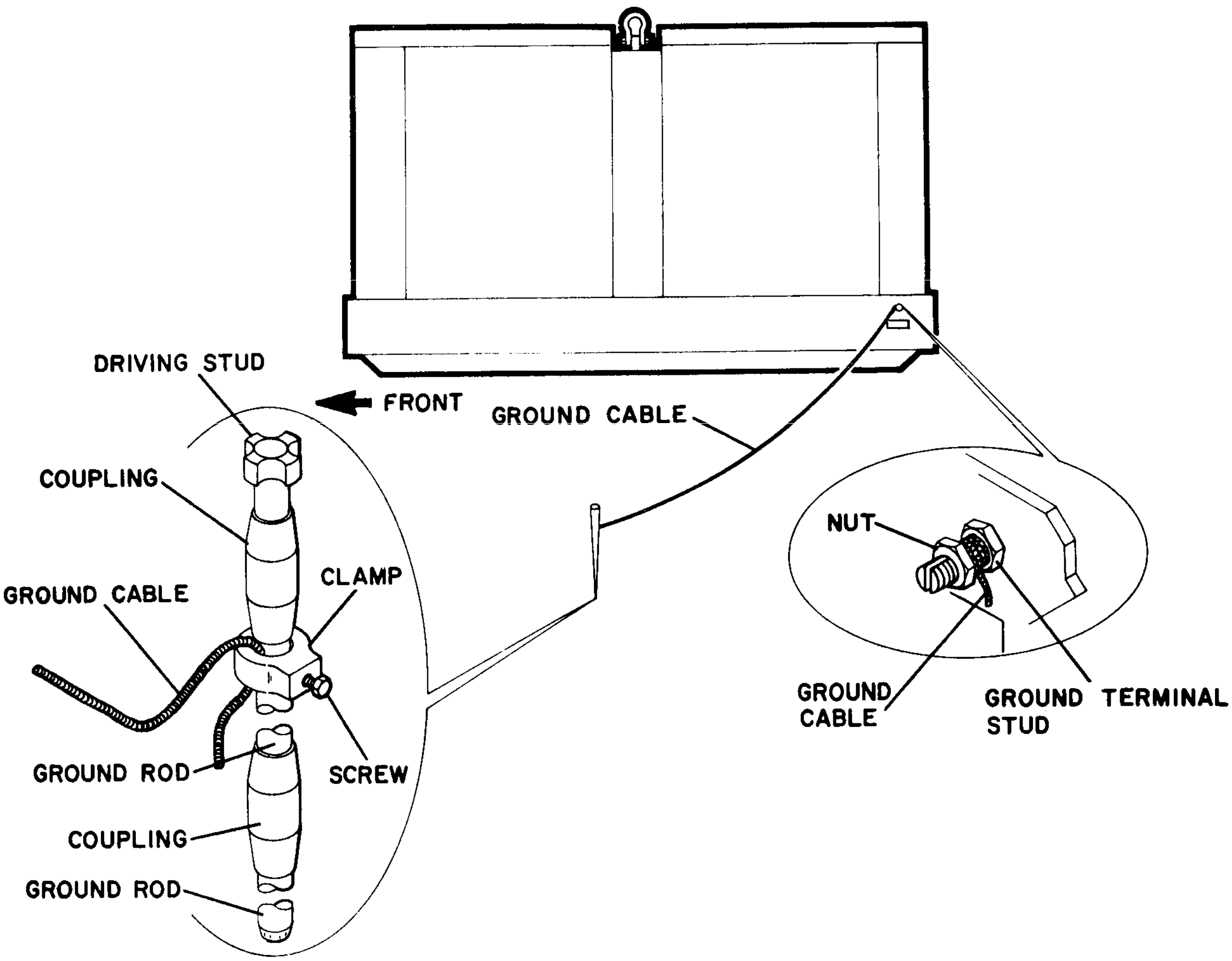
Figure 2-2. Grounding Procedures (Sheet 1 of 3)



<u>WARNING</u>

DO NOT OPERATE ENGINE 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.

STEP 1. INSERT GROUND CABLE INTO SLOT IN GROUND TERMINAL STUD AND TIGHTEN NUT.

STEP 2. CONNECT COUPLING TO GROUND ROD AND INSERT DRIVING STUD IN COUPLING. MAKE SURE DRIVING STUD IS BOTTOMED ON GROUND ROD.

STEP 3. DRIVE GROUND ROD INTO GROUND UNTIL COUPLING IS JUST ABOVE THE GROUND SURFACE.

STEP 4. CONNECT ADDITIONAL GROUND RODS, AS REQUIRED, BY REMOVING DRIVING STUD FROM COUPLING AND INSTALLING ANOTHER GROUND ROD IN COUPLING. MAKE SURE EACH NEW GROUND ROD IS BOTTOMED ON GROUND ROD PREVIOUSLY INSTALLED. CONNECT ANOTHER COUPLING ON NEW GROUND ROD AND INSERT DRIVING STUD.

STEP 5. AFTER GROUND RODS HAVE BEEN DRIVEN INTO THE GROUND, REMOVE DRIVING STUD AND TOP COUPLING.

STEP 6. CONNECT CLAMP AND GROUND CABLE TO TOP OF EXPOSED GROUND ROD AND SECURE BY TIGHTENING SCREW.

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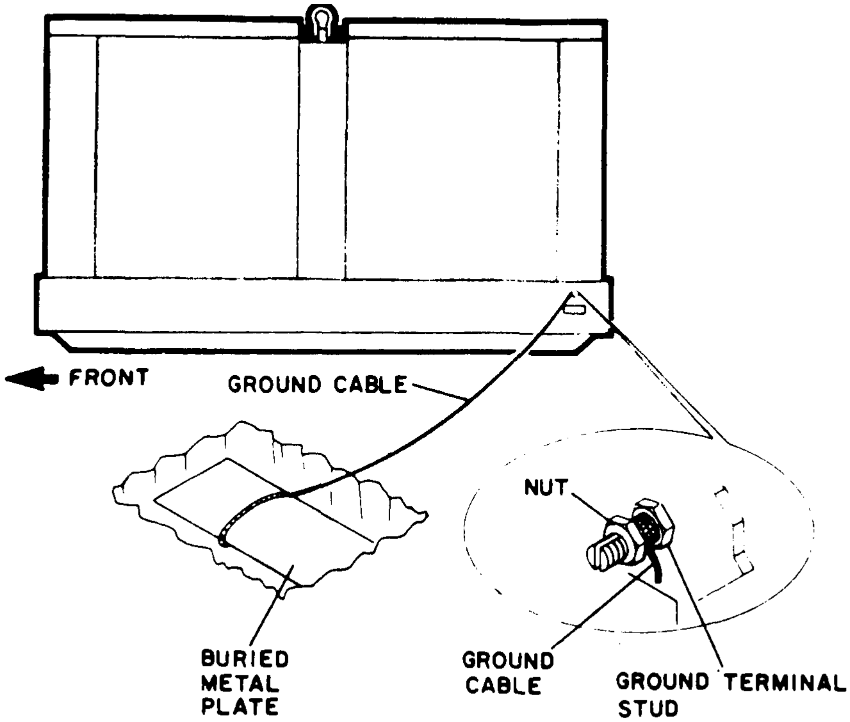
Figure 2-2. Grounding Procedures (Sheet 2 of 3)



WARNING

DO NOT OPERATE ENGINE 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.

STEP 1. INSERT GROUND CABLE INTO SLOT IN GROUND TERMINAL STUD AND TIGHTEN NUT.

STEP 2. PERFORM EXCAVATION AND BURY A METAL PLATE AS SHOWN.

STEP 3. ATTACH GROUND CABLE TO METAL PLATE AND CHECK THAT GOOD ELECTRICAL BOND IS ACHIEVED.

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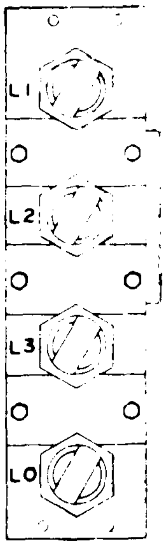
Figure 2-2. Grounding Procedures (Sheet 3 of 3)



WARNING

LETHAL VOLTAGES ARE PRESENT AT THE LOAD CONNECTION BOARD OF THE GENERATOR SET DURING OPERATION. DO NOT ATTEMPT TO CONNECT OR DISCONNECT LOAD LEADS WHILE THE GENERATOR SET IS OPERATING. DO NOT ATTEMPT TO CONNECT OR DISCONNECT LOAD LEADS WITH THE GENERATOR SET SHUTDOWN AND THE LOAD CONNECTED TO ANOTHER POWER SOURCE, OR WHILE THE GENERATOR SET IS PARALLELED TO ANOTHER THAT IS OPERATING. WHEN MAKING ANY ELECTRICAL CONNECTIONS, MAKE SURE THE DC CONTROL CIRCUIT BREAKER (FIG. 2-5) IS OPEN AND THE NEGATIVE BATTERY TERMINAL IS DISCONNECTED.

CAUTION

TO PREVENT WATER AND MOISTURE DAMAGE TO CABLE, ROUTE THE POWER CABLE THROUGH THE LEATHER OR CANVAS BOOT. AFTER THE END OF THE BLACK INSULATION IS INTO THE BOOT, SECURE THE BOOT AROUND THE CABLE BY PULLING THE DRAW STRING. NEXT ROUTE THE CABLES OVER THE TERMINAL BOARD. THEN DOWN AND AROUND TO THE PROPER TERMINAL.

NOTE

ONE OR MORE SINGLE-PHASE LOADS CAN BE SERVED ALONE OR IN COMBINATION WITH 3-PHASE LOADS, BUT THE LOAD ON ANY ONE PHASE MUST NOT EXCEED 33 PERCENT OF THE CURRENT RATING OF THE ENGINE GENERATOR SET (PHASE BALANCE IS 5 PERCENT).

STEP 1. 208V OR 416V SINGLE-PHASE LOAD CONNECTIONS. USING WRENCH PROVIDED, CONNECT FIRST LOAD TO L1 AND L2. CONNECT SECOND LOAD TO L2 AND L3. CONNECT THIRD LOAD TO L1 AND L3.

STEP 2. 120V OR 240V SINGLE-PHASE LOAD CONNECTIONS. CONNECT FIRST LOAD TO L1 AND L0. CONNECT SECOND LOAD TO L2 and L0. CONNECT THIRD LOAD TO L3 AND L0.

STEP 3. 3-PHASE LOAD CONNECTIONS. THE PHASE SEQUENCE OF THE ENGINE GENERATOR SET OUTPUT IS L1-L2-L3 AND INSURE THAT THE EXTERNAL LOAD IS APPROPRIATELY CONNECTED.

Figure 2-3. Generator Load Terminal Board Connections

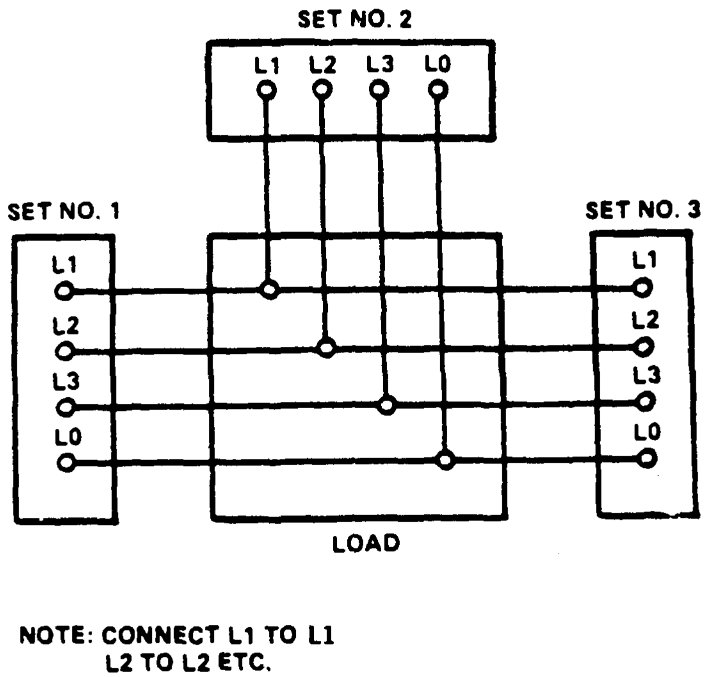


Figure 2-3.1. Parallel Connection

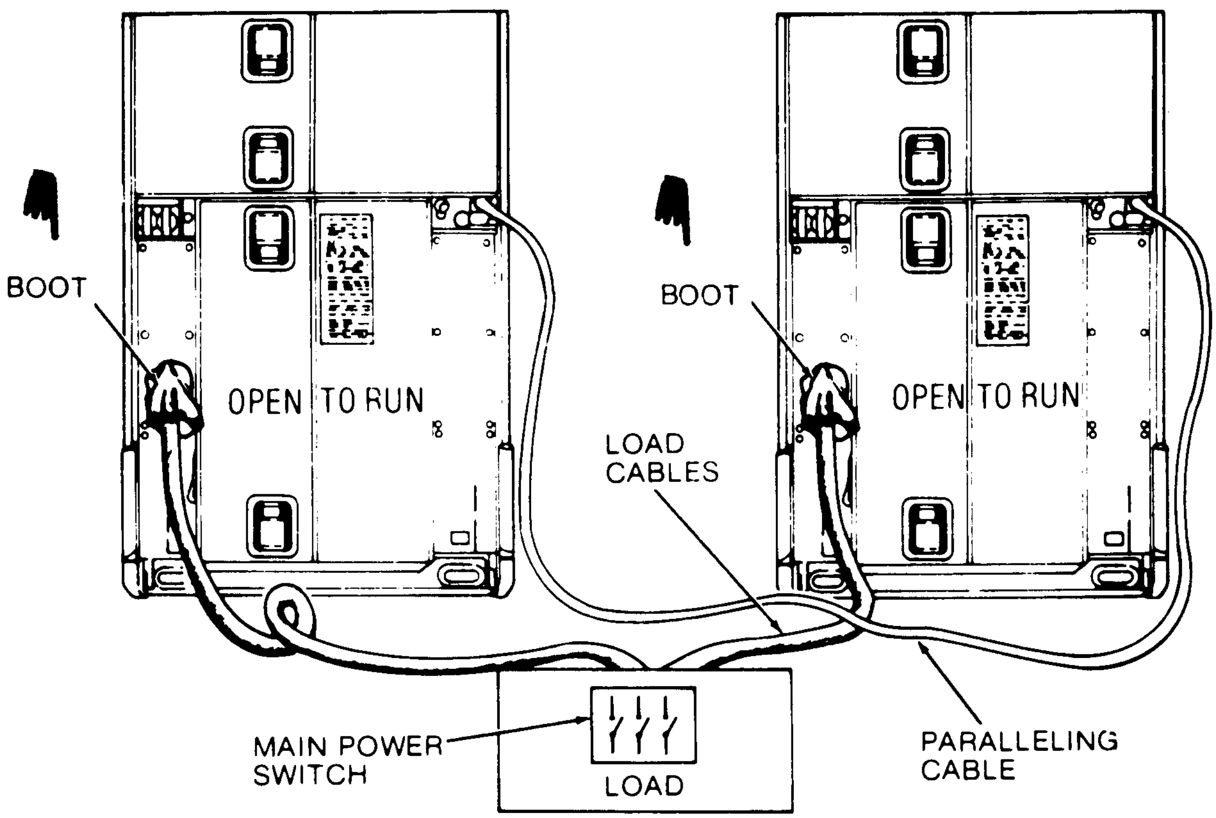
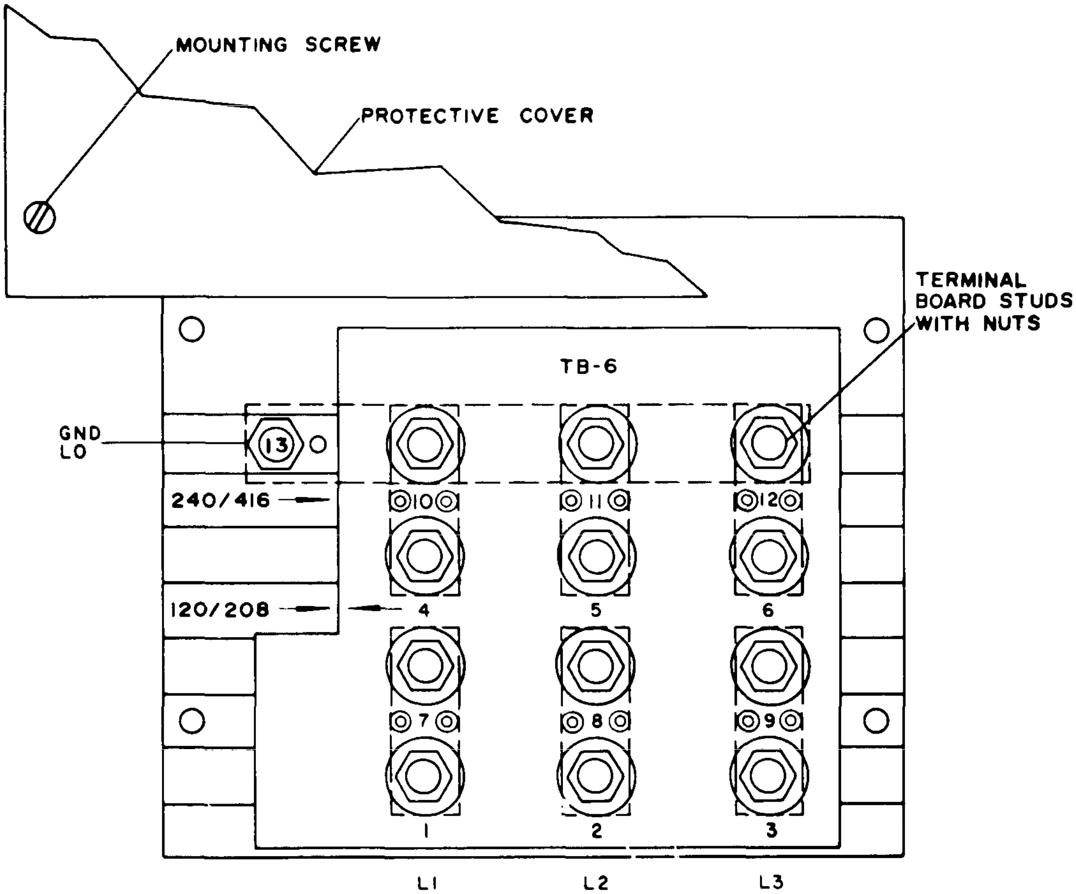


Figure 2-3.2. Parallel Connection.



NOTE
120/208 VAC OPERATION CONNECTION SHOWN

WARNING

DO NOT ATTEMPT TO ALTER THE POSITION OF THE VOLTAGE RECONNECTION BOARD WHILE THE GENERATOR SET IS OPERATING. MAKE SURE THAT THE GENERATOR SET IS NOT PARALLELED TO ANOTHER THAT IS OPERATING. FAILURE TO OBSERVE THIS WARNING MAY RESULT IN DEATH BY ELECTROCUTION. WHEN MAKING ELECTRICAL CONNECTIONS, MAKE SURE THAT THE DC CONTROL CIRCUIT BREAKER (FIG. 2-5) IS OPEN AND THE NEGATIVE BATTERY TERMINAL IS DISCONNECTED.

STEP 1. UNSCREW 4SCREWS AND REMOVE PROTECTIVE COVER.

STEP 2. REMOVE 12 MOUNTING NUTS FROM STUDS NUMBERED 1 THROUGH 12 AND MOVE RECONNECTION BOARD UP OR DOWN TO CONVERT TO 240/416 VAC OR 120/208 VAC OPERATION.

STEP 3. REPLACE AND TIGHTEN MOUNTING NUTS.

STEP 4. REPLACE PROTECTIVE COVER AND SECURE WITH 4 SCREWS.

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Figure 2-4. Voltage Conversion

Section II. MOVEMENT TO NEW WORKSITE

2-7. Dismantling for Movement.

WARNING

Make certain that engine generator set is not operating in a standby mode, or connected to a parallel bus.

a. Preparation for Movement.

(1) Disconnect the load cables from the load terminal board (fig. 2-3) and tag for identification.

(2) Remove the exhaust pipe extension, if used .

(3) Drain fuel (fig. 3-7) and coolant (para 3-41) if transportation by railroad is anticipated or the distance to be traveled is great.

(4) Refer to the basic issue item list (Appendix B) and make sure that all items are present and properly stowed.

(5) Disconnect the ground lead from the ground terminal stud (fig. 2-2).

(6) Disconnect any other external hoses, lines and cables, if used.

(7) Close and secure all doors and panels.

b. Movement.

(1) If the engine generator set is to be moved only a short distance and the terrain is suitable, attach a suitable towing device to the towing openings of the engine generator set and tow the engine generator set to the new worksite.

(2) If the engine generator set is to be moved a long distance, or if the terrain is unsuitable for towing, prepare engine generator set for moving as described in paragraph 2-7 a.

2-8. Reinstallation after Movement.

Refer to paragraph 2-5 for reinstallation after movement to a new worksite.

Section III. CONTROLS AND INSTRUMENTS

2-9. General.

This section describes and illustrates the various controls and instruments required for generator set operation.

2-10. Controls and Instruments.

The purpose of the generator set controls and instruments and the normal and scale readings of the instruments are illustrated in figure 2-5.

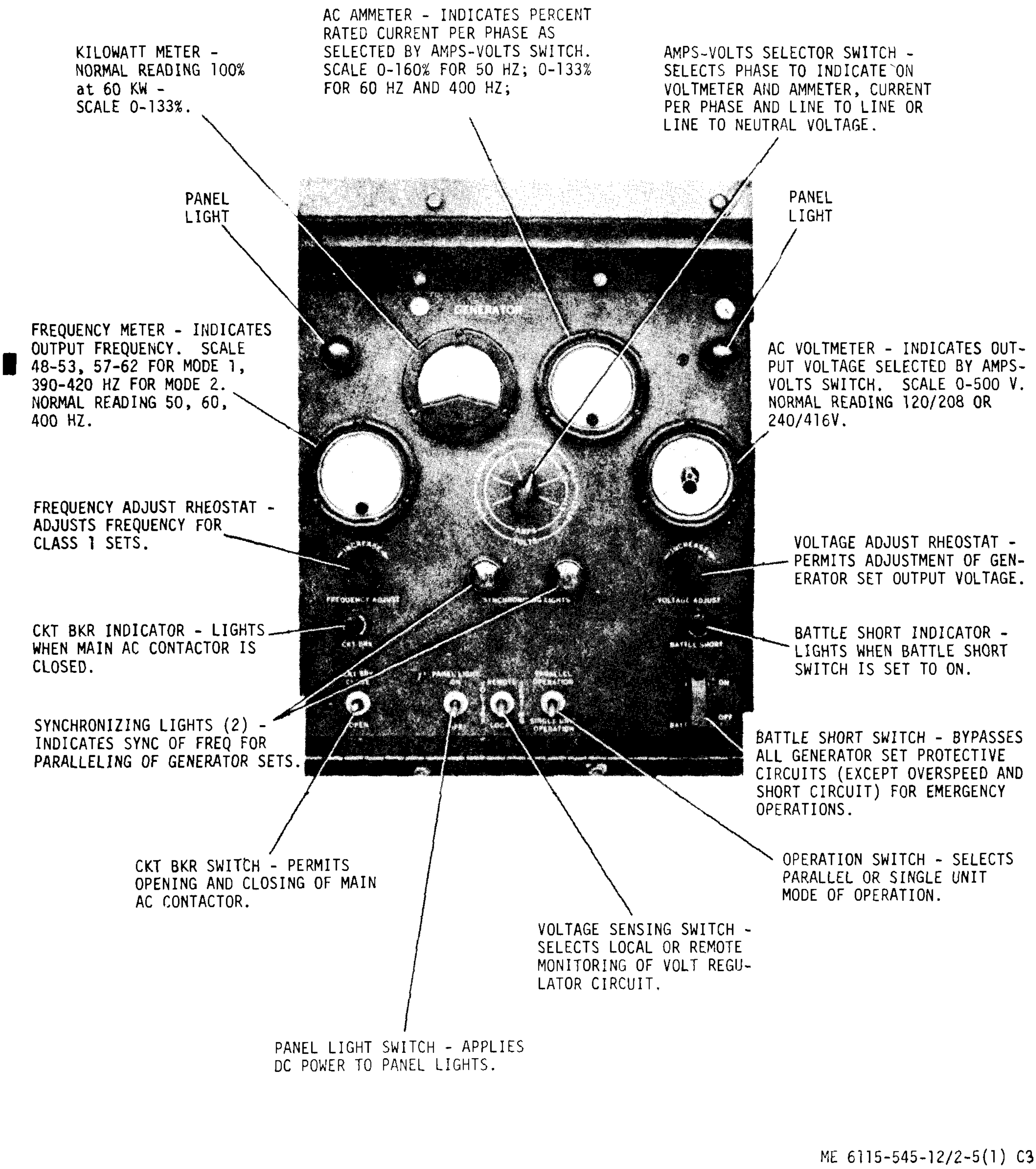


Figure 2-5. Generator Set Controls and Instruments (Sheet 1 of 6)

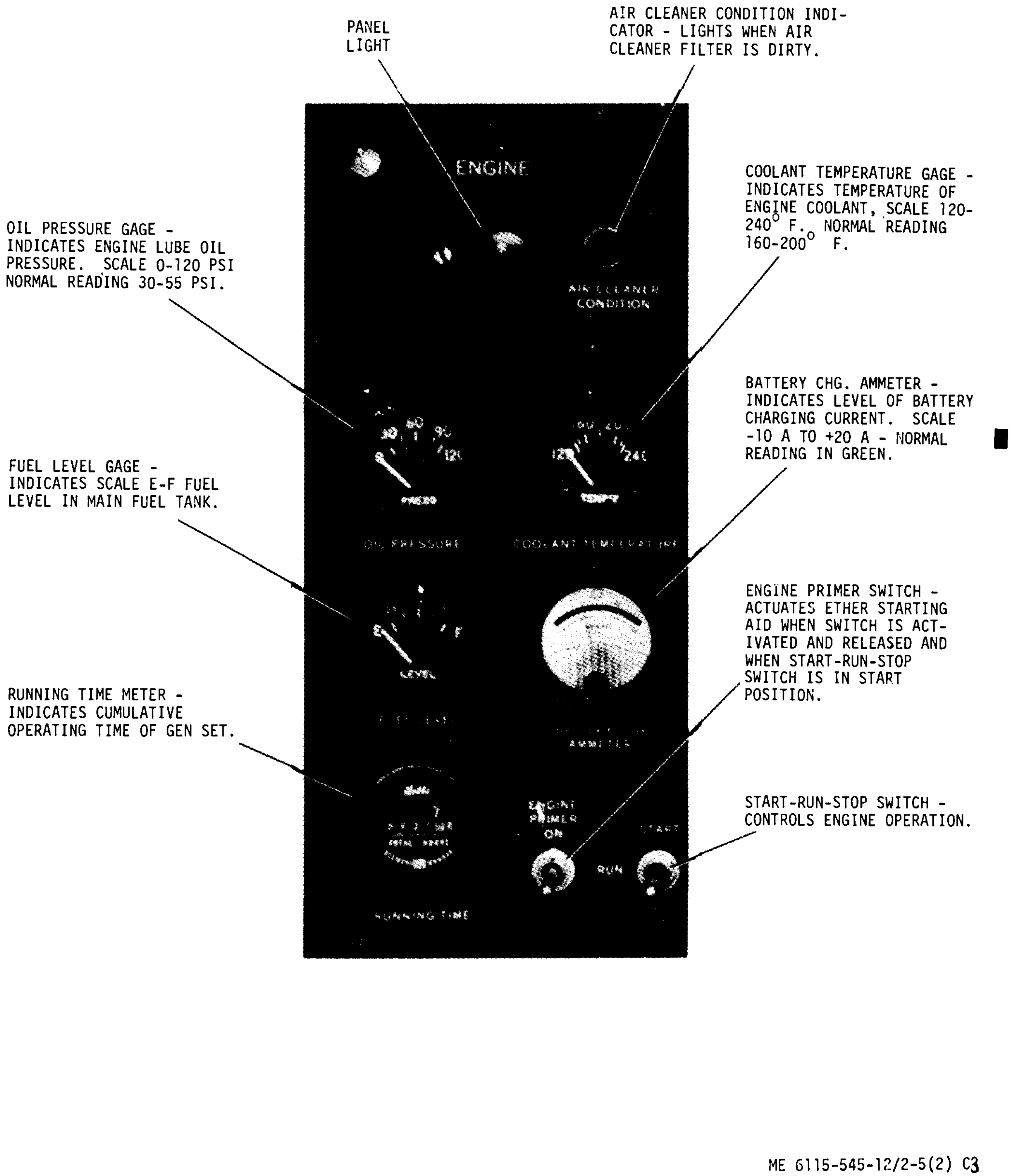
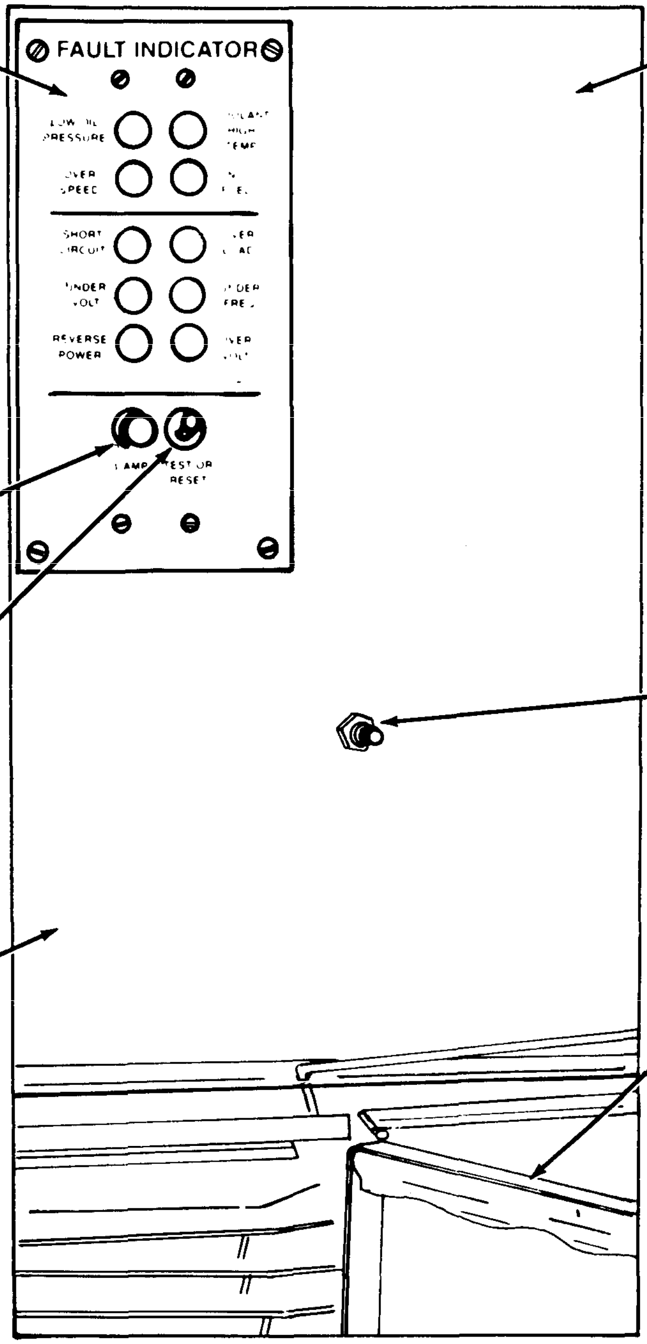


Figure 2-5. Generator Set Controls and Instruments (Sheet 2 of 6)

FAULT INDICATORS NORMALLY OUT SEE TABLE 2-2 FOR FUNCTION

MOUNTING LOCATION FOR ELECTRIC HEATER CONTROL BOX OR ELECTRICAL WINTERIZATION KIT. (SEE FIG. 2-12.)



1 AMP FUSE - PROTECTS FAULT INDICATOR CIRCUITS.

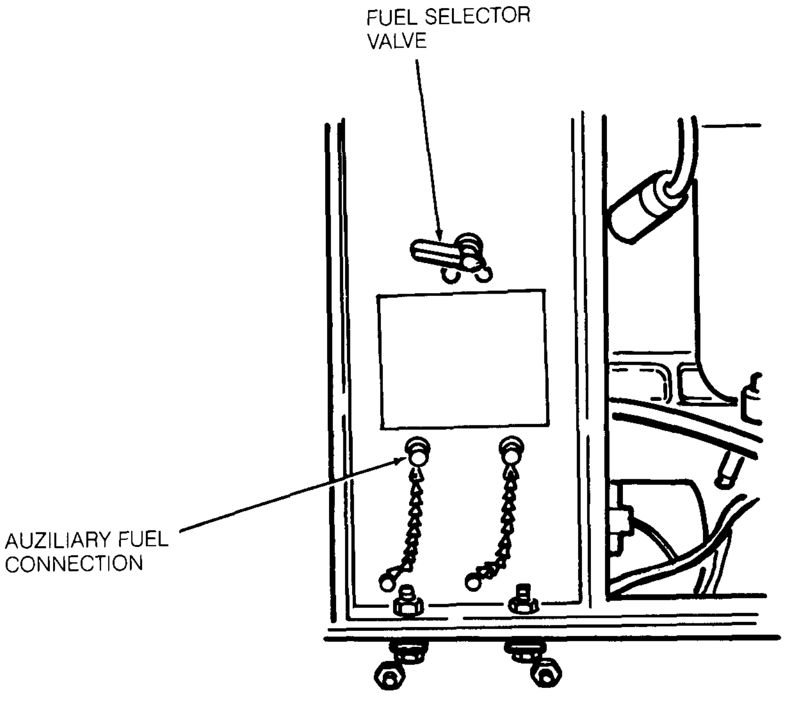
TEST OR RESET SWITCH - PERMITS TESTING OF FAULT INDICATOR LAMPS AND RE-SETTING.

DC CONTROL CIRCUIT BREAKER - APPLIES 24 VDC FROM BAT-TERIES TO CONTROL CIRCUITS.

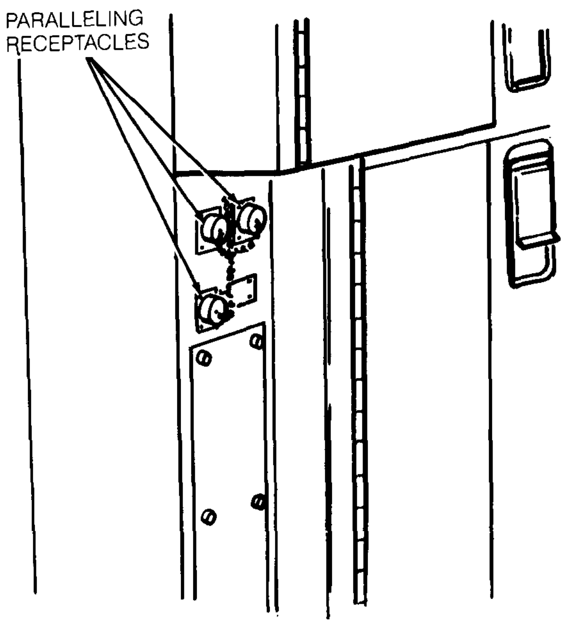
MANUAL THROTTLE CONTROL - CONTROLS ENGINE SPEED BY DE-PRESSING (INCREASE) OR WITH-DRAWING (DECREASE) ON UTILITY (CLASS 2) SETS. (THROTTLE HIDDEN BEHIND DOOR)

MOUNTING LOCATION FOR HEATER CONTROL PANEL FOR FUEL BURNING WINTERIZATION KIT. (SEE FIG. 2-11.)

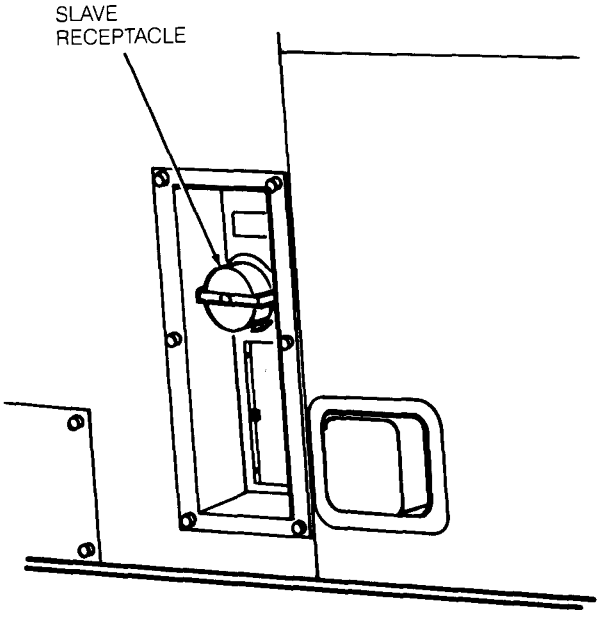
Figure 2-5. Generator Set Controls and Instruments (Sheet 3 of 6)



A – FUEL SELECTOR VALVE - PERMITS SELECTION OF THE MAIN FUEL TANK (SET TANK) OR AN EXTERNAL SOURCE (AUXILIARY) AS FUEL SUPPLY FOR THE SET.

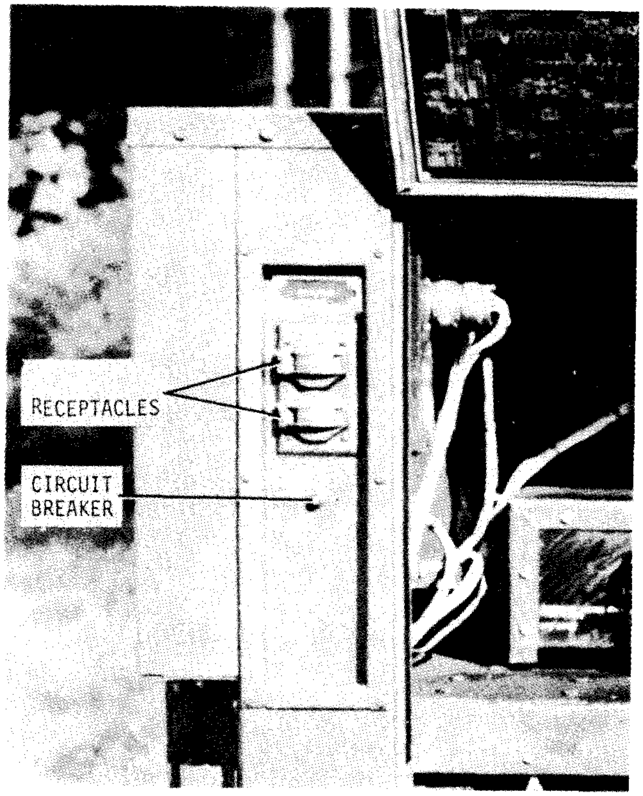


B – PARALLELING RECEPTACLES - PROVIDES CONNECTION FOR OPERATION OF THREE SETS OF SAME CLASS MODE AND SIZE IN PARALLEL.

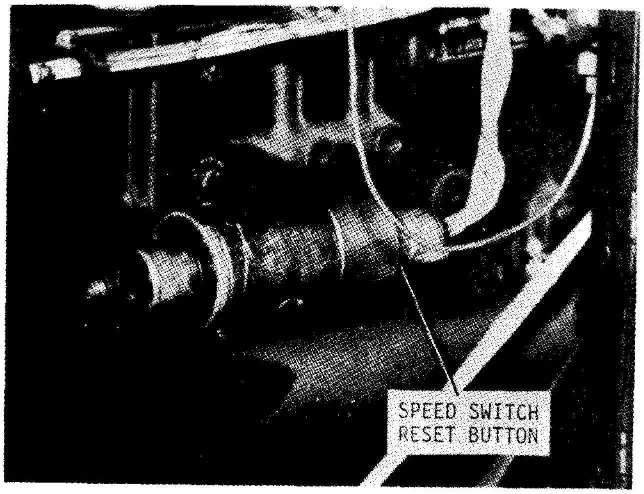


C – SLAVE RECEPTACLE - PROVIDES CONNECTION TO SUPPLY OR RECEIVE 24 VDC POWER. USE SLAVE RECEPTACLE (SR1 OR SR2) WHEN EXTRA CRANKING POWER IS REQUIRED.

Figure 2-5. Generator Set Controls and Instruments (Sheet 4 of 6)



D - CONVENIENCE CIRCUIT BREAKER AND RECEPTACLES - PROVIDES OUTPUT CONNECTION AND CIRCUIT BREAKER PROTECTION FOR THIS OUTPUT LINE.



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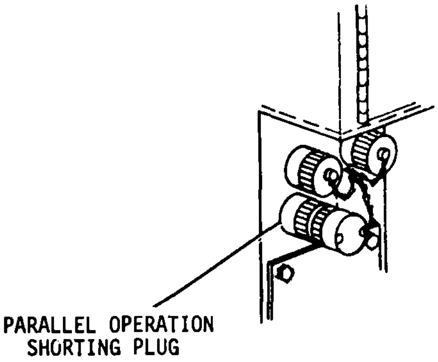
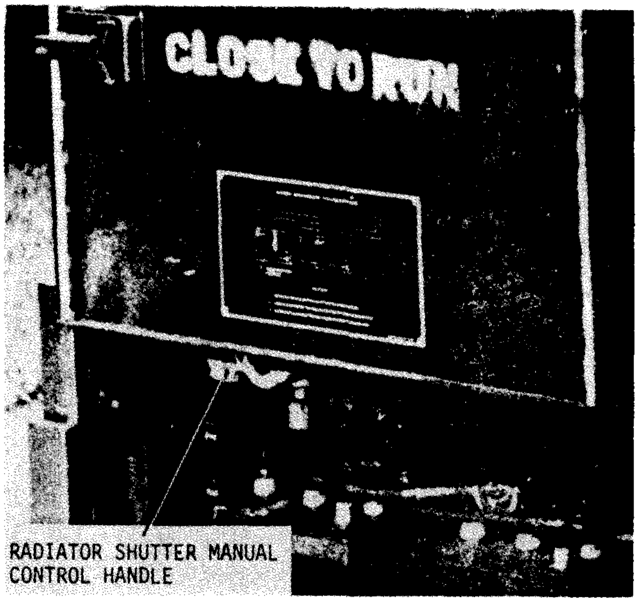
E - SPEED SWITCH RESET BUTTON

Figure 2-5. Generator Set Controls and Instruments (Sheet 5 of 6)



F - PARALLEL OPERATION SHORTING PLUG



G - RADIATOR SHUTTER MANUAL CONTROL HANDLE

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Figure 2-5. Generator Set Controls and Instruments (Sheet 6 of 6)

Table 2-2. Fault Indicators Function

INDICATOR (Fig. 2-5)	FUNCTION
LOW OIL PRESSURE	Lights if oil pressure drops below 20 ± 2 psi.
COOLANT HIGH TEMP	Lights if coolant temperature rises above 222 ± 3° F.
OVERSPEED	Lights if engine rpm reaches 2400 to 2450 rpm.
NO FUEL	Lights if fuel in day tank falls to level permitting only one minute of engine operation.
SHORT CIRCUIT	Lights if output reaches 425 ± 25% of rated current.
OVER LOAD	Lights if any phase current exceeds 110% of rated load.
UNDER VOLT	Lights (Class 1 sets only) instantaneously if output falls below 48 volts, or 6 ± 2 sec after output reaches 99 ± 4 volts.
UNDER FREQ	Lights on (Class 1 sets only) when output freq drops to: Mode I - 46 ± 1 Hz for 50 Hz operation, 55 ± 1 Hz for 60 Hz operation, Mode II - 370 ± 5 Hz for 400 Hz.
REVERSE POWER	Lights if power flow into set exceeds 20% of rated value.
OVER VOLT	Lights if output voltage rises above 153 ± 3 volts.

2-11. General.

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

b. The operator must know how to perform every operation of which the engine generator set is capable. This section gives instructions on starting and stopping the engine generator set, operation of the generator set and coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary procedures to fit the individual job.

2-12. Starting.

a. Preparation for Starting. Instructions to be followed when preparing to start the engine generator set are shown in figure 2-6. Preventive maintenance procedures to be performed before operation are given in table 3-1.

b. Starting. After performing the preparation for starting procedure of paragraph 2-12a, start the engine generator set as shown in figure 2-7. If the engine will not start or if any other abnormality is observed, notify organizational maintenance personnel.

2-13. Stopping.

a. Normal Stopping. (See figure 2-8). Preventive maintenance procedures to be performed after equipment operation are given in table 3-1.

b. Stopping by Safety Devices. The engine generator set is equipped with safety device electrical circuits that will automatically stop the engine and simultaneously open the main ac contactor in case of; (1) high coolant temperature, (2) low oil pressure, (3) engine overspeed, (4) over-voltage or, (5) no fuel. A short circuit, overload, or reverse power protective relay will automatically open the main ac contactor but will not stop the engine. On precise class 1 engine generator sets only, under voltage and under frequency relay protective circuits will similarly open the main ac contactor but will also not stop the engine. A specific FAULT INDICATOR (fig. 2-5) will light when any of these abnormal conditions occur. Refer to table 2-2 for the specific criteria for which these safety device electrical circuits operate. Once the engine generator set has been stopped due to the action of one of these safety devices, the problem must be corrected before the engine generator set is placed back in operation.

c. Emergency Stopping. To stop the engine generator set in an emergency, open DC CONTROL CIRCUIT BREAKER (fig. 2-8).

2-14. Operation of Equipment.

a. Single Engine Generator Set Operation. See-fig. 2-9 for single engine generator set operating instructions.

b. Parallel Operation of Engine Generator Sets, See-fig. 2-10 for parallel operation instructions for up to 3 engine generator sets of the same class, mode and size.

c. Emergency Operation. If any emergency situation requires continued operation of the engine generator set after being shut down by one of the safety device electrical circuits (para 2-13 b), the BATTLE SHORT switch (fig. 2-7) can be used to override all safety devices except the overspeed and short circuit operation of this switch is as follows:

(1) Place BATTLE SHORT switch in OFF position.

(2) Hold START-RUN-STOP switch in START POSITION and start engine (fig. 2-7).

(3) Lift cover and push BATTLE SHORT switch to ON position.

(4) Release START switch and push BATTLE SHORT switch to OFF position as soon as possible after emergency has passed.

NOTE

The BATTLE SHORT switch may be actuated, as necessary, any time the engine generator set is operating.

d. Load Connections for Parallel Operation.

NOTE

Prior to attempting parallel operation, ensure all generator sets have the same frequency and voltage output.

WARNING

Lethal voltages are present at the load terminal board of the generator set during operation. Do not attempt to connect or disconnect load leads while the generator set is operating. Do not attempt to connect or disconnect load leads with the generator set shut down and the load connected to another power source, or while the generator set is paralleled to another set which is operating.

WARNING

Do not attempt to connect the paralleling cable while either or both of the sets to be paralleled is operating. Make sure that there is no input to the load from another source. Failure to observe this warning may result in death by electrocution.

CAUTION

Precise generator sets equipped with the electric governor system cannot be paralleled with sets that have the electro hydraulic governor system.

(1) If the generator sets are to share a load greater than the KW rating of a single set, connect load terminal boards as shown in figure 2-3A. This arrangement allows for sharing or transferring of the load between generator sets.

(2) Open the left access door to the set compartment and remove the safety cover from the terminal board (figure 2-3).

(3) Insert load leads through plate and sleeve assembly (figure 2-3) located to the left of the generator set air intake.

NOTE

The load terminal boards will accommodate 2-wire single phase and 4-wire three phase loads. One or more single phase loads can be served alone or in combinations with three phase loads; but the load on any one phase must not exceed 100 percent of the current rating of that phase. Be sure that wire sizes are correct for load to be carried.

(4) Connect the load to terminals marked L1, L2, L3 and L0 (figure 2-3).

NOTE

Make certain that the load terminal boards of the sets to be paralleled are connected properly. Reading left to right, phase rotation for the phase loads is L1, L2, L3. Be sure L1 is connected to L1, L2 is connected to L2, etc.

(5) Connect load leads and paralleling cables as shown in figures 2-3A and 2-3B.

NOTE

After load connection, tighten binding nuts with plastic/phenolic box end wrench and install safety cover.

NOTE

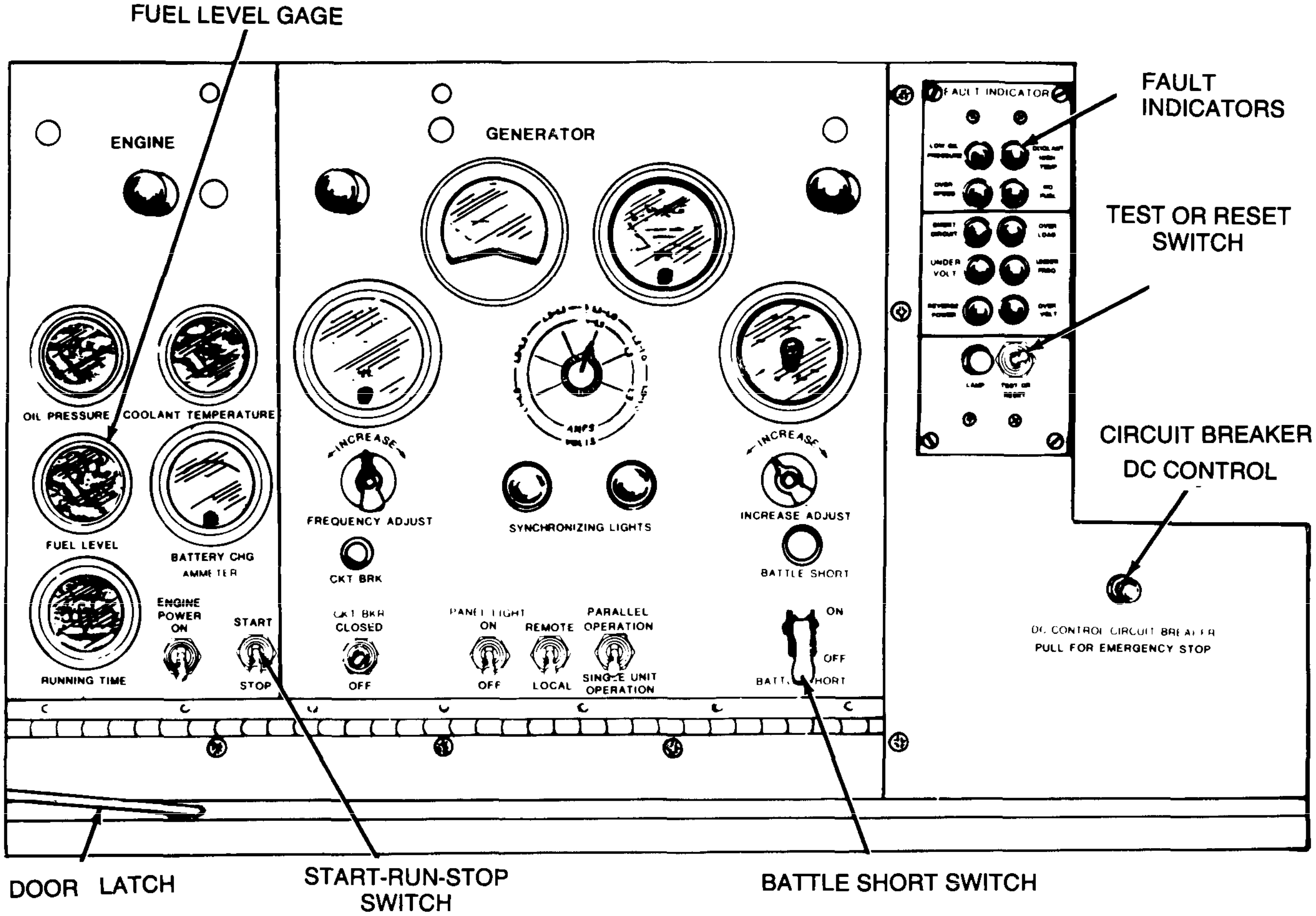
Paralleling of tactical precise generator sets requires that paralleling cables be installed and the shorting plug located on one of the paralleling receptacles of each generator set be removed.

2-15. Exercise of Engine on Standby Service.

A diesel engine on standby service that is customarily operated under optimum conditions should be exercised at least every 30 days. However, under environmental conditions involving extreme temperatures, humidity, dust, sand, etc., it maybe found necessary to shorten the interval between exercise periods teas often as weekly. Exercise period should be long enough to enable the engine to attain normal operating temperature (160°-200°F) while carrying, if possible, at least 50 percent of its normal load. To exercise engine, proceed as follows:

a. Perform the preparation for starting instruction shown in figure 2-6. Make complete visual inspection of unit to be sure it is in operating condition.

b. Start engine as shown in figure 2-7. After an acceptable warm-up period, run engine at rated speed with whatever load is available, up to full load, for



A–Generator set operating controls

WARNING

BEFORE MAKING CONNECTIONS FOR PARALLEL OPERATION, BE SURE THE ENGINE-GENERATOR SETS ARE NOT OPERATING. DO NOT OPERATE ENGINE GENERATOR SET UNLESS GROUND TERMINAL STUD HAS BEEN CONNECTED TO SUITABLE GROUND (FIG. 2-2). ELECTRICAL FAULTS IN ENGINE GENERATOR SET, LOAD LINES OR LOAD EQUIPMENT CAN CAUSE INJURY OR ELECTROCUTION FROM CONTACT WITH AN UNGROUNDED SYSTEM.

NOTE

ENGINE-GENERATOR SETS TO BE OPERATED IN PARALLEL MUST HAVE THE SAME VOLTAGE, FREQUENCY RATING AND GOVERNOR CONTROL UNIT.

STEP 1. CONNECT GENERATOR SET TO LOAD AS SHOWN IN FIGURE 2-3. IF GENERATOR SET INCORPORATES A LOAD BANK, PERFORM INSTRUCTIONS CONTAINED IN FIGURE 2-14.

STEP 2. CHECK ENGINE LUBRICATING OIL LEVEL (REFER TO PARAGRAPH 3-3).

STEP 3. CHECK ENGINE COOLANT LEVEL. PROPER COOLANT LEVEL IS 2 INCHES BELOW FILLER NECK.

STEP 4. CLOSE DC CONTROL CIRCUIT BREAKER.

STEP 5. CHECK FUEL LEVEL ON FUEL LEVEL GAGE BY PLACING START-RUN-STOP SWITCH IN RUN POSITION AND BATTLE SHORT SWITCH IN ON POSITION. IF FUEL MUST BE ADDED REFER TO PARAGRAPH 2-3c.

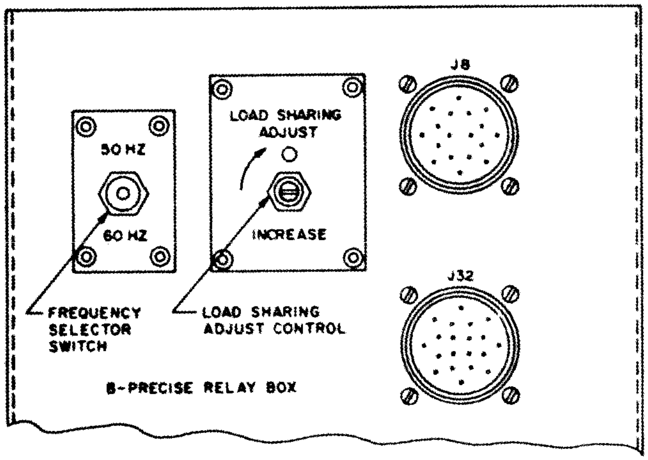
STEP 6. CHECK THAT LOW OIL PRESSURE (ALL SETS) UNDER VOLT AND UNDER FREQ FAULT INDICATORS LIGHT.

STEP 7. (CLASS 1 SETS ONLY) PRESS TEST OR RESET SWITCH AND CHECK THAT ALL FAULT INDICATORS LIGHT.

STEP 8. RELEASE TEST OR RESET SWITCH AND CHECK THAT STEP 6 INDICATION REMAINS IN EFFECT.

STEP 9. RETURN BOTH SWITCHES TO THE STOP AND OFF POSITION, RESPECTIVELY.

Figure 2-6. Preparation for Starting (Sheet 1 of 2)



B - PRECISE RELAY BOX

C - SHUTTER MANUAL CONTROL HA NDLE

STEP 10. CHECK VOLTAGE AND FREQUENCY REQUIREMENTS OF THE LOAD AGAINST THE VOLTAGE AND FREQUENCY CONNECTION OF THE GENERATOR SET (SEE FIGURE 2-4 FOR VOLTAGE CONVERSION PROCEDURE. ON 50/60 HZ PRECISE CLASS 1 SETS ONLY, SET FREQUENCY SELECTOR SWITCH ON PRECISE RELAY BOX (B) FOR DESIRED OUTPUT FREQUENCY (50 OR 60 HZ).

STEP 11. MAKE SURE SHUTTERS ON RADIATOR END OF THE ENGINE GENERATOR SET ARE NOT MANUALLY LOCKED OPEN AND CHECK THAT SHUTTERS OPEN AND CLOSE FREELY WHEN ACTUATED BY SHUTTER MANUAL CONTROL HANDLE (C).

STEP 12. CLOSE ALL DOORS EXCEPT THOSE ON CONTROL CUBICLE END OF ENGINE GENERATOR SET.

STEP 13. FASTEN CONTROL CUBICLE DOORS AND DOORS BELOW CONTROL CUBICLE IN OPEN POSITION USING DOOR LATCHES (A).

STEP 14. BATTERY TERMINAL MINUS (-) IS TO BE CONNECTED TO GROUND.

WARNING

MAKE CERTAIN THAT NO TOOLS, PARTS OR LOOSE BARS ARE ON ANY PART OF THE ENGINE SINCE THEY MIGHT CAUSE BODILY INJURY TO PERSONNEL WHEN THE ENGINE IS STARTED.

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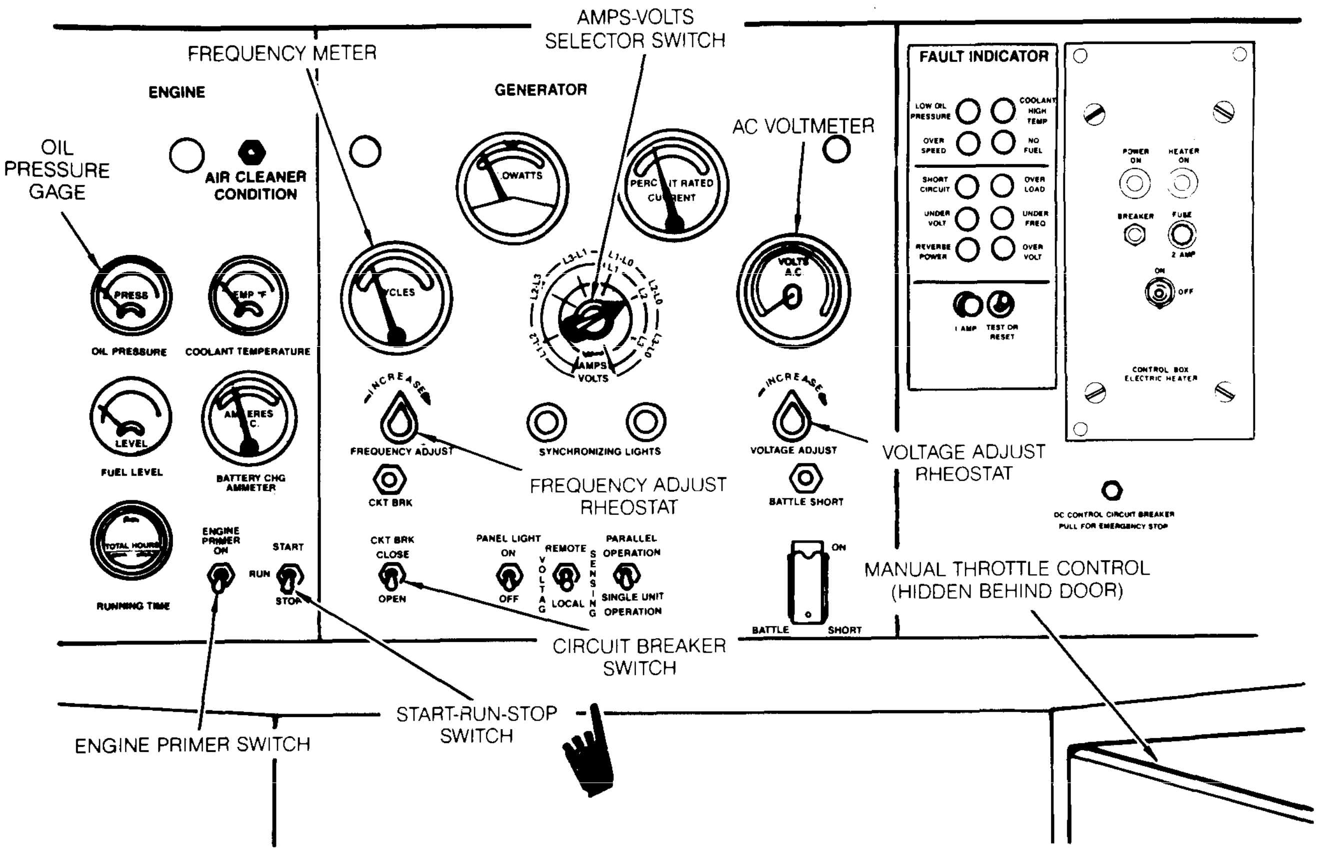
Figure 2-6. Preparation for Starting (Sheet 2 of 2)



AMBIENT AIR TEMPERATURE ABOVE MINUS 25° F

STEP 1. CRANK ENGINE BY PLACING START-RUN-STOP SWITCH IN START POSITION. USE SLAVE RECEPTACLE (SR1 OR SR2) WHEN EXTRA CRANKING POWER IS REQUIRED.

CAUTION

DO NOT CRANK MORE THAN 15 SECONDS AT A TIME. ALLOW AT LEAST 15 SECONDS TO ELAPSE BETWEEN CRANKINGS.

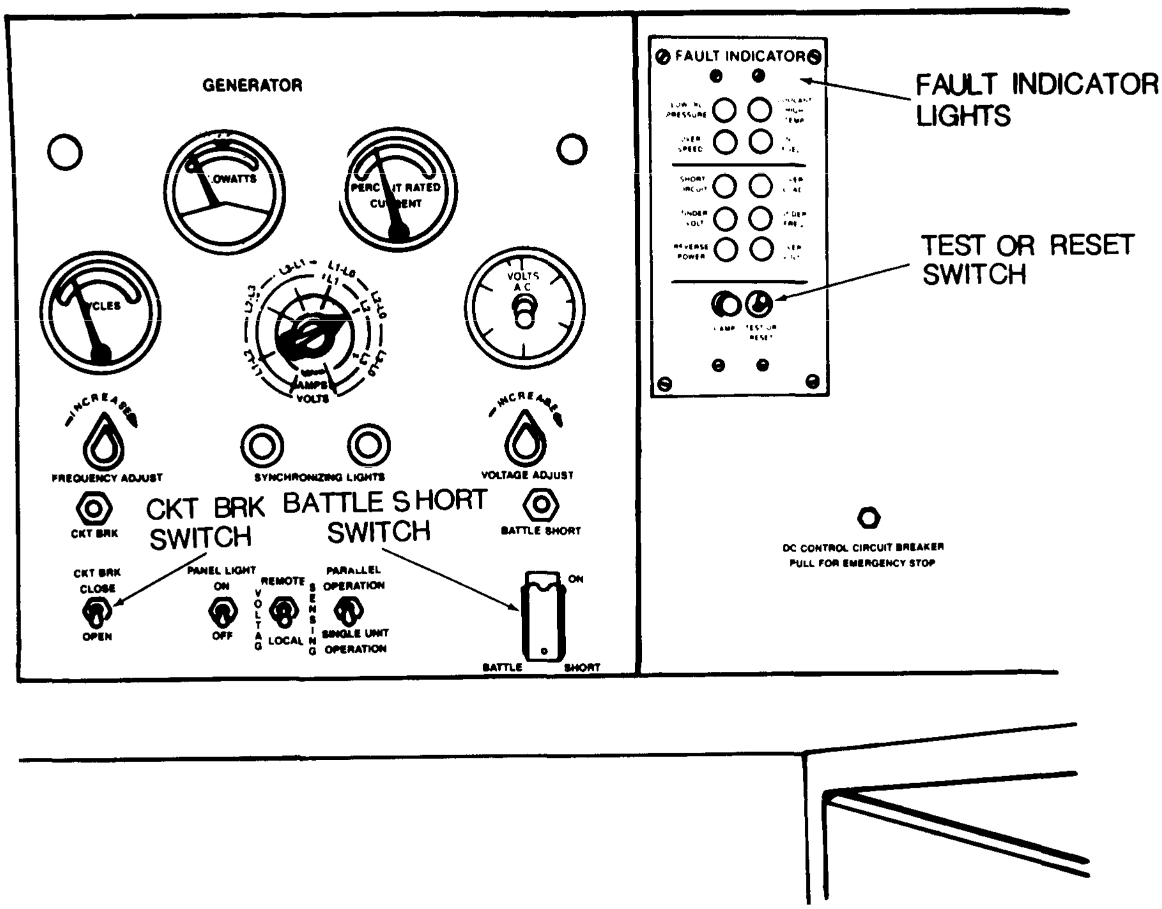
STEP 2. WHEN AIR TEMPERATURE IS BELOW PLUS 40° F, ENGINE ETHER PRIMER MAY BE REQUIRED. TO USE ETHER PRIMER, MOMENTARILY PLACE ENGINE PRIMER SWITCH IN THE ON POSITION AND RELEASE WHILE CRANKING THE ENGINE. EACH TIME THE SWITCH IS CYCLED, ONE METERED SHOT OF ETHER IS INJECTED INTO ENGINE AIR INTAKE SYSTEM.

STEP 3. AFTER ENGINE STARTS, CONTINUE TO HOLD START-RUN-STOP SWITCH IN START POSITION UNTIL OIL PRESSURE GAGE READING IS ABOVE 20 PSI AND MAIN GENERATOR VOLTAGE IS NORMAL. AC VOLTMETER SHOULD INDICATE 208 OR 416 VOLTS IF AMPS-VOLTS SELECTOR SWITCH IS SET AT L1-L2, L2-L3 OR L1-L3. 120 OR 240 VOLTS WILL BE INDICATED IF AMPS-VOLTS SELECTOR SWITCH IS SET AT L1-L0, L2-L0 OR L3-L0.

STEP 4. POSITION VOLTAGE ADJUST RHEOSTAT AS REQUIRED TO OBTAIN PROPER VOLTAGE OUTPUT STATED IN STEP 3.

STEP 5. ON PRECISE CLASS 1 ENGINE GENERATOR SETS POSITION FREQUENCY ADJUST RHEOSTAT TO OBTAIN 50, 60 HZ OR 400 HZ ON FREQUENCY METER. ON UTILITY CLASS 2 ENGINE GENERATOR SETS, ADJUST MANUAL THROTTLE CONTROL TO OBTAIN DESIRED READING (50 OR 60 HZ) ON FREQUENCY METER.

Figure 2-7. Starting Instructions (Sheet 1 of 2)



Step 6. ALLOW ENGINE TO WARM UP TO NORMAL OPERATING TEMPERATURE (100 - 150°F) WITH NO LOAD APPLIED.

CAUTION

TO PREVENT ENGINE CARBON DEPOSITS DO NOT RUN ENGINE-GENERATOR SETS FOR MORE THAN 5 MINUTES AT GOVERNED SPEED WITHOUT LOAD.

STEP 7. RESET FAULT INDICATOR LIGHTS BY PRESSING TEST OR RESET SWITCH. IF FAULT INDICATORS, ARE EXTINGUISHED AFTER BEING RESET, PROCEED WITH STEP (8). IF ANY FAULT INDICATOR LIGHTS, THE INDICATED FAULT (TABLE 2-2) MUST BE CORRECTED BEFORE PROCEEDING.

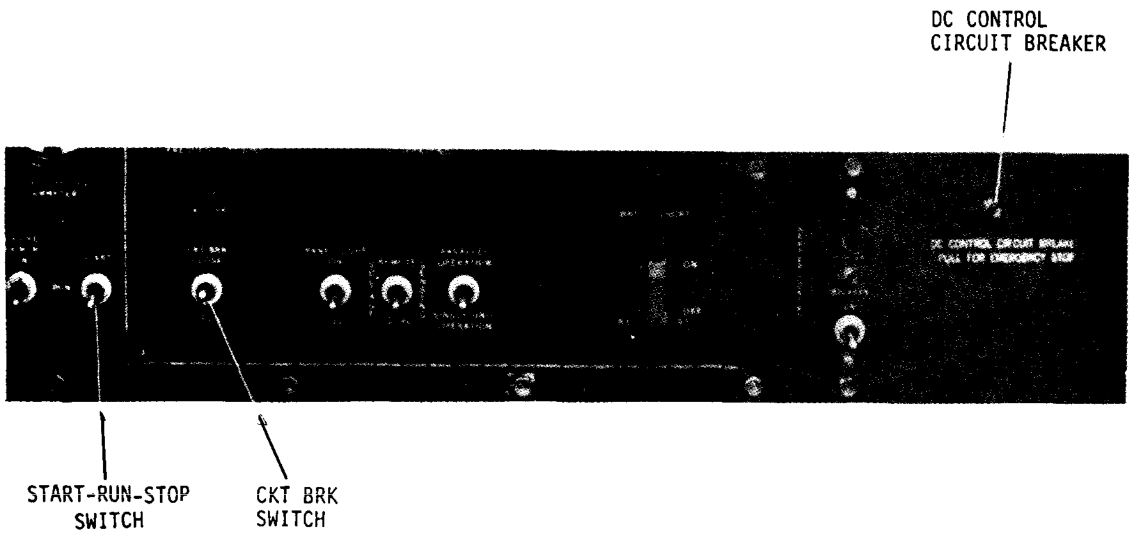
STEP 8. CLOSE MAIN AC CONTACTOR BY MOMENTARILY PLACING CKT BKR SWITCH IN CLOSE POSITION. MOMENTARILY PLACING CKT BKR SWITCH IN OPEN POSITION WILL OPEN THE AC CONTACTOR.

AMBIENT AIR TEMPERATURE BELOW MINUS 25° F

STEP 1. PREHEAT ENGINE COOLANT AND LUBRICATING OIL USING EITHER THE FUEL BURNING OR ELECTRIC WINTERIZATION KIT CONTROLS AS SHOWN IN FIGURES 2-11 and 2-12 RESPECTIVELY.

STEP 2. PERFORM STARTING PROCEDURE OF STEPS 1 THROUGH 8 SPECIFIED FOR ABOVE MINUS 25° F.

Figure 2-7. Starting Instructions (Sheet 2 of 2)



NORMAL

STEP 1. OPEN MAIN AC CONTACTOR BY MOMENTARILY PLACING CKT BRK SWITCH IN OPEN POSITION.

STEP 2. ALLOW 3 MINUTES TO ELAPSE AFTER PERFORMING STEP 1 AND PLACE START-RUN-STOP SWITCH IN STOP POSITION.

STEP 3. AFTER ENGINE STOPS, REMOVE DC CONTROL POWER BY OPENING DC CONTROL CIRCUIT BREAKER.

EMERGENCY

PULL DC CONTROL CIRCUIT BREAKER.

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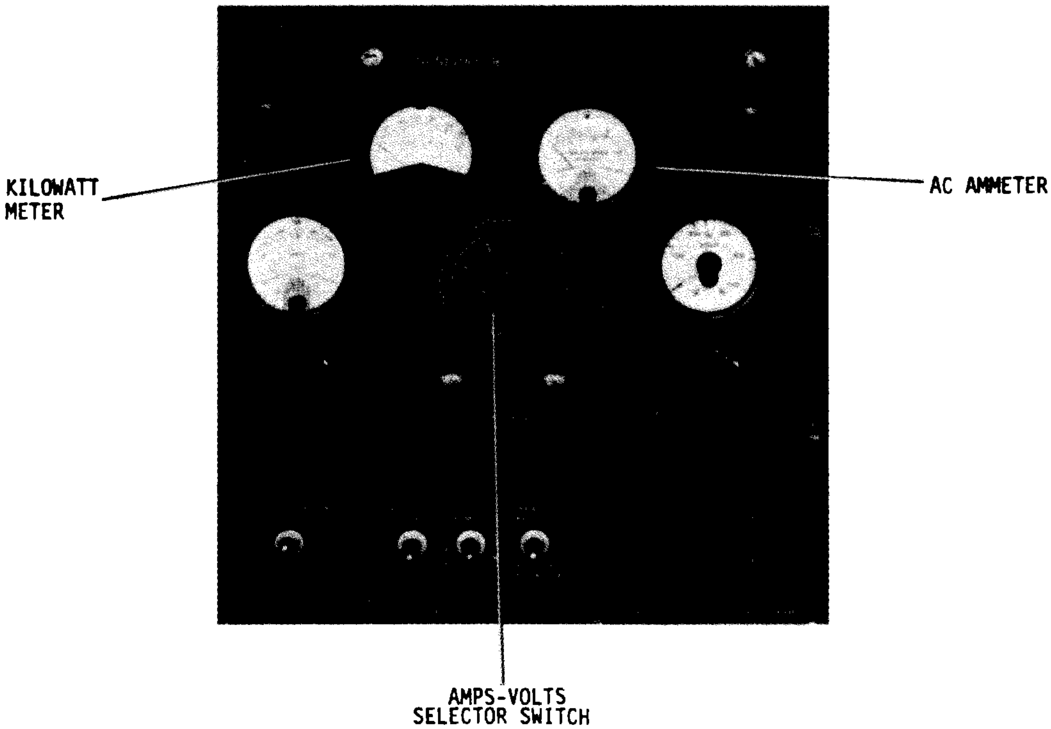
Figure 2-8. Stopping Instructions



STEP 1. PREPARE ENGINE GENERATOR SET FOR STARTING (FIG. 2-6).

STEP 2. START ENGINE GENERATOR SET (FIG. 2-7).

STEP 3. ROTATE AMPS-VOLTS SELECTOR SWITCH TO EACH PHASE POSITION WHILE OBSERVING AC AMMETER. IF MORE THAN 100% RATED CURRENT IS INDICATED IN ANY PHASE POSITION, REDUCE THE LOAD.

STEP 4. IF MORE THAN THE 100% PERCENT LOAD IS INDICATED ON THE KILOWATT METER, REDUCE THE LOAD.

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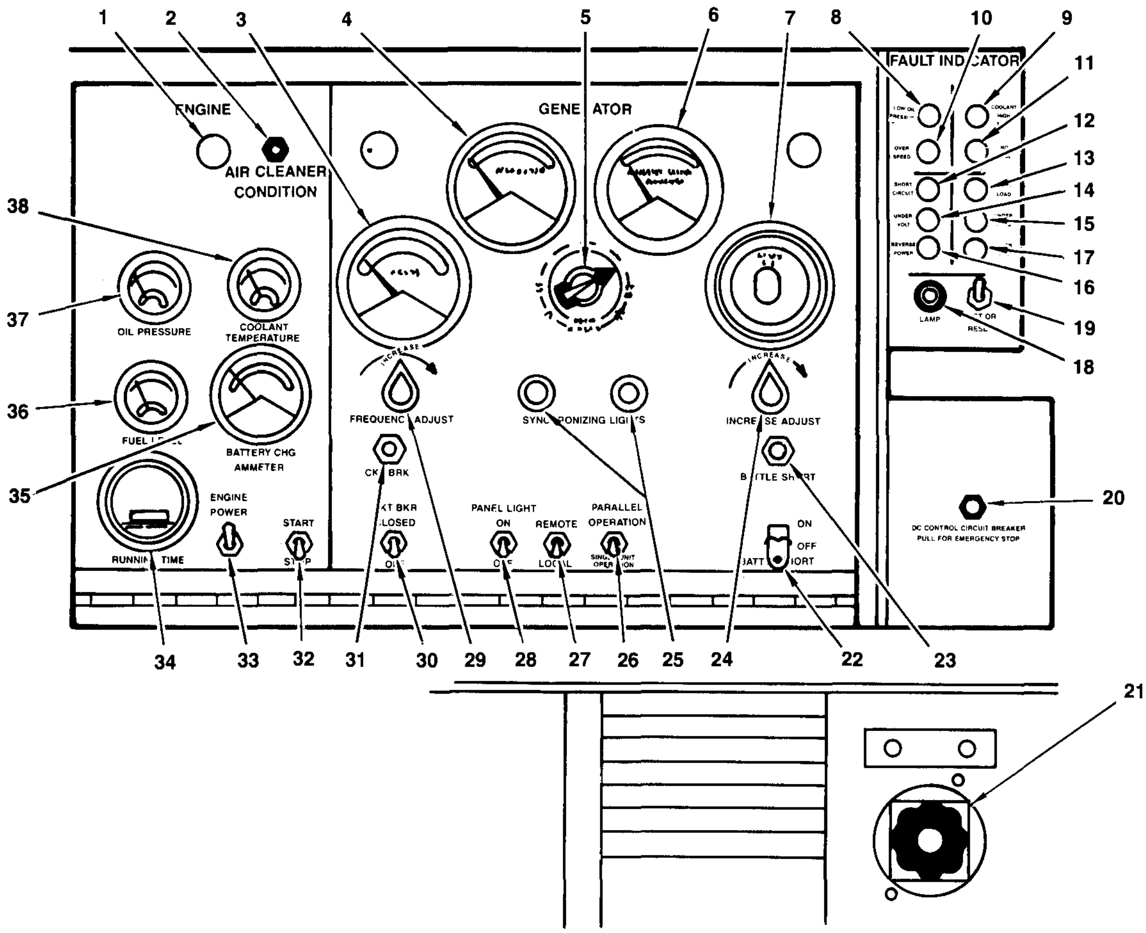
Figure 2-9. Single Generator Unit, Operating Instructions



1. Panel illumination light
2. Air cleaner condition indicator
3. Frequency meter
4. Kilowatt meter
5. Volts-amps transfer switch
6. AC ammeter
7. AC voltmeter
8. Low oil pressure indicator
9. Coolant high temperature indicator
10. Overspeed indicator
11. No fuel indicator
12. Short circuit indicator
13. Overload indicator
14. Under voltage indicator
15. Under frequency indicator
16. Reverse power indicator
17. Over voltage indicator
18. Fault location indicator fuse
19. Test or reset switch
20. DC circuit breaker
21. Manual speed control
22. Battle short switch
23. Battle short indicator
24. Voltage adjust rheostat
25. Synchronizing lights
26. Operations switch
27. Voltage sensing switch
28. Panel light switch
29. Frequency adjust rheostat
30. Circuit breaker switch
31. Circuit breaker indicator
32. Start-run-stop switch
33. Engine primer switch
34. Running time meter
35. Battery charge ammeter
36. Fuel level gauge
37. Oil pressure gauge
38. Coolant temperature gauge

Figure 2-10. Parallel Operation (Load Sharing and Load Transfer) (Sheet 1 of 5)

A - PARALLEL OPERATION (LOAD SHARING)

STEP 1. THE FIRST SET STARTED SHALL BE DESIGNATED AS “ON-LINE” AND THE SETS IN PARALLEL OPERATION SHALL BE DESIGNATED “ON-COMING.” WITH ALL SETS SHUT DOWN INSTALL THE PARALLELING CABLE AND CONNECT THE LOAD TERMINAL BOARDS AS DESCRIBED IN FIGURE 2-3A. CHECK THAT THE VOLTAGE RECONNECTION BOARDS (FIGURE 2-4) OF THE SETS ARE IDENTICALLY POSITIONED.

CAUTION

DO NOT PLACE THE CIRCUIT BREAKER SWITCH ON ANY OF THE GENERATOR SETS IN THE CLOSE POSITION UNTIL SPECIFICALLY DIRECTED TO DO SO. CLOSING THE CIRCUIT BREAKER SWITCH AT ANY OTHER TIME MAY SEVERELY DAMAGE ONE OR MORE OF THE GENERATOR SETS.

CAUTION

CHECK THAT THE MAIN POWER SWITCH (FIGURE 2-3.2) AT THE LOAD IS OPEN BEFORE ATTEMPTING TO PLACE A GENERATOR SET ON LINE.

STEP 2. START THE GENERATOR SETS AS DESCRIBED IN FIGURES 2-6 AND 2-7. DO NOT PERFORM STEP 8 OF FIGURE 2-7.

STEP 3. HOLD THE CKT BRK SWITCH (FIGURE 2-5) OF THE “ON-LINE” SET IN THE CLOSE POSITION UNTIL THE CKT BRK INDICATOR LIGHT ILLUMINATES. PLACE THE OPERATION SWITCH IN THE PARALLEL POSITION.

STEP 4. ADJUST THE VOLTAGE ON BOTH SETS TO THE REQUIRED VALUE. ADJUST THE FREQUENCY OF THE “ON-LINE” SET TO THE REQUIRED VALUE. PLACE THE OPERATION SWITCH OF THE “ON-COMING” SET IN THE PARALLEL POSITION.

NOTE

OBSERVE THE SYNCHRONIZING LIGHTS OF THE “ON-COMING” SET. THE LIGHTS SHOULD GO ON AND OFF SIMULTANEOUSLY. IF THE LIGHTS GO ON AND OFF ALTERNATELY, SETS ARE OUT OF PHASE. STOP BOTH SETS AND CORRECT INTERCONNECTION CABLES AS DESCRIBED IN (FIGuRE 2-3.1). IF THE PROBLEM PERSISTS, REFER TO NEXT HIGHER LEVEL OF MAINTENANCE.

STEP 5. ADJUST THE FREQUENCY OF THE “ON-COMING” SET A LITTLE HIGHER THAN THE “ON-LINE” SET. THEN REDUCE THE FREQUENCY SLOWLY WITH THE FREQUENCY ADJUST RHEOSTAT UNTIL THE SYNCHRONIZING LIGHTS REMAIN ON OR OFF AT 2 TO 3 SECOND INTERVALS.

STEP 6. CAREFULLY OBSERVE THE SYNCHRONIZING LIGHTS OF THE “ON-COMING” SET AND, AT THE INSTANT BOTH LIGHTS GO DARK, PLACE THE CKT BRK SWITCH OF THE “ON-COMING” SET TO THE CLOSE POSITION. WHEN THE CKT BRK INDICATOR LIGHT ILLUMINATES, THE SETS ARE OPERATING IN PARALLEL.

Figure 2-10. Parallel Operation (Load Sharing and Load Transfer) (Sheet 2 of 5)

CAUTION

THE KILOWATT METER AND AC AMMETER INDICATE PERCENTAGES AND DO NOT INDICATE TRUE KW AND AMPERE READINGS.

STEP 7. WITH NO EXTERNAL LOAD ON THE PARALLELED SETS, ADJUST THE FREQUENCY ADJUST RHEOSTAT OF THE "ON-COMING" SET UNTIL BOTH RATED LOAD METERS (KILOWATT) READ ZERO. ADJUST THE VOLTAGE ADJUST RHEOSTAT OF THE "ON-COMING SET UNTIL THE PERCENT OF RATED CURRENT METERS (AMMETERS) ON BOTH SETS READ ZERO. TURNING COUNTERCLOCKWISE WILL DECREASE READINGS.

STEP 8. APPLY LOAD TO THE SETS. THE KILOWATT LOAD SHOULD DIVIDE SO THAT THE LOAD ON EACH SET IS EQUAL. IF THE LOAD AND CURRENT ARE NOT SHARED EQUALLY, ADJUST THE VOLTAGE AND FREQUENCY RHEOSTATS OF THE "ON-COMING" SET UNTIL LOAD AND CURRENT ARE DIVIDED EQUALLY BETWEEN THE GENERATOR SETS.

STEP 9. THE CURRENT SHOULD DIVIDE SO THAT THE OBSERVED DIFFERENCE BETWEEN THE CURRENT ON ANY PHASE BETWEEN THE "ON-LINE" AND "ON-COMING" SETS IS NOT MORE THAN 20 PERCENT. IF THE READINGS ARE NOT WITHIN 20 PERCENT, NOTIFY HIGHER LEVEL MAINTENANCE.

NOTE

IF THE REVERSE POWER INDICATOR OF EITHER SET ILLUMINATES AND THE MAIN LOAD CONTACTOR OPENS, OPEN THE MAIN POWER SWITCH AND REPARALLEL THE GENERATOR SETS.

CAUTION

WHEN GENERATOR SETS ARE BEING OPERATED IN PARALLEL, ONE OR MORE OPERATORS MUST REMAIN WITH THE SETS TO MONITOR THE RATED LOAD AND CURRENT METERS.

NOTE

TWO OR MORE GENERATOR SETS CAN BE OPERATED IN PARALLEL. PARALLELING PROCEDURES-ARE THE SAME AS THOSE DESCRIBED ABOVE. ONE GENERATOR AT A TIME IS BROUGHT ON LINE.

CAUTION

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

STEP 10. TO REMOVE A GENERATOR SET FROM PARALLEL OPERATION, PLACE THE CIRCUIT BREAKER SWITCH OF THE SET IN THE OPEN POSITION. STOP THE SET AS DESCRIBED IN FIGURE 2-8.

