

TM 9-6115-668-13

SUPERSEDES TM 9-6116-668-13, 02 AUGUST 1996

TECHNICAL MANUAL

OPERATOR, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL

**GENERATOR SET, DIESEL ENGINE DRIVEN,
SKID MOUNTED,
150 kW, 400 Hz, ALTERNATING CURRENT**

(NSN 6115-12-337-8494)

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Technical Manual
OPERATOR, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL
for
GENERATOR SET, DIESEL ENGINE DRIVEN.
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Technical Manual

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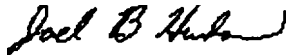
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WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes. Wear goggles and rubber gloves to protect eyes and skin. Wash exposed skin thoroughly. Do not smoke or use near open flame or excessive heat. Failure to observe this warning can cause severe personal injury or death.

WARNING

With any access flap open, the noise level of this Generator Set 150 kW could cause hearing damage when operating. Hearing protection must be worn when working near the Generator Set 150 kW during operation.

WARNING

The fuel in this Generator Set 150 kW is highly explosive. Do not smoke or use open flame when performing maintenance. Fire and explosion could occur, resulting in severe personal injury or death.

WARNING

High voltage is produced when this Generator Set 150 kW is in operation. Improper operation could result in personal injury or death.

WARNING

Never attempt to connect control or power cables while the Generator Set 150 kW is running. Failure to observe this warning could result in severe personal injury or death by electrocution.

WARNING

Do not operate Generator Set 150 kW unless it is properly grounded and all load terminals are not shorted. Failure to observe this warning can result in severe personal injury or death.

WARNING

Never attempt to disconnect control or power cables while Generator Set 150 kW is running. Failure to observe this warning could result in severe personal injury or death by electrocution.

WARNING

- Potential 150 kW shock hazard with failure to adhere to this warning. Contact with this high power could result in death or severe injury. If the removal of one generator from the EPP III is required, replace it with an extra generator. Always make sure that two generators are mounted to the EPP III. Continued use of the EPP III with only one generator could result in a catastrophic shock hazard.
- Do not operate one of the EPP III generators when the other generator is dismantled.
- Prior to energizing the equipment the operator must check for exposed electrical terminals.
- Always install protective covers on control and power cables when cables are not connected.
- Be sure to observe all warning signs on equipment.

WARNING

Always wear gloves when operating actuator. Failure to observe this warning could result in severe personal injury.

WARNING

- Do not stand in the operating area of the crane or forklift.
- Do not walk under the suspended load.
- Move the container slowly so that it remains in the horizontal position. Failure to observe these warnings could result in severe personal injury or death.

WARNING

Make sure that there are no open flames in the vicinity, and that fuel cannot splash onto hot components. Failure to observe this warning could result in severe personal injury.

WARNING

To prevent severe personal injury from hot engine, perform this inspection only when engine is cold.

WARNING

To prevent personal injury, wear protective gloves when loosening nuts from corrugated hoses.

Refer to FM 21-11 for first aid.

TECHNICAL MANUAL

NO. 9-6115-668-13

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., 01 June 1998

OPERATOR, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL

**GENERATOR SET, DIESEL ENGINE DRIVEN, SKID MOUNTED,
150 kW, 400 Hz, ALTERNATING CURRENT (NSN: 6115-12-337-8494)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, U. S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO, Fort Monmouth, New Jersey 07703-5000. The fax number is 732-532-1413, DSN 992-1413. You may also e-mail your recommendations to AMSEL-LC-LEO-PUBS-CHG@cecom3.monmouth.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028. In either case a reply will be furnished to you.

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HOW TO USE THIS MANUAL

DESCRIPTION OF THE MANUAL.

Manual Organization. This manual is designed to help you operate and maintain the generator set 150 kW. Warning pages are located in the front of this manual. Read the warnings before operating or doing maintenance on the equipment.

The major elements of this manual are the chapters and appendices. Each chapter has one or more sections. The Table of Contents, beginning on page i, is provided for quick reference to the subjects covered by each chapter, section, and appendix. Each chapter also has a chapter index. The chapter index lists the chapter sections and paragraphs.

A glossary follows the last appendix. The glossary lists and explains the special or unique abbreviations and the unusual terms used in this manual.

An alphabetical index follows the glossary. That index is for use in locating specific items of information.

Chapters. This manual has five chapters and eight appendices. Each chapter is divided into sections. Each section is divided into descriptive paragraphs. The paragraphs have specific information about the generator set 150 kW and their major components.

Paragraph Numbering. All paragraphs are numbered. This helps you find what you need when you need it. USE THE TABLE OF CONTENTS OR ALPHABETICAL INDEX TO FIND THE SECTION OR PARAGRAPH YOU NEED. Some paragraphs have a related illustration, to show the items discussed in the paragraph. Also, some paragraphs have a related table that provides a detailed list of items introduced by the paragraph. Each primary paragraph, illustration, and table is identified by the number of the chapter in which it appears, followed by a dash and another number. The number after the dash indicates the sequence in which the paragraph, illustration, or table appears in the chapter. Some paragraphs are further divided into subparagraphs. Subparagraphs are identified by the number of the primary paragraph followed by a decimal number, as follows:

- Examples:
- 4.5. is the fifth paragraph in chapter 4.
 - 4.5.1 is the first subparagraph of paragraph 4.5.
 - 4.5.2 is the second subparagraph of paragraph 4.5.
 - 4.5.2.1 is the first subparagraph under 4.5.2.
 - Figure 3-3. is the third illustration in chapter 3.
 - Table 2-1. is the first table in chapter 2.

Amendices. Each appendix covers a specific subject.

CHAPTER 1 - INTRODUCTION.

Chapter 1 provides an introduction to the generator set 150 kW. It is divided into three sections, as follows:

Section I - General Information. This section provides general information about this manual and the related forms and records. Instructions are provided for making equipment improvement recommendations. Coverage includes a reference to the TM that contains instructions on destruction of material to prevent enemy use. Also, a nomenclature cross-reference list is provided.

Section II - Equipment Description. This section describes generator set 150 kW capabilities, characteristics, and features. It provides basic equipment data and shows the locations of major generator set 150 kW components. Descriptions of the major components are also provided.

Section III - Principles of Operation. This section provides functional descriptions of the generator set 150 kW.

CHAPTER 2 - OPERATING INTRODUCTIONS.

Chapter 2 provides introductions for operating the generator set 150 kW. The chapter is divided into four sections, as follows:

Section I - Description and Use of Operator's Controls and Indicators. This section contains information on operator's controls and indicators for the generator set 150 kW.

Section II - Operator Preventive Maintenance Checks and Services (PMCS). This section contains detailed instructions for the before, during, and after operation preventive maintenance checks and services that the operator must perform.

Section III - Operation Under Usual Conditions. This section contains instructions for preparing the generator set 150 kW for use and operating under usual conditions.

Section IV - Operation Under Unusual Conditions. This section contains instructions for preparing the generator set 150 kW for use and operating under unusual conditions.

CHAPTER 3 - OPERATOR MAINTENANCE INSTRUCTIONS.

Chapter 3 covers maintenance of the generator set 150 kW that is to be performed by the operator. Its purpose is to provide you with the information you need to keep the equipment in good operating condition. This chapter is divided into three sections, as follows:

Section I - Operator Lubrication. This section provides references to the applicable lubrication instructions.

Section II - Troubleshooting. This section covers troubleshooting procedures and corrective actions that are to be performed at the operator maintenance level.

Section III - Maintenance Procedures. This section refers the operator to the preventive maintenance checks and services required by section II of chapter 2.

CHAPTER 4 - UNIT MAINTENANCE INSTRUCTIONS.

Chapter 4 provides instructions covering the generator set 150 kW maintenance that must be performed at unit level. This chapter is divided into seven sections, as follows:

Section I - Lubrication Instructions. This section contains specific lubrication instructions for the generator set 150 kW.

Section II - Repair Parts: Tools: Special Tools: Test, Measurement, and Diagnostic Equipment (TMDE): and Support Equipment. This section lists the documents that contain the needed information.

Section III - Service Upon Receipt of Equipment. This section contains instructions for inspecting and servicing each generator set 150 kW when it is received. It includes instructions for unpacking the equipment when it is received. The instructions include unpacking and stowing the basic issue items that accompany the generator set 150 kw. Also included are instructions on positioning the generator set 150 kW for operating and connecting an external fuel source.

Section IV - Unit Preventive Maintenance Checks and Services (PMCS). This section contains instructions covering the PMCS that must be performed at the unit maintenance level. A table provides information on maintenance intervals and actions required.

Section V - Troubleshooting. This section covers troubleshooting procedures and corrective actions that are to be performed at the unit maintenance level.

Section VI - Radio Interference Suppression. This section describes procedures which have been performed on the Generator Set 150 kW to avoid Electro Magnetic Induction (EMI).

Section VII - Maintenance Procedures. This section contains detailed instructions on unit level maintenance of the generator set 150 kW.

CHAPTER 5 - DIRECT SUPPORT MAINTENANCE INTRODUCTIONS.

Chapter 5 provides instructions for the maintenance actions designated to be performed at the direct support maintenance level. The chapter is divided into three sections, as follows:

Section I - Repair Parts: Tools: Special Tools: Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment. This section lists the documents that contain the needed information.

Section II - Troubleshooting. This section includes instructions for troubleshooting faults in the operation of the control cabinet assembly. It includes eighteen go-no-go flowcharts for eighteen possible control cabinet malfunctions.

Section III - Maintenance Procedures. This section contains detailed instructions for direct support maintenance of the generator set 150 kW.

APPENDICES.

Appendix A - References. This appendix lists all publications that are referenced in the various chapters of the technical manual. The listing includes the title of each publication.

Appendix B - Maintenance Allocation Chart (MAC). This appendix has four sections, as follows:

Section I - Introduction. This section explains what is covered in the maintenance allocation chart.

Section II - Maintenance Allocation Chart. This section contains a tabular listing that assigns maintenance functions to specific maintenance levels. It lists the work time needed to perform each maintenance function at the assigned level. It also contains a column that has entries keyed to the tools and equipment listed in section III. Another column has entries keyed to the remarks in section IV.

Section III - Tool and Test Equipment Requirements. This section contains complete identification information for the items referenced in the tools and equipment column of section II.

Section IV - Remarks. This section provides additional information for each entry in the remarks column of section II.

Appendix C - Components of End Item (COEI) and Basic Issue Items (BI) Lists. This appendix lists the items that are usually packaged separately but needed for installation and operation of the generator set 150 kW. The appendix has three sections, as follows:

Section I - Introduction. This section explains what is covered in section II and section III.

Section II - Components of End Item. The generator set 150 kW is shipped fully assembled, so this section is not applicable.

Section III - Basic Issue Items. This section contains a list of the accessories needed for installation and operation of the generator set 150 kW.

Appendix D - Additional Authorization List (AAL). This appendix lists additional items you are authorized for support of the generator set 150 kW.

Appendix E - Expendable and Durable Items List. This appendix lists expendable/durable supplies and materials needed to operate and maintain the generator set 150 kW. The appendix contains two sections, as follows:

Section I - Introduction. This section explains the entries in section II.

Section II - Expendable and Durable Supplies and Materials List. The list indicates the maintenance level that needs each item and identifies the items by National Stock Number, description, and unit of measure.

Appendix F - Operator's Lubrication Instructions. This appendix contains instructions for lubrication, if necessary.

Appendix G - Torque Limits. This appendix lists standard torque values for bolts and screws used in the generator set 150 kW.

Glossary. This Glossary has two sections, as follows:

Section I - Abbreviations. This section lists the special or unique abbreviations used in this technical manual. Special or unique abbreviations are those not listed in MIL-STD-12D.

Section II - Definition of Unusual Terms. This section lists and defines the terms used in this technical manual that are not listed in the Army dictionary (AR 310-25).

INDEX.

An alphabetical index at the back of this technical manual provides a listing of subjects covered, cross-referenced to the applicable paragraph.

HOW TO FIX A GENERATOR SET 150 KW MALFUNCTION.

Determining the Cause. Finding the cause of a malfunction, troubleshooting, is the first step in fixing the generator set 150 kW and returning it to operation. Follow these simple steps to determine the cause of the problem:

- a. Turn to the Table of Contents in this manual (page i).
- b. Locate "Troubleshooting" under the chapter that covers your level of maintenance.

Turn to the page indicated.

- c. For operator troubleshooting, follow the instructions in the references listed in Chapter 3.
- d. For troubleshooting at the unit maintenance level, find the malfunction listing in the troubleshooting symptom index. Follow the instructions in the figure (troubleshooting chart) indicated by the symptom index.

Preparing for a Task. Be sure that you understand the entire maintenance procedure before beginning any maintenance task. Make sure that all parts, materials, and tools are handy. Read all steps before beginning. Prepare to do the task as follows:

a. Carefully read the entire task before starting. It tells you what you will need and what you have to know to start the task. **DO NOT START THE TASK UNTIL:**

- (1) You know what is needed
 - (2) You have everything you need
 - (3) You understand what to do
- b. If parts are listed, they can be drawn from technical supply. Before you start the task, check to make sure you can get the needed parts. National Stock Numbers (NSNs) and part numbers for the generator set 150 kW parts are listed in the Repair Parts and Special Tools List (RPSTL) manual, TM 9-6115-668-23P.
- c. If expendable/durable supplies or materials are needed, get them before starting the task. Refer to Appendix E for the correct nomenclature and NSN.

How to do the Task. Before starting read the entire task. Be sure that you understand the entire procedure before you begin the task. As you read, remember the following:

- a. PAY ATTENTION TO WARNINGS, CAUTIONS, AND NOTES.
- b. Use the GLOSSARY if you do not understand the special abbreviations or unusual terms used in this manual.
- c. The following are standard maintenance practices. Instructions about these practices are usually not included in task steps. When standard maintenance practices do not apply, the task steps will tell you. The standard maintenance practices are:
 - (1) Tag electrical wiring before disconnecting it.
 - (2) Discard used preformed packing, retainers, gaskets, cotter pins, lock washers, and similar items. Install new parts to replace the discarded items.
 - (3) Coat packing before installation, in accordance with the task instructions.
 - (4) Disassembly procedures describe the disassembly needed for total authorized repair. You may not need to disassemble an item as far as described in the task. Follow the disassembly steps only as far as needed to repair/replace worn or damaged parts.
 - (5) Clean the assembly, subassembly, or part before inspecting it.
 - (6) Before installing components having mating surfaces, inspect the mating surfaces to make sure they are in serviceable condition.
 - (7) Hold the bolt (or screw) head with a wrench (or screwdriver) while tightening or loosening a nut on the bolt (or screw).
 - (8) Torque to the special torque cited when the task instructions include the words "torque to." Use standard torques at all other times.
 - (9) When a cotter pin is required, align the cotter pin holes within the allowable torque range.
 - (10) Inspect for foreign objects after performing maintenance.

CHAPTER 1

INTRODUCTION

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Section I. GENERAL INFORMATION

1.1 SCOPE.

This Manual provides information for operation, troubleshooting and maintenance of the Generator Set 150 kW (figure 1-1). Information is provided on operating principles, controls and indicators, preventive maintenance checks and services, lubrication, operation under usual and unusual conditions, troubleshooting, and maintenance.

1.2 MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those described by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

1.3 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Destruction of Army materiel to prevent enemy use shall be in **accordance** with TM 750-244-3.

1.4 PREPARATION FOR STORAGE AND SHIPMENT.

Refer to Chapter 4, Section VII.

1.5 EQUIPMENT IMPROVEMENT RECOMMENDATION (EIR).

If your Generator Set 150 kW needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, U. S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO, Fort Monmouth, New Jersey 07703-3000. We will send you a reply.

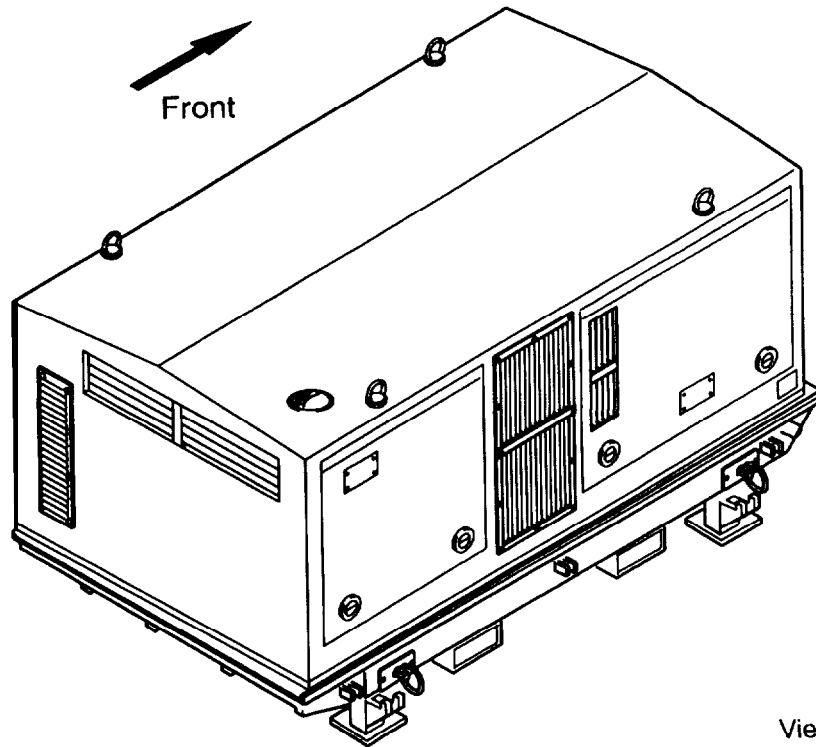
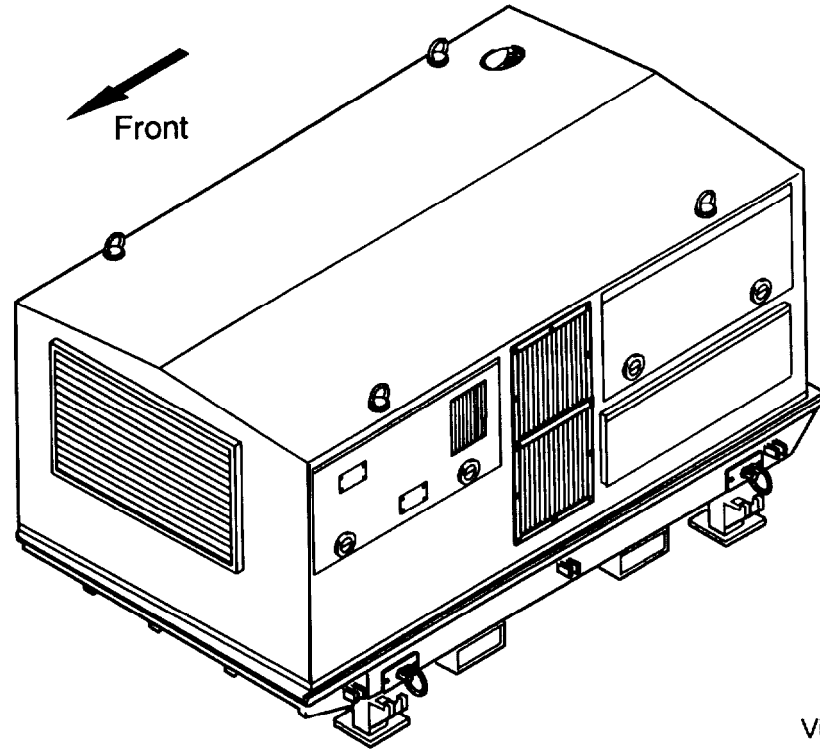


Figure 1-1 Generator Set 150 kW.

1.6 NOMENCLATURE CROSS-REFERENCE LIST.

Refer to table 1-1 for nomenclature cross-reference list.

Table 1-1 Nomenclature Cross-Reference List.

Common Name	Official Nomenclature
ECS	Engagement Control Station
EHG	Electra-hydraulic Fan
EPP III	Electric Power Plant III
FK	Filter Box
GEN SET 150 kW	Generator Set 150 kW
KHD	Klockner Humboldt Deutz (Diesel Engine Company)
OH	Operating Hours
PDU	Power Distribution Unit
RS	Radar Set

1.7 LIST OF ABBREVIATIONS.

Refer to the glossary at the back of this manual.

1.8 GLOSSARY.

Refer to the glossary at the back of this manual.

Section II. EQUIPMENT DESCRIPTION

1.9 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

The 400-Hz synchronous generator in the Generator Set 150 kW generates phase/line voltages of 120/208 volts. Maximum permissible phase current is 521 A. It is driven by an g-cylinder diesel engine with a continuous power output of 186 kW at 2182 RPM. The air, fuel, and oil filters are dimensioned so that the Generator Set 150 kW is suitable for desert conditions. An Engine Preheating Assembly is provided to allow operation at less than -22 °F (-30 °C). Fuel is supplied from a tank with a diesel fuel capacity of 101.7 gallons (385 liters). With a full tank and at full load, operating time is approximately 10 hours (correspondingly longer at partial load). The Generator Set 150 kW contains connection, activation, deactivation, and operational monitoring systems and can be operated independently. The Generator Set 150 kW is mounted in pairs on the EPP III pallet frame. Both Generator Sets 150 kW are connected to the PDU. They operate in parallel to generate the power delivered from the EPP III to the ECS and RS loads (see TM 9-6115-669-13&P).

1.10 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Figure 1-2 shows the location of major components of the Generator Set 150 kW. Table 1-2 provides a short description of the major components of the Generator Set 150 kW.

Table 1-2 Description of Major Components, Generator Set 150 kW

Item No.	Item Name	Short Description
1	Unit Hood Assembly	Protects assemblies from the elements, and muffles the noise produced by the diesel engine and synchronous generator.
2	Diesel Engine	Drives the Synchronous Generator Assembly.
3	Base Frame Assembly	For installation of Generator Set 150 kW assemblies.
4	Engine Preheating Assembly	Preheats the engine oil, fuel injection pump, cylinder heads, and generator belts.
5	Scavenge Pump Assembly	Pumps out engine oil, e.g. for oil changes or repair purposes.
6	Silencer Assembly	Muffles noise produced by the diesel engine.
7	Battery Set Assembly	Provides power for the Engine Preheating Assembly, diesel engine glow plugs, starter, and 24 VDC electrical system.
8	Fuel Tank Assembly	Capacity is approximately 101.7 gallons (385 liters) of fuel.
9	Ground Strap	Grounds the Control Cabinet Assembly to the Unit Hood Assembly.
10	Identification Plate	Identifies the Generator Set 150 kW (NSN, P/N and SERIAL NO).
11	Control Cabinet Assembly	For activation, deactivation, control, and monitoring of Generator Set 150 kW.
12	Air filter Assembly	Filters incoming combustion air.
13	Synchronous Generator Assembly	Generates electrical power.
14	Subcurrent Filter Assembly	Filters the engine oil.
15	Slave Receptacle Connector Assembly 24V	For parallel connection of battery sets (onboard set with an external battery set).
16	Lifting Ring	For hoisting the Generator Set 150 kW.
17	Eyeboft	For securing the Unit Hood Assembly.

1.11 CONSTRUCTION.

1.11.1 Base Frame Assembly and Unit Hood Assembly.

The Generator Set 150 kW consists of the base frame assembly (3, figure 1-2) on which the assemblies and the unit hood assembly are mounted. The engine and generator compartments are separated from one another by a panel and is fastened to the base frame assembly. The base frame assembly is a welded aluminum frame on which the following components are mounted:

- Identification plate for the Generator Set 150 kW (10)
- Identification plate for the base frame, complete
- J3 SLAVE RECEPTACLE 24 VOLTS (15) and designation plate for the J3 SLAVE RECEPTACLE 24 VOLTS
- Four lifting rings (16) for hoisting the Generator Set 150 kW
- Six eyebolts (17) for securing the unit hood assembly

The unit hood assembly (1) protects the assemblies from the elements, and muffles the noise produced by the diesel engine and synchronous generator. On each long side it has two swing-up flaps, supported on gas cylinders, providing access to the engine and generator compartment and the control cabinet assembly displays and controls. For voltage equalization, each flap is connected by a grounding strap to the unit hood assembly, and the unit hood assembly is grounded to the base frame assembly with a strap. The control cabinet assembly connectors are accessible through an opening in the unit hood assembly that is covered by a protective profile. Four eyebolts are mounted on the top surface to allow removal of the unit hood assembly.

1.11.2 Engine Compartment.

The engine compartment contains the diesel engine with starter, battery charging alternator, and fuel and oil filters, the subcurrent filter assembly, the scavenge pump assembly, and the engine preheating assembly.

The diesel engine (2) is fastened to the base frame assembly with two shock absorbers and two engine mounts, and connected to the synchronous generator with a clutch. It is cooled by the electro-hydraulic fan (EHG). Cooling air is drawn in at the front of the unit hood assembly, blown over the diesel engine cooling fins, and exhausted through the two air leading ducts in the unit hood assembly. Combustion air is drawn in at the back of the unit hood assembly and delivered to the diesel engine through the air filter assembly (12) integrated into the partition, and the turbocharger. Exhaust gases are discharged through the silencer assembly (6) mounted under the base frame assembly and then into two exhaust hoses. Engine oil is filtered through the oil filter located on the diesel engine, and the subcurrent filter assembly (14). The subcurrent filter assembly is connected to the diesel engine by two oil lines. It performs the function of the oil filter on the EHG, whose centrifugal oil cleaner is not accessible for maintenance. For oil changes and repair operations, engine oil is pumped out with the manually operated scavenge pump assembly (5), which is equipped with a stopcock. The intake side is connected to the oil sump with an oil hose. A ball cock with handle is fitted to the oil drain hose.

The engine preheating assembly (4) provides a cold-start capability for the diesel engine. This assembly consists of:

A heating system with air and exhaust hoses, supplied with fuel from the fuel tank assembly through two fuel hoses (inflow and return flow);

An electric oil pump connected with oil hoses to the diesel engine sump and to an air-oil-heat exchanger;

An air-oil-heat exchanger connected with an oil hose to the diesel engine oil filler neck;

A heat exchanger box containing the air-oil-heat exchanger and electric oil pump; and an air flap, actuated by a puller magnet, mounted on the heat exchanger box;

An air hose, located above the oil hose from the sump to the electric oil pump, through which hot air is blown;

An air hose running from the air flap to the diesel engine, through which hot air is blown onto the fuel injection pump and diesel engine cylinder heads;

A length of pipe flanged onto the heat exchanger box, through which hot air is blown onto the generator belts;

The control circuit installed in the control cabinet assembly.

Qualification for desert conditions - i.e. protection of the diesel engine from sand and dust - is the result of suitably dimensioned air, fuel, and oil filters.

1.11.3 Generator Compartment.

The generator compartment contains the synchronous generator, control cabinet assembly, fuel tank assembly, battery set assembly, and air filter assembly.

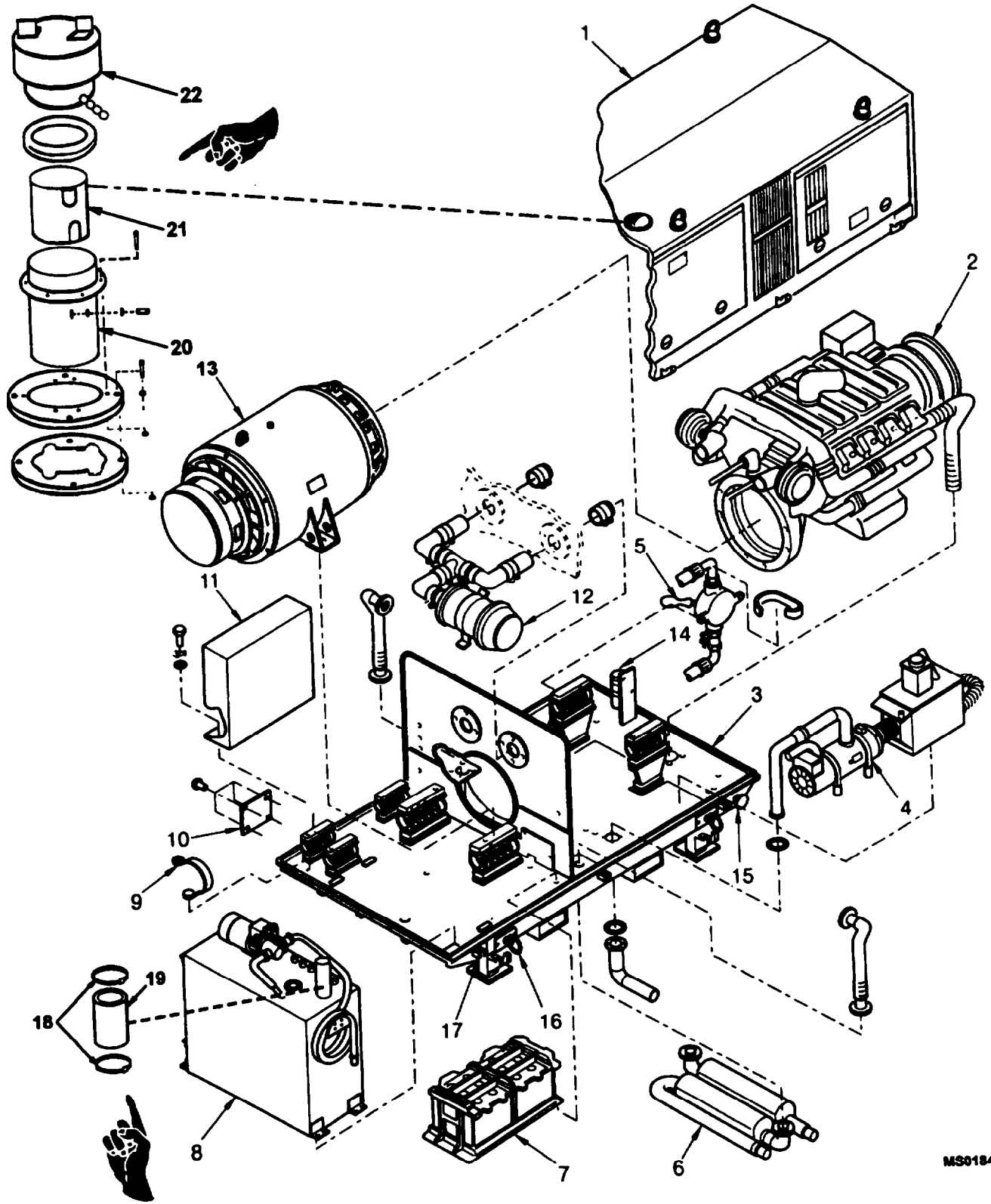
The synchronous generator (13) is fastened to the base frame assembly by two shock absorbers, and connected to the diesel engine with a clutch. It is cooled by a fan wheel located on the engine end of the generator shaft. Cooling air is drawn in at the back of the unit hood assembly, passes over the windings of the synchronous generator, and is exhausted through an air guide box in the base frame assembly. The synchronous generator cables, protected by corrugated hoses, are bolted to the control cabinet. The control cabinet (11) is fastened to the base frame assembly by four shock absorbers, and connected to the base frame assembly by a ground strap (9). Assemblies N1 to N5, the contactors, the timing relays, the thermistor relay F12, the circuit breakers, and the filter box (FK) are mounted to the back wall either directly or on mounting bars. The controls and displays are located in the front panel section. After unlocking four quick-release fasteners, the upper front panel section can be swung to the right and secured. The key that unlocks the fasteners is located on the housing frame. The connection panel with the connectors is located in the lower front panel section, which is bolted to the control cabinet. The connection panel is used to connect the control and power cables that are permanently connected to the EPP III power distribution unit.

The fuel tank assembly (8) consists of a tank with a capacity of 101.7 gallons (385 liters), on which an electric fuel pump is mounted. The fuel tank is connected to the tank by a fuel hose. Mounted on the in-

take side is a 177 in. (4.5 meter) long fuel hose with a tank filling valve. It is coiled on a holder mounted on one end of the tank.

The tank has a filler tube (21) and a rubber fuel fill hose (19) connected to a standard fuel filler neck (20) and is secured by two metal band clamps (18). It also has a screw-on cap (22) located on top of the hood assembly. Minimum and maximum tank level switches, and a level sensor, are installed in the tank. The tank can be emptied through a drain plug at the bottom. Welded onto one long side of the tank is a bracket on which the generator regulator (N6) and EHG regulator (N7) are mounted. The engine preheating assembly is connected to the tank by two fuel hoses (inflow and return flow). The diesel engine is connected to the tank by three fuel hoses (manual pump inflow, fuel injection pump return flow, engine oil overflow line).

The battery set assembly (7) consists of two sealed, maintenance-free, rechargeable 12-volt batteries with terminal protector caps, a cable set, and the battery set holder. The battery set holder consists of an upper and lower casing. The lower battery set holder casing is fastened to the base frame assembly. The air filter assembly (12), integrated into the partition, consists of a chamber for the filter cartridge and a dust collector. The built-in maintenance switch closes when the filter cartridge is dirty.



MS018401

Figure 1-2 Generator Set 150 kW, Location of Major Components.

1.12 EQUIPMENT DATA.**1.12.1 Tabulated Data.**

Refer to table 1-3 for tabulated data,

Table 1-3 Tabulated Data for Generator Set 150 kW

WEIGHTS AND DIMENSIONS

Operational weight	6,608 pounds (2,977 kg)
Shipping weight	8,139 pounds (3,692 kg)
Overall length *	113.38 in. (288.0 cm)
Overall width *	69.29 in. (176.0 cm)
Overall height *	62.99 in. (160.0 cm)

* See figure 1-3

GENERAL SPECIFICATIONS

Manufacturer	Lechmotoren GmbH
Apparent output	187.5 kVA
Rated power factor	cos φ 0.8
Rated voltage	3~ 400 Hz, 120/208 V
Maximum inclination	maximum 10° (18%)

TRANSPORTATION

Truck, rail, air and trailer transportable	Tiedown rings provided
Inclined transport (angle)	25° (maximum), any direction

**PERFORMANCE CHARACTERISTICS
UNIT HOOD ASSEMBLY**

Manufacturer	Lechmotoren GmbH
Weight	352.4 pounds (160 kg)
Overall length	113.38 in. (288.0 cm)
Overall width	68.11 in. (173.0 cm)
Overall height	46.73 in. (118.7 cm)

Table 1-3 Tabulated Data for Generator Set 150 kW (continued).**DIESEL ENGINE**

Manufacturer	Klockner-Humboldt-Deutz
Model no.	BF8L513
Continuous power output	186 kW
Rated speed	2182 RPM
Number and arrangement of cylinders	V-8, 90°
Firing sequence	1-8-4-5-7-3-6-2
Operating mode	Four-stroke diesel engine with direct fuel injection and exhaust-driven turbochargers
Cubic capacity	13820 cm ³
Lubrication	Pressurized recirculating system
Lubricating oil pressure	>0.5 bar at 600 RPM with engine warmed up
Oil capacity, with/without filter	5.8 gallons (22 l)/5 gallons (19 l)
Direction of rotation	counterclockwise, facing flywheel
Starting aid	Flame glow plug system
Cooling	Electra-hydraulic fan
Fuel consumption	Approximately 10.8 gallons/hr (41 l/hr) at full load
Air filter	Dry air filter with dust collector
Weight with starter and generator	2,312.8 lb (1050 kg)

STARTER

Manufacturer	Bosch
Starter voltage	24 VDC
Starter actuation	Electromagnetic

BATTERY CHARGING ALTERNATOR

Manufacturer	Bosch
Rated voltage	28 VDC
Rated current	55 A

BATTERY SET ASSEMBLY

Wiring pattern	Two 12-V batteries in series
Rated voltage	24 V
Rated capacity	100 Ah
Weight	154.2 lb (70 kg)

FUEL TANK ASSEMBLY

Manufacturer	Lechmotoren GmbH
Weight (empty)	84.6 lb (38.4 kg)
Length	41.38 in. (105.0 cm)
Width	17.72 in. (45.0 cm)
Height	34.25 in. (87.0 cm)
Capacity	101.7 gallons (385 l) incl. reserve

Table 1-3 Tabulated Data for Generator Set 150 kW (continued).

SYNCHRONOUS GENERATOR ASSEMBLY

Manufacturer	Lechmotoren GmbH
Model no.	SDV 52.25-22
Apparent output	187.5 kVA
Rated power factor	cos φ 0.8
Rated voltage	3~400 Hz, 120/208 V
Rated current	521 A
Weight	1674.0 pounds (760 kg)
Length	38.27 in. (97.2 cm)
Width	29.92 in. (76.0 cm)
Height	26.89 in. (68.3 cm)
Cooling	Built-in fan

CONTROL CABINET ASSEMBLY

Manufacturer	Lechmotoren GmbH
Model no.	SA 150-400
Input/output power	187.5 kVA
Input/output voltage	3~400 Hz, 120/208 V
Input/output current	521 A
Weight	319.4 pounds (145 kg)
Length	43.31 in. (110 cm)
Width	14.76 in. (37.5 cm)
Height	39.57 in. (100.5 cm)

ENGINE PREHEATING ASSEMBLY

Manufacturer	Webasto
Model no.	HL 10011
Rated voltage	24 VDC
Rated output	120 W
Heating current	maximum 11.6 kW
Fuel consumption	maximum 1.34 kg/h
Weight	30.8 pounds (approximately. 14 kg)
Length	25.59 in. (65 cm)
Width	7.87 in. (20 cm)
Height	9.65 in. (24.5 cm)

BASE FRAME ASSEMBLY

Manufacturer	Lechmotoren GmbH
Weight	726.9 pounds (330 kg)
Length	113.38 in. (288.0 cm)
Width	68.89 in. (175.0 cm)
Height	11.81 in. (30.0 cm)
Construction	Welded aluminum frames

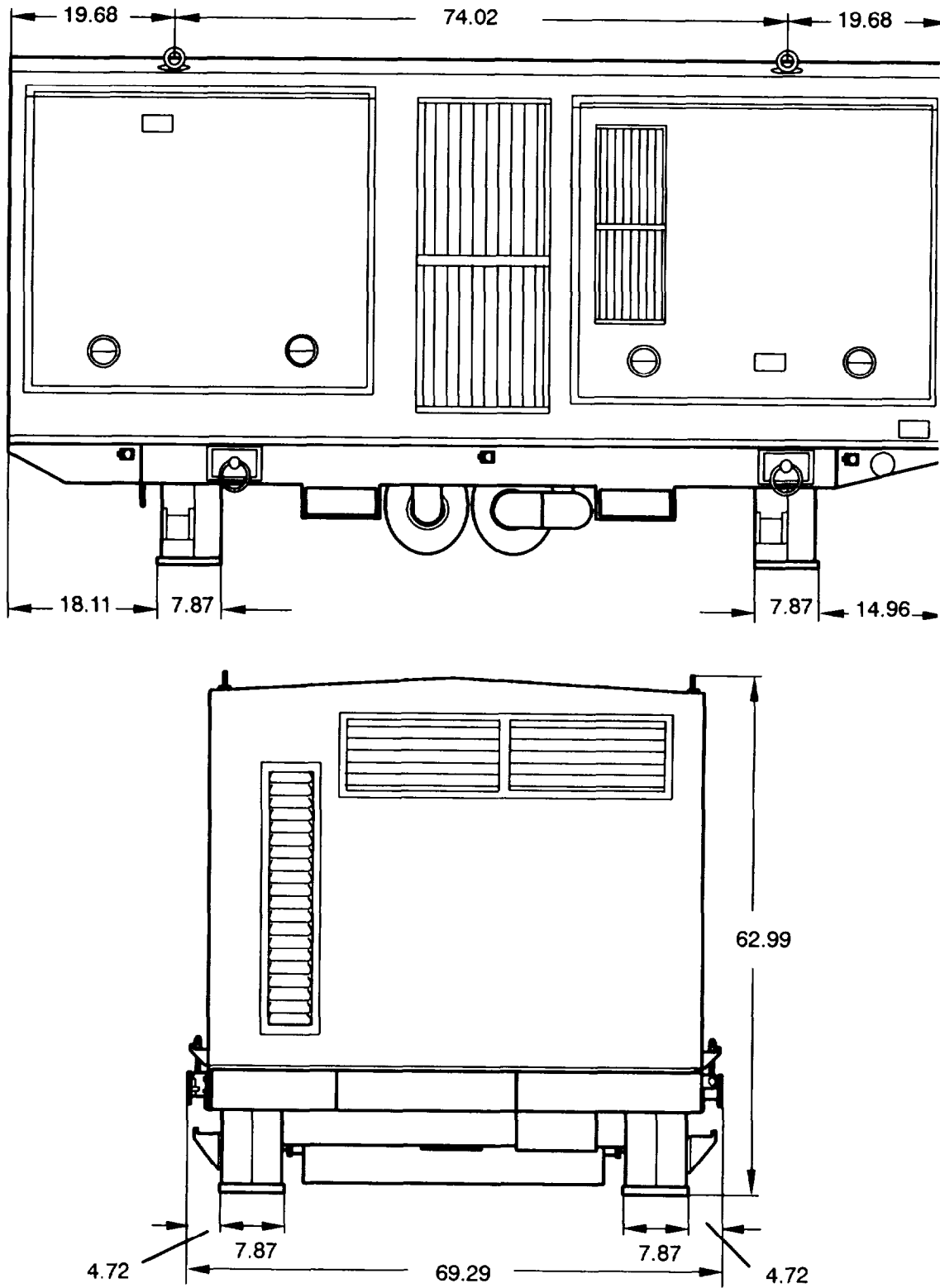


Figure 1-3 Generator Set 150 kW, Dimensions.