B - PARALLEL OPERATION (LOAD TRANSFER)

THE FOLLOWING METHOD OF PARALLEL OPERATION IS TO BE USED WHEN IT IS NECESSARY TO TRANSFER THE LOAD FROM ONE SET TO THE OTHER WITHOUT INTERRUPTING POWER.

Figure 2-10. Parallel Operation (Load Sharing and Load Transfer) (Sheet 3 of 5)

NOTE

VISUALLY CHECK THAT THE POWER CABLE AND PARALLEL CABLE ARE IN ACCORDANCE WITH FIGURE 2-3B. IF THE CABLES ARE NOT ATTACHED AS INDICATED, SHUT DOWN THE “ON-LINE” SET AND FOLLOW INSTRUCTIONS IN PARAGRAPH 2-14D.

CAUTION

DO NOT ATTEMPT LOAD CONNECTS IN PARAGRAPH 2-14D UNLESS ALL SETS ARE OFF AND NO OTHER EXTERNAL VOLTAGE IS APPLIED TO THE LOAD.

STEP 1. THE SET IN OPERATION SHALL BE DESIGNATED AS “ON-LINE” AND THE SETS PLACED IN PARALLEL OPERATION SHALL BE DESIGNATED “ON-COMING.”

STEP 20 PLACE THE OPERATIONS SWITCH (FIGURE 2-5) ON BOTH SETS IN THE PARALLEL OPERATION POSITION.

CAUTION

DO NOT CLOSE THE CIRCUIT BREAKER SWITCH AFTER STARTING THE “ON-COMING” SET AS SERIOUS DAMAGE TO ONE OR BOTH GENERATOR SETS MAY RESULT.

STEP 3. REFER TO FIGURE 2-6 AND 2-7 (DO NOT PERFORM STEP 8 OF FIGURE 2-7), AND START THE “ON-COMING” SET.

STEP 4. NOTE THE VOLTAGE INDICATED ON THE “ON-LINE" SET. ADJUST THE VOLTAGE OF THE “ON-COMING" SET TO THE VOLTAGE NOTED ON THE “ON-LINE” SET.

STEP 5. ADJUST THE FREQUENCY OF THE “ON-COMING” SET TO A HIGHER VALUE THAN THAT OF THE “ON-LINE” SET.

STEP 6. SLOWLY REDUCE THE FREQUENCY OF THE “ON-COMING” SET UNTIL THE SYNCHRONIZING LIGHTS (FIGURE 2-5) FLASH AT 2 TO 3 SECOND INTERVALS.

CAUTION

DO NOT PLACE THE CIRCUIT BREAKER SWITCH OF THE “ON-COMING” SET IN THE CLOSE POSITION WHILE THE SYNCHRONIZING LIGHTS ARE LIT AS DAMAGE TO ONE OR BOTH GENERATOR SETS MAY RESULT.

STEP 7. CAREFULLY WATCH THE SYNCHRONIZING LIGHTS OF THE “ON-COMING” SET. AT THE INSTANT BOTH LIGHTS GO DARK, MOVE THE CIRCUIT BREAKER SWITCH OF THE “ON-COMING” SET TO THE CLOSE POSITION.

STEP 8. ADJUST THE VOLTAGE AND FREQUENCY RHEOSTATS OF THE “ON-COMING” SET UNTIL LOAD AND CURRENT ARE DIVIDED EQUALLY BETWEEN THE TWO GENERATOR SETS.

STEP 9. MOVE THE CIRCUIT BREAKER SWITCH OF THE “ON-LINE” SET TO THE OPEN POSITION.

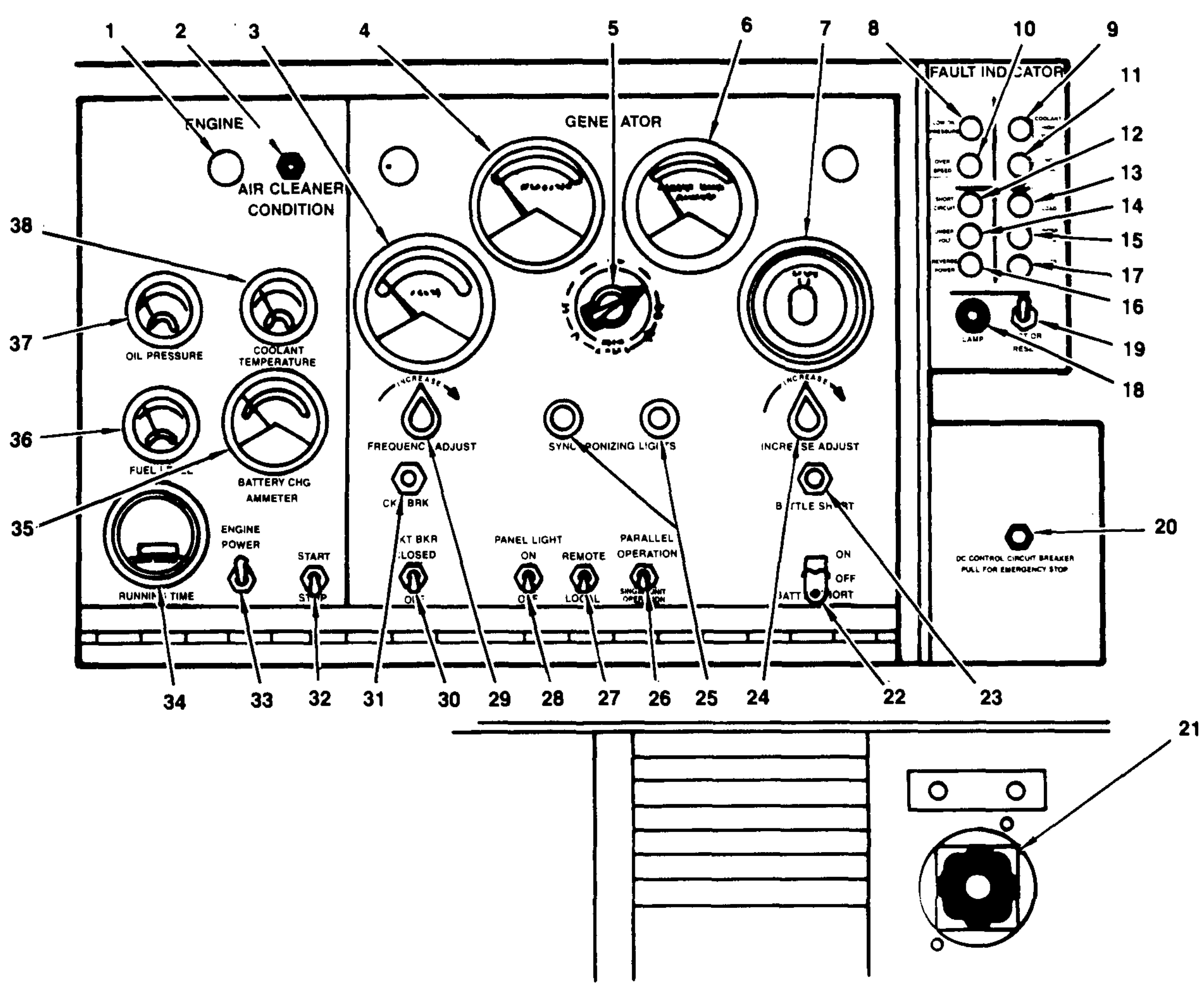
STEP 10. PLACE THE OPERATIONS SWITCH OF THE “ON-COMING” SET TO THE SINGLE UNIT OPERATION POSITION.

Figure 2-10. Parallel Operation (Load Sharing and Load Transfer) (Sheet 4 of 5)

STEP 11. READJUST VOLTAGE AND FREQUENCY OF THE “ON-COMING” SET AS NECESSARY.

STEP 12. REFER TO FIGURE 2-8 AND STOP THE “ON-LINE” SET.

Figure 2-10. Parallel Operation (Load Sharing and Load Transfer) (Sheet 5 of 5)



1. Panel illumination light
2. Air cleaner condition indicator
3. Frequency meter
4. Kilowatt meter
5. Volts-amps transfer switch
6. AC ammeter
7. AC voltmeter
8. Low oil pressure indicator
9. Coolant high temperature indicator
10. Overspeed indicator
11. No fuel indicator
12. Short circuit indicator
13. Overload indicator
14. Under voltage indicator
15. Under frequency indicator
16. Reverse power indicator
17. Over voltage indicator
18. Fault location indicator fuse
19. Test or reset switch
20. DC circuit breaker
21. Manual speed control
22. Battle short switch
23. Battle short indicator
24. Voltage adjust rheostat
25. Synchronizing lights
26. Operations switch
27. Voltage sensing switch
28. Panel light switch
29. Frequency adjust rheostat
30. Circuit breaker switch
31. Circuit breaker indicator
32. Start-run-stop switch
33. Engine primer switch
34. Running time meter
35. Battery charge ammeter
36. Fuel level gauge
37. Oil pressure gauge
38. Coolant temperature gauge

Figure 2-10A. Parallel Operation of Tactical Utility Generator Sets (Load Sharing and Load Transfer) (Sheet 1 of 4)

A - PARALLEL OPERATION OF TACTICAL UTILITY GENERATOR SETS (LOAD SHARING)

STEP 1. THE FIRST SET STARTED SHALL BE DESIGNATED AS “ON-LINE” AND THE SETS IN PARALLEL OPERATION SHALL BE DESIGNATED “ON-COMING.” WITH ALL SETS SHUT DOWN CONNECT THE LOAD TERMINAL BOARDS AS DESCRIBED IN FIGURE 2-3. CHECK THAT THE VOLTAGE RECONNECTION BOARDS (FIGURE 2-4) OF THE SETS ARE IDENTICALLY POSITIONED.

CAUTION

DO NOT PLACE THE CIRCUIT BREAKER SWITCH ON ANY OF THE GENERATOR SETS IN THE CLOSE POSITION UNTIL SPECIFICALLY DIRECTED TO DO SO. CLOSING THE CIRCUIT BREAKER SWITCH AT ANY OTHER TIME MAY SEVERELY DAMAGE ONE OR MORE OF THE GENERATOR SETS.

CAUTION

CHECK THAT THE MAIN POWER SWITCH (FIGURE 2-3.2) AT THE LOAD IS OPEN BEFORE ATTEMPTING TO PLACE A GENERATOR SET ON LINE.

STEP 2. START THE GENERATOR SETS AS DESCRIBED IN FIGURES 2-6 AND 2-7. DO NOT PERFORM STEP 8 OF FIGURE 2-7.

STEP 3. HOLD THE CKT BRK SWITCH (FIGURE 2-5) OF THE “ON-LINE” SET IN THE CLOSE POSITION UNTIL THE CKT BRK INDICATOR LIGHT ILLUMINATES. PLACE THE OPERATION SWITCH IN THE PARALLEL POSITION.

STEP 4. SET “VOLT-AMPS TRANSFER SWITCH” IN THE LI-LO POSITION. ADJUST THE VOLTAGE ADJUST RHEOSTAT UNTIL THE AC VOLTMETER INDICATES 122 VOLTS FOR THE 120/208 CONNECTION AND 244 VOLTS FOR THE 240/416 CONNECTION. ADJUST MANUAL SPEED CONTROL UNTIL THE FREQUENCY METER INDICATES 61 HERTZ. PLACE THE OPERATION SWITCH OF THE “ON-COMING” SET IN THE PARALLEL POSITION.

NOTE

OBSERVE THE SYNCHRONIZING LIGHTS OF THE “ON-COMING” SET. THE LIGHTS SHOULD GO ON AND OFF SIMULTANEOUSLY IF THE LIGHTS GO ON AND OFF ALTERNATELY, SETS ARE OUT OF PHASE. STOP BOTH SETS AND CORRECT INTERCONNECT CABLES (FIGURE 2-3.1). IF PROBLEM PERSISTS, REFER TO NEXT HIGHER LEVEL OF MAINTENANCE.

STEP 5. ADJUST THE MANUAL SPEED CONTROL OF THE “ON-COMING” SET UNTIL THE SYNCHRONIZING LIGHTS, SIMULTANEOUSLY, REMAIN ON OR OFF AT 2 TO 3 SECOND INTERVALS.

STEP 6. CAREFULLY OBSERVE THE SYNCHRONIZING LIGHTS OF THE “ON-COMING” SET AND, AT THE INSTANT BOTH LIGHTS GO DARK, PLACE THE CKT BRK SWITCH OF THE “ON-COMING” SET TO THE CLOSE POSITION. WHEN THE CKT BRK INDICATOR LIGHT ILLUMINATES, THE SETS ARE OPERATING IN PARALLEL.

Figure 2-10A. Parallel Operation of Tactical Utility Generator Sets (Load Sharing and Load Transfer) (Sheet 2 of 4)

STEP 7. WITH NO EXTERNAL LOAD ON THE PARALLELED SETS, ADJUST THE MANUAL SPEED CONTROL OF THE "ON-COMING" SET UNTIL BOTH PERCENT POWER METERS (KILOWATT) INDICATE ZERO. ADJUST THE VOLTAGE ADJUST RHEOSTAT OF THE "ON-COMING" SET UNTIL THE PERCENT OF RATED CURRENT METERS (AMMETERS) ON BOTH SETS INDICATE ZERO. TURNING COUNTERCLOCKWISE WILL DECREASE READINGS.

STEP 8. APPLY LOAD TO THE SETS. THE KILOWATT LOAD SHOULD DIVIDE SO THAT THE LOAD ON EACH SET IS EQUAL. IF THE LOAD AND CURRENT ARE NOT SHARED EQUALLY, ADJUST THE LOAD BY OBSERVING THE SET WHICH HAS THE HIGHER READING ON THE KILOWATT METER. DECREASE THE ENGINE SPEED OF THIS SET BY ADJUSTING COUNTERCLOCKWISE THE MANUAL SPEED CONTROL IN SMALL INCREMENTS. INCREASE THE ENGINE SPEED OF THE SET WITH THE LOWER KILOWATT READING BY ADJUSTING CLOCKWISE THE MANUAL SPEED CONTROL IN SMALL INCREMENTS. ADJUSTMENTS SHOULD BE MADE BETWEEN BOTH SETS UNTIL THE KILOWATT METERS ARE BALANCED.

STEP 9. THE CURRENT SHOULD DIVIDE SO THAT THE OBSERVED DIFFERENCE BETWEEN THE CURRENT ON ANY PHASE BETWEEN THE "ON-LINE" AND "ON-COMING" SETS IS NOT MORE THAN 20 PERCENT. IF THE READINGS ARE NOT WITHIN 20 PERCENT, NOTIFY HIGHER LEVEL MAINTENANCE.

CAUTION

WHEN GENERATOR SETS ARE BEING OPERATED IN PARALLEL, ONE OR MORE OPERATORS MUST REMAIN WITH THE SETS TO MONITOR THE RATED LOAD AND CURRENT METERS. MAKE FURTHER ADJUSTMENTS AS REQUIRED TO MAINTAIN EQUAL LOAD ON THE PARALLELED SETS.

CAUTION

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

STEP 10. TO REMOVE A GENERATOR SET FROM PARALLEL OPERATION, PLACE THE CIRCUIT BREAKER SWITCH OF THAT SET IN THE OPEN POSITION. STOP THE SET AS DESCRIBED IN FIGURE 2-8.

B - PARALLEL OPERATION (LOAD TRANSFER)

THE FOLLOWING METHOD OF PARALLEL OPERATION IS TO BE USED WHEN IT IS NECESSARY TO TRANSFER THE LOAD FROM ONE SET TO THE OTHER WITHOUT INTERRUPTING POWER.

NOTE

VISUALLY CHECK THAT THE POWER CABLE AND PARALLEL CABLE ARE IN ACCORDANCE WITH FIGURE 2-3.2. IF THE CABLES ARE NOT ATTACHED AS INDICATED, SHUT DOWN THE "ON-LINE" SET AND FOLLOW INSTRUCTIONS IN PARAGRAPH 2-14D.

CAUTION

DO NOT ATTEMPT LOAD CONNECTS IN PARAGRAPH 2-14D UNLESS ALL SETS ARE OFF AND NO OTHER EXTERNAL VOLTAGE IS APPLIED TO THE LOAD.

Figure 2-10.1. Parallel Operation of Tactical Utility Generator Sets (Load Sharing and Load Transfer) (Sheet 3 of 4)

STEP 1. THE SET IN OPERATION SHALL BE DESIGNATED AS "ON-LINE" AND THE SETS PLACED IN PARALLEL OPERATION SHALL BE DESIGNATED "ON-COMING."

STEP 2. PLACE THE OPERATIONS SWITCH (FIGURE 2-5) ON BOTH SETS IN THE PARALLEL OPERATION POSITION.

CAUTION

DO NOT CLOSE THE CIRCUIT BREAKER SWITCH AFTER STARTING THE "ON-COMING" SET AS SERIOUS DAMAGE TO ONE OR BOTH GENERATOR SETS MAY RESULT.

STEP 3. REFER TO FIGURE 2-6 AND 2-7 (DO NOT PERFORM STEP 8 OF FIGURE 2-7), AND START THE "ON-COMING" SET.

STEP 4. NOTE THE VOLTAGE INDICATED ON THE "ON-LINE" SET. ADJUST THE VOLTAGE OF THE "ON-COMING" SET TO THE VOLTAGE NOTED ON THE "ON-LINE" SET.

STEP 5. ADJUST THE FREQUENCY OF THE "ON-COMING" SET TO A HIGHER VALUE THAN THAT OF THE "ON-LINE" SET.

STEP 6. SLOWLY REDUCE THE FREQUENCY OF THE "ON-COMING" SET UNTIL THE SYNCHRONIZING LIGHTS FLASH AT 2 TO 3 SECOND INTERVALS.

CAUTION

DO NOT PLACE THE CIRCUIT BREAKER SWITCH OF THE "ON-COMING" SET IN THE CLOSE POSITION WHILE THE SYNCHRONIZING LIGHTS ARE LIT AS DAMAGE TO ONE OR BOTH GENERATOR SETS MAY RESULT.

STEP 7. CAREFULLY WATCH THE SYNCHRONIZING LIGHTS OF THE "ON-COMING" SET. AT THE INSTANT BOTH LIGHTS GO DARK, MOVE THE CIRCUIT BREAKER SWITCH OF THE "ON-COMING" SET TO THE CLOSE POSITION.

STEP 8. ADJUST THE VOLTAGE AND FREQUENCY RHEOSTATS OF BOTH SETS UNTIL LOAD AND CURRENT ARE DIVIDED EQUALLY BETWEEN THE TWO GENERATOR SETS,AS EXPLAINED IN FIGURE 2-10.1, PARAGRAPH A, STEPS 7 AND 8.

STEP 9. MOVE THE CIRCUIT BREAKER SWITCH OF THE "ON-LINE" SET TO THE OPEN POSITION.

STEP 10. PLACE THE OPERATIONS SWITCH OF THE "ON-COMING" SET TO THE SINGLE UNIT OPERATION POSITION.

STEP 11. READJUST VOLTAGE AND FREQUENCY OF THE "ON-COMING" SET AS NECESSARY.

STEP 12. REFER TO FIGURE 2-8 AND STOP THE "ON-LINE" SET.

Figure 2-10.1. Parallel Operation of Tactical Utility Generator Sets (Load Sharing and Load Transfer) (Sheet 4 of 4)

the period of time required to obtain two consecutive water temperature readings of 160° F minimum, taken at a 15-minute interval. Then continue to operate engine for 30 minutes. Check and correct any coolant or oil leaks.

c. Stop engine as shown in figure 2-8. If the accumulated hours of operation during the above exercise periods do not total 300 hours (recommended lube filters and lubricating oil change period) during a six-month period, it is recommended that the filters and lubricating oil be changed (para 3-4). If the accumulated hours of operation during the above exercise periods do not total 100 hours (recommended fuel filter change period) during a 12-month period, it is recommended that the fuel filter element be replaced (para 3-160).

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-16. Operation in Extreme Cold (Below- 25°F).

a. General. The engine generator set is designed to operate in temperatures down to - 25°F without winterization equipment. To operate successfully at temperatures below -25° F, the engine must be heated by integrally mounted electric winterization heating equipment (fig. 2-12) which receives auxiliary power from an external source or by a fuel burning winterization system (fig. 2-11). Operate fuel burning winterization system for 55 minutes or until fuel burning winterization system cycles off. Operate electric winterization for 5 hrs.

b. Fuel System. Keep the fuel tank as full as possible to prevent condensation of moisture. Be sure the proper grade of fuel is used for existing temperatures. Service the fuel filters and strainers (para 3-34b) more frequently than normal. Remove ice, snow, and moisture from the filler cap and filler neck. At end of day's operation, drain water from fuel tank (fig. 3-7) and from the fuel filters (para 3-56).

c. Engine Electrical System. Clean the batteries and cables and inspect for cracked or damaged cases. Be sure the battery terminals are tight, clean, and lightly greased. See that the battery cap vent holes are open. The electrolyte level must be 3/8 inch above the plates. To prevent the batteries from freezing, see that they are kept fully charged. Inspect all electrical wiring for cracks, breaks, and fraying. Tighten loose connections.

NOTE

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

d. Lubrication. Lubricate the engine generator set in accordance with instructions in paragraphs 3-3 and 3-4.

e. Cooling System. Inspect the level of the coolant in the radiator. Inspect the cooling system for leaks, aying particular attention to gaskets and hose connections. Verify that antifreeze mixture is in accordance with table 2-1.

f. Air Cleaner. Refer to paragraph 3-32 for proper maintenance of air cleaner.

2-17. Operation in Extreme Heat (up to + 125° F).

a. Keep the cooling system free from rust and scale. If necessary, add an approved rust inhibitor. Keep cooling system filled with clean, approved coolant. Avoid, if possible, the use of alkaline water or salt water, which cause the accumulation of rust and scale. Inspect the belts for proper adjustment. Be sure that the engine generator set is free of dust and dirt. Check for obstructions in the cooling fins of the radiator and make sure shutter controls are operating properly.

b. Lubricate the engine in accordance with the instructions in paragraph 3-3 and 3-4.

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

d. Inspect battery electrolyte level daily. The plates should be covered with 3/8 inch of water. Add water if necessary.

WARNING

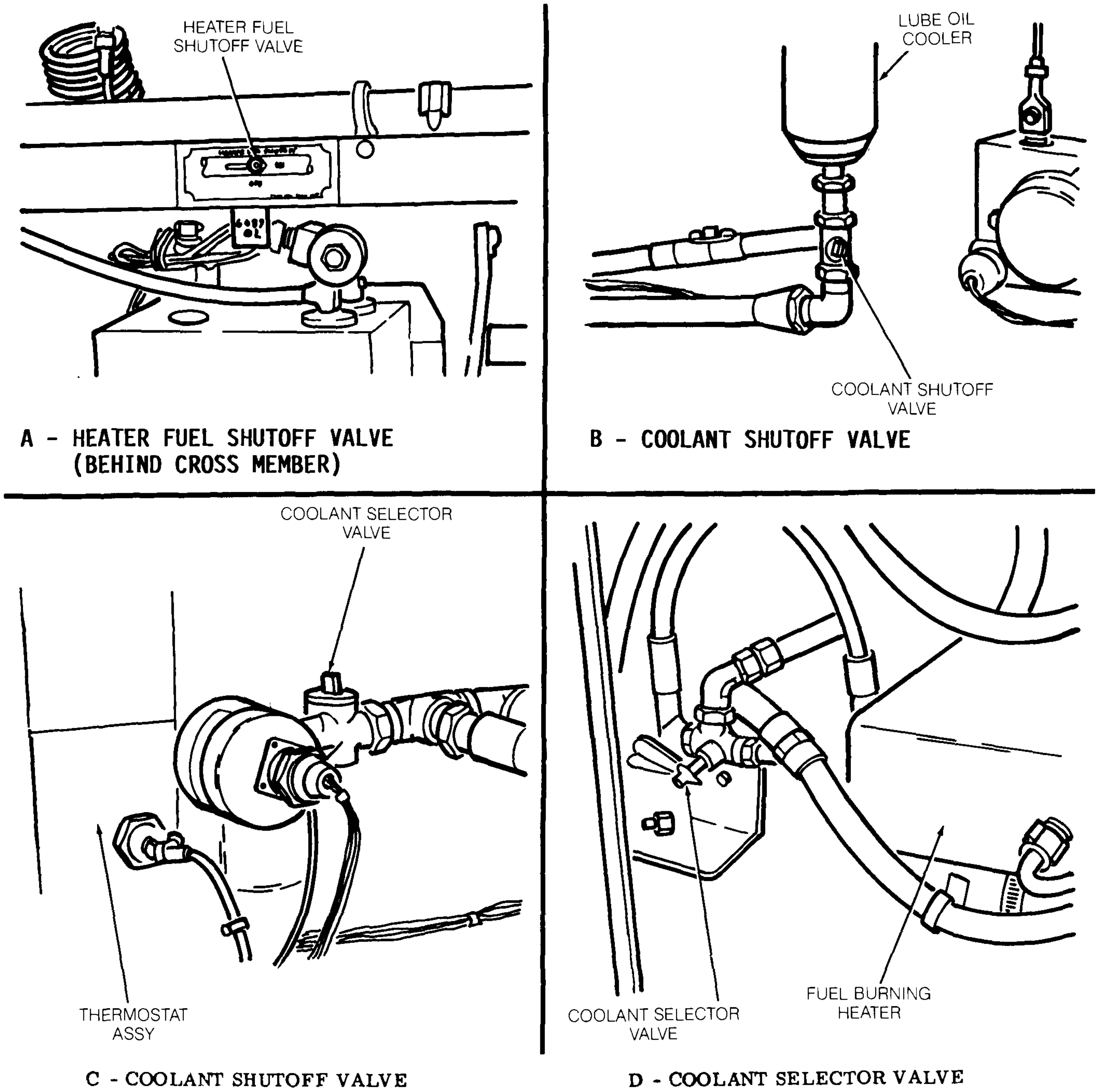
Exhaust discharge contains noxious and deadly fumes. Do not operate generator sets in inclosed areas unless exhaust discharge is properly vented to the outside.

e. Check that the engine generator set is free of air-flow restrictions. When operating indoors, make provisions for adequate ventilation and the venting of exhaust fumes to the outside. To prevent excessive back pressure, it is recommended that an exhaust extension of flexible tubing be no longer than 20 feet (maximum).

f. Keep external surface of engine clean.

g. The unit should be allowed to run at no load to allow the engine to cool prior to shutdown.

2-18. Operation in Dusty or Sandy Areas.



NOTE

ELECTRIC AND FUEL BURNING WINTERIZATION KITS CAN NOT BE OPERATED SIMULTANEOUSLY.

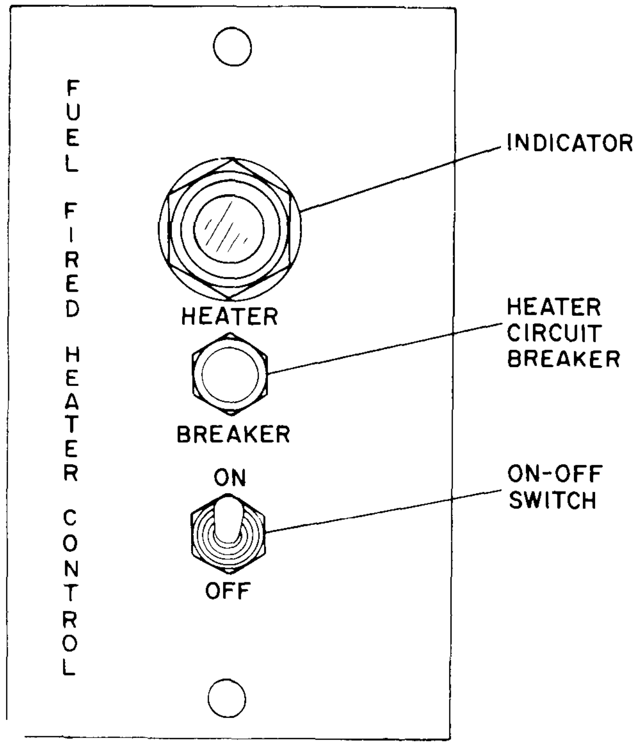
STARTING

STEP 1. CHECK FUEL SUPPLY AND TURN MANUAL HEATER FUEL SHUT-OFF VALVE (A) TO ON

STEP 2. OPEN BOTH COOLANT SHUTOFF VALVES LOCATED NEXT TO LUBE OIL COOLER (B) AND THERMOSTAT ASSEMBLY (C).

STEP 3. OPEN COOLANT SELECTOR VALVE (D) BY PLACING HANDLE (IN 3-O'CLOCK POSITION) POINTING TOWARDS FUEL BURNING HEATER.

Figure 2-11. Fuel Burning Winterization Kit Operating Instructions (Sheet 1 of 2)



E -HEATER CONTROL PANEL

STEP 4. PRESS HEATER CIRCUIT BREAKER AND PRESS THE PRESS-TO-TEST INDICATOR, INDICATOR LAMP SHALL LIGHT.

STEP 5. SET ON - OFF SWITCH TO ON. INDICATOR LAMP SHALL LIGHT WHEN HEATER GOES INTO RUN CYCLE (APPROXIMATELY THREE MINUTES). OPERATE HEATER FOR 50 MINUTES OR UNTIL CYCLE OPERATION OCCURS AS INDICATED BY EXTINGUISHING OF INDICATOR LAMP.

NOTE

IF INDICATOR LAMP DOES NOT LIGHT IN APPROXIMATELY FOUR MINUTES, SET ON-OFF SWITCH TO OFF. WAIT THREE MINUTES BEFORE ATTEMPTING TO RESTART HEATER.

STOPPING

STEP 1. SET ON-OFF SWITCH TO OFF. INDICATOR LAMP SHALL REMAIN ILLUMINATED UNTIL HEATER COMPLETE PURGE CYCLE (APPROXIMATELY 4-1/2 MINUTES).

STEP 2. AFTER INDICATOR LAMP EXTINGUISHES, REENERGIZE BREAKER.

STEP 3. CLOSE BOTH COOLANT SHUTOFF VALVES (B AND C).

STEP 4. TURN MANUAL HEATER FUEL VALVE TO OFF.

STEP 5. PLACE COOLANT SELECTOR VALVE (D) HANDLE (IN 9-O'CLOCK POSITION) POINTING DIRECTLY AWAY FROM FUEL BURNING HEATER.

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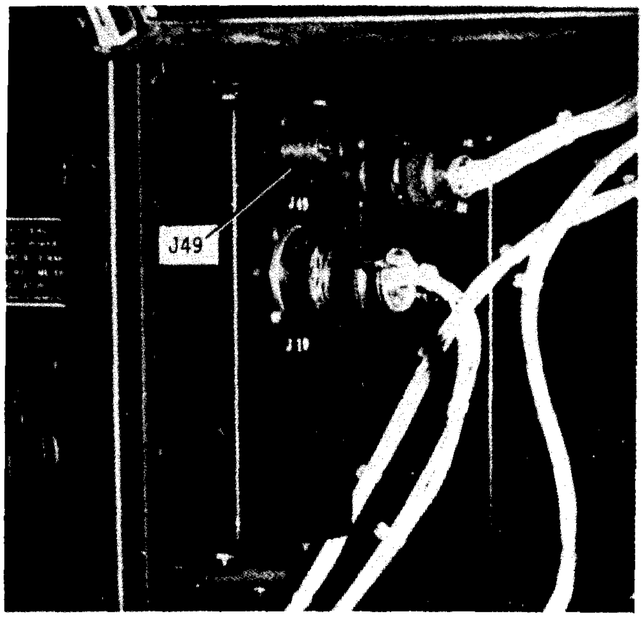
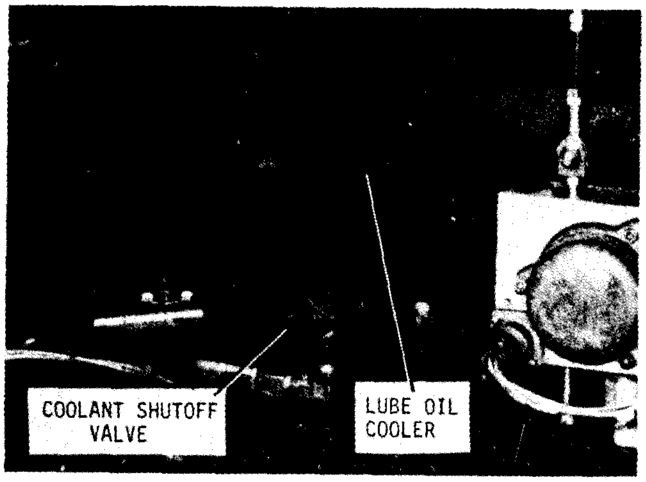
Figure 2-11. Fuel Burning Winterization Kit Operating Instructions (Sheet 2 of 2)

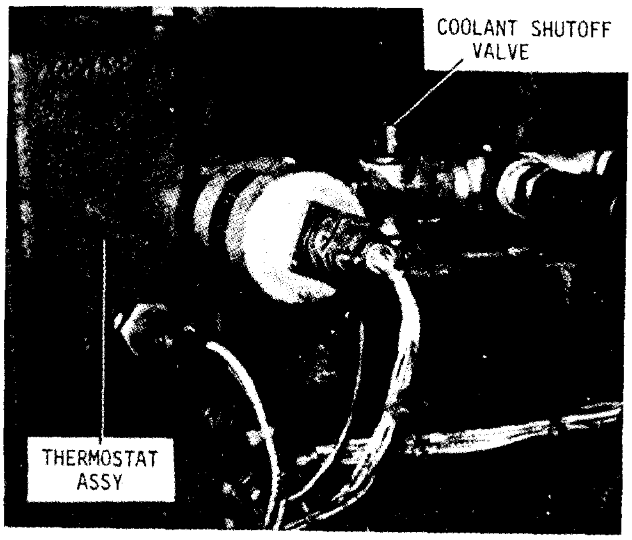


A - RECEPTACLE J49

B -COOLANT SELECTOR VALVE



C - SHUTOFF VALVE



D - SHUT OFF VALVE

STARTING

NOTE

ELECTRIC AND FUEL WINTERIZATION KITS CAN NOT BE OPERATED SIMULTANEOUSLY.

STEP 1. INSURE THAT A 205-240 VOLT, 50/60 OR 400 HZ, SINGLE PHASE SOURCE OF EXTERNAL POWER TO ELECTRIC WINTERIZATION KIT RECEPTACLE 49 (A) HAS BEEN CONNECTED,

STEP 2. PLACE COOLANT SELECTOR VALVE (B) HANDLE (IN 12-0'CLOCK POSITION) POINTING STRAIGHT UP.

STEP 3. OPEN BOTH COOLANT SHUTOFF VALVES (C & D) LOCATED NEXT TO LUBE OIL COOLER AND THERMOSTAT ASSEMBLY.

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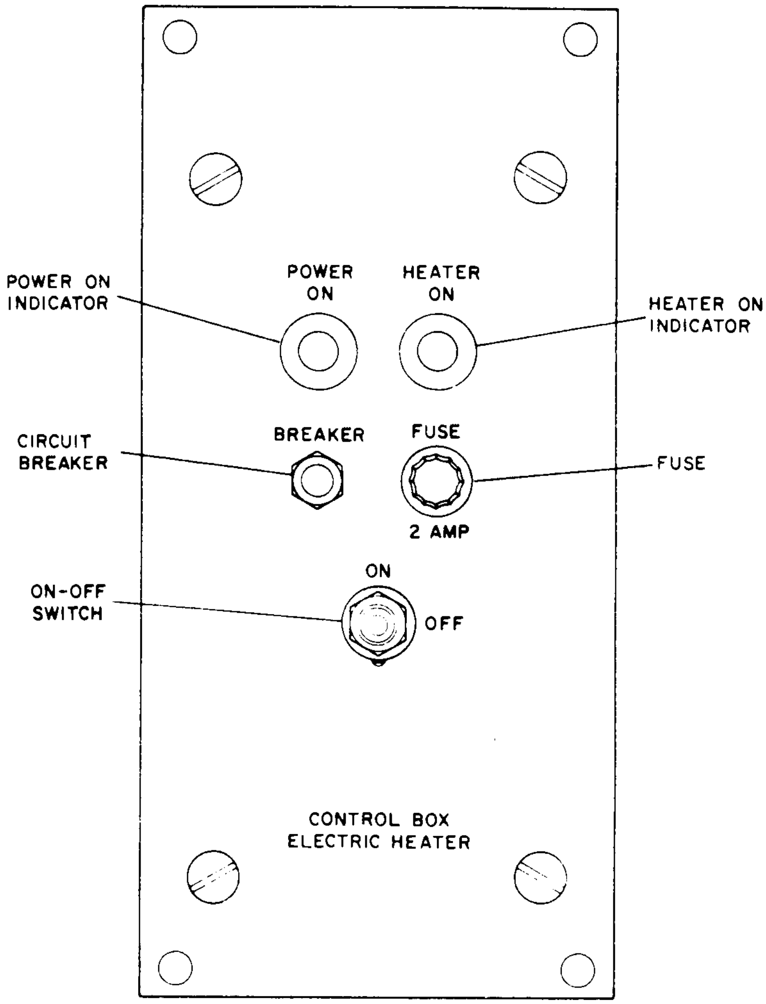
Figure 2-12. Electric Winterization Kit, Operating Instructions (Sheet 1 of 2)



E - ELECTRIC HEATER CONTROL BOX

STEP 4. CLOSE CIRCUIT BREAKER (E) AND SET ON-OFF SWITCH TO ON, CHECK THAT POWER ON AND HEATER ON INDICATORS LIGHT.

STEP 5. COOLANT IS NOW BEING HEATED AND PUMP IS OPERATING.

STOPPING

STEP 1. SET ON-OFF SWITCH TO OFF AND OPEN CIRCUIT BREAKER. POWER ON AND HEATER ON INDICATORS SHOULD BE EXTINGUISHED.

STEP 2. PLACE COOLANT SELECTOR VALVE (A) HANDLE (IN 9-O'CLOCK POSITION) POINTING DIRECTLY AWAY FROM FUEL BURNING HEATER.

Figure 2-12. Electric Winterization Kit. Operating Instructions (Sheet 2 of 2)

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

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

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

2-19. Operation Under Rainy or Humid Conditions.

Keep the fuel tank full to prevent forming of condensation. During dry periods when the set is not operating, open the doors and allow the set to dry out. Drain water and sediment from fuel tank (fig. 3-7) more frequently,

2-20. Operation in Salt Water Areas.

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

b. Remove rust or other corrosion and paint all damaged preprinted surfaces in accordance with services requirements.

2-21. Operation at High Altitudes.

The engine generator set will operate at elevations up to 5,000 feet above sea level without special adjustment or reduction in load. At 8, 000 feet above sea level, the 50/60 kw rating is reduced to 45 54 kw. Since higher altitudes also increase the possibility of freezing, the coolant antifreeze protection should be checked (table 2-1) and the batteries should be tested (paragraph 3-82 b). A reduction in the load may be also be necessary since engines are more likely to overheat at high altitudes.

2-22. Operation in Snow.

Keep the fuel tank full to prevent forming of condensation. Drain water and sediment from fuel tank (fig. 3-7) more frequently. Check coolant antifreeze protection (table 2-1) and test the batteries (para 3-82b). Insure that drifting snow does not obstruct normal cooling air flow.

2-23. Control Cubicle Removal for Remote Operation.

The set is designed for operation with the control panel located up to 500 feet from the set.

If a remote location is desired, prepare a suitable location for mounting the panel. Disconnect and remove wiring harness (1, Fig. 3-17) and control cubicle assembly (7). Fabricate a new cable of required length using wire compatible with the connectors P1 and P2.

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

2-24. General.

This section contains operating instructions for all kits and auxiliary equipment. Included are the fuel burning winterization kit, electric winterization kit, wheel mounting kit, and load bank.

2-25. Fuel Burning Winterization Kit.

The fuel burning winterization kit is utilized to preheat engine coolant and lubricating oil in extreme cold weather. The fuel burning winterization kit is installed as described in paragraph 4-4. In ambient temperature of -65° F, the kit should be placed in operation a minimum of 55 minutes prior to starting. Operating time may be reduced or increased for warmer or colder temperatures, respectively. Operating instructions for the fuel burning winterization kit are shown in figure 2-11.

2-26. Electrical Winterization Kit.

The electrical winterization kit consists of a heat exchanger, control box, coolant pump, thermostat and accessories. The primary purpose of the kit is to maintain the set in a heated condition, at any ambient temperature from 125° F. to -65° F. to enable it to accept 75% of rated load in one step within 20 seconds after starting action is initiated. The coolant temperature is thermostatically controlled at 130° F. to 150° F.

The kit can also be used to warm the Generator Set for initial starting within 5 hours at any ambient temperature down to -65°F.

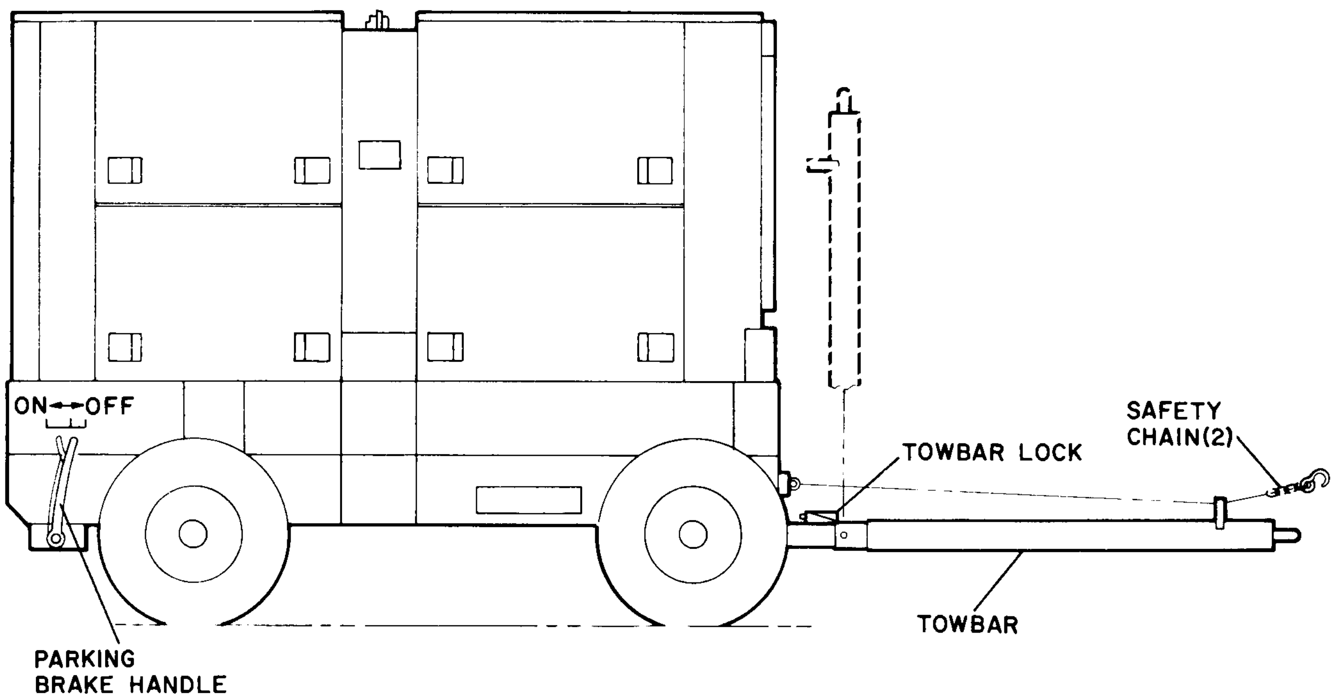
Power for operation of the kit may be obtained from any power source that supplies 205 to 240 volts at 50, 60 or 400 Hz single phase. For electrical winterization kit operating instructions refer to Fig. 2-12.

2-27. Wheel Mounting Kit.

The wheel mounting kit provides a means of mobility for the generator set. The maximum towing speed is 5 mph on paved surfaces. Operation of the wheel mounting kit is illustrated in figure 2-13.

2-28. Load Bank.

The load bank provides up to 50% of the rated load of the generator set to compensate for underrated loads. Operating instructions for the load bank are illustrated in figure 2-14.



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

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

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

STEP 4. RAISE TOWBAR UNTIL TOWBAR LOCK ENGAGES.

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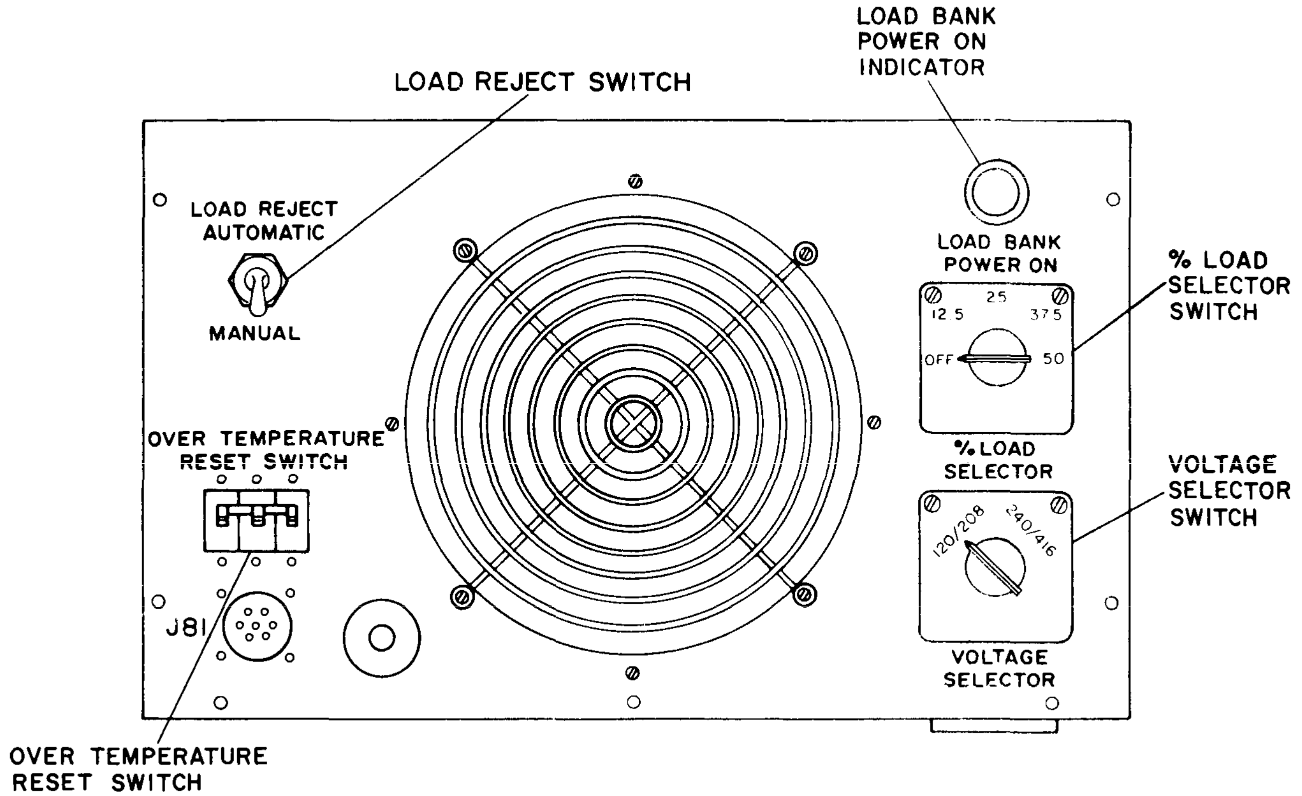
Figure 2-13. Wheel Mounting Kit Operation



STEP 1. INSURE THAT VOLTAGE SELECTOR SWITCH ON LOAD BANK CONTROL PANEL IS COMPATIBLE WITH THAT SHOWN ON RECONNECTION PANEL.

CAUTION

FAILURE TO PERFORM STEP 2 MAY RESULT IN DAMAGE TO THE LOAD BANK.

STEP 2. SET PERCENT OF LOAD SELECTOR SWITCH TO OFF POSITION.

STEP 3. SET LOAD REJECT SWITCH TO AUTOMATIC OR MANUAL POSITION FOR MODE OF OPERATION. IN AUTOMATIC MODE, LOAD BANK IS DISCONNECTED FROM GENERATOR OUTPUT WHEN COMBINED OUTPUT EXCEEDS 30 KW. IN MANUAL MODE, OPERATOR MUST MONITOR KILOWATT METER (FIG. 2-5) AND REDUCE % LOAD SELECTOR SETTING WHEN COMBINED OUTPUT EXCEEDS 30 KW

STEP 4. ACTUATE OVER TEMPERATURE RESET SWITCH. OVER TEMPERATURE RESET SWITCH OPENS AUTOMATICALLY DISCONNECTING LOAD BANK, WHEN AN OVER-TEMPERATURE CONDITION EXISTS IN THE LOAD BANK OR AN AUTOMATIC LOAD REJECT CONDITION (STEP 3) EXISTS.

STEP 5. CHECK THAT LOAD BANK POWER ON INDICATOR LIGHTS, INDICATING THAT AC POWER IS BEING APPLIED TO THE LOAD BANK.

STEP 6. SET % LOAD SELECTOR SWITCH TO POSITION REQUIRED TO OBTAIN DESIRED INTERNAL LOAD TO BE APPLIED TO GENERATOR OUTPUT. LOADS IN 1/4 INCREMENTS UP TO A MAXIMUM OF 50 PERCENT ARE AVAILABLE.

STEP 7. LOAD BANK OPERATION MAY BE TERMINATED BY PLACING % LOAD SELECTOR SWITCH TO OFF POSITION OR BY SETTING OVER TEMPERATURE RESET SWITCH TO DOWN POSITION.

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Figure 2-14. Load Bank, Operating Instructions.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

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

3-1. Tools and Equipment.

a. Basic Issue (Army). Tools and repair parts issued with or authorized for use with the engine generator set are listed in the basic issue items list, Appendix B of this manual.

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

3-2. Organizational Maintenance Repair Parts (Army).

Organizational maintenance repair parts are listed and illustrated in the publications listed in Appendix A.

Section II. LUBRICATION

3-3. General Lubrication Information.

WARNING

To avoid accidental engine cranking or startup, set CKT BRK switch (fig. 2-5) to OPEN position and disconnect cable from battery negative terminal, prior to servicing the engine generator set. Reconnect cable at completion of service procedures.

a. This paragraph contains a reproduction of the lubrication order and lubrication instructions which are supplemental to, and not 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 DA Pam 310-4 (Army) for the current LO.

c. The oil level gage (fig. 3-2) is the shielded type which allows the operator to check oil level while the engine is either stopped or running. The gage is stamped on both sides to indicate two different oil level locations. The engine RUNNING side is stamped ADD, FULL, and RUNNING. The engine STOPPED side is stamped ADD, FULL, and STOPPED.

CAUTION

Use appropriate ADD and FULL marks depending upon whether the engine is stopped or running.

d. The engine cannot be operated safely when the oil level has dropped to the add mark on the oil level gage, oil must be added to raise its level to the full mark. When oil level is at the full mark, the proper amount of oil is in the crankcase. Never fill crankcase above full marks.

e. A seal in the oil level gage cap prevents oil from leaking to the outside of the engine and foreign material from entering. For these reasons, the gage must be kept tight on the level gage adaptor. Each time oil is changed, inspect the seal to make certain it is in good condition.

f. The purpose of the breather tubes 2, 6, & 8, fig. 3-12.1) is to vent the inside of the engine thus preventing pressure buildup and removing harmful vapors from the crankcase , gear train, and valve compartment . Fumes are redirected into the air intake system and burned in the combustion of the engine. If the tubes become clogged, vapors are trapped within the engine, and pressure buildup could force oil past crankcase seals, oil level gauge or cylinder head cover gasket.

3-4. Detailed Lubrication information.

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

NOTE

When changing oil, drain valve must be open to drain crankcase and closed before refilling.

(1) Lubricating oil must be in accordance with the requirements of figure 3-1. Keep oil free of water and abrasives by proper handling and storage.

(2) Before each period of operation, check oil level in the crankcase. If necessary, add oil to bring level to full mark on the oil level gage, Inspect engine for evidence of oil leaks and make necessary repairs.

(3) After each operation interval of 100 hours,

LUBRICATION ORDER
LI-00038G-12

LO5-6115-545-12

(Supersedes LO5-6115-545-12, Dated 5 December 1975)

GENERATOR SET, DIESEL DRIVEN, 60 KW, 120/208-240/416V, 3 PHASE, 4 WIRE, 50-60 HERTZ, SKID MOUNTED, (TACTICAL UTILITY) NSN 6115-00-118-1243 AND (TACTICAL PRECISE) NSN 6115-00-118-1252 AND GENERATOR SET, DIESEL DRIVEN, 60 KW, 120/208-240/416V, 3 PHASE, 4 WIRE, 400 HERTZ, SKID MOUNTED, (TACTICAL PRECISE) NSN 6115-00-118-1253

Reference, TM5-6115-545-12 and C9100-IL

Hard time intervals and the related task-hour times are based on normal operation. The task-hour time specified is the time you need to do all the services prescribed for a particular interval. Change the interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer-than-usual operating hours. The interval may be extended, during periods of low activity. If extended adequate preservation precautions must be taken.

On-condition (OC) intervals for oil changes shall be determined by the Army Oil Analysis Program (AOAP) laboratory and shall be applied unless otherwise notified.

Hard time oil change intervals will be applied in the event AOAP laboratory support is not available.

Clean fittings before lubricating. Lubricate points indicated by dotted arrow shaft on both sides of equipment. Clean parts with drycleaning SOLVENT (SD), type II or equivalent. Dry before lubricating. Drain crankcase when HOT. Fill and check level. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following: (C) Operator/Crew; or (O) Organizational Maintenance.

You can help improve this publication. If you find any mistake or if you know of a way to improve the procedures, please let us know. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed directly to: Commander, US Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Blvd, St. Louis, MO 63120-1798. A reply will be furnished to you.

LUBRICANT ● INTERVAL

Hydraulic Filter (O) (See notes 5 & 6) — 1000

Hydraulic Sump Sight Gage (C) (check level) (See note 5) — 100

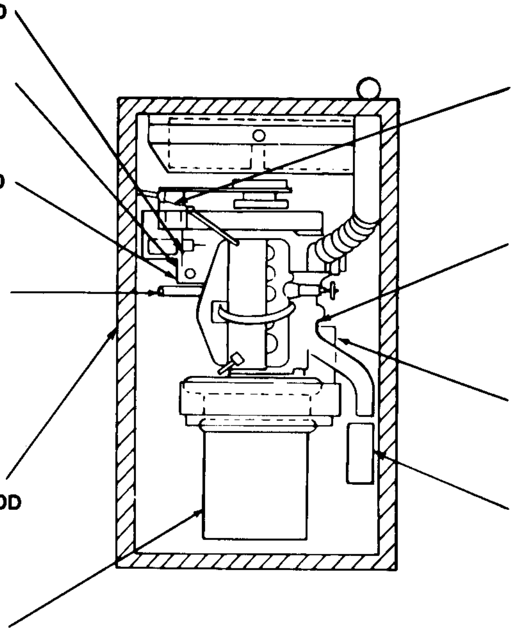
Hydraulic Sump Fill and Drain Plugs (O) (Drain and fill) (See key & note 5) — OHA 1000

Crankcase Oil Fill Cap and Level Gage (C) (check level) (See key & note 4) — OE/HDO 8

CAUTION: When OEA oil is used, check level more often.

Engine Oil Drain (O) on-condition AOAP analysis (Drain and fill) (See notes 7 & 8) — OC 50 or 60D

Main Generator (Sealed bearings; no lubrication required)



INTERVAL ● LUBRICANT

Engine Accessory Alternator (Sealed bearings; no lubrication required)

OC 300 or 6M — Oil Filters (O) AOAP analysis (Disassemble, clean, and replace elements) (See notes 3, 7, & 8)

Starter (Sealed bearings; no lubrication required)

Air Cleaner, Dry Type (No lubrication required)

Figure 3-1. Lubrication Order (Sheet 1 of 2)

*The time specified is the time required to perform all services at the particular interval (On-condition or hard time).

*TOTAL TASK-HR		*TOTAL TASK-HR	
INTERVAL	TASK-HR	INTERVAL	TASK-HR
8	0.1	50H or 60D	0.6
100	0.1	1000	1.0

-KEY-

LUBRICANTS		CAPACITY	EXPECTED TEMPERATURES			For arctic operation refer to FM 9-207	INTERVALS
			ABOVE +32°F (ABOVE 0°C)	+40°F TO -10°F (+5°C TO -23°C)	0°F TO -65°F (-18°C TO -50°C)		
OE/HDO (MIL-L-2104C)	LUBRICATING OIL, Engine		OE/HDO 30	OE/HDO 10	OEA		Intervals given are in hours of normal operation
	Engine Crankcase with Filters	26 qts (29.5L)					
	Oil Can Points						
OEA (MIL-H-46167)	LUBRICATING OIL, Engine, Subzero						
OHA (MIL-H-5606B)	HYDRAULIC FLUID Hydraulic Tank, Filters and Lines	4 qts (3.8L)	OHA				

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F (-23°C). Remove lubricants prescribed in the key for temperatures above -10°F (-23°C). Clean parts with drycleaning SOLVENT (SD), type II or equivalent. Lubricate with lubricants specified in the key for temperatures 0°F to -65°F.

2. OIL CAN POINTS. Every 100 hours lubricate hinges, latches, control linkages, and all exposed adjusting threads with OE-HDO.

3. OIL FILTER. Every 300 hours remove filter element, clean housing, install new element, fill crankcase, place dead crank switch (S22) in the off (down) position, and crank engine for 15 seconds, then return dead crank switch to the on (up) position. Start and operate engine for 5 minutes, check for leaks, check crankcase oil level and bring to full mark. Oil filter replacement interval shall aline with on-condition AOAP or hard time oil change requirements. See notes 7 and 8.

4. CRANKCASE. Crankcase level may be checked with the engine in either a static or operating condition.

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

6. HYDRAULIC FILTER. Disassemble hydraulic filter, renew element, and reassemble. Bring oil level to full, run for 15 minutes, check level and fill if necessary.

7. CRANKCASE OIL. A sample of the oil shall be sent to an AOAP laboratory for analysis at an interval of 50 hours or 60 days. Refer to TB 43-0210 for sampling requirements.

8. When AOAP laboratory support is not available, drain and refill crankcase oil at 300 hours or 6 months.

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:

CARL E. VUONO
General, United States Army
Chief of Staff

OFFICIAL:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

Figure 3-1. Lubrication Order (Sheet 2 of 2)

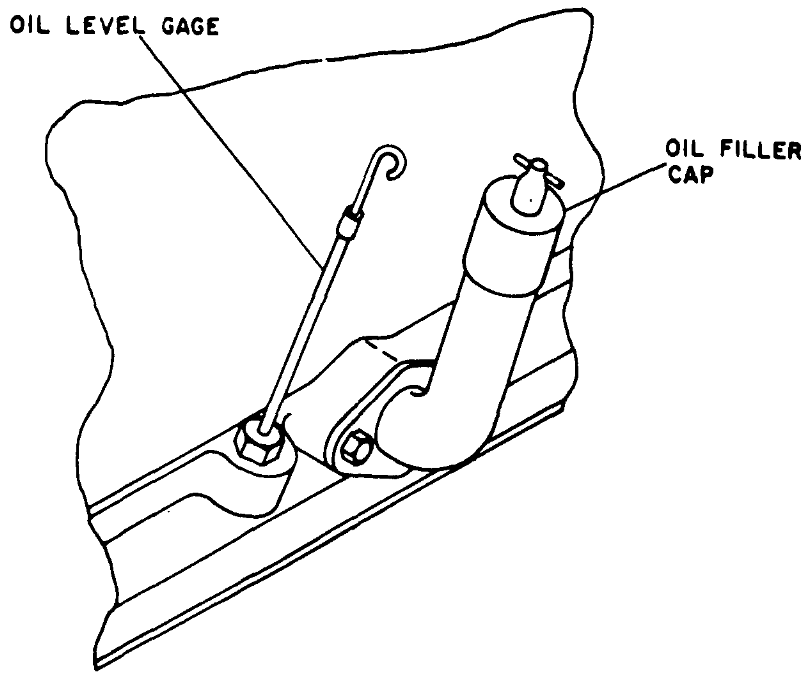


Figure 3-2. Oil Level Gage and Filler

remove breather tubes (2, 6 & 8, fig. 3-12.1) from the valve cover, crankcase, oil separator and air intake system. Clean inside of tubes with cleaning solvent, blow out with compressed air, and replace on engine and oil separator.

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

c. Oil Level.

CAUTION

To prevent overfill of the oil sump, remove oil filler cap when checking oil with set running.

(1) Crankcase oil level must be checked frequently.

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

(3) Before draining the oil system, operate the engine until a minimum coolant temperature of 160° F is obtained. Shut engine off, open the engine oil drain valve and remove the oil drain plug from the skid and allow the oil to drain into appropriate container. Refer to para 3-4 d. for oil filter service.

(4) Install the drain plug, close the oil drain valve and fill the crankcase with 26 quarts of the specified grade of lubricant to the FULL mark on the oil level gage. Use the side of the oil level gage stamped STOPPED.

(5) Place dead crank switch (49, fig. 3-27) in the off (down) position and crank engine for 15 seconds, then place dead crank switch in on (up) position.

(6) Start and operate the engine for approximately 5 minutes.

(7) Stop the engine and allow several minutes for the oil to drain back to the crankcase before checking the oil level.

(8) Using the oil level gage, (fig. 3-2) check the oil level and add oil as necessary to raise the level even with the FULL mark on the oil level gage.

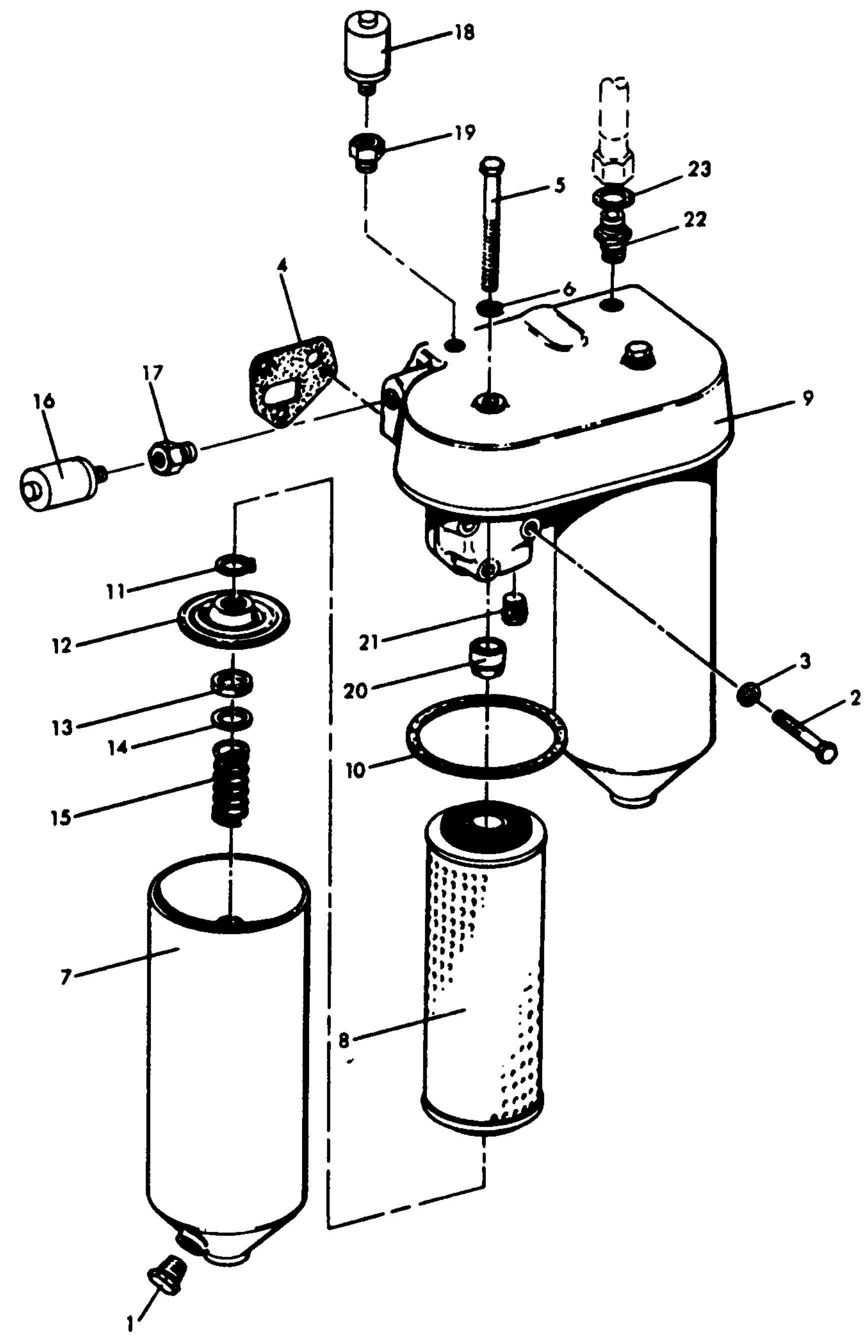
(9) Observe the engine for oil leakage. Repair oil leaks before continuing operation.

d. Oil Filter Service See figure 3-3 and service the oil filters as follows:

CAUTION

Disconnect negative lead from battery prior to servicing oil falter.

(1) Drain oil filter by removing plug (l). Drain oil into appropriate container.



1. Plug	7. Filter body	13. Washer	19. Nipple
2. Screw	8. Filter element	14. Oil Seal	20. Cap
3. Washer	9. Header	15. Spring	21. Plug
4. Gasket	10. Gasket	16. Switch	22. Connector
5. Screw	11. Retaining Ring	17. Nipple	23. Gasket
6. Washer	12. Adapter	18. Transmitter	

Figure 3-3. Engine Lube Oil Filters

(2) Remove screw (5), and washer (6), and remove filter body (7) and filter element (8) as an assembly from the header (9).

(3) Remove filter element (8) from filter body (7). Remove and discard filter element (8) and gasket (10).

(4) Thoroughly wash and dry interior of filter body (7), header (9), and surrounding area. Install the new filter element (8) and gasket (10) in filter body (7) using reverse procedure of disassembly.

(5) Replace plug (1) in filter body (7).

(6) Tighten screw (5) to a torque of 45 to 50 ft. - lbs.

(7) Add oil as described in paragraphs 3-4 c (4) through 3-4 c (9).

(8) Place dead crank switch (49, fig. 3-27) in off (down) position and crank engine in 15 second cranks followed by 3 minute rests until oil pressure gauge shows pressure. Then place dead crank switch in on (up) position

(9) Observe the engine lube oil filter for oil leakage and be certain that filter body (7) and gasket (10) are properly installed.

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 thay result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-6 and 3-7. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. Air Force users shall refer to the applicable inspection manuals and work card sets in T. O. 35C2-3-Series for periodic preventive maintenance requirements and table 3-1 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 3-1 contains a tabulated listing of Preventive maintenance services which must be performed daily by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements.

3-7. Monthly and Semi-annual Preventive Maintenance Checks and Services (Army and Navy).

a. Table 3-1.1 contains a tabulated listing of preventive maintenance checks and service: which must be performed by organizational maintenance personnel at monthly and semi-annual intervals.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to table 3-1.1 for the preventive maintenance services.

3-7.1. Perform weekly as well as before PMCS if:

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

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

3-7.2. Leakage definitions for operator/crew PMCS shall be classified as follows :

CLASS I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

CLASS II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

CLASS III Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

Section IV. OPERATOR'S MAINTENANCE

3-8. General.

Instructions in this section are provided to assist the operator in maintaining the engine generator set.

3-9. Batteries.

a. Inspection. See figure 3.4 and remove screws (9),and washers (10) and studs (8) which attach battery tray (11) to base and slide storage batteries and trays (11) out. Inspect storage batteries for cracks and leaks. Check for loose cables (1, 2 and 3) and mountings and excessive corrosion.

b. Service. Refer to table 3-1. Fill to 3/8 inch above plates. In freezing weather, run engine a minimum of 1 hour after adding distilled water. Apply grease to cable connectors.

3-10. Slave Receptacle Inspection.

A slave receptacle (17, fig. 3-4) is located in a receptacle box on the forward left side of the housing. Inspect the slave receptacle for loose mounting, loose electrical connections, loose covers, corrosion and other damage.

3-11. Muffler, Exhaust Pipe and Breather System Inspection

Inspect muffler and exhaust pipes (fig. 3-12) and breather system (Fig. 3-12.1) for crocks, leaks, breaks, loose mounting, and other damage.

3-12. Convenience Receptacle Assembly Inspection.

Inspect convenience receptacles assembly (fig. 3-13) and components for loose mounting, loose covers, corrosion and other damage.

Table 3-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION

ITEM NO.	INTERVAL B	INTERVAL D	INTERVAL A	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
					WARNING Do not attempt to service (make adjustments, connections, reconnection of wires or cables) or correct anything inside the generator set until the generator set is shut down and completely de-energized. **CAUTION** • Equipment operation is allowable with minor leakages (Class I or II). Of course, you must consider the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor. • When operating with Class I or Class II leaks, continue to check fluid levels as required in your PMCS. • Class III leaks should be reported to your supervisor or organizational maintenance,	
1	•			Generator Set	Visually inspect unit for fuel, oil, coolant, and hydraulic leaks. Check for proper levels.	Class III oil, coolant, and hydraulic fluid are found during inspection
	•				Visually inspect the generator for missing, loose or damaged parts and hardware , and for unusual wear or deterioration.	
	•				Check for proper ground connection. (Para. 2-5e, fig. 2-2).	Generator set not properly grounded.
	•			Dead Crank Switch	Place dead crank switch in the run position.	If switch malfunctions.

Table 3-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cent)

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION

ITEM NO.	INTERVAL B	INTERVAL D	INTERVAL A	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
	•			Batteries	Remove corrosion and apply grease to cable connectors. Tighten loose cables and mountings. Inspect for cracks and leaks. Fill batteries to 3/8 inch above the plates. Clean vent hole in filler cap before installing. In freezing weather run engine a minimum of 1 hour after adding water.	Cable connections cannot be tightened, or battery is cracked or leaking.
	•			Fuel Selector Valve	Turn fuel selector valve to the correct position.	Fuel selector valve is inoperable.
2		•		Controls and instruments:	Instruments shall indicate within specified limits. (Fig. 2-5)	
				a. Battery charging ammeter	Green portion of scale	Ammeter does not indicate charging current.
				b. Coolant temp gage	180° to 200° F	Temp exceeds 200° F.
				c. Voltmeter	120/208 - 240/416	Voltage cannot be properly adjusted.
				d. Oil pressure gage	30 to 55 psi	Pressure is below 30 psi.
				e. A.C. ammeter	Indicates percentage of applied current. Not to exceed 100%	Meter is nonfunctional.
				f. Wattmeter	Indicates applied load. Not to exceed 100%.	Meter is nonfunctional.
				g. Frequency meter	400 Hz - 50/60 Hz	Frequency cannot be properly adjusted.

Table 3-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - BEFORE OPERATION D -DURING OPERATION A - AFTER OPERATION

ITEM NO.	INTERVAL B	INTERVAL D	INTERVAL A	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF
				h. Fault indicator panel	All lights out during operation. Check bulb operation using test or reset switch on panel.	Fault light will not extinguish when switch is placed to TEST RESET position, then released.
3			•	Fuel tank	Fill fuel tank at completion of operation. (Fig. 1-2; para 2-16b, 2-17c, 2-19, and 2-22)	
4	•	•		Oil level	Check engine oil and add as required as indicated by oil level gage. (Fig. 3-2; para 3-4a, 3-4b, 3-4c, (l-9))	
5	•		•	Fuel filters and strainers	Check for leaks. Drain water and sediment. NOTE In freezing weather, drain shortly after operation. Allow to drain until fuel runs clear.	Class III leakage is detected.
6	•		•	Day Tank	Drain water and sediment. NOTE In freezing weather, drain shortly after operation. Allow to drain until fuel runs clear.	

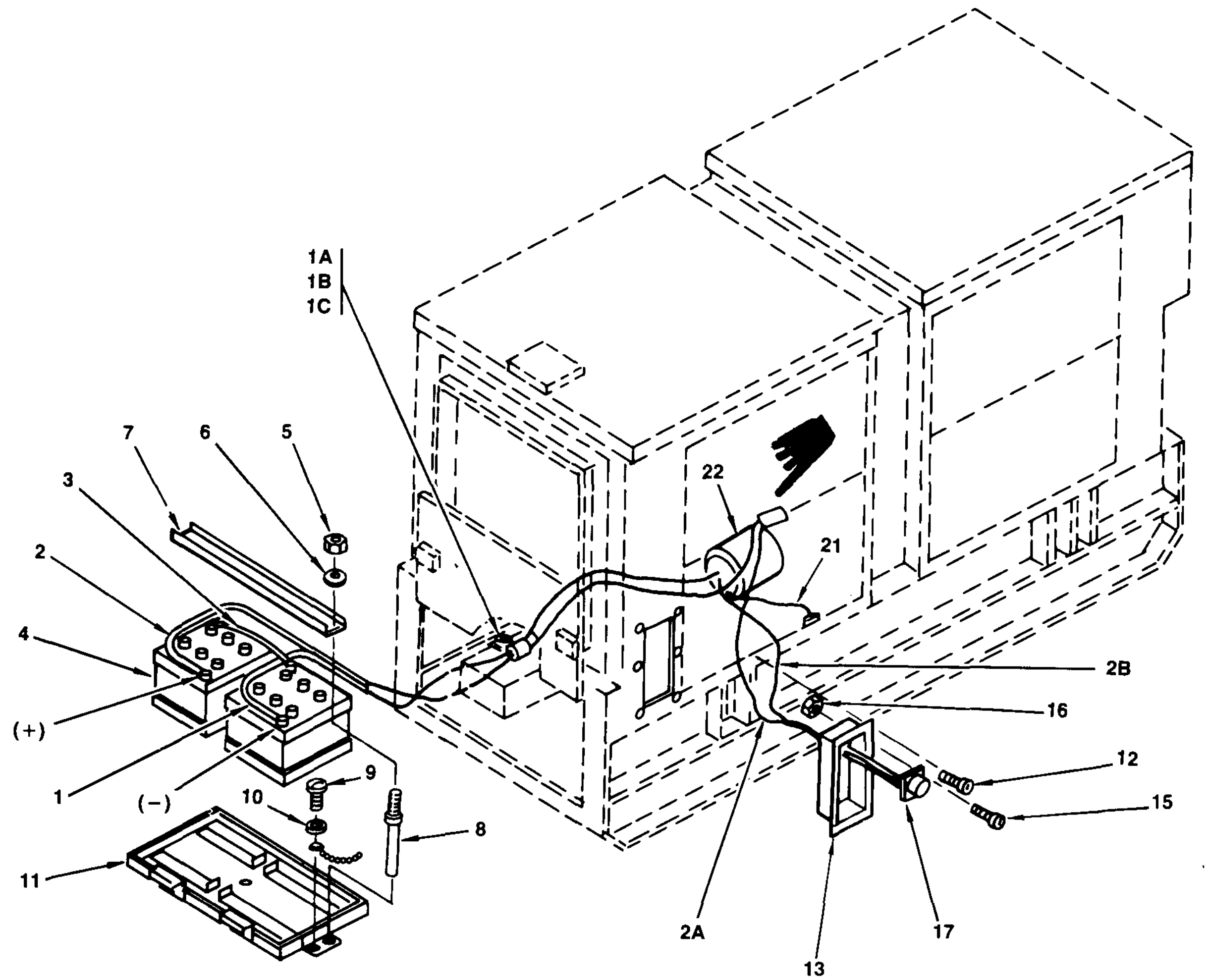
Table 3-1.1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

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	●				Fluid level	Check fluid levels.	
					a. Lubricating oil	Check oil and add as required. (Fig. 3-1; 3-2)	
					b. Hydraulic sump	Check and add fluid as required. (Fig. 3-44)	
					c. Cooling system	Check coolant level. Proper level is 2 inches below filler neck. (Para 2-3 c 2).	
2					Fuel tank	Drain water and sediment from fuel tank. (Fig. 1-4; para 3-62b2) Note: In freezing weather, tank should be drained shortly after operation. Close drain cocks as soon as clean fuel begins to run out.	
3	●				Fuel filters and strainers	Drain water and sediment from filters and strainers. Note: In freezing weather, filters and strainers should be drained shortly after operation. Close drain cocks as soon as clean fuel begins to run out. (Fig. 1-1; para 3-6 and 3-9)	
4		●			Batteries	Check battery electrolyte level. (Para 3-9) Perform a hydrometer check of the battery electrolyte prior to adding distilled water. Recharge or replace battery if specific gravity reading is low. (Para 3-82 b)	
5		●			Day tank	Drain water and sediment from day tank. Note: In freezing weather, tank should be drained shortly after operation. Close drain cock as soon as clean fuel begins to run out. (Para 3-33 b)	
6		●			Generator set	Inspect entire unit for loose, damaged, or missing parts; and unusual wear or deterioration.	

Table. 3-1.1. 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.	M	S	H	ITEM TO BE INSPECTED	PROCEDURES	EQUIPMENT WILL BE REPORTED NOT READY (RED) IF:
7	●			V-belts	Inspect for worn, frayed, oil soaked, or cracked belts. Check adjustment of V-belts. Proper adjustment for fan belt is a deflection of 9/32 inch with application of 12-14 lb pressure midway between accessory drive pulley. For alternator drive belt, a deflection of 9/64 inch with application of 3-5 lb pressure midway between alternator pulley and accessory drive pulley. (Fig. 3-35)	
8			●	Air filters	This unit is equipped with an air filter condition indicating light that will indicate when the filter elements need cleaning. Clean elements when necessary as indicated by the light.	
9				Deleted.		
10			●	Engine oil	Drain engine oil and refill. (Para 3-4c) Change lubricating oil every 300 hours or 6 months.	
11			●	Oil filters	Replace lubricating oil filters. (Para 3-4d) Change lubricating oil filters every 300 hours or 6 months.	
12				Fuel filters and strainer:	Replace primary and secondary fuel filters, and clean fuel strainers every 100 hours. (Para 3-34, 3-36, and 3-165 a)	
13		●		Hydraulic sump	Drain and refill hydraulic sump. (Para 3-44)	
14		●		Hydraulic filter	Replace hydraulic filter. (Para 3-45)	
15		●		Hydraulic actuator	Clean actuator filter screen. (Para 3-175)	



NOTE

Ground wire (21) is grounded to the inside frame of the generator set on the right hand side.

1. Negative cable
1A. Screw
1B. Nut
1C. Clamp
2. Positive cable
2A. Positive cable
2B. Negative cable
3. Jumper cable
4. Storage battery (2)
5. Nut
6. Lockwasher
7. Battery retainer
8. Stud
9. Screw
10. Lockwasher
11. Tray
12. Screw
13. Receptacle box
14. (Deleted)
15. Screw
16. Nut
17. Slave receptacle
18. (Deleted)
19. (Deleted)
20. (Deleted)
21. Ground cable
22. Electric starter

Figure 3-4. Batteries and Slave Receptacles

3-13. (Deleted)

3-14. Plate and Sleeve Assembly Inspection.

Inspect plate and sleeve assembly (fig. 3-15) for tears, dents and other damage.

3-15. Paralleling Receptacles Inspection.

Inspect the paralleling receptacles (fig. 3-16) for loose electrical connection, loose mounting, bent pins, cracks, breaks, corrosion, and other damage. Inspect the connector leads for broken or frayed insulation and other damage.

3-16. DC Circuit Breaker Inspection and Fault Indicator Lamp Test.

Inspect DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) for loose mounting, loose electrical connections, or damage and check lamp operation as follows:

a. Close DC CONTROL CIRCUIT BREAKER (fig. 2-5).

b. Set START-RUN-STOP switch to RUN,

c. Set and hold fault indicator TEST OR RESET switch to test and check that all fault indicators light.

b. Set START-RUN-STOP switch to RUN.

c. Set and hold fault indicator TEST OR RESET switch to test and check that all fault indicators light.

3-17. AC Voltmeter.

a. Inspection. Inspect ac voltmeter (42, fig. 3-18) for cracks, breaks, corroded and/or loose terminals, and other damage.

b. Adjustment. With generator off, adjust voltmeter zero control until the pointer is at zero.

3-18. Kilowatt Meter.

a. Inspection. Inspect kilowatt meter (39, fig. 3-18) for cracks, breaks, corroded and/or loose terminals, and other damage.

b. Adjustment. With generator off, adjust kilowatt meter zero control until pointer is at zero.

3-19. AC Ammeter.

a. Inspection. Inspect ac ammeter (8, fig. 3-18) for cracks, breaks, corroded and/or loose terminals, and other damage.

b. Adjustment. With generator off, adjust ac ammeter zero control until pointer is at zero.

3-20. Frequency Meter.

Inspect freq meter (7, fig. 3-18) for cracks, breaks, loose and/or corroded terminals, and other damage.

3-21. Control Cubicle Panel Switches Inspection.

Inspect switches on the control cubicle panel (96, fig. 3-18), for cracks, breaks, corroded terminals, loose electrical connections, loose mounting, and other damage.

3-22. Control Cubicle Panel Gages Inspection.

Inspect gages on the control cubicle panel (96, fig. 3-18), for cracks, breaks, corroded terminals, loose electrical connection, loose mounting, and other damage.

3-23. Running Time Meter Inspection.

Inspect RUNNING TIME meter on the control cubicle panel (96, fig. 3-18), for cracks, breaks, corroded terminals, loose electrical connections, loose mounting, and other damage.

3-24. Battery Charge Ammeter Inspection.

Inspect BATTERY CHG AMMETER (77, fig. 3-18) on the control cubicle panel for cracks, breaks, corroded terminals, loose electrical connections, loose mounting, and other damage.

3-25. Panel Light Assemblies.

a. Inspection.

(1) Inspect lens (17, fig. 3-18) for cracks, breaks, loose mounting.

(2) Inspect lamp (24, fig. 3-18) for breaks or loose mounting.

b. Test and Replacement.

(1) Close DC circuit breaker.

(2) Set PANEL LIGHT switch to ON position.

(3) If any panel lamps do not light, replace lamp.

3-26. Press-to-Test Light Assemblies.

a. Inspection.

(1) Inspect lens (26 and 33, fig. 3-18) for cracks, breaks, loose mounting.

Table 3-2. Fault Indicator Test Points

Fault indicator	Pin no.
LOW OIL PRESSURE	12-D
OVER SPEED	12-E
COOLANT HIGH TEMP	12-K
NO FUEL	12-L
SHORT CIRCUIT	12-F
UNDER VOLTAGE	12-G
REVERSE POWER	12-H
OVER LOAD	12-M
UNDER FREQ	12-N
OVER VOLT	12-I

(2) Inspect lamps (31 and 38, fig. 3-18) for breaks or loose mounting.

b. Test and Replacement,

(1) Close DC circuit breaker.

(2) Press press-to-test light assemblies.

(3) If lamp doesn't light, unscrew lens and replace lamp.

(4) Re-install lens.

3-27. Synchronizing Light Assembly Inspection.

Remove lens and inspect lamp (of synchronizing lights (16, fig. 3-18) for damage or loose mounting.

3-28. Door Holders Inspection

Open door and inspect door holder (85, fig. 3-18) for damage.

3-29. Crosspin Assembly Inspection.

Open door to gain access to rear of control cubicle panel and examine crosspin (94, fig. 3-18) for damage.

3-30. Control Cubicle Door Inspection.

Open door and inspect both sides for damage.

3-31. Housing Group Inspection.

Inspect engine generator set doors for proper operation. Inspect doors, covers, and panels for loose mounting, dents or other damage (fig. 3 -22).

3-32. Air Cleaner Assembly.

a. Inspection.

(1) (Deleted)

(2) (Deleted)

(3) Inspect air cleaner condition switch for loose mounting, loose connector wires, and other damage.

(4) Inspect air cleaner filter element for signs of blockage, holes, and other damage.

b. Service. Service the air cleaner as described and illustrated in figure 3-5.

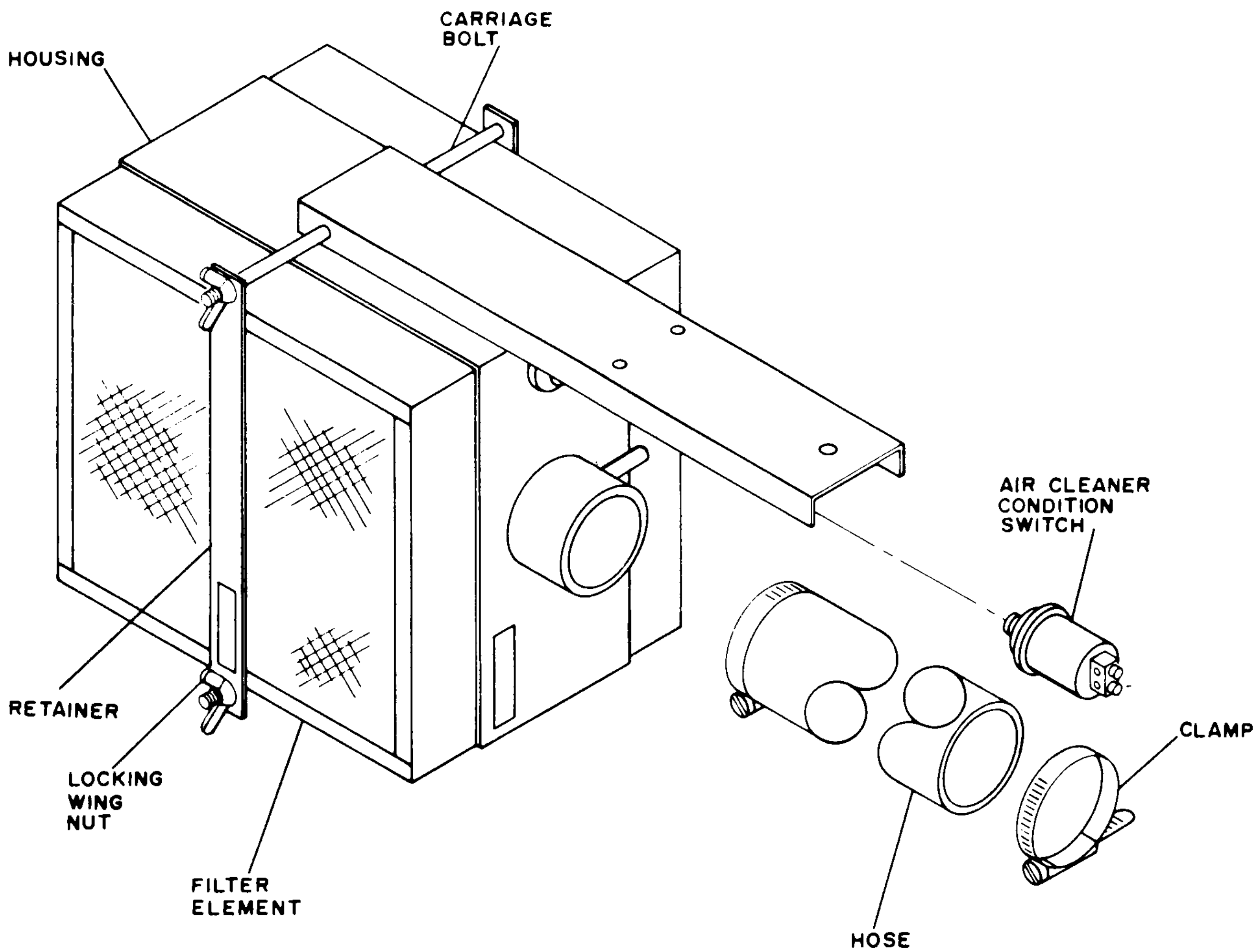
3-33. Day Tank Assembly.

a. Inspection. Inspect the day tank assembly (fig. 3-27) for cracks, breaks, holes, loose electrical connector and other damage.

b. Service. Service the day tank assembly at intervals shown in table 3-1.1, item 5 and proceed as follows: Open the drain cock (36) at the bottom of the day tank and let the tank drain until clean fuel is seen, then close the drain cock.

3-34. Fuel Filter and Strainer Assembly.

a. Inspection. Inspect fuel filter and strainer assembly (fig. 3-6) for leaks, cracks, breaks, dents and other damage.



STEP 1. REMOVE WING NUTS AND RETAINER.
STEP 2. CAREFULLY REMOVE DIRTY FILTER ELEMENT.
STEP 3. CLEAN INSIDE OF HOUSING.
STEP 4. CLEAN FILTER ELEMENT BY EITHER METHOD A OR B DESCRIBED BELOW.

CAUTION

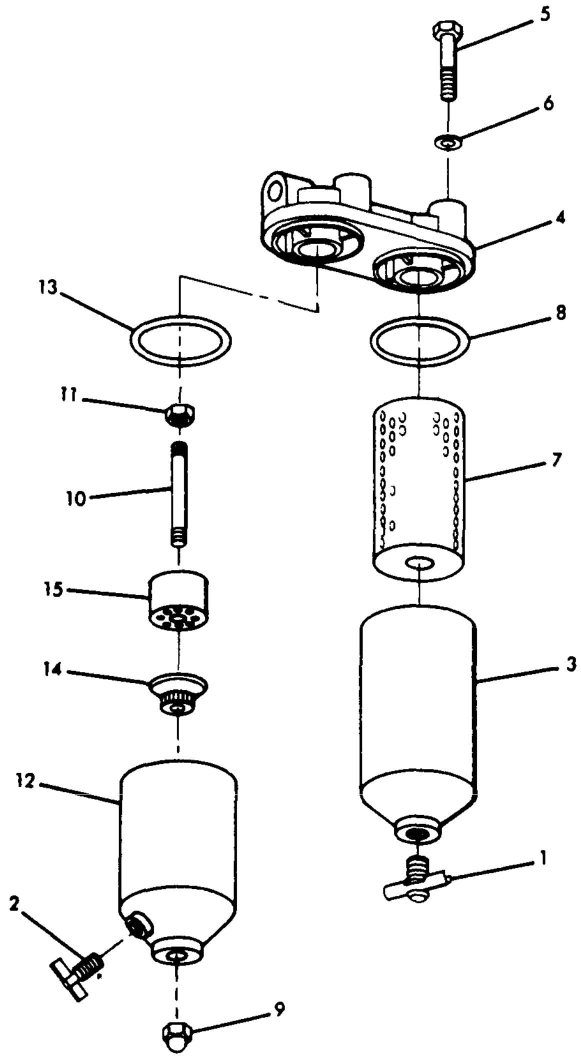
DO NOT CLEAN IN GASOLINE OR OTHER PETROLEUM SOLVENT.

METHOD A. COMPRESSED AIR
DIRECT COMPRESSED AIR (100 PSI MAX.) THROUGH PANEL OPPOSITE DIRECTION OF ARROWS ON ELEMENT DECAL OR OPPOSITE AIRFLOW DIRECTION.

METHOD B. WASHING WITH WATER
SOAK 15 MINUTES IN WATER AND MILD DETERGENT. RINSE UNTIL CLEAN. AIR DRY DO NOT USE COMPRESSED AIR.

STEP 5. INSTALL FILTER ELEMENT.
STEP 6. INSTALL WING NUTS AND RETAINER AND TIGHTEN WING NUTS FINGER TIGHT.

Figure 3-5. Air Cleaner Service



1. Drain Cock
2. Drain Cock
3. Filter body
4. Header
5. Screw
6. Gasket
7. Filter cartridge
8. Gasket
9. Nut
10. Stud
11. Nut
12. Strainer body
13. Gasket
14. Retainer
15. Strainer element

Figure 3-6. Fuel Filter and Strainer

b. Service. Service the fuel filter assembly at intervals shown in table 3-1.1, item 12, and proceed as follows :

(1) Open the drain cocks (1 and 2, fig. 3-6) at bottom of filter and strainer and allow to drain into suitable container.

(2) Remove filter body (3) from header (4) by removing screw (5) and gasket (6).

(3) Remove and discard filter cartridge (7) and gasket (8). Unscrew nut (9) from stud (10) and remove strainer body (12) and gasket (13).

(4) Remove retainer (14) and strainer element (15).

(5) Clean the strainer element (15) and all parts including interior of strainer body (12) with cleaning solvent Federal Specification P-D-680.

(6) Dry with compressed air or lint free cloth.

(7) See figure 3-6 and install new filter cartridge (7) and gasket (8) and replace fuel filter and strainer in reverse order of removal.

3-35. Start Aid Assembly.

a. Inspection. Inspect ether tank (8, fig.. 3-28), solenoid valve, and tank bracket for loose mounting, dents, loose fittings, and other damage.

b. Servicing. Either tank must be replaced by Organizational Maintenance personnel when empty (tank weighs 2 lbs. 4 oz. when full; 1 lb. when empty). Service the starting aid assembly as follows:

WARNING

Be careful not to inhale ether gas as drowsiness and unconsciousness may result.

(1) Disconnect atomizer (2, fig. 3-28) and tube (1) from intake manifold and solenoid valve adapter (3).

(2) Crank engine and momentarily actuate ENGINE PRIMER switch while an observer watches adapter opening. If no spray is observed, notify Organizational Maintenance personnel.

(3) Clean atomizer and tube with a source of compressed air.

3-36. Filler Cap, Gasket and Strainer.

a. Inspection. (See fig. 3-7)

(1) Inspect main fuel tank cap and strainer for breaks, cracks, holes or other evidence of damage.

(2) Inspect main fuel tank cap gasket for tears or deterioration. Check that valve opening in cap IS clear of obstruction.

(3) Inspect fuel tank filler hose for leaks. cracks, loose mounting, deterioration or other evidence of damage.

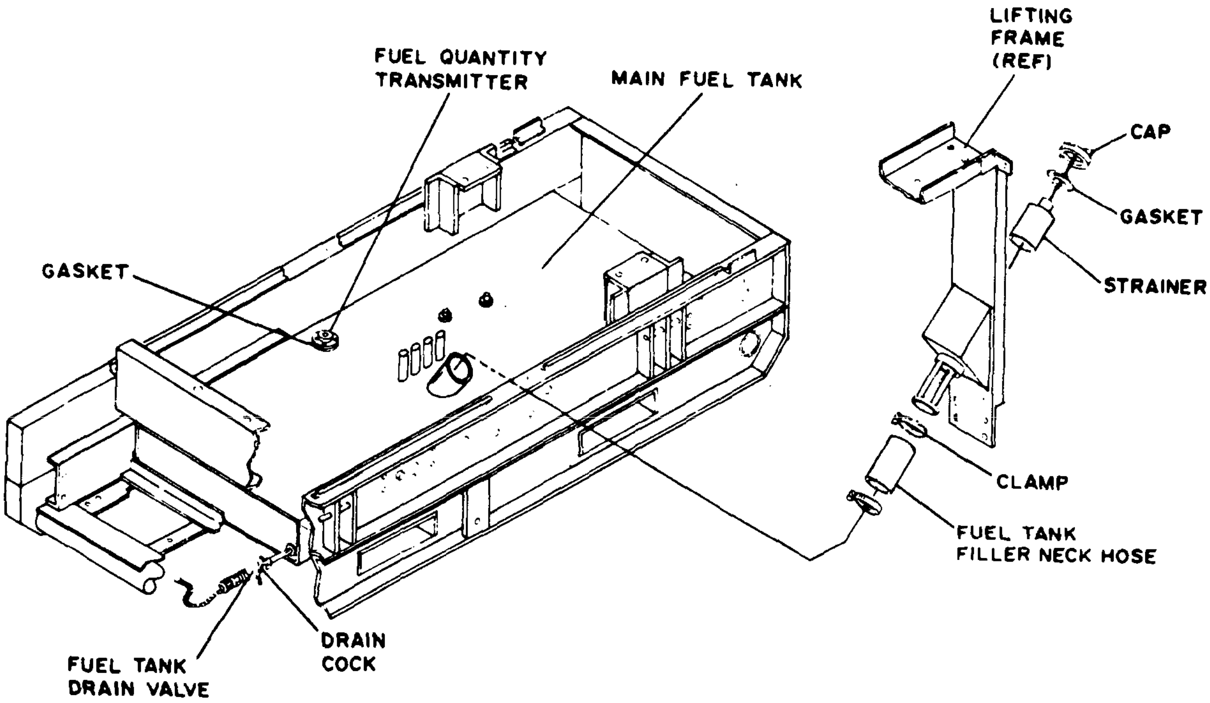


Figure 3-7. Main Fuel Tank

(4) Inspect main fuel tank vent hoses for cracks, loose mounting, deterioration or other evidence of damage.

b. Service. (See fig. 3-7.)

(1) Remove main fuel tank cap, gasket, and strainer.

(2) Clean all metal parts and dry thoroughly.

(3) Replace a damaged or defective gasket.

(4) Replace a damaged or defective main fuel tank strainer.

3-37. Fuel Transfer Pump.

Inspect fuel transfer pumps (37 and 38, fig. 3-28) for leaks, loose correctors, dents, cracks and other damages.

3-38. Radiator Grille.

Inspect radiator grille (fig. 3-31) for dirt, foreign matter, cracks, dents, leaks, and other damage.

3-39. Fan Guard Inspection.

Inspect the LH and RH fan guards (25 and 26, fig. 3-29) for dirt, cracks, dents or other damage.

3-40. Shutter and Shutter Thermostat Inspection.

Verify that the linkage connecting the shutter control assembly (10, fig. 3-30), which houses the shutter thermostat (6) to the shutter (2, fig. 3-31) is secure and not damaged. Check thermostat housing for cracks, leaks or other damage.

3-41. Radiator.

a. Inspection. Inspect the radiator assembly (35, fig. 3-29) for leaks.

b. Service.

(1) Service the radiator as follows:

WARNING

Scalding can result from steam in the coolant system escaping when the radiator cap is removed. Always allow coolant to cool and remove the radiator cap slowly to permit any pressure to escape.

(a) Open radiator cap access door and remove cap.

(b) Refer to Table 2-1 for proper coolant and fill radiator until coolant level is two inches below filler neck.

(c) Fasten tag near radiator cap indicating date, type of coolant and level of protection.

NOTE

At the time the cooling system is required to be drained, the coolant in the lube oil cooler should also be drained as described in paragraph 3-199 b.

(d) To drain the radiator place suitable container to collect coolant. Remove radiator cap.

(e) Open radiator shutoff cock (21) and drain radiator coolant into container. Needle valve (9, fig. 3-34) should be also opened to drain the engine block.

(f) Close shutoff cock (21, fig. 3-29) and close needle valve (9, fig. 3-34).

3-42. Hydraulic Cooler (MEP105A Only) Inspection.

Inspect fins and lines of hydraulic cooler (19, fig. 3-29) for cracks, breaks, dents, leaks, loose mounting and other damage.

3-43. Hydraulic Sump (MEP105A Only) Inspection.

Inspect hydraulic actuator (fig. 3-32) for loose mounting, loose hose connections, loose connectors, loose linkage, and other damage.

3-44. Hydraulic Sump (MEP105A Only).

a. Inspection. Inspect hydraulic sump (1, fig. 3-8) for cracks, leaks, breaks and other damage. Inspect filler cap (3) for secure fitting. Inspect seal on tiller cap (3) for excessive wear and other damage. Inspect hydraulic sump sight glass (2) for legibility of marking, loose fitting, and other damage. Inspect hydraulic sump for cracks, loose mounting, leaks and other damage.

b. Service. To service hydraulic sump (1, fig. 3-8) refer to table 3-1 and proceeds as follows:

(1) Check oil level; level should be up to sight glass (2, fig. 3-8).

(2) Remove tiller cap (3). Add hydraulic oil conforming to Military Specification MIL-H-5606 to obtain proper level.

(3) To drain tank, place suitable container beneath drain plug (4) and remove drain plug. Repeat step (2) to refill sump tank.

3-45. Hydraulic Filter (MEP105A Only).

a. Inspection. Inspect hydraulic filter (fig. 3-8) for cracks, breaks, and other damage.

b. Service. To service the hydraulic filter refer to table 3-1 and figure 3-8 and proceed as follows:

(1) Cut lockwire (5). Remove filter body (6) and filter element (7). Discard filter element.

(2) Clean filter body with cleaning solvent, Federal Specification P-D-680 and dry thoroughly.

(3) Soak new filter element in clean hydraulic oil conforming to Military Specification MIL-H-5606 to remove air trapped in filter material.

(4) Install new preformed packing (8) and backup rings (9).

(5) Apply a light coat of hydraulic oil to the preformed packing (8), and backup rings (9), header (10), and the threads of the filter body (6).

(6) Install new element in filter body (6) and fill bowl with clean hydraulic fluid. Install filter body (6) in header (10) and tighten. Lockwire header to filter body on the threads of the filter body.

3-46. Engine Assembly Service.

Refer to table 3-1 and service the engine crankcase as follows:

a. Check crankcase lubricating oil level using oil level gage (fig. 3-2).

b. Remove engine lubricating oil filler cap and add oil as required to obtain full level on oil level gage. See figure 3-1 for proper lubricating oil.

c. To drain the crankcase, remove plug and place suitable container at drain hose.

d. Open engine lubricating shutoff cock valve and drain oil into container.

e. Close shutoff cock and replace plug.

f. To refill the crankcase; remove the oil filler cap and add oil until crankcase is full; verify crankcase is full by checking oil level gage.

3-47. Fan Belts Inspection

Inspect drive belts (fig. 3-35) for signs of wear, damage or oil soaking.

3-48. Battery Charging Alternator Inspection.

Inspect battery charging alternator (fig. 3-36) for cracks, loose mounting, dents, loose or damaged connector, and other defects.

3-49. Speed Switch Inspection.

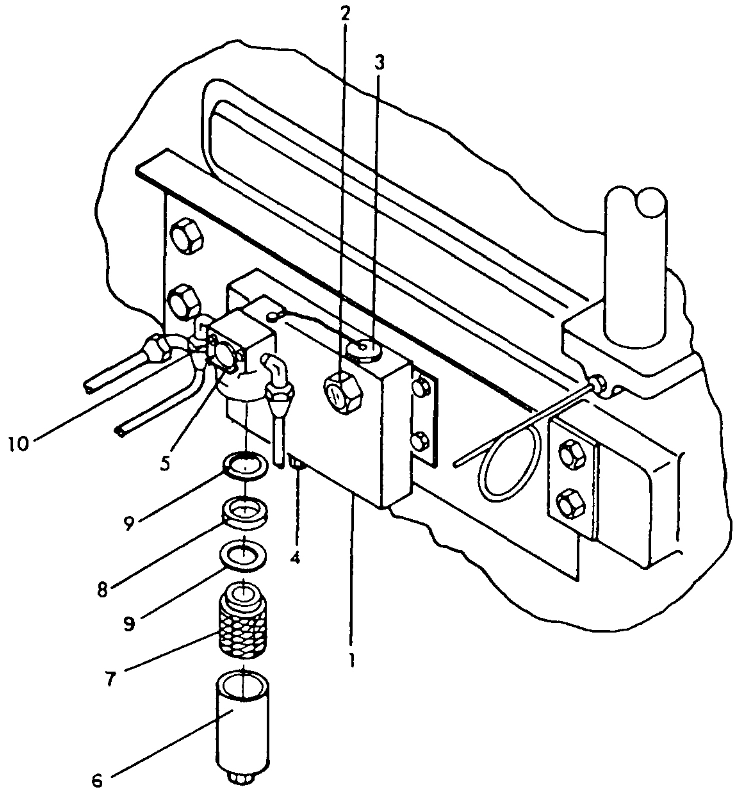
Inspect speed switch (fig. 3-37) for loose mounting, loose connector and other damage.

3-50. Angle Adapter Inspection.

Inspect angle adapter (fig. 3-38) for loose mounting, breaks, cracks and other damage.

3-51. Hydraulic Pump and Drive Assembly (MEP105A Only) Inspection.

Inspect hydraulic pump and drive assembly (fig. 1-2) for leaks and loose mounting.



1. Hydraulic sump
2. Sight glass
3. Filler cap
4. Drain plug
5. Lockwire
6. Filter body
7. Filter element
8. Preformed packing
9. Backup rings
10. Header

Figure 3-8. Hydraulic Sump and Filter (MEP105A)

3-52. Oil Level Gage and Filler Inspection.

See figure 3-2 and proceed as follows:

a. Inspect oil level gage legibility of marking, loose fitting and other damage.

b. Inspect oil filler cap for secure fitting.

c. Inspect seal on oil filler cap for excessive wear, and other damage.

d. Inspect oil filler for cracks, loose mounting, and other damage.

3-53. Starter Assembly Inspection.

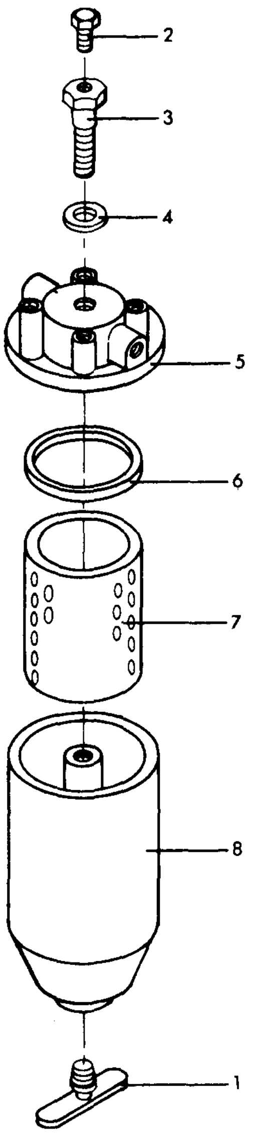
Inspect starter assembly for cracks, dents, loose, damaged or missing parts, loose mounting, loose electrical connections, and other damage.

3-54. Oil Pressure Transmitter Inspection.

Inspect transmitter (18, fig. 3-3) for leaks, cracks, loose mounting, loose electrical connection and other damage.

3-55. Lube Oil Filter Assemblies Inspection.

Inspect lube oil filters (fig. 3-3) for leaks, cracks, breaks, dents and other damage.



1. Drain cock
2. Bleed screw
3. Capscrew
4. Gasket
5. Header
6. Gasket
7. Filter element
8. Bowl

Figure 3-9. Secondary Fuel Filter

3-56. Secondary Fuel Filter.

a. Inspection. Inspect secondary fuel filter (fig. 3-9) for breaks or cracks. Inspect threaded parts for damage or stripped threads.

b. Service. To service the fuel filter proceed as follows:

(1) Uncouple line from day tank at filter, and raise line above day tank level.

(2) Open drain cock (1, fig. 3-9) and drain filter.

(3) Open bleed screw (2) remove capscrew (3) and remove and discard gasket (6) and filter element.

(4) Clean interior of bowl (8) with cleaning solvent Federal Specification P-D-680. Dry with compressed air or lint free cloth.

(5) Install new filter element (7) and new gasket (6) in the reverse order of removal.

(6) Close drain cock (l), and bleed fuel filter and recouple fuel line to fuel filter.

c. Fuel System Bleeding Procedure.

(1) Open bleed screw (2) on secondary filter,

(2) Depress the DC Circuit Breaker (20, fig. 2-10A).

(3) Place the battle short switch to the ON position (22, fig. 2-10A).

(4) Place the start-run-stop switch to the run position (32, fig. 2-10A).

(5) Observe fuel coming from top of secondary filter. When air free fuel is flowing, tighten bleed screw (2).

(6) Place the start-run-stop switch to stop position (32, fig. 2-10A),

(7) Open the DC Circuit Breaker (20, fig. 2-10A).

(8) Place the battle short switch to the OFF position (22, fig. 2-10A),

3-57. Fuel Injection Pump Inspection.

Inspect fuel injection pump (fig. 1-1) for dents, cracks, breaks, leaky connections and other damage.

3-58. Water Pump Inspection.

a. Inspect water pump (18, fig. 3-43) for leaks, cracks, breaks, loose mounting and other damage.

b. With engine running check that excessive noise is not heard from water pump.

3-59. Fan Inspection.

Inspect fan for cracks, breaks, loose mounting and other damage.

3-60. Temperature Transmitter Inspection.

Inspect coolant temperature transmitter (10, fig, 3-44) for leaks, cracks, loose mounting, loose electrical connections and other damage.

3-61. Oil Pan Assembly Inspection.

a. Inspect oil heater coolant line connections for leaks around fittings, loose line connections, cracks, and other damage.

b. Inspect drain fitting, valve, hose connections and plug for leaks, cracks, loose mounting, and other damage.

c. Inspect hose for deterioration, tears and other damage. Inspect oil pan for cracks, dents, leaks and other damage.

3-62. Main Fuel Tank.

a. Inspection.

(1) Inspect main fuel tank (fig. 3-7) for loose mounting.

(2) Inspect main fuel tank for leaks, cracks, breaks and other damage.

(3) Inspect fuel quantity transmitter gasket and electrical connection.

(4) Refer to paragraph 3-36 a for fuel tank cap, gasket and strainer inspection procedure.

b. Service.

(1) Refer to paragraph 3-36 b for fuel tank cap, gasket and strainer servicing procedure.

(2) Connect auxiliary fuel line (fig. 1-1) to hose connector at end of fuel tank drain valve (fig. 3-7), located at the engine end of the fuel tank. Drain into suitable container. Open drain cock and allow water and sediment to completely drain off. Close drain cock when clean fuel runs out.

(3) Add fuel as required.

3-63. Paralleling Cable Inspection.

Inspect the parallel cable (fig. 1-1) for loose connections, damaged connectors/pins, loose mounting, damaged cable, and other damage.

3-64. Auxiliary Fuel Line Inspection.

Inspect the auxiliary fuel line (fig. 1-1) for loose connections, leaks, cracks, breaks, and other damage.

Section V. TROUBLESHOOTING

3-65. General

Table 3-3 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the engine generator set and its components. Each malfunction stated is followed by a list of the probable causes of the trouble. The corrective action recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to the next higher level of maintenance. The engine generator set must be completely serviced with fuel, coolant, and lubricating oil. Before troubleshooting, check that all electrical connections are correct and operating controls are in the correct positions.

NOTE

Air Force and Navy users are authorized to perform maintenance within the scope of their capability.

Table 3-3 Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Engine fails to crank when START-STOP-RUN switch is moved to START position.	a. Improper starting procedure.	a. Perform starting procedure as described in paragraph 2-12.
	b. Batteries weak,	b. Recharge or replace batteries (para 3-82). Refer to page 2-14, fig. 2-5c and page 2-21, step 1, prior to replacing batteries.
	c. Batteries improperly installed.	c. Connect batteries as indicated in figure 3-4.
	d. Defective, corroded or loose battery cables.	d. Tighten all loose connections and clean corrosion from all terminals. (Refer to item 16, table 3-1.)
	e. Defective or loose control wires.	e. Inspect control wires and repair or tighten as necessary.
	f. Defective DC CONTROL CIRCUIT BREAKER.	f. Replace DC CONTROL CIRCUIT BREAKER (para 3-100).
	g. Defective START-RUN-STOP switch	g. Replace START-RUN-STOP switch (para 3-119).
	h. Defective speed switch	h. Replace defective speed switch (para 3-186).
2. Engine cranks but will not start.	a. Improper starting procedure.	a. Perform starting procedure as described in paragraph 2-12.
	b. Fuel supply exhausted	b. Fill fuel tank or use auxiliary fuel supply (para 2-3).
	c. Water in fuel supply	c. Drain fuel system, service with proper grade of fuel (para l-4b).
	d. Air in fuel system.	d. Bleed fuel system (para 3-56c).
	e. Restricted fuel supply line.	e. Clean restriction or replace tine.
	f. Defective day tank float switch.	f. Replace float switch (para 3-159).
	g. Defective fuel solenoid valve.	g. Replace fuel solenoid valve (para 3-158).
	h. Clogged fuel fitter and strainer elements,	h. Service filter and strainer (para 3-34).
	i. Clogged secondary filter element.	i. Service filter (pars 3-197).
	i. Defective nozzle holder assembly.	i. Replace nozzle holder assembly (para 3-201).
	k. Clogged air intake system.	k. Service air filter assembly (fig. 3-5).

Table 3-3 Troubleshooting (Cont)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
	l. Contaminated or improper grade of fuel.	l. Drain fuel supply, service with proper grade of fuel (para l-4b).
	m. Speed switch not reset after overspeed shutdown.	m. Reset speed switch by depressing reset button on back end of switch.
	n. Open or defective dead crank switch.	n. Close switch (49, fig. 3-27) and test for continuity. Replace if defective.
	o. Closed fuel shutoff lever (Class I only).	o. Open lever for fuel inlet to injection pump.
3. Engine runs when START -RUN-STOP SWITCH is held in START position but stops when switch is set to RUN.	a. Switch not held in start position sufficient amount of time to enable engine to exceed 600 rpm.	a. Hold in start for a longer period (para 2-12).
	b. Defective speed switch.	b. Replace speed switch (para 3-186).
	c. Defective START-RUN-STOP switch.	c. Replace switch (para 3-119).
	d. Defective oil pressure switch.	d. Replace oil pressure switch (para 3-194).
	e. High coolant temperature.	e. Refer to malfunction item 11.
4. Engine runs errati-tally or misfires	a. Contaminated or improper fuel.	a. Drain fuel system and fill with proper fuel (para 1-4).
	b. Air in fuel system.	b. Bleed fuel lines (pars 3-56).
	c. Restricted fuel fines.	c. Clean fuel lines.
	d. Defective nozzle holder assembly.	d. Replace nozzle holder assembly (para 3-201).
	e. Dirty air cleaner.	e. Service air filters (fig. 3-5).
	f. Defective turbocharger.	f. Replace turbocharger (para 3-203).
5. Engine exhaust excessively black	a. Improper fuel.	a. Drain fuel system and fill with proper fuel (para 1-4).
	b. Clogged air intake	b. Service sir filter assembly (fig. 3-5).
	c. Defective turbocharger. Clogged turbo.	c. Replace turbocharger (para 3-203).
	d. Generator set overloaded.	d. Reduce load to rated level.
	e. Improper timing.	e. Correct timing.
6. Engine exhaust white or blue.	a. Improper fuel.	a. Drain fuel system and fill with proper fuel (para 1-4).
	b. Engine operating temperature too low due to faulty thermostat.	b. Replace thermostat (para 3-209).
	c. Oil level too high.	c. Drain crankcase until proper level is indicated on oil level gage (para 3-4).
	d. Defective nozzle holder assembly.	d. Replace nozzle holder assembly (para 3-201).
	e. improperly adjusted valves.	e. Adjust valves (para 3-220).

Table 3-3. Troubleshooting (Cont)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
7. LOW oil pressure indicated on oil pressure gage.	a. Oil level too low.	a. Add oil until proper level is indicated on oil level gage (para 3-4).
	b. Defective oil pressure gage.	b. Replace gage (para 3-121).
	c. Defective oil pressure transmitter.	c. Replace transmitter (para 3-193).
	d. Clogged lube oil filters.	d. Service filters (para 3-4).
	e. Improper viscosity oil	e. Drain crankcase and fill with proper lube oil (fig. 3-l).
	f. Worn oil pump.	f. Replace oil pump.
	g. Worn bearings.	g. Replace bearings.
8. Noisy turbocharger.	a. Improper turbocharger lubrication.	a. Clean turbocharger oil passages (para 3-203).
	b. Loose turbocharger end plates.	b. Tighten end plate screws (para 3 -203).
9. Turbocharger leaks oil.	a. Loose turbocharger end plates.	a. Tighten turbocharger end plate screws (para 3-203).
	b. Defective turbocharger housing.	b. Inspect housing. Replace turbocharger (para 3-203).
10. High oil pressure indicated on oil pressure gage.	a. See b, c and e from malfunction 7.	a. See b. c and e of malfunction 7.
	b. Oil pressure regulator.	b. Replace oil pressure regulator
11. High coolant temperature indicated on coolant temperature gage.	a. Coolant level low.	a. Add coolant (para 3-41).
	b. High coolant temperature due to incorrect coolant.	b. Check for proper coolant mixture. Correct or replace as necessary (para 3-41).
	c. Lube oil level low.	c. Add lube oil (fig. 3-l).
	d. Defective or improperly adjusted fan belts.	d. Adjust or replace fan belts (para 3-183).
	e. Insufficient heat transfer through radiator.	e. Check that air inlet doors are open. Check shutter operation (para 3-171). Insure that there is at least 10.200 CFM or 12,300 CFM cu. ft. air supply (fig. 2-l).
	f. Defective coolant thermostat.	f. Replace thermostat (para 3-209).
	g. Defective water pump.	g. Replace water pump (para 3-206).
	h. Clogged radiator.	h Replace radiator (para 3-172).
	i. Generator set overloaded.	i. Check that the generator load does not exceed the ratings specified on the kilowatt capacity nameplate 70-1345 (M2), 70-1346 (Ml).
	j. Defective coolant temperature transmitter.	j. Replace transmitter (para 3-209).
	k. Defective coolant temperature gage.	k. Replace gage (para 3-120).

Table 3-3. Troubleshooting (Cont)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
11. (Deleted)	l. & m. (Deleted)	l. & m. (Deleted)
12. Low coolant temperature indicated on coolant temperature gage.	a. Defective coolant thermostat.	a. replace thermostat (para 3-209).
	b. Defective or improperly adjusted radiator shutter and control assembly.	b. Adjust or replace shutter or control assembly (para 3-171).
	c. Defective coolant temperature transmitter.	c. Replace transmitter (para 3-209).
	d. Defective coolant temperature gage.	d. Replace gage (para 3-120).
13. Battery charging ammeter shows no charging when batteries are low or discharged.	a. Blown alternator fuse.	a. Replace fuse located at back end of alternator.
	b. Improperly adjusted alternator.	b. Adjust alternator (para 3-184).
	c. Defective or improperly adjusted alternator belt.	c. Adjust or replace belt (para 3-183).
	d. Defective alternator.	d. Replace alternator (para 3-184).
	e. Defective battery charging ammeter.	e. Replace ammeter (para 3-124).
	f. Open wire in charging circuit.	f. Find open wire and repair.
14. Battery charging ammeter indicates excessive charging rate after prolonged operation.	a. Improperly adjusted alternator.	a. Adjust alternator (para 3-184).
	b. Defective batteries.	b. Service or replace batteries (para 3-82).
	c. Low resistance or short to ground.	c. Inspect wiring and repair as necessary.
	d. Defective alternator.	d. Replace alternator (para 3-184).
	e. Defective battery charging ammeter.	e. Replace ammeter (para 3-108).
15. Ac voltmeter does not indicate any set voltage,	a. Defective speed switch.	a. Replace speed switch (para 3-186).
	b. Defective VOLTS-AMPS selector switch.	b. Replace switch (para 3-11 2).
	c. Defective ac voltmeter.	c. Replace voltmeter (para 3-105).

Table 3-3. Troubleshooting (Cont)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
16. Ac voltage too high or too low.	Defective VOLTAGE ADJUST rheostat.	Replace rheostat (para 3-110).
17. Ac voltmeter indicates voltage but frequency is off scale to left.	a. Engine speed too low.	a. Adjust frequency adjust control (precise). Increase speed manually (utility).
	b. Defective meter or transducer.	b. Replace meter and transducer (para 3-111).
18. Ac voltage fluctuates.	a. Loose electrical connection.	a. Inspect harness and connectors and repair (para 3-139).
	b. Defective VOLTS-AMPS switch.	b. Replace switch (para 3-112).
	c. Defective VOLTAGE ADJUST rheostat.	c. Replace Rheostat (para 3-110).
	d. Defective ac voltmeter.	d. Replace meter (para 3-105).
19. Erratic frequency indicator on frequency meter.	a. Air in fuel.	a. Bleed fuel system (para 3-56).
	b. Defective nozzle holder assembly.	b. Replace nozzle holder assembly (para 3-201).
	c. Improperly adjusted valves.	c. Adjust valves (para 3-220).
	d. Defective frequency transducer or frequency meter.	d. Replace transducer and meter (para 3-111).
20. Frequency meter fails to register.	a. Frequency meter defective.	a. Replace meter and transducer (para 3-111).
	b. Frequency transducer defective.	b. Replace frequency meter and transducer (para 3-111).
21. Kilowatt. meter fails to register.	Kilowatt meter defective,	Replace meter (para 3-106).
22. Engine generator set shuts down, NO FUEL indicator illuminates, but sufficient fuel remains in main tank for operation.	a. Defective day tank float switch.	a. Replace float switch (para 3-159).
	b. Defective fuel solenoid valve.	b. Replace solenoid valve (para 3-158).
	c. Clogged fuel filter or strainer.	c. Service filter and strainer. (para 3-34).
	d. Clogged fuel transfer pump screens.	d. Service fuel transfer pumps (para 3-165).
	e. Defective fuel transfer pumps.	e. Replace pumps (para 3-165).

Table 3-3. Troubleshooting (Cont)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
23. Engine generator set shuts down, HIGH COOLANT TEMP indicator illuminates but coolant temperature is normal.	Defective coolant temperature switch.	Replace switch (para 3-209).
24. Engine generator set shuts down, low oil pressure indicator illuminates, but oil pressure is normal.	Defective oil pressure switch.	Replace switch (para 3-194).
25. Engine generator set shuts down, overspeed indicator illuminates, but engine speed is normal.	Defective overspeed switch.	Replace switch (para 3-186).
26. All meters read correctly except voltmeter reads off scale high.	Defective voltage adjust rheostat.	Replace rheostat (para 3-110).
27. Circuit breaker switch is closed and indicator does not light.	a. Defective load circuit breaker switch. b. Lamp burned out.	a. Replace circuit breaker switch (para 3-117). b. Replace lamp (para 3-26).
28. Main AC contactor (CB2) will not close.	Main AC contactor (CB2) defective.	Measure continuity of coil pins A and B. If no continuity, replace contactor (para 3-141).

3-66. General.

Organizational maintenance level troubles may occur while the engine 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.

3-67. Fuel is not Strained.

Trouble	Expedient Remedy
Fuel tank strainer element defective.	Run engine generator set, with defective strainer element installed until replacement is obtained (para 3-34).

3-68. Housing Filled With Smoke.

Trouble	Expedient Remedy
Defective exhaust pipe.	Run engine generator set with defective exhaust pipe until replacement is obtained (para 3-86).

3-69. Engine Overheating.

Trouble	Expedient Remedy
Shutter control assembly not operational.	If the engine is running too hot, manually open shutter with the lever to keep shutters open until the engine is normally shut down for maintenance or other reason.

3-70. Loss of Coolant.

Trouble	Expedient Remedy
Leaking coolant hose.	If necessary shut down engine, drain coolant, tightly wrap leaky area of hose with plastic electricians tape. Keep monitoring repaired hose area while engine is operating until replacement hose is obtained.
Leaking radiator.	Liberally apply epoxy, tar, putty, or other nonsoluble substance to leaking area of radiator. Let dry. Fill radiator and operate engine until replacement radiator is obtained.
	WARNING Do not add coolant to radiator until pressure has been relieved.
Water pump leaks.	Loosen radiator cap so as to relieve pressure. Continue engine operation adding coolant to radiator as frequently as necessary to maintain water level above top of radiator coil assembly until engine can be conveniently shut down for water pump replacement.

3-71. Engine Heat Up.

Trouble	Expedient Remedy
Badly worn fan belt.	Continue engine operation with defective fan belt installed until replacement belt is obtained, or until engine can be shut down. Frequently observe fan belt (Para 3-183.)

3-72. Engine Cranks But Will Not Start or Starts and Runs Erratically or Misfires.

Trouble	Expedient Remedy
Clogged fuel filter.	Shut down engine and remove fuel filter cartridge and strainer element (para 3-34b). Use compressed air, if available, or shake vigorously, to clear obstruction. Reassemble and continue operation until replacement parts are obtained.
Clogged fuel transfer pump screen.	Shut down engine and remove pump screen (para 3-165). Use compressed air, if available, or shake vigorously, to clear obstruction. Reassemble and continue operation until replacement parts are obtained.
Defective fuel line.	Shut down engine and tightly wrap area of line leak with plastic electrician's tape. Keep monitoring repaired line while engine is operating until a replacement fuel line is obtained.

3-72. Engine Cranks But Will Not Start or Starts and Runs Erratically or Misfires. (Cont)

Trouble	Expedient Remedy
	If repaired fuel line leaks, shut down engine.
Clogged air filter.	Shut down engine and remove filter element (fig. 3-5). Use compressed air, if available, or shake vigorously, to clear obstruction. Reassemble and continue operation until replacement parts are obtained.
Defective fuel selector valve.	Shut down engine and disconnect fuel selector valve (para 3-166). Connect hose assembly (21, fig. 3-28) directly to hose assembly (24). Use hose assembly (15) connection and plastic electrician's tape as necessary to complete connection. Keep monitoring reconnected fuel line while engine is operating until a replacement fuel selector valve is obtained. If reconnected fuel line leaks, shut down engine.

3-73. Engine Shuts Down and LOW OIL PRESSURE Indicator Lights.

Trouble	Expedient Remedy
Defective oil line.	Tightly wrap area of oil line leak with plastic electrician's tape. Keep monitoring repaired line while engine is operating and a replacement oil line is obtained.

3-74. Battery Charging Ammeter Shows No Charge.

Trouble	Expedient Remedy
Battery charging alternator defective.	Continue engine operation with defective battery charging alternator installed until replacement is obtained or until engine can be shut down for battery charging alternator service or repair.

3-75. Loss of Frequency Control (Class 1 Sets Only).

Trouble	Expedient Remedy
Governor system fails to operate properly.	Shut down the engine generator set and disconnect plugs J17 and J21 on the electrical governor control (fig. 1-1). Remove cover (12, fig. 3-17). Loosen screw (13) and move fuel pump lever all the way forward and tighten screw. Move actuator linkage to the retracted position. Operate set as class 2 unit until fault in governor system can be corrected.

NOTE

If actuator linkage does not remain in retracted position disconnect actuator linkage and wire arm (3, fig, 3-32) in the down position (fig. 3-10).

Section VII. RADIO INTERFERENCE SUPPRESSION

3-76. General Methods Used to Attain Proper Suppression.

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

3-77. Interference Suppression Components.

a. Primary Suppression Components. The primary suppression components are those whose function is to suppress radio interference. The exciter regulator contains an Electromagnetic Interference (EMI) suppression assembly to suppress EMI from this assembly. The fuel pumps, main ac contactor, day tank solenoid valve, battery charging alternator and load bank (if installed) contain primary suppression components.

b. Secondary Suppression Components. These components have radio interference suppression functions which are incidental or secondary to their primary function. No secondary suppression components are included on this generator set.

3-78. Replacement of Suppression Components.

a. Fuel Pumps. Replace fuel pumps with integral radio interference suppression components as described in paragraph 3-165.

b. Battery Charging Alternator. Replace the alternator with integral RFI suppression diodes as described in paragraph 3-184.

c. Load Bank. RFI suppression capacitors C301 through C306 (fig. 4-14) are replaced in the Load Bank as described in paragraph 4-38.

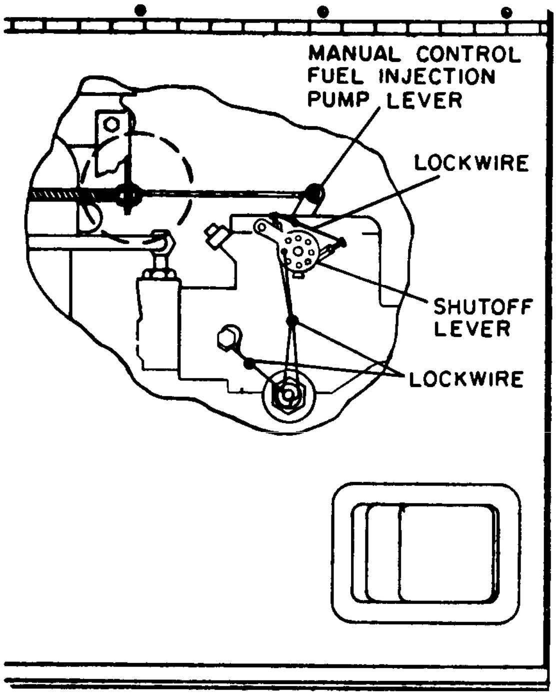


Figure 3-10. Lockwire of Fuel Injector Pump for Class 2 Operation

3.78 Replacement of Suppression Components, (Cont)

d. Main AC Contactor Three RFI suppression capacitors C3, C4 and C5 are connected between terminals A2, B2, and C2 respectively, of the main ac contractor CB2 and ground. Replace suppression capacitors as shown in A of figure 3–11.

e. Day Tank Solenoid Valve. Diode suppressors CR27 are provided at the connector of the day tank solenoid valve. Replace diode suppressors as shown in B of figure 3-11.

3-79. Testing of Radio Interference Suppression Components.

Test the capacitors for leaks and shorts using a multimeter or other capacitor tester. Replace defective capacitors. If test equipment is not available and interference is indicated, isolate the cause of interference by the trial and error method of re- placing each component in turn until the cause of interference is located and eliminated.

Section VIII. ORGANIZATIONAL MAINTENANCE

3-80. General

Instructions are provided in sections IX through XLIV for the information and guidance of responsible personnel to maintain the engine generator set at the organizational level. Where essential, sections are arranged in the most logical order of disassembly of equipment.

Section IX. BATTERIES, AND RELATED PARTS

3-81. General.

This section contains information on the batteries, battery tray and slave receptacles of the engine generator set. Two 12-volt 100 ampere, lead acid type batteries are mounted side by side on a battery tray. The batteries are electrically connected in series to supply 24 Vdc for starting the engine generator set. There is a slave receptacle electrically connected in parallel with the batteries. The receptacle facilitates external connection with the batteries, in order to supply or receive an auxiliary source of electrical power. A source of 24 Vdc electrical power is therefore available for other development. Normally, the engine generator set should be operating so as not to run down the batteries when supplying this source of dc power.

3-82. Batteries.

a. Replacement. To replace one or both batteries, see figure 3-4 and proceed as follows:

(1) Remove screw (lA), nut (lB) and clamp (lC). Disconnect battery negative cable (1) positive cable (2) and jumper cable (3) from storage batteries (4)

(2) Remove two nuts (5) and lockwashers (6), which secure battery retainer (7) to studs (8), and remove storage batteries (4).

(3) Install new storage battery in reverse order of removal.

b. Battery Testing.

NOTE

Failure to perform this task prior to adding distilled water will result in an erroneous reading.

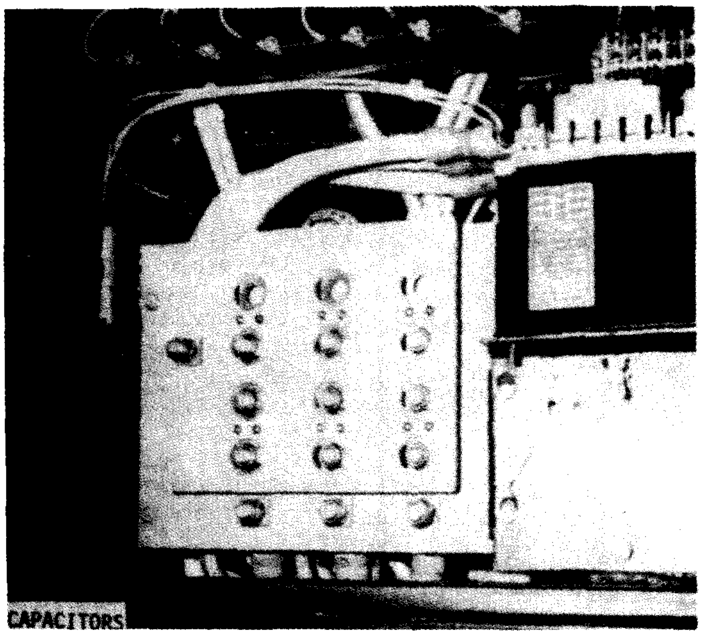
Battery hydrometer readings should be tested on all cells monthly. Always test a battery for a degree of charge before adding water. The specific gravity between the cells should be within .05. A dangerously low point of charge indicated by a hydrometer reading of 1.150 or less will permit the battery to freeze at a temperature of 5° F. A specific gravity of 1.250 will permit the battery to withstand temperatures as low as -65°F without freezing. An acceptable hydrometer reading of 1.210-1.220 at 80°F will be obtained from a fully charged battery (2.0-2.2 volts dc per cell).

Battery reading of less than 1.200 or cell variance of .05 or greater will be replaced if attempts to restore the battery fail. Compare specific gravity readings with previous readings for cell deterioration.

NOTE

The 6TN and 6TL batteries can be mixed or matched. However, maintenance–free batteries cannot be mixed or matched with military batteries. The 6TN and or the 6TL batteries will perform properly in hot weather as long as electrolyte levels are carefully monitored. If the electrolyte expands and causes the level to rise, some fluid must be removed. If the level becomes too low due to evaporation, distilled water may be used to obtain the proper level. A good grade of drinking water (excluding mineral waters) may be used if distilled water is not available.

Electrolyte (NSNs 6810-00-249-9354 and 6810-00-843-1640) have a specific gravity of 1.280 and should be used in these batteries. Do NOT adjust the electrolyte in wet batteries to a lower specific gravity.



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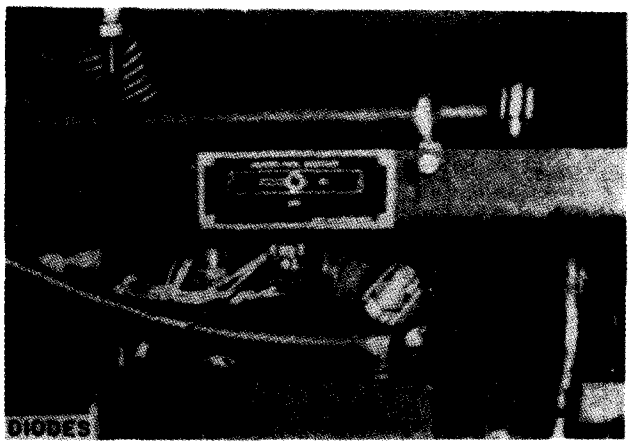
A. MAIN AC CONTACTOR CAPACITORS



ME 6115-545-12/3-11B

B. DAY TANK SOLENOID VALVE DIODES

Figure 3-11. Interference Suppression Components Removal and Installation temperatures as low as -65°F. without freezing. An acceptable hydrometer reading of 1.210 - 1.220 at 80°F will be obtained from a fully charged battery (2.0-2.2 volts dc per cell).

c. Battery Preparation

WARNING

Do not smoke or use an open flame in the vicinity when servicing batteries. Batteries generate hydrogen during charging, a highly explosive gas. A severe bum will result when electrolyte is spilled on the skin or clothing. Use extreme care in handling while filling batteries.

(1) Remove cell caps and fill battery cells with electrolyte to 38 inches above the plates.

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

3-83. Battery Tray Replacement

To replace the battery tray, remove batteries as described in paragraph 3-82a. Remove screws (9, fig. 3-4) and lockwashers (10) which secures battery tray (11) in position, and install new battery tray.

3-84. Slave Receptacle Replacement.

To replace the slave receptacle, see figure 3-4 and proceed as follows:

a. Disconnect battery negative cable (1).

b. Remove six screws (12) which secure receptacle box (13) to housing and tilt box forward to gain access to wiring connections. Disconnect wiring connections, clamps, harness ties and tag for ease of Installation.

c. Remove four screws (IS) and nuts (16) which secure slave receptacle (I"), and remove receptacle.

d. (Deleted)

e. install receptacle in reverse order of removal.

Section X. MUFFLER AND EXHAUST PIPES AND BREATHER SYSTEM

3.85. General.

Thin section contains information on the muffler and exhaust pipes and breather system of the engine generator set. The muffler and exhaust pipes provide a method for expelling exhaust gases from the engine generator set. The exhaust pipe allows the exhaust gases from the engine to he discharged from an opening above the grille. The discharge opening is covered by a cap that is opened by exhaust pressure when the engine generator set is running. The breather system provides a method for returning oil to the crankcase and improving the atmosphere around the engine generator set. Accumulated oil residue and gases in the valve cover pass through an oil separator which separates the oil and the gases. The oil is returned to the crankcase and the gases exhaust into the air cleaner inlet. The breather system is removed as outlined in paragraph 3-87.

3-86. Muffler and Exhaust Pipe Replacement.

To replace the exhaust pipe, see figure 3-12 and proceed as follows

WARNING

Allow exhaust pipe to cool if engine has been running.

Loosen nut (1) from screw (2) and remove weather cap (3).

b. Loosen nuts (4) which secure 0-bolt (6) and bracket (7) to nozzle (8) and muffler (9) pipes, and slide 0-bolt (6) and bracket (7) toward muffler.

Remove screws (10) which secure nozzle (8) to housing. Place 0-bolt (6) on muffler (9) pipe and remove nozzle (8).

d. Loosen nuts (11) which secure 0-bolt (13) and bracket (14) to muffler (9) and exhaust pipe (15). Place 0-bolt (13) with bracket (14) on muffler pipe and remove muffler and both 0-bolt assemblies.

e. Disconnect exhaust pipe (15) from engine and remove exhaust pipe.

f. Install new exhaust pipe in reverse order of removal.

3-87. Breather System Replacement.

To replace the breather system. see figure 3-12.1 and proceed as follows:

Loosen clamps (1) and disconnect hose (2) from oil separator (4) and elbow (3).

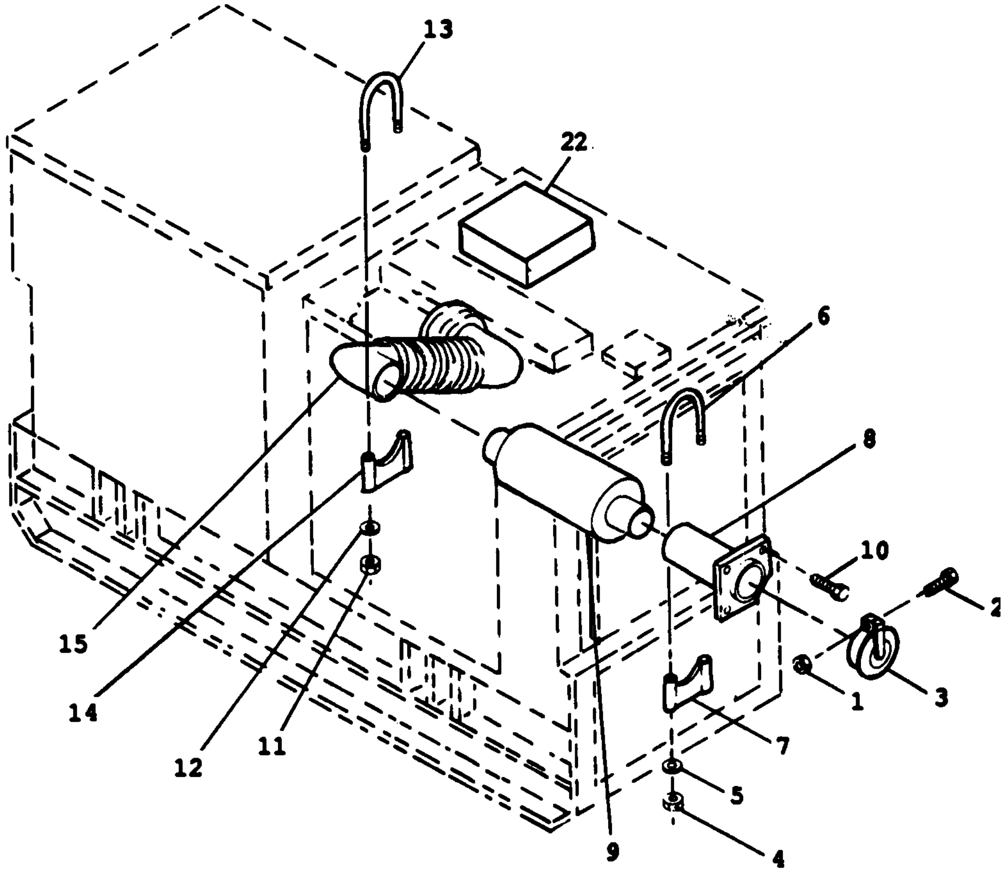
b. Loosen clamps (5) and disconnect hose (6) from oil separator (4) and valve cover crankcase breather.

c. Loosen clamps (7) and disconnect hose (8) from oil separator (4) and air cleaner inlet (9).

d. Loosen clamp (10) and slide out oil separator (4)

Remove nuts (1 1). camp and bracket (10), nuts (12), and screws (13).

f. Install breather system in reverse order of removal.



1. Nut	5. Washer	9. Muffler	13. u–bolt	22. Document Compartment
2. Screw	6. U-bolt	10. Screw	14. Bracket	
3. Weather Cap	7. Bracket	11. Nut	15. Exhaust Pipe	
4. Nut	8. Nozzle	12. Washer	16.-21. Deleted	

Figure 3-12. Exhaust Pipe

Section XI. CONVENIENCE RECEPTACLE

3-88. General.

This section contains information on the convenience receptacle and associated circuit breaker.

3-89. Convenience Receptacle Box Assembly Replacement.

See figure 3-13 and proceed as follows

Remove six screws (1) which secure box cover (2) and box (3) to frame (4).

b. Tilt box cover (2) and disconnect electrical connections from receptacle (5) and circuit breaker (9) and remove box cover and assembly.

c. Remove grommet (12) from box (3) and feed electrical wires back through grommet hole. Tag all electrical connections for positive identification during installation.

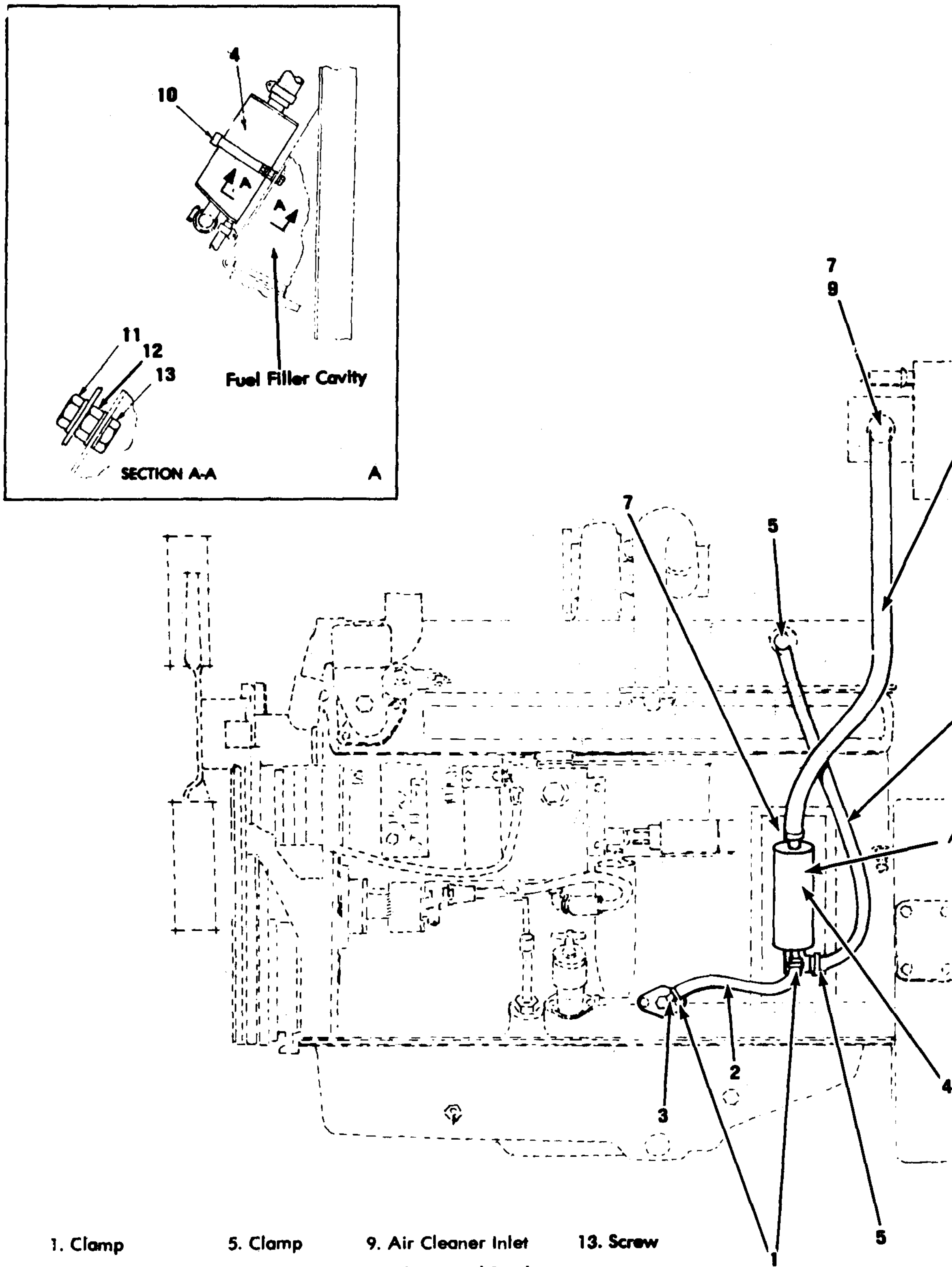
d. Install new convenience receptacle box assembly in reverse order of removal.

3-90. Convenience Receptacle Replacement.

See figure 3-13 and proceed as follows

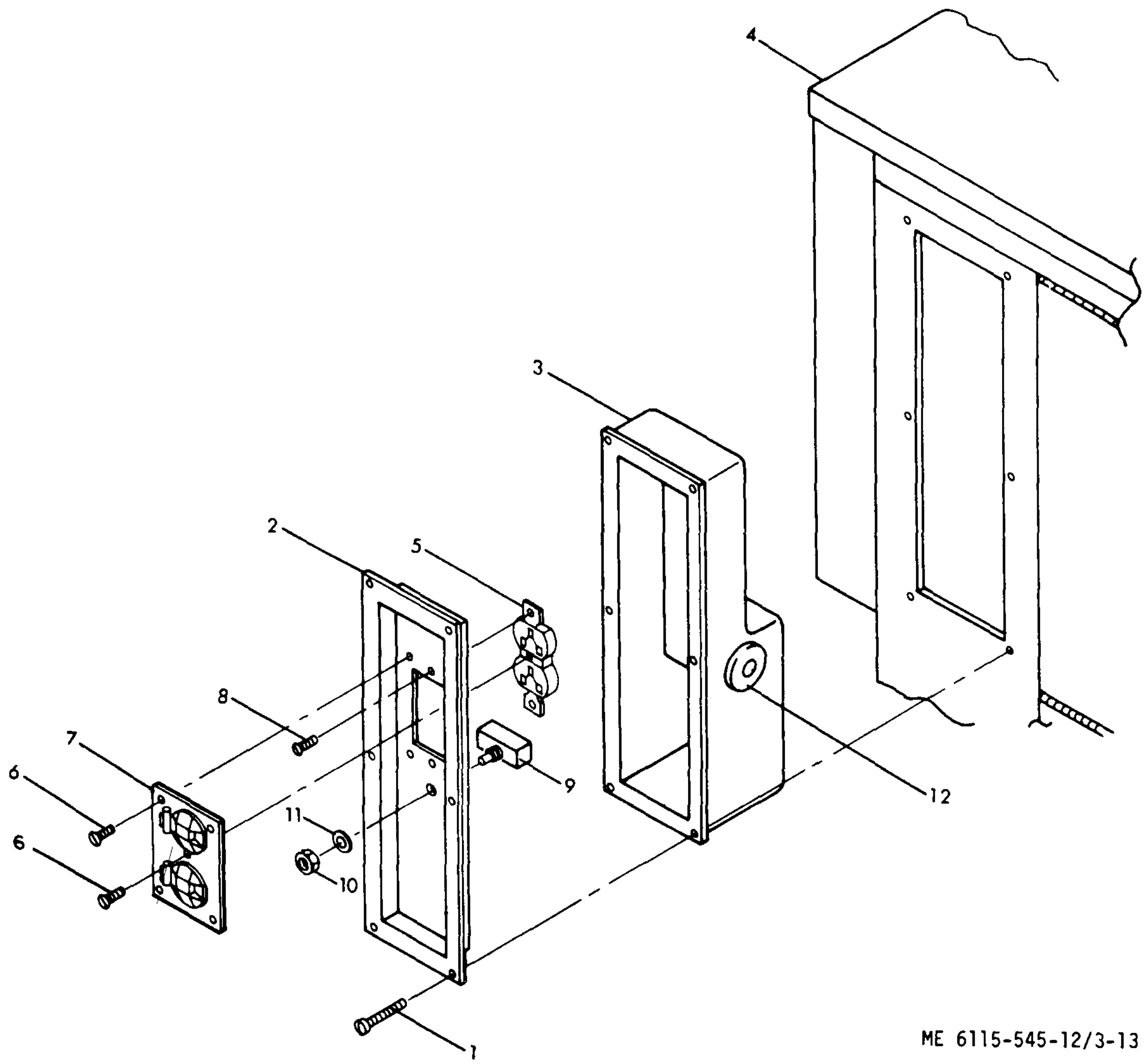
a. Remove six screws (1) which secure box cover (2) and box (3) to frame (4).

b. Tilt box cover (2) and disconnect electrical connections from receptacle (5).



1. Clamp
2. Hose
3. Elbow
4. Oil Seperater
5. Clamp
6. Hose
7. Clamp
8. Hose
9. Air Cleaner Inlet
10. Clamp and Bracket
11. Nut
12. Nut
13. Screw

Figure 3-12.1. Crankcase Breather System



1. Screw
2. Box cover
3. Box
4. Frame
5. Receptacle
6. Screw
7. Cover
8. Screw
9. Circuit breaker
10. Nut
11. Washer
12. Grommet

Figure 3-13. Convenience Receptacle

c. Remove five screws (6) which secure receptacle cover (7) to box cover (2).

d. Remove two screws (8) which secure receptacle (5) to rear of box cover.

e. Redate receptacle with new one in reverse sequence of removal.

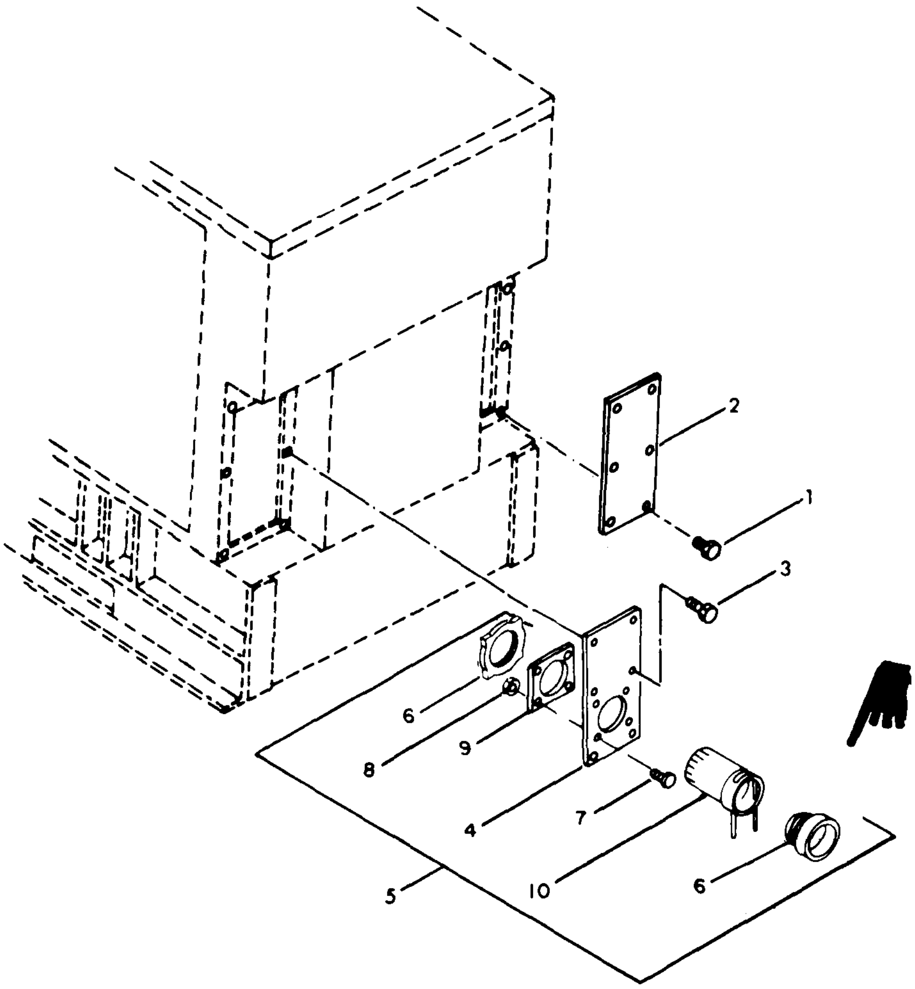
3-91. Circuit Breaker Test and Replacement.

Close circuit breaker and test for continuity. If defective see figure 3-13 and proceed as follows:

a. Repeat paragraph 3-89 a and tilt box cover (2) to disconnect electrical connections from circuit breaker (9).

b. Remove nut (10) and washer (11) which secure circuit breaker to box cover.

c. Replace circuit breaker with new one in reverse sequence of removal.



1. Screw
2. Cover
3. Screw
4. Plate
5. Plate and sleeve assy
6. Bushing
7. Screw
8. Nut
9. Retaining plate
10. Cloth sleeve

Figure 3-15. Plate and Sleeve Assembly.

Section XIII. PLATE AND SLEEVE ASSEMBLY

3-95. General.

This section contains information on the plate and sleeve assembly. The plate and sleeve assembly provides an opening for kit installation. and load cable, with a cover to secure the opening.

3-96. Replacement.

To replace the cover plate and sleeve assembly see figure 3-15, and proceed as follows:

a. Remove screws (1) which secure cover (2) to housing. Remove screws (3) which secure plate (4) of plate and sleeve assembly (5) to housing.

b. Remove screws (7) and nuts (8) which secure retaining plate (9) and cloth sleeve (10) to plate. Remove bushing (6), cloth sleeve (10) and retaining plate (9).

c. Install a new plate and sleeve assembly, or parts thereof, in the reverse order of removal.

3-97. General.

This section contains information on the paralleling receptacles of the engine generator set. The paralleling receptacles provide a means of interconnecting three generator sets of the same class, mode and size by the use of 25 foot, four conductor cables. The paralleling receptacles include the wiring harness with connectors, protector caps for the connectors, and the shorting plug dummy connector.

3-98. Replacement.

To replace the paralleling receptacles, see figure 3-16 and proceed as follows:

a. Disconnect battery power cable from battery negative terminal.

b. Remove plate and sleeve assembly (para 3-96) to gain access to convenience and paralleling wiring harness.

c. Remove cap and chain (4) and shorting plug (5) by removing screws (1), washers (2), and nuts (3).

d. Remove screws (8) and nuts (9) which secure receptacle in place.

e. Using full wiring harness (10) slack available, disconnect wiring connections at rear of receptacles and tag wiring to ease installation. Each paralleling receptacle may be replaced in the reverse order of removal.

f. Disconnect convenience receptacle wiring harness by performing procedure of paragraph 3-89a through c.

g. Unscrew wiring harness connector from receptacle on special relay box.

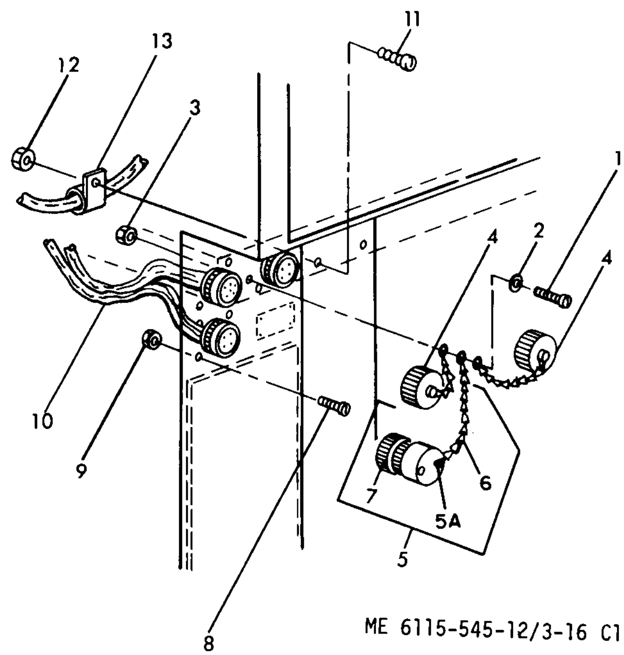
h. Remove two clamps (13) which secure wiring harness along relay table by removing nuts (12) and screws (11).

i. Reinstall new or repaired wiring harness in reverse order of removal.

j. Replace any damaged cap and chain (4) with new ones and secure in place with screws (1), washers (2) and nuts(3).

k. Replace and plate and sleeve assembly removed in step b.

l. Reconnect battery power cable.



1. Screw	7. Connector
2. Washer	8. Screw
3. Nut	9. Nut
4. Cap and chain	10. Wiring harness
5. Dummy connector (shorting plug)	11. Screw
5A. Screw	12. Nut
6. Chain	13. Clamp

Figure 3-16. Paralleling Receptacles

3-99. General.

The engine generator set control assembly consists of a wiring harness, and an engine generator control panel assembly. The generator control panel assembly provides a means of controlling engine generator operation.

3-100. DC Control Circuit Breaker.

a. Test.

(1) Depress circuit breaker (27, fig. 3-17) to insure that it is in the reset position (flush to panel).

(2) Remove screw and lockwasher which secure leads to one terminal of circuit breaker.

(3) With an ohmmeter test circuit breaker for closed contacts. If meter shows an open circuit, replace circuit breaker.

b. Replacement. Replace defective DC CONTROL CIRCUIT BREAKER (27) as follows:

(1) Removal.

(a) Tag leads and remove screws and lockwashers which secure leads to DC CONTROL CIRCUIT BREAKER.

(b) Remove DC CONTROL CIRCUIT BREAKER mounting hardware and remove circuit breaker.

(2) Installation. Install DC CONTROL CIRCUIT BREAKER using removal steps in reverse order. Remove tags.

3-101. Wiring Harness Replacement.

See figure 3-17 and remove wiring harnesses (1 and 2) as follows:

a. Unplug and disconnect wiring harnesses at terminations. Tag all connectors and electrical leads to assure position identification during replacement.

b. See detail A of figure 3-17, and remove all screws (3), nuts (4) and clamps (5) securing wiring harnesses in position.

c. Install new or repaired wiring harnesses in reverse sequence of removal.

3-102. Manual Speed Control.

a. Inspection. Inspect throttle and governor linkages for loose mounting, loose connections, and loose linkage.

b. Test. Check that the throttle and governor linkages motion is smooth and unrestricted. A 90-degree rotation of the manual speed control knob shall provide a linear cable movement of 0.036 $\pm$ 0.005 inch.

c. Replacement.

(1) Disconnect negative lead from the battery. On Class 1 sets, remove screws (11, fig. 3-17) which secures cover (12) and remove cover.

(2) See detail B and remove manual control assembly (21) by loosening screw (13) and removing nut (16), washer (17), nut (18), nut (19) and washer (20).

3-103. Fault Indicator.

See figure 3-17 and proceed as follows:

a. Inspection. Inspect FAULT INDICATOR panel (10) for cracks, breaks, and other damage.

b. Testing. Test the fuse as described below:

(1) Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17).

(2) Unscrew fuseholder cap (24), and remove fuse (25).

(3) Using ohmmeter, check that continuity exists through fuse and open circuit is not in effect.

(4) Install existing fuse, or replacement fuse as necessary, and replace fuse holder cap (24).

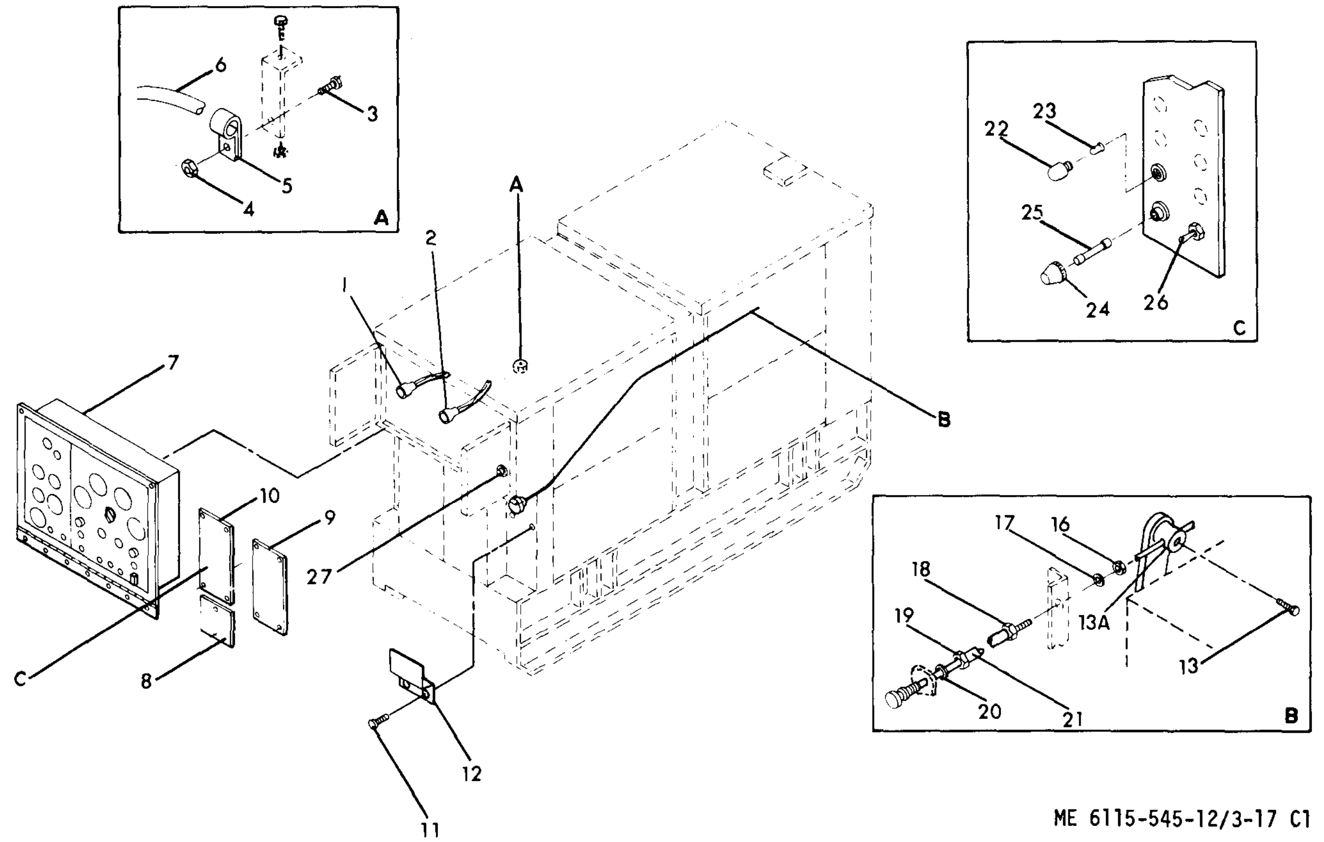
(5) Remove the harness plug from the back of the fault indicator control box. Apply 24 Vdc to pins 12-A (positive) and 12-B of the fault indicator receptacle.

(6) Sequentially jump pin C of the fault indicator receptacle to the pins listed in table 3-2 of the fault indicator receptacle. The light that corresponds to the particular fault opposite the pin numbers should light and stay lit. Reset the lights with the TEST OR RESET switch before proceeding to the next set of pins. If the correct light does not light up or if an incorrect light lights, the fault indicator control box must be replaced.

c. Replacement. See figure 3-17 to remove and install FAULT INDICATOR panel (10).

d. Lamp and Fuse. To replace indicator lamp and fuse, see detail C of figure 3-17 and proceed as follows:

(1) Unscrew lens (22) and remove lamp (23).



1. Wiring harness
2. Wiring harness
3. Screw
4. Nut
5. Clamp
6. Wiring harness
7. Control cubicle assembly
8. Blank panel
9. Blank panel
10. Fault indicator panel
11. Screw
12. Cover(Class 1 sets)
13. Screw, stop lever
13A. Throttle lever assembly
14. (Deleted)
15. (Deleted)
16. Nut
17. Washer
18. Nut
19. Nut
20. Washer
21. Manual control assembly
22. Lens
23. Lamp
24. Fuse holder cap
25. Fuse
26. Test or reset switch
27. Dc control circuit breaker

Figure 3-17. Generator Set Controls

(2) Unscrew fuse holder cap (24) and remove fuse (25). Install new fuse and replace fuse holder cap (24).

3-104. Control Cubicle Assembly.

See figures 3-18, 19 and 20, and proceed as follows:

a. Inspection. Inspect the generator control cubicle for defective, broken, cracked, or otherwise defective components.

b. Testing. Testing of components of the control cubicle is described under the appropriate heading in paragraphs 3-105 through 3-130.

c. Repair. Repair by replacement of components which do not function properly during testing.

CAUTION

Turn engine off and remove the battery negative connection before removing any electrical leads to avoid possible short circuit and resulting damage.

d. Replacement. If a component needs replacement, gain access to the rear of the control cubicle panel (96, fig. 3-18) by loosening the three quarter-turn fastener and permitting the control cubicle panel to pivot about its hinges in a forward direction. Replace control cubicle panel components which do not function properly in step b (testing) as indicated in following paragraphs. Replace control box (123, fig. 3-18) as described in paragraph 3-135 b.

3-105. AC Voltmeter Replacement.

See (42, fig. 3-18) and replace the ac voltmeter as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER before testing or replacing the ac voltmeter.

a. Testing.

(1) Gain access to rear of control cubicle panel (96).

(2) Connect multimeter with appropriate ac voltmeter connections across ac voltmeter terminals.

(3) Perform preparation for starting procedure (fig. 2-6) and zero ac voltmeter with front panel VOLTAGE ADJUST control.

(4) Perform starting procedure (fig. 2-7) steps 1 through 4.

(5) Check that readings on multimeter and ac voltmeter do not differ by a voltage greater than that listed below for each setting of the AMPS-VOLTS selector switch.

(a) 240/416 V operation.

AMPS -VOLTS setting	Voltage Difference
L1-L2	34 V
L1-L0	22 V

(b) 120/208 V operation.

AMPS -VOLTS setting	Voltage Difference
L1-L2	21 V
L1-L0	11 V

(6) If voltage differences, greater than those specified above are obtained, the ac voltmeter is faulty and must be replaced. Faulty ac voltmeter must be forwarded to higher maintenance level for repair.

(7) Stop engine generator (fig. 2-8).

(8) Disconnect multimeter and secure control cubicle panel.

b. Removal.

(1) Gain access to rear of control cubicle panel (96).

(2) Tag and remove ac voltmeter (42) leads.

(3) Remove screws (40) and nuts (41) which secure ac voltmeter and remove ac voltmeter.

c. Installation. Install replacement ac voltmeter using removal steps in reverse order. Remove tags.

3-106. Kilowatt Met er Replacement.

See (39, fig. 3-18) and replace the kilowatt meter as follows:

a. Removal.

(1) Gain access to rear of control cubicle panel (96).

(2) Tag and remove kilowatt meter (39) leads.

(3) Remove three screws and nuts which secure kilowatt meter and remove kilowatt meter.

b. Installation. Install replacement kilowatt meter using removal steps in reverse order. Remove tags.

3-107. Watt meter Converter Inspection and Replace - ment.

See (102, fig. 3-18) and proceed as follows:

a. Inspection. Gain access to interior of control cubicle and inspect wattmeter converter for signs of corrosion, loose mounting, loose electrical connect ions, or evidence of damage.

b. Removal.

(1) Gain access to rear of control cubicle panel (96).

(2) Tag and remove electrical leads.

(3) Remove screws (100) and nuts (101) which secure wattmeter converter (102) and remove wattmeter converter.

c. Installation. Install replacement wattmeter converter (102) using removal steps in reverse order. Remove tags.

3-108. AC Ammeter Replacement,

See (8, fig. 3-18) and replace the ac ammeter (8) as follows:

a. Removal.

(1) Gain access to rear of control cubicle panel (96).

(2) Tag and remove ac ammeter leads.

(3) Remove three screws and nuts which secure ac ammeter (8) and remove ac ammeter.

b. Installation. Install replacement ac ammeter (8) removal steps in reverse order. Remove tags.

3-109. Frequency Adjust Rheostat.

See (57, fig. 3-18) and proceed as follows:

a. Inspection.

(1) Gain access to rear of control cubicle panel (96).

(2) Inspect FREQUENCY ADJUST rheostat (57) for breaks, loose mounting, evidence of corrosion, or other damage.

b. Testing.

(1) Tag leads and remove screws which secure leads to the FREQUENCY ADJUST rheostat (57).

(2) Connect an ohmmeter probe to each of the outer terminals on the FREQUENCY ADJUST rheostat (57), The ohmmeter should read 500 ohms ±3%.

(3) To check wiper arm of the FREQUENCY ADJUST rheostat (57), connect one ohmmeter probe to either outer terminal and the other probe to the center terminal (wiper arm). Turn the FREQUENCY ADJUST rheostat slowly throughout its range, which should be 0 to 500 ohms. As the shaft is rotated, the ohmmeter indicator should move at the same rate as the rotating shaft. If the pointer does not move, or moves unevenly, the FREQUENCY ADJUST rheostat is defective and should be replaced.

(4) Reconnect leads as tagged using screws and washers. Remove tags.

c. Replacement. Replace defective FREQUENCY ADJUST rheostat (57) as follows:

(1) Removal.

(a) Tag leads and remove three nuts and lockwashers which secure the three leads to FREQUENCY ADJUST rheostat (57).

(b) Remove knob and hardware which secure rheostat to panel and remove rheostat,

(2) Installation. Install FREQUENCY ADJUST rheostat (57) using removal steps in reverse order. Remove tags.

3-110. Voltage Adjust Rheostat.

See (54, fig. 3-18) and proceed as follows:

a. Inspection.

(1) Gain access to rear of control cubicle panel (96).

(2) Inspect VOLTAGE ADJUST rheostat (54) for breaks, loose mounting, cracks, evidence of corrosion, and other damage.

b. Testing.

(1) Tag and unsolder leads from VOLTAGE ADJUST rheostat (54) and test rheostat as described for FREQUENCY ADJUST rheostat (para 3 -109), except that the resistance value is 250 ohms ±3% and the range is 0 - 250 ohms.