Section III. PRINCIPLES OF OPERATION

1.13 GENERAL DESCRIPTION.

1.13.1 Diesel Engine.

The engine is an 8-cylinder diesel engine with exhaust-driven turbochargers, direct fuel injection, electronic speed control, and an electro-hydraulic fan (figure 1-4).

In the speed control system, the speed pick-up detects actual engine speed at the flywheel toothed ring. That value is sent to speed governor assembly N1, which compares actual engine speed to the adjustable engine speed setpoint. If there is a discrepancy, N1 sends a control signal to the speed control device. The speed control device converts the control signal to a rotary motion that acts on the fuel injection pump through a linkage. The engine speed setpoint, and therefore the generator frequency, are adjusted with the FREQUENCY ADJUST potentiometer (R4).

If the load changes, digital isochronous load sharing module N4 generates, from the current changes detected by T2 to T4, a control signal that is superimposed on the voltage (engine speed setpoint) picked off from the FREQUENCY ADJUST potentiometer (R4). N1 and the speed control device thus counteract any decrease in engine speed caused by increased load, or any increase in engine speed resulting from a load falloff. Speed governor assembly N1, which has a slower control response, then performs fine adjustments.

The diesel engine is cooled by an electro-hydraulic fan (EHG). To achieve temperature-dependent speed regulation of the EHG, the engine oil and cylinder head temperatures are sensed by temperature-dependent resistors (1830.1 at cylinder 6 and 1B30.2 at cylinder 1). These are connected to EHG controller N7, which controls solenoid valve 1Y11. The solenoid valve modifies the volume of oil flowing through the EHG (and therefore the fan rotation speed) as a function of temperature.

The pressure and temperature of the diesel engine oil are determined by sensors, and displayed on the OIL PRESSURE (P9) and OIL TEMPERATURE (P10) meters. If values go above or below the allowable range, pressure and temperature sensitive switches close and shut down the Generator Set 150 kW. Faults are indicated by the OIL PRESSURE (H3) and OIL TEMP-CYLINDER HEAD (H4) lamps.

All electrical cables to the fuel tank assembly and the diesel engine (except the shielded cables to the control device and the pick-up) pass through the filter box (FK) for filtration and interference suppression. The low-pass filters dissipate HF voltages to ground, and the varistors suppress voltage spikes.

1.13.2 Fuel Tank Assembly.

The tank can be filled with a fueling nozzle, a canister, or the electric fuel pump. The fuel pump is turned on with the FUEL TANK PUMP ON illuminated pushbutton switch (S19), and shut down with the FUEL TANK PUMP OFF pushbutton switch (S18). The maximum tank level switch automatically shuts off the fuel pump at maximum tank capacity. The fuel level sensor delivers a tank level signal that is displayed on the FUEL LEVEL meter (P11). The minimum tank level switch delivers a signal indicating that two hours of operating time remain.

The LOW FUEL lamp (H15) lights up when this level is reached. The alarm signal is applied to PARALLEL OPERATION receptacle J9, and sent via the EPP III to the ECS.

1.13.3 Maintenance Free Battery Set Assembly.

The battery set consists of 12-volt batteries 2G1 and 2G2, connected in series. It provides power for the diesel engine glow plugs and starter, and for the 24-V power circuits in the engine preheat assembly and switching system. Since battery capacity is one of the factors determining the cold-starting ability of a diesel engine, at temperatures below about 19.4 °F (-7 °C) the onboard battery set is connected in parallel to an external battery set through the J3 SLAVE RECEPTACLE 24 VOLTS.

1.13.4 Starter.

The 1M1 starter, flange-mounted on the diesel engine, is an electromagnetically actuated DC series-characteristic motor. During starting, it turns the diesel engine until the engine can run on its own.

1.13.5 Battery Charging Alternator.

The 1G3 battery charging alternator, flange-mounted on the diesel engine, is a self-excited synchronous generator with a three-phase current rectifier and a generator regulator N6. It charges battery set 2G1 and 2G2 via shunt R11. N6 limits charging voltage when the battery set is charged, and charging current when it is discharged. Charging current is displayed on the BATTERY CHARGE meter (P7). If the battery set is not being charged during operation, the BATTERY CHARGING CONTROL lamp (H2) will light up.

1.13.6 Engine Preheating Assembly.

The engine preheating assembly consists of a heating unit with fan, an air/oil heat exchanger, an electric oil pump, and an air guide system with air flap. Air heated by the heating unit is blown through the air/oil heat exchanger connected to the engine oil circuit. Cold engine oil is drawn up from the sump and monitored by temperature switch S103/S104. Engine oil heated in the air/oil heat exchanger is pumped back to the engine by the electric oil pump. A portion of the heated air is blown through an air flap onto the fuel injection pump and engine cylinder heads. Another portion of the heated air is blown onto the generator 1G3 belts.

1.13.7 Synchronous Generator Assembly.

The synchronous generator is a 400-Hz generator with an apparent output of 187.5 kVA and a rated power factor of 0.8. It consists of the exciter (external pole generator), a rotating rectifier, and the actual generator (internal pole generator). Voltage regulator N2 prepares and regulates exciter voltage in order to regulate the output voltage. N2 consists of the Equal Power Distribution, Linear Regulator, Averaging Circuit, and Voltage Sensing Transformer boards.

The current-proportional voltage tapped at T11/R12, T12/R13, and T13/R14 is transformed by a voltage sensing transformer to values that can be processed by the averaging circuit. The reason for the averaging circuit is that the sensed voltage can be overlain by interference pulses that falsify the readings. The linear regulator generates exciter output for the synchronous generator (or generators, in parallel operation).

The equal power distribution circuit detects the reactive power component of the current based on the current-proportional voltage tapped at T1/R15. Without reactive power compensation, synchronous generators operated in parallel would experience different loads. The outcome of this process affects the exciter voltage of the linear regulator.

1.14 FUNCTIONAL DESCRIPTION.

1.14.1 Engine Preheating Assembly Operation.

- Circuit breakers F1 to F11 and F101 to F103 in control cabinet assembly are closed (figure FO-1).

1.14.1.1 Start- up, Time t = 0.

On control cabinet assembly, MASTER SWITCH (S1) to ON:

+24V is applied to the control cabinet 24-V circuits through F1 to F9.

BATTERY CHARGING CONTROL indicator lamp (H2) and OIL PRESSURE indicator lamp (H3) light up (+V_{reg} from N5).

+24 V is present at terminal X101, connector 1 of the engine preheating assembly.

On control cabinet, press HEATING ON illuminated pushbutton switch (S102):

+24 V is applied, through S102, to the coils of K111, K107, K110, K101 and K106.

Auxiliary contactor K111 energizes and switches +24 V, through N-O contact 30-87, to N-O contacts 30-87 of K103 and K104 (input voltage to heating control system).

Auxiliary contact K101 energizes and switches +24 V:

through N-O contact 30-87 and R100 to R102 to glowplug R108, which preheats the combustion chamber. R100 to R102 heat speed governor assembly N1 in the control cabinet through N-O contact 30-87 and V106 to the coil of K109. Auxiliary contactor K109 energizes:

+V_{reg} is applied through N-O contact 13-14 to the HEATING ON indicator lamp (H101), which lights up; S102 is bridged through N-O contact 23-24 and S103/S104 (latch);

+24 V is applied through N-O contact 33-34 to the puller magnet of the air flap, which opens; N-C contact 71-72 disconnects the coil of K10 (oil pressure) from +24 V (shutoff delay due to insufficient oil pressure).

Time relay K106 energizes and blocks excitation of K103. K103 prevents the excitation of K105, i.e. the solenoid valve in the intake manifold is not connected to +24 V through N-O contact 30-87 of K105.

1.14.1.2 Time t approximately 1 minute.

K106 deenergizes. +24V is applied through N-C contact 15-16 to the coil of K103.

Auxiliary contactor K103 energizes and switches +24 V, through N-O contact 30-87:

and V105 to the coil of K109;

and V102 to the fan motor of the heating system;

to the coils of K104, K105, and K108.

Auxiliary contactor K105 energizes and switches +24 V, through N-O contact 30-87, to the solenoid valve in the intake manifold (diesel fuel can be drawn into the heating system).

If burner monitor temperature switch S109 is closed (burner ignited), auxiliary contactor K104 energizes and latches itself through N-O contact 30-87. The fuel-air mixture is ignited and heats the air-oil-heat exchanger.

1.14.1.3 Time t approximately 2.8 minutes.

K106 energizes and disconnects the coil of K103 from +24 V. K103 deenergizes.

If burner monitor temperature switch S109 is open, i.e. K104 is not excited, the heating system must be restarted.

1.14.1.4 Time t approximately 3 minutes.

Time relay K110 energizes:

N-C contact 15-16 is open, disconnecting the coil of K101 from +24 V. K101 deenergizes. The combustion chamber is no longer preheated, and N1 is no longer heated.

+24 V is applied through N-O contact 15-18 to the coil of K102. Auxiliary contactor K102 energizes and switches +24 V, through N-O contact 30-87, to the oil pump motor (2M3).

If burner monitor temperature switch S109 is closed, K109 remains excited. Engine oil is pumped through the air-oil-heat exchanger and heated. Residual heat from the preheating assembly is blown through the air flap and a hose onto the fuel injection pump, cylinder heads, and generator belts. This status is maintained for a timed period.

If temperature switch S109 is open, K109 deenergizes and H101 goes out. The heating system must be restarted.

1.14.1.5 Time t approximately 13 minutes.

Time relay K108 energizes:

N-C contact 25-26 is open, disconnecting the air flap puller magnet from +24 V. The air flap closes. This prevents the engine EHG from forcing cold air into the heating system.

The READY TO START IF HEATING IS ON indicator light (H102) is connected to +V_{reg} through N-O contact 15-18, and lights up. The diesel engine can be started.

If the diesel engine is started before the READY TO START IF HEATING IS ON lamp lights up, the air flap puller magnet is disconnected from +24 V by the open N-C contact 21-22 of K6, and the air flap closes (see above).

1.14.1.6 Starting Up, the Engine Preheating Assembly at Temperatures above 14 °F (-10 °C).

If the engine preheating assembly is started up at a temperature above 14 °F (-10 °C), one of the two temperature switches S103/S104 is open. As a result, K109 does not latch, i.e. the heating system shuts down again within one minute (paragraph 1.14.1.1).

1.14.1.7 Shutting Down the Engine Preheating Assembly.**Normal Operation**

When the engine oil has reached a temperature of approximately 140 °F (60 °C) either temperature switch S103 (60-degree, 3%) or S104 (63-degree, 6%) opens, and shuts down the heating system.

Manual Shutdown

If the engine reaches a stable speed prior to automatic shutdown, the heating system can be shut down with the HEATING OFF pushbutton switch (S101).

Overtemperature Shutdown

If the heating system overheats, temperature switch S110 opens. If S110 is open, K105 de-energizes:

+24 V is switched to R103 through N-C contact 30-87a.

The >0,5 A current produced by R103 triggers circuit breaker F103:

N-O contact 1-2 is open; K109 deenergizes and the HEATING ON indicator lamp (H101) goes out.

The HEATING FAILURE indicator lamp (H103) is connected to +V_{reg} through N-C contact 21-22, and lights up.

After every heating system shutdown (for any reason including a fault), time relay K107 remains energized for about 90 seconds. This causes the heating system fan motor to continue running for about 90 seconds, since it is connected to +24 V through N-O contact 15-18 of K107. This run-on function prevents hot air from building up, thus preventing the heating system from overheating.

1.14.2 Operating the Generator Set 150 kW.

- Circuit breakers F1 to F11 in the control cabinet assembly closed (figure FO-1),
- BATTLE SHORT function (K11) not activated.

1.14.2.1 Operating the Flame Glowplug System.

MASTER SWITCH (S1) in control cabinet assembly to ON:

+24 V is applied, through F1 to F9, to the control cabinet 24-V circuits.

BATTERY CHARGING CONTROL indicator lamp (H2) and OIL PRESSURE indicator lamp (H3) light up (+V_{reg} from N5).

Auxiliary contactor K2 (fault message) energizes.

GLOWPLUG/START rotary switch (S2) to GLOWPLUG:

Flame glowplugs (1R5, 1R6) and fuel delivery solenoid valve (1Y1) are activated through R1.

After no more than 90 seconds, the GLOWPLUG ON indicator lamp (H1) lights up. The diesel engine can be started.

1.14.2.2 Operating the Diesel Engine and Synchronous Generator.

GLOWPLUG/START rotary switch (S2) to START

Auxiliary contactor K28 energizes and latches through N-O contact 13-14.

+24 V is applied to connector 50 of the starter (1 MI) via N-O contacts 13-14 and 23-24 of K2, and 1-2 and 3-4 of K28. The starter turns the engine at the speed required to catch, until it starts running under its own power.

K28 prevents the starter from shutting down.

Time relay K10 (oil pressure) energizes after a delay (delayed shutdown due to insufficient oil pressure).

If oil pressure is >0.8 bar, the oil pressure switch (1S2) opens and the OIL PRESSURE indicator lamp (H3) goes out. If oil pressure does not reach the required level because of a fault, 1S2 does not open and the OIL PRESSURE lamp (H3) does not go out.

The battery charging alternator (1G3) charges the battery set (2G1/2) via R11, and the BATTERY CHARGING CONTROL indicator lamp (H2) goes out.

If the battery charging alternator is not charging the battery set due to a fault (no indication on BATTERY CHARGING meter (P7), the BATTERY CHARGING CONTROL lamp (H2) does not go out.

Auxiliary contactor K2 (error message) deenergizes. The time totalizing meter (P8) receives operating voltage through N-C contact 81-82, and runs,

GLOWPLUG/START rotary switch (S2) to "0":

GLOWPLUG ON lamp (H1) goes out.

Auxiliary contactor K28 deenergizes.

Starter shuts down, and cannot be restarted while engine is running (K2 provides starter lockout).

Speed governor assembly N1 and digital isochronous load sharing module N4 are provided with +24 V through N-C contacts 51-52 and 61-62 of K2 and K5.

N1 regulates engine speed, and therefore generator frequency, to the setpoint set with the FREQUENCY ADJUST potentiometer (R4).

The coil of K3 is connected to +24 V through N-C contact 71-72 of K2.

Time relay K3 energizes after a time delay, and switches +24 V through N-O contact 15-18 to the coil of K6.

Auxiliary contactor K6 energizes and switches +24 V through N-O contacts 1-2 and 3-4 to the coil of K25 and K26, the interlock chain, voltage regulator N2, and safety device N3.

Time relay K26 energizes after a time delay and switches +24 V through N-O contact 15-18 to the coil of K25, thus enabling shutdown due to faults:

Under/over-frequency (K7);

Under/overvoltage (K8);

Reverse power (K27); and

Generator temperature too high (K9).

N2 regulates generator voltages to the setpoint set with the VOLTAGE ADJUST potentiometer (R3).

During the energizing delay of time relay K13, safety device N3 checks the generator for:

Under/overfrequency;

Under/overvoltage; and

Reverse power.

Thermistor relay F12 and auxiliary contactor K9 respond if the stator winding temperature reaches or exceeds approximately 302 °F (150 °C).

1.14.2.3 Voltages Present at Control Cabinet Assembly Receptacles.

If the AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch (S8) is pressed and the interlock chain is closed, +24 V is applied to the coil of K14. The interlock chain consists of:

K13, N-O contact 15-18 closed, interlock chain operating;
S7, N-C contact 1-2 closed, AC CIRCUIT INTERRUPTER OFF pushbutton switch;
S8, N-O contact 3-4 closed, AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch;
K16, N-C contact 21-22 closed, power systems of Generator Set 150 kW and Commercial Power Converter are synchronized;

K17, N-O contact 15-18 closed, Generator Set 150 kW power systems are synchronized;
S12, N-O contact 13-14 closed, interlock switch in receptacle L1 (OA);
S13, N-O contact 13-14 closed, interlock switch in receptacle L2(OB);
S14, N-O contact 13-14 closed, interlock switch in receptacle L3 (OC);
S15, N-O contact 13-14 closed, interlock switch in receptacle N;
K27, N-C contact 21-22 closed, no reverse power from second Generator Set 150 kW;
K21, N-C contact 31-32 closed, no overload at one, at two, or at receptacles L1 (OA), L2 (OB), L3 (OC);
K12, N-C contact 81-82 closed, not activated at ECS EMERGENCY;
K25, N-C contact 15-16 closed, Commercial Power Converter in operation.

Auxiliary contactor K14 energizes and latches through N-O contact 1-2:

+24 V is applied through N-O contact 3-4 to the coil of K1. Main contactor K1 energizes and switches generator voltages to control cabinet assembly receptacles L1 (OA), L2 (OB), L3 (OC) and N.

(See paragraph 1.14.4.1 for maximum current monitoring of receptacles L1 (OA), L2 (OB) and L3 (OC)).

AC CIRCUIT INTERRUPTER ON lamp (H14) is connected to +V_{reg} through N-O contact 5-6 and lights up.

The control signal (0 V) is applied to PARALLEL OPERATION receptacle J9 through N-O contact 43-44, and is transferred through the EPP III to the second Generator Set 150 kW.

Generator voltages are applied through F10 to the VOLTAGE SELECTOR SWITCH (S11), with which the phase and line voltages can be switched for display on the VOLTAGE meter (P6). These voltages are applied, through F10 (phases U, V, W) and the N-O contacts 2-1 and 4-3 of K1 (phase U, OA and phase V, OB), to power measuring transducer P4a. This measures the active power output, based on the line currents detected by T8 to T10, which is displayed on the KILOWATTS meter (P4).

The phase U phase voltage is applied, through the N-O contact 2-1 of K1 and F11, to the J1/120 V 400 Hz double receptacle. Generator voltages arrive at the EPP III Power Distribution Unit through power cables L1, L2, L3, and N.

1.14.3 BATTLE SHORT Mode.

BATTLE SHORT mode is activated by the BATTLE SHORT switch (S21) in the control cabinet (or the BATTLE SHORT switch in the ECS) (figure FO-1).

When BATTLE SHORT mode is active, auxiliary contactor K11 in the control cabinet is excited:

The BATTLE SHORT indicator light (H17) is connected to $+V_{reg}$ through N-O contact 43-44, and lights up; +24 V is applied through N-O contacts 13-14 and 23-24 to connector 50 of starter 1M1, i.e. in BATTLE SHORT mode the starter can be turned on with the GLOWPLUG/START rotary switch; N-C contact 51-52 is open: the coil of K2 is disconnected from +24 V and K2 cannot energize; N-C contact 81-82 is open: K5 cannot energize if K8 or K9 is excited; N-C contact 61-62 is open: K12 cannot energize.

1.14.3.1 Fault Shutdowns and Indications.

If the faults marked with a * occur in BATTLE SHORT mode, K11 prevents main contactor K1 from shutting down (table 1-4). If the unmarked faults occur in BATTLE SHORT mode, the interlock chain is interrupted and main contactor K1 shuts down voltages to control cabinet assembly receptacles L1 (OA), L2 (OB) L3 (OC) and N (paragraph 1.14.2.3). in BATTLE SHORT mode there is no restriction on fault indication.

Table 1-4 BATTLE SHORT Mode.

Fault display	Source	Shutdown in BATTLE SHORT mode
★ BATTERY CHARGING CONTROL (H2)	K2	No
★ OIL PRESSURE (H3)	K2	No
★ OIL TEMP-CYLINDER HEAD (H4)	K2	No
AIR FILTER (H5)	K4	Indication only
★ UNDER/OVER VOLTAGE (H9)	K8, K5	No
★ GENERATOR OVER TEMPERATURE (H10)	K9, K5	No
UNDER/OVER FREQUENCY (H8)	K7, K5	Yes
OVERLOAD (H13)	K21	Yes
REVERSE POWER (H11)	K27, N3	Yes

1.14.3.2 Emergency Shutdown.

If the EMERGENCY switch in the ECS is actuated in BATTLE SHORT mode, 0 V is applied to K12, A2 through contact C of PARALLEL OPERATION receptacle J9. Because N-C contact 61-62 of K11 opens, disconnecting K12, A1 from +24 V, auxiliary contactor K12 cannot energize and the interlock chain is interrupted. This means that the voltages to control cabinet assembly receptacles L1 (OA), L2 (OB), L3 (OC) and N are not shut down.