(2) Resolder leads to terminals as tagged. Remove tags.

c. Replacement.

(1) Removal.

(a) Tag leads and unsolder leads from VOLTAGE ADJUST rheostat (54).

(b) Remove knob and hardware which secure VOLTAGE ADJUST rheostat (54) to panel (96) and remove rheostat.

(2) Installation. Install VOLT AGE ADJUST rheostat (54) using removal steps in reverse order. Solder leads to rheostat. Remove tags.

3-111. Frequency Transducer and Meter. (See fig. 3-18.)

a. Inspection. Inspect transducer (6) and frequency meter (7) for loose mounting, loose leads and other damage.

b. Replacement. The transducer (6) and frequency meter (7) are a matched set (5) and must be replaced by another matched set. Replace frequency meter and transducer as follows:

(1) Removal.

(a) Gain access to rear of control cubicle panel (96).

(b) Tag and remove frequency meter (7) leads.

(c) Remove screws (3) and nuts (4) which secure the frequency meter to the panel (96) and remove frequency meter (7).

(d) Tag and remove transducer (6) leads.

(e) Remove screws (1) and nuts (2) which secure transducer (6) to the rear panel and remove the transducer.

(2) Installation. Install frequency meter (7) and transducer (6) using removal steps in reverse order. Remove tags.

3-112. AMPS-VOLTS Selector Switch.

See (48, fig. 3-18) and proceed as follows:

a. Testing.

(1) Gain access to rear of control cubicle panel (96).

(2) Tag AMPS-VOLTS selector switch (48) leads and removes crews and lockwashers which secure leads to AMPS-VOLTS selector switch (48) and test AMPS-VOLTS selector switch for continuity using ohmmeter and schematic, figure 3-21. Sequentially select each

position, starting with L1 -L2 (volts), and rotate AMPS-VOLTS selector switch clockwise a step at a time. The circuit for the L1 -L2 position is illustrated in figure 3-21. As the selector switch is rotated clockwise (CW), the contacts rotate CW as shown.

(3) Install leads as tagged and remove tags.

b. Replacement. Replace defective AMPS-VOLTS selector switch (48) as follows:

(1) Removal.

(a) Tag AMPS-VOLTS selector switch (48) leads and remove screws and lockwashers which secure the leads to the AMPS-VOLTS switch.

(b) Remove knob (43) and hardware which secure AMPS-VOLTS selector switch (48) to panel (96) and remove switch.

(2) Installation. Install AMPS-VOLTS selector switch (48) using removal steps in reverse order and remove tags.

3-113. Panel Light Switch.

See (66, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) before testing or replacing PANEL LIGHT switch.

a. Testing.

(1) Gain access to rear of control cubicle panel (96, fig. 3-18).

(2) Remove screw that secures one of the leads to PANEL LIGHT switch (66).

(3) With an ohmmeter test PANEL LIGHT switch for continuity in ON position.

(4) Test PANEL LIGHT switch for open contacts no continuity in OFF position.

(5) Reconnect lead to PANEL LIGHT switch.

b. Replacement. Replace defective PANEL LIGHT switch (66) as follows:

(1) Removal.

(a) Tag PANEL LIGHT switch leads and remove screws and lockwashers which secure leads to switch.

(b) Remove mounting hardware which secures PANEL LIGHT switch to panel and remove switch.

(2) Installation. Install PANEL LIGHT switch (66) using removal steps in reverse order and remove tags.

3-114. Voltage Sensing Switch, Local-Remote.

See (67, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, figure 3-17) before testing or replacing VOLTAGE SENSING switch.

a. Testing.

(1) Gain access to rear of control cubicle panel (96, fig. 3-18).

(2) Tag all VOLTAGE SENSING switch (67) leads.

(3) Remove screws and lockwashers which secure tagged leads to VOLTAGE SENSING switch.

(4) Place VOLTAGE SENSING switch to REMOTE position. With an ohmmeter, test for continuity, (closed contacts) from center contacts to upper contacts.

NOTE

Upper contacts are those closest to panel hinge.

(5) Place VOLTAGE SENSING switch in LOCAL position. Test for continuity (closed contacts) from center contacts to lower contacts.

(6) If the VOLTAGE SENSING switch does not operate correctly replace it.

(7) Reconnect leads, as tagged, and remove tags.

b. Replacement. Replace VOLTAGE SENSING switch (67) as follows:

(1) Removal.

(a) Tag VOLTAGE SENSING switch leads and remove screws and lockwashers which secure leads to the VOLTAGE SENSING switch.

(b) Remove mounting hardware which secures VOLTAGE SENSING switch to panel (96) and remove switch.

(2) Installation. Install VOLTAGE SENSING switch (67) using removal steps in reverse order. Remove tags.

3-115. Single/Parallel Operation Switch.

See (68, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) before testing or replacing OPERATION switch (68).

a. Testing.

(1) Gain access to rear of control cubicle panel (96, fig. 3-18).

(2) Tag all OPERATION switch (68) leads.

(3) Remove screws and lockwashers which secure tagged leads to the OPERATION switch.

(4) Place OPERATION switch in PARALLEL OPERATION position. With an ohmmeter, test for continuity (closed contacts) from center contacts to upper contacts.

NOTE

Upper contacts are those closest to the panel hinge.

(5) Place OPERATION switch in SINGLE UNIT OPERATION position. Test for continuity (closed contacts) from center contacts to lower contacts.

(6) If the OPERATION switch does not operate correctly, replace it.

(7) Reconnect leads, as tagged, and remove tags.

b. Replacement. Replace defective OPERATION switch (68) as follows:

(1) Removal.

(a) Tag OPERATION switch leads and remove screws and lockwashers which secure leads to OPERATION switch.

(b) Remove mounting hardware which secures OPERATION switch (68) to panel (96) and remove OPERATION switch.

(2) Installation. Install OPERATION switch (68) using removal steps in reverse order. Remove tags.

3-116. Battle Short Switch.

See (62, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) before testing or replacing BATTLE SHORT switch.

a. Testing.

(1) Gain access to rear of control cubicle panel (96, fig. 3-18).

(2) Tag the center leads of BATTLE SHORT switch (62).

(3) Remove screws and lockwashers which secure tagged leads to BATTLE SHORT switch.

(4) Place BATTLE SHORT switch in ON position. With an ohmmeter test for continuity (closed contacts) from center contacts to upper contacts.

NOTE

Upper contacts are those closest to the panel hinge.

(5) Place BATTLE SHORT switch in OFF position. Test for continuity (closed contacts) from center contacts to lower contacts.

(6) If the BATTLE SHORT switch does not operate correctly, replace it.

b. Replacement. Replace defective BATTLE SHORT switch (62) as follows:

(1) Removal.

(a) Tag BATTLE SHORT switch (62) leads and remove screws and lockwashers which secure leads to BATTLE SHORT switch.

(b) Remove BATTLE SHORT switch mounting hardware and remove switch.

(c) Remove BATTLE SHORT switch cover.

(2) Installation. Install BATTLE SHORT switch (62) using removal steps in reverse order. Remove tags.

3-117. Circuit Breaker Switch.

See (65, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) before testing or replacing CKT BRK switch.

a. Testing.

(1) Gain access to rear of control cubicle panel (96, fig. 3-18).

(2) Check that spring return is in its center position.

(3) Tag and remove all leads from CKT BRK switch (65, fig. 3-18).

(4) With an ohmmeter, test for continuity between contact 5 and contact 6 with CKT BRK switch (65) in the CLOSE and center position and no continuity with the CKT BRK switch in the OPEN position.

(5) With an ohmmeter, test for no continuity between contact 2 and contact 3 with CKT BRK switch (65) in CENTER and OPEN position, and continuity with CKT BRK switch in CLOSE position.

(6) If the CKT BRK switch does not operate correctly, replace it.

(7) Reconnect leads.

b. Replacement. Replace CKT BRK switch (65) as follows:

(1) Removal.

(a) Tag leads and remove screws and lockwashers which secure leads to CKT BRK switch.

(b) Remove CKT BRK switch mounting hardware and remove CKT BRK switch.

(2) Installation. Install CKT BRK switch (65) using removal steps in reverse order. Remove tags.

3-118. Engine Primer Switch.

See (63, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) before testing or replacing ENGINE PRIMER switch.

a. Testi Test ENGINE PRIMER switch (63, fig. 3-18 as follows:

(1) Gain access to the rear of the control cubicle panel (96).

(2) Remove screw and lockwasher which secure a lead to the ENGINE PRIMER switch.

(3) Check that ENGINE PRIMER switch is spring loaded to "OFF" position. With an ohmmeter, test ENGINE PRIMER switch for open circuit with ENGINE PRIMER switch in "OFF" position.

(4) Test ENGINE PRIMER switch for a closed circuit with ENGINE PRIMER switch held in "ON" position.

(5) Reconnect lead using screw and lockwasher.

b. Replacement. Replace ENGINE PRIMER switch (63) as follows:

(1) Removal.

(a) Tag both leads and remove two screws and lockwashers which secure leads to the ENGINE PRIMER switch.

(b) Remove mounting hardware which secures ENGINE PRIMER switch (63) to panel (96) and remove ENGINE PRIMER switch.

(2) Installation. Install ENGINE PRIMER switch (63) using removal steps in reverse order. Remove tags.

3-119. Engine Start-Run-Stop Switch.

See (64, fig. 3-18) and proceed as follows:

CAUTION

Open DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) before testing or replacing START-RUN-STOP switch.

a. Testing. Test the engine START- RUN-STOP switch (64, fig. 3-18) as follows:

(1) Gain access to the rear of the control cubicle panel (96).

(2) Check spring return from START to RUN position.

(3) Tag and remove leads from the engine START -RUN-STOP switch and test the switch for continuity as follows:

(a) Place engine START -RUN-STOP switch to START position and with an ohmmeter test for continuity (closed contacts) between contacts 2 to 3; contacts 5 to 6; contacts 8 to 9; and contacts 11 to 12.

(b) Place engine START -RUN-STOP switch to RUN position, test for continuity between contacts 2 to 3 and contacts 8 to 9.

(c) Check for open circuit between contacts 5 to 6, and between contacts 11 to 12.

(d) Place engine START -RUN-STOP switch to STOP position and test for open circuit between all contacts.

(e) If engine START-RUN-STOP switch does not operate correctly, replace it.

(f) Reconnect leads as tagged and remove tags.

b. Replacement. Replace defective engine START-RUN-STOP switch as follows:

(1) Removal.

(a) Tag and remove leads from the engine START -RUN-STOP switch.

(b) Remove mounting hardware which secures engine START-RUN-STOP switch (64) to panel (96) and remove switch.

(2) Installation. Install engine START-RUN-STOP (64) switch using removal steps in reverse order. Remove tags.

3-120. Coolant Temperature Gage.

See (80, fig. 3-18) and proceed as follows:

a. Testing.

(1) Gain access to the rear of the control cubicle panel (96).

CAUTION

Disconnect negative battery terminal prior to making circuit changes. Reconnect this terminal prior to checking meters, gages and indicating lights.

(2) Tag and remove the lead from the SEND contact of the COOLANT TEMPERATURE gage (80).

(3) The O to 500 ohm FREQUENCY ADJUST rheostat on the control cubicle panel (96) can be used to check the COOLANT TEMPERATURE gage. Disconnect and tag all leads from the FREQUENCY ADJUST rheostat.

(4) Connect a multimeter between the wiper arm terminal and either other terminal of the FREQUENCY ADJUST rheostat and adjust the rheostat until the multimeter reads precisely 460 ohms. Disconnect the multimeter but do not disturb the rheostat setting.

(5) Check that START-RUN-STOP switch (fig. 2-5) is set to RUN, BATTLE SHORT switch (fig. 2-5) to ON, and the DC CONTROL CIRCUIT BREAKER (27, fig. 3-17) is in closed ON position. Connect the 460 ohm resistance of the FREQUENCY ADJUST rheostat in series with ground and the SEND terminal of the coolant temperature gage. Gage should read approximately 240°F.

(6) Disconnect rheostat from circuit and reconnect leads removed in paragraph (3) above/

(7) If the COOLANT TEMPERATURE gage does not operate correctly, replace it.

b. Replacement. Replace the COOLANT TEMPERATURE gage as follows:

(1) Removal.

(a) Gain access to the rear of the control cubicle panel (96).

(b) Tag and remove the leads from COOLANTTEMPERATURE gage (80).

(c) Remove the two nuts (81), two washers (82), and clamp (83) which secure the COOLANT TEMPERATURE gage (80) and remove gage.

(2) Installation. Install COOLANT TEMPERATURE gage (80) using removal steps in reverse order, Remove tags.

3-121. Oil Pressure Gage.

See (78, fig. 3-18) and proceed as follows:

a. Testing

(1) Gain access to the rear of the control cubicle panel (96).

CAUTION

Connect battery negative terminal prior to checking the OIL PRESSURE gage (78) readings. Remove this terminal prior to making circuit changes.

(2) Tag and remove the lead from the SEND terminal of the OIL PRESSURE gage.

(3) The 0-500 ohm FREQUENCY ADJUST rheostat can be used to check the OIL PRESSURE gage. Disconnect and tag all leads from the FREQUENCY ADJUST rheostat.

(4) Connect a multimeter between the wiper arm terminal and either terminal of the FREQUENCY ADJUST rheostaL and adjust FREQUENCY ADJUSTMENT rheostat until the multimeter reads precisely 30 ohms. Disconnect the multimeter but do not disturb rheostat setting.

(5) Set START-RUN-STOP switch to RUN, BATTLE SHORT switch to ON, and DC CONTROL CIRCUIT BREAKER to the closed ON position. Connect the 30 ohm resistance of the FREQUENCY ADJUST rheostat in series with ground to the SEND terminal of the OIL PRESSURE gage. Gage should read approximately 120 psi.

(6) Disconnect FREQUENCY ADJUST rheostat from circuit and reconnect leads removed in paragraph (3) above.

(7) If the OIL PRESSURE gage does not operate correctly, replace it.

b. Replacement. Replace the OIL PRESSURE gage (78) as follows

(1) Removal.

(a) Gain access to the rear of the control cubicle panel (96).

(b) Tag and remove the leads from the OIL PRESSURE gage/

(c) Remove the two nuts, two washers, and clamp which secure the OIL PRESSURE gage and remove gage.

(2) Installation. Install OIL PRESSURE gage (78) using removal steps in reverse order.

3-122. Fuel Level Gage.

See (79, fig. 3-18) and proceed as follows:

a. Testing.

(1) Gain access to the rear of the cubicle control panel (96).

CAUTION

Connect battery negative terminal prior to checking the gage readings. Remove this terminal prior to making circuit changes.

(2) Tag and remove the lead from FUEL LEVEL gage (79). Check that START-RUN-STOP switch is set to RUN. BATTLE SHORT switch to ON, and that DC CONTROL CIRCUIT BREAKER is in closed (on) position. Apply ground (0 ohms) to SEND terminal of the gage. Gage should read EMPTY.

(3) The 0-500 ohm FREQUENCY ADJUST rheostat can be used to check the FUEL LEVEL gage. Discomect and tag all leads from the FREQUENCY ADJUST rheostat.

(4) Connect a multimeter between the wiper arm terminal and either other terminal of the rheostat and adjust the FREQUENCY ADJUSTMENT rheostat until the multimeter reads 30 ohms. Disconnect the multimeter but do not disturb rheostat setting.

(5) Check that START-RUN-STOP switch is set to RUN, BATTLE SHORT switch to ON, and that DC CONTROL CIRCUIT BREAKER is in closed (on) position. Connect the 30 ohm resistance of the FREQUENCY ADJUST rheostat in series with ground to the SEND terminal of the FUEL LEVEL gage. FUEL LEVEL gage should read FULL.

(6) Disconnect FREQUENCY ADJUST rheostat from circuit and reconnect leads removed in paragraph (3) above.

(7) If the FUEL LEVEL gage does not operate correctly, replace it.

b. Replacement. Replace the FUEL LEVEL gage (79) as follows:

(1) Removal.

(a) Gain access to the rear of the control cubicle panel (96).

(b) Tag and remove the leads from FUEL LEVEL gage.

(c) Remove the two nuts, two washers, and clamp which secure the FUEL LEVEL gage and remove gage.

(2) Installation. Install FUEL LEVEL gage (79) using removal steps in reverse order. Remove tags.

3-123. Running Time Meter.

See (74, fig. 3-18) and proceed as follows:

a. Testing. Check that START-RUN-STOP switch is set to RUN, BATTLE SHORT switch to ON, and that DC CONTROL CIRCUfT BREAKER is in closed (on) position. RUNNING TIME meter should operate and change by one-tenth of an hour. Check for 24 Vdc input to meter. If voltage is present and the meter does not operate, replace it.

b. Replacement. Replace RUNNING TIME meter (74) as follows:

(1) Removal.

(a) Gain access to the rear of the control cubicle panel (96).

(b) Tag and remove the leads from tne RUNNING TIME meter.

(c) Remove the three screws (72) and nuts (73) which secure the RUNNING TIME meter (74) and remove meter.

(2) Installation. Install RUNNING TIME meter (74) using removal steps in reverse order. Remove tags.

3-124. Battery Charging Ammeter.

See (77, fig. 3-18) and proceed as follows:

a. Testing.

(1) Gain access to the rear of the control cubicle panel (96).

CAUTION

Disconnect battery negative terminal prior to checking the indicator readings or making circuit changes.

(2) Set VOLTMETER to R Xl scale and connect across terminals of BATTERY CHG AMMEtER (77). Reading on voltmeter should be zero and BATTERY CHG AMMETER should indicate a charge or discharge reading. If voltmeter does not read zero, replace BATTERY CHG AMMETER.

b. Replacement. Replace the BATTERY CHG AMMETER (77) as follows

(1) Removal.

(a) Gain access to the rear of the control cubicle panel (96).

(b) Tag and remove the leads from the BATTERY CHG AMMETER.

(c) Remove the three screws (75) and nuts (76) which secure the BATTERY CHG AMMETER (77) and remove meter.

(2) Installation. Install BATTERY CHG AMMETER (77) using removal steps in reverse order. Remove tags.

3-125. DC Control Circuit Breaker.

Test and replacement instructions for DC circuit breaker are contained in paragraph 3-100.

3-126. Control Box Relay Assembly.

See (99, fig. 3-18) and proceed as follows:

a. Inspection. Visually inspect for damaged components.

(b). Replacement.

(1) Removal.

(a) Gain access to inside of control box (123).

(b) Tag and remove the leads from relay assembly (99).

(c) Remove the relay assembly (99) by removing the four attaching nuts (98).

(2) Installation. Install relay assembly (99) using removal steps in reverse order. Remove tags.

3-127. Terminal Board Assembly.

See (105, fig. 3-18) and proceed as follows:

a. Inspection. Visually inspect for broken barriers, loose hardware and other damage.

b. Replacement.

(1) Removal.

(a) Gain access to inside of control box (123).

(b) Tag and remove the leads from the terminal board (105).

(c) Remove jumper (107) by removing screws (106) and note location of jumper.

(d) Remove the four screws (103) and nuts (104) and remove terminal board (105).

(2) Installation. Install terminal board (105) assembly using removal steps in reverse order. Remove tags. Make certain to replace jumper (107) across same terminals in removal procedures.

3-128. Panel Light Assembly.

See (9, fig. 3-18) and proceed as follows:

a. Replacement. Replace panel light assemblies as follows:

(1) Removal.

(a) Tag leads and remove screws which secure leads to panel light assembly.

(b) Remove panel light assembly mounting hardware and remove panel light assembly.

b. Installation. Install panel light assembly using removal steps in reverse order. Remove tags.

3-129. Press-to-Test Light Assembly Replacement.

a. Removal. See (25, 32, 124, fig. 3-18) and proceed as follows

(1) Tag leads and unsolder leads to light assembly.

(2) Remove light assembly mounting hardware and remove light assembly.

b. Installation. Install light assembly using removal steps in reverse order. Solder leads to light assembly. Remove tags.

3-130. Synchronizing Lights.

See (16, fig. 3-18) and proceed as follows:

a. Testing.

(1) Gain access to the rear of the control cubicle panel (96).

NOTE

Make certain DC CONTROL CIRCUIT BREAKER is open.

(2) Remove screw which secures lead to one terminal of SYNCHRONIZING LIGHT assembly (16).

(3) With an ohmmeter, test lamp (24) for continuity. If meter shows an open circuit, replace lamp.

(4) Reconnect lead.

b. Replacement. Replace SYNCHRONIZING LIGHT assemblies (16) as follows:

(1) Removal.

(a) Tag leads and remove screws which secure leads to light assembly.

(b) Remove light assembly mounting hardware and remove light assembly.

c. Installation. Install SYNCHRONIZING LIGHT assembly (16) using removal steps in reverse order. Remove tags.

3-131. Door Holder.

See (85, fig. 3-18) and proceed as follows:

a. Removal and Installation.

(1) Remove screw (88), nut (87) and washer (86) which secures one end of door holder (85) to panel.

(2) Unhook other end of door holder from bracket in control box (123) and remove door holder (85).

(3) Install door holder using removal steps in reverse order.

3-132. Crosspin Assembly.

See (94, fig. 3-18) and proceed as follows:

a. Removal and Installation.

(1) Gain access to rear of control cubicle panel (96).

(2) Press out crosspin (94) through stud.

(3) Remove stud (93) and grommet (95) from panel (96).

(4) Install in reverse order of removal.

3-133. Control Cubicle Panel Replacement.

See (96, fig. 3-18) and proceed as follows:

Remove the six screws (89) and nuts (92) which attach the panel (96) to the hinge (90) and remove panel. Replace panel (96) in reverse order of removal.

3-134. Control Box Wiring Harness.

See (119, fig 3-18) and proceed as follows:

a. Inspection.

(1) Inspect connectors for damaged threads; bent, loose, or missing pins.

(2) Inspect terminal lug for security and condition.

(3) Inspect wiring for defective insulation.

b. Repair.

(1) If a broken wire is accessible; remove sufficient insulation from each side of the break to allow a good connection of the bared ends by twisting them together. Solder the connection and wrap with electrical tape.

(2) If a wire is broken from a terminal lug, replace the lug. If a wire is broken from a connector, resolder and reassemble.

CAUTION

Under no condition leave the bare connection exposed.

(3) If a break in the wire is inaccessible within wiring harness (119), disconnect it at both ends and tape both ends. Lace a new lead of the same gage and insulation outside the wiring harness and connect it to the proper terminals or pins. Properly tag both ends of all replacement wires.

c. Replacement. If 30% of the harness wires are defective, the wiring harness must be rebuilt by intermediate maintenance, and replaced by organizational maintenance. Tag all wires, connectors, and terminals for positive identification when a defective wiring harness is removed. To remove wiring harness, remove four screws and nuts which attach connector to box. Remove the four clamps 71, 110, 113 and 116 with the associated attaching hardware and remove wiring harness. Install wiring harness in reverse order of removal. Remove tags.

3-135. Control Box.

See (123, fig. 3-18) and proceed as follows:

a. Inspection. Visually inspect control box for damage.

b. Replacement.

(1) Removal.

(a) Disconnect all electrical connections at rear of control box.

(b) Remove control cubicle panel (96) from hinge (90) by removing six screws (89) and nuts (92).

(c) Remove 14 screws (97) and attached washers which secure control box (123) to frame and remove control box.

(d) Remove six rivets (89A) which secure the hinge (9O) and spacer (91) to the control box (123).

(2) Installation. Install box in reverse order of removal.

KEY to fig. 3-18:

1. Screw
2. Nut
3. Screw
4. Nut
5. Freq meter and transducer (Matched Set)
6. Transducer
7. Freq meter
8. AC ammeter
9. Panel light (3)
10. Hood
11. Nut
12. Washer
13. Washer
14. Holder
15. Lamp
16. Synchronizing lights (2)
17. Lens
18. Washer
19. Nut
20. Washer
21. Washer
22. Gasket
23. Holder
24. Lamp
25. Air cleaner condition light assembly
26. Lens
27. Nut
28. Washer
29. Nut
30. Light Assembly
31. Lamp
32. Ckt bkr light assembly
33. Lens
34. Nut
35. Washer
36. Nut
37. Holder
38. Lamp
39. Kilowatt meter
40. Screw
41. Nut
42. Ac voltmeter
43. Knob
44. Nut
45. Washer
46. Washer
47. Nut
48. Amps-volts selector switch
49. Knob
50. Nut
51. Washer
52. Washer
53. Nut
54. Voltage adjust rheostat
55. Knob
56. Nut
57. Frequency adjust rheostat
58. Guard
59. Nut
60. Washer
61. Washer
62. Battle short switch
63. Engine prlrner switch
64. Start-run-stop switch
65. Ckt bkr switch
66. Panel light switch
67. Voltage sensing switch
68. single/parallel operation switch
69. Screw
70. Nut
71. Clamp
72. Screw
73. Nut
74. Running time meter
75. Screw
76. Nut
77. Battery chg ammeter
78. Oil pressure gage
79. Fuel level gage
80. Coolant temperature gage
81. Nut
82. Washer
83. Clamp
84. Hook
85. Door holder
86. Washer
87. Nut
88. Screw
89. Screw
89A. Rivet
90. Hinge
91. blacer
92. Nut
93. Stud
94. Cross pin
95. Grommet
96. Panel
97. Screw
98. Nut
99. Relay assembly
100. Screw
101. Nut
102. Wattmeter converter
103. Screw
104. Nut
105. Terminal board
106. Screw
107. Jumper
108. Screw
109. Nut
110. Clamp
111. Screw
112. Nut
113. Clamp
113A. Nut
114. Screw
115. Nut
116. ClaInp
117. Screw
118. Nut
119. Wiring harness
120. Rivet
121. Receptacle
122. (Deleted)
123. Control box
124. Battle short light assembly

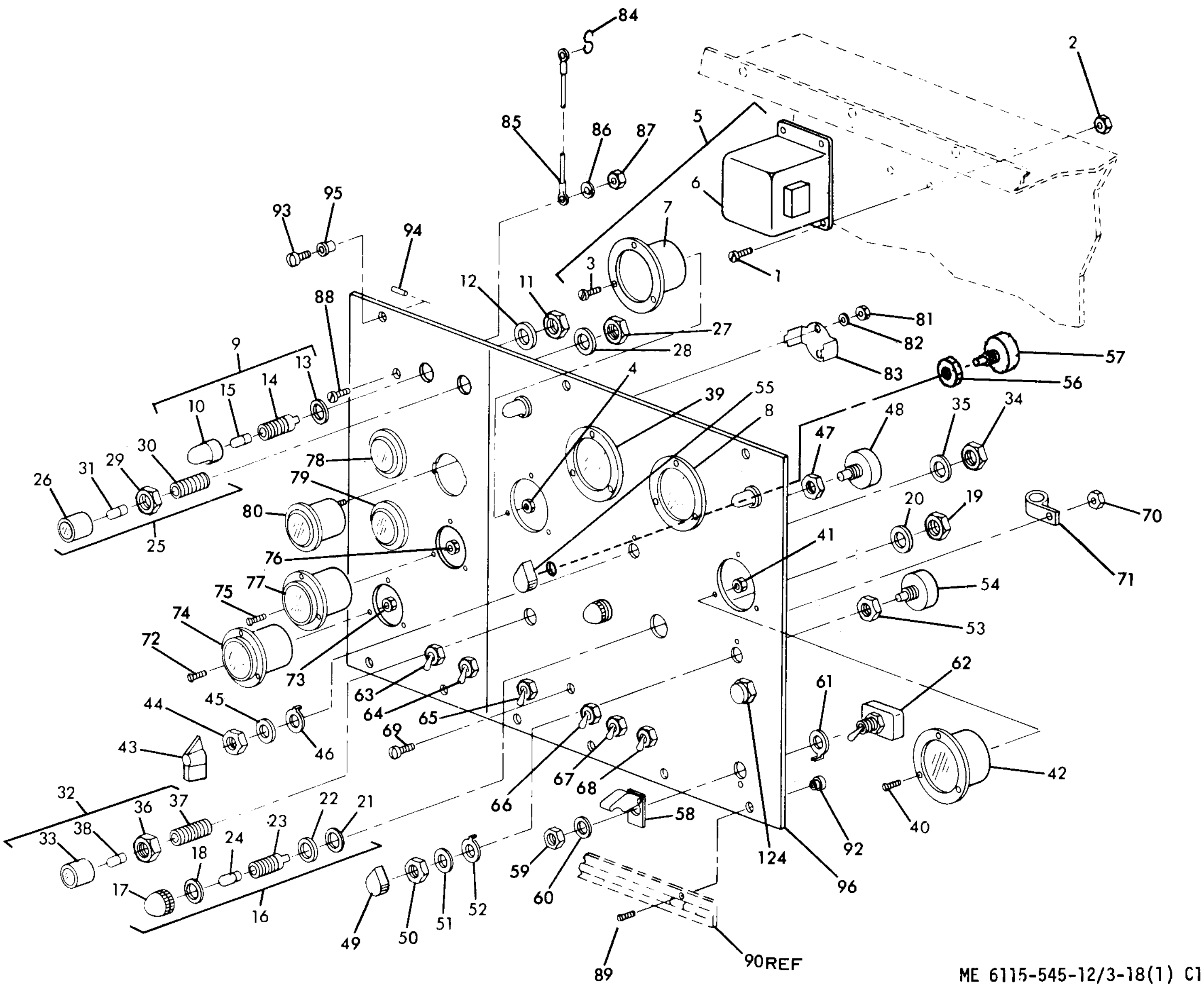


Figure 3-18. Control Cubicle Assembly (Sheet 1 of 2)

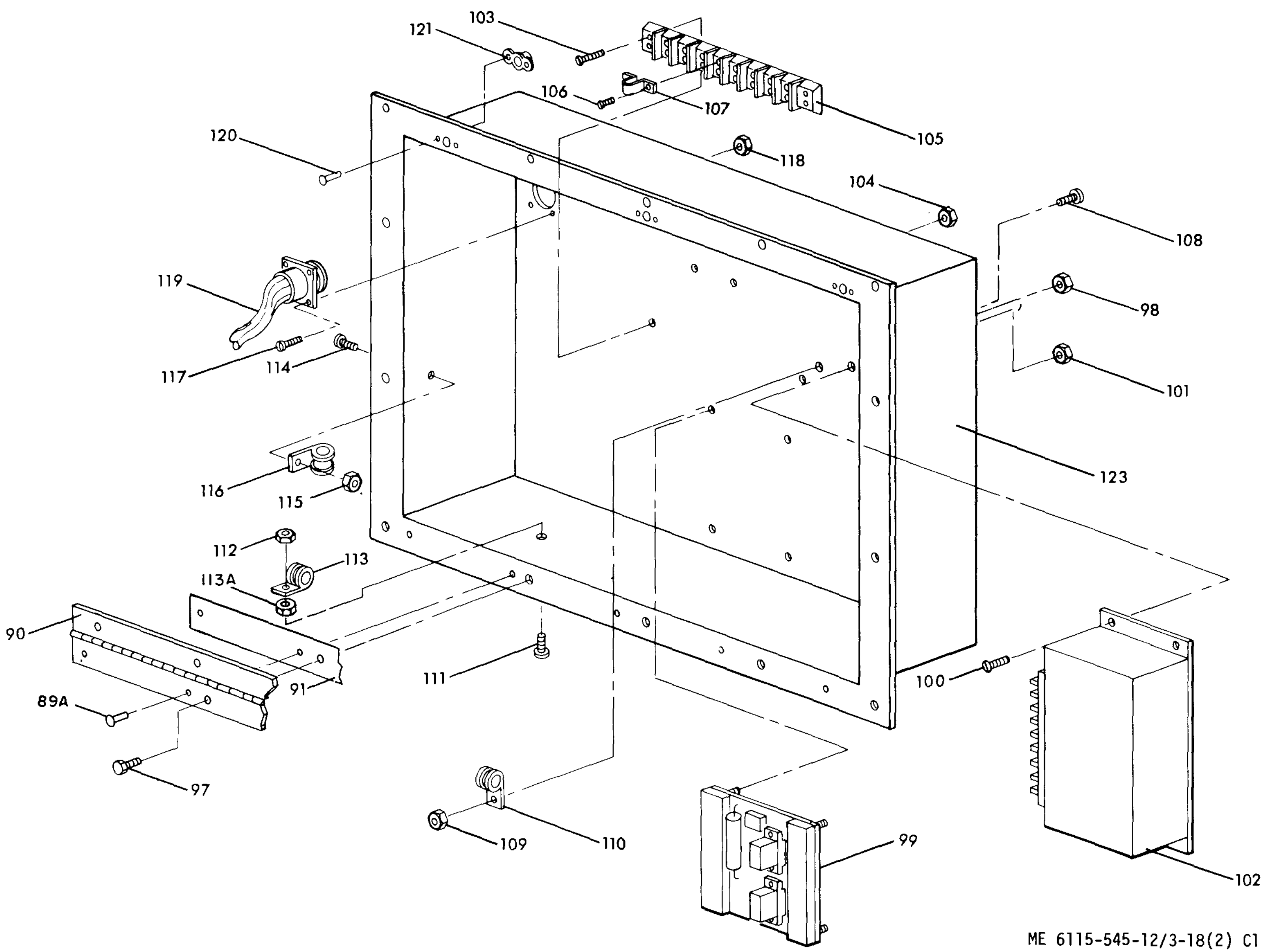
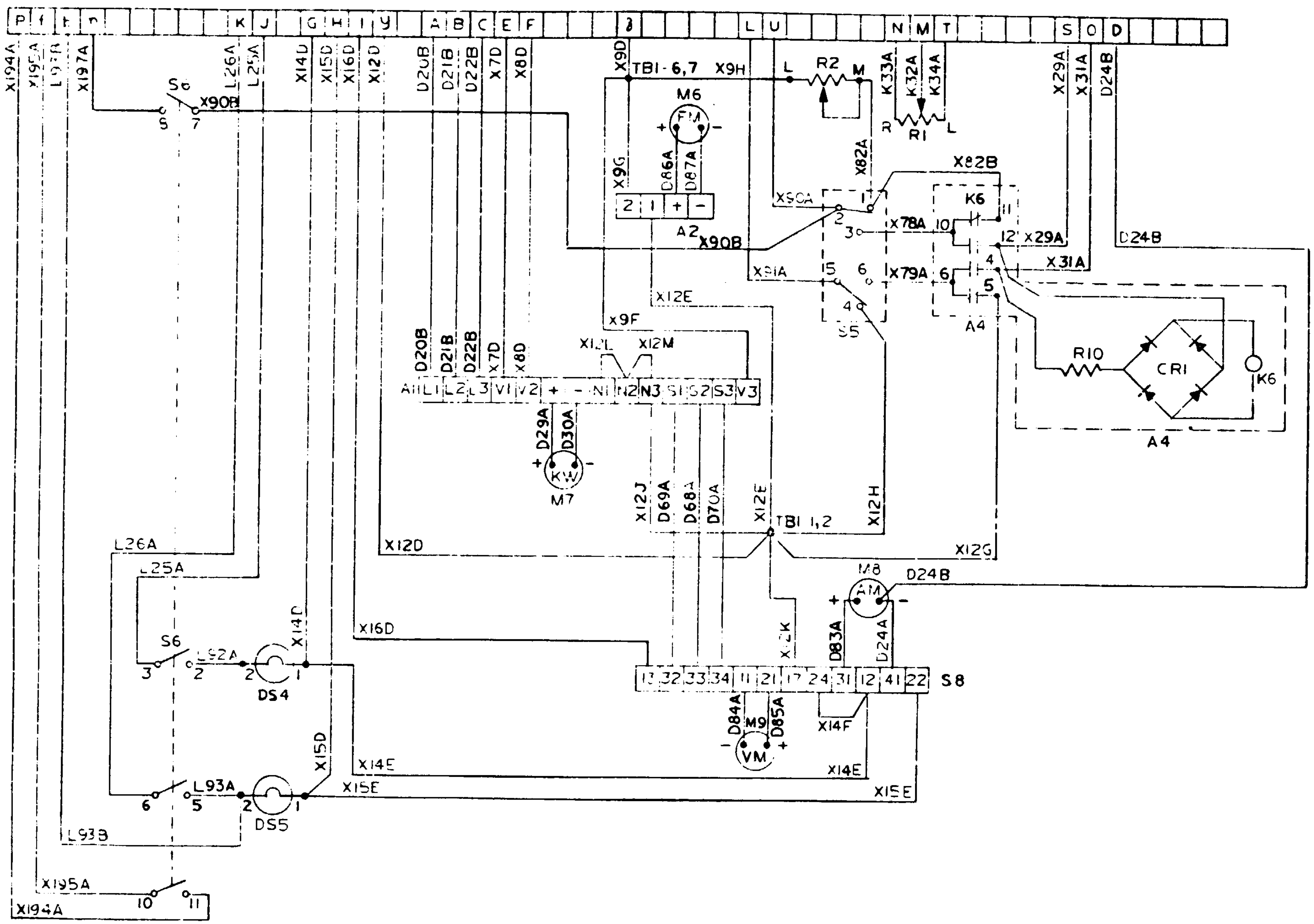


Figure 3-18. Control Cubicle Assembly (Sheet 2 of 2)



REF DES	DESCRIPTION
A1	THERMAL WATT CONVERTER
A2	CONVERTER, FREQUENCY
A4	CONTROL PANEL RELAY ASSEMBLY
A4K1	RELAY, STOP-RUN
A4K6	RELAY, REMOTE VOLTAGE SENSING
CR1	DIODE, FULL WAVE BRDG
DS1	LIGHT, PANEL
DS2	LIGHT, PANEL
DS3	LIGHT, PANEL
DS4	LIGHT, SYNCHRONIZING
DS5	LIGHT, SYNCHRONIZING
DS6	LIGHT, INDICATOR, CIRCUIT BREAKER
DS7	LIGHT, PROTECTION BY PASS
DS8	LIGHT, AIR CLEANER RESTRICTION
K1	RELAY, STOP-RUN
K6	RELAY, RMT V SNSR
M1	GAGE, OIL PRESSURE
M2	GAGE, WATER TEMPERATURE
M3	GAGE, FUEL LEVEL
M4	METER, AMMETER (DC)
M5	METER, TOTAL TIME
M6	METER, FREQUENCY
M7	METER, KILOWATT
M8	METER, AMMETER, AC
M9	METER, VOLTMETER, AC
R1	RHEOSTAT, FREQUENCY ADJUSTING
R2	RHEOSTAT, VOLTAGE ADJUSTING
S1	SWITCH, ENGINE PRIMER
S2	SWITCH, START-RUN-STOP
S3	SWITCH, CONTACTOR
S4	SWITCH, PANEL LIGHTS
S5	SWITCH, LOCAL-REMOTE VOLTAGE
S6	SWITCH, UNIT PARALLEL
S7	SWITCH, BATTLE SHORT
S8	SWITCH, AMMETER/VOLTMETER SELECTOR

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Figure 3-19. Control Cubicle Schematic Diagram
(Sheet 1 of 2)

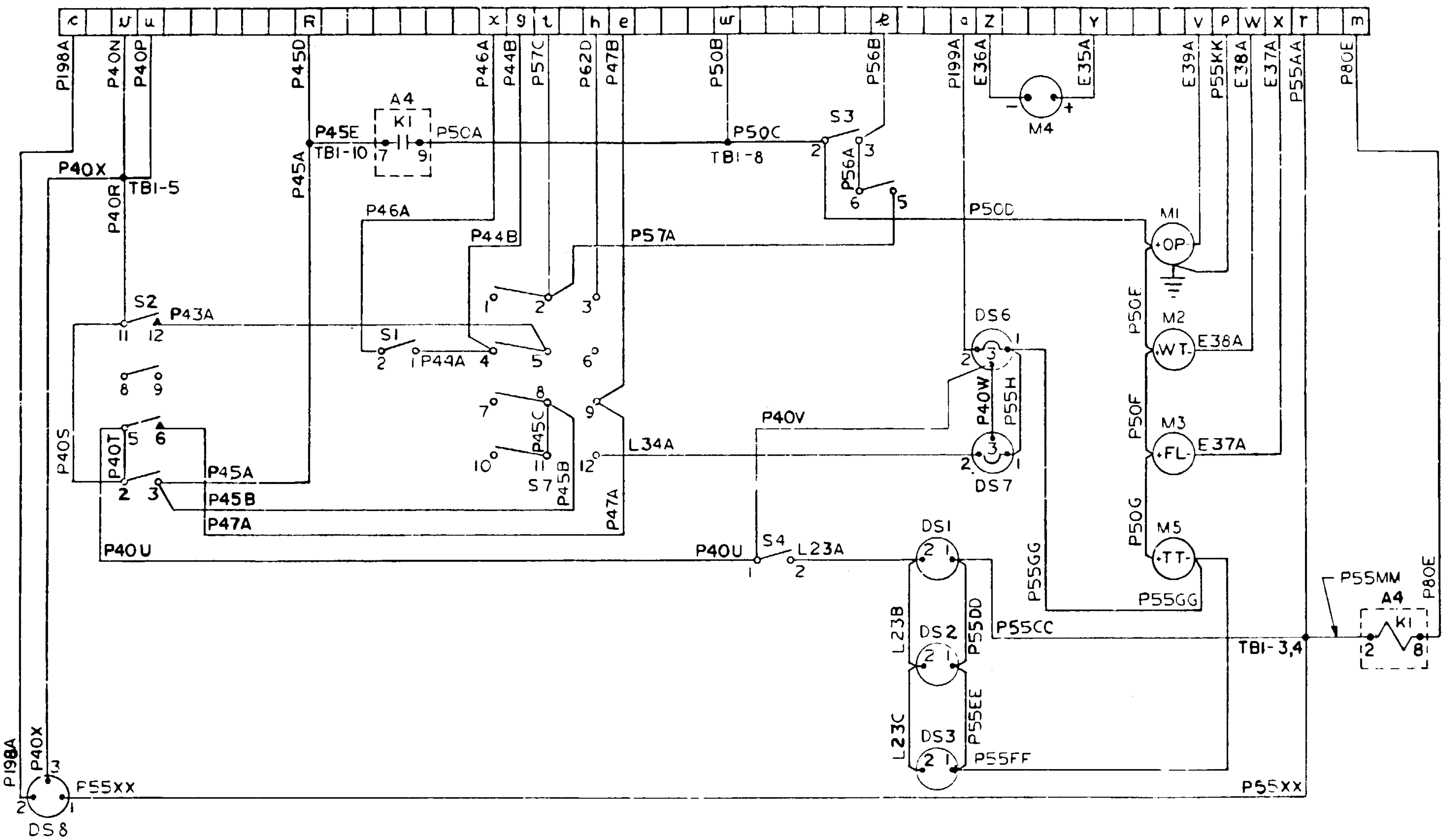

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Figure 3-19. Control Cubicle Schematic Diagram
(Sheet 2 of 2)

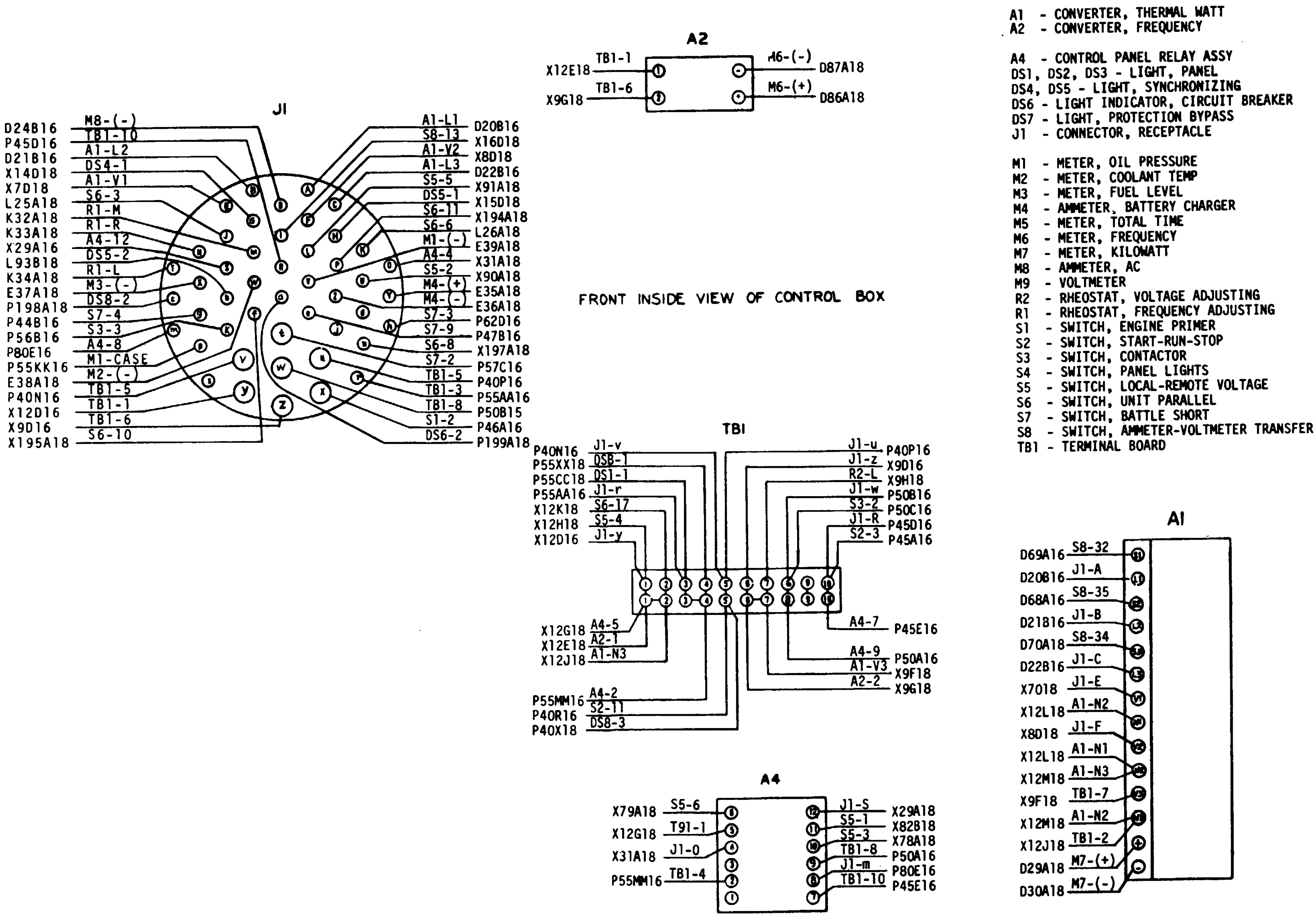

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Figure 3-20. Control Cubicle Wiring Diagram
(Sheet 1 of 2)

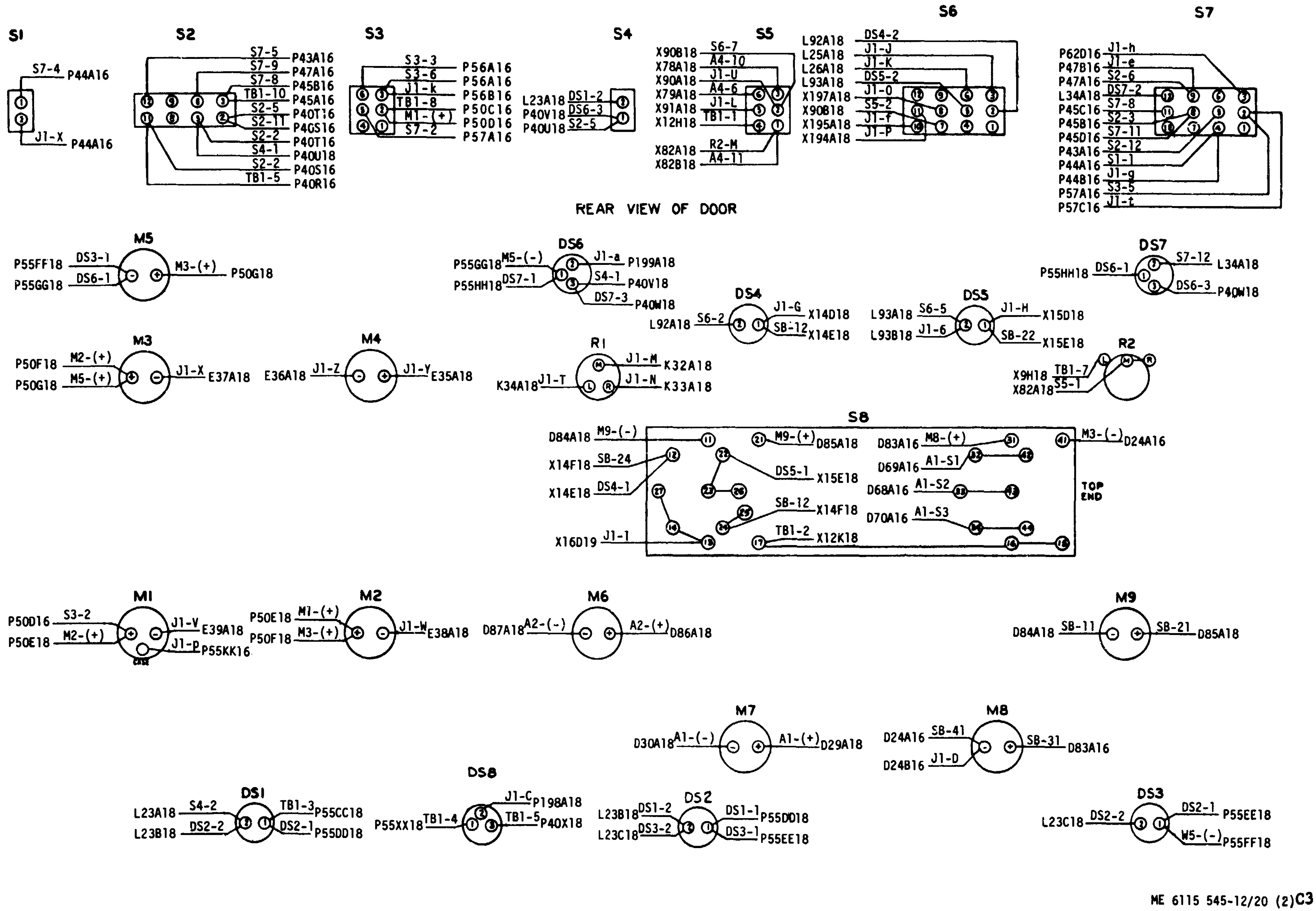
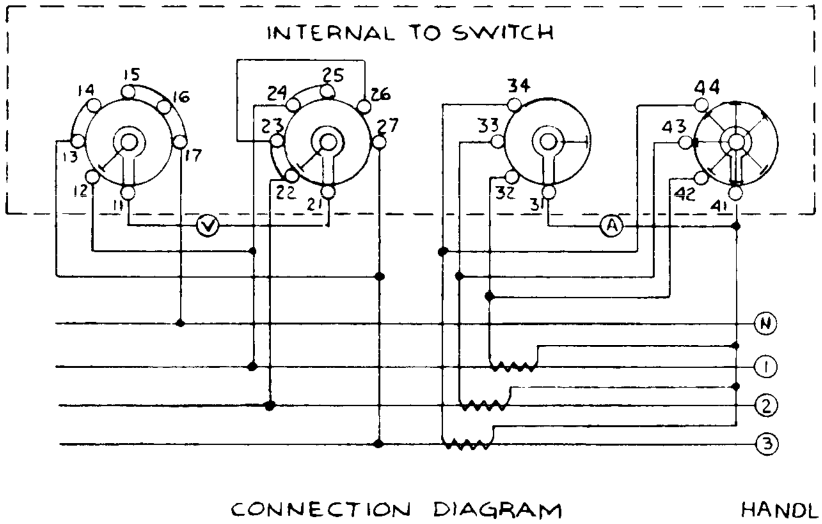
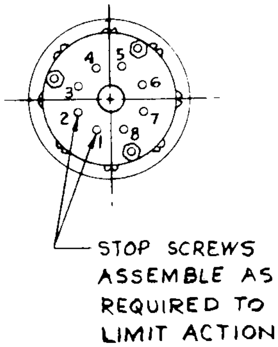


Figure 3-20. Control Cubicle Wiring Diagram (Sheet 2 of 2)





HANDLE POSITIONS
FRONT VIEW

POS.	VOLT	AMP
1	1 - 2	NONE
2	2 - 3	NONE
3	3 - 1	NONE
4	1 - N	1
5	2 - N	2
6	3 - N	3

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Figure 3-21. Ammeter-Voltmeter Selector Switch Schematic

Section XVI. ENGINE GENERATOR SET HOUSING GROUP

3-136. General.

This section contains information on the housing group which encloses the engine generator set. The housing group is made up of covers and panels which are bolted together, and hinged doors which provide access to components.

3-137. Removal and Replacement.

See figure 3-22 and remove and replace damaged doors, covers, panels, and associated hardware of the housing group. Remove the load bank, if installed, as described in paragraph 4-49.

Section XVII. ENGINE GENERATOR AND CHASSIS INTERCONNECTING WIRING HARNESSES

3-138. General.

This section contains information on interconnecting wiring harnesses of the engine generator and chassis. The wiring harnesses provides electrical interconnection between major assemblies of the engine generator set.

3-139. Inspection, Test, Repair and Replacement.

See figure 3-23 and proceed as follows:

CAUTION

As a precaution against short circuits, disconnect the battery ground cable from the batteries before inspecting, testing, or replacing any wiring.

a. Inspection.

(1) Inspect connectors for damaged threads; bent, loose, or missing pins.

(2) Inspect terminal lug for security and condition.

(3) Inspect wiring for defective insulation.

b. Test. Perform continuity check, using multimeter between connecting points in the wiring harness using the wiring data contained in figs. 1-13 through 1-16. Check for short circuits between connector pins of the same receptacle or terminal board following data shown in figs. 1-13 through 1-16.

c. Repair.

(1) If a broken wire is accessible, remove sufficient insulation from each side of the break to allow a good connection of the bared ends by twisting them together. Solder the connection and wrap with electrical tape.

(2) If a wire is broken from a terminal lug, replace the lug. If a wire is broken from a connector, resolder and reassemble.

CAUTION

Under no condition leave the bare connection exposed.

(3) If a break in the wire is inaccessible within the wiring harness, disconnect it at both ends and tape both ends. Lace a new lead of the same gage and insulation outside the harness and connect it to the proper terminals or pins. Properly tag both ends of all replacement wires.

d. Replacement. If 30% of the harness wires are defective, the harness must be rebuilt by intermediate maintenance, but may be replaced by organizational maintenance. Tag all wires, connectors, and terminal boards for positive identification when a defective harness is removed. Disconnect harness connectors from receptacles by unscrewing connectors in counterclockwise direction. Remove all clamps which secure harness in position. Install new or repaired harness in reverse sequence of removal.

Section XVIII LOAD CONNECTION GROUP

3-140. General.

The load connection group (fig. 3-24) is used to provide the electrical connection between the engine generator set and the external equipment to be operated.

3-141. Main AC Contactor.

See figure 3-24 and proceed as follows:

a. Inspection. Inspect main ac contactor (3), which is located at the right of the reconnection board (15), for secure mounting, loose electrical connections, frayed cables or insulation, loose connector mating and other damage.

KEY to fig. 3-22.

1. Screw
2. Nut
3. Rubber seal
4. Paddle lock
5. Access door
6. Screw
7. Nut
8. Access door
9. Rivet
10. Plate, information, dc troubleshooting
11. Screw
12. Nut
13. Access door
14. Screw
15. Nut
16. Access door
17. Rivet
18. Plate. information, dc schematic
19. Rivet
20. Plate, information, ac schematic
21. Screw
22. Nut
23. Access door
24. Screw
25. Nut
26. Access door
27. Screw
28. Nut
29. Access door
30. Screw
31. Nut
32. Access door
33. Rivet
34. Plate, information
35. Safety cover assembly
36. Screw
36A. Washer
37. Cover
38. Rivet
39. Plate, operational data
40. Rivet
41. Plate, operational data
42. Screw
43. Nut
44. Access cover, radiator cap
45. Oval stud
46. Retainer stud
47. Screw
48. Nut
49. Receptacle, lock
50. Screw
51. Compartment, document
52. Screw
53. Lockwasher
54. Nut
55. Screw
56. Nut
57. Housing, top, front
58. Screw
59. Nut, cage
60. Side housing, left front
61. Side housing, right front
62. Screw
63. Nut
64. Housing, top rear
65. Screw
66. Nut, cage
67. Screw
68. Nut
69. Post, left hand, rear
70. Screw
71. Nut
72. Side housing, right rear
73. Screw
74. Nut
75. Side housing, left rear
76. Screw
77. Nut, cage
78. Grille
79. Screw
80. Screw
81. Washer
82. Nut
83. Door holder
84. Screw
85. Nut
86. Battery access door
87. Rivet
88. Battery connection instruction plate
89. Screw
90. Nut, cage
91. Screw
92. Nut, cage
93. Housing, lower front
94. Screw
95. Nut
96. Housing, upper front
97. Screw
98. Nut
99. Screw
100. Nut
101. Control and access door, right
102. Door hook
103. Rivet
104. Instruction plate, service instructions
105. Screw
106. Nut
107. Control panel, access door, left
108. Door hook
109. Rivet
110. Instruction plate, operating
111. Screw
112. Nut
113. Air inlet door, right
114. Door hook
115. Screw
116. Nut
117. Air inlet door, left
118. Door hook
119. Screw
120. Control box, mounting
121. Screw
122. Nut
123. Rear corner panel, left hand
124. Screw
125. Rear corner panel, right hand
126. Screw
127. Screw
128. Panel, air intake

KEY to fig. 3-22. (Cont)

129. Screw
130. Nut
131. Rivet
132. Plate, designator, paralleling receptacles
133. Screw
134. Screw
135. Panel, fuel tank access
136. Screw
137. Nut, cage
138. Housing corner post, left hand
139. Housing corner post, right hand
140. Screw
141. Screw
142. Rear corner panel, left hand
143. Rivet
144. Plate, lifting instructions
145. Rivet
146. Plate, fuel system instructions
147. Screw
148. Screw
149. Rear corner panel, right hand
150. Rivet
151. Plate, identification

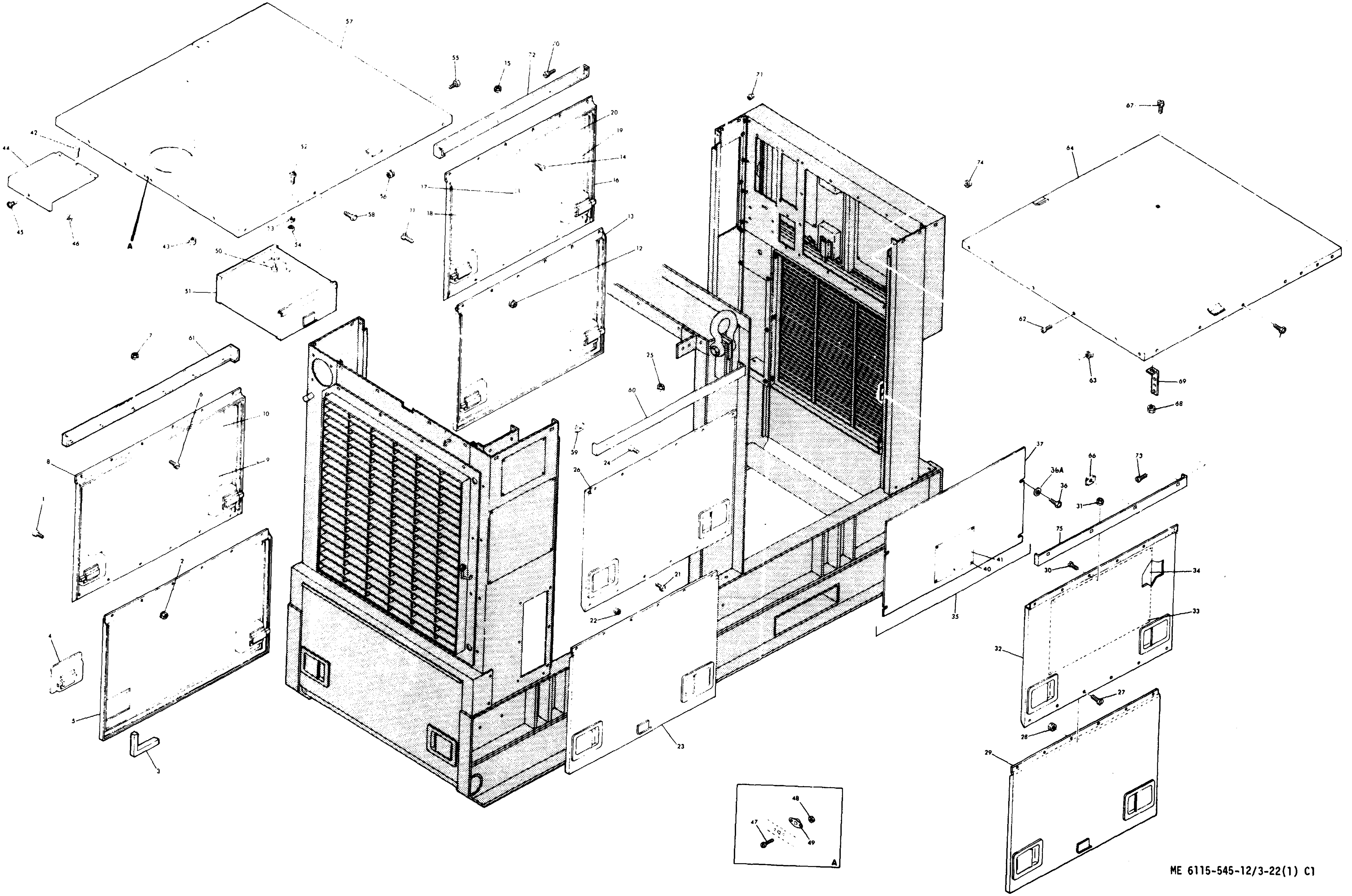

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Figure 3-22. Housing Group, Top and Side (Sheet 1 of 2)

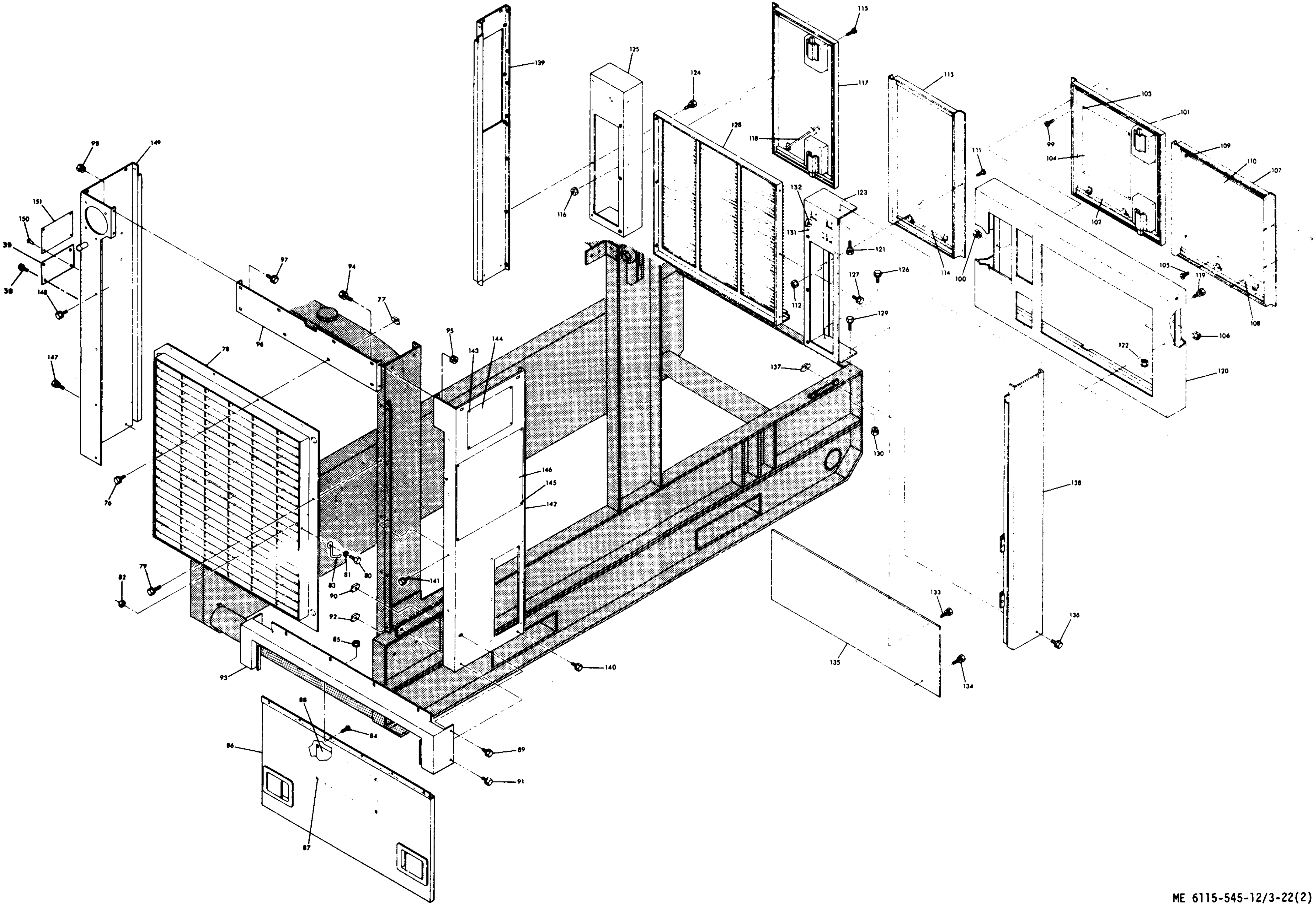

Figure 3-22. Housing Group, Front and Rear
(Sheet 2 of 2)

KEY to fig. 3-23.

1. Precise relay box wiring harness to governor control unit (Mode 1 Class 1 only)
2. Precise relay box wiring harness to special relay box (Mode 1 Class 1 only)
3. Screw
4. Clamp
5. Excitation group wiring harness
6. LMU assembly wiring harness
7. Tactical relay box wiring harness
8. Governor control unit to precise relay wiring harness (Mode 1 Class 1 only)
8. Governor control unit wiring harness (Mode II Class 1 only)
9. Screw
10. Nut
11. Clamp (Class 1 only)
12. Bracket
13. Dead Crank Switch
14. Screw
15. Nut
16. Clamp (Class 1 only)
17. Screw
18. Nut
19. Clamp (Class 1 only)
19A. Screw
19B. Nut
19C. Clamp
20. Screw
21. Nut
22. Clamp
23. (Deleted)
24. (Deleted)
25. (Deleted)
26. (Deleted)
27. (Deleted)
28. (Deleted)
29. Screw
30. Nut
31. Bracket
32. Governor control to actuator wiring harness (Class 1 only)
33. Governor control to actuator wiring harness (Class 1 only)
34. Screw
35. Nut
36. Clamp
36A. Screw
36B. Nut
36C. Clamp
37. Screw
38. Nut
39. Clamp
40. (Deleted)
41. (Deleted)
42. (Deleted)
43. (Deleted)
44. (Deleted)
45. (Deleted)
46. Screw
47. Nut
48. Clamp
49. Screw
50. Nut
51. Clamp
52. Screw
53. Nut
54. Clamp (Class 1 only)
55. Screw
56. Clamp
57. Screw
58. Nut
59. Screw
60. Nut
61. Bracket
62. Bracket
63. (Deleted)
64. Clamp
65. Screw
66. Nut
67. Clamp
68. Screw
69. Washer
70. Bracket
71. Engine accessories wiring harness
72. AC power control wiring harness
73. Screw
74. Diode Suppressor
75. Bracket
76. Screw
77. Nut
78. Clamp
79. Screw
80. Nut
81. Clamp
82. Screw
83. Nut
84. Clamp
84A. Screw
84B. Nut
84C. Clamp
84D. Screw
84E. Nut
84F. Clamp
84G. Screw
84H. Nut
84J. Clamp
85. Nut
86. Screw ground stud
87. Ground strap
88. RFI capacitors wiring harness

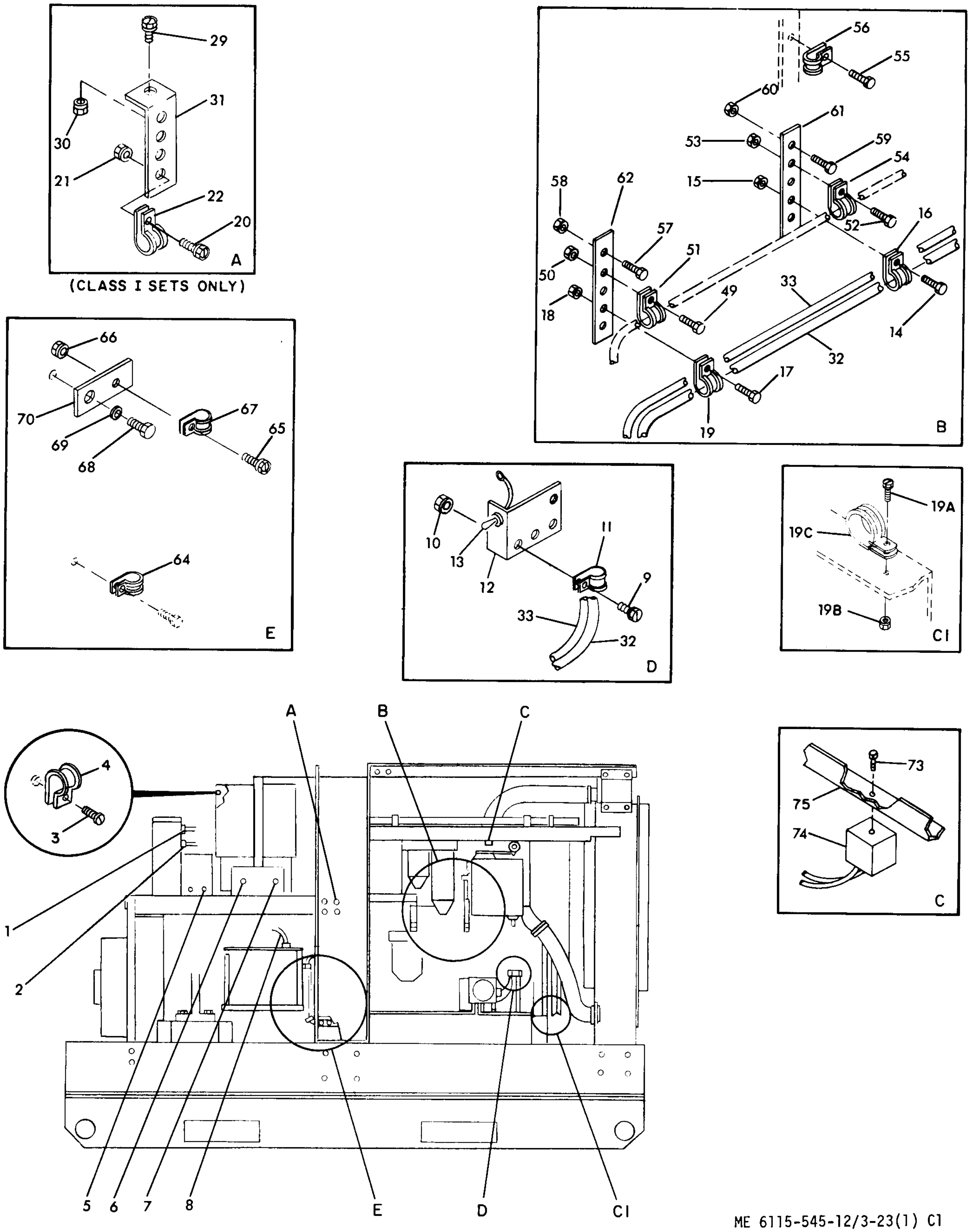

Figure 3-23. Engine Generator and Chassis Wiring Harness (Sheet 1 of 2)

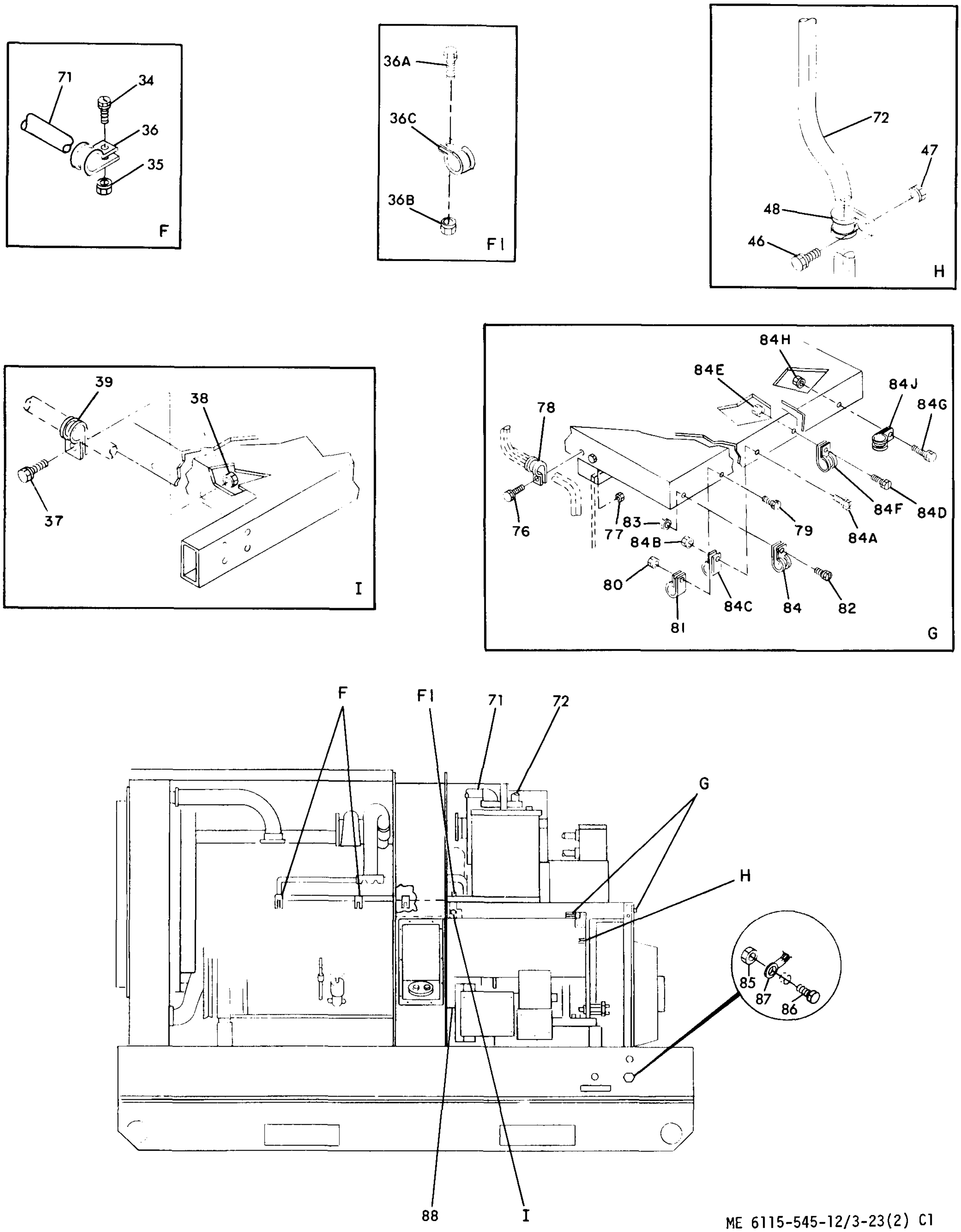

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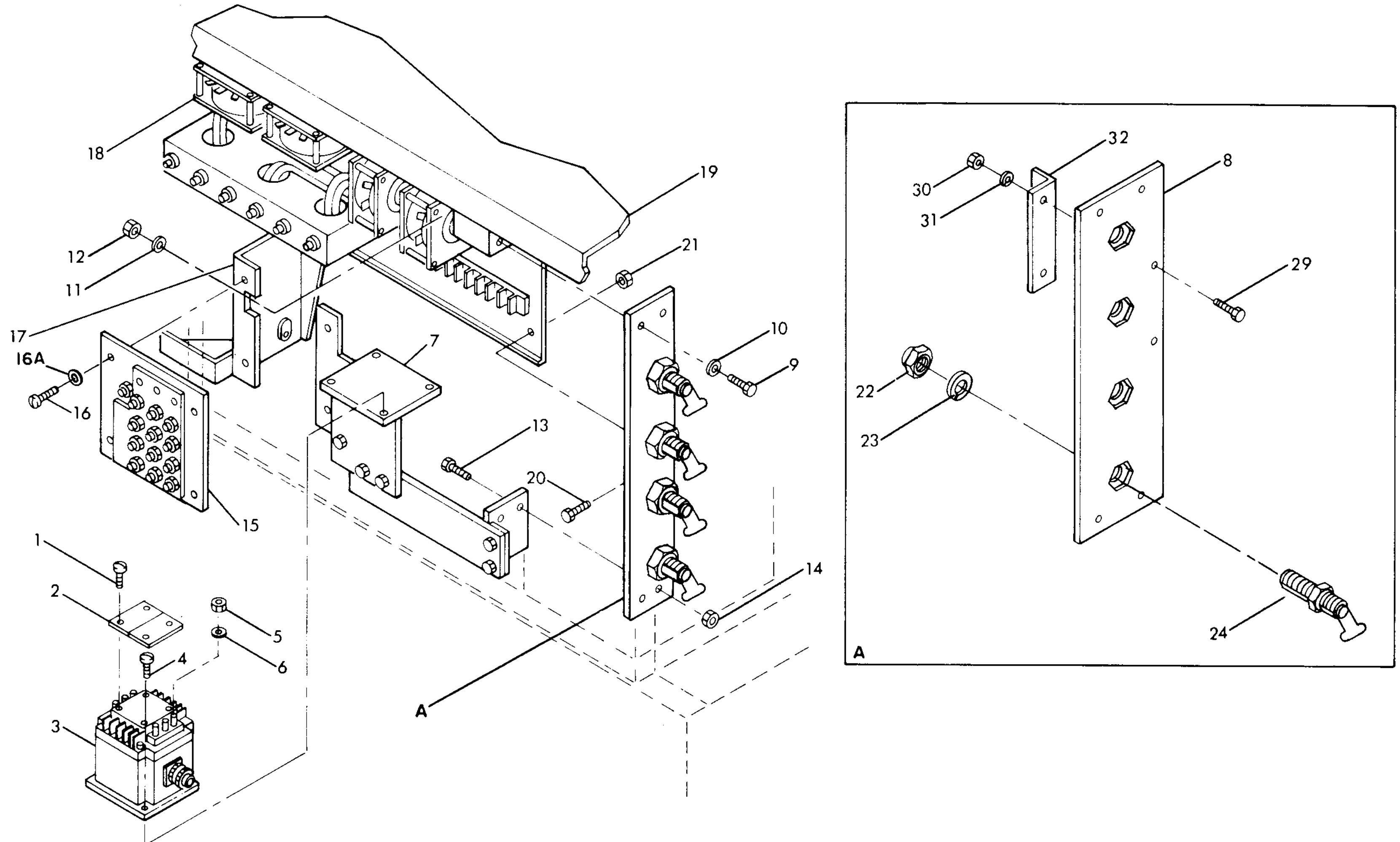
Figure 3-23. Engine Generator and Chassis Wiring Harness (Sheet 2 of 2)



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1. Screw
2. Cover
3. Main ac contactor
4. Screw
5. Nut
6. Washer
7. Mounting bracket
8. Load terminal board
9. Screw
10. Washer
11. Washer
12. Nut
13. Screw
14. Nut
15. Reconnection board
16. Screw
16A. Washer
17. Bracket
18. Current transformer assembly
19. Relay table
20. Screw
21. Nut
22. Nut
23. Washer
24. Load terminal
25. (Deleted)
26. (Deleted)
27. (Deleted)
28. (Deleted)
29. Screw
30. Nut
31. Washer
32. Mounting bracket

Figure 3-24. Load Connection Group

b. Testing.

(1) Apply 24 Vdc at pins A and B of main ac contactor (3) connector. When main ac contactor operates, it should create a distinctive noise.

(2) With an ohmmeter, check for continuity between terminal A1 to A2, B1 to B2, and C1 to C2 on top of the main ac contactor.

(3) At the connector, check for continuity between pins C to D, E to F, G to H, J to K, and R to T.

(4) At the connector, check for an open circuit between pins L to M, N to P, and R to S.

(5) Remove the 24 Vdc and check for the opposite of the conditions (continuity or open circuit) listed in steps (2), (3), and (4).

c. Replacement. See figure 3-24 and replace the main ac contactor (3) as follows:

(1) Removal.

(a) Remove four screws (1) which secure covers (2) on top of main ac contactor (3).

(b) Tag and remove electrical connections to main ac contactor by removing six nuts and washers (5 and 6).

(c) Remove four screws (4) which secure main ac contactor to mounting bracket (7).

(2) Installation. See figure 3-24 and install the main ac contactor (3) in reverse order of removal.

3-142. Repair of Load Terminal Board.

a. Inspection. See figure 3-24 and inspect the load terminal board (8) for cracks, breaks, loose terminals and other damage. Inspect all electrical leads for broken or frayed insulation and other damage.

b. Replacement of Load Terminal Board. See figure 3-24 and replace the load terminal board (8) as follows:

(1) Removal.

(a) Tag and remove electrical connections to load terminal board (8).

(b) Remove the two screws (9), four washers (10 and 11), and two nuts (12) at the top and the two screws (13) and nuts (14) at the bottom and remove the load terminal board (8).

(c) Disassemble load terminal board (8) as shown in detail A.

(d) Inspect load terminal board (8) for damaged threads on studs, and signs of physical damage.

(e) Reassemble in the reverse order of disassembly.

(2) Installation. See figure 3-24 and install load terminal board in reverse order of removal.

c. Replacement of Lost or Broken Terminal Clip (Retainer, Safety Clip). The terminal clip is a component of both the load terminal and the ground terminal. If the terminal clip is lost or broken, fabricate as follows:

(1) Requisition bulk wire NSN 9505-00-804-3814 (0.042 inch diameter) for the ground terminal (ground stud). Requisition bulk wire NSN 9505-01-049-0144 (0.050 inch diameter) for the load terminal.

(2) Cut off about 3 inches of the wire; short enough to keep the clips from touching another terminal or the generator frame in the open or closed position.

(3) Slip the wire through the hole in the terminal.

(4) Hold the terminal as shown (Detail A, figure 3-24.1) and bend both ends of the wire straight up keeping the wire in as straight a line as you can with the terminal body.

(5) Bend the wire into back-to-back 90° angles (Detail B, figure 3-24.1) so that the legs of both angles are about one-half inch long.

(6) Bend the ends of each 90° angle down and around into a U-shape (Detail C, figure 3-24.1) so that if done properly, the clip will hold the nut when it is unscrewed to install the cable (Detail D, figure 3-24.1).

d. Repair. Repair damaged threads with a die or by filing with a fine mill triangular file.

3-143. Current Transformer Assembly.

See figure 3-24 and inspect the current transformer assembly (18) for cracks, breaks, loose mounting, loose connections, corrosion and other damage.

3-144. Reconnection Board.

See figure 3-25 and proceed as follows:

a. Inspection. Inspect reconnection board (15, fig. 3-24) for cracks, breaks, loose mounting nuts, and other damage.

b. Testing. Test reconnection board for continuity as follows:

(1) Remove 12 nuts (1, fig. 3-25) holding insulator (20) and remove insulator (20).

(2) Inspect bus bars (19) on rear of insulator (20) and replace bus bars if damaged or missing.

(3) See figure 2-4 and check for continuity between studs 1 and 4; 2 and 5; 3 and 6; 7 and 10; 8 and 11; and 9 and 12. If no continuity, check respective studs for continuity on insulator (24, fig. 3-25). If continuity is not obtained, generator is at fault. If check indicates continuity, replace reconnection panel.

c. Replacement. Replace reconnection board (15, fig. 3-24) as follows:

(1) Removal.

(a) Remove four screws (16) which secure the reconnection board (15) to the brackets (17).

(b) Tag and disconnect wires at back of reconnection board.

(c) Remove reconnection board (15).

(2) Installation. Install reconnection board (15) using removal steps in reverse order.

d. Repair. Repair reconnection board (see fig. 3-25) by replacement of damaged components.

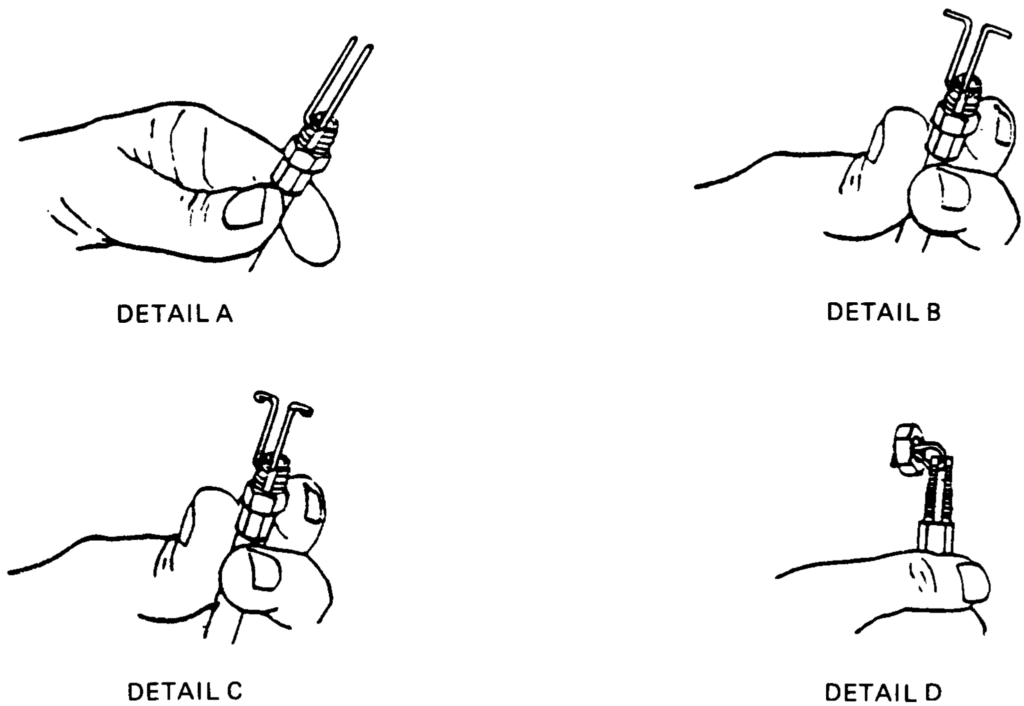


Figure 3-24.1 Terminal Clip Replacement

SECTION XIX. GOVERNOR CONTROL UNIT (CLASS 1 ONLY)

3-145. General.

The governor control unit is the control position of the governing system on precise generator sets. This section contains information on organizational maintenance inspection requirements for the governor control unit.

3-146. Governor Control Unit Inspection.

Inspect the governor control unit (fig. 1-1) for cracks, breaks, loose mounting, damage or loose connectors, and other damage.

3-146.1 Electric Governor Control Box Frequency Adjust Rheostat (MEP115A).

a. The frequency adjust rheostat (1, Fig 3-24.2) will adjust the oscillator frequency of the control box (2). The control box compares the oscillator frequency with the signal frequency sent from the magnetic pick up speed sensor (3). This sends the proper voltage to the electric governor actuator (4) which controls the speed of the engine.

NOTE

Normally this rheostat is only adjusted when the control box is changed or when there is a requirement to change the frequency of the governor set.

b. If the frequency of the generator fluctuates or is incorrect and cannot be adjusted by the Frequency Adjust (29, Fig 2-10) control located on the generator set control panel, do not adjust the rheostat on the Electric Governor Control Box until the following checks are made:

(1) Frequency Adjust (29, Fig 2-10) on generator set control panel is in mid-position.

(2) The magnetic pickup speed sensor is checked by removing its connector plug and sensor (3, Fig 3-24.2). Ensure there is no dirt or magnetic particles on the sensor's end. To install the sensor, turn slightly by hand until the tip contacts the top of the Ring Gear Tooth (5). Then back out three- quarters of a turn and secure with jam nut (6). Reconnect wiring on the magnetic pickup speed sensor (3).

WARNING

Ensure DC power source is disconnected before the following step is accomplished. Serious injury could result if this procedure is not followed.

(3) Remove connector plug (P22) from J-22 (7) and using a multimeter the following checks should be made: on P22; pin "G" to ground should be O ohms; pin "B" to "D" 8 ohms; pins "T" to "S" should read between 50 to 500 ohms; pins "F" to "R" 500 ohms; pins "R" to "K" 2,000 ohms and pins "J" to "H" should read 85,000 ohms. Reconnect the battery, DC Control Circuit Breaker (20, Fig 2-10) pushed in and the Start, Run, Stop Switch (32, Fig 2-10) placed in the Run position. Connect the Multimeter between pin "C" and ground. A reading of 24 VDC should be obtained. Disconnect DC power source and connect plug (P22) to J22 (7, Fig 3-24.2);

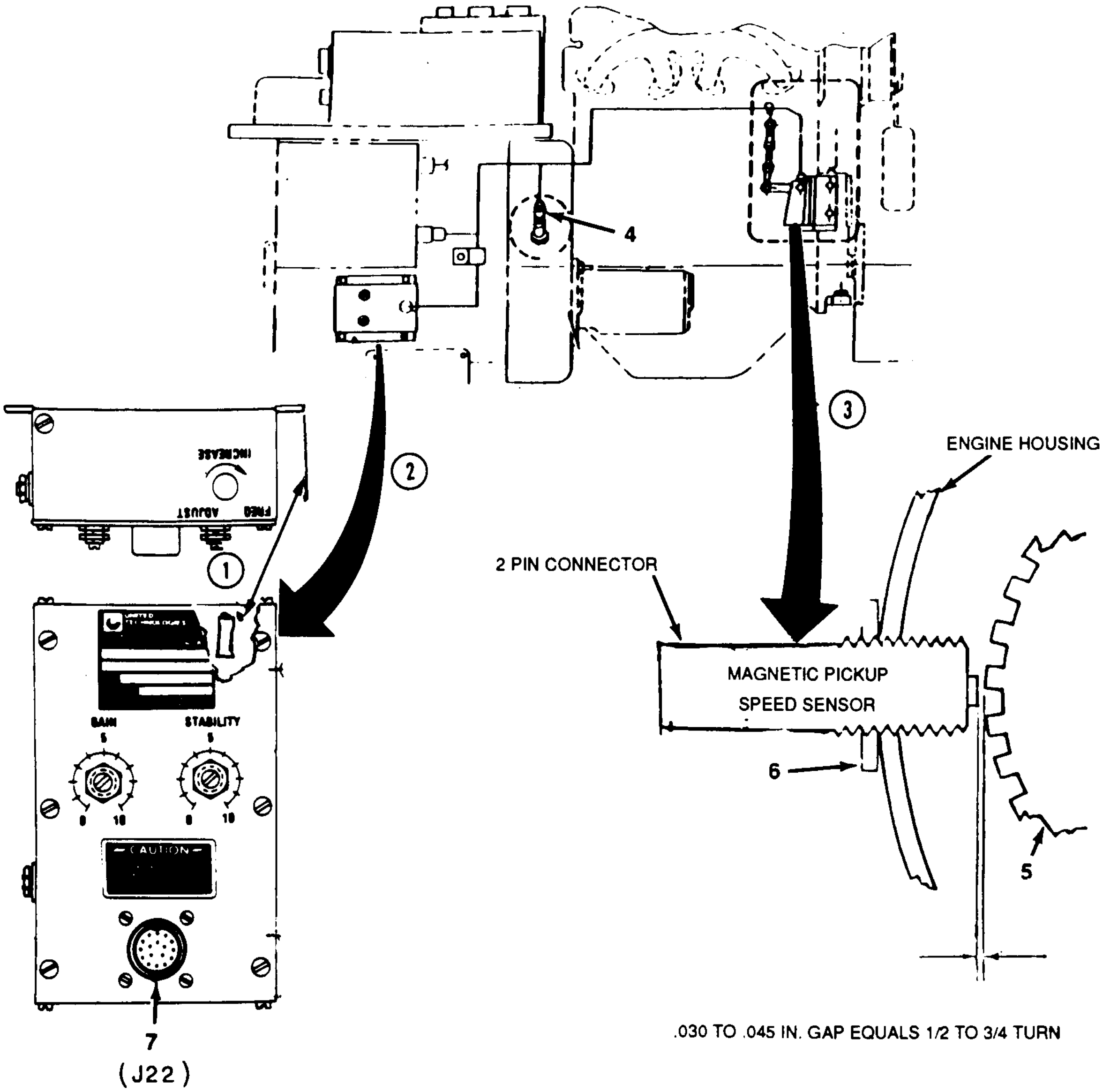
(4) Check for loose and/or binding electric governor actuator linkage.

CAUTION

The Frequency Adjust Rheostat (1, Fig 3-24.2) is a multi turn rheostat and will not handle excessive twisting and turning, otherwise damage to the rheostat will result. Adjust with care.

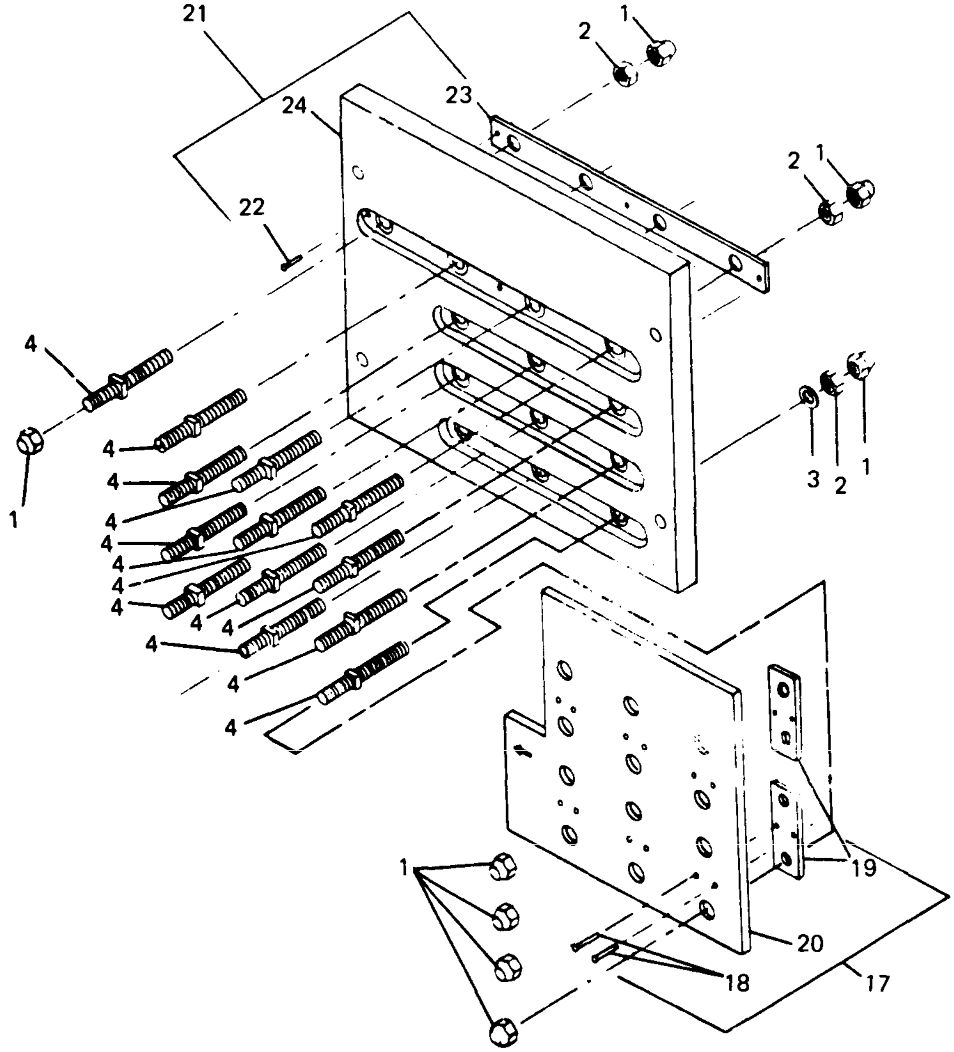
(5) If the generator frequency is either high of low with the Frequency Adjust (29, Fig 2-10) control located on the generator set control panel in mid position, adjust the Frequency Adjust rheostat (1, Fig 3-24.2) in small increments. Check the Frequency Meter (3, Fig 2-10) on the generator control panel after each increment. Adjust until the proper frequency is attained.

(6) If you cannot get the correct frequency after completing all of the above checks, notify higher level of maintenance for troubleshooting and repair.



1. Frequency Adjust Rheostat
2. Electric Governor Control Box
3. Magnetic Pickup Speed Sensor
4. Electric Governor Actuator
5. Ring Gear Tooth
6. Jam Nut
7. Electric Jack, J22

Figure 3-24.2. Governor Control Unit (MEP115A)



1. Nut
2. Nut
3. Washer
4. Stud (13)
5. (Deleted)
6. (Deleted)
7. (Deleted)
8. (Deleted)
9. (Deleted)
10. (Deleted)
11. (Deleted)
12. (Deleted)
13. (Deleted)
14. (Deleted)
15. (Deleted)
16. (Deleted)
17. Insulator
18. Eyelet
19. Bus bar
20. Insulator
21. Insulator
22. Eyelet
23. Bus bar
24. Insulator

Figure 3-25. Reconnection Board

SECTION XX. AIR CLEANER ASSEMBLY

3-147. Air Cleaner Assembly.

a. Removal. The air cleaner assembly filters incoming combustion air to the engine.

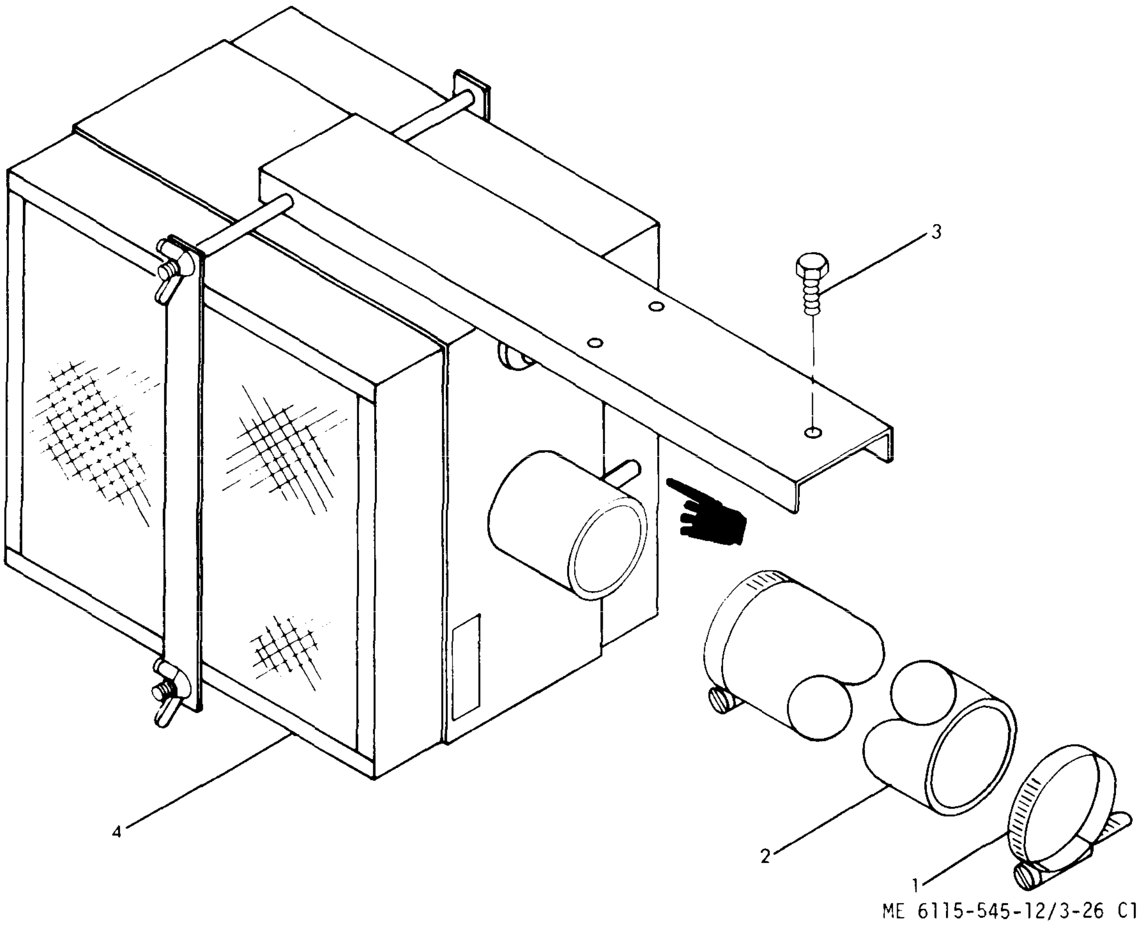
b. Replacement. See figure 3-26 and remove air cleaner assembly in accordance with the sequence of index numbers. See paragraph 3-87 for removal and replacement of hose connecting air cleaner inlet to oil separator. Install air cleaner assembly in reverse order of removal. Removal and replacement of filter element is shown in figure 3-5.

SECTION XXI. RELAY TABLE GROUP

3-148. General.

a. This section contains information on the relay table group. The relay table boxes are located behind the control cubicle on a relay table (19, Fig 3-24) above the generator. The relay boxes contain protective relays and devices used to control the generator set during paralleling and to provide monitoring of voltages and frequencies.

b. On Class 1, Mode I generator sets there is a precise relay assembly that provides under frequency, under voltage and permissive paralleling monitors of the generator set for more complex ap-



1. Hose clamp (2)
2. Hose
3. Screw
4. Air cleaner assembly

Figure 3-26. Air Cleaner and Related Parts

plications. These monitors are included in the Mode II, Class 1 sets within the set special box.

3-149. Tactical Relay Assembly Inspection.

a. Remove nine screws which secure cover and remove cover.

b. Inspect terminal boards for loose mounting, loose terminal connections, corrosion, and other damage.

c. Inspect connectors for bent or broken pins and other damage.

d. Inspect relays for loose mounting, loose wiring corrosion and other damage.

e. Inspect wiring for fraying, corrosion and other damage.

f. Reassemble the assembly by replacing cover and nine screws.

3-150. Precise Relay Assembly Class 1 (50 60 Hz Sets) Inspection.

a. Inspect the two connectors for bent or broken pins and other damage.

b. Inspect the 50 60 Hz switch for loose mounting, corrosion and other damage.

3-151. Special Relay Assembly (50 60 Hz) Inspection.

a. Loosen the two top screws which secure the cover to the front panel.

b. Remove the bottom two screws and let the front panel slide down, then remove.

c. Inspect the cross current adjust control for loose mounting, loose wiring, corrosion, and other damage.

d. Inspect the terminal boards for loose mounting, loose terminal connections, and other damage.

e. Inspect transformer for loose mounting, loose connections, corrosion, and other damage.

f. Inspect wiring for fraying, corrosion, and other damage.

g. Inspect the special relay assembly for dents, loose mounting, loose connectors, and other damage.

h. Replace by sliding front panel under the top two screws and securing it to special relay assembly with bottom two screws.

i. Tighten top two screws.

3-152. Special Relay Assembly (400 Hz) Inspection.

a. Loosen the two top screws which secure the cover to the front panel.

b. Remove the bottom two screws and let the front panel slide down then remove.

c. Inspect the load sharing adjust and cross current adjust controls for loose mounting, loose wiring, corrosion, and other damage.

d. Inspect the terminal boards for loose mounting, loose terminal connections, for corrosion, and other damage.

e. Inspect transformer for loose mounting, loose connections, corrosion, and other damage.

f. Inspect the relays for loose mounting, loose connections, corrosion, and other damage.

g. Inspect wiring for fraying, corrosion, and other damage.

h. Inspect the special relay assembly for dents, loose mounting, loose connectors, and other damage.

i. Replace front panel by sliding the panel under the top two screws and securing it to special relay assembly with bottom two screws.

j. Tighten top two screws.

3-153. Load Measuring Unit Inspection.

Inspect the load measuring unit for dents, breaks, loose mounting, loose connector, and other damage.

Section XXII. GENERATOR ASSEMBLY

3-154. General.

The generator assembly is used to generate electrical power. Maintenance at the organizational level consists of the following inspections.

3-155. Generator Inspection.

a. Inspect ac generator (fig. 1-1) for excessive heat by placing an open hand on the generator end bell. If the hand cannot be maintained in this position for one minute, due to overheat, refer to next higher maintenance level.

b. Inspect ac generator frame for cracks, and other damage.

c. Listen for unusual noises while in operation.

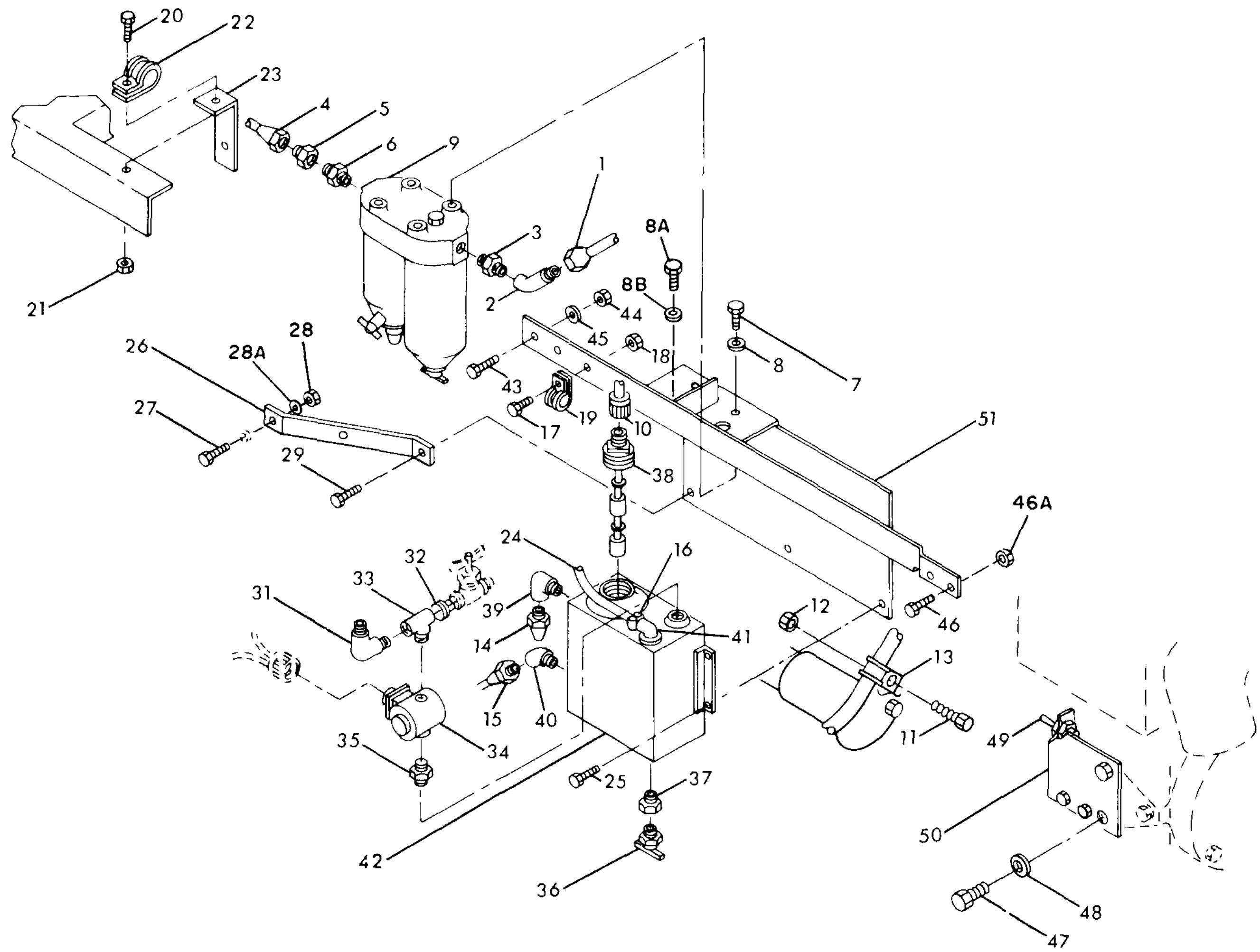
3-156. Generator Bearing Inspection.

Inspect ac generator bearing by removing inspection cover plate. Examine bearing for signs of wear, or discoloration due to overheating.

Section XXIII. DAY TANK AND FUEL FILTER ASSEMBLY

3-157. General.

This section contains information on day tank and fuel filter assembly. The day tank is used to gravity feed fuel to the fuel injector pump. The fuel supplied to the day tank from the main tank passes through the strainer and primary fuel filter. The strainer and primary fuel filter prevent foreign particles from entering the day tank. A solenoid valve on the main tank is used to control the flow of fuel to the day tank. The solenoid valve is controlled by the float level switch which is actuated by the level of the fuel in the day tank.



1. Hose assy
2. Elbow
3. Reducer
4. Hose assy
5. Connector
6. Reducer
7. Screw
8. Washer
8A. Screw
8B. Washer
9. Fuel filter assy
10. Connector
11. Screw
12. Nut
13. Clamp
14. Hose assy
15. Hose assy
16. Clamp
17. Screw
18. Nut
19. Clamp
20. Screw
21. Nut
22. Clamp
23. Bracket
24. Hose assy
25. Screw
26. Bracket
27. Screw
28. Nut
28A. Washer
Screw
(Deleted)
Elbow
32. Plug*

*Note: Heater fuel shutoff valve if fuel winterization kit installed

33. Tee
34. Solenoid valve
35. Nipple
36. Drain cock
37. Reducer
38. Float switch
39. Elbow
40. Elbow
41. Elbow
42. Day tank
43. Screw
44. Nut
45. Washer
46. Screw
46A. Nut
47. Screw
48. Washer
49. Dead crank switch
50. Bracket
51. Bracket

Figure 3-27. Day Tank and Fuel Filter Assembly

3-158. Solenoid Valve.

See figure 3-27 and proceed as follows:

a. Inspection. Inspect solenoid valve (34) for loose mounting, dents, breaks, stripped threads or other damage.

b. Testing. Test solenoid valve (34) as follows:

(1) Disconnect electrical connector on solenoid valve (34).

(2) Intermittently apply 24 volts to the terminals on the solenoid valve connector and

listen for evidence of solenoid actuation. If no solenoid action is heard, replace the solenoid valve (34).

(3) Reconnect the electrical connector.

c. Removal and Replacement. To replace the solenoid valve (34) proceed as follows:

(1) Open drain cock(36) on bottom of day tank (42) and drain tank contents into a suitable container.

(2) Disconnect and tag electrical connectors from the float switch (38) and the solenoid valve (34).

(3) Disconnect fuel lines from day tank.

(4) Disconnect fuel line attached to elbow (31) and remove elbow from tee (33).

NOTE

If fuel winterizat ion kit is installed, disconnect heater fuel shutoff valve (32) from tee (33).

(5) Remove the four screws (25) and washers (28A) which secure day tank (42) to bracket (51) and remove day tank.

(6) Remove tee (33) from solenoid valve (34).

(7) Unscrew and remove solenoid valve (34) from day tank (42).

(8) Install new solenoid valve (34) in reverse sequence of removal procedures.

3-159. Day Tank and Float Switch

See figure 3-27 and proceed as follows:

a. Inspection. Inspect the float switch (38) which is mounted on the day tank (42) for loose connector (10), loose mounting, and other damage.

b. Testing. Test the float switch (38) as follows:

(1) Remove connector (10) from float switch (38).

(2) Remove float switch (38) from day tank (42).

(3) Connect an ohmmeter between pins C and D of the connector (10) and verify continuity when the bottom float is placed at its bottom position and verify open circuit when float is placed at its top position.

(4) Connect an ohmmeter between pins A and B of the connector (10) and verify continuity when the top float is placed at its bottom position and verify open circuit when float is placed at its top position.

(5) Install float switch (38) using above removal steps in reverse order.

c. Removal and Replacement. Replace the day tank (42) as follows:

(1) Removal.

(a) Open drain cock (36) on bottom of day tank (42) and drain tank contents into a suitable container.

(b) Tag and disconnect the electrical connectors from float switch (38) and solenoid valve (34).

(c) Unscrew the float switch (38) from the day tank (42) and lift the float switch assembly from the tank.

(d) Disconnect fuel lines from day tank (42) and solenoid valve (34)

(e) Remove the four screws (25) and washers (28A) which secure day tank (42) to bracket (51) and remove day tank.

(2) Replacement. Install day tank (42) by using the removal steps in reverse order.

3-160. Fuel Filter Assembly Removal and Replacement.

To replace the fuel filter assembly, see figure 3-27 and proceed as follows:

NOTE

Refer to paragraph 3-34 for procedures to replace filter element of fuel filter assembly.

a. Removal.

(1) Open drain cocks on fuel filter assembly (9) and drain into suitable container.

(2) Clean dirt from filter head, filter body and surrounding area.

(3) Disconnect hose assemblies (1 and 4) and remove fuel filter assembly (9) by removing the four screws (7) and washers(8).

b. Installation.

(1) See figure 3-27 and replace fuel filter assembly (9) in the reverse order of removal.

(2) Close drain cocks on fuel filter assembly (9).

3-161. General.

The center support is located at the center of the housing and provides a means of lifting the generator set by use of a clevis located on each side of the top of the center support. The start aid assembly mounted on the center support, is used as an aid in starting the engine at temperatures below 40° F. This system is controlled by the ENGINE PRIMER switch on the control cubicle panel when the engine is being cranked and the START-RUN-STOP switch is in the START position. Each time the ENGINE PRIMER switch is momentarily actuated, under these conditions, one metered shot of ether is injected into the engine air intake system. This section also contains information for maintenance of the electric fuel transfer pumps which are utilized to transfer fuel from the main fuel tank to the day tank.

3-162. Start Aid Assembly.

a. Inspection. Inspect ether tank (8, fig. 3-28) solenoid valve (4) and bracket (7) for loose mounting, dents, loose fittings, and other damage.

b. Testing and Replacement.

(1) Disconnect tube (1, fig. 3-28) from adapter (3) on solenoid valve (4).

WARNING

Be careful not to inhale ether gas as drowsiness and unconciousness may result.

(2) Crank the engine and momentarily actuate and release the ENGINE PRIMER switch, while an observer watches the solenoid valve (4) opening. If no spray of ether is observed, perform step (3).

(3) Listen for audible evidence of solenoid valve (4) operation while the ENGINE PRIMER switch is repeatedly actuated.

(4) If solenoid valve (4), operation is verified in step (3), replace ether tank (8) as follows:

(a) Open bracket (7).

(b) Unscrew ether tank (8) from solenoid valve (4) and remove ether tank.

(c) Install new ether tank (8) using above procedure in reverse.

WARNING

Be careful not to inhale ether gas as drowsiness and unconciousness may result.

(d) Check operation of ether tank (8) as outlined in step (2) above.

(e) Connect tube (1) to adapter (3) on solenoid valve (4).

(5) If solenoid valve (4) operation was not verified in step (3), disconnect solenoid connector and check for 24 volts dc at the pins of its mating connector each time the ENGINE PRIMER switch is actuated with the engine cranked.

(6) If 24 volts dc is measured in step (5), replace the solenoid valve (4) as follows:

(a) Remove two screws (9) and nuts (10) which secure the solenoid valve (4) to the framework.

(b) While holding ether tank (8) securely, open bracket (7) and remove the tank and attached solenoid valve as an assembly.

(c) Remove adapter (3) and install in a new solenoid valve.

(d) Install the new solenoid valve (4) with adapter using two screws (9) and nuts (10). Do not tighten screws (9) securely.

(e) Connect tube (1) to adapter (3) on solenoid valve (4) and tighten the solenoid valve mounting screws (9) securely.

(f) Screw a new ether tank (8) into the solenoid valve (4).

(g) Close bracket (7) to secure ether tank (8).

(7) If 24 volts dc was not measured in step (5), test the ENGINE PRIMER switch and replace if defective. (Refer to paragraph 3-118a.)

3-163. Lifting Frame.

a. Inspection. See figure 3-28 and inspect lifting frame (81) for breaks, cracks, loose mounting, corrosion and rust.

b. Replacement. Replace clevis (80) in accordance with figure 3-28.

3-164. Filler Cap, Gasket, Strainer, and Hose Replacement.

See figure 3-28 (items 39 thru 59) and proceed as follows:

a. Remove item (39). Items (40) and (42) will come out together.

b. See paragraph 3-87 and remove oil separator (85).

c. Remove nuts (82), clamp and bracket (84), nuts (83), and screws (86).

d. Remove screws (49), washers (51) and nuts (50). Loosen clamps and remove hoses (47 and 48).

e. Remove clamp (44) and remove filler neck (43).

f. Remove remainder of items in sequential order.

g. Install in reverse sequence of removal.

3-165. Fuel Transfer Pumps.

See figure 3-28 and proceed as follows:

a. Servicing.

(1) Twist and remove cover and gasket from body of fuel pump (37 and 38).

(2) Carefully remove filter from fuel pump body.

(3) Wash filter with cleaning solvent Federal Specification P-D-680 and dry thoroughly.

(4) Inspect filter and gasket for tears. Replace defective filter and gasket.

(5) Position filter, and gasket in fuel pump body and secure with cover.

b. Testing. Test each fuel pump (37 and 38) one at a time as follows:

(1) Disconnect fuel hose assemblies from fuel pumps.

(2) Connect top (inlet) of fuel pump to a fuel source.

(3) Connect bottom (outlet) of fuel pump to a clean empty container.

(4) Connect a 24-Vdc power supply to male receptacle and ground, observing ground polarity requirements (+ or -) as stamped on fuel pump bracket. Fuel pump should deliver 18 gallons per hour of fuel with zero pressure. If fuel pump is inoperative, there may be an open circuit in the wire lead assembly. If fuel pump does not operate after rechecking electrical test connection, replace the fuel pump.

(5) At completion of test, reconnect fuel hose assemblies to fuel pump (37 and 38).

c. Replacement. See figure 3-28 (detail A) and proceed as follows:

(1) Disconnect connectors on fuel pumps (37 and 38).

(2) Disconnect hose assemblies (24).

(3) Disconnect tube assembly (30) from both fuel pumps (37 and 38).

(4) Remove four screws (34) and nuts (35) which secure fuel pumps.

(5) To reassemble, reverse the disassembly sequence.

3-166. Fuel Selector Valve and Lines Replacement.

See figure 3-28 and remove and replace item numbers (24), (25), (15), (17), (16), (18), (20), (19), (21), (23), (22), (27), (28) and (29), as required.

KEY to fig. 3-28:

1. Tube
2. Atomizer
3. Adapter
4. Solenoid valve
5. Screw
6. Nut
6A. Nut
7. Bracket
7A. Strap
8. Ether tank
9. Screw
10. Nut
10A. Nut
11. Screw
12. Nut
13. Cap and chain
14. Adapter
15. Hose assembly
16. Elbow
17. Elbow
18. Hose assembly
19. Elbow
20. Elbow
21. Hose assembly
22. Elbow
23. Elbow
24. Hose assembly
25. Connector
26. Elbow
27. Screw
28. Nut
29. Fuel selector valve
30. Tube assembly
31. Elbow
32. Elbow
33. Elbow
34. Screw
35. Nut
36. (Deleted)
37. Fuel pump
38. Fuel pump
39. Fuel cap
40. Fuel cap gasket
41. Hook
42. Strainer
43. Filler neck
44. Clamp
45. Fillerneck hose
46. Clamp
47. Hose
48. Hose
49. Screw
50. Nut
51. Washer
52. Hose
53. Tee
54. Hose
55. Tee
56. Hose
57. Hose
58. Tee
59. Hose
60. Screw
61. Nut
62. Washer
63. Load bank support bracket
64. Screw
65. Nut
66. Washer
67. Bracket
68. Screw
69. Nut
70. Washer
71. Tail pipe bracket
72. Rivet
73. Fuel selector valve instruction plate
74. Screw
75. Nut
76. Cap and chain
77. Cotter pin
78. Nut
79. Bolt
80. Clevis
80A. Nut
80B. Washer
80C. Screw
80D. Nut
80E. Washer, flat
80F. Washer, bevel
80G. Screw
81. Lifting frame
82. Nut
83. Nut
84. Clamp and bracket
85. Oil separator
86. Screw

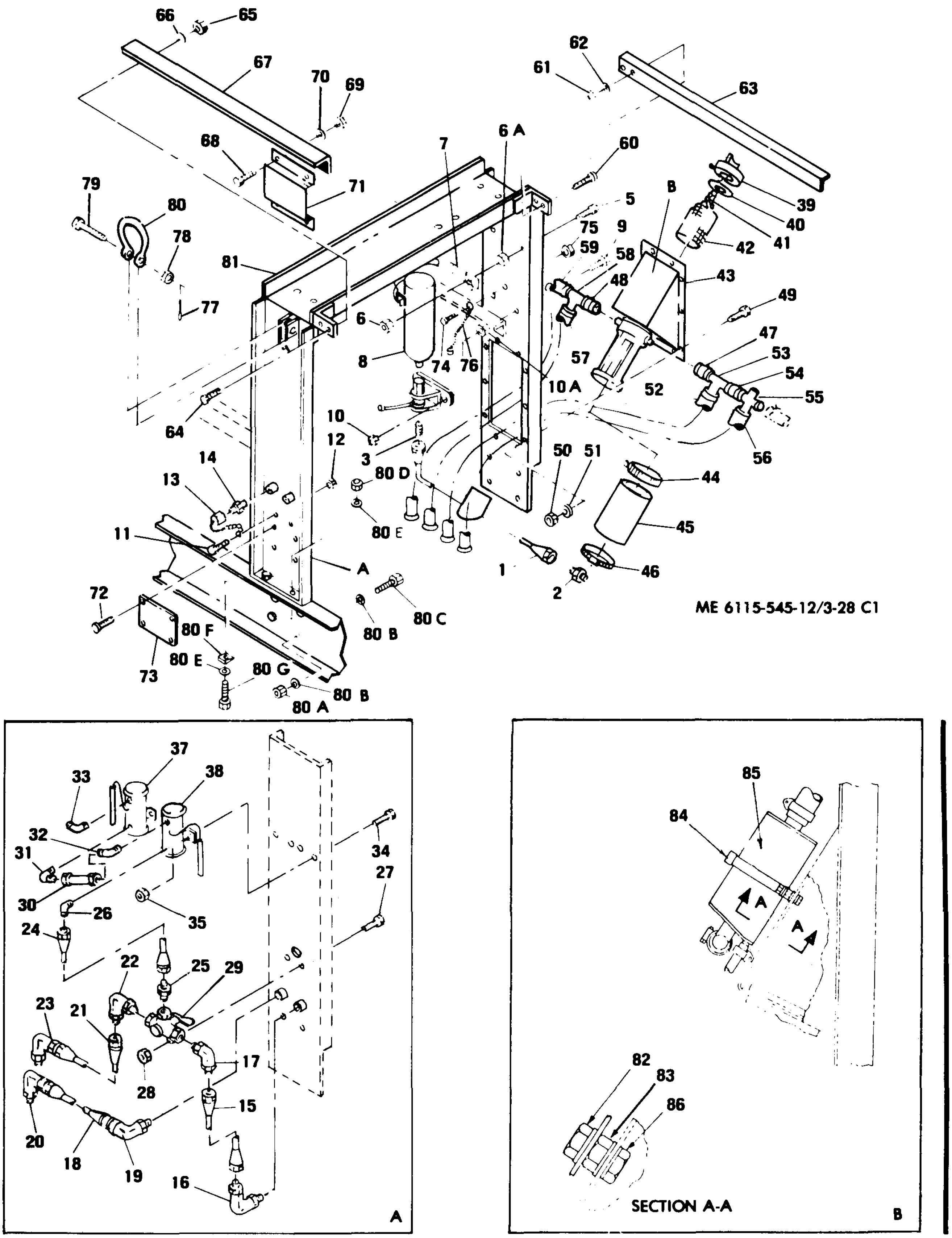


Figure 3-28. Center Support and Related Parts

1. Hose clamp
2. Hose clamp
3. Hose
4. Hose clamp
5. Hose clamp
6. Hose
6A. Spring
*7. Hose
*8. Elbow
*9. Connector
*10. Flared nut
*11. Hose
*12. Connector
*13. Adapter
*14. Flared nut
*15. Screw
*16. Clamp
*17. Screw
*18. Clamp
*19. Hydraulic cooler
20. Adapter
21. Shutoff cock
22. Elbow
23. Nipple
24. Screw
25. LH fan guard
26. RH fan guard
27. Screw
28. Washer
29. Washer
30. Nut
31. Screw
32. Bevel washer
33. Washer
34. Nut
35. Radiator assy
36. Radiator shroud
37. RH radiator support
38. LH radiator support
39. Skid base

*Class I Sets Only

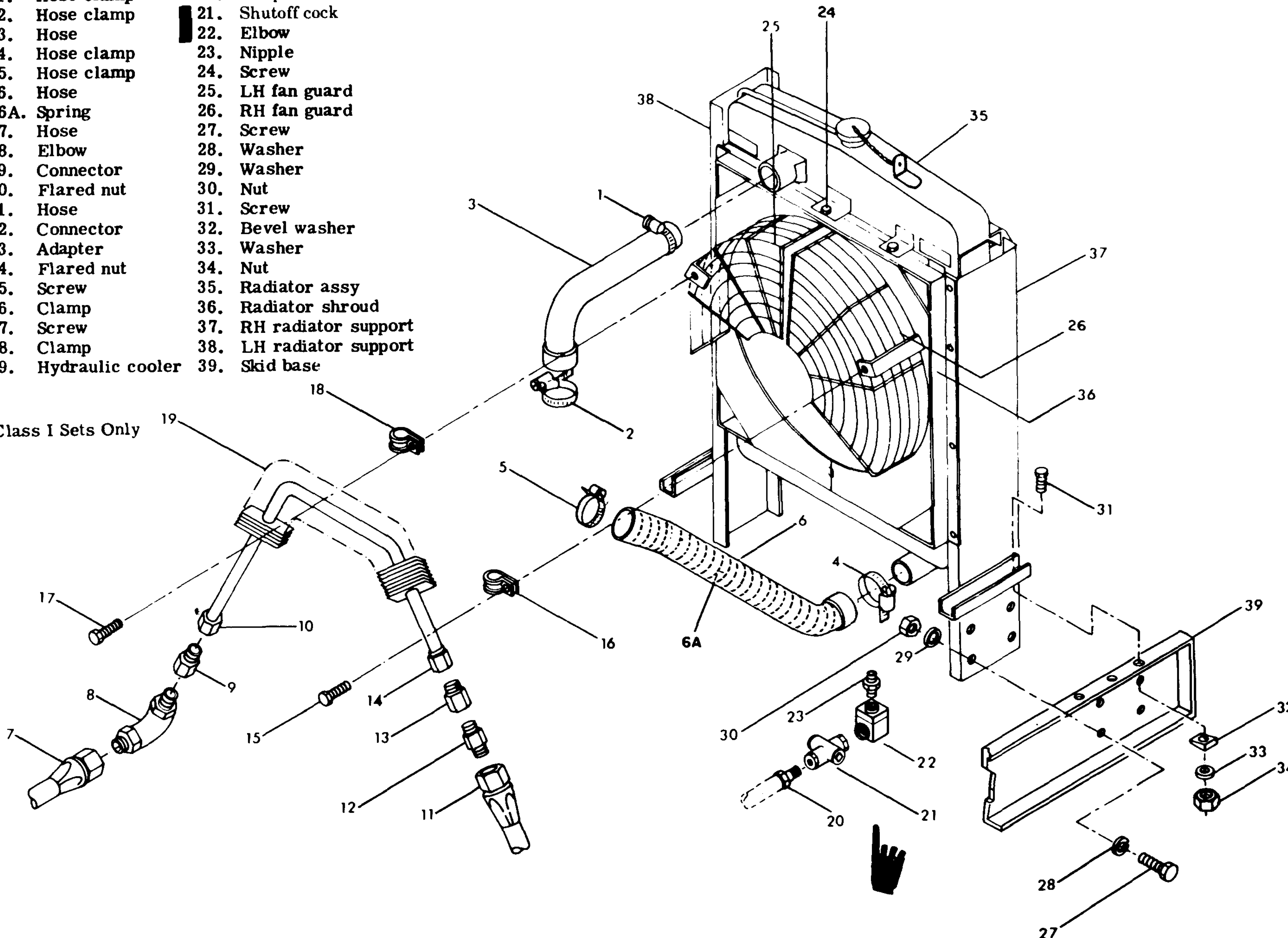


Figure 3-29. Cooling Group And Related Parts

3-167. General.

The cooling system consists of a radiator, shutter and shutter controls, and the necessary lines, fittings, and linkage to connect these components. The shutter is controlled by the shutter control thermostat, which can also be operated manually. See figure 3-29 to remove hoses and other related parts.

3-168. Grille.

a. Replacement. Replace grille (78, fig. 3-22) as follows:

(1) Removal.

(a) Remove screws (76, fig. 3-22) and cage nuts (77) which secure grille (78) at top and bottom.

(b) Remove 2 screws (79) which secure grille at each side and remove grille (78).

(2) Installation. Install grille in reverse order of removal.

b. Repair. Repair grille (78) by straightening cross members and corners. Remove rust or other corrosion and repaint prepainted surfaces in accordance with services requirements.

3-169. Fan Guard.

a. Replacement.

(1) Remove the 2 screws (15 and 17, fig. 3-29) which secure the two clamps (16 and 18) on the hydraulic cooler lines to the fan guards (25 and 26).

(2) Remove 7 screws (24) which secure fan guards (25 and 26) to radiator shroud (36) and remove both fan guards.

(3) Re-install in reverse order of removal.

b. Repair. Repair fan guard (25 and 26) by straightening cross members. Remove rust or other corrosion and repaint prepainted surfaces in accordance with service requirements.

3-170. Shutter Thermostat.

a. Testing.

(1) To test shutter thermostat (fig. 3-30) operation, verify that the shutters on the shutter assembly change from a closed position when the engine is cold, and to an open position when the engine is at operating temperature.

(2) Remove the thermostat (6, fig. 3-30). (Refer to paragraph b below).

(3) Suspend thermostat (6) in a container of clean water. Thermostat must be completely immersed but not touching bottom of container.

(4) Heat water gradually and stir so heat is evenly distributed.

CAUTION

Check temperature of water with a reliable thermometer. Do not overheat.

(5) Observe thermostat (6) as temperature of the water increases. If the thermostat (6) is functioning properly, it should begin to open at 160° F and be fully open at 202° F.

(6) Thermostat (6) is not adjustable. If it does not operate within the above limits it must be replaced.

b. Replacement. Replace the thermostat (6) as follows:

(1) Removal.

(a) Drain radiator assembly (35, fig. 3-29) by removing the radiator cap and opening shutoff cock (21).

(b) Loosen hose clamp (4) which secures lower hose (6) to the shutter control assembly.

(c) Remove nuts 1(fig. 3-30) which secure shutter assembly to control assembly (10) and remove the rod (2) from control assembly (10).

(d) Remove the two screws (3, fig. 3-31) and washers (4) which secure shutter control assembly (5) to the bottom of radiator (17) and remove shutter control assembly (5) with attached coupling fitting, elbow, drain valve, and drain hose.

(e) Remove two nuts (3, fig. 3-30) and studs (4) which secure the control assembly to the coupling fitting and remove thermostat (6).

(2) Installation. Install the thermostat (6, fig. 3-30) in reverse order of removal steps.

3-171. Shutter Assembly.

a. Testing. Test shutter (2, fig. 3-31) as follows:

(1) Verify that shutter (2) changes from a closed position, when the engine is cold, to an open position when the engine is at operating temperatures.

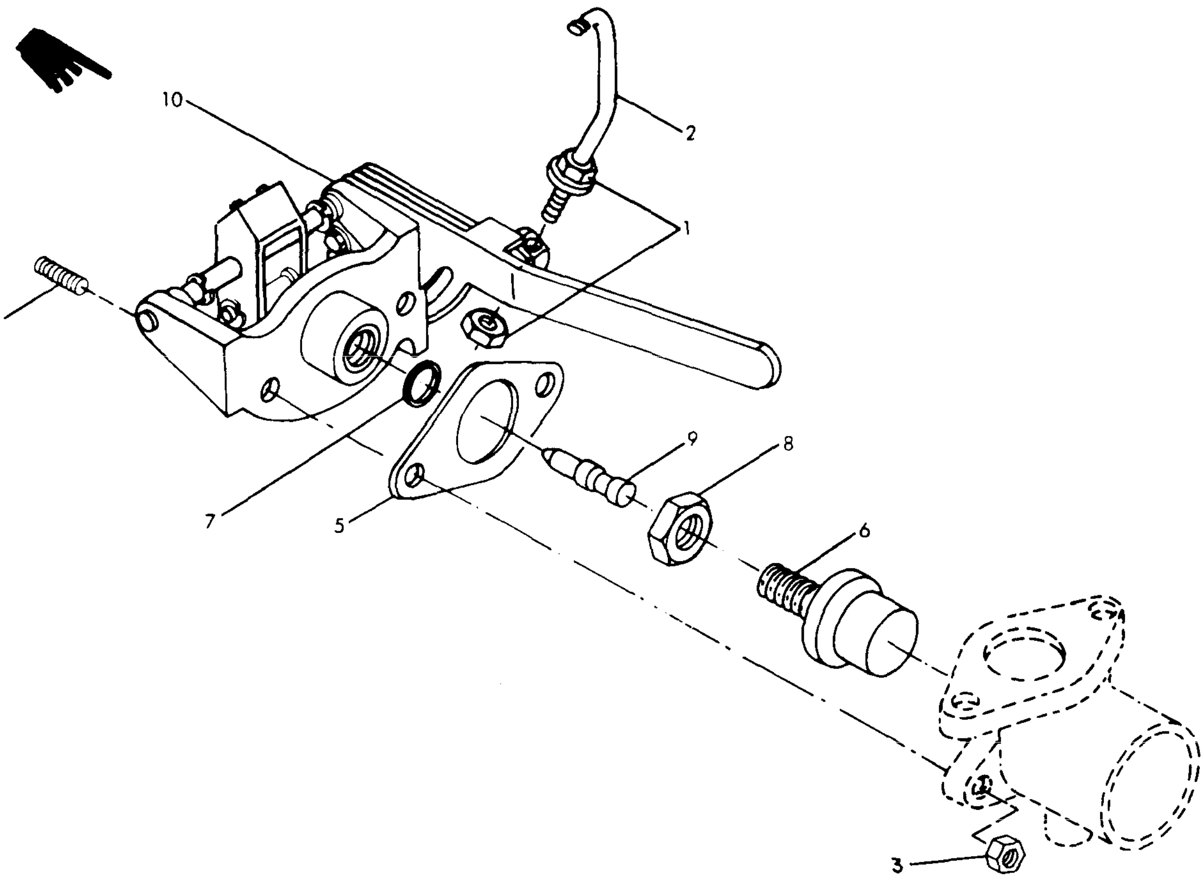
(2) Verify shutter (2) opens and closes freely when operated manually.

b. Adjustment. With the engine cold and the manual shutter control in the closed position adjust the nuts on the shutter assembly threaded link shaft to assure that the shutters are fully closed. Check that with manual shutter control in open position, the shutters are opened fully.

c. Replacement. Replace the shutter(2) as follows:

(1) Removal.

(a) Remove grille as described in paragraph 3-168a.



1. Nut
2. Rod
3. Nut
4. Stud
5. Gasket
6. Thermostat
7. Packing
8. Nut
9. Piston
10. Control assy

Figure 3-30. Shutter Thermostat Replacement

(b) Remove nuts (1, fig. 3-30) which secure shutter assembly threaded rod (2) to control assembly (10).

(c) Remove the 8 screws and washers (1, 1A, fig. 3-31) which secure shutter (2) to the radiator (17), and remove the shutter (2).

(2) Installation. Install shutter (2) in the reverse order of removal.

3-172. Radiator.

a. Replacement. To replace the radiator (17, fig. 3-31) proceed as follows:

(1) Removal.

(a) Position suitable container to collect radiator coolant.

(b) Perform steps (a) through (d) of paragraph 3-170b (1).

(c) Loosen hose clamp (1, fig. 3-29) and remove upper hose (3) from radiator.

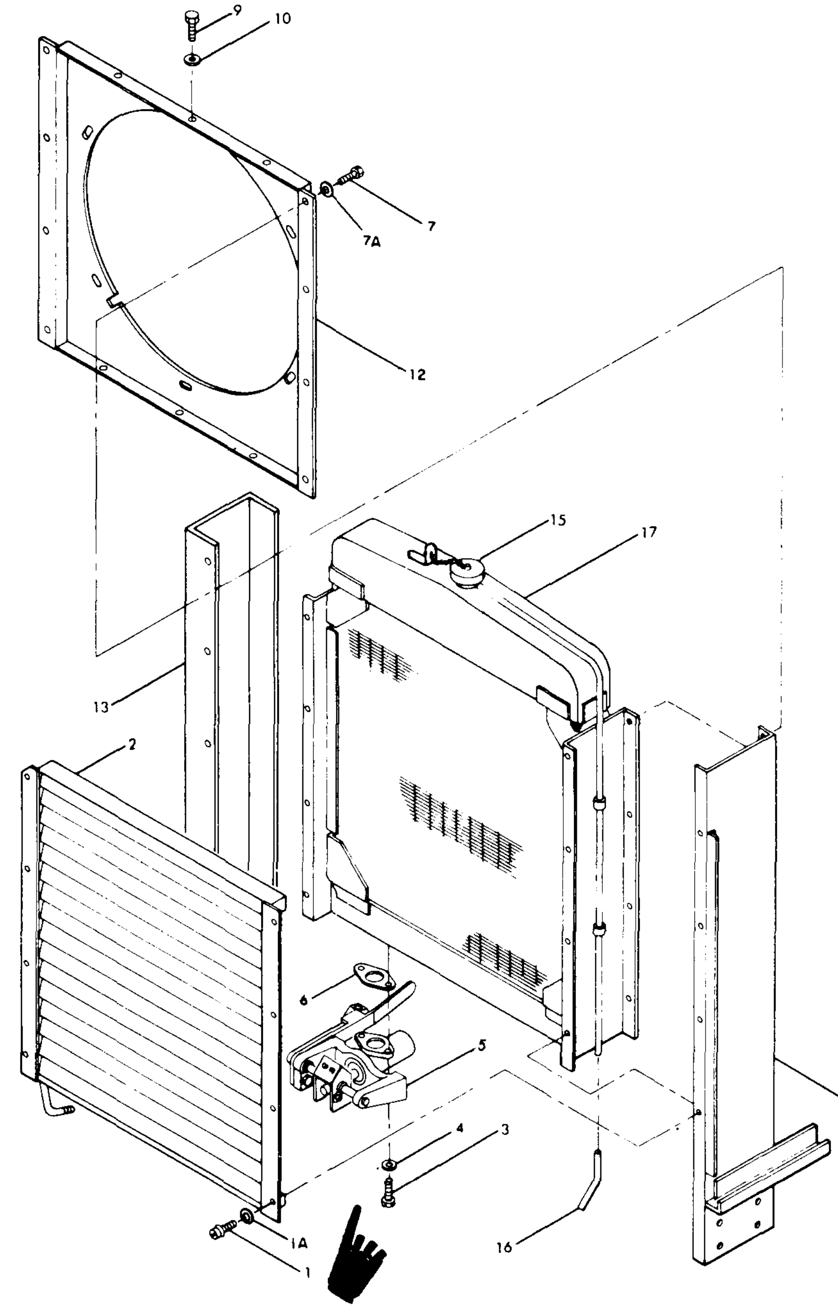
(d) Remove shutter as described in paragraph 3-171.

(e) Remove six screws (84, fig. 3-22) and nuts (85) which secure the battery access door (86) to the lower front housing (93) and remove battery access door (86).

(f) Perform steps a through d of paragraph 3-87.

(g) Remove 10 screws (55) and nuts (56) which secure the housing top front (57) in the front and rear.

26).



1. Screw
1A. Washer
2. Shutter
3. Screw
4. Washer
5. Shutter control assy
6. Gasket
7. Screw
7A. Washer
8. (Delete)
9. Screw
10. Washer
11. (Delete)
12. Shroud
13. RH radiator support
14. LH radiator support
15. Cap
16. Drain hose
17. Radiator

Figure 3-31. Cooling Group

(h) Remove 12 screws (58) and cage nuts (59) which secure the housing top front (57) on the sides, and remove the cover.

(i) Remove the 2 screws (15 and 17, fig. 3-29) which secure the two clamps (16 and 18) on the hydraulic cooler lines to the fan guards (25 and 26).

(j) Remove 7 screws (24) which secure fan guards (25 and 26) to radiator shroud (36) and remove both fan guards.

(k) Disconnect wiring connections (14, fig. 3-4) at the battery slave receptacles.

(l) Remove 4 screws (89 and 91, fig. 3-22) and cage nuts (90 and 92) which secure the lower front housing (93) to the left and right hand housing corner posts (138 and 139).

(m) Remove 4 screws (94 and 97) and nuts (95 and 98) which secure the upper front housing (96) to the left and right hand housing corner posts and remove upper front housing (96).

(n) Perform steps a through c of paragraph 3-86.

(o) Remove 10 screws (141 and 148) which secure the front left and right hand housing corner posts (138 and 139) to the radiator support.

(p) Remove 4 screws (140 and 147) which secure th bottom of the left and right hand housing corner posts (138 and 139) to the radiator support, and remove corner posts.

(q) Remove 6 screws (31, fig. 3-29), 12 bevel washers (32), washer (33) and nuts (34) which secure the RH and LH radiator supports (37 and 38) at the top of the skid base (39).

(r) Remove 8 screws (27), 16 washers (28 and 29) and 8 nuts (30) which secure the RH and LH radiator supports (37 and 38) to the sides of skid base (39).

(s) Remove radiator assembly (35), RH and LH radiator supports (37 and 38) and radiator shroud (36) from skid base (39).

(t) Remove 8 screws and washers (7, 7A, fig. 3-31) and nuts (8) which secure radiator (17) and shroud (12) to RH and LH radiator supports (13 and 14) and remove supports.

(u) Remove screws (9) and washers (10) which secure radiator 17) to shroud (12) and remove the shroud and radiator.

(2) Installation. Install radiator assembly component using the removal steps as applicable in reverse order.

3-173. Hydraulic Cooler.

The hydraulic cooler is used on Class 1 sets only.

a. Service. To service the hydraulic cooler (19, fig. 3-29) proceed as follows:

(1) Check that the mounting screws (15 and 17) are secure.

(2) Clean dirt off fins.

b. Replacement. To replace the hydraulic cooler (19, fig. 3-29) proceed as follows:

(1) Removal.

(a) Position suitable container to receive hydraulic oil drained from hoses and tubing when disconnected.

(b) Disconnect hose (7) from elbow (8)

(c) Remove elbow (8) from connector (9) and remove connector from flare nut (10).

(d) Disconnect hose (11) from connector (12) and remove connector from adapter (13).

(e) Disconnect adapter (13) from return line (14).

(f) Remove screw (15) and clamp (16) which secure return line to RH fan guard (26).

(g) Remove screw (17) and clamp (18) which secure input line to LH fan guard (25), and remove hydraulic cooler (19).

(2) Installation. Install hydraulic cooler (19) in reverse order of removal. Replenish hydraulic sump with hydraulic oil.

Section XXVI. HYDRAULIC ACTUATOR AND SUMP AND FILTER (MEP105A ONLY)

3-174. General (See fig. 1-28.)

a. The hydraulic actuator is utilized on precise engine generator sets. The actuator regulates the engine fuel injection system in order to maintain rated speed for all load conditions.

b. The hydraulic sump is mounted on the left side of the engine, on Class 1 precise generator sets. The sump acts as a reservoir for the hydraulic oil pump, used to supply hydraulic power to the hydraulic actuator.

c. The hydraulic oil filter is mounted on the sump and provides protection against contaminant in the hydraulic oil pressure system.

3-175. Hydraulic Actuator Service.

a. Disconnect hose (6, fig. 3-32) from elbow (7) and remove elbow (7) and packing (8).

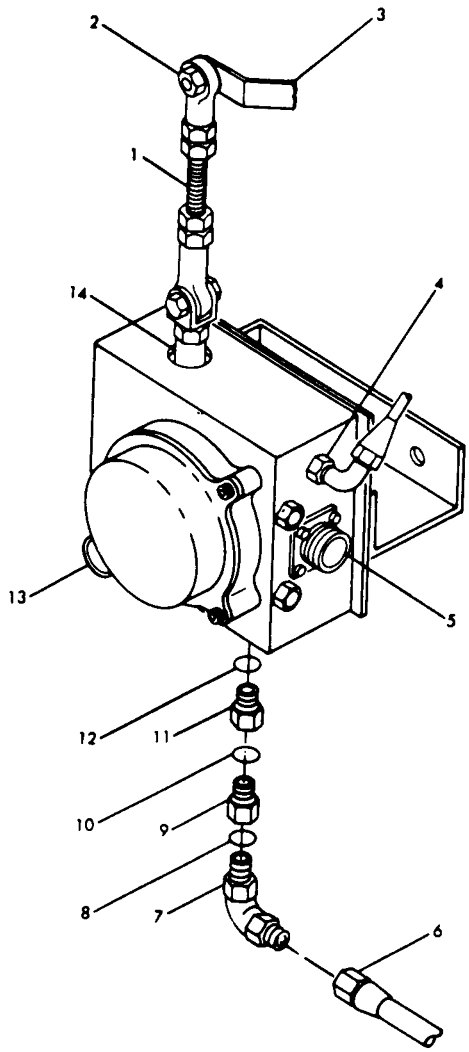
b. Disconnect reducer expander (9) with packing (10) from filter plug (11).

c. Remove filter plug (11) and packing (12) from hydraulic actuator.

d. Clean filter plug (11) with cleaning solvent, Federal Specification P-D-680, and dry thoroughly.

e. Inspect filter screen for tears, holes, irregularity of mesh, or other damage.

f. Replace cleaned filter plug (11), if serviceable, or install a new plug and reassemble in the reverse order of removal.



1. Throttle linkage
2. Nut self-locking
3. Lever arm
4. Return Adapter
5. Connector J25
6. Hose
7. Elbow assembly bulkhead
8. Packing
9. Reducer expander
10. Packing
11. Filter plug
12. Packing
13. Connector J24
14. Piston

Figure 3-32. Hydraulic Actuator Servicing (MEP105A)

3-176. Removal, of Sump and Filter.

a. Remove plug (1, fig. 3-33) on sump tank (21). Drain sump and discard oil.

b. Remove hose assembly (2) from elbow assembly (7). Remove two loop clamps and associated hardware front of engine.

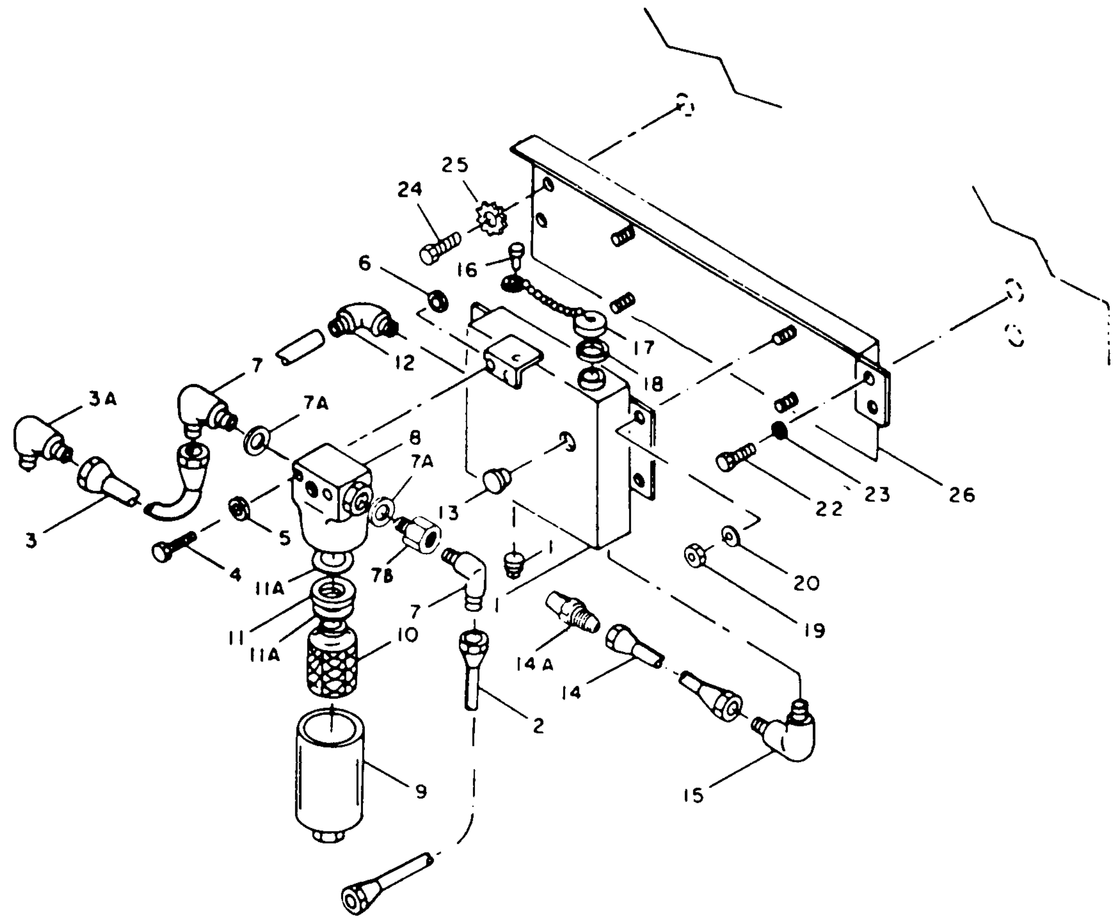
c. Remove hose assembly (3) from elbow assembly (7) and from elbow assembly (3A).

d. See figure 3-33 and remove sump and filter as illustrated.

3-177. Cleaning and Inspection of Sump and Filter.

a. Cleaning.

(1) Flush sump tank (21) thoroughly with hot water or steam under pressure.



1.	Plug	9.	Filter body	18.	Preformed packing
2.	Hose assy	10.	Filter element	19.	Nut
3.	Hose assy	11.	Preformed packing	20.	Washer
3A.	Elbow	11A.	Backup ring	21.	Sump tank
4.	Screw	12.	Elbow	22.	Screw
5.	Washer	13.	Sight gage	23.	Washer
6.	Nut	14.	Hose Assy	24.	Screw
7.	Elbow assembly, bulkhead	14A.	Adapter	25.	Washer
7A.	Ring	15.	Elbow	26	Bracket
7B.	Reducer-expander	16.	Screw		
8.	Filter head	17.	Cap and chain		

Figure 3-33. Hydraulic Sump and Filter (MEP105A)

(2) Clean sump tank and filter thoroughly with cleaning solvent, Federal Specification P-D-680.

b. Inspection.

(1) Inspect threaded areas for damage.

(2) Inspect sump tank (21) for cracks or distortion.

(3) Inspect filter for damage.

3-178. Installation.

a. See figure 3-33 and install sump tank (21) and filter in reverse order of removal.

b. Connect hydraulic lines.

c. Fill sump with hydraulic oil, MIL-H-5606.

Section XXVII. ENGINE ASSEMBLY

3-179. General.

The engine assembly and components generate the mechanical power to drive the generator.

3-180. Engine Assembly Testing.

a. Testing. To test the engine assembly proceed as follows:

(1) With engine running, test for overheating by observing COOLANT TEMPERATURE indicator (fig. 2-5).

(2) With engine running test for proper oil pressure by observing OIL PRESSURE indicator (fig. 2-5).

(3) With engine running test by listening for engine knocks, excessive noise and visually observe for vibrations.

(4) With engine running observe exhaust for excessive black, gray, or blue emissions.

(5) With engine running observe BATTERY CHG AMMETER (fig. 2-5) for proper charging indication.

3-181. Drain Hoses.

To remove and install the oil pan drain hose assembly and the water block drain hose assembly. See figure 3-34 and proceed as follows:

a. Remove oil drain hose (3) by removing clamps (1 and 2).

b. Unscrew and remove nipple (4) shutoff cock (5) and connector (6).

c. Disconnect water drain hose (7) from nipple (8) and remove water drain hose (7).

d. Unscrew and remove nipple (8) and needle valve (9).

e. Install oil drain hose and water drain hose in reverse sequence of removal.

Section XXVIII. ALTERNATOR AND RELATED PARTS

3-182. General.

The alternator is a 24 volt, continuous output, diode rectified unit, designed and constructed to provide extra long periods of reliable service with minimum maintenance. The rotor is mounted on bearings. Both front and rear bearings are sealed and lubricated for life. The alternator is driven by the crankshaft pulley with a single belt. The idler, the water pump and the fan mounted on the water pump pulley are driven simultaneously by the crankshaft pulley with an identical matched pair of belts.

3-183. Drive Belts.

See figure 3-35. and proceed as follows:

a. Adjustment.

(1) Adjust belts for tension which conforms with table 3-1.

(2) To obtain proper alternator belt (7, fig. 3-35) tension, loosen the alternator adjusting brace capscrew (5) and move alternator in or out as required.

CAUTION

When adjusting alternator belt tension, apply force against stator laminations between alternator and frames, not against the end frames.

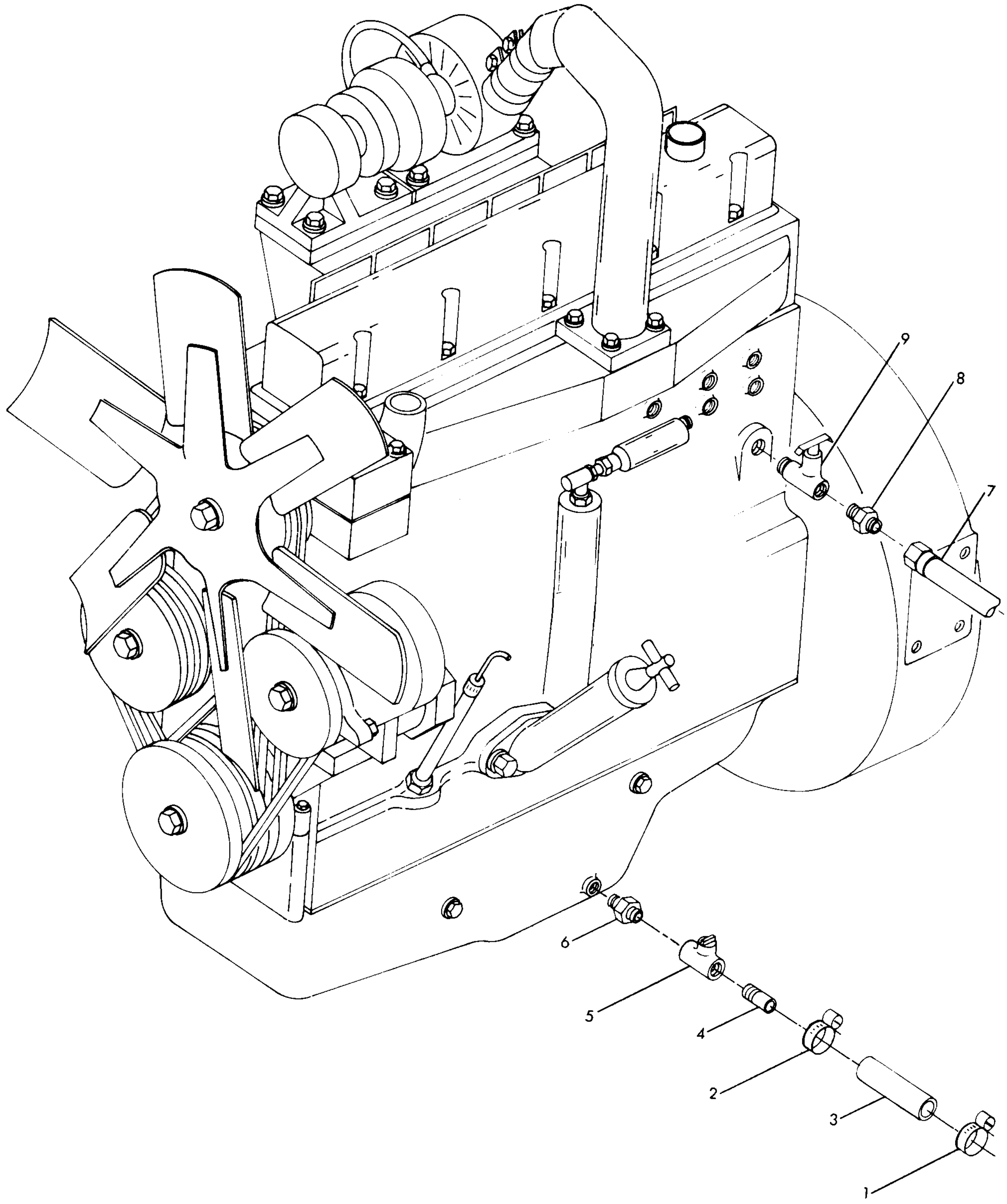
(3) Retighten the alternator adjusting brace capscrew (5).

(4) To obtain proper fan belt (9) tension loosen the idler pulley adjusting bracket capscrew (6) and move idler pulley (4) as required.

(5) Tighten idler pulley adjusting bracket capscrew (6).

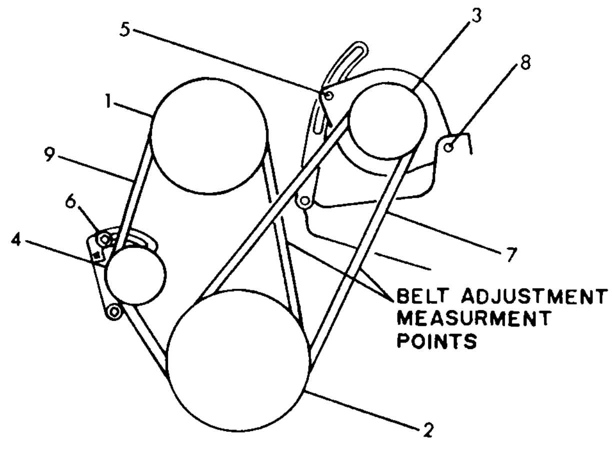
b. Replacement.

(1) Replace fan belts as required. Proceed as follows:



1. Hose clamp
2. Hose clamp
3. Oil drain hose
4. Nipple
5. Shutoff Cock
6. Connector
7. Water drain hose
8. Nipple
9. Needle Valve

Figure 3-34. Drain Hose Removal



1. Water pump pulley
2. Crankshaft pulley
3. Alternator pulley
4. Idler pulley
5. Alternator adjusting brace capscrew
6. Idler pulley adjusting bracket capscrew
7. Alternator belt
8. Alternator mounting bolt
9. Fan belts

Figure 3-35. Belt Adjustment and Replacement

(a) Remove fan guard by removing the seven fan guard mounting screws (24, fig. 3-29), which secure the left and right hand fan guards (26, 25) to the radiator shroud (36).

(b) Remove alternator belt (7, fig. 3-35) as follows:

1. Loosen the alternator mounting bolt (8).

2. Loosen the alternator adjusting brace capscrew (5), and remove the alternator belt from its pulleys.

3. Remove the alternator belt (7) by carefully manipulating it over the fan blades, Manually rotate the fan, as required, to facilitate belt removal.

CAUTION

Do not force a belt over sharp metal surfaces.

(c) Remove the fan belts as follows:

1. Manually position the fan blades to gain access to the idler pulley adjusting bracket capscrew (6).

2. Loosen idler pulley adjusting bracket capscrew (6) and remove the front belt from its pulleys.

3. Remove the fan belts, one at a time, by carefully manipulating them over the fan blades. Manually rotate the fan, as required, to facilitate belt removal.

CAUTION

Do not force a belt over sharp metal surfaces.

(2) Installation. Install the alternator and fan belts using appropriate removal steps in reverse order and adjust the belts as described in paragraph 3-183 a (1) and (2).

NOTE

Replace fan belts in sets.

3-184. Battery Charging Alternator.

a. Testing. Testing of the battery charging alternator (14, fig. 3-36) at the organizational maintenance level is accomplished by performing an operational verification as instructed in step c below. If the alternator output cannot be varied in accordance with the recommended voltage settings in step c, shut down generator set and proceed as follows:

(1) Measure and adjust alternator belt tension, (para 3-183 a (1) and (2).

(2) Check that fuse (21, fig. 3-36) is not burned out.

(a) Cut lockwires (1) attached to connector (2) and receptacle mounting screw (3) and remove connector and lockwire.

(3) Check battery connections for security.

(4) If alternator (14) output is not correct after belt tension has been adjusted, replace the alternator (14).

b. Replacement. Replace the alternator (14), adjustable brace (10), or mounting bracket (20) as follows:

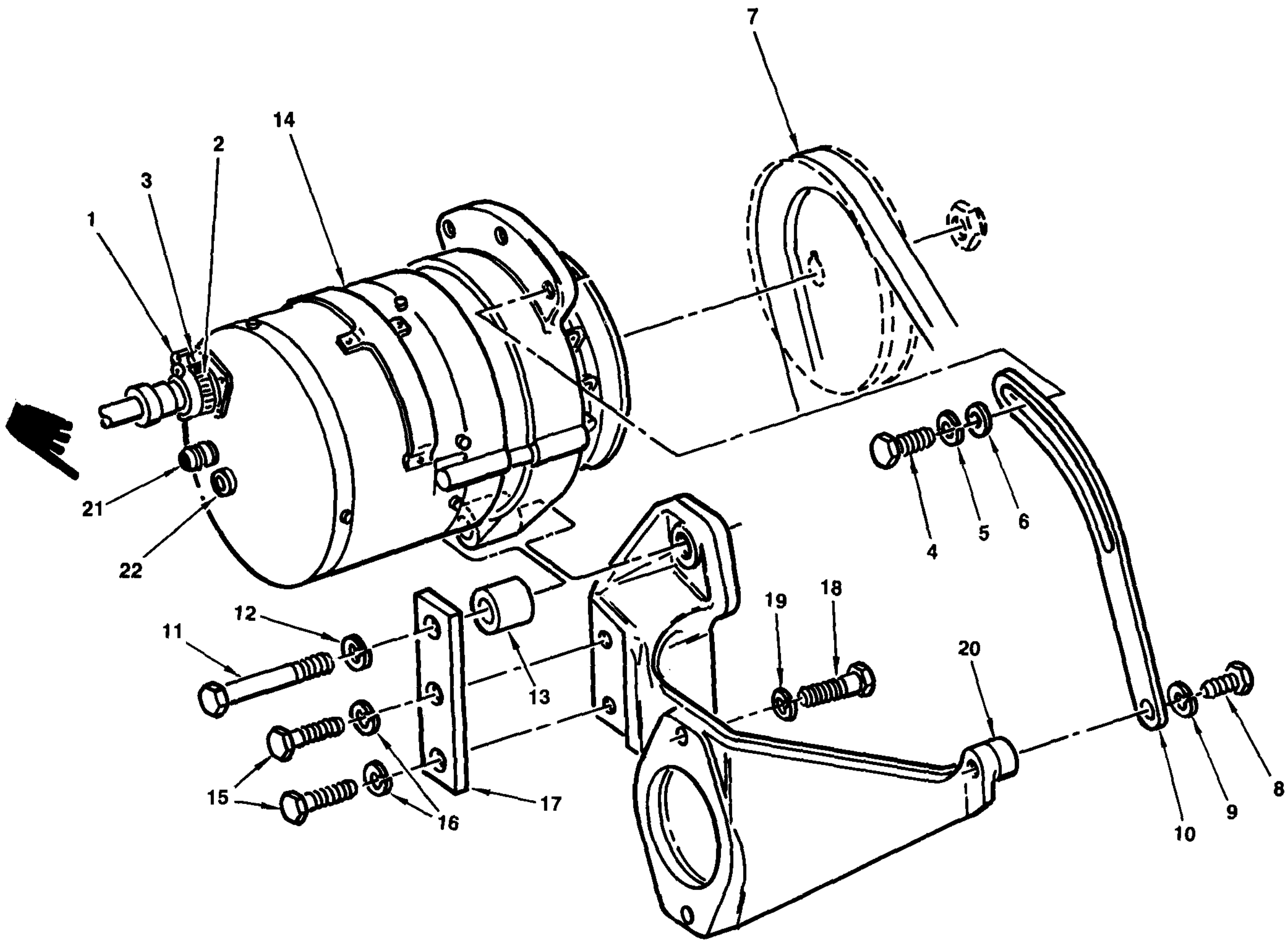
(1) Removal.

(a) Remove screw (4) and washers (5 and 6) from alternator (14).

(b) Remove belt tension and remove belt (7) from alternator pulley.

(c) Remove screw (8) and washer (9) securing adjustable brace (10) to alternator mounting bracket (20) and remove adjustable brace (10).

(d) Remove screw (11) washer (12), spacer (13) and alternator (14) from the mounting bracket (20).



1. Lockwire
2. Connector
3. Receptacle mounting screw
4. Screw
5. Washer
6. Washer
7. Belt
8. Screw
9. Washer
10. Adjustable brace
11. Screw
12. Washer
13. Spacer
14. Alternator
15. Screw
16. Washer
17. Support bracket
18. Screw
19. Washer
20. Mounting bracket
21. Fuse
22. Adjusting Screw

Figure 3-36. Alternator and Related Parts

(e) Remove two screws (15) and washers (16) securing support bracket (17) to the mounting bracket (20), and remove the support bracket.

(f) Remove screw (18) and washer (19) securing mounting bracket (20) to the front cover and remove mounting bracket.

2. Installation. Install the battery charging alternator (14), adjustable brace (10) and mounting bracket (20) using removal steps in reverse order as required. Wind lockwire (1) one turn around threads at receptacle mounting screw (3) before tightening screw and attaching lockwire to installed connector (2).

c. Adjustment. With the engine generator set running, adjust the alternator as follows:

(1) Disconnect negative terminal from battery.

(2) Connect a voltmeter across terminals of either slave receptacle and adjust alternator output by rotating adjusting screw (22) located on the rear housing.

(3) To increase alternator output, rotate output adjusting screw (22) clockwise. To decrease alternator output, rotate adjusting screw (22) counterclockwise.

(4) Recommended voltage settings are as follows:

Above 100° F . . . . . . 26.2 Vdc

0° F to 100° F . . . . . 28. 0 Vdc

0° F to -65° F . . . . 30. 0 Vdc

(5) At completion of adjustment, disconnect voltmeter and reconnect battery negative terminal.

Section XXIX. SPEED SWITCH

3-185. General.

The speed switch is driven by the camshaft through a drive assembly and an angle adapter. The speed switch provides sequenced control of circuits during engine startup and protection against engine overspeed during operation.

3-186. Testing and Replacement.

a. Testing. A complete test of the speed switch can only be performed at a higher maintenance level. Organizational level testing is accomplished as follows (see fig. 3-37).

(1) Remove connector (3) from the speed switch (5) and perform the continuity measurements as indicated in steps (2) and (3) with the engine off. If any continuity measurement is not verified, replace the speed switch.

(2) Short circuit between speed switch connector pins A and B; G and H.

(3) Open circuit between speed switch connector pins F and J, A and C, D and E.

(4) Reconnect connector (3) to the speed switch (5).

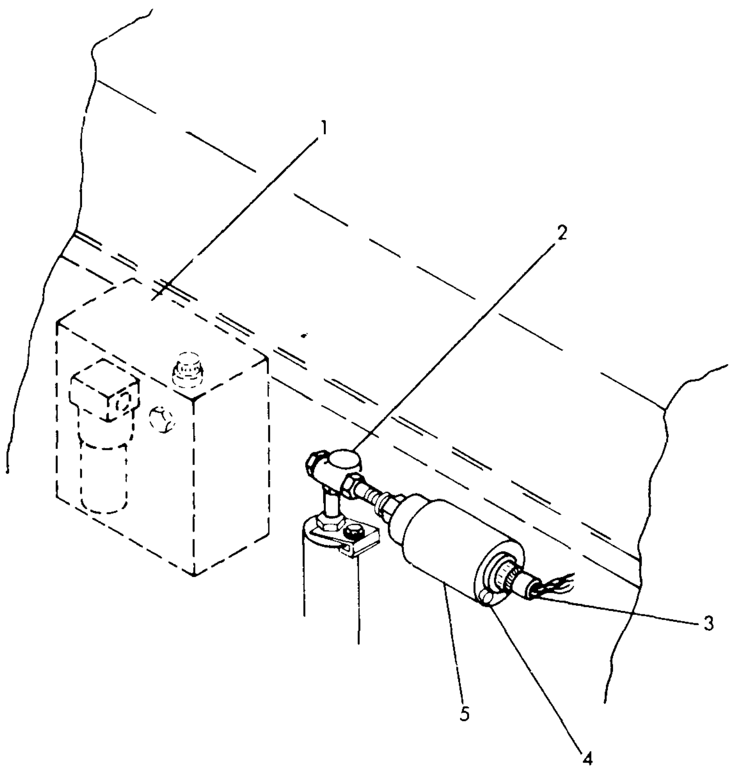
b. Replacement. Replace speed switch (5, fig. 3-37) as follows:

(1) Removal.

(a) Remove cable connector (3).

(b) Loosen nut from adapter (2) and remove speed switch (5) from adapter (2).

(2) Installation. Install speed switch (5) using removal steps in reverse order.



1. Hydraulic sump 2. Adapter 3. Connector 4. Reset button 5. Speed switch

Figure 3-37. Speed Switch

3-187. General.

The oil level gage is used to check the engine oil level. The filler cap provides means of adding oil as required.

3-188. Replacement.