1.14.4 Control Cabinet Assembly.

1.14.4.1 Maximum Current Monitoring for L1 (OA), L2 (OB) and L3 (OC).

Safety device N3 provides synchronization as well as monitoring of the voltage, frequency, and maximum current of receptacles L1 (OA), L2 (OB) and L3 (OC) and reverse power. To perform these tasks, it consists of the Synchronizing Relay, Voltage Sensing Transformers, Voltage/Frequency Error Detection, and Overcurrent/Rev. Power Detection boards.

Current transformers T5, T6, and T7 generate current-proportional voltages at resistors R5, R6, and R7 (figure FO-1). The voltages are applied to N3 and J/JT/JS/JR. For example, if too high a current is flowing in the T5, T6, or T7 line, N3 triggers self-locking auxiliary contactor K21. N-C contact 31-32 of K21 opens, interrupting the interlock chain of K14. Auxiliary contactor K14 and main contactor K1 de-energize. K1 shuts down voltages to control cabinet assembly receptacles L1 (OA), L2 (OB), L3 (OC) and N.

The OVERLOAD indicator lamp (H13) is connected to $+V_{reg}$ through N-O contact 43-44 of K21, and lights up. The alarm signal is applied to PARALLEL OPERATION receptacle J9, and is delivered through the EPP III to the ECS. Once the fault has been remedied, the fault is canceled with the OVERLOAD illuminated pushbutton switch (S10). K21 is reset, and lamp H13 goes out. If a Generator Set 150 kW is in operation, K1 can be turned back on.

1.14.4.2 Indicator Lamp Brightness Adjustment.

The PANEL DIMMER (S16/R2) can be used to adjust the output voltage $+V_{reg}$ of brightness regulator N5 (positive controller) between a minimum and maximum value (figure FO-1). When the PANEL DIMMER is turned all the way to the left, S16 is open and the three front panel lights H6 and meter lights P9, P10, and P11 receive no voltage. For lamps H2 to H15, H8 to H10, H12 to H17, and H101 to H103, voltage $+V_{res}$ is set to its minimum value. When S16 is turned on, the three front panel lights H6 and the meter lights P9, P10, and P11 also receive voltage, and $+V_{reg}$ can be adjusted between its minimum and maximum values with R2.

1.14.4.3 Lamp Test.

When the LAMP TEST pushbutton switch is pushed, lamps H1, H8 to H17, and H101 to H103 are connected to $+V_{reg}$ through a diode and S20, contact 23-24, and lamps H2 to H5 are connected through a diode and S20, contact 13-14 to 0 V; they should all light up (figures FO-1 and FO-2). Lamp brightness can also be adjusted during the LAMP TEST.

1.14.4.4 Reporting and Control Functions.

Table 1-5 lists reporting and control functions that are exchanged, through PARALLEL OPERATION receptacle J9, with the second Generator Set 150 kW, EPP III, ECS, and Commercial Power Converter. Contacts V, W, a, b, c, d, e, and f of J9 are unoccupied (figure FO-1).

Table 1-5 J9 PARALLEL OPERATION Receptacle, Monitoring and Control Functions.

Control Cabinet Assembly, Designation	Source	J9 PARALLEL OPERATION, Contact	Affects
0 V (24 dcV system)	---	A	EPP III, 0 V (24 dcV system)
BATTLE SHORT (S21)	Excitation of K11	B	ECS, BATTLE SHORT switch
---	Excitation of K12	C	ECS, EMERGENCY switch
0 V	Excitation of K25	D	Commercial Power Converter operation
+24 V	Excitation of K17	E	EPP III operation
Interlock loop	Excitation of K20	F	2nd Gen Set 150 kW, J9-G, N-O contact K14
AC CIRCUIT INTERRUPTER ON	N-O contact K14	G	2nd Gen Set 150 kW, J9-F, excitation of K20
0 V	---	H	2nd Gen Set 150 kW, J9-J, excitation of K18
PARALLEL OPERATION ON (S9)	Excitation of K18	J	2nd Gen Set 150 kW, J9-H, 0 V (24 dcV system)
BATTERY CHARGING CONTROL, OIL PRESSURE, OIL TEMP-CYLINDER HEAD	N-O contact K2	K	ECS, fault message
AIR FILTER	N-O contact K4	K	ECS, fault message
UNDER/OVER FREQUENCY	NO contact K7	K	ECS, fault message
UNDER/OVER VOLTAGE	N-O contact K8	K	ECS, fault message
GENERATOR OVER TEMPERATURE	N-O contact K9	K	ECS, fault message
OVERLOAD	N-O contact K21	K	ECS, fault message
REVERSE POWER	N-O contact K27	K	ECS, fault message
+24 v	N-O contact K1	L	ECS, ON message Gen Set 150 kW
LOW FUEL	N-O contact K23	M	ECS, LOW FUEL message Gen Set 150 kW

Table 1-5 J9 PARALLEL OPERATION Receptacle, Monitoring and Control Functions (continued).

Control Cabinet Assembly, Designation	Source	J9 PARALLEL OPERATION, contact	Affects
+24 v	N-O contact K6	N	EPP III, +24 V (24 dcV system)
+24 v	Excitation of K19	P	2nd Gen Set 150 kW, J9-U, N-C contact K19
Power distribution	N4, connector 10	R	2nd Gen Set 150 kW, J9-R, N4, 10
Active power output	N4, connector 11	S	2nd Gen Set 150 kW, J9-S, N4, 11
Cable shield	---	T	2nd Gen Set 150 kW, J9-T, cable shield
0 V	N-C contact K19	U	2nd Gen Set 150 kW, J9-P, excitation of K19
Power distribution	N2, connector A	X	2nd Gen Set 150 kW, J9-Y, N2, E
Reactive power	N2, connector E	Y	2nd Gen Set 150 kW, J9-X, N2, A
Cable shield	---	Z	2nd Gen Set 150 kW, J9-Z, cable shield

1.15 RELATED TECHNICAL MANUALS.

Refer to appendix A for related technical manuals.

CHAPTER 2

OPERATING INSTRUCTIONS

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Section I. DESCRIPTION AND USE OF CONTROLS AND INDICATORS

2.1 CONTROL CABINET ASSEMBLY.

2.1.1 Controls and Indicators.

The controls and indicators of the control cabinet assembly are shown in figure 2-1 and listed in table 2-1.

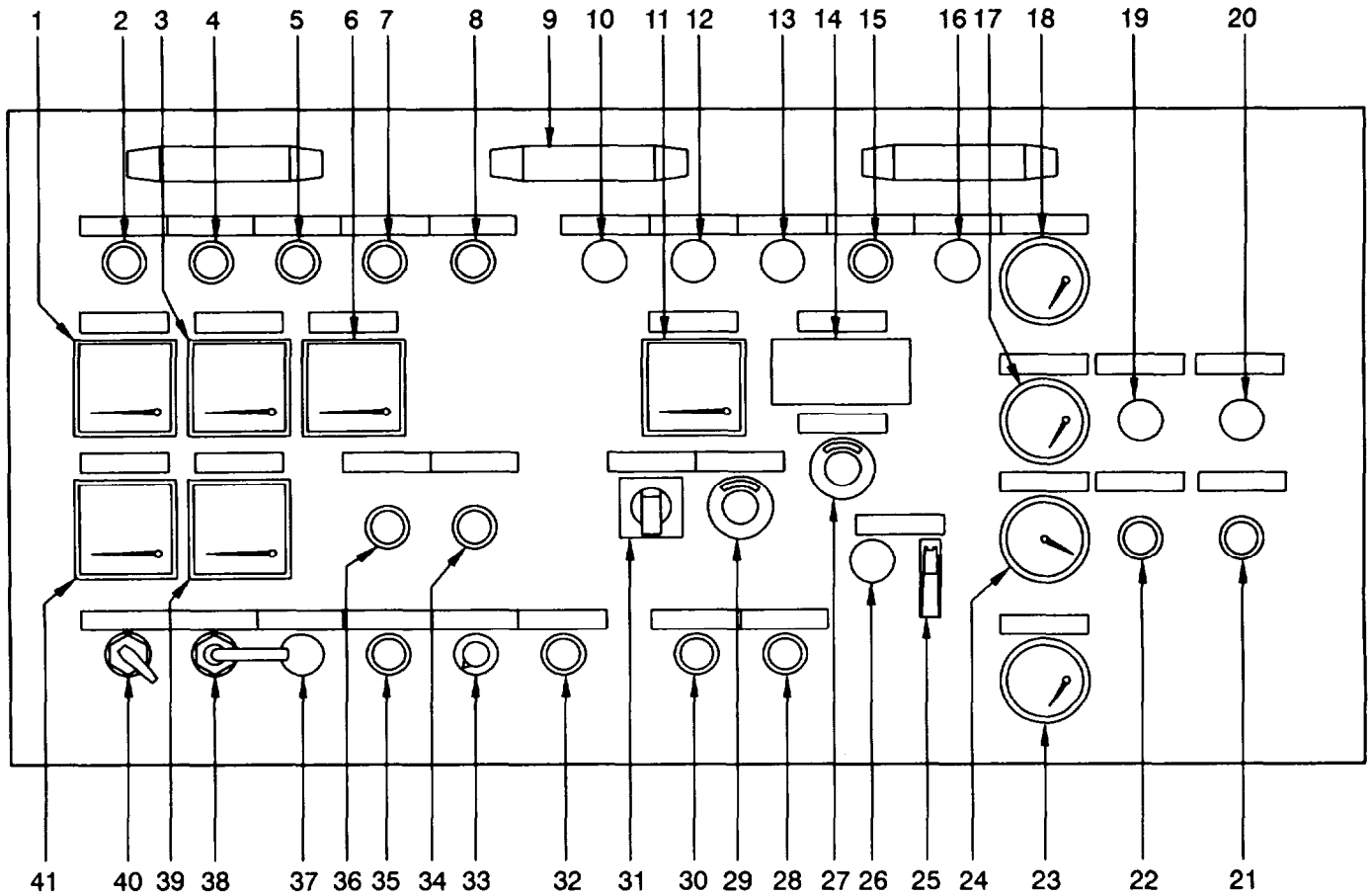


Figure 2-1 Control Cabinet Assembly, Controls and Indicators.

Table 2-1 Control Cabinet Assembly, Description of Controls and Indicators.

Item Number	Description	Function
1	AMPS L1 (OA) meter 0 - 600 A (P1)	Indicates current in line 1
2	UNDER/OVER FREQUENCY illuminated pushbutton switch, red (H8, S4)	H8 lights up if generator frequency is above or below setpoint; S4 cancels the fault message
3	AMPS L2 (OB) meter 0 - 600 A (P2)	Indicates current in line 2
4	UNDER/OVER VOLTAGE illuminated pushbutton switch, red (H9, S5)	H9 lights up if generator voltage is above or below setpoint; S5 cancels the fault message
5	GENERATOR OVER TEMPERATURE illuminated pushbutton switch, red (H10, S6)	H10 lights up if generator overheats; S6 cancels the fault message
6	AMPS L3 (OC) meter 0 - 600 A (P3)	Indicates current in line 3
7	OVERLOAD illuminated pushbutton switch, red (H13, S10)	H13 lights up if generator overloads; S10 cancels the fault message
8	REVERSE POWER illuminated pushbutton switch, red (H11, S22)	H11 lights up if reverse power is too high; S22 cancels the fault message
9	Lights (H6)	For front panel illumination; use PANEL DIMMER switch/potentiometer (33) to turn on and adjust brightness
10	BATTERY CHARGING CONTROL lamp, red (H2)	Must go out after start; if H2 lights up during operation, battery set is not being charged
11	VOLTAGE meter 0 - 250 V (P6)	Indicates line or phase voltages L-L or L-N
12	OIL PRESSURE lamp, red (H3)	Must go out after start; if H3 lights up during operation, oil pressure is too low
13	OIL TEMP-CYLINDER HEAD lamp, red (H4)	Lights up when oil and/or cylinder head temperature is too high
14	FREQUENCY meter, digital display (P5)	Displays generator frequency (400.0 ± 0.2 Hz during operation)

Table 2-1 Control Cabinet Assembly, Description of Controls and Indicators (continued).

Item Number	Description	Function
15	AIR FILTER illuminated pushbutton switch, red (H5, S17)	H5 lights up when the air filter is dirty; S17 cancels the fault message
16	LOW FUEL lamp, amber (H15)	Lights up when fuel level in fuel tank has dropped to minimum tank level
17	OIL TEMPERATURE meter, illuminated (P10) <ul style="list-style-type: none"> • Green arc • Red arc 	Indicates engine oil temperature: Operating temperature range Over temperature range
18	OIL PRESSURE meter, illuminated, 0 - 5 bar (P9)	Indicates engine oil pressure (>4 bar during operation)
19	READY TO START IF HEATING IS ON lamp, green (H102)	Lights up when engine preheat time has elapsed and engine can be started
20	HEATING FAILURE lamp, red (H103)	Lights up in the event of a heating system failure
21	HEATING ON illuminated pushbutton switch, green (S102, H101)	Turns heating system on: H101 lights up when heating system is on
22	HEATING OFF pushbutton switch (S101)	Shuts heating system off; H101 goes out when heating system is off
23	FUEL LEVEL meter 0 - 1/1, illuminated (P11)	Indicates level in fuel tank
24	HOURMETER meter (P8)	Activated when diesel engine is operating
25	BATTLE SHORT switch (S21)	Shuts off safety and monitoring functions
26	BATTLE SHORT lamp, amber (H17)	Lights up when safety and monitoring functions are off
27	FREQUENCY ADJUST potentiometer, 10-gang (R4) <ul style="list-style-type: none"> • Set between 4 and 5 	Adjusts generator frequency: For rated frequency indicated on FREQUENCY meter (14)

Table 2-1 Control Cabinet Assembly, Description of Controls and indicators (continued).

Item Number	Description	Function
28	AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch, green (S8, H14)	Turns on power system (main contactor), H14 lights up when power is ON
29	VOLTAGE ADJUST potentiometer, 10-gang (R3) <ul style="list-style-type: none"> • Set between 4 and 5 	Adjusts generator voltage: For rated voltage indicated on VOLTAGE meter (11)
30	AC CIRCUIT INTERRUPTER OFF pushbutton switch (S7)	Shuts down power system (main contactor); H14 goes out when power is OFF
31	VOLTAGE SELECTOR SWITCH (S11) <ul style="list-style-type: none"> • L3-L1, L2-L3, L1-L2 • L1-N, L2-N, L3-N 	Line voltages Phase voltages Indicated on VOLTAGE meter (11)
32	PARALLEL OPERATION ON illuminated pushbutton switch, white (S9, H12)	Initiates synchronization; H12 lights up during synchronization
33	PANEL DIMMER with switch (S16, R2) <ul style="list-style-type: none"> • S16 off, R2 turned all the way left • S16 on, R2 turned to the right 	Adjusts panel light brightness and shuts off lights All active lights at minimum brightness All lights at maximum brightness
34	FUEL TANK PUMP ON illuminated pushbutton switch, green (S19, H16)	Turns fuel pump on; H16 lights up when fuel pump is on
35	LAMP TEST pushbutton switch (S20)	Tests operation of front panel lamps
36	FUEL TANK PUMP OFF pushbutton switch (S18)	Shuts fuel pump off; H16 goes out when fuel pump is off
37	GLOWPLUG ON lamp, amber (H1)	Lights up about 90 seconds after glowplug operation begins

Table 2-1 Control Cabinet Assembly, Description of Controls and indicators (continued).

Item Number	Description	Function
38	GLOWPLUG/START rotary switch (S2) SWITCH POSITION <ul style="list-style-type: none"> • O • GLOWPLUG • START 	Off Activates flame glowplugs and solenoid valve; GLOWPLUG ON lamp (37) lights up Activates flame glowplugs, solenoid valve, and starter
39	BATTERY CHARGE meter 0 ... 60 A (P7)	Indicates battery charging current (approximately 10 A when batteries are charged)
40	MASTER SWITCH key switch (S1) SWITCH POSITION <ul style="list-style-type: none"> • LOCK • OFF • ON 	Removable key Off 24 V power off 24 V power on; Engine can be started with GLOWPLUG/START rotary switch (38)
41	KILOWATTS meter 0 - 200 kW (P4)	Indicates active power output

2.1.2 Circuit Breakers.

Control cabinet assembly circuit breakers are illustrated in Figure 2-2. Table 2-2 describes circuit breaker functions.