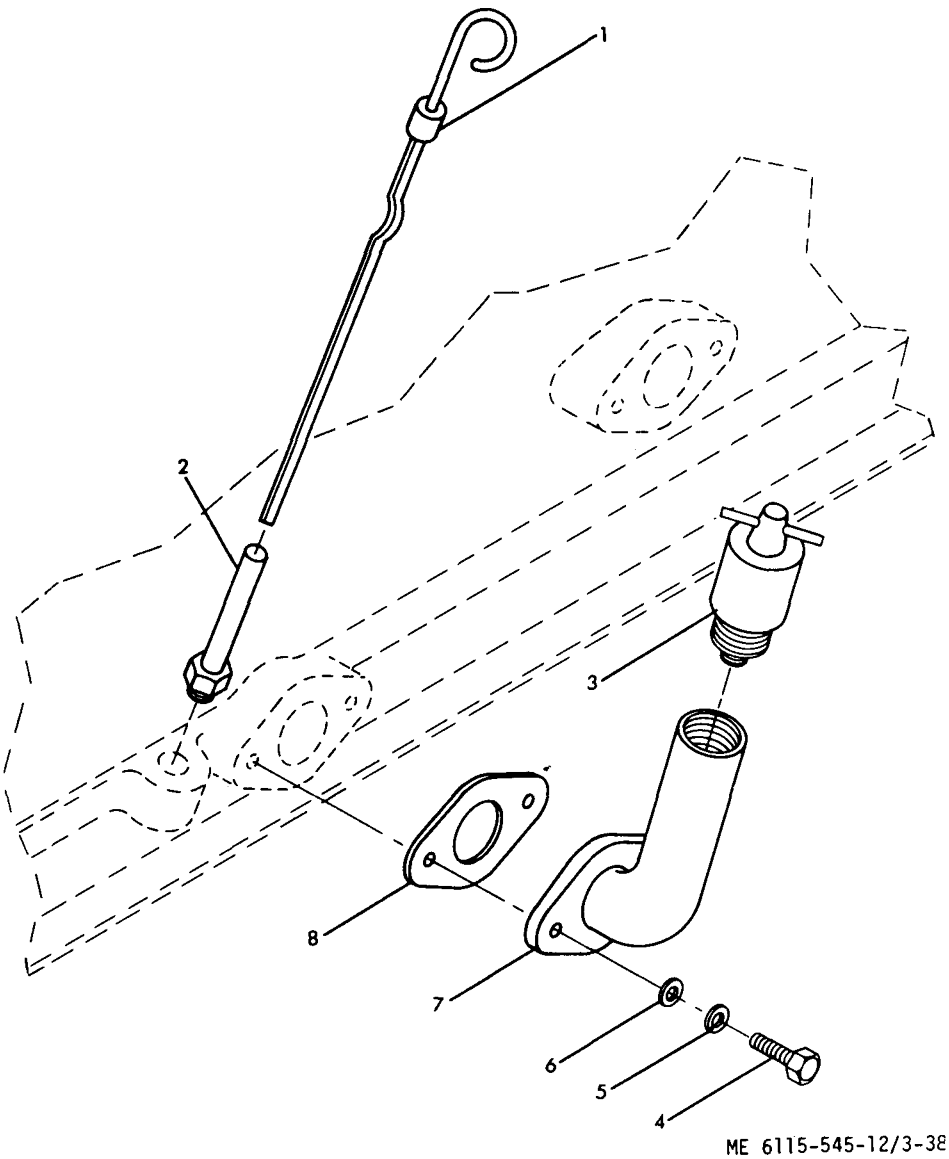
See figure 3-38 and proceed as follows:

a. Replace oil level gage (1, fig. 3-38) by removing and installing new gage.

b. Replace oil level gage adapter (2) by unscrewing and installing new adapter.

c. Replace oil filler cap (3) by unscrewing cap handle and removing cap. Install new cap and screw handle tight.

d. Replace oil filler elbow (7) by removing screw (4), lock washer (5) and flat washer (6), and gasket (8). Install elbow (7) in reverse order of removal.



1. Oil level gage	3. Oil filler cap	5. Lock washer	7. Elbow
2. Adapter	4. Screw	6. Flat washer	8. Gasket

Figure 3-38. Oil Level Gage and Adapter and Filler Elbow and Cap

Section XXXI. ELECTRIC STARTER AND ADAPTER

3-189. General.

The starting motor is a heavy duty, 24 volt overrunning clutch type unit. A solenoid switch, which is an integral part of the starting motor is connected by linkage and a shift lever to a clutch in the starting motor nose housing. The solenoid shifts the starter pinion gear into mesh with the engine flywheel ring gear and holds it in mesh during engine cranking.

CAUTION

Do not operate starting motor for more than 15 seconds at a time. Allow at least 3 minutes before operating again. Failure to observe this rule can result in over heating and failure of the motor.

3-190. Starter Assembly.

a. Testing. Testing starter is an operational test. Perform test as follows:

(1) Verify that the battery is fully charged

(2) Verify that battery connector/terminal contact surfaces are not corroded.

(3) Tighten battery connectors securely.

(4) Verify that all leads to the starter and the starter solenoid are tightened securely.

(5) Verify that the three starter mounting bolts are tightened securely.

(6) Refer to paragraph 2-12 b and perform the starting procedure while a qualified observer observes starter motor operation.

(7) If the starter solenoid emits an audible noise each time the START-RUN-STOP switch is cycled into the START position, and the engine does not turn over, the starter assembly must be replaced.

b. Starter Replacement.

(1) Removal.

(a) Disconnect the negative cable from the battery.

(b) Tag and disconnect battery cables and electrical wires from starter (3, fig. 3-38.1).

(c) Remove tool box to gain access to starter screws (1).

(d) Remove three 12-point screws (1) and three washers (2). Remove starter (3) and starter adapter (4).

NOTE

Check ring gear to assure that teeth are not damaged.

(2) Installation. Install the starter (3, fig. 3-38.1) on the flywheel housing in reverse order of removal.

3-191. Starter Solenoid.

To test the starter solenoid proceed as follows:

If the starter solenoid does not operate with an audible click each time the START-RUN-STOP switch is cycled into the START position, check for 24 Vdc across solenoid and ground. If voltage is present, the starter assembly must be replaced.

Section XXXII. LUBE OIL FILTERS AND SENSORS

3-192. General.

The engine lubricating oil filters are of the full-flow type and contain replaceable elements. A drain plug in each filter permits draining of the filters before replacing the filter elements. The sensors provide a means of monitoring the engine lubricating system.

3-193. Oil Pressure Transmitter.

See figure 3-3 and proceed as follows:

a. Testing.

(1) Remove nut, lockwasher, flat washer, and electrical lead from transmitter (18, fig. 3-3) threaded terminal.

(2) Using multimeter, measure resistance between transmitter screw terminal and ground. If measured resistance on the R x 1 scale is greater than 60 ohms, replace the transmitter (18). If resistance is approximately zero ohms, crank engine to determine that resistance increases. If resistance does not increase, replace transmitter (18).

b. Replacement.

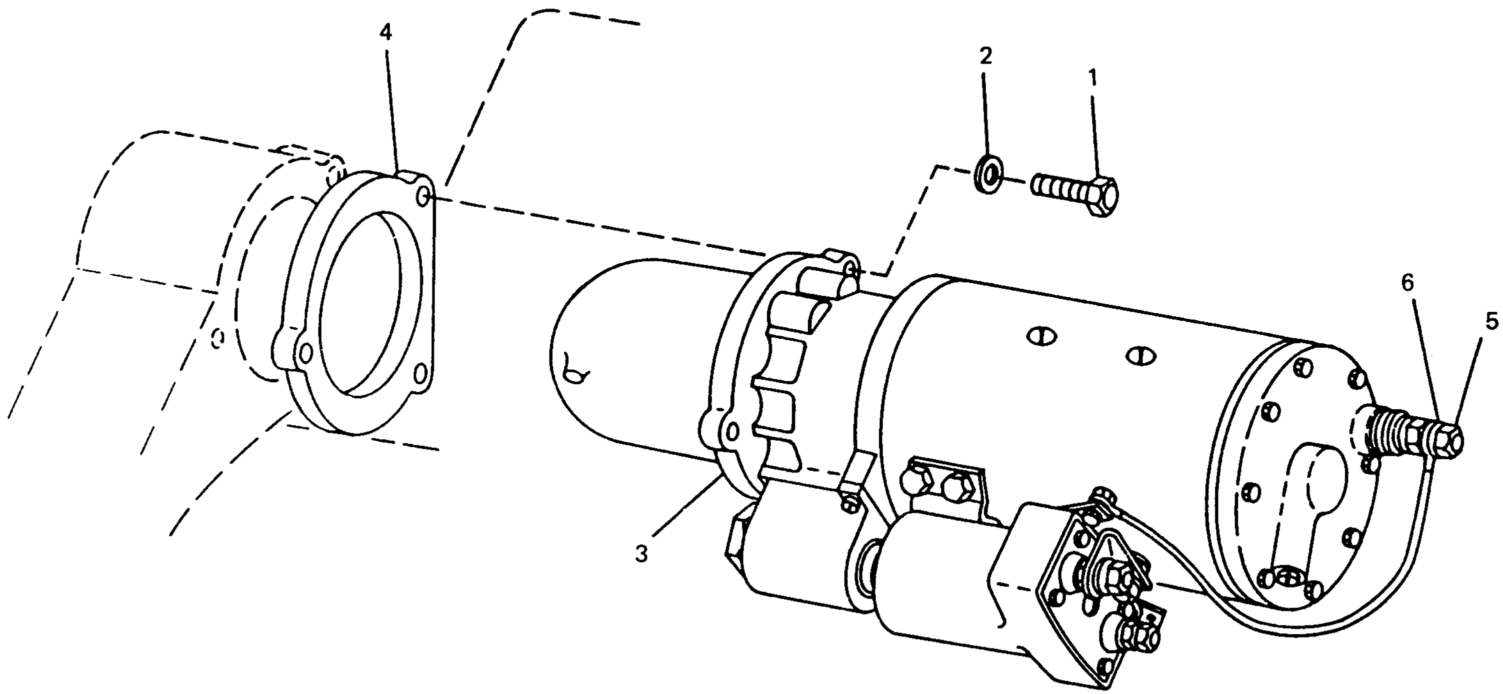
(1) Removal.

(a) Remove nut, lockwasher, flat washer and lead from transmitter (18, fig. 3-3) threaded terminal.

(b) Unscrew transmitter (18) from nipple (19).

(2) Installation.

(a) Screw transmitter (18, fig. 3-3) into threaded nipple (19).



1. Screw (12 point)
2. Washer
3. Starter
4. Adapter
5. Nut
6. Washer

Figure 3-38.1 Electrical Starter Removal

(b) Reconnect electrical lead using nut, lockwasher, and flat washer.

3-194. Low Oil Pressure Shutdown Switch.

See figure 3-3 and proceed as follows:

a. Inspection. Inspect the switch (16, fig. 3-3) for loose mounting, loose connector, dents, and other damage.

b. Testing. To test the switch (16, fig. 3-3), disconnect the connector and connect a multimeter between pins B and C of the switch and verify continuity. Then connect multimeter between pins A and D and verify open circuit. If switch does not check out properly, replace switch.

c. Replacement. Replace switch (16, fig. 3-3) as follows:

(1) Removal.

(a) Disconnect connector from switch (16).

(b) Unscrew switch (16) from nipple (17).

(2) Installation. Screw switch (16, fig. 3-3) into nipple (17) and tighten to 20 foot-pounds. Reconnect connector to switch.

3-195. Oil Filter Assembly.

a. Replacement. To replace the oil filter assembly, see figure 3-3 and remove and install as illustrated, while observing the following:

(1) Drain oil system as described in paragraph 3-4c (3) and drain filter by removing plug (1, fig. 3-3) and draining into a suitable container.

(2) Remove screw (5) and washer (6) and remove both filter bodies (7) and filter elements (8) as assemblies from header (9).

(3) Disconnect and tag oil line and electrical connections and remove screws (2) and washers (3) which secure header (9) to engine block. Remove straight connector (22) and gasket (4).

(4) Install using a new gasket (4) and mount onto engine block with screws (2) and washers (3). Tighten center screw (5) to a torque of 45 to 50 foot-pounds. Replace straight connector and reconnect oil line and electrical connections (22).

b. Check the engine lube oil filter for oil leakage and be certain that filter body (7) and gasket (10) are properly installed.

Section XXXIII. SECONDARY FUEL FILTER

3-196. General.

The secondary fuel filter is the final filtration device in the fuel system. It removes contaminated particles of five micron and larger from the fuel.

3-197. Replacement.

To replace the secondary fuel filter, see figure 3-39 and proceed as follows:

a. Open drain cock (1).

b. Drain fuel into suitable container.

(1) Removal.

(a) Remove fuel lines to filter and remove elbows (2 and 3) from filter assembly (6).

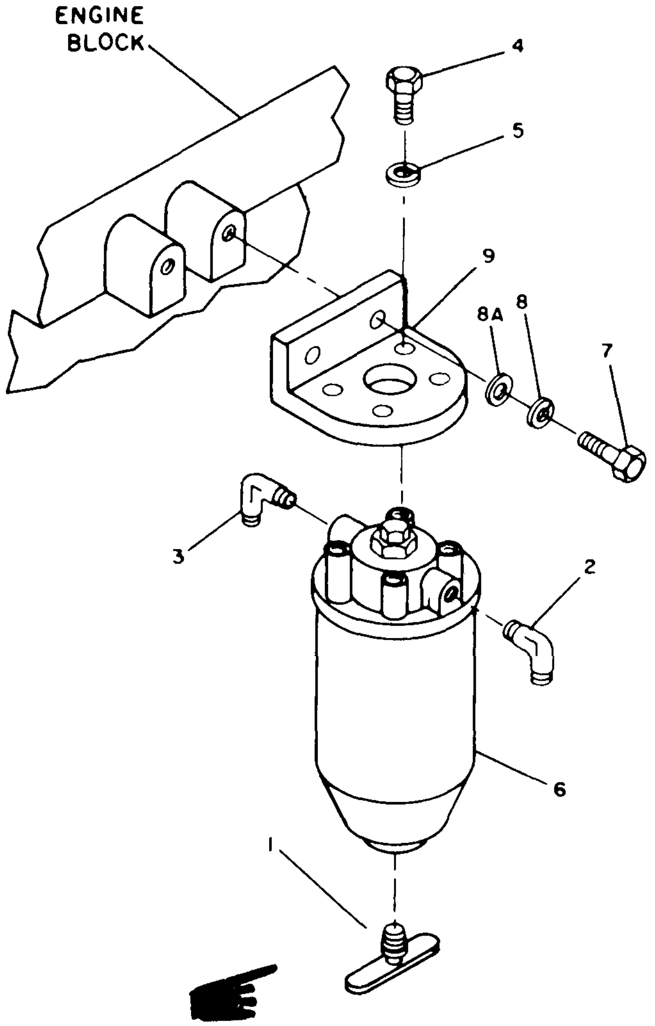
(b) Remove four screws (4) and lockwashers (5) holding filter assembly (6) to bracket (9) and remove filter assembly (6).

(c) Remove two screws (7) lockwashers (8) and washer (8A) and remove bracket (9) from engine.

(2) Installation.

(a) Close drain cock (1).

(b) Install bracket (9) and filter assembly (6) in the reverse order of removal.



1. Drain cock
2. Elbow
3. Elbow
4. Screw
5. Lockwasher
6. Filter assembly
7. Screw
8. Lockwasher

8A. Washer

9. Bracket

Figure 3-39. Secondary Fuel Filter Assembly

Section XXXIV. LUBE OIL COOLER

3-198. General.

The engine lube oil cooler, located on the right side of the engine, consists of a corrosion resistant cooling core and tank. The water pump circulates coolant through the cooling core tubes, and the engine oil pressure pump circulates oil through the tank and around the outside of the tubes of the cooling core, thereby controlling oil temperature.

3-199. Inspection and Replacement.

See figure 3-40 and proceed as follows:

a. Inspection. Inspect oil cooler for internal leaks, cracks, loose mounting, and other damage.

b. Replacement. Replace the engine oil cooler as follows:

(1) Removal.

(a) Refer to paragraph 3-41 and drain cooling system, also drain coolant from lube oil cooler by removing drain plug (1, fig. 3-40) or if winterization kit is installed by opening shutoff cock (45, fig. 4-1) after removing hose (34) from elbow (46).

(b) Drain secondary fuel filter into a two gallon container. Refer to paragraph 3-197 and remove secondary fuel filter.

(c) Remove fuel filter head with filter element intact.

(d) Refer to paragraph 3-203 and remove turbocharger oil drain tube assembly between turbocharger and cylinder block.

(e) Remove five screws (2 and 5, fig. 3-40) and lockwashers (3) and (6) and securing lube oil cooler (7) to cylinder block. Fifth screw (2) and lockwasher (3) secures manual control bracket (4) to lube oil cooler (7). Remove lube oil cooler (7) by pulling towards the rear of engine.

(f) Remove preformed packing (8) from lube oil cooler (7).

(g) Remove cooler tube (9) with preformed packing (10) from the lube oil cooler (7) volute.

(h) Remove winterization kit nipple, shutoff cock, and elbow from lube oil cooler (7) drain plug (1) receptacle.

(2) Installation.

NOTE

If winterization kit is installed, install kit, nipple, shutoff cock, and elbow in lube oil cooler (7, fig. 3-40) drain plug (1) receptacle.

(a) Assemble new preformed packing (10, fig. 3-40) on cooler tube (9) and install one end of cooler tube (9) into lube oil cooler (7) volute. Install new preformed packing (8) in the back of the lube oil cooler (7). Hold packing in place with a light coating of grease.

(b) Install lube oil cooler (7) by positioning header over the rear end of cooler tube (9) and pushing forward.

(c) Install five screws (2) and (5), five lockwashers (3) and (6) and manual control bracket (4). Secure lube oil cooler (7) to cylinder block tightening screws (2) and (5) securely.

(d) Install lube oil cooler drain plug (1) or connect hose (34, fig. 4-1) to elbow (46) and open shutoff cock (45).

(e) Refer to paragraph 3-203 and install turbocharger oil drain tube assembly between turbo charger and cylinder block.

(f) Refer to paragraph 3-197 and install secondary filter.

(g) Refer to paragraph 3-41 and fill cooling system.

(h) Operate engine and check for oil and water leaks at oil cooler (7, fig. 3-40) connections. Correct any leaks found. Stop engine. Refer to paragraph 3-46 and check crankcase oil level in oil pan adding oil as necessary to raise oil level to the full mark on the oil level gage. Refer to paragraph 3-41 and check coolant level in the radiator adding coolant as necessary.

Section XXXV. NOZZLE HOLDER ASSEMBLIES AND LINES

3-200. General.

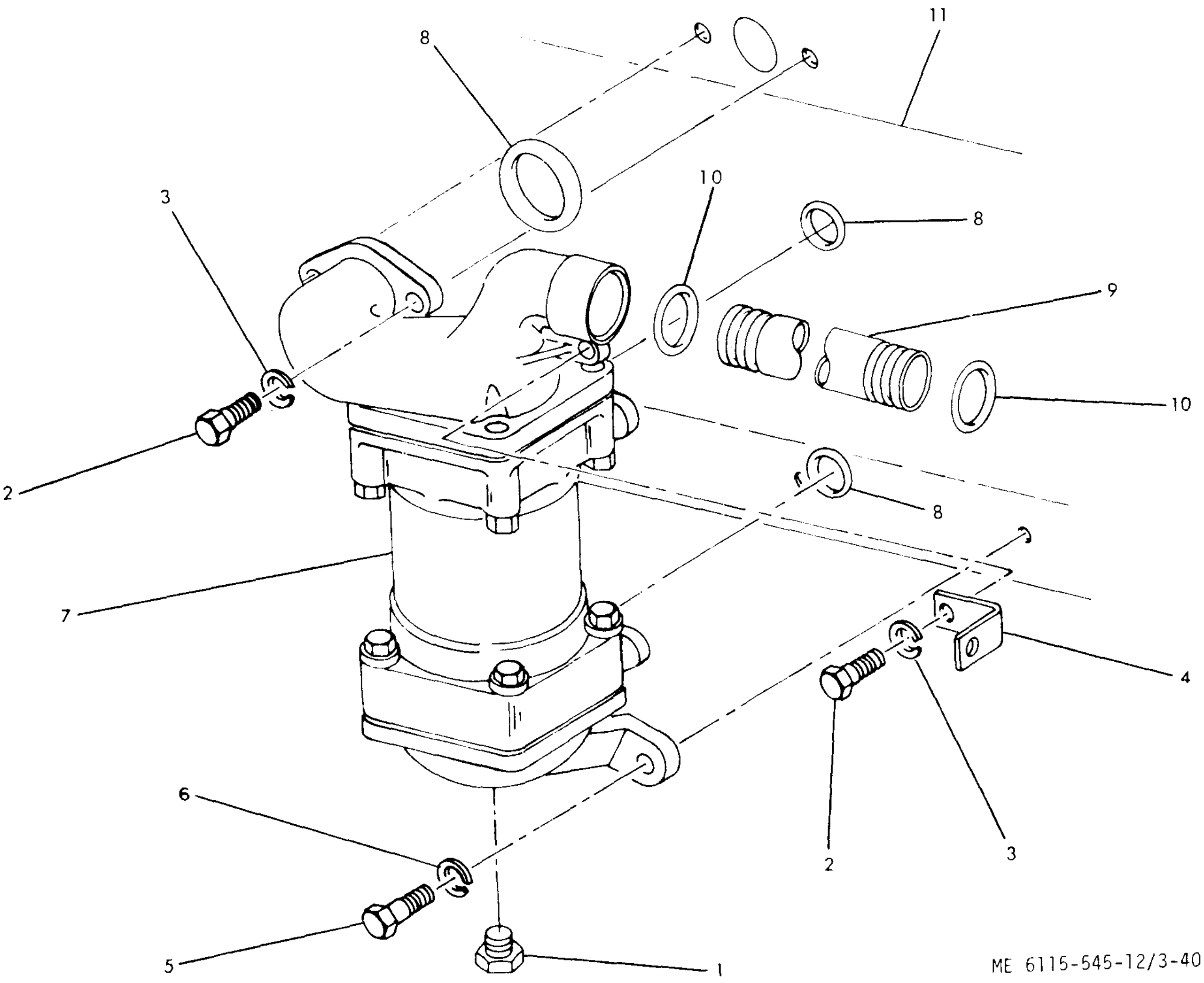
There is a nozzle holder assembly for each cylinder consisting of a fuel injection nozzle holder. The nozzle holder assemblies are used to position the injection nozzles in the cylinder head. The lines provide a means of delivering the fuel from the fuel injection pump to the nozzle.

3-201. Inspection, Testing, and Replacement.

See figure 3-41 and proceed as follows:

a. Inspection.

(1) Check for a sufficient fuel level for operation.



1. Plug drain (-If winterization kit is installed, drain plug is replaced by nipple and shutoff cock.)

2. Screw	5. Screw	8. Packing, preformed	11. Engine
3. Lockwasher	6. Lockwasher	9. Tube, cooler	
4. Bracket, manual control	7. Lube oil cooler	10. Packing, preformed	

Figure 3-40. Lube Oil Cooler

(2) Examine all fuel lines (3, 8, and 23 through 28, fig. 3-41) and nozzle holder assemblies (32) for signs of leakage.

b. Testing.

(1) With engine running, one by one loosen the fuel input connection to each injector while observing the engine action and listening to the sound. Fuel should flow out when the connection is loosened. When the input to a faulty injector is loosened, there should be little or no change in engine sound or action. The engine action (or symptom) should become worse when the input to a good injector is loosened.

(2) To verify a low compression condition as opposed to an injector malfunction, proceed as follows:

(a) With the engine stopped and the DEAD CRANK switch in down position, remove the injector assembly from number one cylinder (or the cylinder which has a suspected failure).

(b) Insert a compression gage into the injector opening.

(c) Turn the START-STOP-RUN switch to the START position for a period of 5 to 15 seconds to obtain a compression reading while the engine is cranking. Return the switch to the STOP position.

CAUTION

Do not crank more than 15 seconds at a time. Allow at least 15 seconds before operating again.

(d) A compression gage reading of 400 psi (at sea level) is normal for a new engine. If a difference in compression readings in excess of 50 lbs between high and low cylinders exists refer to next higher maintenance level.

c. Replacement. To replace the nozzle holder assemblies and lines, see figure 3-41 and proceed as follows:

(1) Removal.

(a) Thoroughly clean nozzle holders (32 fig. 3-41), lines (3), (8), and (23) through (28), connections and surrounding area. Gain access to nozzle holder assemblies (32) from right side reaching over the engine valve cover.

CAUTION

Cleanliness is extremely important when working with fuel injectors. Injection nozzle service troubles are, in most instances, caused by dirt. Use clean paper on the work bench and place components in a container of clean diesel fuel as they are removed.

(b) Remove fuel return line (8) by disconnecting connectors (6) to the fuel injection pump (detail A) and tee (4).

(c) Disconnect fuel injection lines (23) through (28), nuts (9) at the nozzle holder assemblies (32) and screws (11) at the fuel injection pump (detail A).

NOTE

Gain access to screws (11) and washers (12) which secure fuel lines (23 through 28) to fuel injection pump by removing self-locking nut (see fig. 3-32) and swinging lever arm of hydraulic actuator. Temporarily stow self- locking nut back in place. Remove coupling nuts (1, fig. 3-41) and washers (12) from fuel injection pump, remove lines from pump, and temporarily stow screws and washers on pump.

NOTE

Clamps (16, 21 and 29) must be unclamped (detail B and C) before removing lines (23 through 28).

(d) Remove manifold drip line (3) by disconnecting coupling nut (1) from tee (4) and nozzle-holder assemblies (32).

CAUTION

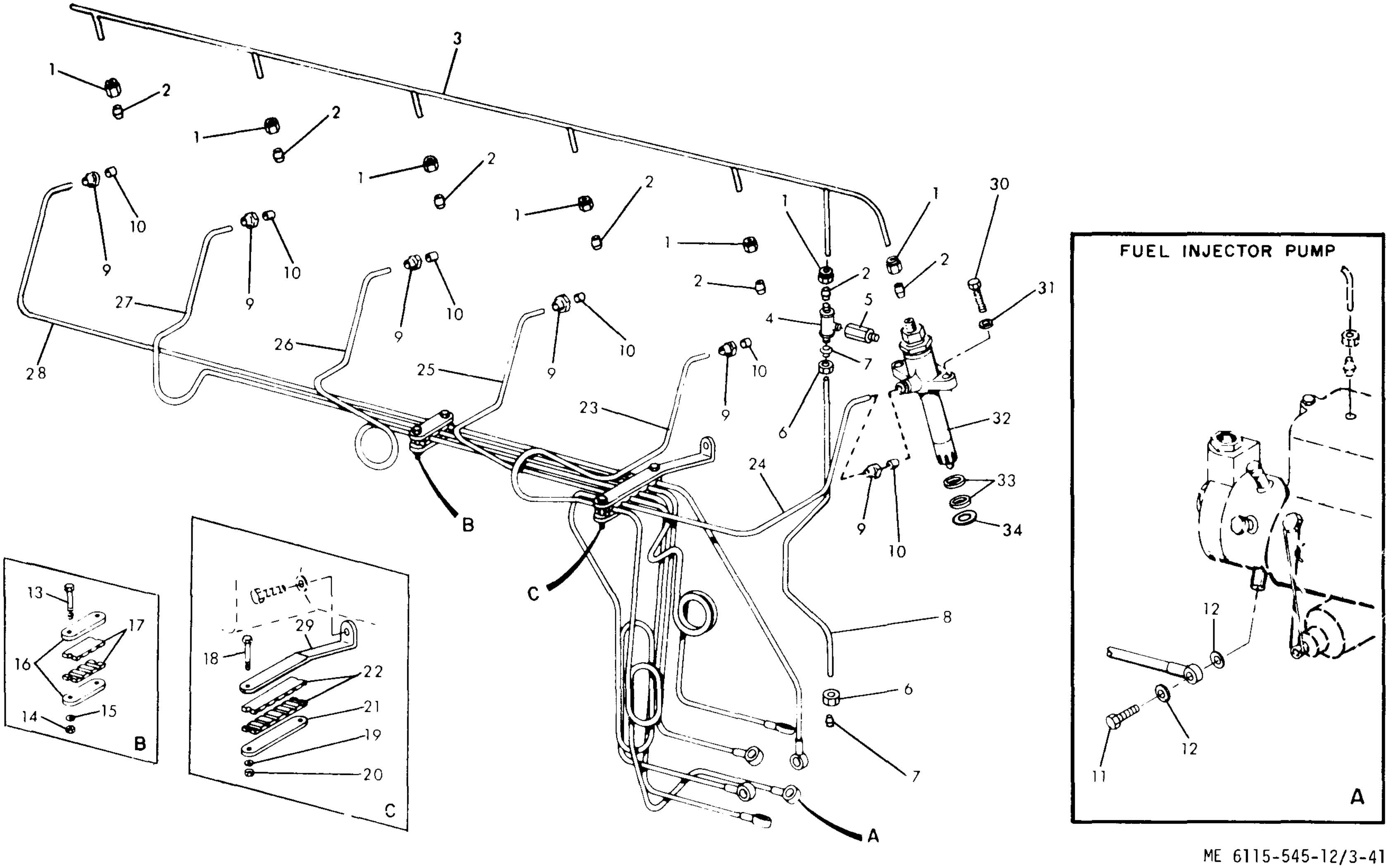
Do not bend lines when disconnecting. Cover all openings immediately to prevent entrance of dirt.

(e) Remove two capscrews (30) and two lockwashers (31) securing nozzle-holder assemblies (32) to cylinder head.

(f) Remove nozzle-holder assemblies (32) from cylinder head by using two small pry bars, or by using a slide hammer with an adapter. Mark each injector nozzle with the number of the cylinder from which it was removed. Insure that nozzle gasket (34) is removed.

CAUTION

Use care when removing an injector nozzle to prevent striking nozzle tip against a hard object which could result in damage to the tip.



1. Coupling nut
2. Sleeve
3. Line, manifold drip
4. Tee
5. Adaptor, day tank
6. Connector
7. Sleeve
8. Line, fuel return
9. Nut
10. Sleeve
11. Screw
12. Washer
13. Bolt
14. Nut
15. Washer
16. Clamp
17. Spacer
18. Bolt
19. Washer
20. Nut
21. Clamp
22. Spacer
23. Injection line #5
24. Injection line #6
25. Injection line #4
26. Injection line #3
27. Injection line #2
28. Injection line #1
29. Clamp
30. Capscrew
31. Lockwasher
32. Nozzle-holder assy
33. Dust shield
34. Nozzle gasket

Figure 3-41. Nozzle Holder and Line Assemblies

(2) Installation.

(a) Thoroughly clean nozzle-holder assemblies (32, fig. 3-41) bores in cylinder head. When cleaning bores, ensure old nozzle holder gaskets are removed because new gaskets must be used when installing the nozzle holders. Ensure no small particles of carbon are in nozzle holder bores that could prevent nozzle holder gaskets from seating properly, thereby permitting "blow-by" from the cylinders.

(b) Install new nozzle gasket (34), concave face down, in position on nozzle-holder assemblies (32). Carefully position nozzle-holder assemblies in nozzle bore of cylinder head.

(c) Install two nozzle holder lockwashers (31) and two capscrews (30) for each nozzle holder assembly but do not tighten at this time. Place fuel injection lines (23 through 28) in position in nozzle holders (32) and fuel injection pump (detail A). Start injection line nuts (9) and screws (11) but do not tighten at this time. Install fuel return line (8) by connecting connectors (6) to tee (4) and fuel injection pump (detail A).

NOTE

Always install new washers (12) when connecting injector lines to injector pump.

(d) Install manifold drip line (3) by connecting coupling nut (1) to tee (4) and nozzle-holder assembly (32).

e. Tighten nozzle-holder capscrews (30) alternately. Tighten capscrew on one side to 3 to 6 foot-pounds torque. Tighten capscrew on opposite side to full torque of 11 to 13 foot-pounds. Then tighten first capscrew to full torque. Tighten injection lines fuel return line, and manifold drip line nut (9) and screws (11), connectors (6), and coupling nuts (1).

NOTE

Secure clamps (16, (21) and (29) after lines (23 through 28) have been installed.

f. Start engine and observe fuel injection line, fuel return line, and manifold drip line connections for fuel leakage. Correct any leaks found.

Section XXXVI. DIFFUSER AND TURBOCHARGER

3-202. General.

This section contains information on the inspection and replacement of the turbocharger and diffuser. The turbocharger provides greater engine power output. It is driven by engine exhaust gases. The turbocharger draws in ambient air through the input diffuser, compresses the air and directs the compressed air into the engine intake manifold.

3-203. Turbocharger.

See figure 3-42 and proceed as follows:

a. Inspection. Operate engine at approximate rated output and listen for unusual turbocharger noise. Do not mistake whine heard during rundown for one that indicates impeller shaft bearing failure during operation. Other unusual noises can result from improper clearance between turbine impeller and turbine housing. If such noises are heard, the turbocharger must be removed, disassembled, and inspected. Inspect for an accumulation of dirt on the compressor impeller vanes and in the compressor housing. Proceed as follows:

(1) Clean the turbocharger (28, fig. 3-42) and surrounding area with cleaning solvent Federal Specification P-D-680.

(2) Loosen setscrew (17) which secures the exhaust pipe to the diffuser (24).

(3) Ref to paragraph 3-86 and remove nozzle, muffler and exhaust pipe.

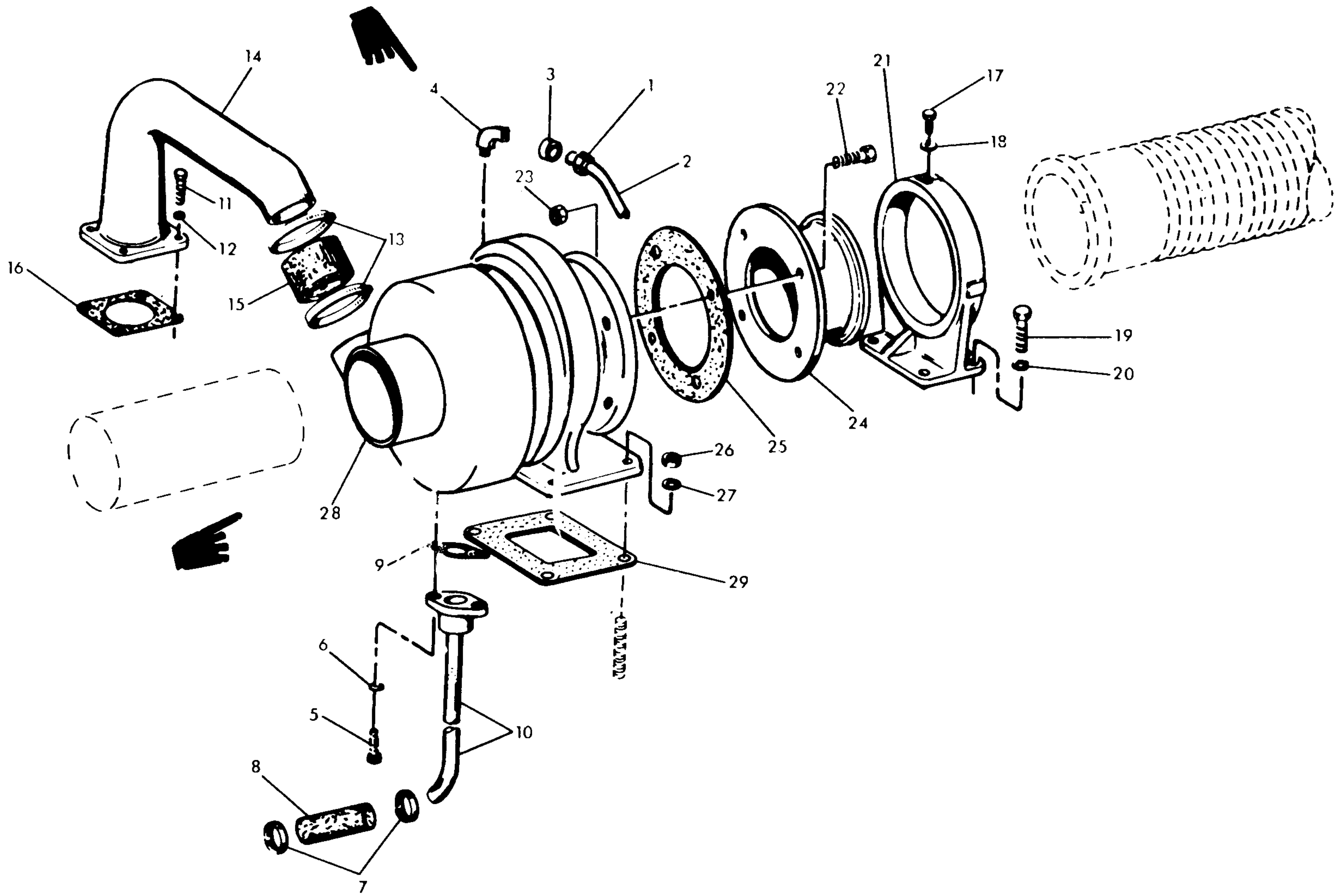
(4) Inspect the turbine wheel and shaft assembly in the exhaust end of turbocharger (28) for signs of damage.

(5) Loosen the clamps (13) which secure air hose (15) to the turbocharger (28) and remove the hose from the turbocharger. Remove air hose from air cleaner outlet to turbocharger inlet.

(6) Inspect the turbocharger compressor wheel and compressor housing for dirt. If the coating of dirt is light and even, cleaning the compressor wheel is not necessary. An uneven buildup of dirt will disturb the balance of the rotating parts and lead to failure of the turbocharger (28). If the coating of dirt is uneven, excessive, or approaching the appearance of a layer which might flake-off, cleaning is necessary. If this cannot be cleaned satisfactorily, replace turbocharger. Should an excessive build-up of dirt occur in the diffuser (24) a loss of efficiency in the turbocharger will result. This loss of turbocharger efficiency is recognized by excessive exhaust smoke. If this cannot be cleaned satisfactorily, replace diffuser. If replacement is not required, reconnect the exhaust pipe and air hoses which were disconnected above.

b. Replacement. See figure 3-42 and proceed as follows:

(1) Removal. Remove turbocharger (28) and diffuser (24) as follows:



1. Nut
2. Line, inlet
3. Seal
4. Elbow
5. Screw
6. Washer
7. Clamp
8. Hose
9. Gasket
10. Line, return
11. Screw
12. Washer
13. Clamp
14. Elbow, air outlet
15. Hose
16. Gasket
17. Setscrew
18. Nut
19. Screw
20. Washer
21. Diffuser ring
22. Bolt
23. Nut
24. Diffuser
25. Gasket
26. Nut
27. Washer
28. Turbocharger
29. Gasket

Figure 3-42. Diffuser and Turbocharger

(a) Disconnect and remove the oil inlet line (2).

(b) Disconnect and remove the oil return line (10).

(c) Loosen hose (15) clamp (13).

(d) Remove the four nuts (26) which attach turbocharger (28) to the exhaust manifold.

(e) Remove four screws (19) and washers (20) which attach diffuser ring (21) to the exhaust manifold and remove diffuser (24) turbocharger (28). Refer to paragraph 3-204 to remove diffuser (24) from turbocharger (28).

CAUTION

While diffuser (24) turbocharger (28) is off the engine, keep all intake and exhaust manifold openings covered. This will prevent foreign objects from accidentally getting into the manifolds and damaging the turbocharger or engine when the engine is again put into operation.

(2) Installation.

(a) Before installing the turbocharger: (28, fig. 3-42):

1. Refer to paragraph 3-32 and service the air cleaner.

2. Refer to paragraph 3-195 and replace the lubricating oil filter elements.

3. Refer to paragraph 3-46 and change engine lube oil.

4. Ensure that the oil inlet line and oil return line are clean before they are connected. Remove the lines and inspect for cleanliness and restrictions.

5. Check exhaust manifold for cracks, foreign matter, and proper mounting. Check condition of gaskets, tightness of mounting nuts, and flatness of the turbocharger mounting surfaces.

6. Check intake manifold and air inlet elbow and hoses for cracks, foreign matter, and general condition. Check condition of manifold mounting nuts and tightness of 28-33 foot-pounds torque.

7. Replace any air or oil line hose connections (15 and 8, fig. 3-42) found to be deteriorated.

8. Ensure all air and oil line hose clamps (13 and 7) are tight.

9. Ensure the gaskets (9,16,25, and 29) do not extend into the port openings of the exhaust manifold, turbocharger mounting adaptor, and mounting pads.

10. Just prior to mounting the unit, prime the lubrication system. Pour clean oil into the oil inlet of the center housing. Turn the rotating assembly by hand to coat the bearings and thrust collar with oil.

(b) Refer to paragraph 3-204 to install diffuser (24) on turbocharger (28).

(c) Install a new gasket (29) and mount the turbocharger (28) and diffuser ring (21) on the exhaust manifold. Lubricate the four nuts (26) with anti-seize compound Military Specification MIL-A-13881R, and secure the turbocharger (28) to the exhaust manifold tightening nuts (26) to 18-21 foot-pounds torque, and tightening screws (19).

(d) Connect the oil inlet line (2) to the lubricating oil supply.

CAUTION

Do not connect the oil inlet or return lines (2 and 10) to the turbocharger (28) until it is certain that there is a free flow of oil to the turbocharger and through it.

CAUTION

Do not crank start motor more than 15 seconds at a time. Allow at least 3 minutes to elapse between crankings.

(e) Place dead crank switch in open position (49, fig. 3-27). Hold ENGINE START-RUN-STOP switch to START position. Continue cranking engine until there is a free flow of oil from the upper end of the oil inlet line, then connect the line to the oil inlet of the turbocharger center housing. Crank the engine until oil runs from the oil outlet of the center housing. Return switch to STOP position. Place dead crank switch in on position.

(f) Connect the oil return line (10) to the turbocharger (28) and to the side of the cylinder block.

(g) Connect the air cleaner hose assembly using inspection instructions (a above) in reverse order.

(h) Install the exhaust pipe, muffler and nozzle.

(i) Upon completion of the installation, run engine, and check turbocharger operation.

3-204. Exhaust Diffuser.

a. Inspection. Inspect diffuser (24) for cracks, loose mounting, and other damage.

b. Replacement. See figure 3-42 and proceed as follows:

(1) Removal. Remove the diffuser (24) as follows:

(a) Remove exhaust components from diffuser ring.

(b) Remove four screws (19) which secure diffuser ring (21) to the exhaust manifold.

(c) Remove the four bolts (22) and nuts (23) which secure diffuser (24) to the turbocharger (28) and remove diffuser (24) and gasket (25).

(2) Installation. Install diffuser (24) using the removal steps in reverse order.

Section XXXVII. WATER PUMP AND FAN

3-205. General.

The water pump is a centrifugal type pump that circulates coolant through the engine and radiator. The pump is mounted on the front of the cylinder block and is belt driven from the crankshaft pulley.

3-206. Replacement.

See figure 3-43 and proceed as follows:

a. Removal. Drain engine coolant (para 3-41). Remove fan guards (25 and 26, fig. 3-39). Remove drive belts (para 3-183), and remove fan (3) spacer (4) and pulley (5, fig. 3-43) coolant hoses, and water pump (18) as illustrated in figure 3-43.

(b. Installation. Install water pump (18, fig. 3-43), coolant hoses, and fan (3) as illustrated in figure 3-43. Install and adjust drive belts (para 3-183) and install fan guard (25 and 26, fig. 3-29). Refill engine cooling system in accordance with table 2-1.

NOTE

Apply a small amount of grease to packing groove in water pump volute (25, fig. 3-43). Install new packing (24) in groove and install new gasket (19). Torque screws (20, 22, 12, 14, and 16) to 28-33 foot-pounds. Torque screws (1) to 30-35 foot-pounds.

Section XXXVIII. THERMOSTAT AND HOUSING

3-207. General.

a. The temperature sensitive components namely the thermostat, temperature transmitter and temperature switch are located in the housing. The thermostat is positioned in the system so that when closed, coolant flow from the engine to the radiator is shut-off. When coolant temperature reaches 180° F the thermostat starts to open allowing coolant to pass to the radiator.

b. The temperature transmitter senses the temperature of the engine coolant to operate the unit temperature indicator on the control cubicle panel.

c. The temperature switch which also senses the temperature of the engine coolant and has two sets of contacts, one normally closed and the other normally open. When the engine coolant reaches a temperature over 222° F ± 3° F the normally closed contacts open and the normally open contacts close. This action results in automatic shutdown of engine operation at engine coolant temperatures in excess of 222° F ± 3° F.

3-208. Inspection and Operational Check.

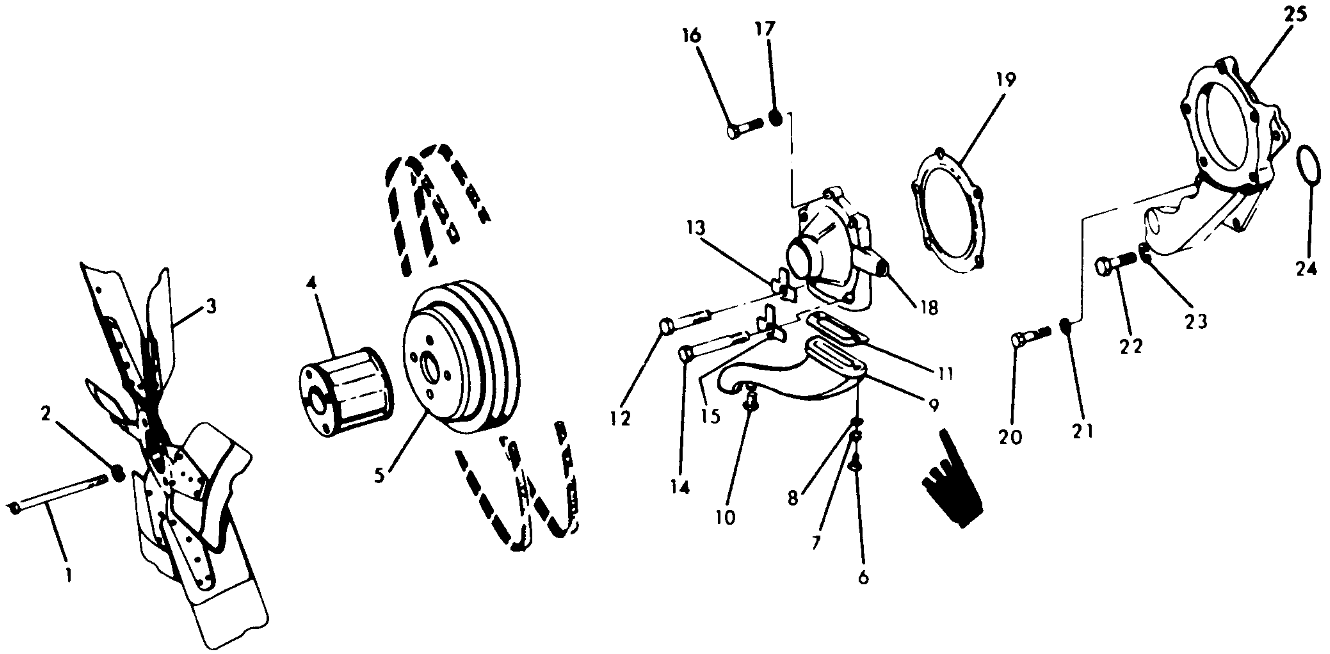
a. Thermostat. Replacement of the thermostat (8, fig. 3-44) is necessary when the thermostat sticks in the open or closed position. If the engine overheats or does not reach a minimum temperature of 180° F, the thermostat should be removed and tested as a possible cause of trouble (refer to para 3-209).

b. Temperature Transmitter. The transmitter (10, fig. 3-44) is not repairable and replacement is necessary when it fails to operate. If the operation of the COOLANT TEMPERATURE indicator in the control cubicle is erratic or inoperative, the transmitter (10) should be removed and tested as a possible cause of trouble.

c. Temperature Switch. Inspect switch (12, fig. 3-44) for corrosion and to assure that the electrical connector to the unit is secure. The switch is not repairable and replacement is necessary when it fails to operate. If the engine is not overheating and the unit shuts down as though it were, or if the engine continues to operate when obviously running hot, switch (12) should be removed and tested as a possible cause of trouble (refer to para 3-209).

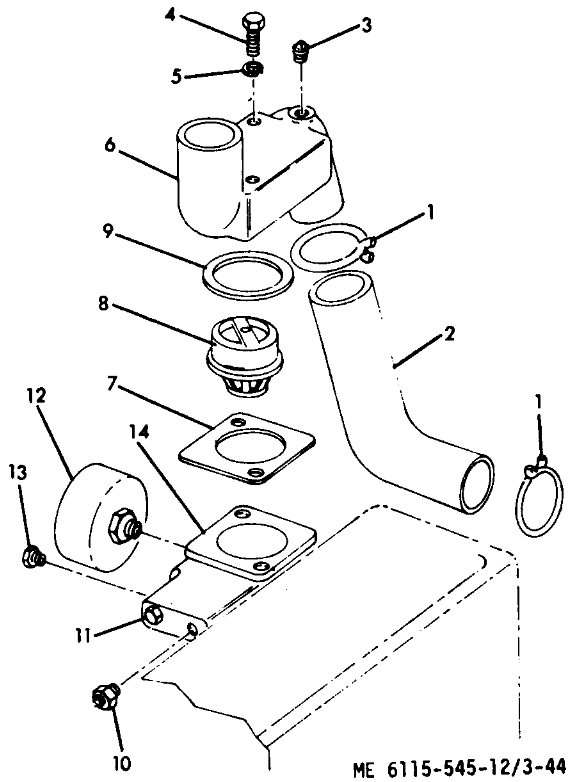
3-209. Removal, Testing and Installation.

a. Removal. Drain the cooling system (para 3-41) and remove thermostat (8, fig. 3-44), transmitter (10), and switch (12) as illustrated in figure 3-44).



1. Screw	6. Screw	11. Gasket	16. Screw	21. Washer
2. Washer	7. Washer	12. Screw	17. Washer	22. Screw
3. Fan	8. Washer	13. Tab washer	18. Water pump	23. Washer
4. Spacer	9. Water inlet pipe	14. Screw	19. Gasket	24. Packing
5. Pulley	10. Plug	15. Tab washer	20. Screw	25. Volute

Figure 3-43. Water Pump and Fan



1. Clamp
2. Hose
3. Plug
4. Screw
5. Washer
6. Housing
7. Gasket
8. Thermostat
9. Gasket
10. Transmitter
11. Plug
12. Switch
13. Plug
14. Housing assembly

Figure 3-44. Thermostat and Housing

b. Thermostat Testing. To test thermostat (8), proceed as follows:

(1) Suspend thermostat (8) in a container of clean water. Thermostat must be completely immersed but not touching bottom of container.

(2) Heat water gradually and stir so heat is evenly distributed.

(3) Check temperature of water with reliable thermometer. Do not overheat. Observe thermostat (8) as temperature increases. If the thermostat is functioning properly it should begin to open between 175°F to 182°F and be fully open at 205°F.

(4) The thermostat (8) is not adjustable. If it does not operate within the above limits, it should be replaced.

c. Temperature Transmitter Testing. To test the transmitter (10), proceed as follows:

(1) Suspend transmitter (10) in a container of clean water. Transmitter should be inserted so that sensing element is completely immersed but connector end is out of water.

(2) Connect ohmmeter between single conductor and case. Heat water gradually and stir so heat is evenly distributed.

(3) Check temperature of water with reliable thermometer. Do not overheat. Observe ohmmeter as temperature increases. If the transmitter (10) is functionin pro erly, the resistance should read between 2100 and 2600 ohms at 120° F and between 680 and 745 ohms at 200° F.

(4) The transmitter (10) is not repairable. If it does not indicate a resistance within the above range, it should be replaced.

d. Temperature Switch Testing. To test the switch (12), proceed as follows:

(1) Suspend switch (12) in a container of anti freeze compound. Switch should be inserted so that sensing element is completely immersed but connector end is out of compound.

(2) Heat compound graduall y and stir so heat is evenly distributed.

(3) Check temperature of compound with reliable thermometer. Do not overheat.

(4) Use ohmmeter and check continuity between pins A and D and also between pins B and C. Under 217°F ±3°F. contacts A and D should indicate a closed circuit and contacts B and C an open circuit.

(5) The switch (12) is not repairable. If it does not operate within the above limits it should be replaced.

e. Installation. See figure 3-44 and install thermostat (8), transmitter (10), and switch (12). Fill radiator with coolant in accordance with table 2-1.

Section XXXIX. CRANKSHAFT PULLEY AND VIBRATION DAMPENER

3-210. General.

a. The crankshaft pulley is mounted on the front end of the crankshaft and is used to transfer drive power from the crankshaft to belt driven accessories such as the water pump, fan and alternator.

b. Vibration dampening is accomplished by bonding a neoprene compound between the crankshaft pulley and the crankshaft hub.

3-211. Inspection.

a. Inspect pulley belt grooves for step wear along sides and bottom of groove, indicating excessive wear.

b. Inspect pulley belt grooves around total circumference of pulley for cracks or distortion.

c. Inspect hub area for cracks.

Section XL. IDLER PULLEY AND MOUNTING BRACKET

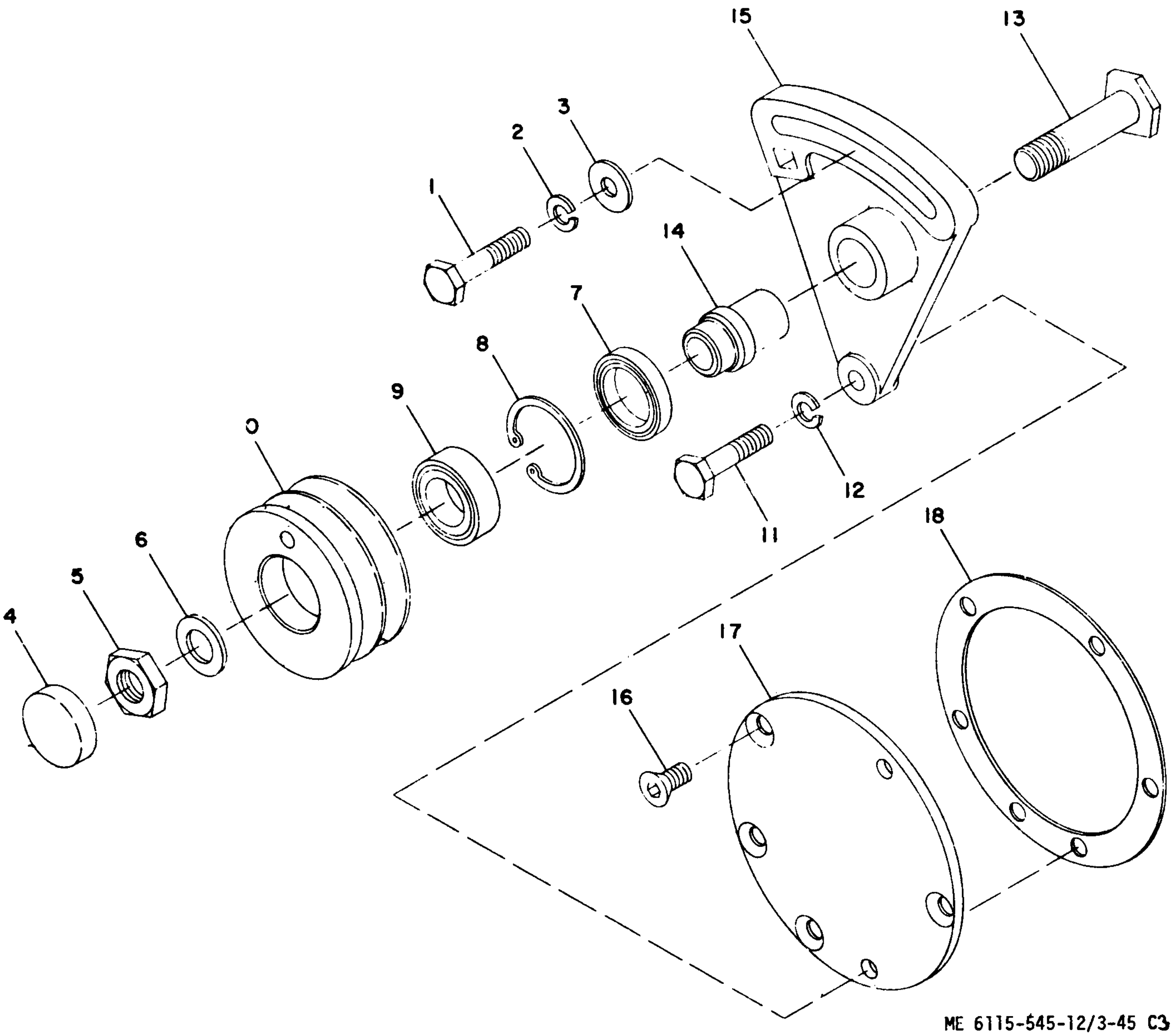
3-212. General.

a. The idler pulley provides capability to adjust tension of the engine drive belts for the fan and the water pump.

b. The idler pulley is mounted on a bracket, with an adjustment slot, located on the front of the engine. While the idler pulley is mounted in place on the bracket, the bracket itself is moveable and can be positioned to increase or decrease tension of the engine drive belts.

3-213. Inspection, Removal and Installation.

See figure 3-45 and proceed as follows:



1. Screw
2. Washer
3. Washer
4. Cup
5. Nut
6. Washer
7. Seal
8. Retaining ring
9. Bearing
10. Pulley
11. Screw
12. Washer
13. Bolt
14. Shaft
15. Bracket
16. Screw
17. Cover
18. Gasket

Figure 3-45. Idler Pulley and Mounting Bracket

a. Inspection. Inspect the idler pulley to assure freedom of rotation and that there is no evidence of cracking or signs of excessive wear.

b. Removal. To remove and disassemble the idler pulley, proceed as follows:

(1) Refer to paragraph 3-183 and remove engine drive belts from around idler pulley (1 O, fig. 3-45).

(2) See figure 3-45 and remove bracket (15) with pulley (1 O) still in place on the bracket (15).

(3) Remove pulley (10) and related hardware from bracket (15).

c. Installation.

(1) Install pulley (10) and related hardware on mounting bracket (15).

(2) Install bracket (15) onto engine.

(3) Torque nut (5) to 140 lb-ft (lubricated).

(4) Pack areas between bearing (9) and two seals (4) and (7) 2/3 - full of BR grease.

NOTE

Do not repack bearing

(5) Refer to paragraph 3-183 and install engine drive belts onto pulley (10). Position bracket (15) for proper belt tension.

d. Repair. Repair of the idler pulley and mounting-bracket is accomplished by replacement of defective components.

Section XLI. INTAKE MANIFOLD

3-214. General.

a. The air intake system consists of components which convey filtered air to the engine cylinders. The intake system includes the air cleaner, compressor side of the turbocharger, and the intake manifold.

b. The intake manifold is sealed to the cylinder head with a one piece gasket and secured in place with screws and washers.

3-215. Removal and Replacement.

See figure 3-46 and proceed as follows

a. Removal.

(1) Disconnect atomizer (1, fig. 3-46) and tube (1A) from intake manifold (6).

(2) Remove screws (11, fig. 3-42) and washers (12) securing turbocharger air outlet elbow (14) to top of intake manifold (6, fig. 3-46). Loosen clamp (13, fig. 3-42) and remove air outlet elbow (14) and gasket (16).

(3) Remove screws (2, fig. 3-46) washers (3), securing intake manifold (6) to cylinder head; remove brackets (5), intake manifold (6), and gasket (7).

b. Inspection. Proceed as follows:

(1) Wash and clean intake manifold with cleaning solvent, Federal Specification P-D-680.

(2) Check manifold for foreign deposits. Clear and remove obstructions found within the manifold.

(3) If manifold is cracked, it must be replaced.

(4) If the mounting surface of the intake manifold is warped enough so that it will not seal, the manifold must be replaced.

(5) Inspect and clean the mounting surface on the cylinder head to make certain it is free of gasket particles or foreign matter.

c. Installation. Proceed as follows

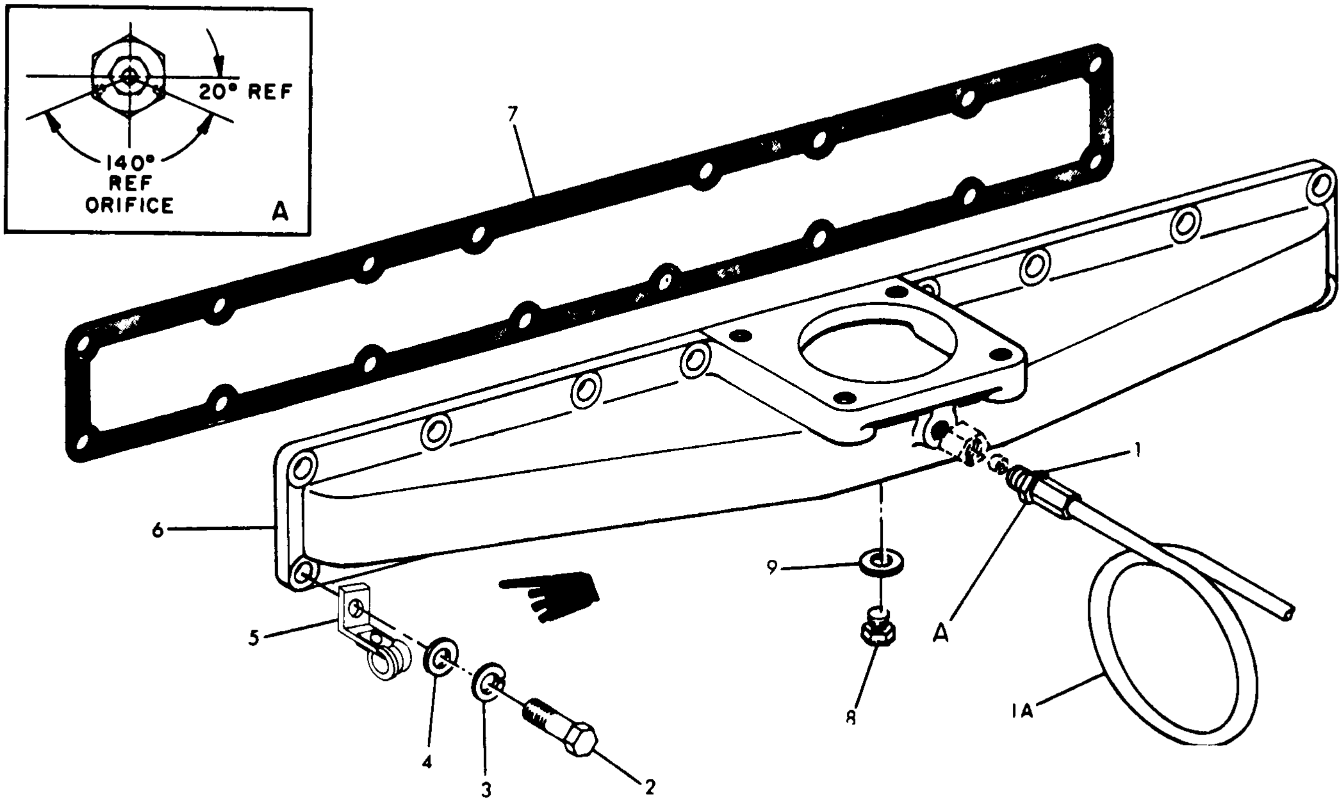
(1) Install the intake manifold (6, fig. 3-46) to the engine in reverse order of removal.

(2) Always use a new gasket (7) when installing the intake manifold (6).

(3) Torque the intake manifold securing screws (2) to 28-33 foot -pounds.

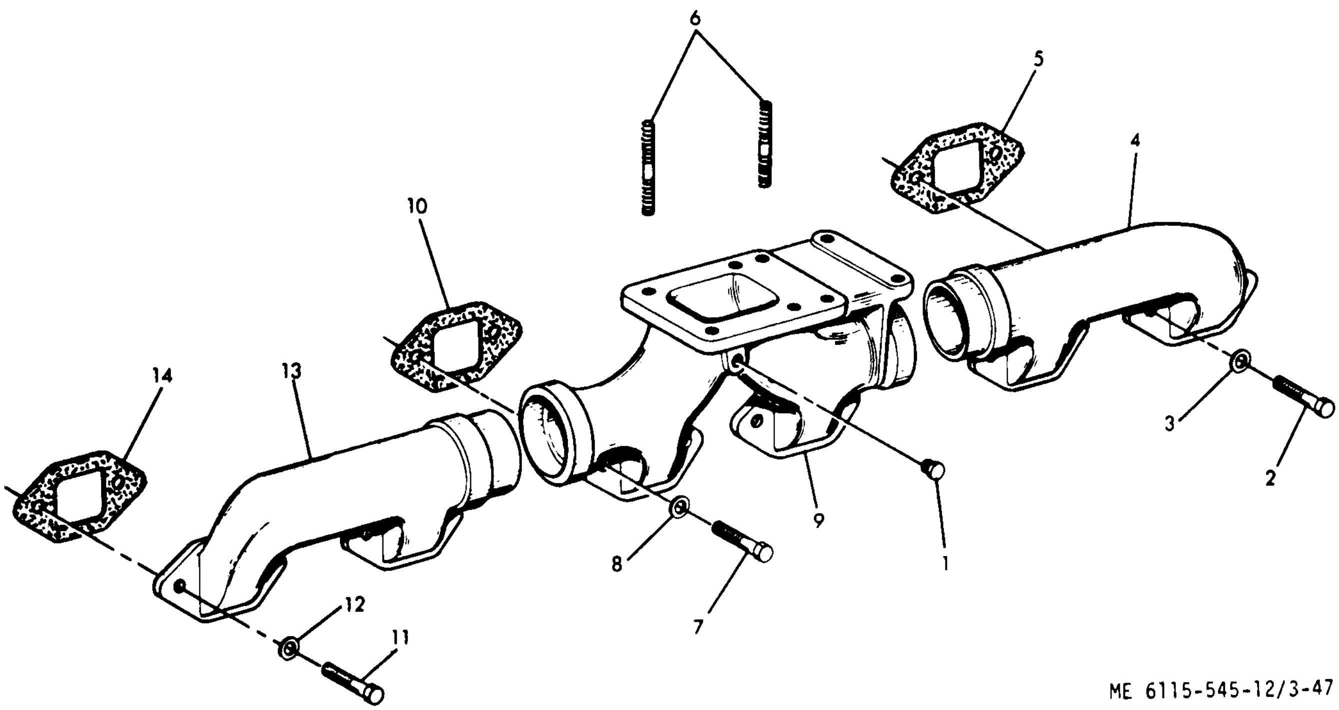
(3A) Install atomizer and tighten atomizer so that locating dots on hex are located as shown in view A of figure 3-46.

(4) After the engine is run and the water temperature reaches approximately 170°F, again torque screws (2) to 28-33 foot-pounds.



1. Atomizer
1A. Tube
2. Screw
3. Washer
4. Washer
5. Bracket
6. Intake manifold
7. Gasket
8. Plug
9. Washer

Figure 3-46. Intake Manifold



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1. Plug
2. Screw
3. Washer
4. Front exhaust manifold
5. Gasket
6. Stud
7. Screw
8. Washer
9. Center exhaust manifold
10. Gasket
11. Screw
12. Washer
13. Rear exhaust manifold
14. Gasket

Figure 3-47. Exhaust Manifold

Section XLII. EXHAUST MANIFOLD

3-216. General.

The exhaust manifold provides for the routing of the engine exhaust gases. At the same time the exhaust gases work to drive the turbocharger.

3-217. Inspection and Replacement.

a. Inspection. Inspect the exhaust manifold for loose mounting, cracks, breaks and other damage.

b. Replacement. See figure 3-47 and proceed as follows:

(1) Removal.

(a) Refer to paragraph 3-203 and remove turbocharger.

(b) Disconnect and plug fuel and oil lines as needed to facilitate removal.

(c) Use suitable container and drain day tank.

(d) Use suitable container and drain primary fuel filter and strainer.

(e) Remove day tank and fuel filter assembly.

(f) Remove injection lines.

(g) See figure 3-47 and remove exhaust manifold in sequential order.

(2) Installation. Install exhaust manifold (4, 9, and 13, fig. 3-47) using the removal steps in reverse order. Use new gaskets (5) (10), and 14) when the exhaust manifold is replaced. Torque the exhaust manifold screws (2, 7 and 11), 25 foot-pounds in 12 foot-pounds increments.

Section XLIII. ROCKER ARM SHAFT ASSEMBLY

3-218. General.

This section contains information for the rocker arm assembly inspection and the valve tappet inspection and adjustment. The rocker arm assembly is mechanically synchronized through drive gear located at the front of the engine to the crankshaft.

3-219. Rocker Arm Shaft Assembly Inspection.

a. Remove cylinder head cover and gasket.

b. See figure 3-48 and inspect adjusting screw (1) end of rocker arm (2) and shaft (3) for evidence of physical damage. Refer to next higher maintenance level for replacement of any damaged items.

NOTE

Adjusting screw must be replaced when less than 36 in-lb driving torque is required to turn screw.

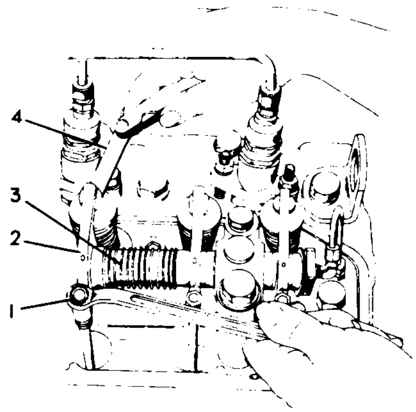
3-220. Valve Tappet Clearance Adjustment.

Correct clearance (valve lash) between end of intake valve stem, exhaust valve stem, and related rocker arms, is very important in diesel engine performance because of high compression developed within the cylinders. Insufficient valve lash will cause loss of compression, misfiring, and eventually lead to burning of valves and valve seats. Excessive valve lash will result in faulty engine operation, valve lifter noise, and cause rapid wear on the valve operating mechanism. With engine at normal operating temperature or 160°F minimum, valve lash for both intake and exhaust valves is 0. 015". After any mechanical work has been done that may have disturbed the valve lash adjust ment, set valves "cold" at 0. 018" clearance so engine can be run and allowed to warm to normal operating temperature. After engine has warmed up to normal operating temperature, check valve lash again for proper clearance.

CAUTION

After any mechanical work has been done that may have disturbed the valve lash adjustment, ensure the rocker arm adjusting screws are turned upward (counterclockwise) high enough to prevent rocker arms and push rods from opening too far. If rocker arms and push rods open too far, the pistons will strike the valves when the engine is barred over.

Valve lash must be adjusted when the piston is near top dead center on its compression stroke and intake and exhaust valves are closed. Number 1 and Number 6 pistons move up and down in their respective cylinders simultaneously. When one piston is on its compression stroke, the other is on its exhaust stroke, and vice versa. Observe valves for Number 6 cylinder; when the exhaust valve is almost closed and the intake valve starts to open, Number 6 piston is near top dead center on its exhaust stroke and Number 1 piston is in the same position on its compression stroke. At this point, both valves for Number 1 cylinder are closed and valve lash can be adjusted. Engine firing order is 1-5-3-6-2-4,



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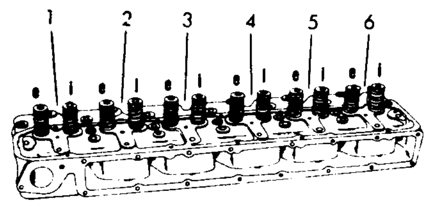
1. Adjusting screw 2. Rocker arm 3. Shaft 4. Feeler gauge

Figure 3-48. Rocker Arm Shaft Assembly



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1. No. 1 cylinder
   e. Exhaust valve
   i. Intake valve
2. No. 2 cylinder
   e. Exhaust valve
   i. Intake valve
3. No. 3 cylinder
   e. Exhaust valve
   i. Intake valve
4. No. 4 cylinder
   e. Exhaust valve
   i. Intake valve
5. No. 5 cylinder
   e. Exhaust valve
   i. Intake valve
6. No. 6 cylinder
   e. Exhaust valve
   i. Intake valve

Figure 3-49. Valve Locations

and if this sequence is followed, the lash for all valves can be checked and adjusted in 2 complete revolutions of the crankshaft. Check valve clearance periodically. See figures 3-48 and 3-49 and proceed as follows to obtain specified clearance:

a. Run engine until operating temperature of 160°F minimum is reached. Stop the engine.

b. Thoroughly clean cylinder head cover and surrounding area.

c. Remove breather tube, capscrews, washers, and cylinder head cover.

d. Using 1-1/2 inch socket wrench on crankshaft pulley nut, bar over engine until exhaust valve for number 6 cylinder (fig. 3-49) is almost closed and intake valve starts to open, then check and adjust intake and exhaust valve lash for number 1 cylinder.

e. Using a 0.015 inch feeler gauge (4, fig. 3-48) check clearance between valve stems and rocker arms (2). Gauge should pass between rocker arm and corresponding valve stem with a slight drag when valve lash is properly adjusted.

NOTE

Cold clearance between valve stems and rocker arms (2) is 0.018 inch and hot clearance is 0.015 inch as described in paragraph 3-220 above.

f. Adjust each valve by turning adjusting screw (1) clockwise to decrease clearance or counterclockwise to increase clearance as necessary.

g. Using 1-1/2 inch socket wrench on crankshaft pulley nut, bar over engine until number 2 cylinder exhaust valve (fig. 3-49) is almost closed and intake valve starts to open, then adjust lash for intake and exhaust valves for number 5 cylinder, following procedure in paragraphs e and f above.

h. Using 1-1/2 inch socket wrench on crankshaft pulley nut, bar over engine until number 4 cylinder exhaust valve is almost closed and intake valve starts to open, then adjust lash for intake and exhaust valves for number 3 cylinder, following procedure in e and f above.

i. Using 1-1/2 inch socket wrench on crankshaft pulley nut, bar over engine until number 1 cylinder exhaust valve is almost closed and intake valve starts to open, then adjust lash for intake and exhaust valves for number 6 cylinder, following procedure in e and f above.

j. Using 1-1/2 inch socket wrench on crankshaft pulley nut, bar over engine until number 5 cylinder exhaust valve is almost closed and intake valve starts to open, then adjust lash for intake and exhaust valves for number 2 cylinder, following procedure in e and a above.

k. Using 1-1/2 inch socket wrench on crankshaft pulley nut, bar over engine until number 3 cylinder exhaust valve is almost closed and intake valve starts to open, then adjust lash for intake and exhaust valves for number 4 cylinder, following procedure in e and f above.

l. Replace cylinder head cover using associated capscrews and washers.

m. Replace breather tube.

Section XLIV. BASE GROUP AND RELATED COMPONENTS

3-221. General.

The base group consists of a rigid frame skid base, fuel tank, and related components. The fuel tank is recess mounted in the skid base. The engine and generator are mounted upon the skid base assembly. Procedures in this section include inspection of the skid-base, testing and replacement of the fuel quantity transmitter, and replacement of the fuel tank and replacement of related components illustrated in figures 3-50 and 3-51.

3-222. Skid Base Inspection.

See figure 3-50 and proceed as follows:

a. Inspect the skid base assembly for rust, corrosion, breaks, loose hardware, and other damage.

b. Verify that the oil drain plug (10) and hose between skid base and engine is not leaking.

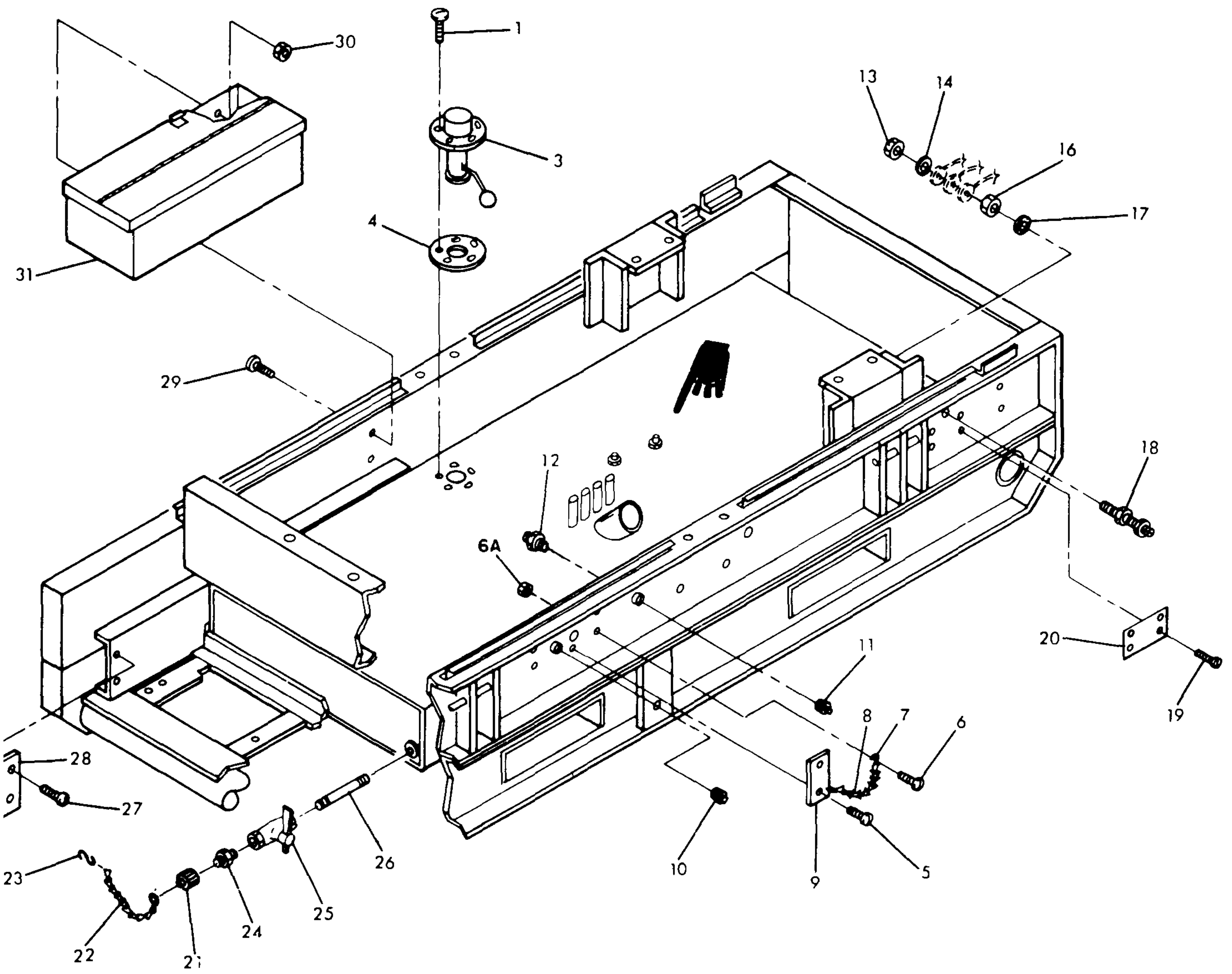
3-223. Fuel Quantity Transmitter Removal, Testing and Replacement.

a. Removal. Disconnect electrical connector and see figure 3-50 to remove the transmitter (3).

b. Testing. Proceed as follows:

(1) Connect multimeter between case of transmitter (3) and the transmitter connector pin as shown in 3-52. With sensing arm of transmitter in lowered position (A), multimeter shall read between 0.00 and 0.90 ohms and with sensing arm of transmitter in raised position (B), multimeter shall read between 29.8 and 31.3 ohms. Disconnect multimeter.

(2) Submerge transmitter (3, figure 3-50) in about 12 inches of water heated to not less than 200°F. Float tank of transmitter must withstand air pressure of 6 PSI without leaking. Bubbles of air will be observed if float tank leaks. Replace fuel quantity transmitter if it fails test (see fig. 3-52).



1.	Screw	16.	Nut
2.	(Deleted)	17.	Washer
3.	Transimtter	18.	Terminal
4.	Gasket	19.	Screw
5.	Screw	20.	Plate
6.	Screw	21.	Cap
6A.	Nut	22.	Chain
7.	Hook	23.	Hook
8.	Chain	24.	Connector
9.	Plate	25.	Valve
10.	Plug	26.	Nipple
11.	Plug	27.	Screw
12.	Connector	28.	Bracket
13.	Nut	29.	Screw
14.	Washer	30.	Nut
15.	(Delete)	31.	Box

Figure 3-50. Base Group and Related Components

1. Screw
2. Panel
3. Screw
4. Bracket
5. Screw
6. Washer
7. Frame
8. Screw
9. Bracket
9A. Screw
10. Bracket
11. Nut
12. Washer
13. Ground strap
14. Tank
15. Base
16. Nut

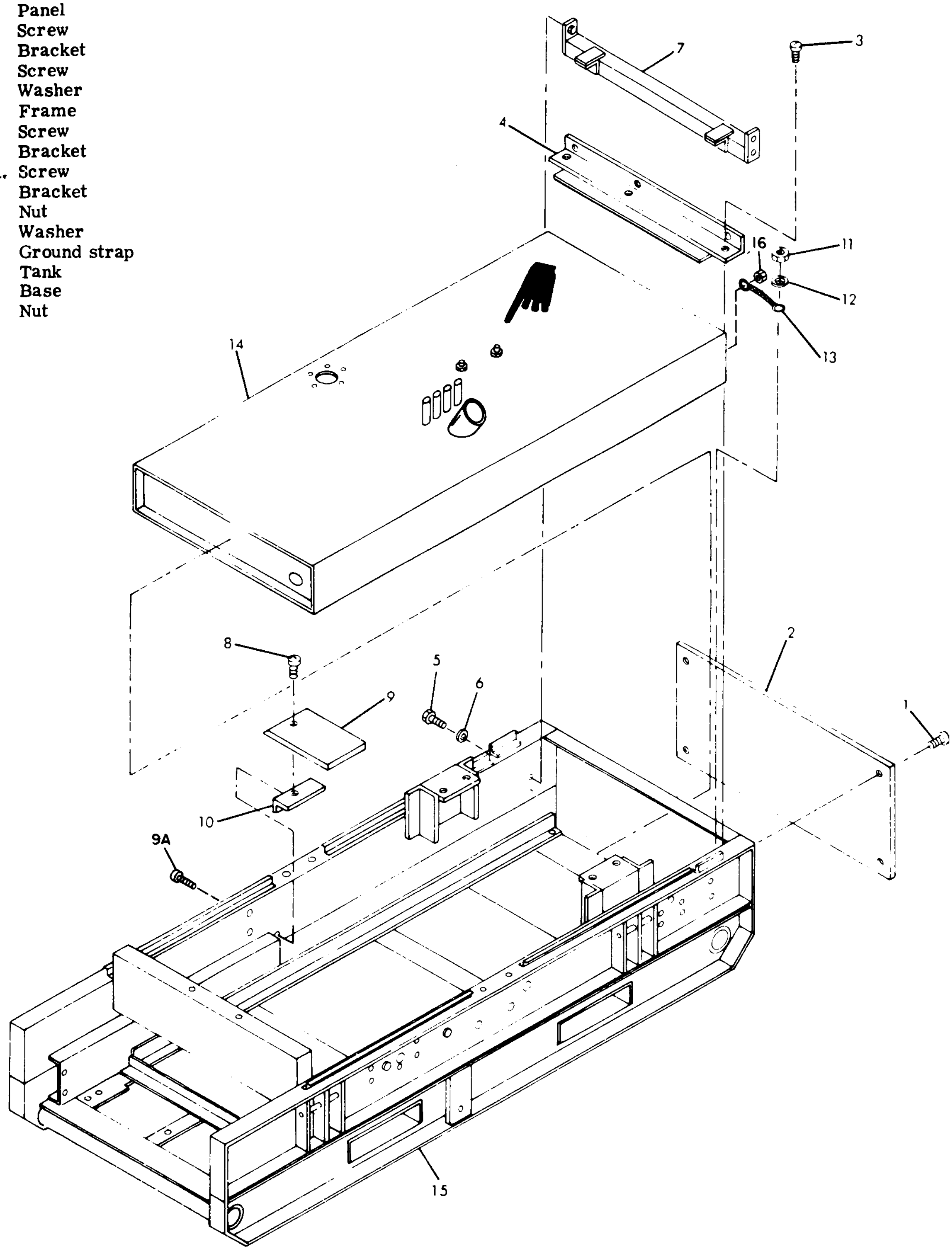


Figure 3-51. Base Group

c. Replacement. See figure 3-50 and replace transmitter (3) in reverse sequence of removal.

3-224. Related Components Replacement.

a. See figure 3-50 to remove and replace related components as required.

b. Replace lost or broken terminal clip (Retainer, Safety Clip). For fabrication procedure, see Chapter 3, Section XVIII, Organizational Maintenance of the Generator Electrical System, paragraph 3-142. 1 Load Terminal Board Assembly.

3-225. Metal Fuel Tank Removal, Cleaning and Inspection, and Installation.

a. Removal. See figures 3-7, 3-50, and 3-51 and proceed as follows:

(1) Remove cap (21, fig. 3-50) and connect auxiliary fuel hose to connector (24) at end of valve (25).

(2) Open valve (25) and allow water and sediment to completely drain off into a suitable container. Close valve (25) when clean diesel fuel runs out. Drain clean fuel into suitable container. Disconnect auxiliary fuel hose.

(3) Refer to paragraph 3-223 and remove fuel quantity transmitter (3, fig. 3-50).

(4) Disconnect four vent hoses and two fuel lines from tank (14, fig. 3-51), tagging each hose and line.

(5) Disconnect main metal fuel tank filler hose from tank (14).