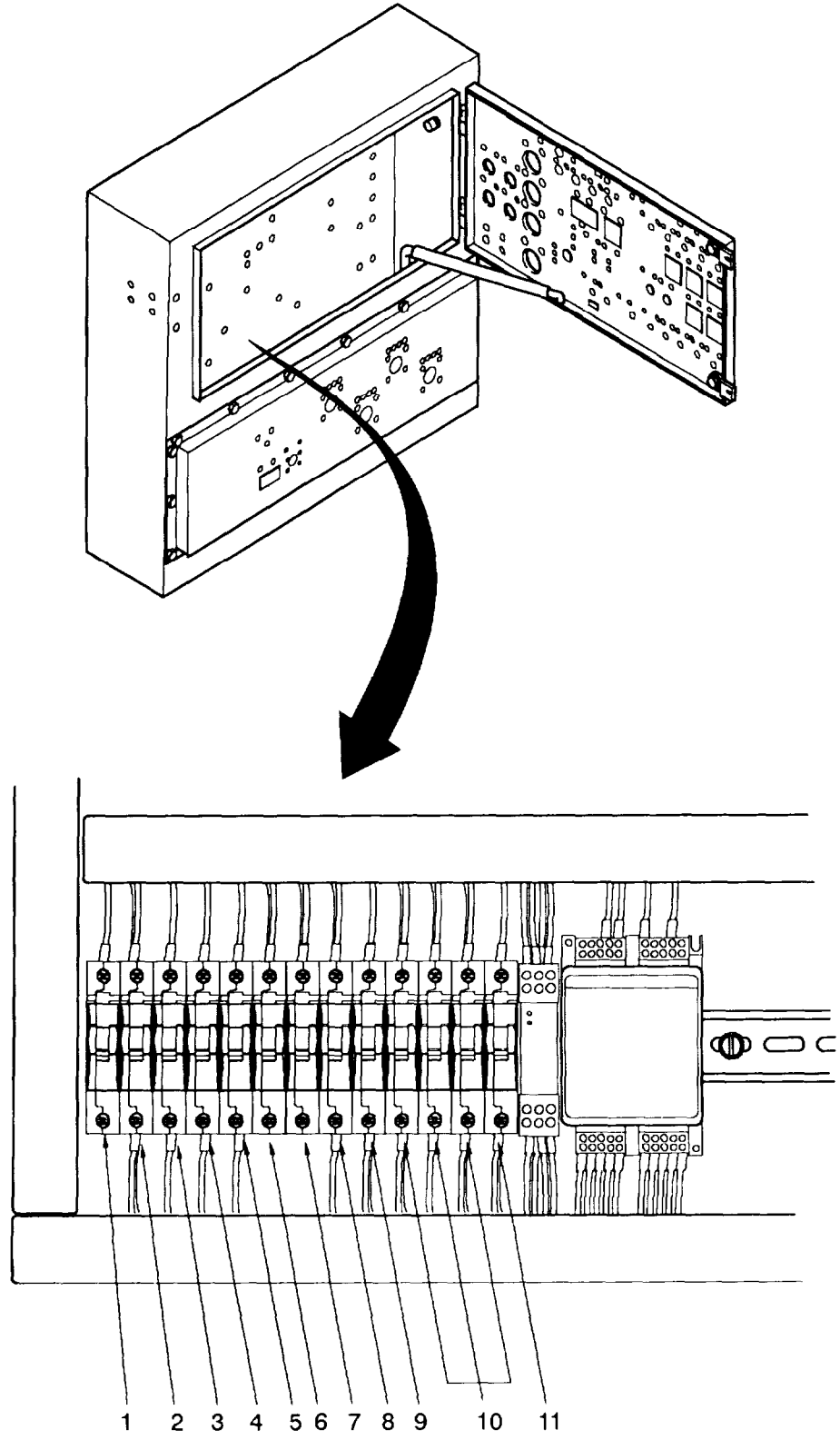


Figure 2-2 Control Cabinet Assembly, Circuit Breakers (sheet 1 of 2),

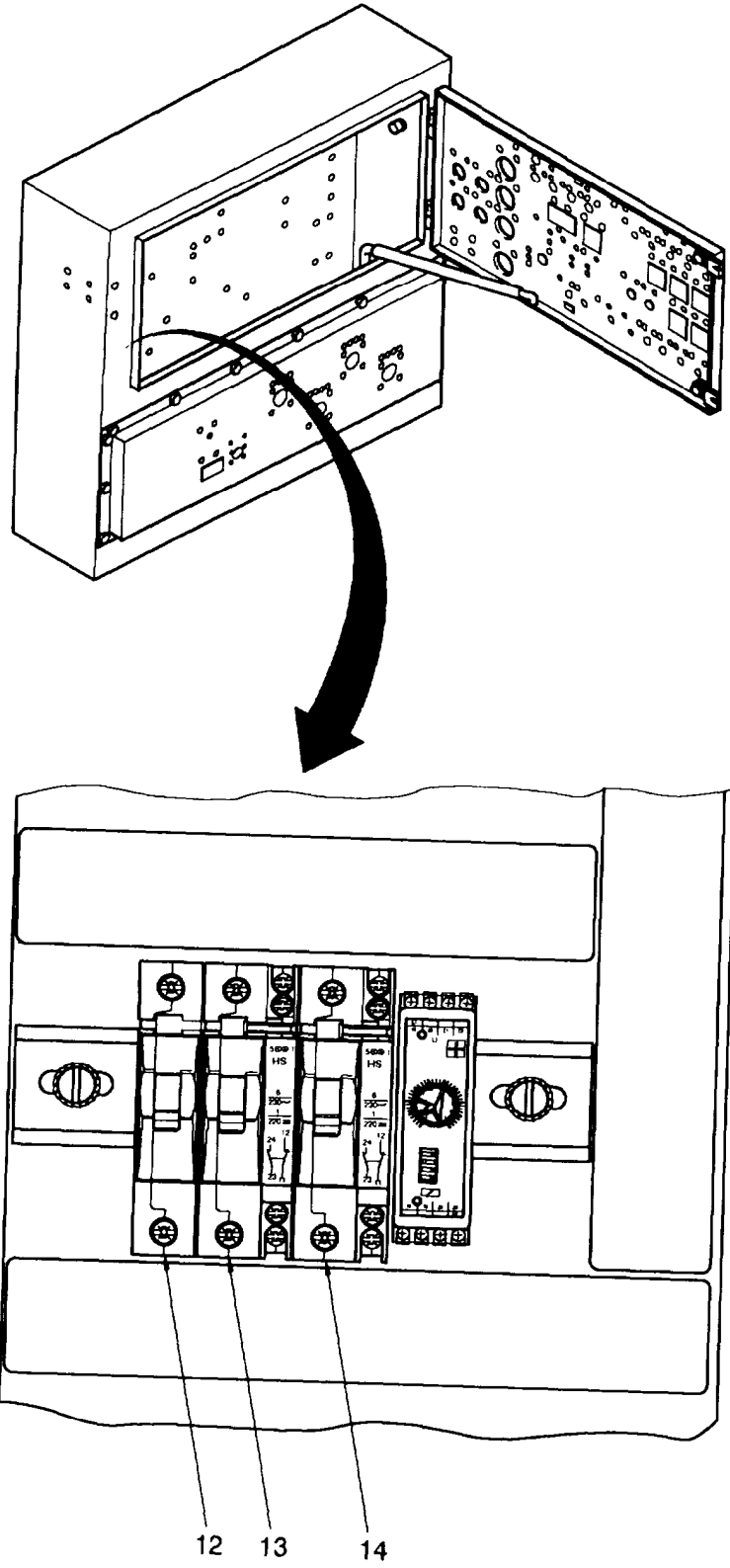


Figure 2-2 Control Cabinet Assembly, Circuit Breakers (sheet 2 of 2).

Table 2-2 Control Cabinet Assembly Description of Circuit Breakers.

Item Number	Description	Protects:
1.	24 V DC/50 A circuit breaker, 1 - pole (F1)	Circuit breakers K4 and K28; time relay K10; control cabinet 24 V circuits (not including J2 and H7)
2.	24 V DC/6 A circuit breaker, 1 - pole (F2)	Cabinet light H7, J2/24 V receptacle
3.	24 V DC/16 A circuit breaker, 1 - pole (F3)	Speed governor assembly N1 , digital isochronous load sharing module N4
4.	24 V DC/6 A circuit breaker, 1 - pole (F4)	Auxilliary contactor K2 (charging control system, oil pressure, cylinder head and oil temperature)
5.	24 V DC/6 A circuit breaker, 1 - pole (F5)	OIL PRESSURE, OIL TEMPERATURE, FUEL LEVEL meters
6.	24 V DC/6 A circuit breaker, 1 - pole (F6)	FREQUENCY meter, HOURMETER meter, brightness regulator N5
7.	24 V DC/16 A circuit breaker, 1 - pole (F7)	Auxilliary contactors K5, K7, K8, K9, K11 , K12, K19, K21, K23 and K27; time relays K3 and K13; thermistor relay F12, safety circuits
8.	24 V DC/16 A circuit breaker, 1 - pole (F8)	Auxilliary contactor K24 (Tank maximum); FUEL TANK PUMP ON illuminated pushbutton switch, FUEL TANK PUMP OFF pushbutton switch
9.	24 V DC/20 A circuit breaker, 1 - pole (F9)	Auxilliary contactors K6, K14, K16, K18 and K20; time relays K25 and K26; main contactor K1; voltage regulator N2; ssafety device N3
10.	120 V AC/6 A circuit breaker, 3 - pole (F10)	FREQUENCY, KILOWATTS and VOLTAGE meters; voltage regulator N2; safety device N3
11.	120 V AC/16 A circuit breaker, 1 - pole (F11)	J1/120 V 400 Hz double receptacle
12.	24 V DC120 A receptacle, 1 - pole (F101)	Auxilliary contactors K101 to K105, K111, time relays K106, K107 and K110, glowplug, air flap, fan motor, circuit breaker F102
13.	24 V DC/20 A circuit breaker, 2 - pole (F102)	Oil pump, HEATING FAILURE lamp H103
14.	24 V DC/0,5 A circuit breaker, 2 - pole (F103)	Time relay K108, auxilliary contact K109, solenoid valve, HEATING FAILURE lamp H103

2.1.3 Receptacles.

Control cabinet assembly receptacles are illustrated in figure 2-3. Receptacle functions are described in table 2-3. J3 SLAVE RECEPTACLE 24 VOLTS on the base frame assembly is illustrated in figure 24.

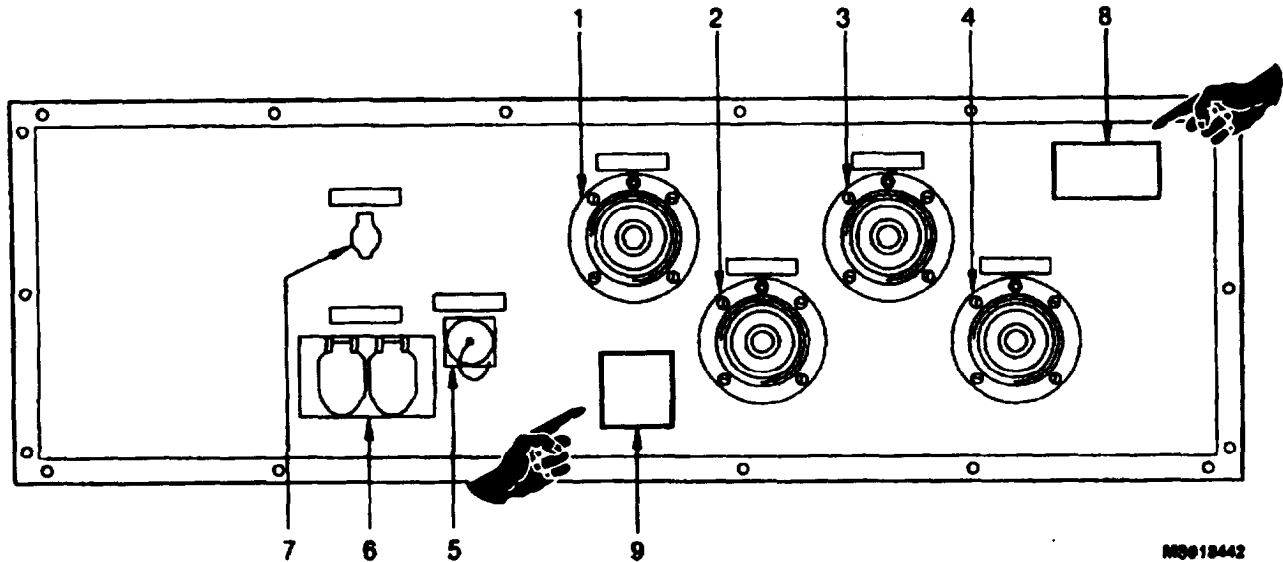


Figure 2-3 Control Cabinet Assembly, Receptacles.

Table 2-3 Control Cabinet Assembly, Description of Receptacles.

Item Number	Description	Function
1.	L1 (ØA) receptacle with locking switch	Connection to EPP III, PDU power cable
2.	L2 (ØB) receptacle with locking switch	Connection to EPP III, PDU power cable
3.	L3 (ØC) receptacle with locking switch	Connection to EPP III, PDU power cable
4.	N receptacle with locking switch	Connection to EPP III, PDU power cable
5.	J9 PARALLEL OPERATION receptacle	Connection to EPP III, PDU power cable
6.	J1/120 V 400 Hz double receptacle	Load connection (maximum 16 A)
7.	J2/24 V receptacle	Load connection (maximum 6 A)
8.	WARNING plate	WARNING 208 VAC
9.	WARNING plate	WARNING 208 VAC - Install Protective Covers

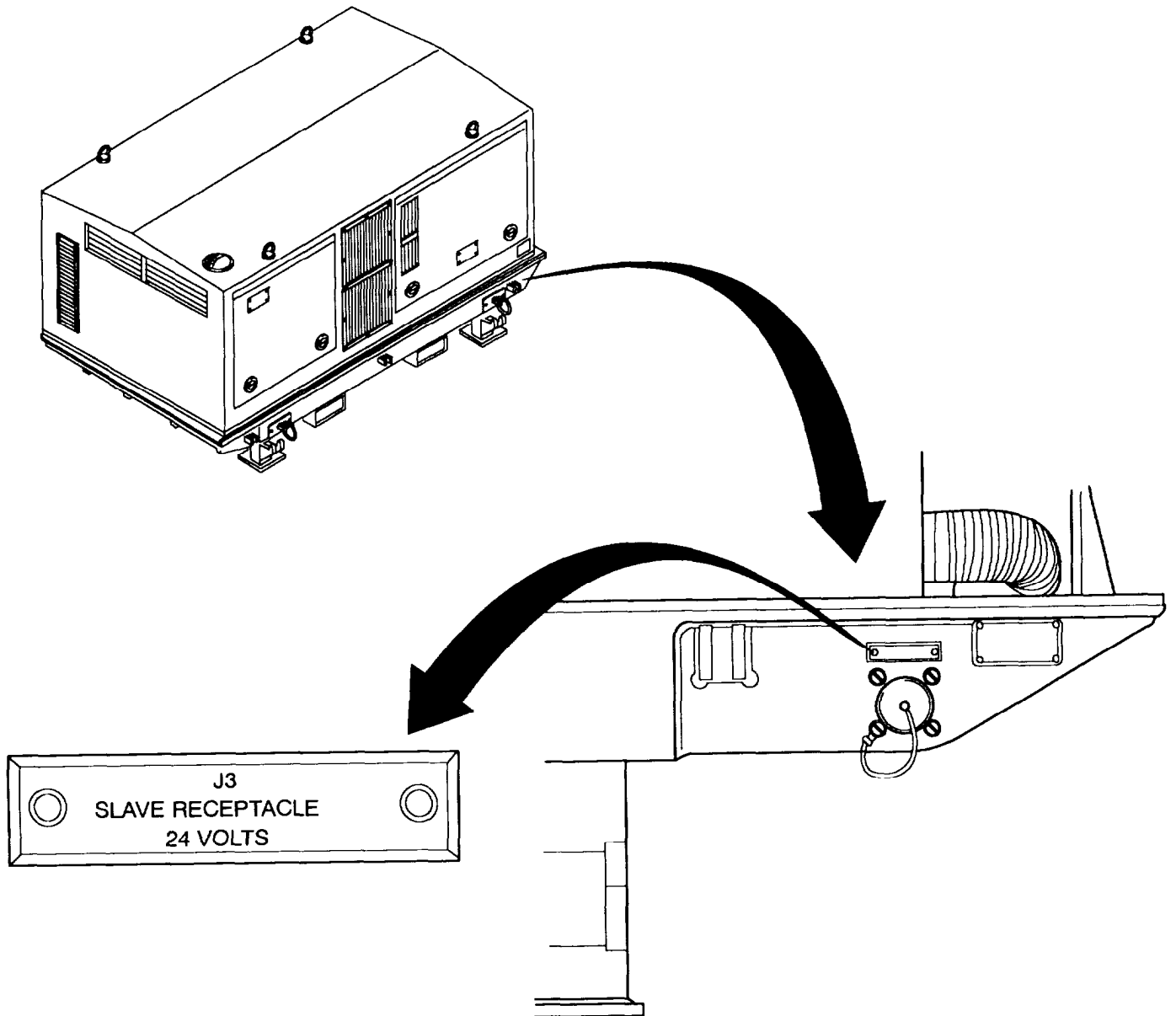


Figure 2-4 Base Frame Assembly, J3 SLAVE RECEPTACLE 24 VOLTS.

Section II. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2.2 INTRODUCTION TO OPERATOR PMCS TABLE.

Table 2-4 (PMCS table) has been provided so you can keep your equipment in good operating condition and ready for its primary mission.

2.2.1 Warnings, Cautions, and Notes. Always observe the **WARNINGS**, **CAUTIONS**, and **NOTES** appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe **WARNINGS** to prevent serious injury to yourself and others. You must observe **CAUTIONS** to prevent your equipment from being damaged. You must observe **NOTES** to ensure procedures are performed properly.

2.2.2 Explanation of Table Entries. The PMCS table is divided into five columns. Each column is explained in the following paragraphs.

2.2.2.1 Item No. Column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

2.2.2.2 Interval Column. This column tells you when you must do the procedure in the procedure column "BEFORE" procedures must be done before you operate the equipment for its intended mission. "DURING" procedures must be done during the time you are operating the equipment for its intended mission. "AFTER" procedures must be done immediately after you have operated the equipment. Perform "WEEKLY" procedures at the listed interval.

2.2.2.3 Location. Item to Check/Service Column. This column lists the location and the item to be checked or serviced. The item location is underlined.

2.2.2.4 Procedure Column. This column gives the procedure for checking or servicing the item listed in the location, item to check/service column. You must perform the procedure to know if the generator set 150 kW is ready or available for its intended mission or operation. You must do the procedure at the time stated in the interval column.

2.2.2.5 Not Fully Mission Capable If: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you make checks or services that shows faults listed in this column, do not operate the equipment.

2.2.3 Other Table Entries. Be sure to observe all special information and notes that appear in your table.

2.2.4 Special Instructions. Preventive maintenance is not limited to performing the checks and services listed in the PMCS table. Covering unused receptacles, stowing unused accessories, and other routine procedures such as equipment inventory, cleaning components, and touch-up painting are not listed in the table. These are things you should do any time you see that they need to be done. If a routine check is listed in the PMCS table, it is because experience has shown that problems may occur with this item. Take along the tools and cleaning cloths needed to perform the required checks and services. Use the information in the following paragraphs to help you identify problems at any time. Use the following information to help identify potential problems before and during checks and services.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes. Wear goggles and rubber gloves to protect eyes and skin. Wash exposed skin thoroughly. Do not smoke or use near open flame or excessive heat. Failure to observe this warning can cause severe personal injury or death.

CAUTION

Keep cleaning solvents, gasoline and lubricants away from rubber or soft plastic parts. They will deteriorate material.

- a. Keep it clean. Dirt, grease, and oil get in the way and may cover up a serious problem. Use dry cleaning solvent to clean metal surfaces,
- b. Use soap and water to clean rubber or plastic parts and material.
- c. Check all bolts, nuts, and screws to make sure they are not loose, missing, bent, or broken. Do not try to check them with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one loose, report it to the next higher level of maintenance.
- d. Inspect welds for loose or chipped paint, rust, or gaps where parts are welded together. If a broken weld is found, report it to the next higher level of maintenance.
- e. Inspect electrical wires, connectors, terminals, and receptacles for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors. Examine terminals and receptacles for serviceability. If deficiencies are found, report them to the next higher level of maintenance.
- f. Inspect hoses and fluid lines. Look for wear, damage, and leaks. Make sure that clamps and fittings are tight. Wet spots and stains around a fitting or connector can mean a leak. If a leak comes from a loose connector, or if something is broken or worn out, report it to the next higher level of maintenance.

2.2.5 Leakage Definitions. You must know how fluid leakage affects the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them. When in doubt, notify your supervisor.

<u>Leakage Class</u>	<u>Leakage Definition</u>
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 the item being checked/inspected.
Class III	Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

2.2.6 Operation of Generator Set 150 kW with Minor Leaks.

CAUTION

Equipment operation is allowable with minor leakage (Class I or ii) of any fluid except fuel. Fluid capacity must be considered before deciding to continue operation of the equipment with minor leaks. When operating with Class I or ii leaks, fluid level must be checked more often than required by the PMCS table. Parts without fluid will stop working and/or cause equipment damage.

- a. Consider the equipment's capacity for the fluid that is leaking. If the capacity is small, the fluid level may soon become too low for continued operation. If in doubt, notify your supervisor.
- b. Check the fluid level more often than required in the PMCS table. Add fluid as needed.

2.2.7 Corrosion Prevention and Control (CPC). CPC of Army material is of continuing concern. It is important that any corrosion problems with the equipment be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem, The form should be submitted to the address specified in DA Pam 738-750.

2.2.8 Order in Which PMCS Will be Done. Figure 2-5 shows the order in which you are to perform your PMCS. The number callouts on figure 2-5 correspond to the numbers in the Item No. column of table 2-4, for "Before" PMCS.

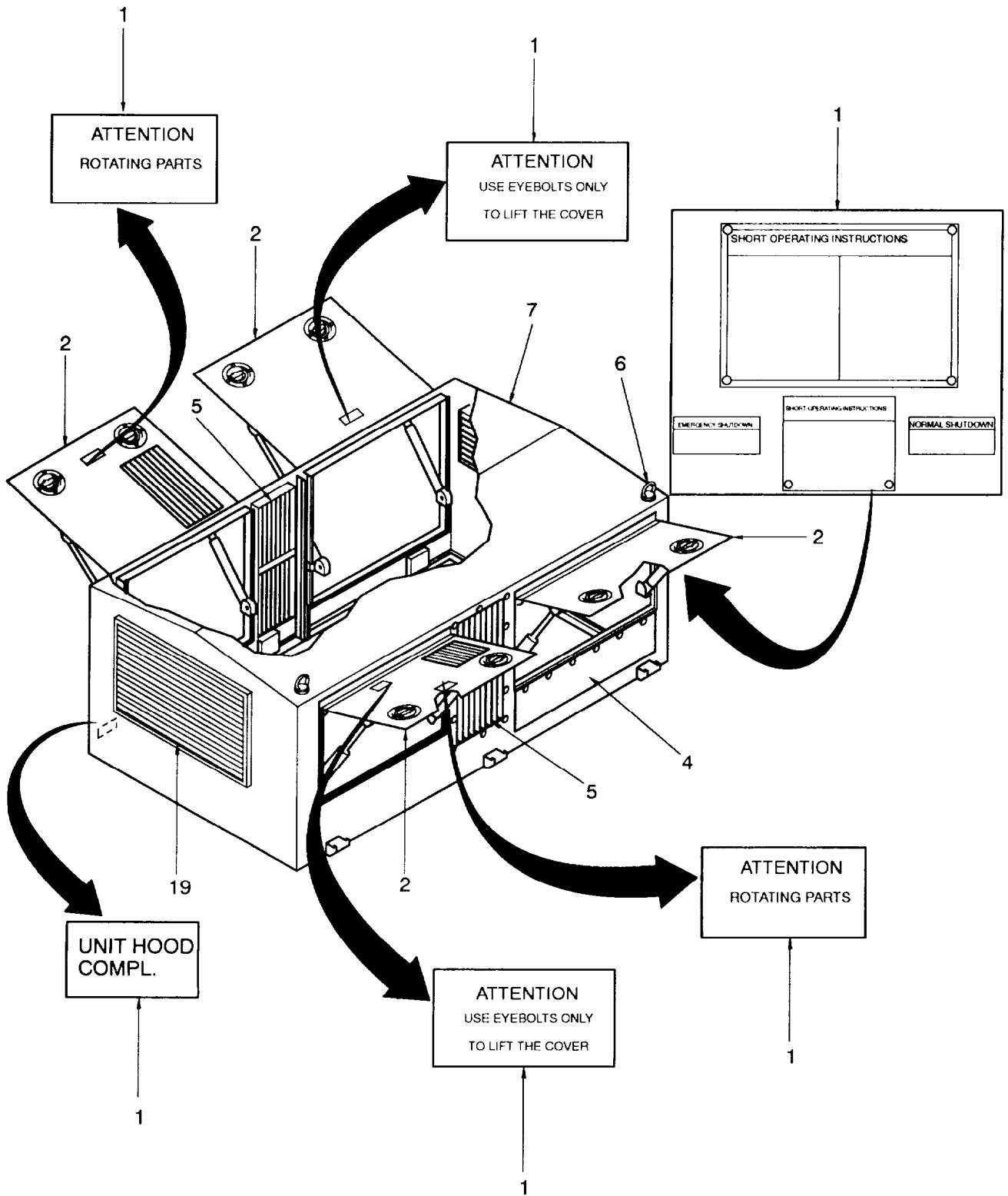


Figure 2-5 Operator PMCS Routing Diagram (sheet 1 of 6).