(6) See figure 3-51, and remove metal tank (14) from base (15) using sequential order of indexes.

b. Cleaning and Inspection.

(1) Flush inside of metal fuel tank with steam under pressure. Rinse with hot water and detergent to insure that rust flakes and other foreign material are removed.

(2) Inspect metal fuel tank for cracks and distortion.

(3) Inspect tapped holes for damaged threads.

c. Installation.

(1) See figure 3-51, and install metal tank (14) into base (15) in reverse order of removal procedure.

(2) Connect main fuel tank filler hose to plastic tank (14).

(3) Connect four vent hoses and two fuel lines to tank (14) as tagged.

(4) Refer to paragraph 3-223 and install transmitter (3, fig. 3-50).

(5) Close valve (25), replace cap (21) on connector (24), and add diesel fuel as required.

3-225A. Plastic Fuel Tank Removal, Cleaning and Inspection, and Installation.

a. Removal. See figures 3-7 and 3-51A and proceed as follows:

(1) Remove cap (17, fig. 3-51A) from connector (18) and connect auxiliary fuel hose to valve (19).

(2) Open valve (19) and allow water and sediment to completely drain off into a suitable container. Close valve (19) when clean diesel fuel runs out. Drain clean fuel into suitable container. Disconnect auxiliary fuel hose.

(3) Refer to paragraph 3-323 and remove fuel quantity transmitter (3, fig. 3-50).

(4) Disconnect vent hoses (13A, fig. 3-51A), fuel lines and ground terminal from tank (14), tagging each hose and line.

(5) Disconnect main fuel tank filler hose from plastic fuel tank (4).

(6) See figure 3-51A and remove plastic tank (14) from base 15) using sequential order of indexes.

b. Cleaning and Inspection.

(1) Rinse inside of plastic fuel tank (14) with hot water and detergent to insure foreign material is removed.

(2) Inspect plastic fuel tank (14) for cracks and distortion.

(3) Inspect tapped holes for damaged threads.

c. Installation.

(1) See figure 3-51A and install plastic tank (14) into base (15) in reverse order of removal procedure.

(2) Connect main fuel tank filler hose to plastic tank (14).

(3) Connect vent hoses (13A), fuel lines and ground terminal to tank (14) as tagged.

(4) Refer to paragraph 3-223 and install transmitter (3, fig. 3-50).

(5) Close valve (19, fig. 3-51A), replace cap (17) on connector (18), and add diesel fuel as required.

1. Screw
2. Panel
3. Screw
4. Bracket
5. Screw
6. Washer
7. Frame
8. Screw
9. Bracket
9A. Screw
10. Bracket
11. Nut
12. Washer
13. Ground Wire Assy
13A. Fuel Vent Hoses
14. Tank, Plastic
15. Base
16. (Deleted)
17. Cap
18. Connector
19. Valve

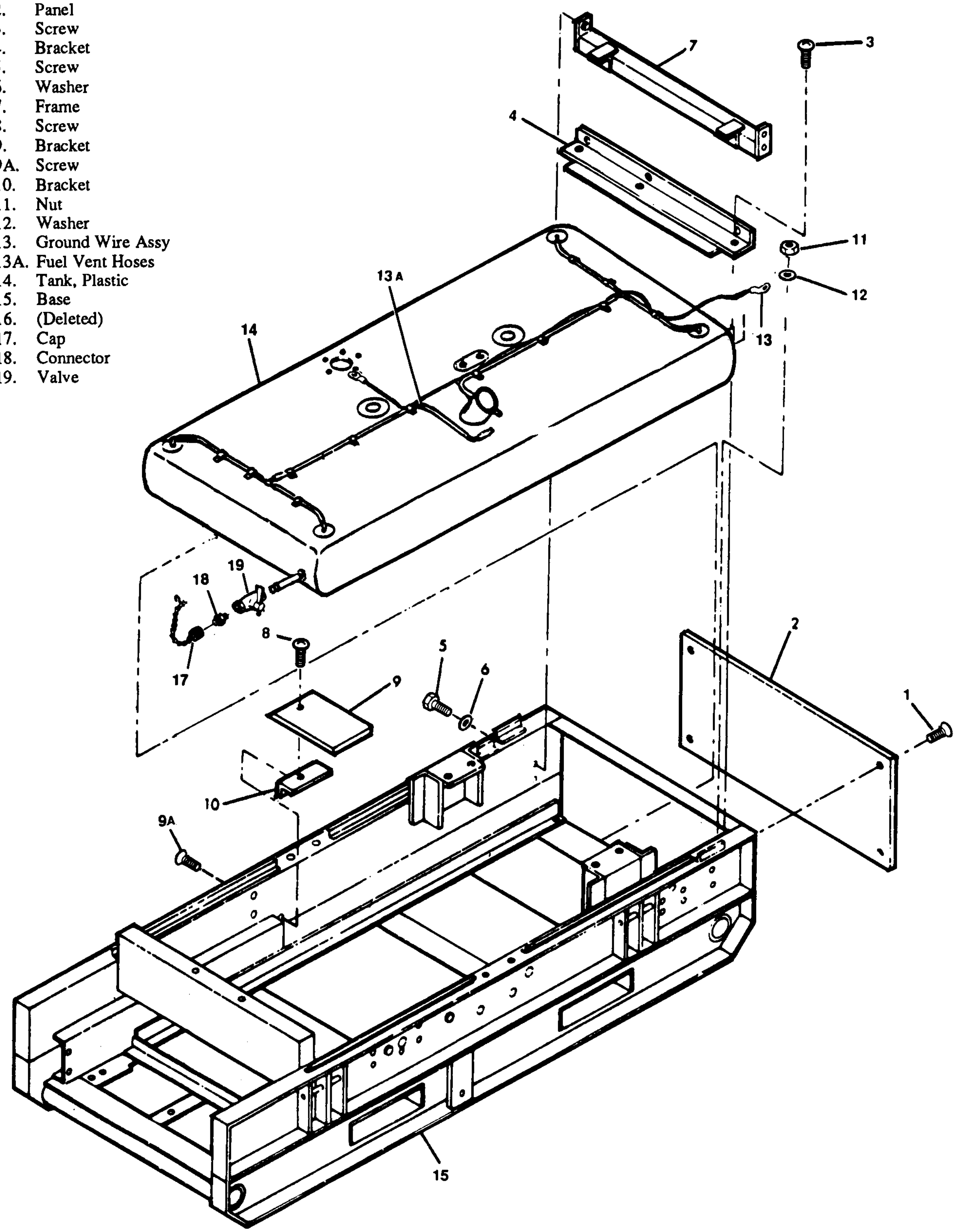


Figure 3–51A. Base Group (with Plastic Fuel Tank).

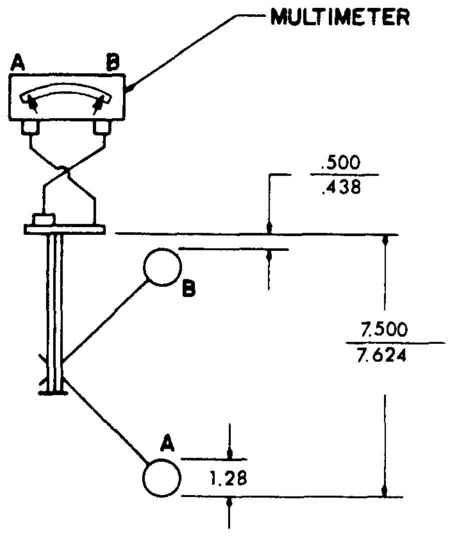


Figure 3-52. Fuel Quantity Transmitter Test

Section XLV. ACCESSORY ITEMS

3-226. General.

a. The engine generator set is provided with a paralleling cable assembly (class 1 only) and an auxiliary fuel line. (Refer to fig. 3-53.)

b. The paralleling cable assembly is a 25 foot, four conductor, flexible, heat and oil resistant cable, which is utilized with the paralleling receptacle to interconnect two precise generator sets.

c. The auxiliary fuel line hose assembly is a 25 foot, flexible, heat and oil resistant hose which is utilized to interconnect the engine generator set to supply or receive fuel.

3-227. Paralleling Cable Assembly

a. Testing. Test each parallel wire for continuity, ensuring 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.

b. Installation and Replacement. No special instructions are required to install or replace a paralleling cable (1, fig. 3-53). When not installed, coil paralleling cable into a loop and install with chain provided in housing on right side of relay table. (See fig. 1-1.).

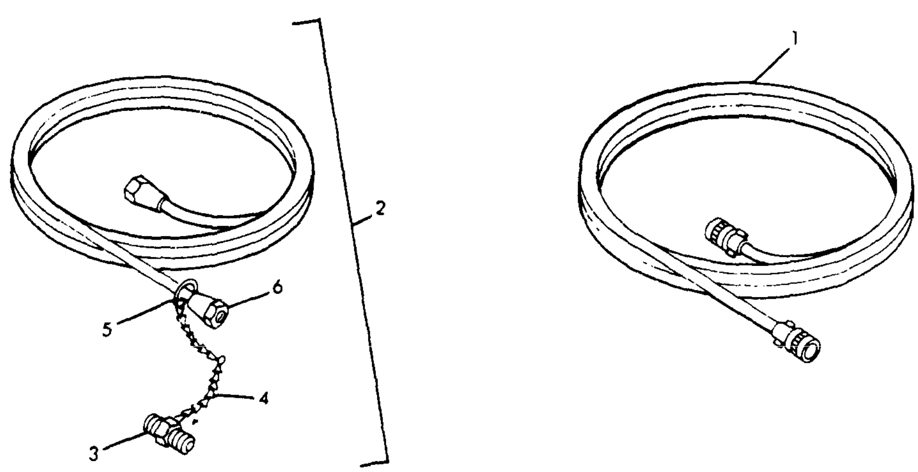
3-228. Auxiliary Fuel Line Hose Assembly.

a. Installation and Replacement. No special instructions are required to install or replace the auxiliary fuel line hose (2, fig. 3-53). When not installed, coil auxiliary fuel line hose into a loop, with ends connected and install on chain provided in housing beneath the governor control unit. (See figure 1-1.)

b. Repair. Replace defective hose (6, fig. 3-53) fittings.

3-229. Storage Space.

Storage space for ground rods is provided on left side of skid base channel facing battery tray. Connectors and ground wire should be stowed in tool box (fig. 1-1) under governor actuator assembly.



1. Paralleling cable assy
2. Auxiliary fuel line hose assy
3. Connector
4. Chain
5. Ring
6. Hose

Figure 3-53. Accessory Items With Attaching Hardware

CHAPTER 4

AUXILIARY MATERIAL USED IN CONJUNCTION WITH THE EQUIPMENT

Section I. GENERAL

4-1. Scope.

This chapter contains maintenance instructions within the scope of the operator and organizational maintenance level for material used in conjunction with the generator set, as allocated by the maintenance allocation chart provided in Appendix C.

4-2. Service upon Receipt of Material.

Upon receipt of material, 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 cleaning solvent, Federal Specification P-D-680, as applicable.

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. FUEL BURNING WINTERIZATION KIT

4-3. General.

Winterization equipment for starting the engine when temperatures are between -25°F. and -65°F. consists of a heater, coolant hoses, fuel lines, electrical controls, wiring harness, and mounting hardware to be installed in the generator set for preheating the engine oil pan and cooling system. The heater can be operated on the fuel available from the engine fuel system. For fuel burning winterization kit operating instructions, refer to paragraph 2-24.

4-4. Installation.

For wiring information, see figures 1-15 or 1-16. To perform initial installation of fuel burning winterization kit, see figure 1-22, 1-26 or 1-27 and 4-1 and proceed as follows:

NOTE

For installation with electrical winterization kit, refer to paragraph 4-18.

a. Disconnect plate to the right of control cubicle (fig. 1-2) below Fault indicator panel by removing two screws and washers. Retain screws and washers for installing kit control box (14, fig. 4-1).

b. Remove protective cover from receptacle J7 on special relay box (fig. 1-2).

c. Refer to paragraph 3-41 and drain radiator.

d. Remove plugs from engine thermostat housing and oil cooler bonnet. Retain plugs.

e. Remove plugs from engine oil pan heat exchanger. Retain plugs.

f. Disconnect exhaust plate by removing two screws.

g. Install kit as described and illustrated in figure 1-22 using installation sequence 74 through 1 of figure 4-1.

h. Insure that valves (41, 45) are open, fill radiator with proper coolant in accordance with table 2-1 and check for leaks.

4-5. Removal.

To remove the fuel burning winterization kit, see figures 1-22 and 4-1 and proceed as follows:

NOTE

For removal with electrical winterization kit, refer to paragraph 4-19.

a. Refer to paragraph 3-41 and drain radiator.

b. Remove kit by proceeding in reverse order of installation procedure using figure 1-22 and removal sequence 1 through 74 of figure 4-1.

c. Refer to paragraph 4-4 and replace plugs, plates, and covers removed during installation.

d. Fill radiator with proper coolant in accordance with table 2-1 and check for leaks.

4-6. Preventive Maintenance.

To insure that the fuel burning winterization kit is ready for operation at all times, when installed on the generator set, 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 kit 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 kit or the end item generator to which it is attached. All deficiencies and shortcomings SHALL be recorded together with the corrective action on the applicable form at the earliest possible opportunity. Air Force users shall refer to the applicable inspection manuals and work card sets in the T. O. 35C2-3- Series for periodic preventive maintenance requirements and table 4-1 for detailed procedures.

4-7. Troubleshooting.

Table 4-2 provides information useful in diagnosing and correcting unsatisfactory operation or failure of the fuel burning winterization kit. (See figure 1-22, 1-15 or 1-16.)

4-8. Control Box Inspection, Testing, and Replacement.

a. Inspect. Inspect indicator light, circuit breaker, switch and control box for cracks, loose connections, breaks and other damage.

b. Test.

(1) Test the lamp and light assembly for continuity.

(2) Energize circuit breaker and press press to test indicator. Indicator should illuminate when pressed.

c. Removal.

(1) Replace control box (14, fig. 4-1) lamp as illustrated in figure 4-2.

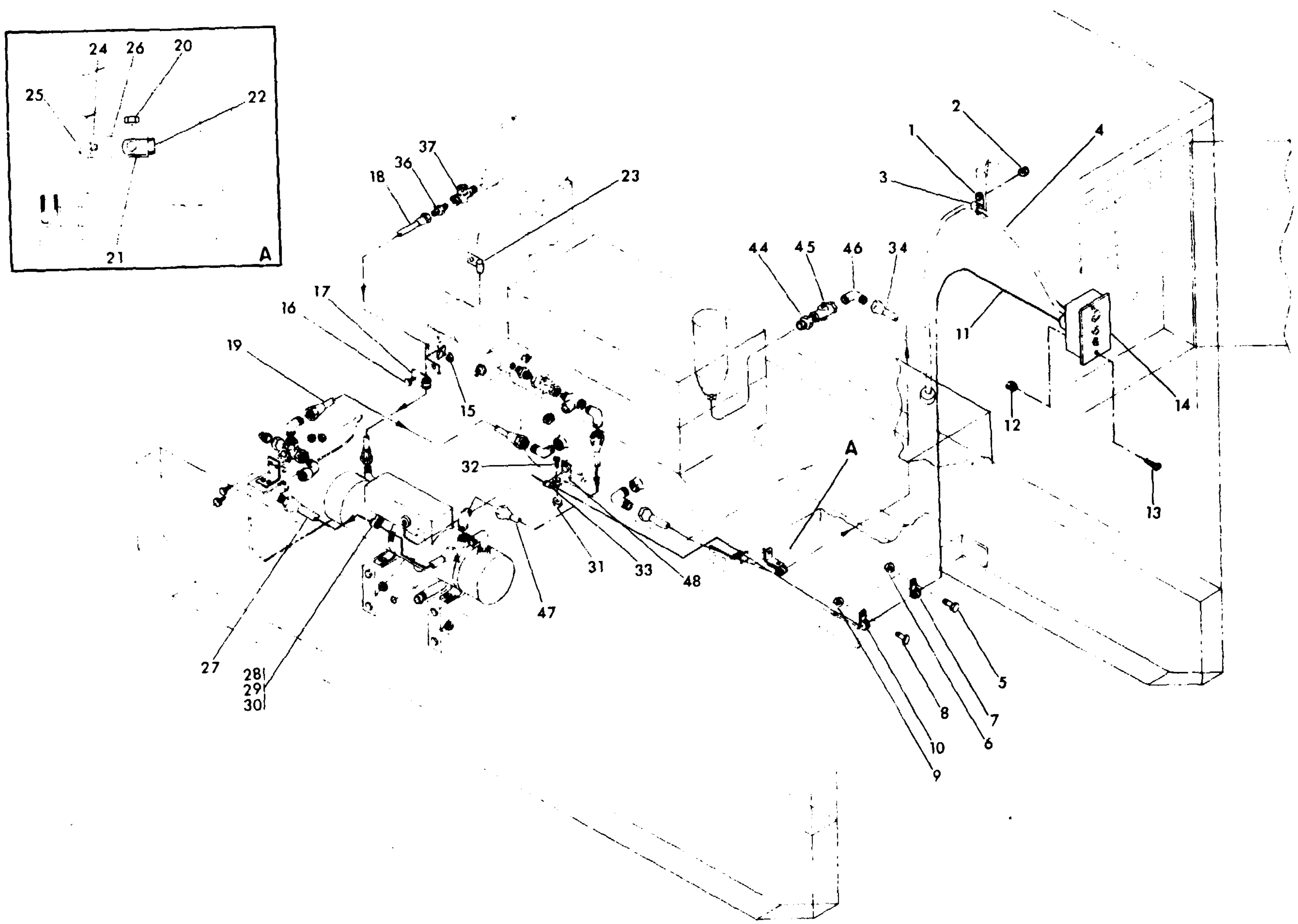
(2) Remove electrical connectors and attaching hardware from control box and remove control box.

d. Installation. Install control box and connectors in reverse order of removal.

Table 4-1. Preventive Maintenance Checks and Services

B - Before Operation | A - After Operation | M - Monthly (100 hrs)
D - During Operat n | W - Weekly (40 hrs) | S - S mi Annual (500 hrs)

ITEM NO.	INTERVA OPERATOR DAILY B	D	A	(V	\	3	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
1	x						Heater fuel shut-off and coolant valves.	Open valves.	(fig. 2-11)
2	x						Heater exhaust.	Move exhaust cover plate away from exhaust opening	(para 4-9)
3	x						Generator set radiator.	Check for proper coolant level.	(para 2-3 and 3-41
4	x						Generator set doors.	Close all doors.	(fig. 1-1 and 1-2)
5	x						Generator set fuel tank.	Check that fuel level is adequate for operating time required.	(para 2-3)
6		x				x	Fuel lines and coolant hoses.	Check for leakage.	(para 4-16)
7			x				Heater exhaust.	Cover exhaust opening with exhaust plate.	(para 4-9)
8			x				Heater fuel shut-off valve.	Close valve.	(fig. 2-11)
9						x	Coolant hoses and fuel lines.	Tighten hoses and lines and check condition.	(para 4-16)
10						x	Attaching hardwar	Tighten hardware.	(para 4-16)
11						x	Wiring harness.	Inspect for frayed or defective insulation. Inspect connectors for damaged threads, bent, loose or missing pins.	(para 3-139)
12						x	Thermostat switch.	Test switch for proper operation.	(para 4-15)



1. Screw
2. Nut
3. Clamp
4. Wiring harness
5. Screw
6. Nut
7. Clamp
8. Screw
9. Nut
10. Clamp
11. Wiring harness
12. Nut
13. Screw
14. Control box
15. Nut
16. Screw
17. Clamp
18. Hose assy
19. Hose assy
20. Nut
21. Screw
22. Clamp
23. Clamp
24. Nut
25. Screw
26. Bracket
27. Hose assy
28. Nut
29. Screw
30. Clamp
31. Nut
32. Screw
33. Clamp
34. Hose assy
35. Hose assy
36. Connector
37. Valve
38. Bracket
39. Thermostat switch
40. Nipple
41. Cock
42. Tee
43. Elbow
44. Nipple
45. Shut-off cock
46. Elbow
47. Hose assy
48. Bracket
49. Plug
50. Elbow
51. Elbow

51A. Relief valve

51B. Reducer

51C. Connector

52. Tee
53. Clamp
54. Tube
55. Elbow
56. Elbow
57. Nut
58. Screw
59. Screw
60. Bracket
61. Heater assy
62. Elbow
63. Elbow
64. Plug (used only when fuel burning winterization kit is not installed)
65. Elbow
66. Elbow
67. Three way valve
68. Nut
69. Screw
70. Bracket
71. Screw
72. Nut
73. Screw
74. Plate
75. Protective cover
76. Screw
77. Receptacle assy

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Figure 4-1. Fuel Burning Winterization Kit (Sheet 1 of 2)

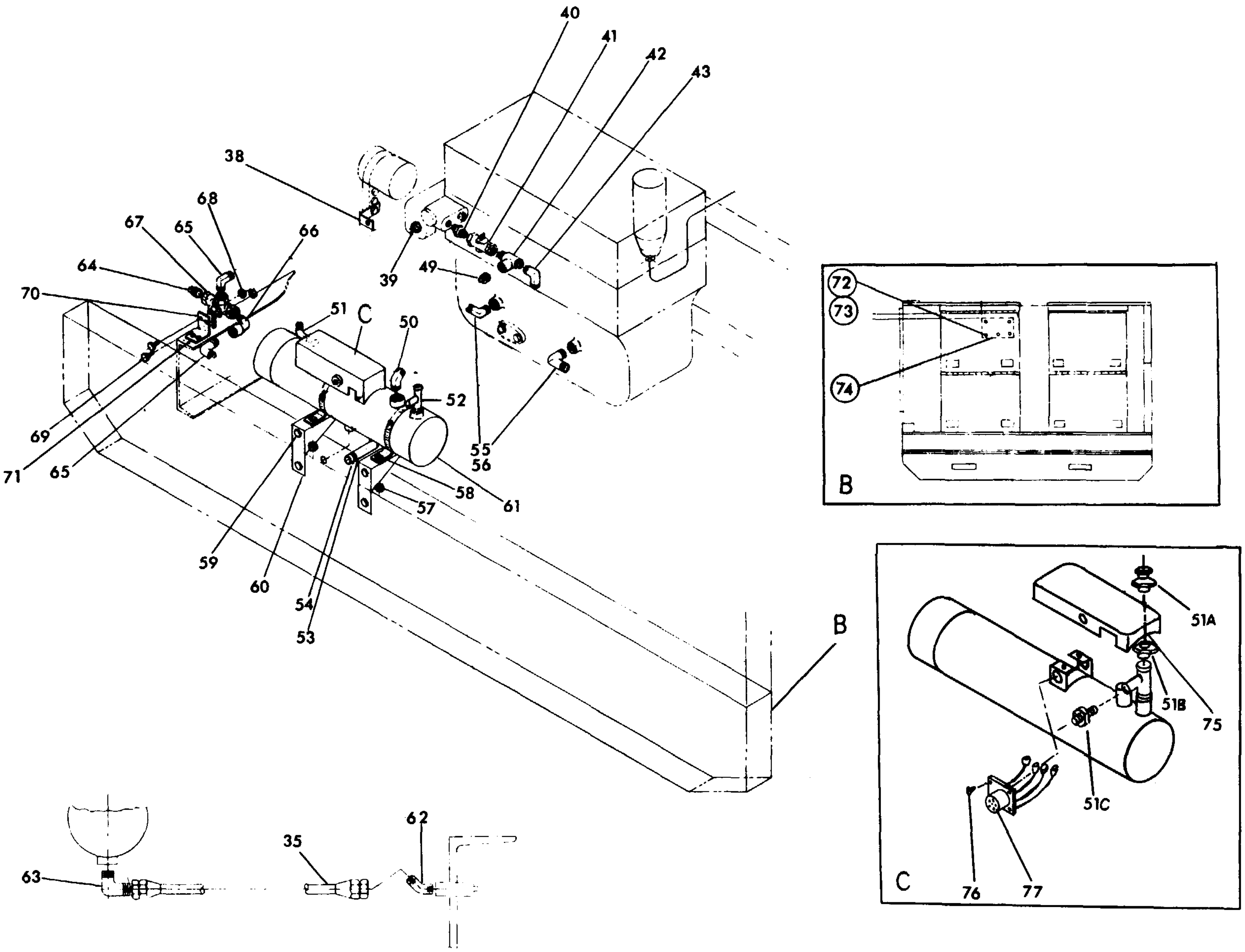

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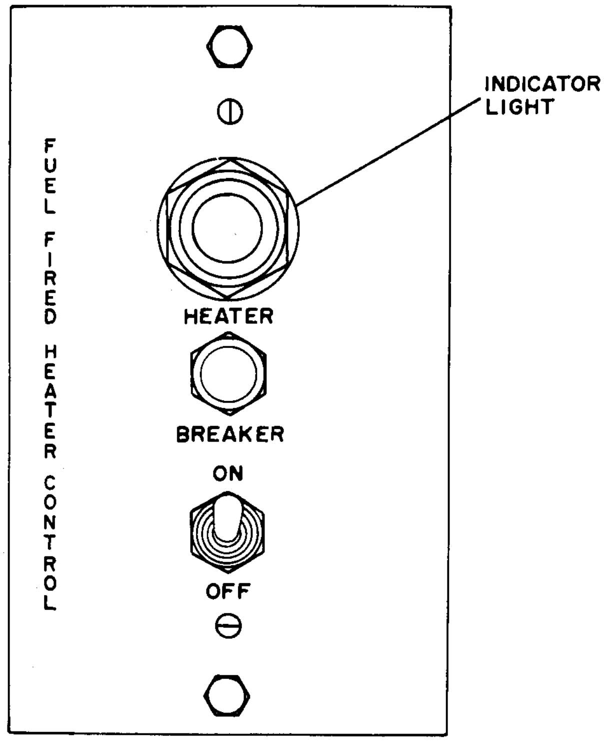
Figure 4-1. Fuel Burning Winterization Kit
(Sheet 2 of 2)

Table 4-2. Fuel Burning Winterization Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Press to test light does not illuminate when pressed.	a. Circuit breaker open.	a. Reset circuit breaker. (Refer to paragraph 4-8.)
	b. Defective lamp.	b. Replace lamp. (Refer to paragraph 4-8.)
	c. Defective control box.	c. Replace if defective. (Refer to paragraph 4-8.)
2. Switch positioned to ON and nothing happens.	a. Circuit breaker open.	a. Reset circuit breaker. (Refer to paragraph 4-8.)
	b. Dead generator set batteries.	b. Charge or replace batteries. (Refer to paragraphs 2-3 and 3-82.)
	c. Defective control box.	c. Replace if defective. (Refer to paragraph 4-8.)
	d. Open thermostat switch.	d Test and replace if defective. (Refer to paragraph 4-15.)
3. Heater pump operates but will not ignite.	a. Heater fuel shut-off valve not open.	a. Open valve. (Refer to paragraph 2-24.)
	b. Generator set fuel supply exhausted.	b. Add fuel as required. (Refer to paragraph 2-3.)
	c. Restriction in fuel supply.	c Remove restriction.
	d. Defective generator set fuel transfer pump.	d. Replace if defective. (Refer to paragraph 3-165.)
4. Heater does not ignite (fuel present).	a. Heater overheat switch tripped	a. Permit heater to cool and restart.
	b. Defective heater.	b. Replace heater. (Next higher level of maintenance.)
	c. Defective thermostat switch.	c. Test and replace if defective. (Refer to paragraph 4-15.)
	d. Low or erratic voltage to heater.	d. Correct cause of improper voltage.
	e. Defective igniter.	e. Replace if defective. (Refer to paragraph 4-13.)
5. Heater will not shutoff when switch is positioned to OFF (after purge cycle).	a. Defective control box.	a. Replace if defective. (Refer to paragraph 4-8.)



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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 AND PRESS TO TEST INDICATOR. INDICATOR SHOULD ILLUMINATE WHEN PRESSED.

Figure 4-2. Fuel Burning Winterization Kit Control Box Lamp Replacement

4-9. Heater Assembly Inspect, Test, Service, and Adjust.

a. Inspect. Remove protective cover (75, fig. 4-1) and proceed as follows:

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

(2) Inspect terminal block and limit switch for cracks, damage, loose terminals or stripped threads.

(3) Inspect receptacle assembly for cracks, burned or damaged insulation, loose connections, and bent or broken terminals. Check for continuity between wires and terminal pins with ohmmeter.

(4) Inspect igniter for broken coil or shorts. Check resistance. Resistance must be one ohm with igniter cold.

(5) Inspect wiring harness (refer to paragraph 3-139).

(6) Inspect thermostat switch for loose connections and bent or broken terminals.

(7) Inspect hoses, lines, and fittings for cracks, fraying, damaged ends or stripped threads.

(8) Replace protective cover (75, fig. 4-1).

b. Test.

To test heater assembly (61, fig. 4-1), set switch to ON position and ascertain that 24 volts DC are connected to the heater igniter. If ambient temperature is above 50°F attach jumper across terminals of thermostat switch. (para 4-5)

(1) If indicator light on heater control panel (fig. 4-2) does not illuminate in approximately three minutes, position switch to OFF, wait three minutes and attempt to restart heater. If heater indicator does not light, and no jumper is connected across terminals of thermostat switch, connect a jumper. If heater indicator lights, remove jumper and replace thermostat switch (39, fig. 4-1).

(2) If heater indicator does not light with thermostat switch jumpered, replace heater assembly (61, fig. 4-1).

c. Service.

Service heater assembly in accordance with procedures in table 4-1.

4-10. Fuel Regulator Valve Adjustment (fig. 4-3).

a. Remove protective cover (75, fig. 4-1) and disconnect fuel tube assembly at orifice assembly.

b. With fuel tube assembly disconnected from igniter (fig. 4-3) apply 24 volts to solenoid. Time fuel flow into a quart container. Flow should measure one quart in 40 to 45 minutes. Turn adjusting screw clockwise to increase flow rate or counterclockwise to decrease flow rate.

4-11. Flame Micro-switch Adjustment (fig. 4-4).

a. Remove protective cover (75, fig. 4-1). To adjust micro-switch in starter condition, back off adjusting screw clockwise slowly until a click is heard. Note the exact spot (screw slot) that this happens. Then give an additional 1/2 (180°) turn clockwise.

b. Remove protective cover (75, fig. 4-1). To adjust micro-switch in dynamic condition, turn adjusting screw counterclockwise until motor starts, then turn adjusting screw clockwise until motor stops. Give adjusting screw an additional 1/2 (180°) turn clockwise.

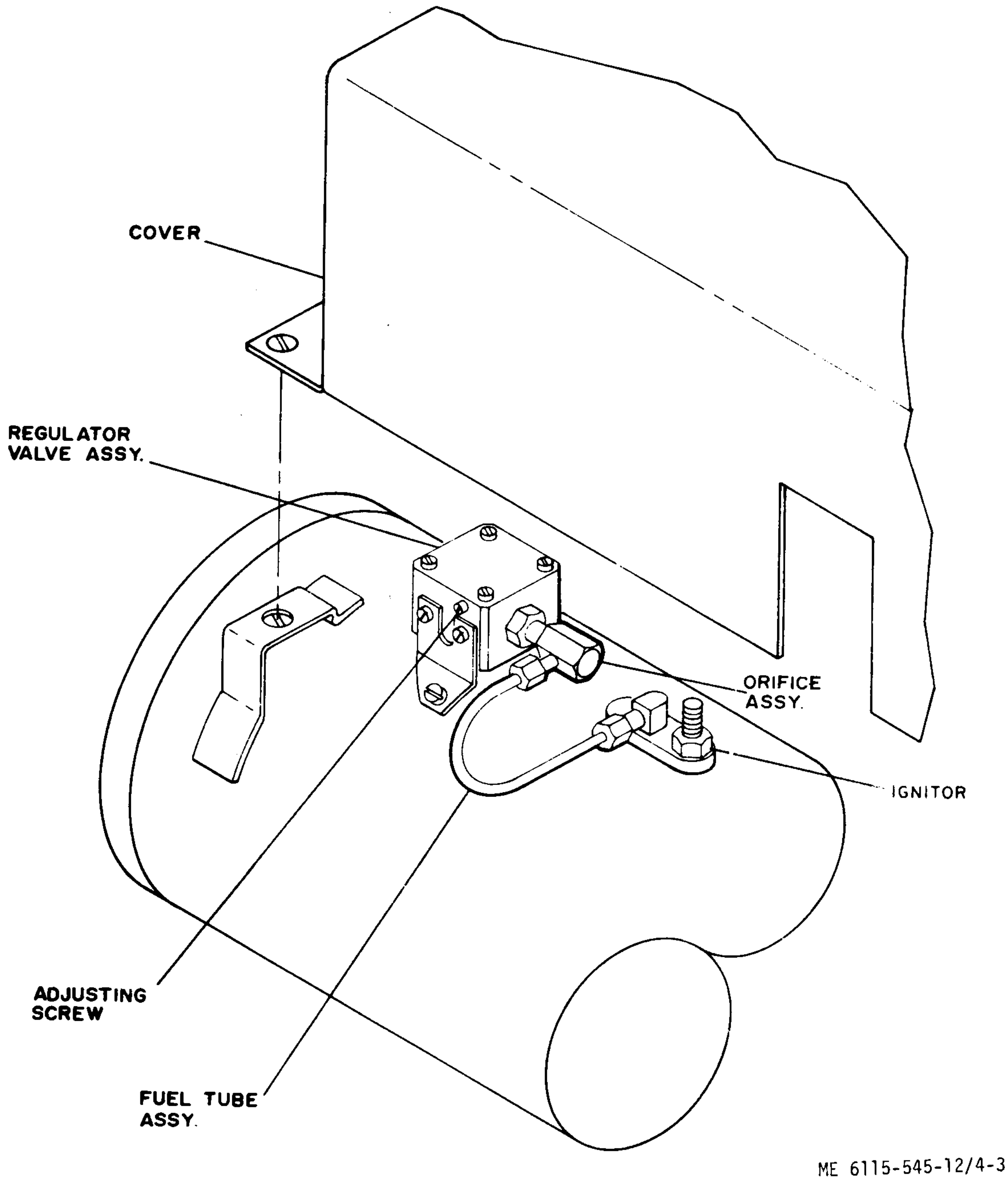

Figure 4-3. Fuel Regulator Valve Adjustment

4-12. Receptacle Assembly Replacement.

a. Removal.

(1) Remove protective cover (75, fig. 4-1).

(2) Remove screws (76) and remove receptacle assembly (77) terminals from terminal board.

(3) Remove screws (76) and remove receptacle assembly (77) from bracket.

b. Installation. Install receptacle assembly (77, fig. 4-1) using removal steps of a. above in reverse order.

4-13. Igniter Assembly Replacement.

To replace igniter assembly, remove protective cover (75, fig. 4-1) and proceed as follows:

a. Disconnect power lead to igniter.

b. Remove igniter from heater using a 7/8 inch socket or spark plug wrench.

c. Install igniter and reconnect power lead to igniter.

4-14. Wiring Harness Replacement.

See figure 4-1 and proceed as follows:

a. Removal. Tag and disconnect all electrical leads and connectors from wiring harness (4 or 11, fig. 4-1) to be removed. Remove all harness clamps and remove wiring harness. If 30% of the harness wires are defective, the harness must be rebuilt at next higher level of maintenance.

b. Installation. Place wiring harness in position, install all harness clamps, and reconnect electrical leads and connectors. Remove tags.

4-15. Thermostat Switch Testing and Replacement.

a. Disconnect and tag electrical connections and remove switch as illustrated in figure 4-5. Plug engine opening.

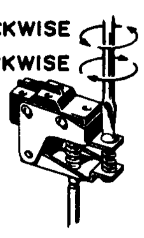

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Figure 4-4. Adjusting Flame Switch

b. Fill a suitable container with antifreeze solution and place thermometer in container. Place temperature sensing end of switch in solution.

c. Vary the temperature of the solution to determine that switch opens at 155° ± 3°F. and closes at 35 ± 5°F.

d. Replace defective switch.

e. To install switch, see figure 4-5. Connect electrical connections removed in step a. above.

4-16. Hoses, Lines, and Fittings Replacement.

See figure 4-1 and proceed as follows:

a. Removal.

(1) Remove hose or line being replaced after closing cock (41, 45).

(2) If fitting is to be replaced, remove fitting and plug opening until part is replaced.

b. Installation. Install hose assembly using removal steps in reverse order.

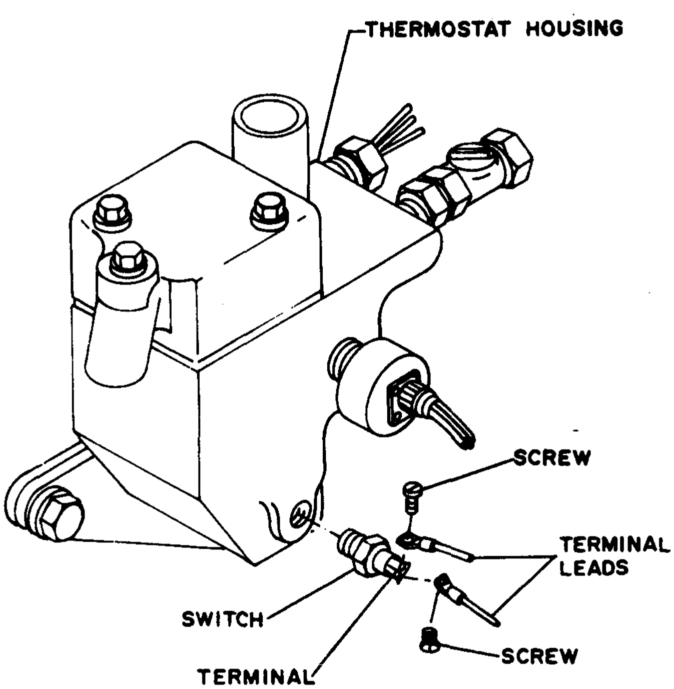

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Figure 4-5. Thermostat Switch Replacement

4-17. General.

The electrical winterization kit consists of a heat exchanger, control box, coolant pump, thermostat and accessories. The primary purpose of the kit is to maintain the set in a heated condition, at any ambient temperature from 125°F. to -65°F. to enable it to accept 75% of rated load in one step within 20 seconds after starting action is initiated. The coolant temperature is thermostatically controlled at 130° F. to 150°F. The kit can also be used to warm the Generator Set for initial starting within 5 hours at any ambient temperature down to -65°F. Power for operation of the kit may be obtained from any power source that supplies 205 to 240 volts at 50, 60 or 400 Hz single phase. For electrical winterization kit operating instructions refer to fig. 2-11.

4-18. Installation.

For wiring information, see figure 4-6. To perform initial installation of the electric winterization kit, see figures 1-23, 1-26 or 1-27, and 4-7 and proceed as follows:

a. Remove plate from rear housing, adj acent to control cubicle (figure 1-2) adj acent to Fault indicator panel, and retain attaching hardware for installation of the electric winterization control box (45, fig. 4-7).

b. Refer to paragraph 3-41 and drain cooling system.

c. Remove two plugs from engine oil pan heat exchanger. Retain plugs.

d. Remove plugs from engine thermostat housing and engine oil cooler. Retain plugs.

e. Install kit as described and illustrated in figure 1-23 using installation sequence 68 through 1 of figure 4-7 except as noted in (1) through (3) below when fuel burning winterization kit and electric winterization kit are used together. (See sheet 2 of figure 4-7.)

(1) Remove plug (64, fig. 4-1) from three way valve (67) and install nipple (69, fig. 4-7) into three way valve (67, fig. 4-1). Connect hose (70, fig. 4-7) between elbow (13) and nipple (69).

(2) Remove plug (49, fig. 4-1) and install nipple (18, fig. 4-7). Connect hose (41) between nipple (18) and nipple (3 1).

(3) Remove plug (19, fig. 4-7) and install elbow (43, fig. 4-1). Connect hose (47) between elbow (43) and elbow (50).

f. Refer to paragraph 2-3 and close coolant shutoff cocks and service radiator.

g. Set electric heater control box POWER switch to OFF position.

h. Connect 50/60 or 400 Hz single phase power cable from an external 208 to 240 volts power source to J49 of kit (figures 1-26 or 1-27).

i. Perform all daily checks before operation preventive maintenance checks and services listed in table 4-3. Refer to paragraph 4-20.

j. Refer to paragraph 2-24 and energize the electric winterization kit and check kit operation as follows:

(1) Audibly check that kit coolant pump is operative.

(2) Check complete kit installation to assure there are no coolant leaks.

(3) Allow five minutes for warmup and then place hand near the heat exchanger. Determine that the heat exchanger is heating.

WARNING

Do not attempt to hold the hand in contact with the heat exchanger.

NOTE

To determine that each heating element is functioning, disconnect electrical lead from one element and check as in step (3) above. Reconnect element and disconnect remaining element and check as in step (3) above.

(4) Slightly loosen the hose coupling on the output end of the heat exchanger (left side, facing the engine radiator). Coolant, under pressure should flow from the union.

(5) Tighten the coupling when the test is complete.

4-19. Removal.

To remove the electric winterization kit, see figure 4-7 and proceed as follows:

a. Refer to paragraph 3-41 and drain cooling system.

b. Set electric control box POWER switch to OFF position and remove power cable from J49.

c. Remove kit by proceeding in reverse order of installation procedure using figure 1-24 and removal sequence of 1 through 69 of figure 4-7 except as

REF. DES.	DESCRIPTION	REF. DES.	DESCRIPTION
B10	Pump Motor	HRT1	Heater
CB301	Circuit Brkr. Power	HRT2	Heater
CR301-CR304	Diode, Full Wave Brdg	K301	Relay, Power
DS301	Indicator, Htr On	S301	Switch-On-Off
DS302	Indicator, Pwr On	T301	Transformer, Voltage
F301	Fuse	TH2	Thermostat

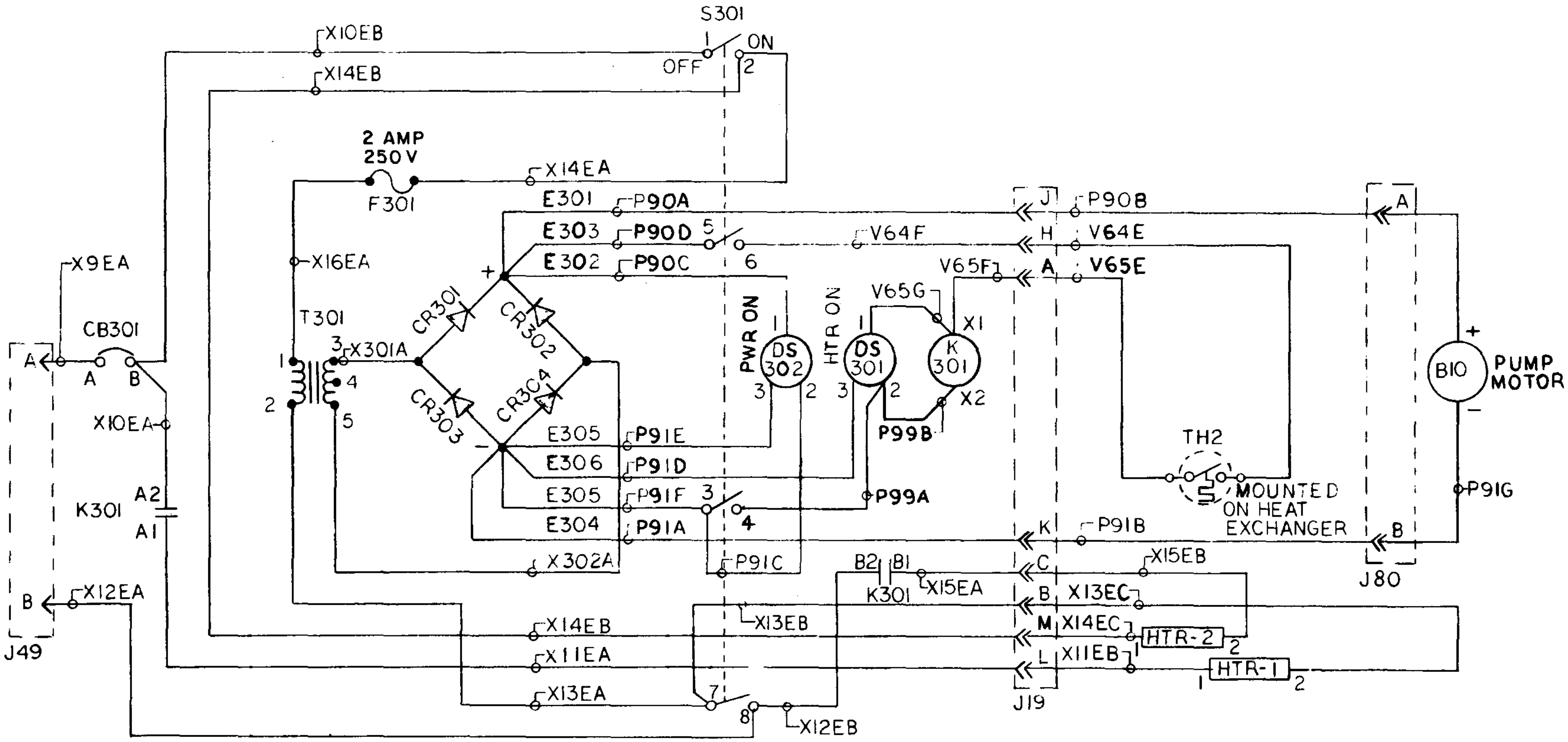

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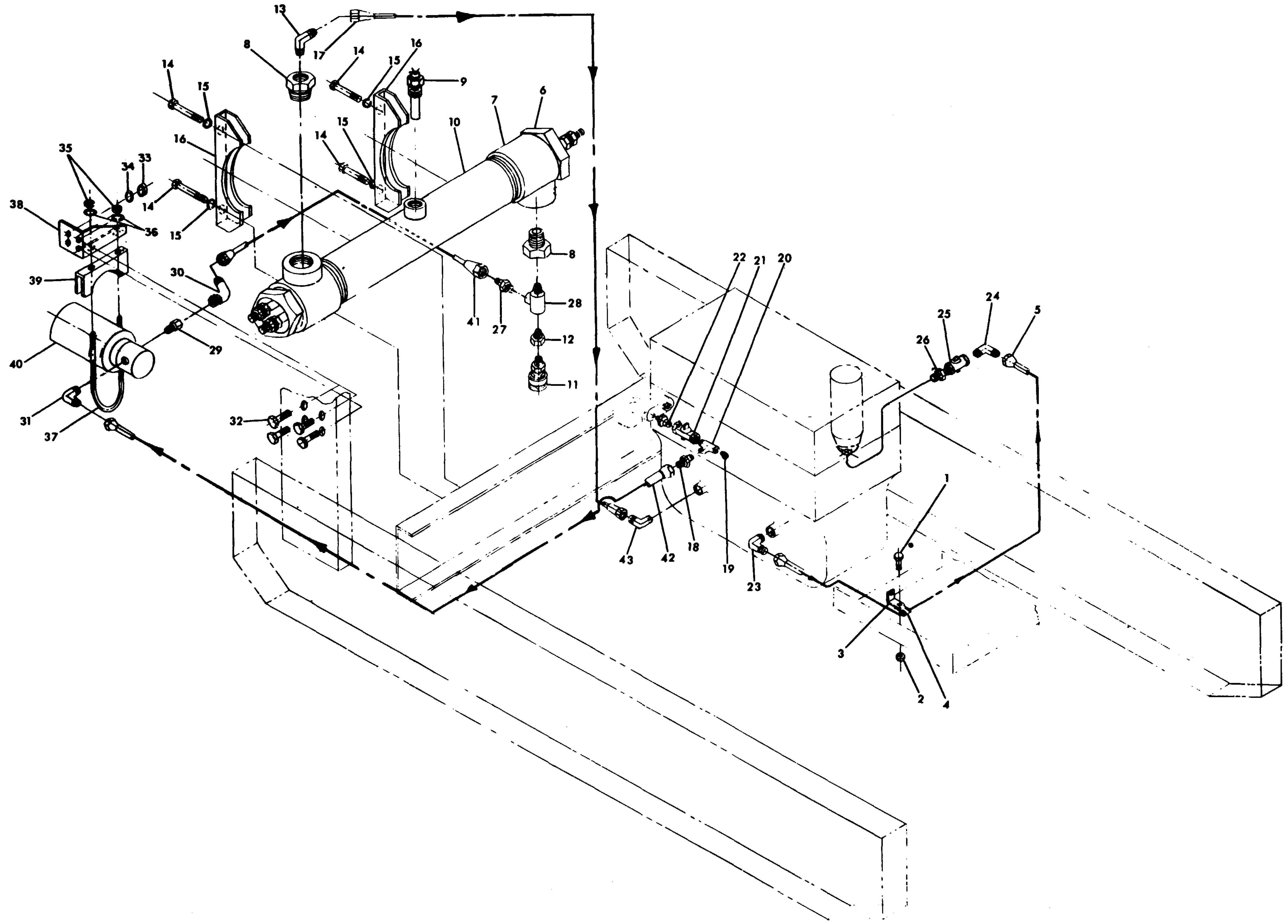
Figure 4-6. Electric Winterization Kit, Schematic Wiring Diagram

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH DOD-STD-100.
2. PLATE SHALL BE PROCESSED IN ACCORDANCE WITH 69-679 USING .032 THICK ALUMINUM ALLOY SHEET.
3. REMOVE BURRS AND BREAK SHARP EDGES.



1. Screw
2. Nut
3. Bracket
4. Clamp
5. Hose assembly
6. Heating element
7. Tee
8. Reducer
9. Thermostat switch
10. Electric winterization pipe
11. Relief valve
12. Reducer
13. Elbow
14. Capscrew
15. Lockwasher
16. Saddle bracket
17. Hose assembly (Used only when fuel burning winterization kit is installed.)
18. Nipple
19. Plug
20. Tee
21. Shut-off cock
22. Nipple
23. Elbow
24. Elbow
25. Shut-off cock
26. Nipple
27. Nipple
28. Tee
29. Reducing connector
30. Elbow
31. Elbow
32. Screw
33. Nut
34. Washer
35. Nut
36. Lockwasher
37. U-bolt
38. Bracket
39. Bracket
40. Coolant pump and motor assembly
41. Hose assembly
42. Hose assembly
43. Elbow
44. Capscrew
45. Control box
46. Screw
47. Nut
48. Clamp
49. Screw
50. Nut
51. Bracket
52. Screw
53. Nut
54. Clamp
55. Screw
56. Nut
57. Clamp
58. Bracket
59. Wiring harness
60. Screw
61. Nut
62. Clamp
63. Screw
64. Nut
65. Bracket
66. Screw
67. Nut
68. Nameplate
69. Nipple (Used only when fuel burning winterization kit is installed.)
70. Hose assembly

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Figure 4-7. Electric Winterization Kit (Sheet 1 of 3)

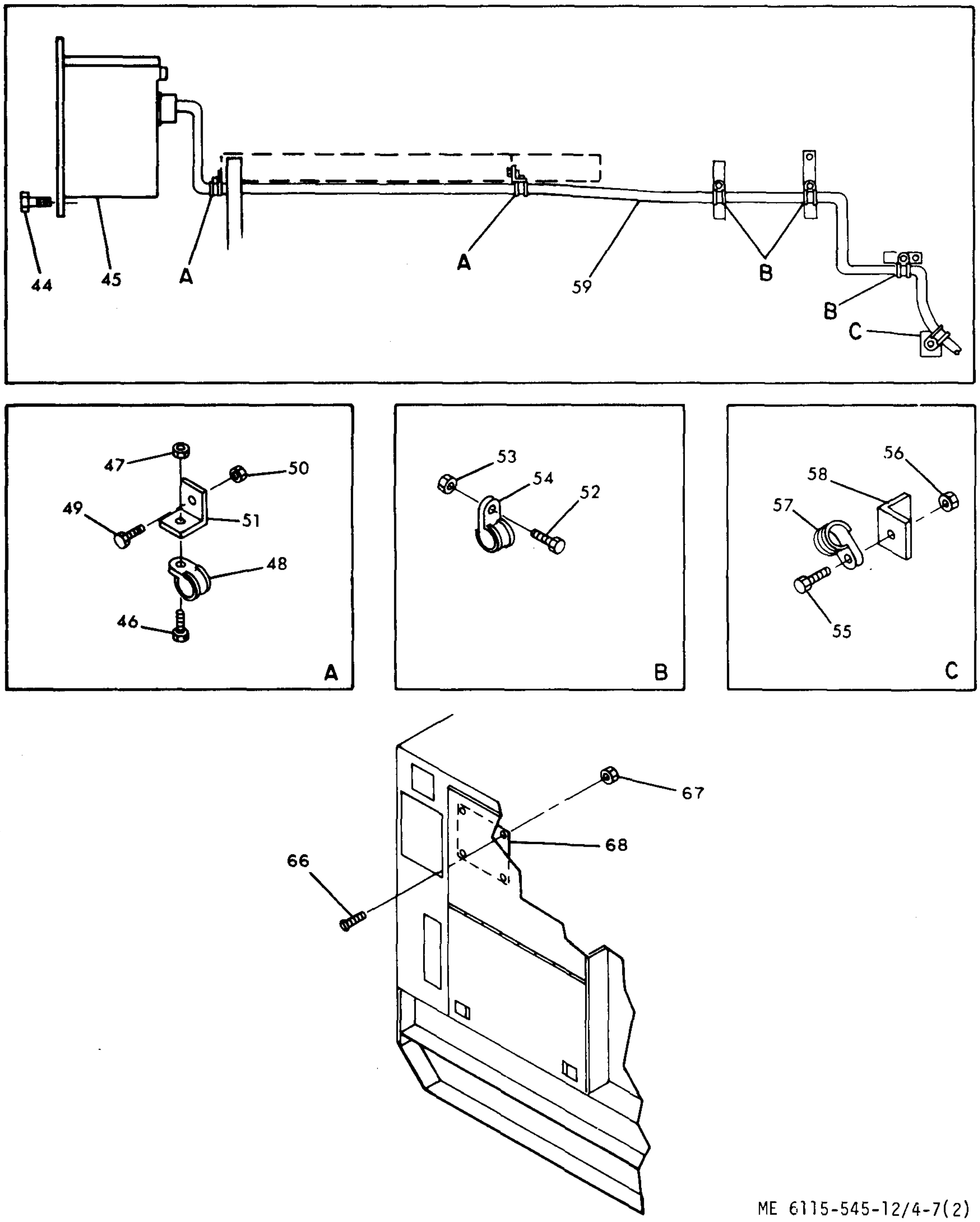
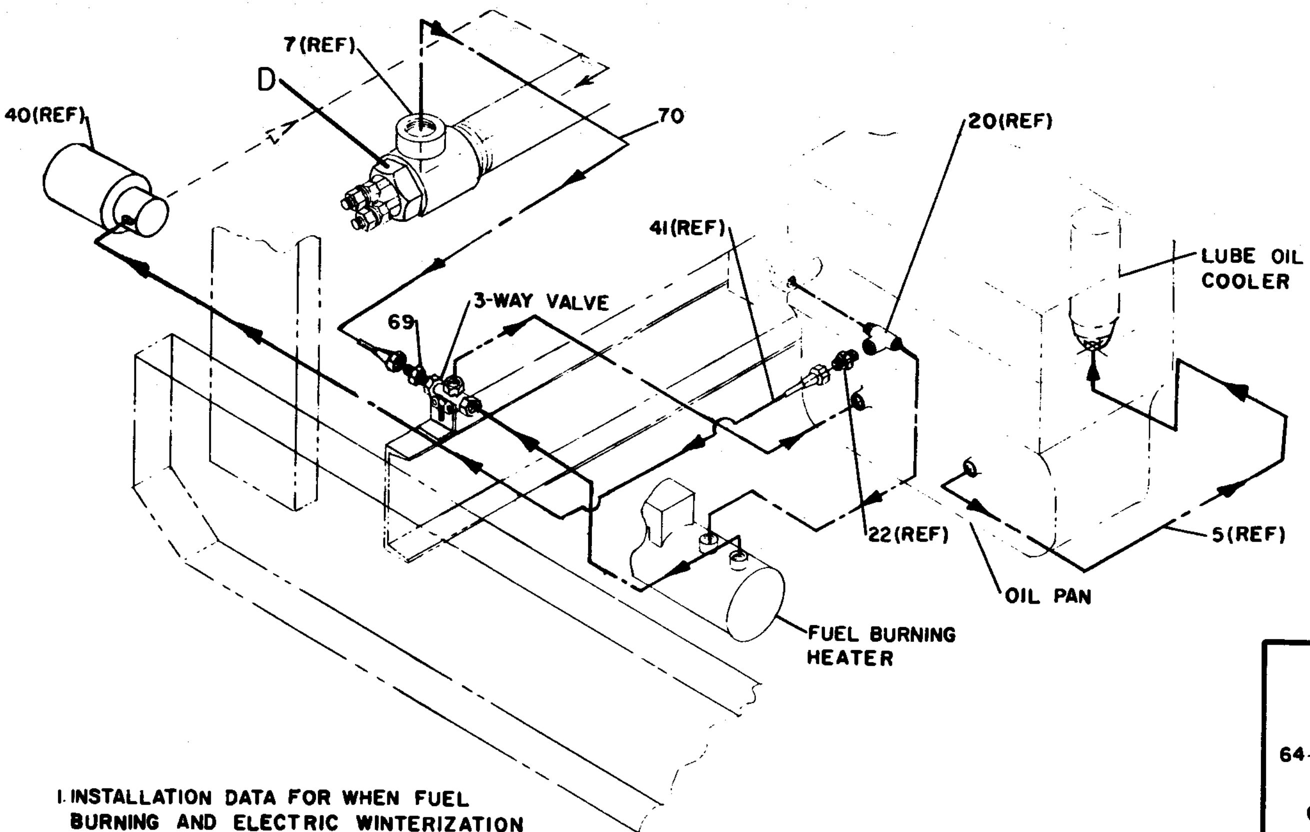
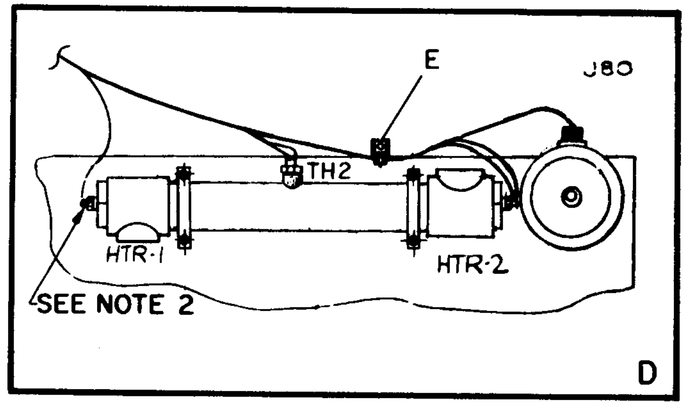


Figure 4-7. Electric Winterization Kit (Sheet 2 of 3)



1. INSTALLATION DATA FOR WHEN FUEL BURNING AND ELECTRIC WINTERIZATION KITS ARE USED TOGETHER.
2. INSTALL RED SLEEVING OVER LEADS, CONNECT LUGS TO STUDS AND SLIP SLEEVING OVER CONNECTIONS.



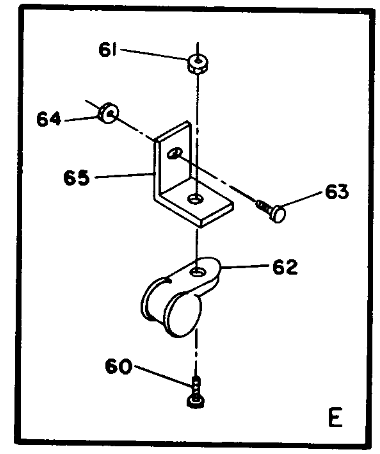


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Figure 4-7. Electric Winterization Kit (Sheet 3 of 3)

Table 4-3. Electric Winterization Kit Preventive Maintenance Checks and Services

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)	
1	x						Power cable.	Connect cable to power supply.	(para 2-25 and 4-18)
2	x						Coolant shutoff cocks.	Open shutoff cocks.	(para 2-25)
3	x						Generator set radiator.	Check for proper coolant level.	(para 3-41)
4	x						Generator set doors.	Close all doors.	(fig. 1-1 and 1-2)
5		x				x	Coolant hoses	Check for leakage.	(para 4-22)
6			x				Coolant shutoff cocks.	Close shutoff cocks.	(para 2-25)
7			x				Power cable.	Remove from power source.	(para 2-25 and 4-19)
8						x	Coolant lines.	Tighten lines and check condition.	(para 4-22)
9						x	Attaching hardware	Tighten hardware.	(para 4-22)
10						x	Wiring harness.	Inspect for frayed insulation and security of terminal lugs and damaged threads, bent, loose, or missing pins of connectors.	(para 4-26)
11						x	Coolant pump.	Test for proper operation.	(para 4-22)
12						x	Thermostat.	Test for proper operation.	(para 4-23)
13						x	Heating elements.	Test heating elements.	(para 4-24)

noted below when fuel burning winterization kit and electric winterization kit are used together. (See sheet 2 of figure 4-7.)

(1) Disconnect hose (70) from elbow (13) and elbow (69). Remove nipple (69) from three way valve (67, fig. 4-1) and install plug (64) into three way valve (67).

(2) Disconnect hose (42, fig. 4-7) from nipple (18) and elbow (31). Remove adapter (18) and replace plug (49, fig. 4-1).

(3) Disconnect hose (47, fig. 4-1) from elbow (43) and elbow (50). Remove elbow (43) and replace plug (19, fig. 4-7).

d. Refer to paragraph 4-18 and replace plugs and plates removed during installation.

e. Fill radiator with proper coolant in accordance with table 2-1 and check for leaks.

4-20. Preventive Maintenance.

To insure that the electric winterization kit is ready for operation at all times, when installed on the generator set, 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 kit 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 kit or the end item generator to which it is attached. All deficiencies and shortcomings SHALL be recorded together with the corrective action on the applicable form at the earliest possible opportunity. Air Force users shall refer to the applicable inspection manuals and work card sets in the T. O. 35C2-3- Series for periodic preventive maintenance requirements and table 4-3 for detailed procedure.

4-21. Troubleshooting.

Table 4-4 provides information useful in diagnosing, isolating, and correcting unsatisfactory operation or failure of the electric winterization kit. (See figures 1-23, 1-26 or 1-27, and 4-6.)

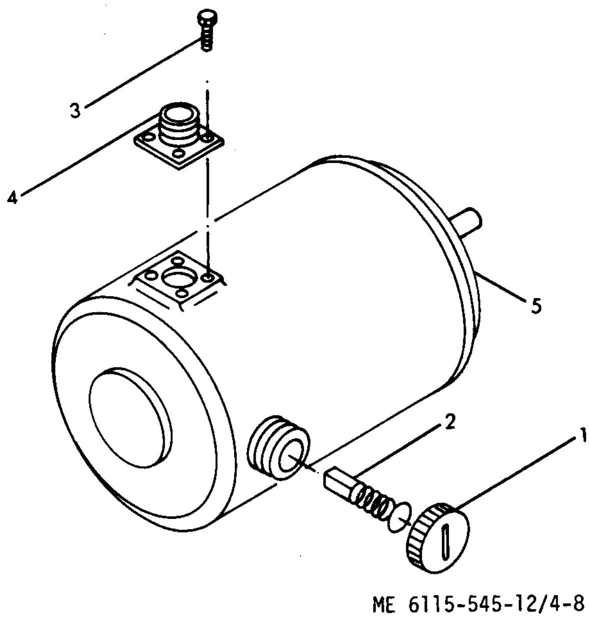
4-22. Coolant Pump and Motor Assembly Inspection, Testing, and Replacement.

a. Inspection. Proceed as follows:

(1) See figure 4-7 and inspect motor assembly for overheating and inspect coolant pump for leaks, loose connections and loose mounting.

(2) See figure 4-8, remove brushcap (1) and check motor brush and spring (2) for damage or excessive wear. Brushes should be at least 1/4 inch long.

(3) See figure 4-8 and check connector (4) for bent pins or damaged threads.



1. Brushcap
2. Brush and spring
3. Screw
4. Connector
5. Motor

Figure 4-8. Coolant Pump Motor - Brush and Connector Replacement

b. Testing. Coolant pump and motor assembly (40, fig. 4-7) testing consists of an operational verification and is performed as follows:

(1) Set heat control switch to OFF position.

(2) Crack the fitting on the output of the coolant pump until a very slow leak is observed.

(3) Set heater control switch to ON position and observe the leak just created in step (2) above. If the leakage rate does not increase, the pump is defective and must be replaced.

(4) Tighten the fitting loosened in step (2) above.

c. Replacement. Proceed as follows:

(1) See figure 4-8 to remove and replace worn or damaged brushes (2) and connector (4).

(2) See figure 4-7 to remove and replace coolant pump assembly (40).

4-23. Thermostat Switch Inspection, Testing and Replacement.

a. Inspection. Inspect the thermostat switch (9, fig. 4-7) for loose connection, frayed wires, corrosion, and loose mounting.

b. Testing.

(1) Remove thermostat switch (9, fig. 4-7) and plug heat exchanger opening.

(2) Fill a container with clean water and place thermometer in water. Suspend temperature sensing end of switch in water.

(3) Heat water and check switch for continuity. Observe water temperature. Switch continuity should be indicated between terminals up to 150° +5°F and open thereafter.

(4) Permit water to cool and observe that continuity is again indicated at 130° +5°F.

(5) If switch fails to meet above tests, it should be replaced.

c. Replacement. Replace thermostat switch as illustrated (9, fig. 4-7).

4-24. Heating Elements Inspection, Testing and Replacement.

See figure 4-7 and proceed as follows:

a. Inspection.

(1) Check that heating elements (6, fig. 4-7) are screwed securely into both ends of electric winterization pipe (10).

(2) Check that electrical connections to both heater elements are secure and protective sleeving is installed.

b. Testing. To test heating element, proceed as follows:

(1) Remove electrical lead from one terminal of heating element (6, fig. 4-7).

(2) Use a multimeter and check resistance between heating element case and terminal. Reading should indicate an open circuit.

(3) Check resistance between heating element terminals. Resistance should be between 27 and 33 ohms.

(4) If heater element resistance check does not satisfy above requirements, heating element is defective and must be replaced.

c. Replacement. Remove and replace heating elements (6) as illustrated in figure 4-7.

4-25. Hoses and Fittings Inspection, Repair and Replacement.

See figure 4-7 and proceed as follows:

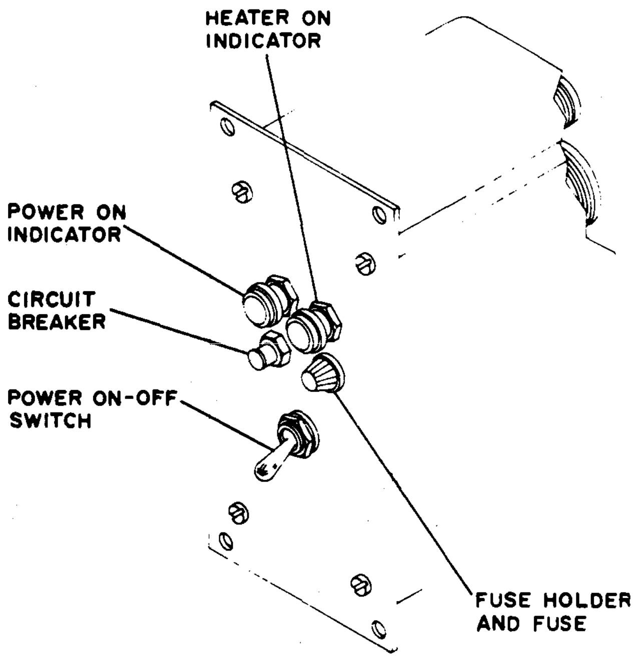
a. Inspection.

(1) Check all hoses for cracks and coolant leaks.

(2) Check hoses and pipe fittings for

Table 4-4. Electric Winterization Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Control box POWER ON switch ON, and nothing happens.	a. Power cable not connected to power supply.	a. Connect power cable.
	b. Blown fuse.	b. Replace fuse (para 4-28).
	c. Circuit breaker open.	c. Reset circuit breaker (para 4-27).
	d. Defective control box.	d. Replace if defective (para 4-27).
2. Heaters inoperative.	a. Thermostat switch.	a. Replace switch (para 4-23).
	b. Defective heater elements.	b. Replace elements (para 4-24).
	c. Defective wiring.	c. Replace wiring (para 4-26).
3. Coolant pump inoperative.	a. Defective pump.	a. Replace pump and motor assembly (para 4-22).
	b. Defective motor.	b. Replace brushes and/or connector (para 4-22).
4. HEATER ON indicator inoperative.	a. Defective lamp.	a. Replace lamp (para 4-28).



1. UNSCREW LENS AND REMOVE LAMP BY PRESSING IN AND TURNING COUNTER-CLOCKWISE.
2. INSTALL NEW LAMP AND LENS.
3. UNSCREW FUSE CAP AND REMOVE FUSE BY TURNING THE CAP COUNTERCLOCKWISE.

Figure 4-9. Electric Winterization Kit Control Box Fuse and Lamp Replacement

looseness, damage, and coolant leaks.

b. Repair. Hoses and fittings are to be replaced, not repaired.

c. Replacement. Replace a hose assembly or fitting as follows:

(1) Removal:

(a) Close heater system shutoff cocks.

(b) Remove hose assembly being replaced.

(c) If fitting is to be replaced, remove the fitting and plug opening until part is replaced.

(2) Installation. Install hose assembly using removal steps in reverse order.

4-26. Wiring Harnesses Inspection, Repair, and Replacement.

See figure 4-7 and proceed as follows:

a. Inspection.

(1) Inspect wiring harness (59, fig. 4-7) for frayed insulation, cracked or loose ty-wraps, loose harness clamping, and loose connection to components and plugs.

(2) Inspect wiring harness connectors for loose, bent or missing pins.

b. Repair. Tape frayed insulation, replace cracked or loose ty-wraps, tighten wiring harness mounting clamps and tighten all electrical connections.

c. Replacement.

(1) Removal. Tag and disconnect all electrical leads and connectors from wiring harness (59, fig. 4-7) to be removed. Remove all harness clamps and remove wiring harness. If 30% of the harness wires are defective, the harness must be rebuilt by direct maintenance level.

(2) Installation. Place wiring harness (59, fig. 4-7) in position, install all harness clamps. Install red sleeving over each wire terminating at heating element (6, fig. 4-7), adjacent to the manual shutter control. Reconnect electrical leads and connectors. Remove tags.

4-27. Control Box Inspection, Testing, and Replacement.

See figure 4-7 and proceed as follows:

a. Inspection. Proceed as follows:

(1) See figure 4-7 and inspect control box (45) for loose mounting, loose connections, and other evidence of damage.

(2) See figure 4-9, and inspect fuseholder assembly, fuse, indicator light assemblies, circuit breaker, and power switch for loose mounting and other damage.

b. Testing. Test control box as follows:

(1) Set circuit breaker to close position.

(2) Set switch to ON position.

(3) Using multimeter, check resistance across pins J49-A and J49-B. Resistance should be approximately 7 ohms. Removal of fuse, opening of circuit breaker, or setting switch to OFF position should remove continuity. If continuity is not removed, repair control box at next higher level of maintenance.

c. Replacement. See figures 4-8 and 4-9 and proceed as follows:

(1) Removal. Disconnect two wiring harness connectors (59, fig. 4-7) from rear of control box. Unscrew four capscrews (44) which secure box to panel and remove control box (45).

(2) Installation. Secure control box (45, fig. 4-7) to panel with four capscrews (44). Screw two wiring harness (59) connectors to receptacles at rear of control box (45).

4-28. Control Box Fuse and Lamp Testing and Replacement.

See figure 4-9 to remove and install control box lamps and fuse.

a. Fuse. See figure 4-9 and remove fuse. Using multimeter, check fuse for continuity. If continuity is not obtained, replace fuse.

b. Lamps. Press to test each indicator. If an indicator does not illuminate, see figure 4-9 and replace lamp. Press to test indicator again. If lamp does not illuminate, replace indicator light assembly at next higher level of maintenance.

Section IV. WHEEL MOUNTING KIT

4-29. General.

a. The wheel mounting kit is provided to enable the engine generator set to become mobile. 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 mechanical parking brake locks rear wheels against rotation and is actuated by a hand lever located at the right rear of the kit.

b. When the wheel mounting kit is installed on the generator set, the set may be towed a maximum of 5 mph on paved highways. The kit has a ground clearance of 8 inches and front wheels turn for steering. For wheel mounting kit operating instructions, refer to paragraph 2-26.

4-30. Preventive Maintenance.

To insure that the wheel mounting kit is ready for operation at all times, when installed on the generator set, 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 kit 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 kit or the end item generator to which it is attached. All deficiencies and shortcomings SHALL be recorded together with the corrective action on the applicable form at the earliest possible opportunity. Air Force users shall refer to the applicable inspection manuals and work card sets in the T. O. 35C2-3- Series for periodic preventive maintenance requirements and table 4-5 for detailed procedure.

4-31. Troubleshooting.

Table 4-6 contains information useful in diagnosing and correcting unsatisfactory operation of the wheel mounting kit.

4-32. Kit Maintenmce Procedures.

Inspection, test, service, and repair of the wheel mounting kit (figures 4-10, 4-11 and 4-12) consists of preventive and corrective maintenance of the various components of the kit as described in table 4-5 and paragraphs 4-33 through 4-35.

4-33. Wheels and Tires.

See figure 4-10 and proceed as follows:

a. Inspection, Test and Service.

(1) Visually inspect tires (5, fig. 4-10) to assure there are no cuts on the sidewalls and that each tire has good tread. Check that wheels (3) are securely mounted.

(2) Check tires for proper air pressure using a standard tire pressure gage. Tire pressure should be 60 psi. Service with compressed air as required.

KEY to fig. 4-10.

1. Nut
2. Washer
3. Wheel
4. Tube
5. Tire
6. Nut
7. Washer
8. Bolt
9. Cotter pin
10. Pin
11. Tow
12. Cotter pin
13. Pin
14. Cotter pin
15. Pin
16. Nut
17. Clevis
18. Clevis
19. Brake rod
20. Lube fitting
21. Pin
22. Lever
23. Bearing
24. Shaft
25. Tie rod
26. Nut
27. Cotter pin
28. Nut
29. Tie rod end
30. Spindle and knuckle
31. Grease fitting

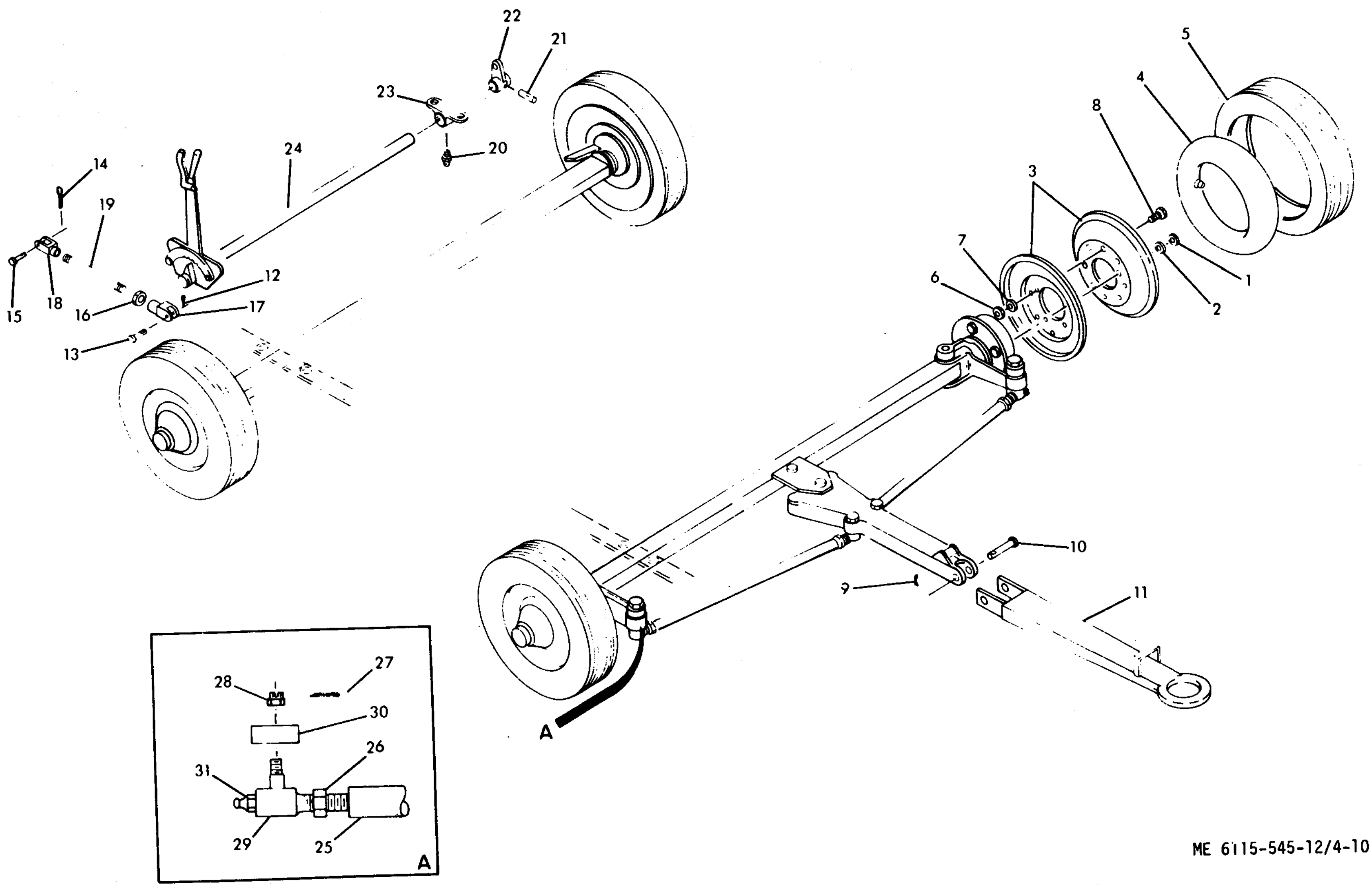
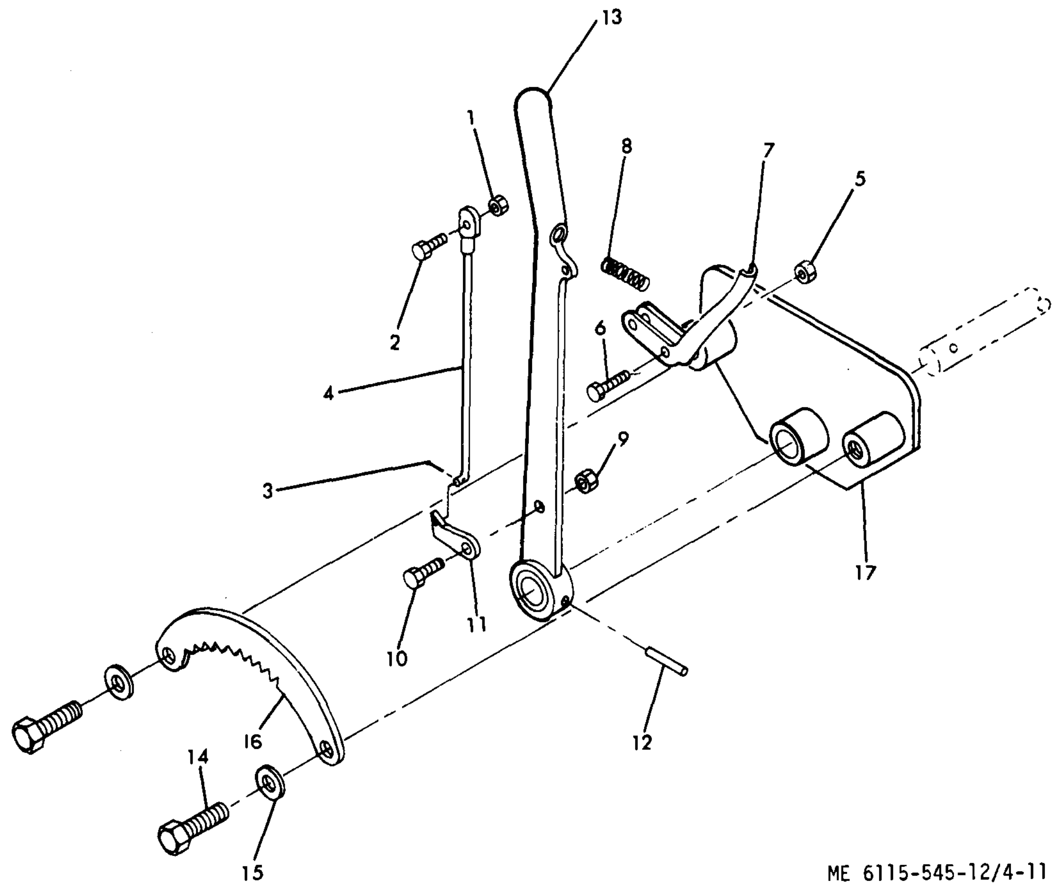


Figure 4-10. Running Gear Assembly

Table 4-5. Wheel Mounting Kit Preventive Maintenance Checks and Services

B - Before Operation A - After Operation M - Monthly (100 hrs)
D - During Operation W - Weekly (40 hrs) S - Semi Annual (500 hrs)

ITEM NO.	INTERVAL OPERATOR DAILY B	D	A	ORG W	M	S	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
1	x					x	Tires.	Note: Perform Item No. 10 for excessive tire wear or uneven wear. Perform Item No. 11 for uneven tire wear or if trailer wanders while being towed. Inspect tires for cuts, breaks and blisters and evidence of deflation, excessive deterioration, or wear.	(para 4-33)
2							Tires.	Service tires.	(para 4-33)
3	x						Safety chain.	Inspect safety chain for condition and proper connection.	(para 2-26)
4							Steering linkages and pivot points.	Lubricate steering linkage and pivot points.	(para 3-3 and 3-4)
5						x	Wheel bearings.	Clean, inspect, and lubricate.	(para 4-34)
6						x	Attaching hardware.	Tighten hardware.	
7	x						Kit to generator skid base attaching hardware.	Check for security and tighten hardware as required.	(para 4-42)
8						x	Wheel brakes.	Inspect linings for wear and adjust brakes.	(para 4-35)
9	x						Handbrake.	Check for proper operation.	(para 2-26)
10	x						Wheels.	Inspect security of wheels.	(para 4-33)
11						x	Wheel alignment.	Check wheel alignment.	(para 4-36)
12						x	Front wheel toe-in.	Check front wheel toe-in.	(para 4-37)
13	x						Tow bar assembly.	Inspect for evidence of damage, misalignment, and freedom of movement.	(para 2-26)
14							King pins.	Inspect for wear.	(fig. 4-12)
15							Tie rod ends.	Inspect for wear.	(fig. 4-12)



1. Nut	5. Nut	9. Nut	13. Lever
2. Screw	6. Screw	10. Screw	14. Screw
3. Cotter pin	7. Latch	11. Pawl	15. Washer
4. Rod	8. Spring	12. Pin	16. Ratchet

17. Bracket

Figure 4-11. Hand Lever and Bracket Assembly

b. Removal.

(1) Remove wheels (3) and tires (5) as illustrated in figure 4-10, observing the instructions in steps (2) and (3) below.

WARNING

If parking brakes must be released to perform maintenance when generator set is jacked, release brakes prior to jacking. Do not perform maintenance on a jacked generator set unless it is properly blocked.

(2) Block wheel to prevent movement when generator set is jacked.

(3) 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.

c. Repair and Replacement.

(1) Refer to Appendix A for listing of applicable service manual for repair of pneumatic tires.

(2) Install wheels (3) and tires (5) as illustrated in figure 4-10.

(3) Remove support blocks, lower generator set and remove jack.

4-34. Wheel Bearings.

Jack generator set and remove wheel (3, fig. 4-10) as described in paragraph 4-33 and proceed as follows:

Table 4-6. Wheel Mounting Kit Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Abnormal tire wear.	a. Improper tire pressure.	a. Correct tire pressure. (Refer to paragraph 4-33.)
	b. Axle assemblies mounting hardware loose.	b. Tighten hardware.
	c. Alignment.	c. Correct wheel alignment. (Refer to paragraph 4-36.)
2. Wheel wobbles.	a. Lug nuts loose.	a. Tighten lug nuts.
	b. Defective or improperly adjusted wheel bearings.	b. Adjust or replace wheel bearings. (Refer to paragraph 4-34.)
	c. Bent wheel.	c. Replace wheel. (Refer to paragraph 4-33.)
3. Kit pulls to one side.	a. Improper tire pressure.	a. Correct tire pressure. (Refer to paragraph 4-33.)
	b. Wheel brake dragging.	b. Adjust brakes. (Refer to paragraph 4-35.)
4. Kit tends to wander.	a. Improper tire pressure.	a. Correct tire pressure. (Refer to paragraph 4-33.)
	b. Axle assemblies mounting hardware loose.	b. Tighten hardware.

a. Removal. Remove wheel bearings (5) and (11) as illustrated in figure 4-12. Do not remove bearing cups (13) and (12) unless they are found to be defective at time of inspection. Tap cups (13) and (12) from drum (14) using drift and hammer.

b. Inspection, Service, and Repair.

(1) Clean parts with a cleaning solvent, Federal Specification P-D-680, and dry thoroughly.

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

(3) Inspect bearings (5 and 11, fig. 4-12) for smoothness of rotation and cups (13) and (12) for pitting.

(4) Repair by replacing defective parts. Bearings and cups are matched sets.

(5) 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 cups, outside and inside diameter of grease seal (10) and axle.

c. Installation. Install wheel bearings (5) and (11) as illustrated in figure 4-12 observing the following:

(1) Ensure brake shoe linings (17 and 18, figure 4-12) and drums (14) are free of grease prior to installation.

(2) Install bearing cups (13) and (12) and grease seal (10) using sleeves the same diameter as cups and seal.

(3) Replace washer (4) and nut (3) and adjust wheel bearings (5) and (11) as specified in paragraph 4-34 d. prior to installing cotter pin (2) and grease cap (1).

d. Adjustment. See figure 4-12 and adjust wheel bearings (5) and (11) as follows:

(1) Tighten nut (3, fig. 4-12) until it is snug. Back off nut until next cutout in nut is aligned with cotter pin (2) hole in axle.

(2) Spin wheel to ensure it is free to rotate and bearings (5) and (11) are not binding.

(3) Install new cotter pin (2) and grease cap (1).

e. Install wheel on axle, remove support blocks, lower generator set and remove jack.

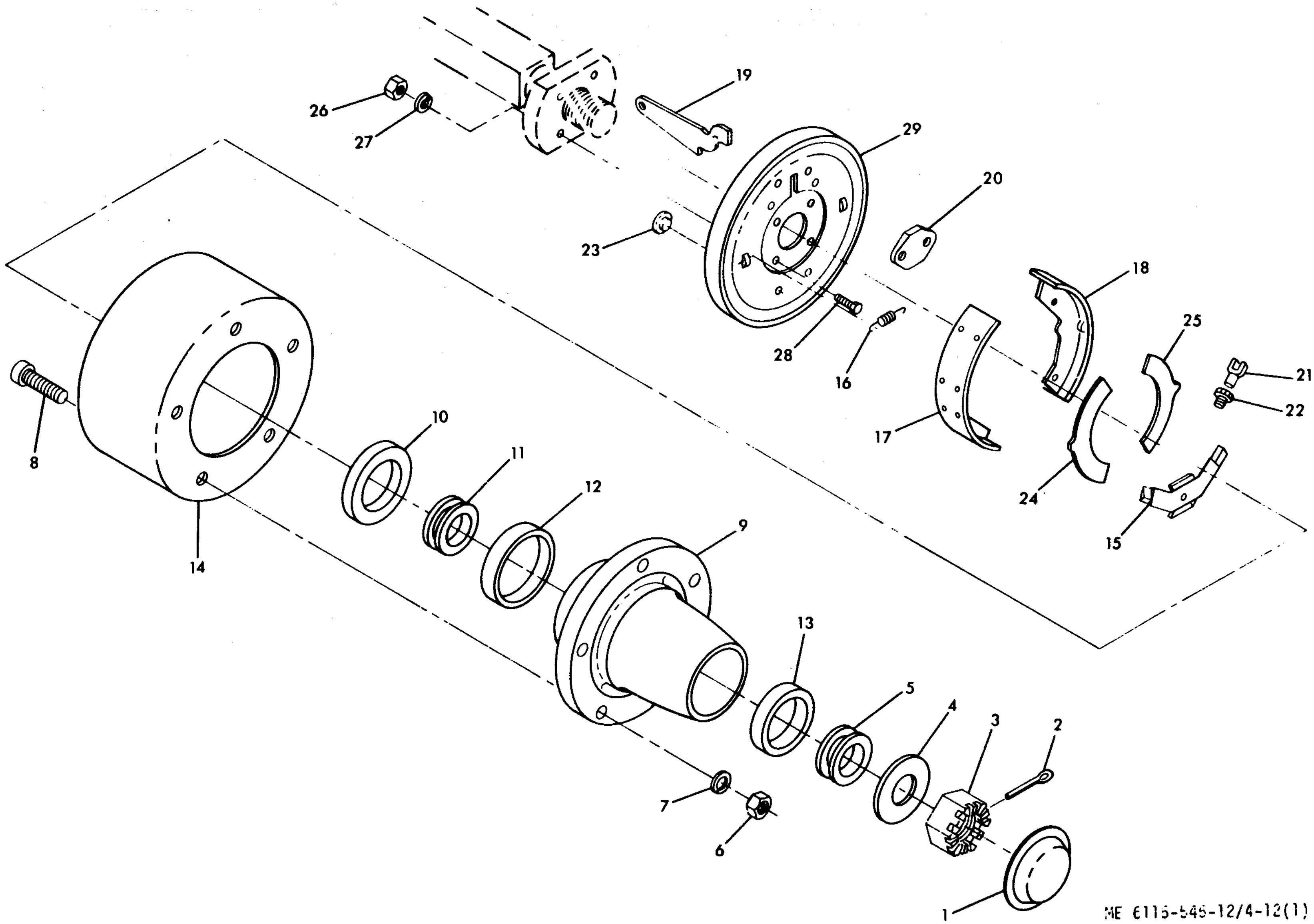
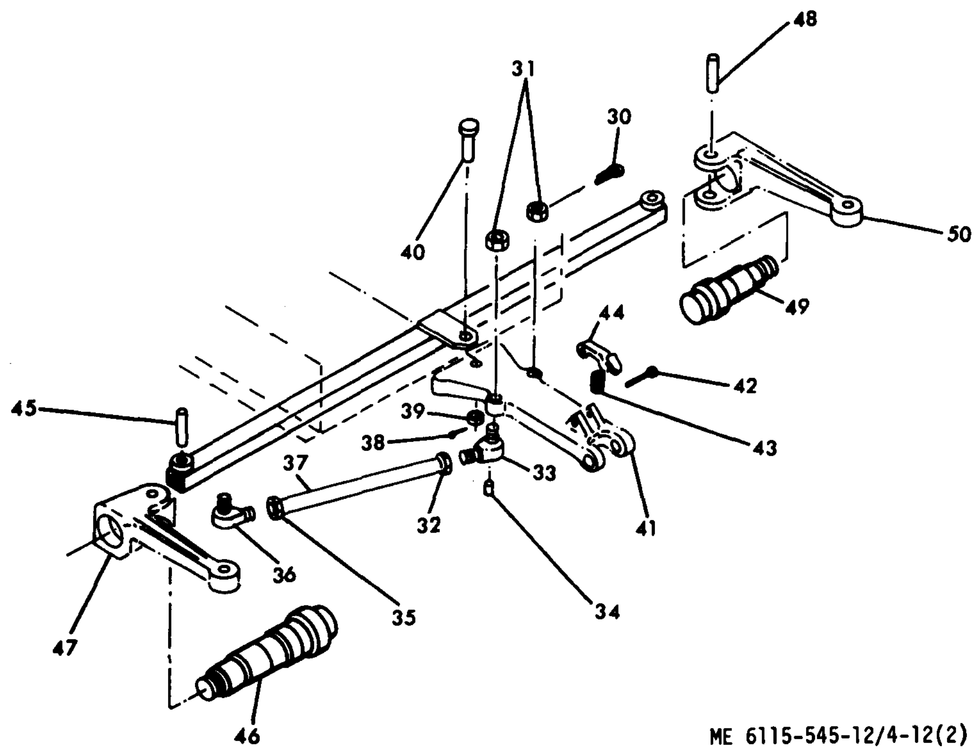


Figure 4-12. Hub and Brake and Front Unit Axle Assemblies (Sheet 1 of 2)



1. Grease cap
2. Cotter pin
3. Nut
4. Washer
5. Wheel bearing (outer)
6. Nut (5)
7. Washer (5)
8. Stud (5)
9. Hub
10. Grease seal
11. Wheel bearing (inner)
12. Bearing cup
13. Bearing cup
14. Drum
15. Spring clip
16. Spring
17. Brake shoe
18. Brake shoe
19. Lever (4)
20. Wedge (4)
21. Pin (2)
22. Brake adjusting bolt (2)
23. Dust cover
24. Lever
25. Lever
26. Nut (4)
27. Washer (4)
28. Screw (4)
29. Stud plate
30. Cotter pin (4)
31. Nut (4)
32. Nut RH (2)
33. Tie rod end RH (2)
34. Lube fitting (9)
35. Nut LH (2)
36. Tie rod end LH (2)
37. Tie rod (2)
38. Cotter pin
39. Washer
40. Pin
41. Arm
42. Pin
43. Spring
44. Latch
45. King pin
46. Spindle
47. Knuckle
48. King pin
49. Spindle
50. Knuckle

Figure 4-12. Hub and Brake and Front Unit Axle Assemblies (Sheet 2 of 2)

4-35. Wheel Brakes and Hand Lever and Bracket Assembly.

Jack generator set as described in paragraph 4-33. Proceed as follows:

a. Removal. Remove components of wheel brakes and hand lever and bracket assembly as illustrated in figures 4-10, 4-11 and 4-12 observing the following:

(1) As necessary, remove components of wheel brakes as illustrated in figures 4-10 and 4-12.

NOTE

Pry spring clip (15, fig. 4-12) off stud plate (29) before attempting to remove brake adjustment bolt (22).

(2) As necessary, remove components of hand lever and bracket assembly as illustrated in figure 4-11.

b. Cleaning and Inspection.

(1) Clean parts, except brake shoes, with cleaning solvent, Federal Specification P-D-680, 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) Replace defective parts.

c. Lubrication.

(1) Apply thin film of grease, conforming to Military Specification MIL-G-10924 to stud plate (29, fig. 4-12) brake shoe contact areas.

(2) Apply film of lubricating oil, conforming to Military Specification MIL-L-15016 to threads of brake adjustment bolts (22) and side slots in wedge (20).

d. Installation. Install components of wheel brakes and hand lever and bracket assembly as illustrated in figures 4-10, 4-11 and 4-12 observing the following:

(1) When installing spring clip (15, fig. 4-12), use hollow punch to tap spring clip onto plate stud (29).

(2) Ensure brake shoes (17) and (18) and drums (14) are free of grease prior to installation.

(3) Install assembled wheel and drum assembly as illustrated in figures 4-10 and 4-12.

(4) As necessary, install components of hand lever and bracket assembly as illustrated in figure 4-11.

(5) Adjust wheel bearings, refer to paragraph 4-34.

(6) Adjust wheel brakes, refer to paragraph e. below.

e. Adjustment. Adjust wheel brakes as follows:

(1) Jack generator set as specified in paragraph 4-33.

(2) Remove dust covers (23, fig. 4-12) from stud plate (29). Adjust each wheel brake using a brake adjusting tool.

NOTE

Each brake shoe (17) and (18) must be adjusted individually.

(3) Rotate brake adjustment bolt (22) counterclockwise until shoe is snug against drum (14). 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. Rotate wheels to ensure they turn freely.

(5). Lower generator set and remove jack.

4-36. Wheel Alignment.

See figure 4-10 and check the alignment of the front wheels to the rear wheels proceeding as follows:

a. Place the trailer on a hard, flat, and level surface, with the front wheels placed in the straight-ahead position.

b. Use a straightedge position across the sides of the front and rear wheels to check that the front wheels align with the rear wheels except for a small amount of toe-in. (Refer to paragraph 4-37.)

c. If the front and rear wheels are not aligned, remove the cotter pin (27, fig. 4-10) and nut (28) that secure each tie rod end (29) to the spindles and knuckles (30). Disengage the tie rod end ball studs (29) and tie rods (25).

d. Using the straightedge, align the front and rear wheels so that they are in line on each side of the vehicle, except for a slight toe-in of the front wheels.

e. Loosen the nuts (26) that lock the tie rod ends (29) to the tie rods (25). Turn the tie rod ends in or out on the tie rods (25) until the tie rod ends (29) are aligned with the holes in the spindles and knuckles (30).

f. Insert the tie rod end ball studs (29) into the spindles and steering knuckles (30). Secure with the slotted hex nuts (28).

g. Recheck the wheel alignment as directed above and check the toe-in as directed in paragraph 4-37. If both are correct, tighten the nuts (26) between tie rods (25) and tie rod ends (29) and install the cotter pins (27) that secure the ball stud nuts (28).

4-37. Front Wheel Toe-In Adjustment.

See figure 4-10 and check and adjust the front wheel toe-in as follows:

a. Position the vehicle on a flat, hard, even surface, with the wheels positioned in the straight-ahead position. Check wheel alignment (paragraph 4-36).

b. Using yellow crayon, mark the front center of the tire tread at each front wheel. Carefully measure the distance between the marks.

c. Push the vehicle backwards in a straight line until the marks are positioned at the back of the wheel. Again measure the distance between marks. The measured distance between marks when at the rear must exceed the distance between the marks when at the front of the wheel by 1/4 inch.

d. If the toe-in is not correct, remove the cotter pin (27, fig. 4-10) and nut (28) that secure each tie rod end ball stud (29) to the spindles and knuckles (30). Disengage the tie rod end ball studs (29) and tie rods (25).

e. Using a straightedge along the sides of the front and rear wheels, position the front wheels so they are correctly aligned with just sufficient toe-in (refer to step c above).

f. Adjust the tie rod ends (29) on the tie rods (25) as directed in paragraph 4-36 above and reconnect the tie rods.

Section V. LOAD BANK

4-38. General.

a. (See figure 4-13). The load bank is a balanced three phase, four wire resistive type load which is used to maintain the generator set load at approximately half-load at 120/208 volts and 240/416 volts, at 50/60 Hz and 400 Hz. The generator set is protected against overloads by the load bank reject control system.

b. The load bank special purpose cable connects the automatic load bank reject control system into the load measuring system. The load bank is connected to the generator set load terminal board via the load bank four wire power cable. A load bank power on indicator lamp indicates when ac power is applied to load bank heating elements.

c. The load bank rotary selector switches permit changes in load from 0 to 50 percent of the generator set KW rating (60 KW) in four 7.5 KW increments of 25 percent of the load capacity (30KW) and permit operation at either 120/208 or 240/416 volts.

d. A load reject toggle switch provides for selection of automatic load reject or manual mode reject mode of operation. During automatic mode, the load measuring unit senses the generator set output (utility load plus load bank). If the combined load exceeds 50% of the generator set capacity of 60 KW, the load measuring unit applied to the load reject relay via the tactical relay box trips the load reject relay which trips the over temperatur reset switch trip coil (3 phase magnetic circuit breaker) removing the selected load from the generator set. (The load reject relay trips when the total current in any phase of the generator set rises to and remains at 125 percent plus or minus five percent of the maximum load bank capacity.) Thus, the utility load continues to be supplied without risk of generator set overload. When the generator set load diminishes the load bank is reconnected by manually resetting the over temperature reset switch. During the manual mode protection of the generator set against overloads is the responsibility of the operator by monitoring the generator set control panel KW meter. If sets rated load capacity is exceeded, the operator reduces or removes the load bank load with the % load selector rotary switch.

e. A fan and motor assembly provides for cooling the load bank resistive load (heater elements).

f. The thermostatic switch operates the trip coil of the over temperature reset switch removing the selected load from the generator set when temperature within load bank reaches 450° F + 15° F. The switch closes with temperature at 450° F + 15° F and opens with temperature at 351°F + 15° F.

g. The purpose of the resistive load (heater elements) is to provide a partial load for the generator set if the normal utility load is too low to keep set operating without carbonization of the engine.

h. For load bank operating instructions, refer to paragraph 2-27.

4-39. Installation.

See figures 1-1, 1-2, 1-21, 1-26 or 1-27, and 4-13 and proceed as follows:

a. Stop generator set.

b. Set % LOAD SELECTOR switch to OFF.

c. See figure 1-21 and, position and secure the load bank to the housing using six screws, 12 lock washers, and six nuts provided on set.

d. Remove the rear top left side screw and nut located on the generator set housing and, loosely mount the load bank loop clamps to the housing with screw provided.

e. Ensure special purpose cable 70-5098 plug p81 (6, fig. 4-14) is connected to load bank harness receptacle J81 (7) and cable is clamped (5) to load bank housing (95).

f. Ensure four wire power cable (13) is clamped (12) to load bank housing (95).

g. Run the load bank four-wire power cable (13) and special purpose cable (6) through the loop clamps (step d above) and tighten the screw and nut securely.

h. Run both cables (13) and (6) through the plate and sleeve assembly hole (fig. 3-15) into the engine generator set.

i. Connect the four-wire power cable wires (13, fig. 4-14) to the load terminal board terminals (figure 3-24) as follows:

Wire color	Load terminal
Green	L0
Black	L1
White	L2
Red	L3

j. Disconnect cable 70-1212 plug p51 from tactical relay box receptacle J51.

k. Connect special purpose cable plug P50 to cable 70-1212 plug J51 disconnected in step j. above.

l. Connect special purpose cable plug P51 (6, fig. 4-14) to tactical relay box receptacle J51.

m. Select voltage corresponding to generator set reconnection panel 120/208 or 240/416 (fig. 2-4) with the load bank voltage selector switch (fig. 2-9).

n. Perform test procedures as outlined in paragraph 4-42 b.

4-40. Preventive Maintenance.

To insure that the load bank kit is ready for operation at all times, when installed on the generator set, 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 kit 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 kit or the end item generator to which it is attached. All deficiencies and shortcomings SHALL be recorded together with the corrective action on the applicable form at the earliest possible opportunity. Air Force users shall refer to the applicable inspection manuals and work card sets in the T. O. 35C2-3- Series for periodic preventive maintenance requirements and table 4-7 for detailed procedure.

4-41. Troubleshooting.

Table 4-8 and figure 4-13 provide information useful in diagnosing, isolating, and correcting unsatisfactory operation or failure of the load bank.

4-42. Kit Maintenance Procedures.

See figures 4-13 through 4-14 and 4-16 and proceed as follows:

WARNING

Unless otherwise specified, ensure generator set is stopped prior to performing load bank maintenance procedures.

a. Inspection. Inspect the load bank as follows:

(1) Inspect the special purpose cable (6, fig. 4-14 and four-wire power cable (13) from the load bank for cracks, breaks, fraying, and other damage.

(2) Inspect special purpose cable (6) and four-wire power cable (13) clamps (5) and (12) for looseness.

(3) Inspect the cable clamps which secure special purpose cable (6) and four-wire power cable (13) at the top left of the housing for looseness.

(4) Inspect special purpose cable (6) and four-wire power cable (13) for excessive wear in the vicinity of clamps (5) and (12).

(5) Inspect the terminals of the load terminal board (fig. 3-24) for loose wire connections and for damage.

(6). Inspect the special purpose cable (6, fig. 4-14) plugs p50 and p51 for proper mating with receptacles.

(7) Inspect six screws, 12 lockwashers, and six nuts securing load bank to housing for looseness.

b. Testing. See figure 2-9 and proceed as follows:

(1) Set the load bank LOAD REJECT switch to MANUAL.

(2) Select voltage corresponding to the generator set reconnection panel 120/208 or 240/416 (fig. 2-4 with the VOLTAGE SELECTOR switch.

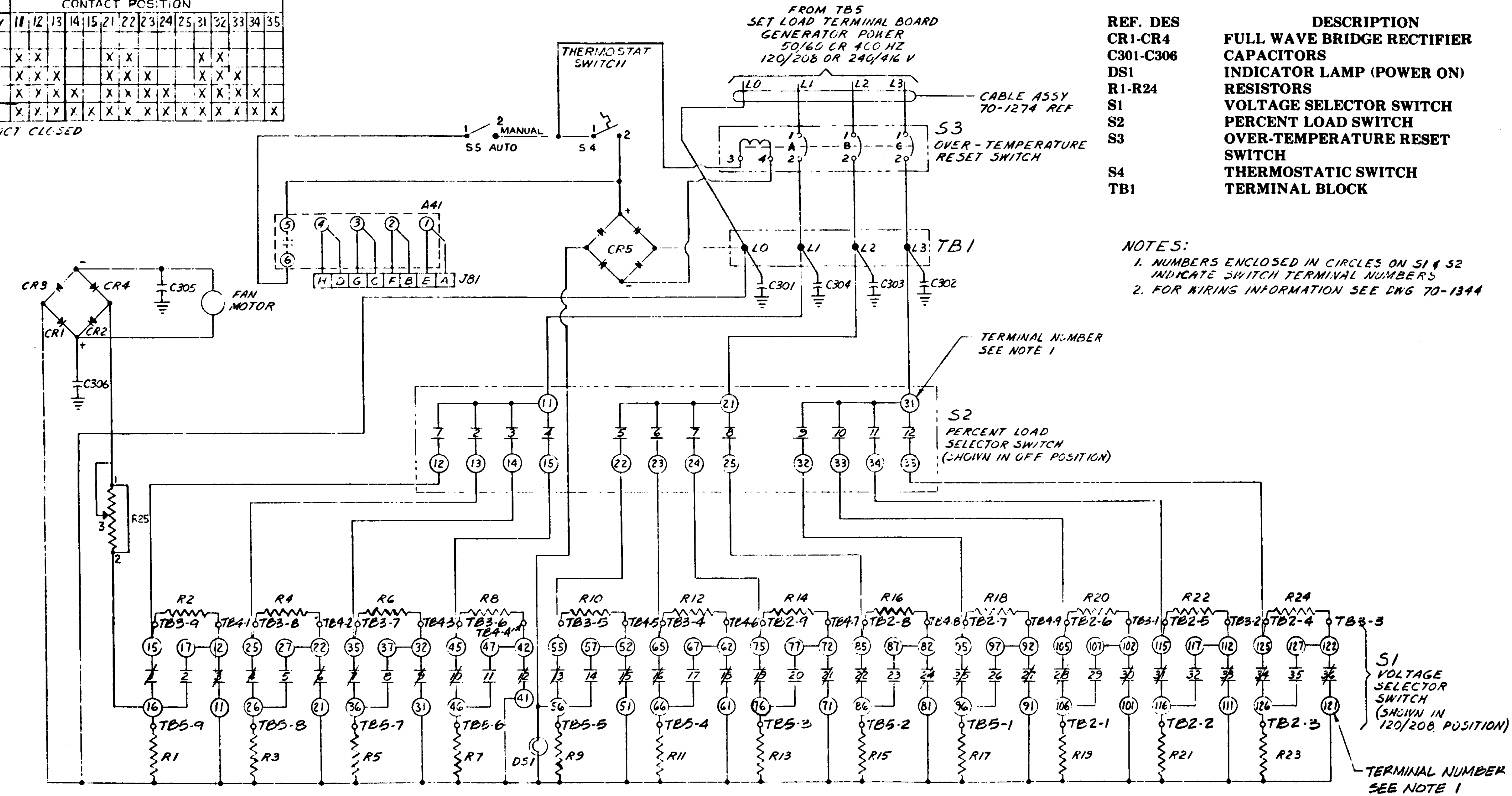
(3) Set the % LOAD SELECTOR switch to OFF.

(4) Refer to paragraph 2-12 and start generator set with no external load connected.

S2 SWITCH DEVELOPMENT

POSITION	CONTACT POSITION 11	12	13	14	15	21	22	23	24	25	31	32	33	34	35
OFF															
12.5 %	X	X				X	X				X	X			
25 %	X	X	X			X	X	X			X	X	X		
37.5 %	X	X	X	X		X	X	X	X		X	X	X	X	
50 %	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

X = CONTACT CLOSED



REF. DES	DESCRIPTION
CR1-CR4	FULL WAVE BRIDGE RECTIFIER
C301-C306	CAPACITORS
DS1	INDICATOR LAMP (POWER ON)
R1-R24	RESISTORS
S1	VOLTAGE SELECTOR SWITCH
S2	PERCENT LOAD SWITCH
S3	OVER-TEMPERATURE RESET SWITCH
S4	THERMOSTATIC SWITCH
TB1	TERMINAL BLOCK

NOTES:

1. *NUMBERS ENCLOSED IN CIRCLES ON S1 & S2 INDICATE SWITCH TERMINAL NUMBERS*
2. *FOR WIRING INFORMATION SEE DWG 70-1344*

S1 SWITCH DEVELOPMENT

POSITION	CONTACT POSITION 11	12	15	16	17	21	22	25	26	27	31	32	35	36	37	41	42	45	46	47	51	52	55	56	57	61	62	65	66	67
120/208V	X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X	
240/416V				X	X				X	X				X	X				X	X				X	X				X	X

POSITION	71	72	75	76	77	81	82	85	86	87	91	92	95	96	97	101	102	105	106	107	111	112	115	116	117	121	122	125	126	127
120/208 V	X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X	
240/416 V				X	X				X	X				X	X				X	X				X	X				X	X

X = CONTACTS CLOSED

Figure 4-13. Load Bank Schematic Diagram.

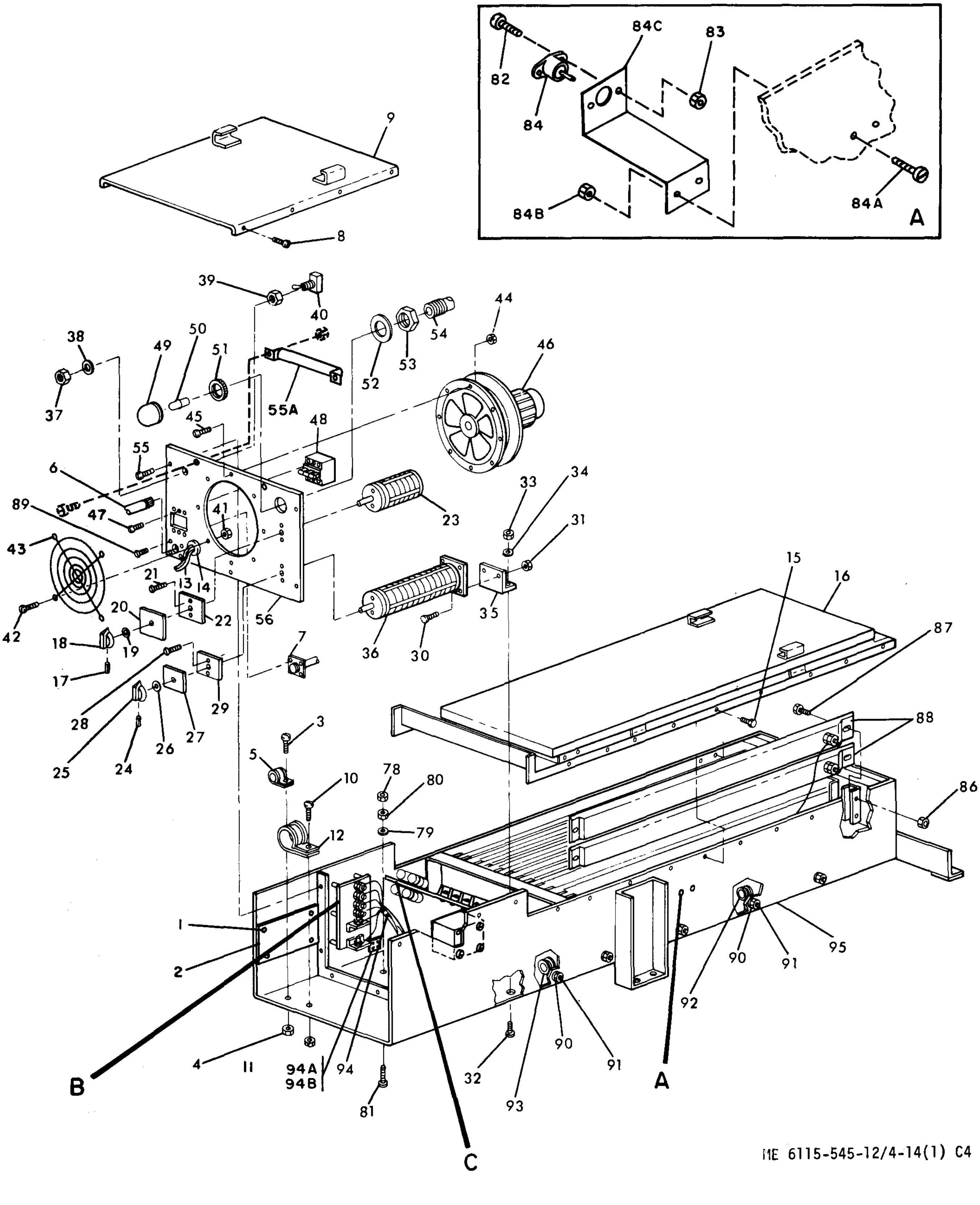


Figure 4-14. Load Bank (Sheet 1 of 2)

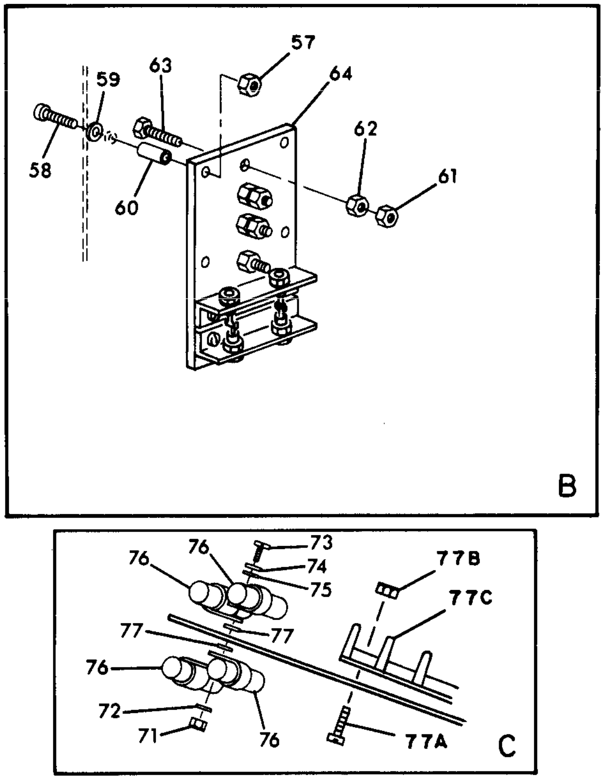


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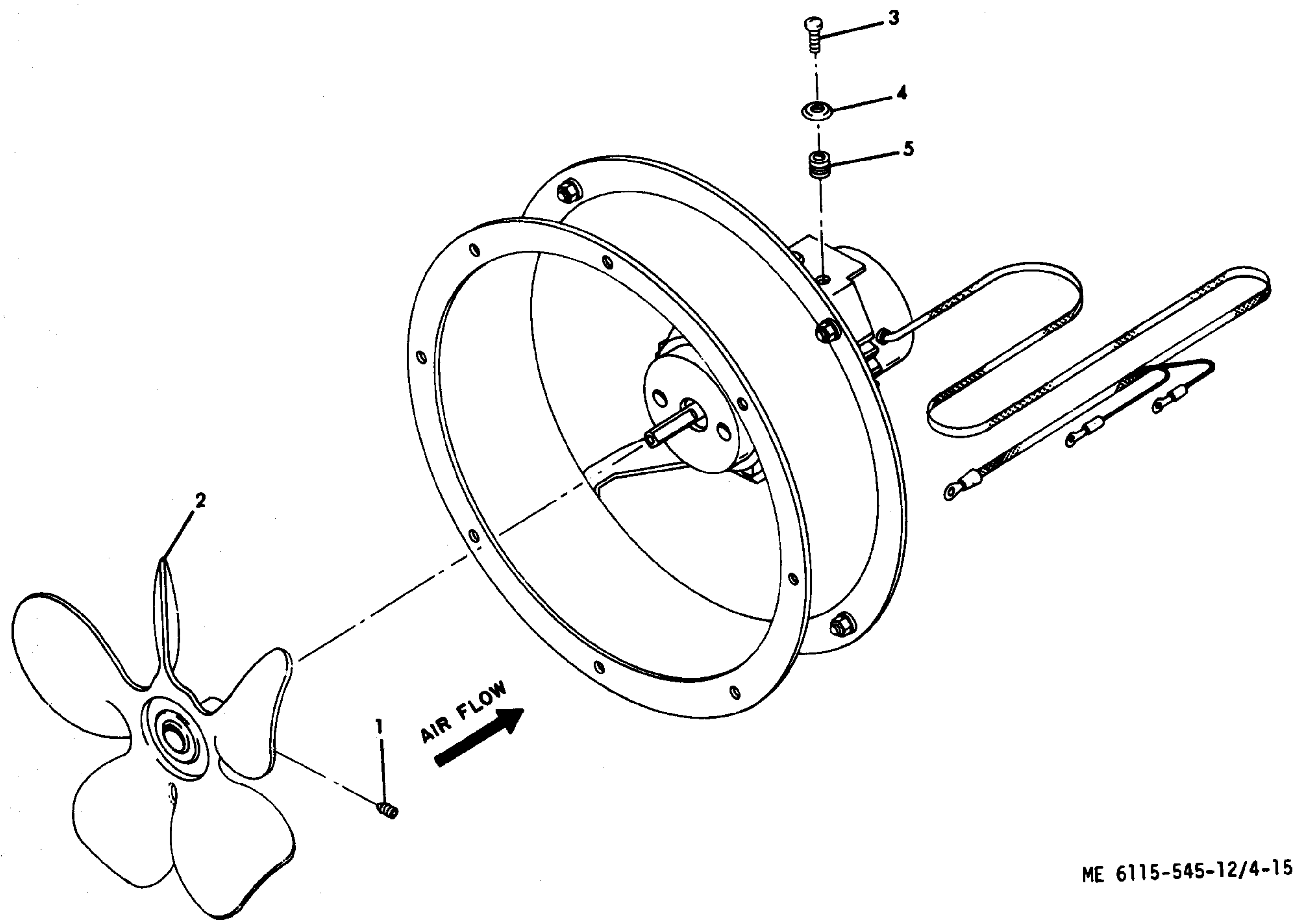
Figure 4-14. Load Bank (Sheet 2 of 2)

1. Rivet
2. Instruction plate
3. Screw
4. Nut
5. Harness clamp
6. Special purpose cable
7. Wiring harness (J81)
8. Screw
9. Cover
10. Screw
11. Nut
12. Harness clamp
13. Four wire power cable
14. Grommet
15. Screw
16. Cover
17. Setscrew
18. Knob
19. Packing
20. Escutcheon plate
21. Screw
22. Plate
23. Load selector switch
24. Setscrew
25. Knob
26. Packing
27. Escutcheon plate
28. Screw
29. Plate
30. Screw
31. Nut
32. Screw
33. Nut
34. Washer
35. Bracket
36. Voltage selector switch
37. Nut
38. Washer
39. Nut
40. Load reject switch
41. Nut
42. Screw
43. Fan guard
44. Nut
45. Screw
46. Fan motor
47. Screw
48. Circuit breaker
49. Lens
50. Bulb
51. Nut
52. Washer
53. Nut
54. Base
55. Screw
55A. Adjustable resistor
56. Panel
57. Nut
58. Screw
59. Washer
60. Spacer
61. Terminal nut
62. Nut
63. Screw
64. Terminal board
65. Nut
66. Screw
67. Lockwasher
68. Washer
69. Capacitor
70. Lockwasher
71. Nut
72. Washer
73. Screw
74. Lockwasher
75. Washer
76. Capacitor
77. Lockwasher
77A. Screw
77B. Nut
77C. Terminal board
78. Nut
79. Washer
80. Nut
81. Screw
82. Screw
83. Nut
84. Thermostat switch
84A. Screw
84B. Nut
85. Bracket
86. Nut
87. Screw
88. Heating element
89. Screw
90. Nut
91. Screw
92. Harness clamp
93. Harness clamp
94. Wiring harness
94A. Screw
94B. Rectifier bridge
95. Load bank housing

Table 4-7. Load Bank Preventive Maintenance Checks and Services

ITEM NO.	INTERVAL OPERATOR DAILY B	D	A	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)
1						x	Kit attaching hardware and cables.	Tighten hardware and inspect cables for wear and security.	(para 4-42)
2						x	Wiring harness.	Inspect for frayed insulation and security of terminal lugs and damaged threads, bent, loose, or missing pins of connectors.	(para 4-43)
3						x	Control panel assembly.	Inspect for loose mounting hardware and tight en as necessary.	(para 4-44)
4						x	Rotary switch.	Inspect switches for positive action between positions, wiring connections and damage. Test for proper operation.	(para 4-44)
5						x	Load reject toggle switch.	Inspect switch for positive action between positions, wiring connections and damage. Test for proper operation.	(para 4-44)
6	x						Fan guard.	Inspect for foreign material.	(para 4-44)
7	x						Air outlet and fan.	Inspect for foreign material and damage to fan.	(para 4-44)
8						x	Fan motor brushes.	Inspect for wear and refer to next higher maintenance level for replacement	(para 4-44)
9						x	Over temperature reset switch circuit breaker.	Inspect circuit breaker for positive action between positions, wiring connections, and damage. Test for proper operation.	(para 4-44)
10						x	Fan mounting grommets.	Inspect for deterioration and looseness.	para 4-44)
11						x	Indicating light and lamp.	Inspect lens and lamp for looseness and damage. Inspect wiring connections for looseness. Test for proper operation.	(para 4-44)
12						x	Load reject relay.	Inspect for security of mounting damage, and loose wiring connections.	(para 4-45)
13						x	Terminal board.	Inspect for loose mounting hardware and tighten as necessary.	(para 4-46)
14							Thermostat.	Inspect for loose mounting and wiring connections. Test for proper operation.	(para 4-47)
15							Heater elements.	Inspect for loose attaching hardware, damage, and wiring connections. Test for proper operation.	(para 4-48)
16						x	Fan motor assembly	Inspect for security of mounting and physical damage	(para 4-44)



1. Setscrew
2. Fan blade
3. Screw
4. Washer
5. Grommet

Figure 4-15. Fan and Motor Assembly

Table 4-8. Load Bank Troubleshooting

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Load bank does not apply load to generator set.	a. Refer to malfunction 2 and 3 below.	a. Refer to malfunction 2 and 3 below.
	b. Defective load selector switch.	b. Test and replace switch if defective. (Refer to paragraph 4-44.)
	c. Defective wiring harness.	c. Repair or replace wiring harness. (Refer to paragraph 4-43.)
2. Over temperature reset switch does not remain engaged in ON position while in manual load reject mode.	a. Defective fan and motor assembly.	a. Check fan and motor assembly for proper operation as in 5 below.
	b. Defective thermostat switch.	b. Test switch and replace if defective. (Refer to paragraph 4-47.)
	c. Defective over temperature reset switch.	c. Test switch and replace if defective. (Refer to paragraph 4-44.)
	d. Defective wiring.	d. Repair or replace wiring. (Refer to paragraph 4-43.)
3. Over temperature reset switch does not remain engaged in ON position while in automatic load reject mode.	a. Same as 2 above.	a. Same as 2 above.
	b. If rated kilowatt meter within load limits of 30 KW, defective load reject relay.	b. Test relay and replace if defective (higher level of maintenance required).
4. Load bank does not disconnect from generator set with rated kilowatt meter above 30 KW while in automatic load reject mode.	a. Defective load reject switch.	a. Test switch and replace if defective. (Refer to paragraph 4-44.)
	b. Defective wiring harness.	b. Repair or replace wiring harness. (Refer to paragraph 4-43.)
5. Fan and motor assembly not operating properly.	a. Defective fan and motor assembly.	a. Test assembly and refer to next higher level of maintenance, if defective.
	b. Defective diode bridge.	b. Test bridge and replace diode(s) if defective. (Higher level of maintenance required.)
	c. Defective wiring harness.	c. Repair or replace wiring harness. (Refer to paragraph 4-43.)
6. Indicator does not illuminate when load bank is in operation.	a. Defective lamp.	a. Test lamp and replace if defective. (Refer to paragraph 4-44.)
	b. Defective light.	b. Test light and replace if defective. (Refer to paragraph 4-44.)
	c. Defective wiring harness.	c. Repair or replace wiring harness. (Refer to paragraph 4-43.)

Table 4-8. Load Bank Troubleshooting (Cont)

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
7. Excessive load on generator set in manual load reject mode.	a. Prime load has exceeded 30 KW.	a. Position % LOAD SELECTOR switch to a lower % load.
	b. Defective wiring harness.	b. Repair or replace wiring harness. (Refer to paragraph 4-43.)
8. Incorrect load bank output monitored on kilowatt meter as % LOAD SELECTOR is sequentially rotated.	a. Defective heater element(s).	a. Test heater element(s) and replace if defective. (Refer to paragraph 4-48.)
	b. Defective wiring harness.	b. Repair or replace wiring harness. (Refer to paragraph 4-43.)
9. Over temperature switch does not disengage when temperature exceeds 450° F + 15°F.	a. Defective thermostat switch.	a. Test switch and replace if defective. (Refer to paragraph 4-47.)
	b. Defective over temperature reset switch.	b. Test switch and replace if defective. (Refer to paragraph 4-44 d.)
	c. Defective diode bridge.	c. Test bridge and replace diode(s) if defective. (Higher level of maintenance required.)
	d. Defective wiring harness.	d. Repair or replace wiring harness. (Refer to paragraph 4-43.)

(5) Set the load bank OVER TEMPERATURE switch to ON.

(6) Set % LOAD SELECTOR switch to 12.5 percent rated load. The load bank fan shall operate, the load bank power indicator shall light, and the generator set kilowatt meter shall read approximately 12.5 percent.

(7) Sequentially select 25, 37.5, and 50 percent load. Generator set kilowatt meter shall read approximately 25, 37.5, and 50 percent load. Return % LOAD SELECTOR switch to OFF.

(8) Refer to paragraph 2-13 and stop generator set. Connect an external load to generator set equal to 25 ± 5 percent of maximum load bank load.

(9) Refer to paragraph 2-12 and start generator set with external load connected.

(10) Set load bank LOAD REJECT switch to AUTOMATIC.

(11) Monitor generator set kilowatt meter and sequentially position % LOAD SELECTOR switch from OFF. Load bank shall be immediately removed when combined external load and selected load bank loads exceed approximately 30 KW.

CAUTION

If load bank is not removed immediately when loads exceed 30 KW, reduce load bank load with % LOAD SELECTOR switch.

(12) Refer to paragraph 2-13 and stop generator set.

4-43. Wiring Harness. **(Figure 4-16)**

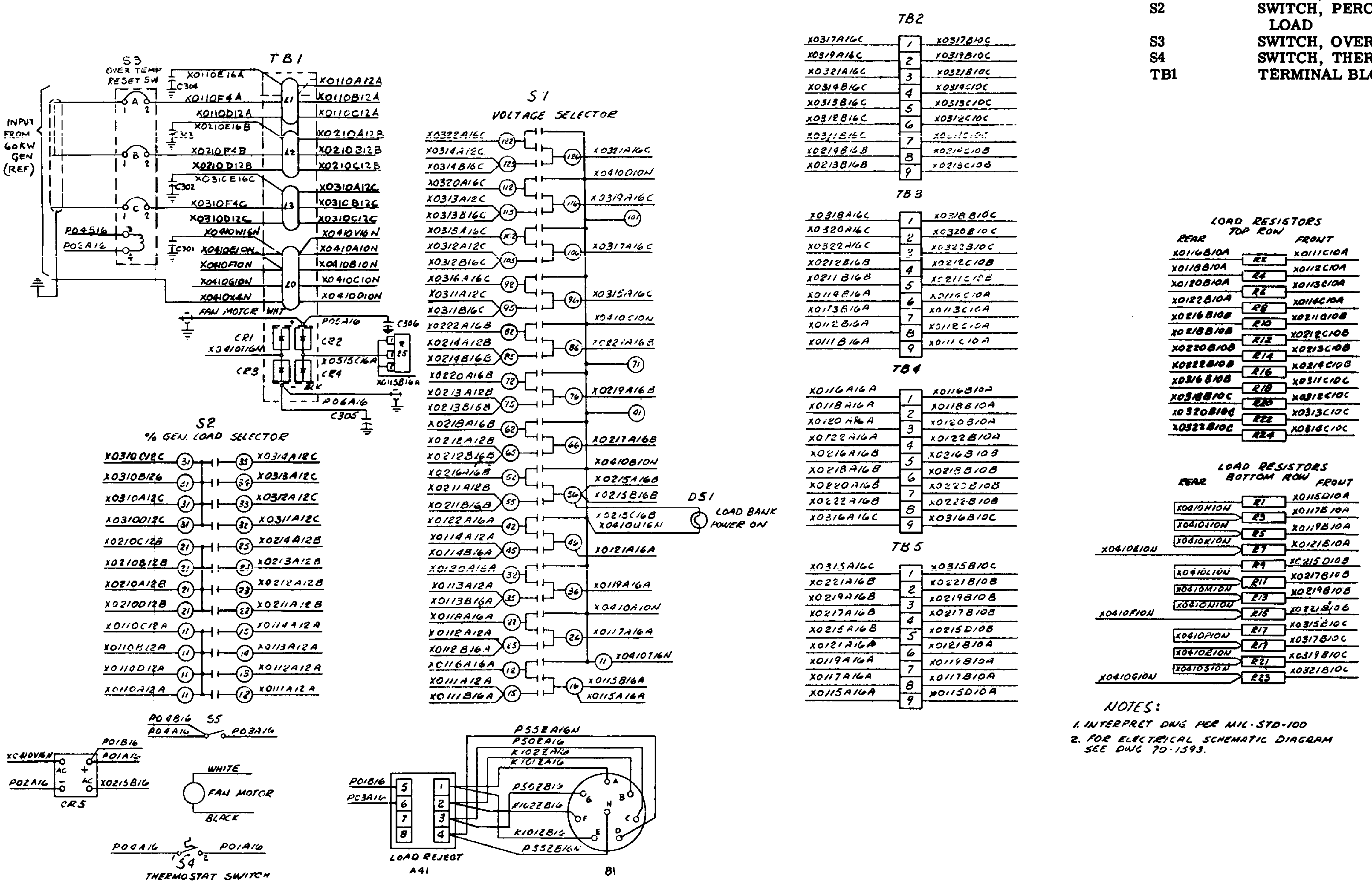
a. Inspect harness for frayed insulation, cracked or loose ty-wraps, loose harness clamps and loose connections to components.

b. Repair. Tape frayed insulation, replace cracked or loose ty-wraps, tighten harness clamps and tighten all electrical connections. If a wire is broken from a terminal lug, replace lug. Repair harnesses in accordance with para 3-139.

c. Replacement. See figure 4-14 and proceed as follows:

(1) Removal. Tag and disconnect all electrical leads and connectors from the wiring harness (7 or 94, fig. 4-14) to be removed. Then, remove all harness clamps (5), (12), (92) and (93) and the wiring harness.

REF. DES.	DESCRIPTION
CR1-CR4	FULL WAVE DIODE BRIDGE RECTIFIER
DS1	INDICATOR LAMP - "POWER ON"
R1-R24	RESISTORS
S1	SWITCH, VOLTAGE SELECTOR
S2	SWITCH, PERCENT OF GENERATOR LOAD
S3	SWITCH, OVER TEMPERATURE RESET
S4	SWITCH, THERMOSTATIC
TB1	TERMINAL BLOCK



NOTES:

1. INTERPRET DWG PER MIL-STD-100
2. FOR ELECTRICAL SCHEMATIC DIAGRAM SEE DWG 70-1593.

Figure 4-16. Wiring Diagram, Load Bank

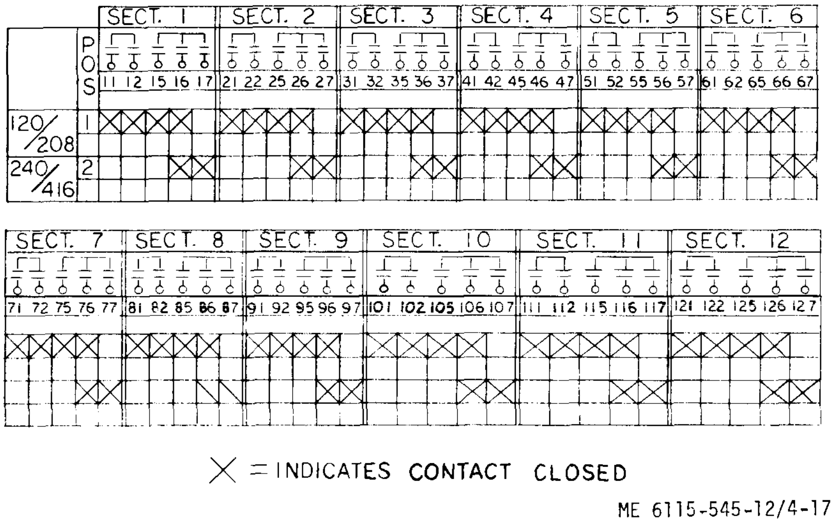


Figure 4-17. Voltage Selector Switch Contact Positions

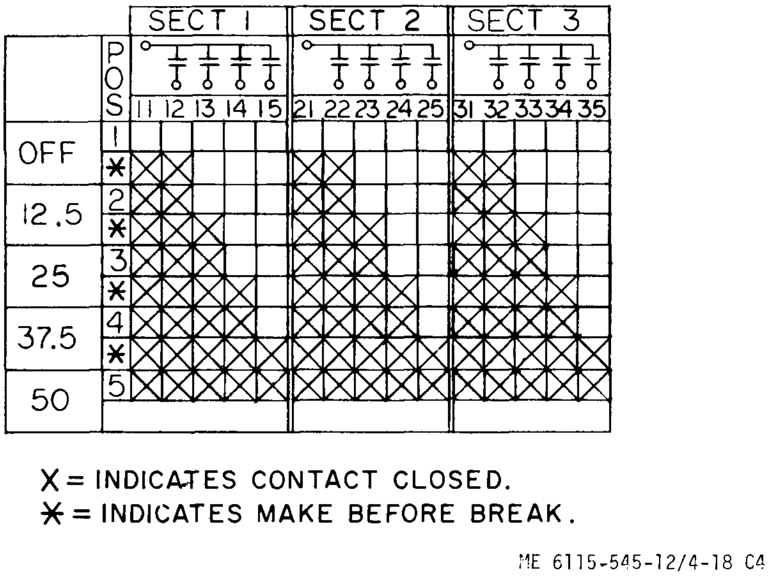


Figure 4-18. Load Selector Switch Contact Positions

(2) Installation. Place wiring harness (7) or (94) in position, install all harness clamps (5), (12), (92), and (93), and reconnect electrical leads to components. Remove tags.

4-44. Load Bank Control Panel Assembly.

a. Rotary Switches.

(1) Inspection. Remove cover (9, fig. 4-14) and inspect switches (23) and (36) for freedom of movement between positions. Check all contact terminals for loose connections. Check body of switches for cracks, breaks, corrosion, and other damage.

(2) Testing. To test the rotary selector switches use a multimeter and proceed as follows:

(a) Remove switch knobs (18 and 25, fig. 4-14) and switch mounting screws (21), (30), and (32), and remove switches (23) and (36) from panel (56).

(b) Test for continuity between the terminals illustrated in figure 4-17 for the voltage selector switch (36, fig. 4-14) and figure 4-18 for the load selector switch (23, fig. 4-14). Sequentially select each position and refer to the particular figure for the contacts that are closed. All closed circuits shall read zero ohms. All open circuits shall read 5 ohms to infinity.

(3) Replacement. See figure 4-14 and replace the selector switch (23) or (36) as follows:

(a) Removal.

1. Remove the switch knob (18 or 25, fig. 4-14) and escutcheon plate (20) or (27).

2. Remove the screws (21) or (28) which secure selector switch (23) or (36) to panel (56).

3. On voltage selector switch (36) also remove screw (30) and nut (31) which secure rear of voltage selector switch (36) to the switch bracket (35).

4. Tag all leads to switch and remove leads from selector switch (23) or (36).

5. Remove selector switch (23) or (36).

(b) Installation.

1. Reconnect wires as tagged, and remove tags.

2. Remount selector switches (23 and 36, fig. 4-14) escutcheon plate (20) or (27), and knob (18) or (25) using removal steps in reverse order.

b. Load Reject Switch.

(1) Inspection. Remove cover (9, fig. 4-14) and inspect load reject switch (40) for positive action between positions. Check for loose connections. Check body of switch for cracks, breaks, corrosion, and other damage.

(2) Testing. To test the load reject switch (40, fig. 4-14), use a multimeter and make continuity check of switch positions, closed in automatic (zero ohms) and open in manual (infinity) positions.

(3) Replacement. To replace load reject switch (40, fig. 4-14), remove nut (37), washer (38), and nut (39) tagging leads before removing lead reject switch. Install in reverse order of removal.

c. Fan and Motor Assembly.

(1) Inspection. Remove cover (9, fig. 4-14) and inspect mounting grommets (5, fig. 4-14) for deterioration and looseness. wiring leads for fraying, and check fan brushes for wear. Inspect fan blade (2) fan guard (43, fig. 4-14), and air outlet for foreign material, and fan blade for damage and looseness. Inspect motor assembly for unusual noises, signs of overheating and other damage.

(2) Testing. During load bank testing (para 4-42b.) observe through fan guard that fan blade rotates clockwise with air flow as shown on figure 4-15.

(3) Replacement. To replace fan blade (2, fig. 4-15), remove fan guard (43, fig. 4-14) by removing nut (41) and screw (42). Loosen setscrews (1, fig. 4-15) securing fan blade (2) and remove blade from motor shaft. To replace grommets (5, fig. 4-15), remove fan and motor assembly (46, fig. 4-14) by removing nut (44) and screw (45) and then remove screw (3, fig. 4-15) and washer (4, fig. 4-15). Install in reverse order of removal.

d. Circuit Breaker (Over Temperature Reset Switch.

(1) Inspection. Remove cover (9, fig. 4-14) and inspect the circuit breaker (48) for positive action between positions, loose mounting, loose electrical connections, and other damage.

(2) Testing. Test the circuit breakers as follows:

(a) Tag leads and remove from circuit breaker

(b) Using multimeter, verify continuity (closed contacts) of circuit breaker in the ON position.

(c) Place circuit breaker in OFF position and verify no continuity (open contacts).

(d) Reconnect leads and remove tags.

(3) Replacement. To replace the circuit breaker (48, fig. 4-14), remove screws (47) and tag leads before removing circuit breaker. Install in reverse order of removal.

e. Indicating Light.

(1) Inspection. Remove cover (9, fig. 4-14) and inspect indicating light for loose mounting, loose connections, corrosion and damage. Inspect lens and lamp for looseness and damage.

(2) Testing. During load bank testing (para 4-42b.), observe that indicating light lights.

(3) Replacement. To replace indicating light (49 through 54, fig. 4-14), remove lens (49), bulb (50), nut (51), washer (52), and nut (53), tagging leads before removing base (54). Install in reverse order of removal.

4-45. Load Reject Relay.

a. Inspection. Remove cover (9, fig. 4-14), and inspect load reject relay for loose mounting, damage, and wiring connections for looseness.

b. Testing. Higher level of maintenance is required.

c. Replacement. Higher level of maintenance is required.

4-46. Terminal Board.

a. Inspection. Inspect the terminal board (64, fig. 4-14) for loose mounting, loose electrical connections, cracks, breaks, and other damage.

b. Replacement. To replace the terminal board (64 fig. 4-14), remove nut (57), screw (58), washer

(59) and spacer (60) tagging leads before removing terminal board (64). Remove terminal nut (61), nut (62), and screw (63). Install in reverse order of removal. Diodes are tested and replaced at a higher level of maintenance.

4-47. Thermostat Switch.

a. Inspection. Remove cover (16, fig. 4-14) and inspect thermostat switch (85) for loose mounting and wiring connections. Test for proper operation.

b. Testing.

(1) See figures 4-13, 4-14, and 4-16 and remove switch in accordance with paragraph c. below.

(2) Fill suitable container with clean oil having a flash point above 600°F.

(3) Suspend thermostat switch in container of oil. Also, suspend a thermometer in container of oil.

(4) Connect multimeter between switch terminals.

WARNING

Ensure oil in container has a flash point exceeding 600° F, oil is heated gradually, and necessary fire precautions are taken.

(5) Heat container of oil gradually, and stir so heat is evenly distributed.

(6) Observe multimeter and thermometer for indication of infinity (open switch) below 450°F ± 15°F. At 450°F ± 15°F, multimeter shall indicate continuity (switch closed).

(7) Permit oil to cool, multimeter shall indicate infinity (switch open) at 351°F ± 15°F. Replace if defective.

c. Replacement. To replace thermostat switch (85, fig. 4-14), remove nut (82), washer (83), and screw (84) tagging leads before removing switch. Install switch in reverse order of removal.

4-48. Heater Elements.

WARNING

Ensure heater elements are cold and load bank is disconnected from generator set.

a. Inspection. Remove cover (16, fig. 4-14) and inspect heater elements (88) for loose mounting. loose electrical connections, cracks, breaks, corrosion, and other damage.

b. Testing.

(1) Remove nut which secures harness lead to one end of heating element and remove lead from element.

(2) Test heating element for continuity. If open, replace heating element.

(3) Measure resistance between terminals. Resistance should be approximately 10 ohms.

(4) Reconnect lead.

Replacement. To replace the heating elements (88, fig. 4-14), remove nut (86) and screw (87) tagging leads before removing elements. Install in reverse order of removal.

4-49. Removal.

See figures 1-1, 1-2, 1-21, 1-26 or 1-27, and 4-13, and proceed as follows:

a. Refer to paragraph 2-13 and stop generator set.

b. Set % LOAD SELECTOR SWITCH to OFF.

c. Disconnect special purpose cable plug P50 (6, fig. 4-14) from tactical relay box receptacle J50.

d. Disconnect special purpose cable plug P51 from cable 70-1212 plug P51.

e. Connect cable 70-1212 plug P51 to tactical relay box receptacle J51.

f. Disconnect load bank four-wire power cable (13) from load terminal board terminals (fig. 3-24).

g. Remove load bank four-wire power cable (13, fig. 4-14) and special purpose cable (6) from the generator set through the plate and sleeve assembly hole (fig. 3-15).

h. Remove load bank four-wire power cable (13, fig. 4-14) and special purpose cable (6) from loop clamps at rear top left side of housing. Replace screws in housing after removal of cables and clamps.

i. Remove six screws, 12 lockwashers, and six nuts securing load bank to set housing and remove load bank from housing.

APPENDIX A

REFERENCES

A-1. Fire Protection.

TB 5-4200-200-10	Hand Portable Fire Extinguisher Approved for Army Users.

A-2. Lubrication.

C9100-IL	Identification List for Fuels, Lubricants, Oils and Waxes.
LO 5-6115-545-12	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 Electric Equipment.
T.O. 1-1-1	Cleaning of Aerospace Equipment.
T.O. 1-1-2	Corrosion Control and Treatment for 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	Components 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.
TM 9-2610-200-20	Organizational Care, Maintenance and Repair of Pneumatic Tires and Inner Tubes.

TM 9-2610-200-34	Direct Support and G. S. Maintenance Manual (Including Depot Rebuild) Pneumatic Tires and Inner Tubes.
T.O. 36Y32-1-142	Care and Maintenance of Pneumatic Tires.
TB 750-651	Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems.
DA Pam 738-750	The Army Maintenance Management Systems.
TM 5-6115-545-12 T.O.35C2-3-444-1 NAVFAC P-8-626-12 TM00038G-12	Operator and Organizational Maintenance Manual.
TM 5-6115-545-34 T.O. 35C2-3-444-2 NAVFAC P-8-626-34 TM 00038G-35	Intermediate (Field) (Direct and General Support) and Depot Maintenance Manual.
TM 5-6115-545-24P T.O. 35C2-3-444-4 NAVFAC P-8-626-25P SL-4-00038G	Organizational, Intermediate (Field), Direct and General Support, and Depot Maintenance Repair Parts and Special Tools List.
TM 9-6140-200-15	Operation and Organizational, Field. and Depot Maintenance Storage Batteries, Lead Acid Type.
TM 5-6115-588-14 T.O. 35CA-1-111 NAFAC P-8-601 TM-6115-15/4	Operator, Organizational, Intermediate (Field) (Direct and General Support) and Depot Maintenance Manual Including Repair Parts and Special Tools List for Auxiliary Equipment 15 Through 200 KW, DOD Family Generator Sets.

A-6. Shipment and storage.

T.O. 35-1-4	Processing and Inspection of Aerospace Ground Equipment for Storage and Shipment.
T.O. 38-1-5	Processing and Inspection of Non-Mounted, Non-Aircraft Gasoline and Diesel Engines for Storage and Shipment.
TB 740-97-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage.
TM 740-90-1	Administrative Storage of Equipment.

A-7. Destruction of Material.

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use.

A-8. Radioactive Material

TB 750-248	Instructions for Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by U.S. Army Mobility Equipment Command.

APPENDIX B

BASIC ISSUE ITEM LIST AND ITEMS

TROOP INSTALLED OR AUTHORIZED

(SECTIONS I, II, AND III NOT Applicable TO USAF)

Section I. INTRODUCTION

B-1. Scope.

This appendix lists basic issue items, items troop installed or authorized which accompany the diesel driven generator set, and required by the crew/operator for operation. installation, or operator's maintenance.

B-2. General.

This basic issue items, items troop installed or authorized list and maintenance and operating supplies is divided into the following sections

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

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

c. Maintenance and Operating Supplies - Section IV. 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 List, Section II, and Items Troop Installed or Authorized List, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR):

(1) Source code, indicates the source for the listed item. Source codes are

Code	Explanation
P	Repair parts, special tools and test equipment supplied from GSA/DSA or Army supply system and authorized for use at indicated maintenance levels.
P 2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.

(2) Maintenance code, indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Crew/Operator

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are non-recoverable. Recoverability y codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis.

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

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

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g. , ft, ea, pr, etc.

e. Quantity Furnished With Equipment (BIIL Only). This column indicates the quantity of an item furnished with the equipment.

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

g. Illustration (Basic Issue Items List Only). This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration in which the items 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 IV.

a. Component Application, Column 1. This colimn identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column 3. This column indicates the item name and brief description.

d. Quantity Required for Initial Operation, Column 4. This column indicates the quantity of each maintenance or operating supply item required for inttial operation of the equipment.

e. Quantity Required for 8 Hours Operation, Column 5. This column indicates the estimated quantities required for an average 8 hours of operation.

f. Notes, Column 6. This column indicates informative notes keyed to data appearing in a preceding column.

B-5. Special Information. (Not applicable).

B-6. Abbreviations.

Abbreviation:	Explanation:
hv- duty	heavy-duty
deg	degree
ea	each
hd	head
ID	inside diameter
in	inch
lb(s)	pound(s)
max	maximum
nom	nominal
oz	ounce
sgl	single
w/	with

Section II. BASIC ISSUE ITEMS

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REF NO. & MFR CODE	(3) USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) QTY FURN WITH EQUIP	(7) ILLUSTRATION (A) FIG NO.	(7) ILLUSTRATION (B) ITEM NO.
PAC	7520-559-9618	Case, Maintenance and Operational Manual		ea		1		
PAC	5935-00-322-8959	Adapter Connector		ea		1		

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REF NO. & MFR CODE	(3) USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY AUTH
PAC	4910-273-3663	GAGE: tire pressure, 10 to 160 lbs range. (See parts manual)		ea	1
PAC	4930-360-2801	GREASE GUN: hand, lever operated, 16 oz.		ea	1
PAC	5120-224-4045	HAMMER, HAND: machinist ball pean, 1-1/4 lb head.		ea	1
PAC	4930-141-8311	HOSE ASSEMBLY: grease gun, hydraulic coupling one end, other end male connection, 1/8 in NPTF, 3/16 in ID hose, 19-11/32 in overall length.		ea	1

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REF NO. & MFR CODE	USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY AUTH
PAC	4930-262-8868	OILER, HAND: Pump, force fed 16 oz. capacity, flexible spout.		ea	1
PAC	5120-223-7396	PLIERS, SLIPJOINT: straight nose, comb w/cutter, 6 in long.		ea	1
PAC	5975-878-3791	ROD, GROUND, ASSEMBLED		ea	1
PAC	5120-293-3176	SCREWDRIVER, FLAT TIP: tip 1/4 in wide, blade 4 in long.		ea	1
PAC	5120-240-5328	WRENCH, OPEN END, ADJUSTABLE: sgl-hd, 22-1/2 deg angle, hv- duty, 8 in nom, 19 overall, 0.947 in max jaw opening.			

Section IV. MAINTENANCE AND OPERATING SUPPLIES

(1) COMPONENT APPLICATION	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) QUANTITY REQUIRED F/INITIAL OPERATION	(5) QUANTITY REQUIRED F/8 HRS OPERATION	(6) NOTES
FUEL TANK		FUEL OIL - DIESEL			
	9140-286-5294(1)	Regular Grade DF 2	55 (4)	50 gal	(1) See C-9100-IL for additional requisitioning data.
	9140-286-5286(1)	Winter Grade DF 1	55 (4)		
	9140-286-5283(1)	Artic Grade DF A	55 (4)		
	2910-209-4997(1)	Ether Bottle	1		
		CAUTION JP-4 & JP-5 fuel are considered an emergency fuel only			(2) See C-6800-IL for additional requisitioning data.
	9130-256-8613(1)	JP4-MIL-T-5624 JP5-MIL-T-5624	55 (4)		(3) See current LO for grade application.
CRANKCASE		OIL LUBRICATING			
	9150-188-9858(1)	OE/HDO 30 (3) 5 Gal Pail	20 (6)		
	9150-189-6727(1)	OE/HDO 10 (3) 1 Qt Can	20 (6)		
	9150-242-7603(1)	OES (3) 5 Gal Pail	20 (6)		(4) Fuel system capacity. (in gallons)
	9150-265-9436(1)	OE/HDO 30 (3) 55 Gal Drum	20 (6)		
	9150-191-2772(1)	OE/HDO 10 (3) 55 Gal Drum	20 (6)		
	9150-242-7604(1)	OES (3) 55 Gal Drum	20 (6)		
GOVERNOR		OIL, HYDRAULIC			(5) Cooling system capacity. (in quarts)
	9150-223-4134(1)	OHA, MIL-H-5606 1 Gal Can	5 qts		
RADIATOR		ANTIFREEZE			
	6850-181-7929(2)	Antifreeze, inhibited	34 (5)		(6) Requires 26 quarts to fill crankcase, lines and filters.
	6850-174-1806(2)	Antifreeze, Artic	34 (5)		
BATTERY	6810-249-9354(2)	ELECTROLYTE	4 (7)		(7) Requires 4 gallons to fill batteries.

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

ARMY and USMC only

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. Group Title. 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 (DS)

H - General support maintenance (GS)

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 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 consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

d. Tools and Equipment. Column 4. This column is provided for referencing by code the tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

e. 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 & 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 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

ARMY and USMC only

For DOD Generator Set Family 60 KW, Tactical, Precise and Utility, 50/60 and 400 Hz

(1) GROUP NO.	(2) GROUP TITLE	(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
01	Batteries and Related Items	C	O	C				O	O				1 - B	A - A, B - B
	Slave Receptacle	C							O					A - A
02	Muffler, Exhaust, and Breather Pipes													
	Muffler	C							O					A - A
	Exhaust	C							O					A - A
	Breather Pipes	C							O					A - A
03	Convenience Receptacle	C							O					A - A
	Circuit Breaker	C	O						O					G - B
04	(Deleted)													
05	Plate & Sleeve Assembly	C							O					A - A
06	Paralleling Receptacles	C							O					A - A
07	Generator Set Controls													
	Circuit Breaker DC	C	O						O					G-B

(1) GROUP NO.	(2) GROUP TITLE	(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
07 (Cont)	Manual Speed Control	O	O						O					A - A
	Fault Indicator	O	O						O	F				A - A, D - B, E - I
	Lamps		C						O					
	Fuse		O						O					
	Control Box Assembly	O	O						O	F				D - B
	Voltmeter AC	C	O		C				O					F - D
	Wattmeter AC	C	F		C				O					D - B, F - D
	Wattmeter Converter	O	F						O					D - B
	Ammeter AC	C	F		C				O					D - B, F - D
	Rheostats/potentiometer	O	O						O				2 - B	G - B
	Frequency Meter	C	F						O					D - B
	Frequency Transducer	O	F						O				2 - B	G - B
	Switches	C	O						O				2 - B	G - B
	Gauges	C	O						O					D - B
	Hourmeter	C	O						O					D - B
	Ammeter DC	C	O						O					D - B
	Relay Assembly	O	F						O					
	Terminal Board	O							O					
	Panel Light Assembly	C	C						O					
	Lamp		C						O					
	Air Cleaner Light	C	C						O					
	Lamp		C						O					
	Battle Short Light	C	C						O					
	Lamp		C						O					
	Circuit Breaker Light	C	C						O					
	Lamp		C						O					
	Sync Lights	C	O						O					

(1) GROUP No.	(2) GROUP TITLE	(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
07 (cont)	Control Box Assembly													
	Lamp		O						O					
	Door Holder	C							O					
	Cross Pin	C							O					
	Door	C							O					
	Harness	O							O	O		F		A-A,J-K
08	Housing Group													
	Doors	C							O	F			3-I	I-I
	Covers	C							O	F			3-I	I-I
	Panels	C							O	F			3-I	I-I
09	Engine, Generator and Chassis Interconnecting Wiring Harnesses	O	O						O	O		F	2-B,4-X	A-A,G-B, J-K
10	Load Connection Group													
	Main Load Contactor	O	O						O	F				A-A,D-B
	Load Term Bd Assembly	O							O	O				A-A
	Current Xfmr Assembly	O	F						F	F			2-B	A-A,K-B
	Reconnection Board	O	O						O	O				
11	Governor Control Unit													
	Electro-Hydraulic	O	F		F				F	F	H		2-B,D,I	L-B,C-1
	Electric													
	Control	O	F		F				O					
	Actuator	O	F						F					
	Magnetic Pick Up	O							F					
12	Air Cleaner Ass'y	C		C					O					A-A
	Element	C		C					O					A-A
13	Relay Table Group													
	Tactical Relay Assembly	O	F						F	F			2-B	K-B
	Precise Relay Assembly	O	F						F	F			2-B	K-B
	Special Relay Assembly	O	F						F	H			2-B	K-B
	Excitation Assembly Exciter	[illegible]	F		F				F	[illegible]			2-B	G-B

(1) Group No.	(2) GROUP TITLE	(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
13 (Cont)	Relay Table Group													
	Voltage Regulator	F	F						F	F			2 — B, 5 — I, J	D — B
	Load Measuring Unit	O	F						F	F				E — I
14	Generator Assembly	O	F						F	F	H	D	6, 7 — H, 8 — B 9 — I, J	D — B
	Bearing	O							F				10 — H	N — A
	Rectifier Rotating	F	F						F	F			2 — B, 11 — I	G — B
	Fan Generator	F							F					
	Rotor Assembly	F	F						F	D		D	2 — B	O — B, P — K
	Stator Exciter Assembly	F	F						F	D		D	2 — B	O — B, P — K
	Stator Generator Assembly	F	F						F	D		D	2 — B	O — B, P — K
15	Day Tank and Fuel Filter Assembly													
	Solenoid Valve	O	O						O				2 — B	G — B
	Day Tank	C		C					O	F				Q — C
	Float Switch	O	O						O					
	Fuel Filter Assembly	C		C					O					Q — C
16	Lifting Frame Assembly													
	Start Aid Assembly	C		C					O					
	Filler Cap, Gasket and Strainer	C		C					O					
	Hoses	C							O					
	Lifting Frame	O							F	F				
	Fuel Transfer Pump	C	O	O					O					
17	Cooling Group													
	Grill	C							O	O				
	Fan Guard	C							O	O				

(1) GROUP NO.	(2) GROUP TITLE	(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
17 (Cont)	Shutter Thermostat	C	O						O				12 — B	R — B
	Shutters Assembly	C	O		O				O	F				D — B
	Radiator	C	F	C					O	F				
	Hydraulic Cooler	C		C					O					
18	Hydraulic Actuator	C	F	C	F				F	F	H		14 — B — D	D — B, T — D
19	Hydraulic Sump and Filter													
	Sump	C		C					O	F				U — C
	Filter	C		C					O					
20	Engine Assembly		C	C					F	F	H		6 — H, 7 — H	D — B
	Belts, Fan	C			C				O				15 — D	V — D
	Alternator/Battery Charging	C	C		C				O	F			2 — B, 16 — B, D	D — B, V — D
	Diodes	F	F						F				2 — B, 11 — H	G — B
	Brush Assy	F							F					
	Rotor	F	F						F				2 — B	G — B
	Field Assembly	F	F						F				2 — B	G — B
	Voltage Regulator (DC)	F	F						F				2 — B, 16 — B	D — B
	Hydraulic Pump & Drive Assembly	C	F		F				F	F			17 — B	W — B, X — D
	Speed Switch and Drive													
	Speed Switch	C	C		F				O	F			2 — B, 18, 19 — D	G — B, Y — D
	Adapter	C							F					
	Tach Drive	F							F	F				
	Oil Level Gage and Filler	C							O					
	Electric Starter and Adapter													
	Starter Assembly	C	C						O	F			2 — B	D — B
	Brushes	F							F					AA — A

(1) GROUP NO.	(2) GROUP TITLE	(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
20 (Cont)	Solenoid Starter		O						F	F			2 - B	D - B
	Armature Starter		F						F	F			22 - B	AB - B
	Drive Starter	F			F				F	F				
	Field Assembly	F	F						F	F				
	Oil Filter and Sensors													
	Xmtr, Pressure	C	O						O				2 - B	G - B
	Switch, Pressure	O	O						O				2 - B	G - B
	Filter Assembly, Oil	C		O					O					AC - C
	Secondary Fuel Filter	C		C					O					AC - C
	Lube Oil Cooler	O	F						O	F				
	Relief Valve	F	F						F	F				
	Nozzle Holder Assemblies and Lines													
	Nozzle Holders	O	O		F				O	F			23 - B, D - I	AE - D
	Lines	O							O					
	Pump, Fuel Injection	C	F		F				F	H	H			L - B, D, I
	Diffuser and Turbocharger													
	Diffuser	O							O					
	Turbocharger	O							O	F				
	Water Pump and Fan													
	Pump	C							O	F				
	Fan	C							O					
	Thermostat and Housing													
	Thermostat		O						O				12 - B	R - B
	Xmtr, Temperature	C	O						O				2 - B	G - B
	Switch, Temperature	O	O						O				2 - B	G - B

(1) GROUP NO.	(2) GROUP TITLE	(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
20 (Cont)	Dampener, Vibration and Crankshaft Pulley	O							F					
	Idler Pulley Assembly	O							O					
	Intake Manifold	O							O					
	Exhaust Manifold	O							O					
	Engine Front Support	F							F					
	Oil Pan Assembly	C							F	F				
	Oil Pump	H	H						H	H				
	Flywheel and Housing													
	Flywheel Assembly													
	Ring Gear	H							H					
	Flywheel	H							H					
	Housing	H							H					
	Timing Gear and Cover	H							H					
	Cylinder Head and Valve Operating Mechanism													
	Rocker Arm Shaft Assembly	O							F	F				
	Rocker Arm Assembly	O			O				F				21 - D	V - D
	Pushrod	F							F					
	Cylinder Head Assembly	F							F	F	H		24 - I, 25 - H	AF - 1
	Valves Intake and Exhaust	F	F						F	F			26 - I	D - B
	Springs Valve	F	F						F				27 - H	AG - B
	Seats Intake and Exhaust Valves	F							H				28 - H	
	Guides Valve	F							H				29 - H	
	Head, Cylinder	F							H		H	D		
	Lifters, Valve	H							H					
	Camshaft	H							H					

(1) GROUP NO.	(2) GROUP TITLE	(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
20 (Cont)	**Piston and Rings**													
	Piston Pin	H							H				30 - A	
	Connecting Rod	H							H				31 - A, 32 - H	
	Rod Bearing	H							H				33 - A	
	Piston Rings	H							H				34 - A, 35 - H	
	Piston	H							H				36 - H	
	Crankshaft and Block													
	Cylinder Sleeves	H							H				33, 37 - A, 38 - H	
	Main Bearings	H							H				33 - A, 37 - A	
	Crankshaft	H							H		H	O	39 - A	
	Brg, Camshaft	H							H				33, 30 - A	
	Cylinder Block	H							H	H	H	O		AH - K
21	**Base Group**													
	Sensor, Fuel	C	O						O				2 - B	D - B
	Tank, Fuel	C		C					O	F				I - I
	Skid Base	O							F	F				
22	**Accessory Items**													
	Paralleling Cable	C	O					C	O			F		A - A, J - K
	Fuel Line, Auxiliary	C						C	O	O				
23	**Parts Kits**													
	Gasket Set, Valve Grinding							C						
	Gasket Set, Intermediate							C						
	Kit, Starter							F						
	Kit, Starter Relay							F						
	Kit, Brush, Electric							F						

(1) GROUP NO.	(2) GROUP TITLE	(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
23 (Cont)	Kit, Starter Solenoid							F						
	Kit, Gasket Set, Fuel Pump							H						
	Kit, Water Pump							F						
	Gasket Set, Oil Pan							F						
	Kit, Cylinder Sleeve							H						
24	Not Used													
25	Winterization Kit Fuel Burning	C						O	O	F	F			
	Control Box Assembly	O	C					O	O	F			2 - B	D - B
	Light Assembly	O	C						F					D - B
	Lamp		C						O					D - B
	Circuit Breaker	O	F						F				2 - B	G - B
	Power Switch		F						F				2 - B	G - B
	Heater Assembly	C	C	C	O				F	F				D - B
	Valve Assembly, Regulator	F	F		O				F					
	Terminal Board	O							F					
	Switch, Limit	O	C						F				2 - B	G - B
	Receptacle Assembly	O	C						O				2 - B	G - B
	Igniter Assembly	O	F						O				8 - B	
	Switch, Flame	F	C		O				F				2 - B	G - B, V - D
	Wiring Harnesses	O							O	C		F		A - A, J - K
	Coolant Pump and Motor Ass	F	F						F	F			8 - B	
	Pump	F	F						F	F				
	Relief Valve		F						F					
	Motor Assembly	F							F	F				
	Fan	F							F					
	Motor	F							F					

(1) GROUP NO.	(2) GROUP TITLE	(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
25 (Cont)	Thermostat Switch	O	O						O				2 - B	D - B
	Burner Chamber	F							F					
	Heat Exchanger	F							F					
	Hoses, Lines and Fittings	C							O			O		
26	Heater Kit, Winterization Electric		O					O	O	F				D - B
	Coolant Pump & Motor Assy	O						O	O	F			8 - B	
	Pump	O	O						F	F				D - B
	Relief Valve		F						F					
	Motor	O	F						F	O				E - I
	Heating Elements	O	O						O					D - B
	Thermostat Switch	O	O						O				2 - B	D - B
	Hoses and Fittings	C							O			C		
	Wiring Harness	C	O						O	O		F		A - A, J - K
	Electric Winterization													
	Control Box	O	O					O	O	F			2 - B	
	Wiring Harness	F							F	F		F		J - K
	Transformers	F	F						F				2 - B	
	Relay	F	F						F				2 - B	G - B
	Semi Conductors		F						F				2 - B	
	Circuit Breaker	O	F						F				2 - B	G - B
	Power Switch	O	F						F				2 - B	G - B
	Fuse Holder	O							F					
	Fuse		O						O				2 - B	G - B
	Light Assembly	O	O						F					D - B
	Indicating Lamps		C						O					D - B

(1) GROUP No.	(2) GROUP TITLE	(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		
27	Kit-Wheel Mounting	C	C	C				F	F	O				
	Wheels and Tires	C	C	C		O			O	O			40 - B	A1 - B
	Bearings Wheel	O		O	O				O					
	Brakes	O		O	O				O	O				
28	Load Bank	O	O					O	O	F	F			D - B
	Wiring Harnesses	O	O					O	O			F		A - A, J - K
	Control Panel Assembly													
	Switches, Rotary	O	O						O				2 - B	G - B
	Switch, Load Reject	O	O						O				2 - B	G - B
	Fan and Motor Assembly	O	O						F	F				E - I
	Brushes	O							F					
	Fan Blade and Guard	O							O					
	Grommets, Mounting	O							O					
	Circuit Breaker	O	O						O				2 - B	G - B
	Indicating Light	O	O						O					
	Lamp		O						O					
	Load Reject Relay	O	F						F				2 - B	K - B
	Terminal Board	O							O					
	Diodes		F						F				2 - B	G - B
	Thermostat		O						O					
	Heater Elements	O	O						O				2 - B	G - B

Section III. MAINTENANCE ALLOCATION CHART

ARMY and USMC only

For DOD Generator Sets, 60 KW, 50/60 and 400 Hz

TOOL AND TEST EQUIPMENT REQUIREMENTS

REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	TOOL NUMBER
1-B	O	Tester, Battery Elect- Rolyte Solution (Component of Tool Set L/I T1 31 52)	6630-171-5126 or Equal
2-B	O	Multimeter	6625-581-2036 or Equal
3-I	F	Torch Outfit, Cutting and Welding (Tool Set L/I W67706)	3433-357-6311 or Equal
4-K	O	Tool Kt, Electrical Connector Repair	5180-876-9336 or Equal
5-D-I-J	F	Oscilloscope	6625-643-1740 or Equal
6-H	F	Hoist, Chain, 3 Ton	3950-292-9879 or Equal
7-H	F	Trestle, Hoist, Portable, 5 Ton	3950-449-7005 or Equal
8-B	F	Multimeter, Split Core	6625-892-1497 or Equal
9-I-J	F	Ohmmeter	6625-581-2466 or Equal
10-H	F	Puller Attachment (Component of Puller Kit 5180-701 -8046)	5180-711-6753 or Equal
11-I	F	Soldering Outfit, Electric	3439-853-8760 or Equal
12-B	O	Thermometer, Self-Indicating 50-400 Degree F. Range	6685-527-7867 or Equal
13		Deleted	
14-B-D	F	Test Stand, Actuator (Class 1 only)	4940-152-2107 or Equal
15-D	O	Scale, Dial Indicating, 0-50 lb	6670-254-4634 or Equal
16-B-D	O	Test Set, Generator and Voltage Regulator	4910-270-3780 or Equal
17-B	F	Test Gage and Hose Ay	4910-774-9343 or Equal
18-D	F	Tachometer, Stroboscopic	6680-892-1510 or Equal

REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	TOOL NUMBER
19-D	F	Test Stand, Ignition Magneto	4910-912-3960 or Equal
20-I	O	Tester Spring Resiliency	6635-449-3750 or Equal
21-D	F	Gage, Thickness	5120-221-1999 or Equal
22-B	F	Test Set, Armature	6625-233-1459 or Equal
23-B-D-I	F	Tool Kit, Diesel Injector Repair	4910-317-8265 or Equal
24-I	F	Grinding Kit, Valve Seat	4910-473-6437 or Equal
25-H	F	Wrench, Torque	5120-542-5577 or Equal
26-I	F	Grinding Machine, Valve Face	4910-540-4679 or Equal
27-H	F	Lifter, Valve Spring	5120-239-8686 or Equal
28-H	H	Remover and Replacer, Insert Valve Seat	5120-473-7393 or Equal
29-H	H	Remover and Replacer, Valve Guide	5120-219-8404 or Equal
30-A	H	Caliper Micrometer, Outside 1" thru 2"	5210-243-2933 or Equal
31-A	H	Indicator, Connecting Rod Alignment	4910-733-2487 or Equal
32-H	H	Wrench, Torque	5120-640-6364 or Equal
33-A	H	Gage Set, Telescoping	5120-473-9350 or Equal
34-A	H	Gage, Thickness	5210-517-8097 or Equal
35-H	H	Compressor, Piston Ring	5120-894-0753 or Equal
36-H	H	Expander, Piston Ring	5120-393-0549 or Equal
37-A	H	Caliper, Micrometer	5120-255-7564 or Equal
38-H	H	Puller, Mechanical, Cylinder, Sleeve	5120-417-2952 or Equal
39-A	H	Caliper, Micrometer	5210-221-1934 or Equal
40-B	C	Gage, Tire Pressure	4910-204-3170 or Equal

REFERENCE CODE	REMARKS
A-A	Visual Inspection
B-B	Hydrometer Test
C-I	Cover Components Only
D-B	Operational Test
E-I	Repair by Replacement of Components
F-D	Zero Adjust
G-B	Continuity Test
H-C	Deleted
I-I	Weld and Straighten
J-K	Fabricate New Harness
K-B	Test for Known Voltage at Terminals
L-B, D & I	In Accordance with Procedures in Applicable TM
M-D	Deleted
N-A	Visual, Audible and Physical Heat Detection
O-B	Insulation Breakdown and Continuity Tests
P-K	Rewind
Q-C	Drain Condensation
R-B	Thermometer Test
S-B	Deleted
T-D	Adjust after Replacement or Repair
U-C	Check Fluid Level
V-D	Adjust to Specifications in Applicable TM
W-B	Test Pressure Output
X-D	Adjust Pressure Output
Y-D	Overspeed Only
Z-D	Deleted
AA-A	Inspect for Minimum Length
AB-B	Growler Test

REFERENCE CODE	REMARKS
AC-C	Replace Element
AD-D	Deleted
AE-D	Adjust Injector Pressure Setting
AF-I	Includes Replacing Valves and Springs
AG-B	Spring Tension and Length
AH-K	Include Replacement of Sleeves
AI-B	Pressure Test

ALPHABETICAL INDEX

I

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, operator maintenance requirements for Generator Sets: 60 KW, 60 HZ, Precise Power; 60 KW, 400 HZ Precise Power; 60 KW, 60 HZ, Utility.

MARCORPS CODE:

AGC

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