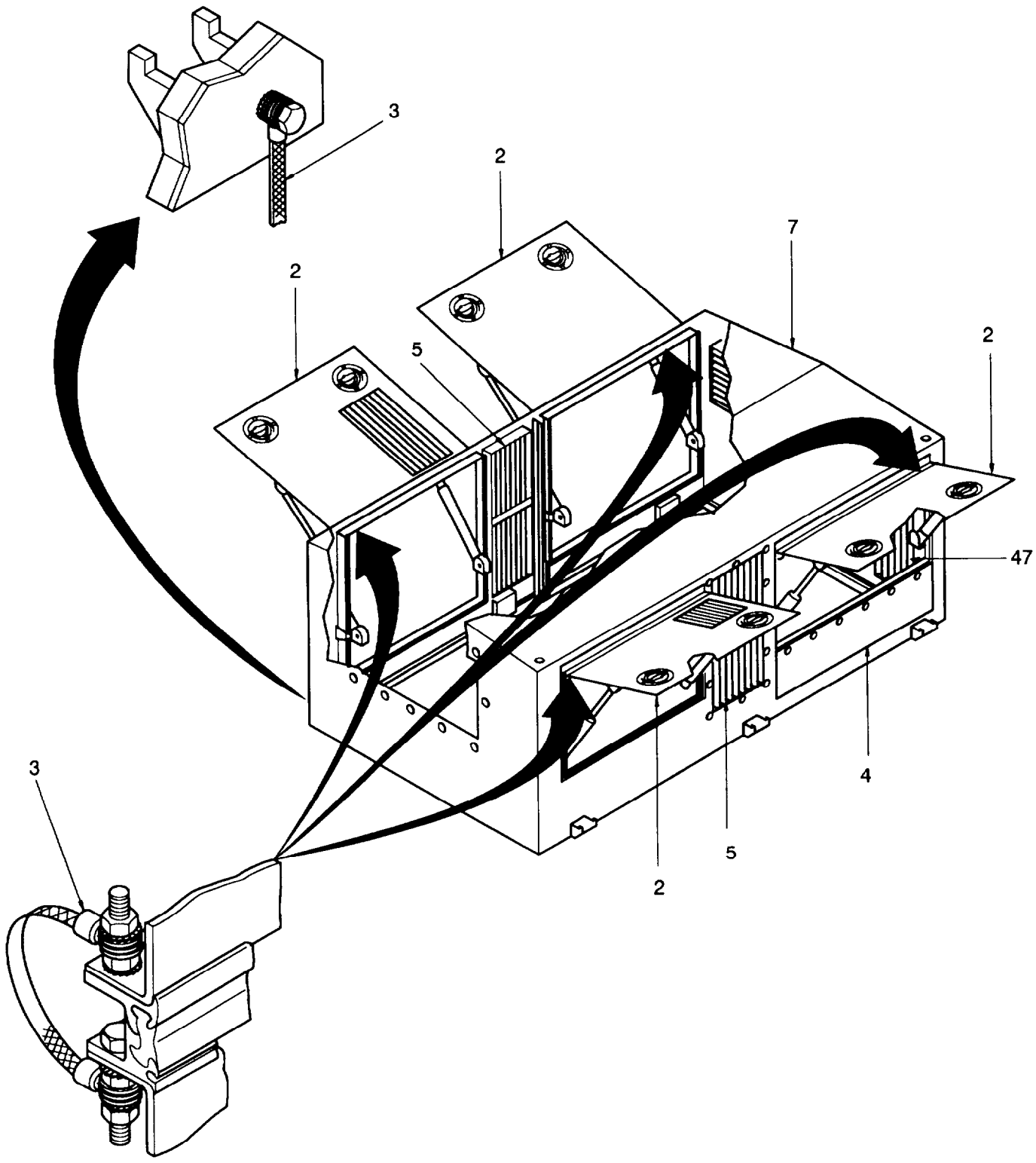


Figure 2-5 Operator PMCS Routing Diagram (sheet 2 of 6).

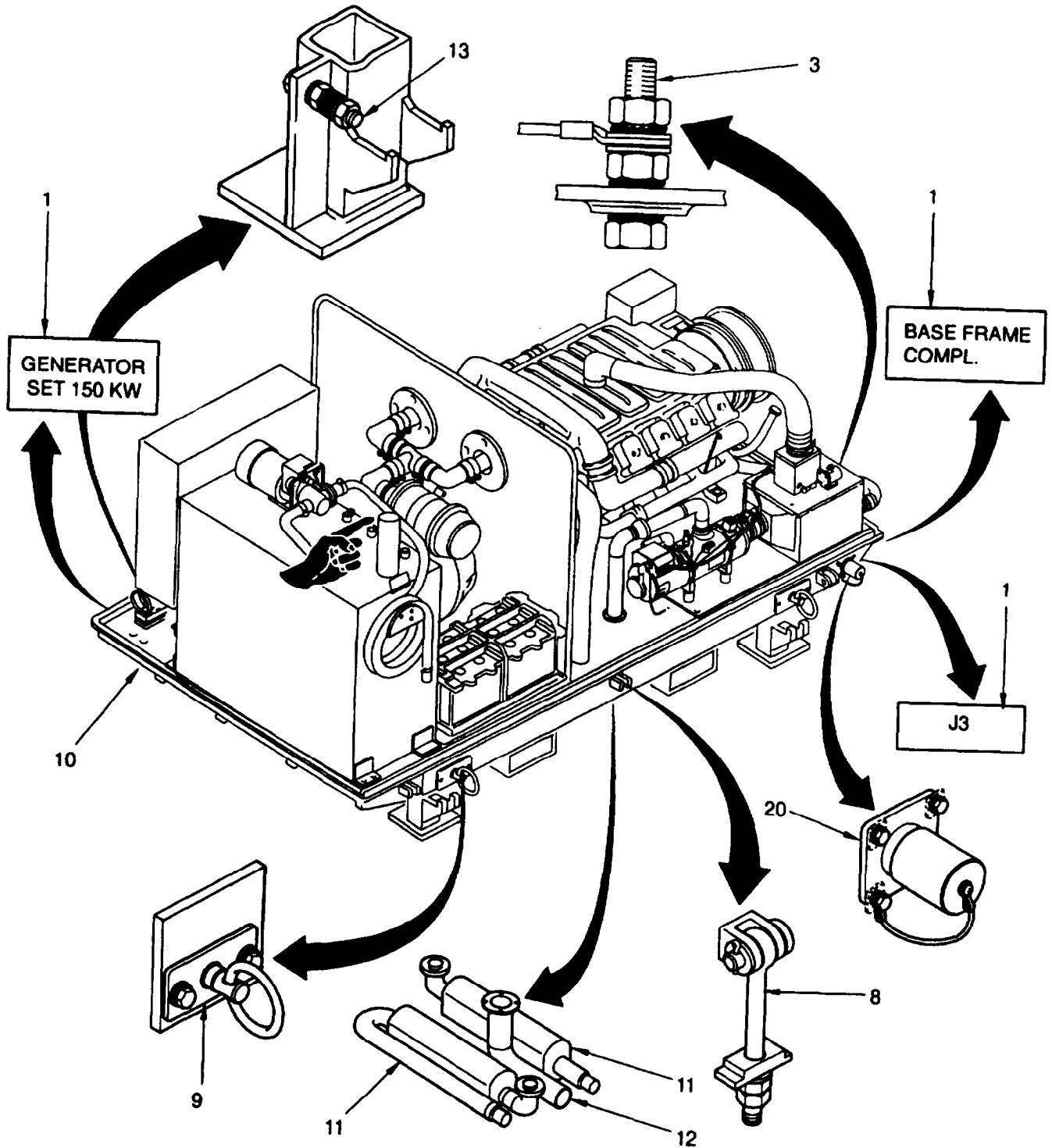


Figure 2-6 Operator PMCS Routing Diagram (sheet 3 of 6).

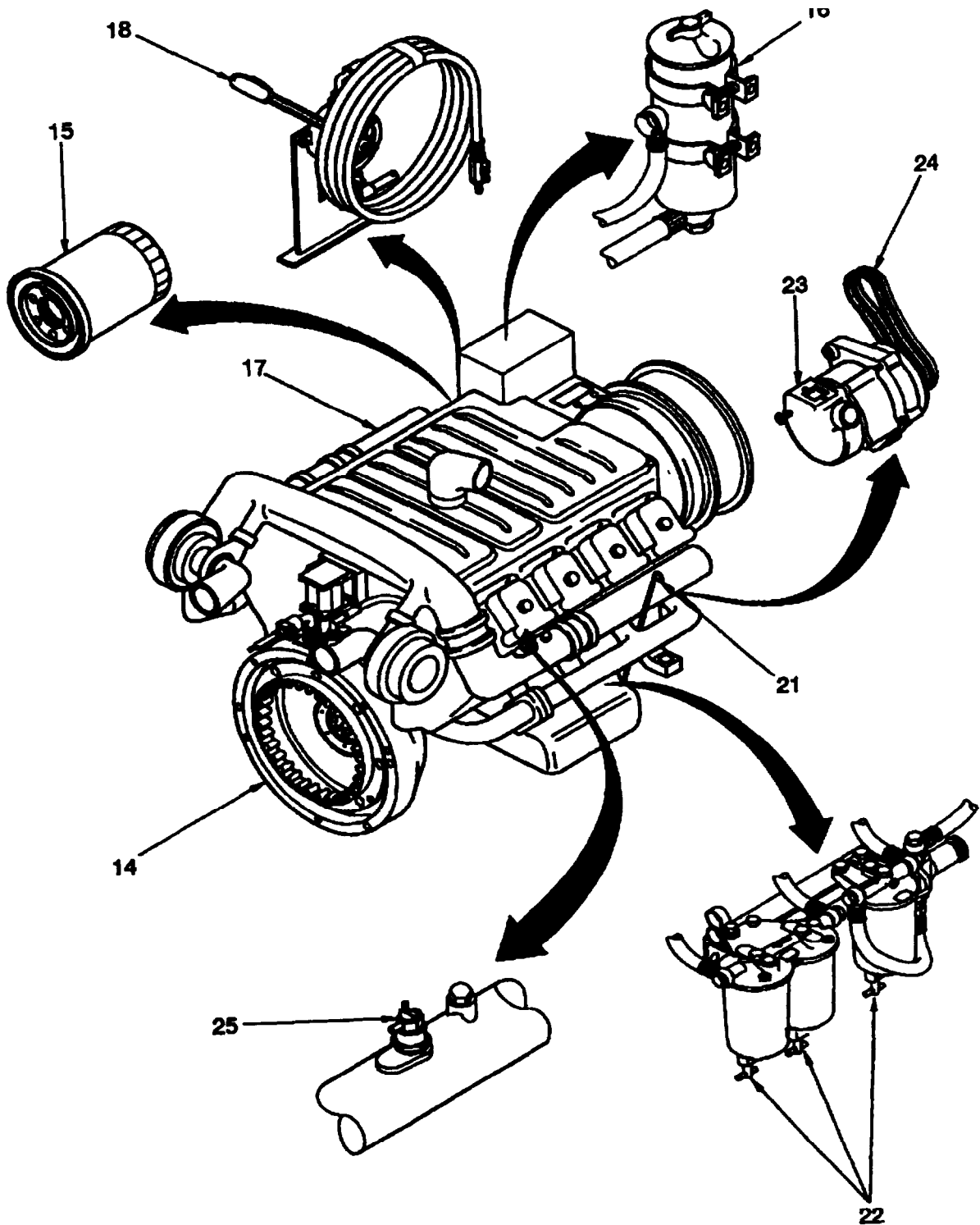


Figure 2-4 Operator PMCS Routing Diagram Tm (sheet 4 of 6).

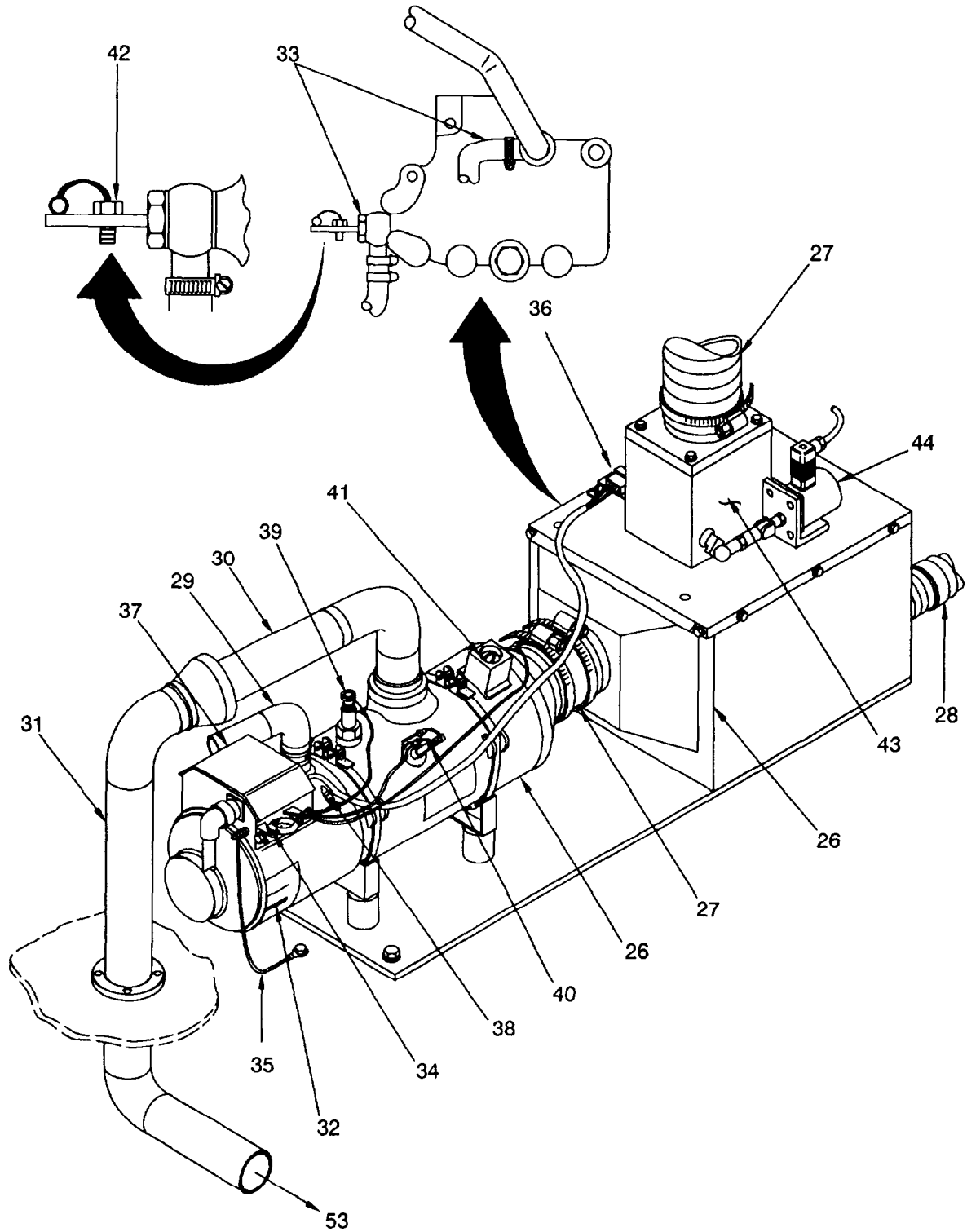


Figure 2-5 Operator PMCS Routing Diagram (sheet 5 of 6).

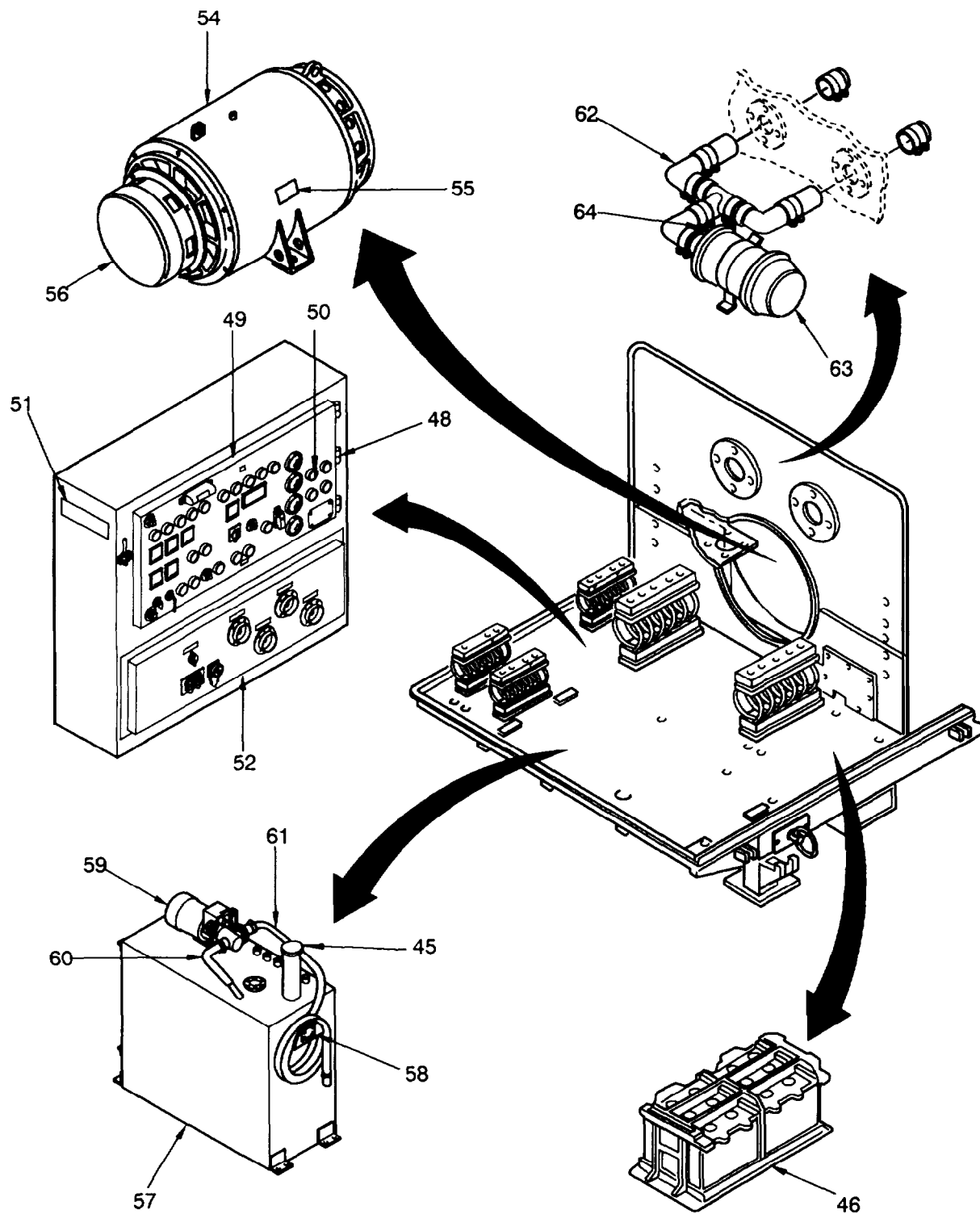


Figure 2-5 Operator PMCS Routing Diagram (sheet 6 of 6).

Table 24 Operator Preventive Maintenance Checks and Services.

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

Item No.	Interval	Location		Procedure	Not Fully Mission Capable if:
		Item to Check/Service			
		UNIT HOOD ASSEMBLY		<p><u>WARNING</u> The fuel in this generator set 150 kW is highly explosive. Do not smoke or use open flame when performing maintenance. Fire and explosion could occur, resulting in severe personal injury or death.</p> <p><u>CAUTION</u> Ensure key is in control cabinet panel in the switch.</p>	
1.	Before	Plates		Check that all plates are firmly attached and readable.	
2.	Before	Flaps		Check condition and operation of twist grips, gas cylinders, and door props.	Flaps cannot be fully opened or maintained in the open position.
3.	Before	Ground straps		Inspect ground straps and ground strap connections for looseness, corrosion, or damage.	Ground straps are loose, damaged, or corroded.
4.	Before	Cover for receptacles		Check condition and attachment of cover. Check for loose or missing hardware.	Cover is damaged or loose.
5.	Before	Air leading ducts (cooling air inlet for diesel engine)		Inspect air leading ducts for looseness, damage, or dirt.	Air leading ducts are loose, damaged, or dirty.
6.	Before	Fuel Cap		Inspect fuel cap, chain, hardware, and strainer for looseness or missing parts.	Fuel cap is missing.

Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location		Procedure	Not Fully Mission Capable if:
		Item to Check/Service			
		UNIT HOOD ASSEMBLY continued			
7.	Before	Hood		Check hood for damage. Check for loose or missing hardware.	
8.	Before	Eyebolts		Check that eyebolts are properly attached, in good condition, and have cotter pins.	Eyebolts cannot be secured to base.
9.	Before	Lifting rings		Check four lifting rings for looseness or damage.	
10.	Before	Base frame		Check base frame for damage.	Base frame is damaged beyond repair.
11.	Before	Silencer assembly (diesel engine)		Check silencer assembly for leaks, corrosion, damage, or missing hardware.	Silencer assembly is leaking or hardware missing.
12.	Before	Gas exhaust endpip (engine preheating assembly)		Inspect for looseness or damage. Check for loose or missing hardware.	Gas exhaust endpip is loose or damaged.
13.	Before	Bolt connecting ground cable from EPP III		Check that bolt is firmly attached and all fastener parts are present (one nut and three washers).	Bolt is loose or fastener parts are missing.
		ENGINE COMPARTMENT			
14.	Before	Diesel engine		Check diesel engine for loose, damaged, missing parts and hardware and any unusual wear, deterioration, or leaks.	Any fuel leaks Or class III oil leak.
15.	Before	Oil filter		Inspect oil filter for leaks, looseness, or damage.	Class III oil leak
16.	Before	Subcurrent filter		Inspect subcurrent filter for leaks, loose, or damage parts.	Class III oil leak
17.	Before	Oil cooler and cylinder cooling fins		Check oil cooler and cylinder cooling fins for dust buildup or Off leaks.	Class III oil leak.

Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

tern No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
18	Before	<u>ENGINE COMPARTMENT-</u> Scavenge pump	Inspect scavenge pump for leaks or loose, damaged, or missing parts.	Class III oil leak. Loose, damaged, or missing parts.
19	Before	Supply air duct (cooling air inlet for diesel engine)	Inspect supply air duct for looseness, damage, or dirt.	Supply air duct is clogged.
20	Before	Slave receptacle	Inspect slave receptacle, and protective cover for looseness, damage, or corrosion.	Slave receptacle connector is damaged.
21	Before	Oil level	Check diesel engine oil level (check cold oil level dots on dipstick).	Oil level is below required level.
22	Before	Fuel prefilter and two step fuel filter	<p>a. Inspect fuel prefilter and two step fuel filter for leaks, loose or damaged parts.</p> <p>b. Drain condensation from fuel prefilter.</p> <p>1. Open flap (1).</p> <p><u>CAUTION</u> Place collection container under fuel prefilter and two step fuel filter.</p> <p>2. Hold small container below filter cup (3) of fuel prefilter (2).</p> <p>3. Remove drain plug (4) until mixture of fuel and condensation water emerges from drain plug hole.</p> <p>4. When only fuel emerges, screw drain plug (4) back in.</p> <p>5. Tighten drain plug (4).</p>	<p>Any fuel leaks.</p> <p>Diesel engine runs roughly after starting because condensation water has collected.</p>

Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
		<p><u>ENGINE COMPARTMENT-</u> <u>continued</u></p>	<p>c. Drain condensation from two step fuel filter.</p> <ol style="list-style-type: none"> 1. Hold small container under right filter cup (5) and left filter cup (8) of two step fuel filter (9). 2. Remove drain plugs (6, 7) until mixture of fuel and condensation water emerges from drain plug holes. 3. When only fuel emerges, screw drain plugs (6, 7) back in one after another. 4. Tighten drain plugs (6, 7). <p style="text-align: center;"><u>CAUTION</u> Remove collection container.</p> <ol style="list-style-type: none"> 5. Close flap (1). 	<p>Diesel engine runs roughly after starting because condensation water has collected.</p>

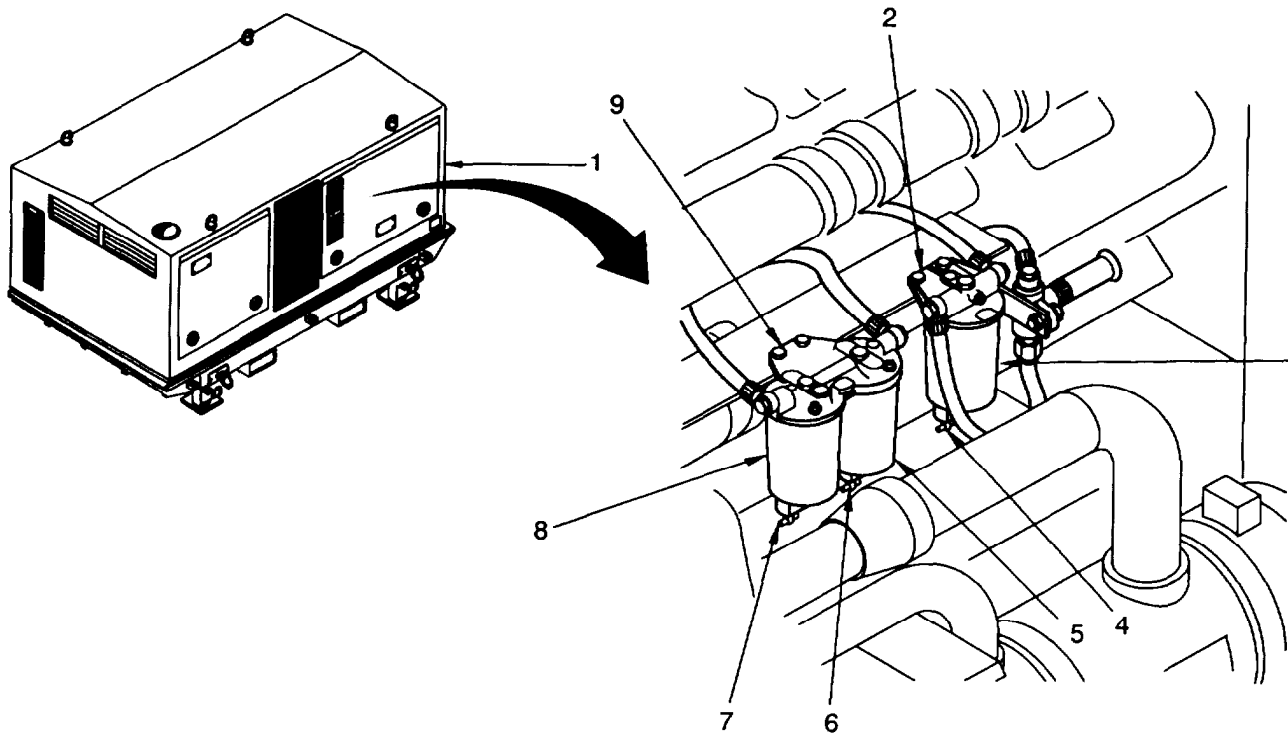


Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
		<u>ENGINE COMPARTMENT-</u> <u>continued</u>		
23	Before	Battery charging alternator	Check battery charging alternator for loose, damaged, or missing parts.	Loose, damaged, or missing parts.
24	Before	V belts	Inspect V belts for cracks, fraying and looseness.	V belt(s) is (are) frayed or broken.
25	Before	Flame Glowplug System	Check that fuel line and cables are firmly attached to both flame glow-plugs.	Any fuel leak, loose, damaged, or missing fuel lines.
26	Before	Heating unit and heat exchanger	Check that heating unit and heat exchanger box are firmly attached to mounting plate; and check for loose, missing, or damaged hardware.	If box is loose or any damaged, loose or missing hardware.
27	Before	Air hoses	Check that air hoses between heating unit and heat exchanger box, and between heat exchanger box and diesel engine are firmly attached and undamaged.	Air hoses are loose or damaged.
28	Before	Air hose	Check that air hose above oil hose is firmly attached to heat exchanger housing and undamaged.	Air hoses are loose or damaged.
29	Before	Air pipe inlet	Check that air pipe inlet is firmly attached to heating unit, and points toward the terminal box.	Air pipe inlet points in the other direction.
30	Before	Gas exhaust manifold	Check that gas exhaust manifold is firmly attached to heating unit, and is properly connected and aligned with gas exhaust intermediate pipe.	Gas exhaust manifold is not connected to gas exhaust intermediate pipe.
31	Before	Gas exhaust intermediate pipe	Check that gas exhaust intermediate pipe is firmly attached to base frame.	Gas exhaust intermediate pipe is loose.
32	Before	Fuel pipes	Check that both fuel pipes are firmly attached to heating unit with no leaks.	Fuel pipes loose or damaged. Any fuel leak.

Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
		<u>ENGINE COMPARTMENT-continued</u>		
33	Before	Oil hoses	Check that both oil hoses are firmly attached to diesel engine oil sump with no leaks.	Oil hoses are loose or damaged.
34	Before	Plastic lever	Check that plastic lever on heating unit terminal box is all the way to the left, and is caged.	Plastic lever is not all the way to the left.
35	Before	Ground strap	Inspect ground strap and ground strap connections to heating unit and base frame.	Ground strap is loose or damaged.
36	Before	Control cable	Check that control cable is firmly connected to connector on terminal box, and is not damaged. Check labeling of J102.	Control cable is loose or damaged.
37	Before	Connector X103	Check that connector X103 is properly assembled and not damaged. Check labeling of X103.	Connector is loose or damaged.
38	Before	Connector X106	Check that connector X106 is bridged. Check labeling of X106.	Jumper is missing.
39	Before	Cable, glowplug	Check that cable is firmly connected to glowplug and is undamaged. Check labeling of X108.	Cable is loose or damaged.
40	Before	Cable, temperature switch (burner monitor)	Check that cable is firmly attached to temperature switch (burner monitor) and is undamaged. Check labeling of X109.	Cable is loose or damaged.
41	Before	Cable, temperature switch (overtemperature)	Check that cable is firmly attached to temperature switch (over-temperature) and is undamaged. Check labeling of X110.	Cable is loose or damaged.
42	Before	Switches, temperature (oil)	Check that cable is firmly attached to temperature switch (oil) and is undamaged. Check labeling of X104.	Cable is loose or damaged.

Table 24 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
		<u>ENGINE COMPARTMENT -</u> continued		
43.	Before	Air flap	Check that air flap moves easily and closes automatically.	Air flap does not move smoothly.
44.	Before	Air flap puller magnet	Check that cable is firmly attached to air flap puller magnet and is undamaged. Check labeling of J104.	Cable is loose or damaged, aged.
		<u>GENERATOR COMPARTMENT</u>		
45.	Before	Fuel Fill Hose	Check that hose is firmly attached to fuel tank and fuel filler neck. Check hose clamps.	Cracked hose, broken clamps or fuel leak.
46.	Before	Battery Set	Check that batteries and connectors are secure.	Batteries or connectors are missing.
47.	Before	Air cooling inlet grate	Inspect air cooling inlet grate for looseness, damage, or dirt.	Air cooling inlet grate is clogged.
			<u>WARNING</u> High voltage is produced when this Generator Set 150kW is in operation could result in personal injury or death.	
48.	During	Front panel door	Check condition and operation of front panel door.	Front panel door cannot be opened.
19.	During	Control cabinet assembly	<ul style="list-style-type: none"> a. Check all indicators and controls for damaged or missing parts. b. Check that designation plates are firmly attached and readable. c. Check that all lamps and indicators operate properly. 	Indicators or controls are damaged or missing.

Table 24 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable I:
		item to Check/Service		
50.	Wing	GENERATOR COMPARTMENT READY TO START IF HEATING IS ON lamp	Check that at READY TO START IF HEATING IS ON lamp on control cabinet assembly lights up after approximately 13 minutes.	READY TO START IF HEATING IS ON lamp does not light.
51.	During	CONTROL CABINET ASSEMBLY plate	Check that control cabinet assembly plate is firmly attached and readable.	
52.	During	Receptacles	Inspect receptacles for looseness or damage. Check that designation plates are firmly attached and readable.	Receptacles are loose or damaged.
53.	During	Exhaust	Check that exhaust is soot free after approximately 5 minute warmup.	Exhaust is not soot free.
54.	During	Synchronous generator	Check synchronous generator for loose or damaged parts.	Parts are loose or damaged.
55.	During	Output plate	Check that output plate is firmly attached and readable.	
56.	During	Exciter hood	Inspect exciter hood for dirt build-up.	Exciter hood is dirty.
57.	During	Fuel tank	Inspect fuel tank for leaks, loose or damaged parts.	Any fuel leaks, loose or damaged parts.
58.	During	Fuel tank assembly plate	Check that fuel tank assembly plate is firmly attached and readable.	
59.	During	Electrical fuel pump	Check that electrical fuel pump is firmly attached, and that cable is firmly connected to electrical fuel pump.	Electrical fuel pump is loose, or control cable is loose or damaged. Any fuel leak.
60.	During	Electrical fuel pump and tank hose	Inspect fuel hose connections to electrical fuel pump and fuel tank.	Fuel hose is loose or damaged. Any fuel leak.
61.	During	Electrical fuel pump and valve hose	Inspect fuel hose and connections to electrical fuel pump and valve.	Fuel hose is loose or damaged. Any fuel leak.

Table 24 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item 10 Check/Service		
62.	During	<u>GENERATOR COMPARTMENT</u> Air filter and piping	Inspect air filter and piping for loose or damaged connections.	Piping or connections are loose.
63.	During	Dust collector	Check dust collector for dust buildup.	Piping or connections Dust collector is filled with dust.
64.	During	Cable connection to maintenance switch	Inspect cable connection to maintenance switch.	Cable is loose or damaged.
65.	During	Battery Set	Inspect battery cables and connectors for corrosion, loose, damaged or missing parts.	Battery cables are loose, damaged or missing.

Pages 2 - 30 through 2 - 33 have been deleted.

Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
		<u>ENGINE COMPARTMENT-continued</u>		
81	After	Subcurrent filter	inspect subcurrent filter for leaks, loose, or damage parts.	Class III oil leak.
82	After	Oil cooler and cylinder cooling fins	Check oil cooler and cylinder cooling fins for dust buildup or oil leaks.	Class III oil leak.
83	After	Scavenge pump	Inspect scavenge pump for leaks or loose, damaged, or missing parts.	Class III oil leak. Loose, damaged, or missing parts.
84	After	Supply air duct (cooling air inlet for diesel engine)	Inspect supply air duct for looseness, damage, or dirt.	Supply air duct is clogged.
85	After	Slave receptacle	Inspect slave receptacle, and protective cover for looseness, damage, or corrosion.	Slave receptacle connector is damaged.
86	After	Oil level	Check diesel engine oil level (check cold oil level dots on dipstick).	Oil level is below required level.
87	After	Fuel prefilter and two step fuel filter	Inspect fuel prefilter and two step fuel filter for leaks, loose or damaged parts.	Any fuel leaks.
88	After	Battery charging alternator	Check battery charging alternator for loose, damaged, or missing parts.	Loose, damaged, or missing parts.
89	After	V belts	Inspect V belts for cracks, fraying and looseness.	V belt(s) is (are) frayed or broken.
90	After	Flame Glowplug System	Check that fuel line and cables are firmly attached to both flame glowplugs.	Any fuel leak, loose, damaged, or missing fuel lines.
91	After	Heating unit and heat exchanger	Check that heating unit and heat exchanger box are firmly attached to mounting plate; and check for loose, missing, or damaged hardware.	If box is loose or any damaged, loose or missing hardware.

Table 2-4 Operator Preventive Maintenance Checks and Services-continued.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
		<u>ENGINE COMPARTMENT-continued</u>		
92	After	Air hoses	Check that air hoses between heating unit and heat exchanger box, and between heat exchanger box and diesel engine are firmly attached and undamaged.	Air hoses are loose or damaged.
93	After	Air hose	Check that air hose above oil hose is firmly attached to heat exchanger housing and undamaged.	Air hose is loose or damaged.
94	After	Air pipe inlet	Check that air pipe inlet is firmly attached to heating unit, and points toward the terminal box.	Air pipe inlet points in the other direction.
95	After	Gas exhaust manifold	Check that gas exhaust manifold is firmly attached to heating unit, and is properly connected and aligned with gas exhaust intermediate pipe.	Gas exhaust manifold is not connected to gas exhaust intermediate pipe.
96	After	Gas exhaust intermediate pipe	Check that gas exhaust intermediate pipe is firmly attached to base frame.	Gas exhaust intermediate pipe is loose.
97	After	Fuel pipes	Check that both fuel pipes are firmly attached to heating unit with no leaks.	Fuel pipes loose or damaged. Any fuel leak.
98	After	Oil hoses	Check that both oil hoses are firmly attached to diesel engine oil sump with no leaks.	Oil hoses are loose or damaged.
99	After	Plastic lever	Check that plastic lever on heating unit terminal box is all the way to the left, and is caged.	Plastic lever is not all the way to the left.
100	After	Ground strap	Inspect ground strap and ground strap connections to heating unit and base frame.	Ground strap is loose or damaged.
101	After	Control cable	Check that control cable is firmly connected to connector on terminal box, and is not damaged. Check labeling of J102.	Control cable is loose or damaged.
102	After	Connector X103	Check that connector X13 is properly assembled and not damaged. Check labeling of X103.	Connector is loose or damaged.

Section III. OPERATION UNDER USUAL CONDITIONS

2.3 INITIAL ADJUSTMENTS, CHECKS, AND SELF TEST.

2.3.1 Initial AdjustmentS.

The Generator Set 150 kW requires no initial adjustments.

2.3.2 Checks and self test.

2.3.2.1 Control Cabinet Assembly Lamp Test.

- Before operating the unit: perform steps a through d.
- During operation of the unit: perform step d.

1. Preparation:

Open flap (1, figure 2-6) and set MASTER SWITCH (10) to ON.

- a. Turn PANEL DIMMER switch/potentiometer (8) all the way to the right.
- b. The following lamps must light up:
The three front panel lights (2)
BATTERY CHARGING CONTROL (3) and OIL PRESSURE (4)
- c. The following meters must be illuminated:
OIL TEMPERATURE (5), OIL PRESSURE (6), and FUEL LEVEL (7)
- d. Pressure LAMP TEST pushbutton (9):
All lamps on front panel must light up.
- e. If any lamp fails to light, refer to the next higher level of maintenance.

2.3.2.2 Cabinet Light

1. Proceed as follows to test the light installed in the cabinet:

- a. Remove the key from the left side of the front panel and using the key turn the four front panel quick-release fasteners to the right to unlock them.
- b. Open the front panel to the right, set the front panel prop to keep the panel open and check that the light installed in the cabinet lights up.
- c. If lamp fails to light, refer to the next higher level of maintenance.
- d. Close the front panel and turn the four front panel quick-release fasteners to the left to secure them. Return key to holder.
- e. Close flap (1, figure 2-6).

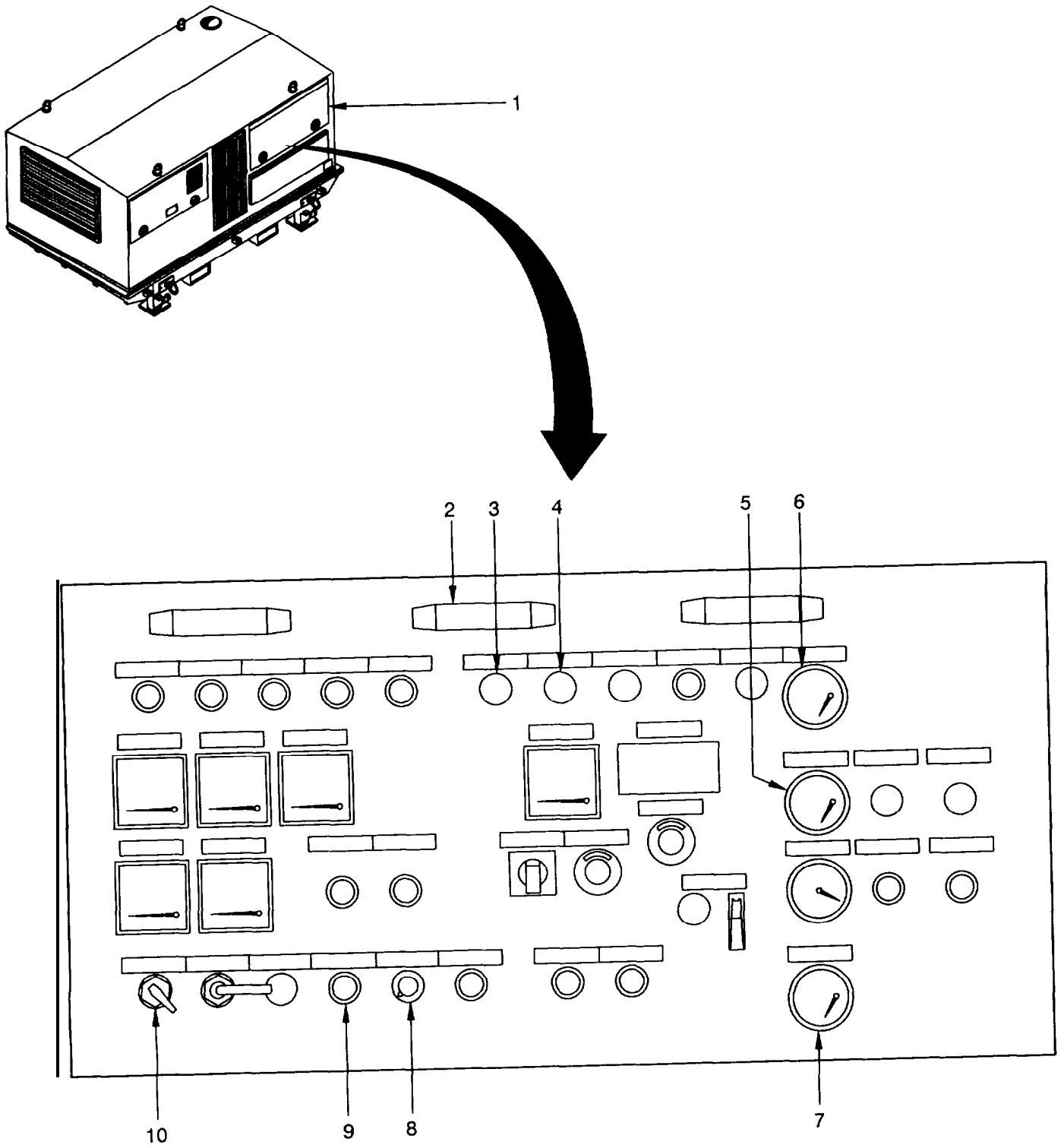


Figure 2-6 Control Cabinet Assembly Lamp Test.

2.3.2.3 Replace Diesel Engine Oil.

1. Open flap (1, figure 2-7) and flap (1, figure 2-8).

NOTE

- **Prepare a container to collect approximately 5.28 gallons (20 liters) of used oil.**
 - **Start diesel engine (paragraph 2.5.1) and allow to reach operating temperature; then shut down diesel engine (paragraph 2.5.2).**
 - **Diesel engine must be on level surface during oil change.**
2. Undo velcro strap (2, figure 2-7) and uncoil hose (3); open stopcocks (4, 5) and insert hose (3) into oil collection container.
 3. Use scavenge pump (6) to pump used oil from diesel engine (7) into collection container.
 4. Close stopcocks (4, 5), coil up hose (3) and secure with Velcro strap (2).
 5. Unscrew oil cap (2, figure 2-8) from oil filler neck (3).

CAUTION

- **Refer to paragraph 2.3.3 to determine proper engine oil for operating conditions.**
 - **Use a cloth to catch any oil overflows.**
6. Place funnel in oil filler neck (3) and add new oil to the upper dot marking (5): approximately 5.28 gallons (20 liters).
 7. Screw oil cap (2) onto oil filler neck (3).
 8. Start diesel engine (paragraph 2.5.1) and allow to reach operating temperature; then shut down engine (paragraph 2.5.2).
 9. Check oil level (paragraph 2.3.2.4 or 2.3.2.5) and correct as necessary.
 10. Close flap (1).

2.3.2.4 Check Diesel Engine Oil Level after Engine Shutdown.

Shut down Gen Set 150 kW, paragraph 2.5.2.

NOTE

Diesel engine oil must be checked on level surface.

1. Open flap (1, figure 2-8).
2. Remove dipstick (4) from tube and wipe off with cloth (item 3, Appendix E).

NOTE

1-2 minutes after engine is shut off, oil level must reach to top line marking (8) on dipstick.

3. Insert dipstick (4) into tube until it stops: pull out and read oil level.

CAUTION

If oil level comes only to lower line (7), immediately add oil of the same specification.

4. Insert dipstick (4) back into tube until it stops.
5. Unscrew oil cap (2) from oil filler neck (3).

CAUTION

- **Do not mix oils of different specifications.**
 - **Use a cloth to catch any oil overflows.**
 - **Check oil level repeatedly while adding; do not go above upper line marking (8).**
6. Place funnel in oil filler neck (3) and add oil of correct specification for the engine, paragraph 2.3.3.
 7. Remove funnel from oil filler neck (3) and screw on oil cap (2).
 8. Close flap (1).

2.3.2.5 Check Diesel Engine Oil Level before starting engine.

Shut down Gen Set 150 kW, paragraph 2.5.2.

NOTE

Diesel engine oil must be checked on level surface.

1. Open flap (1, figure 2-8).
2. Remove dipstick (4) from tube and wipe off with cloth (item 3, Appendix E).

NOTE

Oil level must come up to upper dot marking (5).

3. Insert dipstick (4) into tube until it stops, then remove and read off oil level.

CAUTION

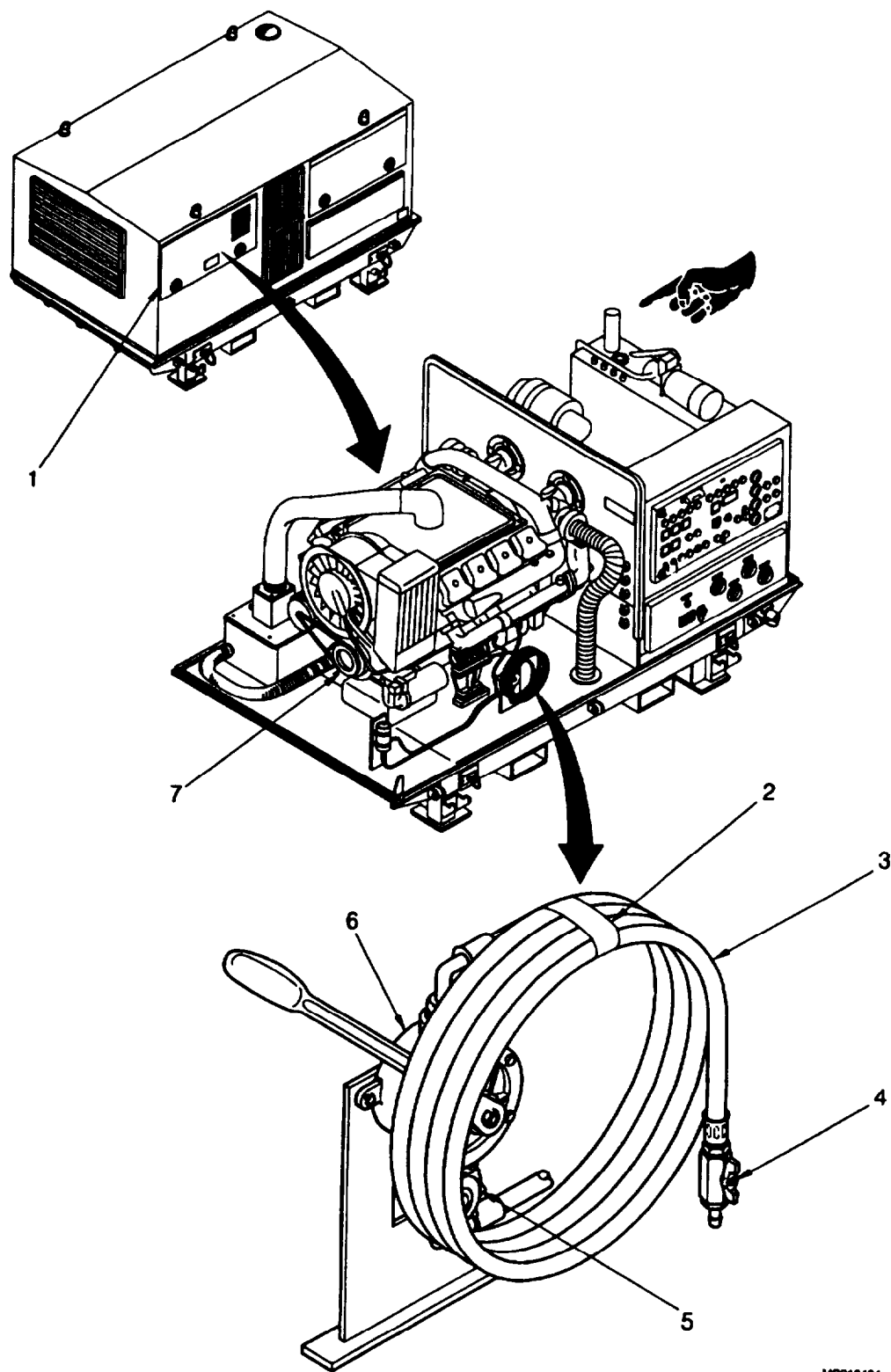
If the oil level reaches only to lower dot marking (6), immediately add oil of the same specification.

4. Insert dipstick (4) back into tube until it stops.
5. Unscrew oil cap (2) from oil filler neck (3).

CAUTION

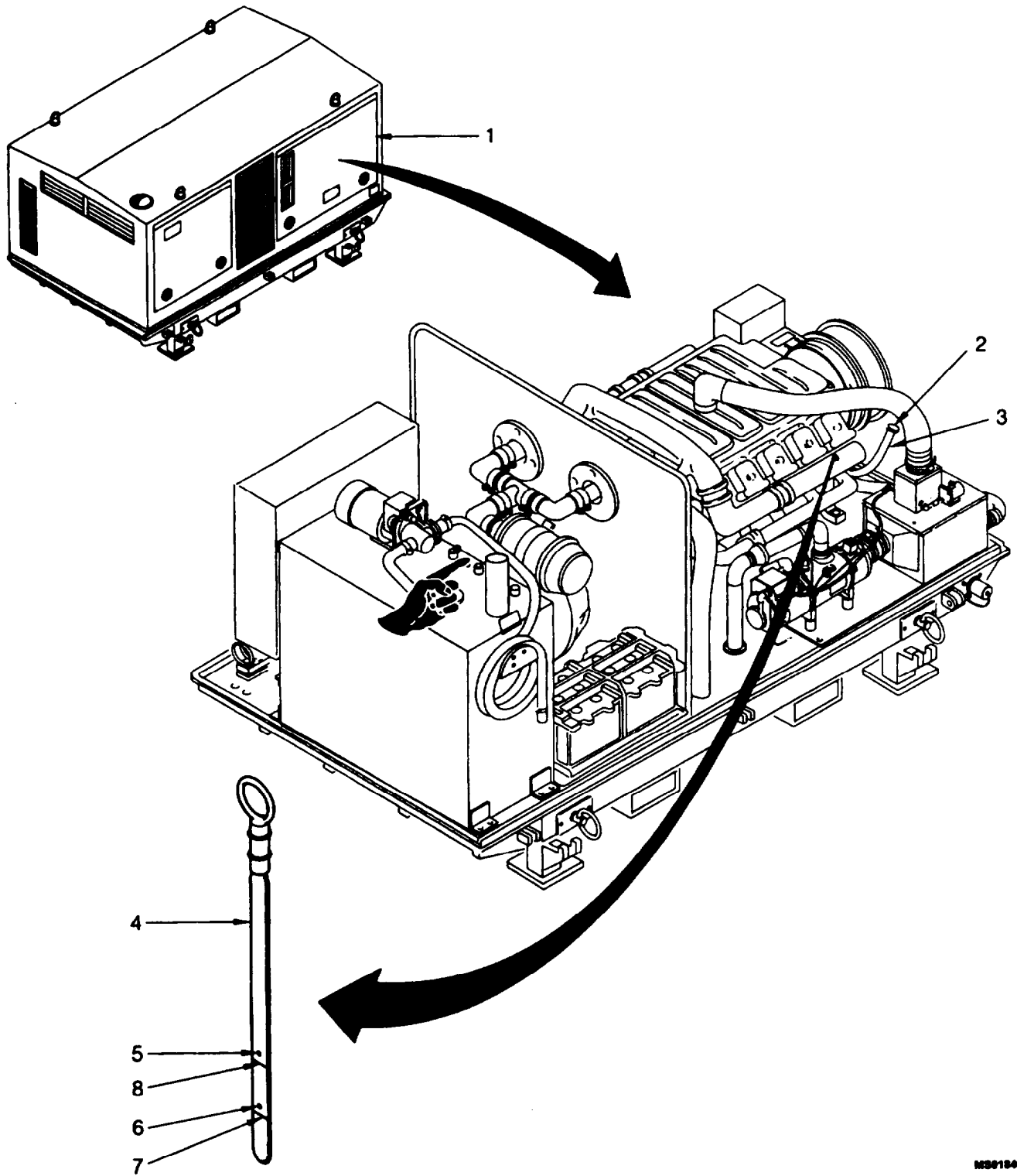
- **Do not mix oils of different specifications.**
- **Use a cloth to catch any oil overflows.**
- **Check oil level repeatedly while adding; do not go above upper dot marking (5).**

6. Place funnel in oil filler neck (3) and add oil of correct specification for the engine, paragraph 2.3.3.
7. Remove funnel from oil filler neck (3) and screw on cap (2).
8. Close flap (1).



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Figure 2-7 Diesel Engine Oil Removal Maintenance.



NSB15405

Figure 2-8 Diesel Engine oil Level Maintenance.

2.3.3 Engine Oil.

CAUTION

KHD warranty for the diesel engine will be void if oils listed in table 2-5 are not used.

2.3.3.1 Oil Quality.

As an internal combustion engine operates, some of the engine oil used to lubricate the cylinders is also burned. Temperature stress and fuel combustion products entering the oil also cause deterioration of the oil, especially its chemical additives, As a result all of the oil must periodically be replaced with fresh oil. The oil manufacturer provides the only guarantee of the quality grade to which an oil belongs. Oil quality is partly defined by API classes: CC/SE or CD/SE ¹⁾ (paragraph 2.3.3.3).

If the only quality information available is from MIL-specifications, proceed as follows:

MIL-L-2104C, added at the same time as MIL-L-46125A, corresponds to API: CD/SE.

SHPD oils 2, (paragraph 2.3.3.3) are approved individually by the engine manufacturer.

Table 2-5 SHPD Oils Approved for Diesel Engine BF8L513.

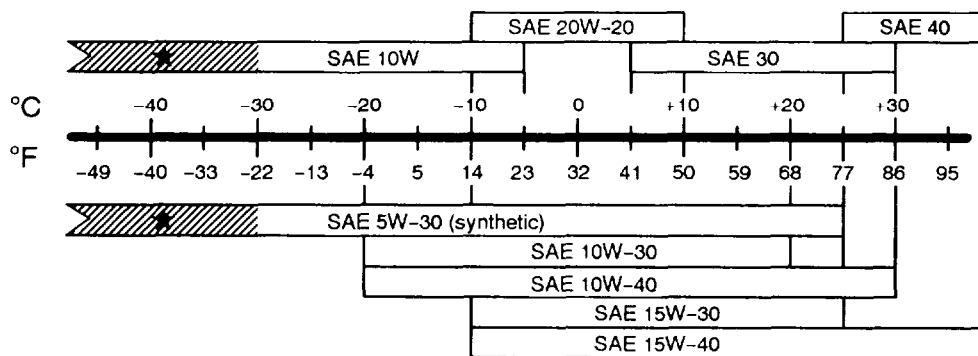
Oil Company	Brand of Oil
Agip	Sigma Turbo
Caltex	RPM DELO 450 Oil
Chevron	Chevron Delo 450 Motor Oil Multigrade
Esso	DIESEL MOTOR OIL 500
Gulf	Gulf Turbo Diesel
Valvoline	Valvoline Super HDS LD
Veedol	Veedol Turbostar

2.3.3.2 Oil Viscosity.

Because the viscosity of an oil changes with temperature, the ambient temperature at the operating location of the diesel engine is a critical factor in selecting the viscosity class (SAE class) (figure 2-9).

If SAE 15W-40 is used, occasional temperatures slightly lower than the limit (e.g. down to 5 °F (-15° C)) may impair cold-starting ability but will not cause engine damage

Excessively viscous oil leads to difficulties in starting, which is why temperature during engine starting is the essential factor in selecting a viscosity for winter operation. The use of multigrade oils eliminates the need for temperature-related oil changes. Multigrade oils are subject to the same oil change intervals as single-grade oils.



* with engine preheating only

Figure 2-9 Viscosity Class (SAE C/ass).

NOTE

- > Greater than
- < Less than
- ≥ Greater than or equal to
- ≤ Less than or equal to

In addition to the possibilities listed in paragraph 2.3.3.1 and 2.3.3.2, it is recommended that SAE 15W-40 (item 1, appendix E) be used when average ambient temperatures are ≤ 32 °F (≥ 0 °C), and SAE 5W-30 (item 2, appendix E) when average temperatures are ≤ 32 °F (≤ 0 °C).

2.3.3.3 Oil Change Intervals.

Since oil deterioration depends on operating conditions, fuel quality, and oil quality, oil change intervals can vary. Table 2-6 indicates oil change intervals in operating hours (OH). Factors affecting these intervals include:

- Oil quality
- Sulfur content of the diesel fuel
- Outside temperature (daily average)

NOTE

Use HOURMETER to determine operating hours.

Table 2-6 Oil change intervals.

Oil change interval (Hours)	Oil quality	Sulfur content in diesel fuel	Continuous operation at outside temperature (daily average)
62.5	CD/SE 1)	0.5 . . . 1 %	<14 °F or >86 °F (≤ 10° C or >30° C)
125		0.5 . . . 1 %	>14 °F or <86 °F (≥ 10° C or <30° C)
250		<0.5 %	>14 °F or <86 °F (≥ 10° C or <30° C)
125	SHPD 2)	0.5 . . . 1 %	<14 °F or >86 °F (≤ 10° C or >30° C)
250		0.5 . . . 1 %	>14 °F or <86 °F (≥ 10° C or <30° C)
500		<0.5 %	>14 °F or <86 °F (≥ 10° C or <30° C)

If a higher grade oil is used after a long period of operation, perform the first change of the higher grade oil at 20 operating hours. At the same time, change the oil filter as described in chapter 4.

2.3.4 Fuel Supply.

2.3.4.1 Fuel Quality.

Do not use diesel fuel with a sulfur content greater than 1%. At temperatures below 32 °F (0° C) use only winter diesel fuel with the appropriate additive or flow improver.

2.3.4.2 Refueling.

The Generator Set 150 kW tank has a capacity of 101.7 gallons (385 liters) of diesel fuel, including reserve. It can be filled with the fuel pump, a fueling nozzle, or a canister.

WARNING

The fuel in this Generator Set 150 kW is highly explosive. Do not smoke or use open flame when performing maintenance. Fire and explosion could occur, resulting in severe personal injury or death.

CAUTION

The fuel pump must always be delivering diesel fuel during operation; it will be damaged if it is allowed to run dry.

NOTE

If the LOW FUEL lamp (5, figure 2-10) lights up during operation, re-

fuel. If refueling is not performed in time, the fuel system will draw in air and must be bled (table 2-4).

2.3.4.2.1 Refueling with the Fuel Pump.

1. Open flaps (1 and 4, figure 2-10) and turn MASTER SWITCH (9) ON.
2. Uncoil fuel hose (2) from its holder on the tank, and immerse the lower end in the storage tank.
3. Press FUEL TANK PUMP ON illuminated pushbutton switch (7):
Fuel pump delivers diesel fuel (refueling an empty tank takes approximately 18 minutes).
4. After the required amount of diesel fuel has been added, press FUEL TANK PUMP OFF pushbutton switch (8) or wait until fuel tank pump automatically turns off when tank is full.
5. Remove the fuel hose from the storage tank, dry it off, and coil it onto the holder.

2.3.4.2.2 Refueling with a Fueling Nozzle or Canister.

1. Open flap (4, figure 2-10) and turn MASTER SWITCH (9) ON
2. Unscrew tank cap (3).
3. Insert fueling nozzle into the filler opening and begin fuel delivery; or insert a funnel into the filler opening and fill the tank from a canister.
4. Have a second person monitor and call out the fuel level from the FUEL LEVEL meter (6).
5. Stop delivering fuel when the tank is full, and screw the tank cap back on.

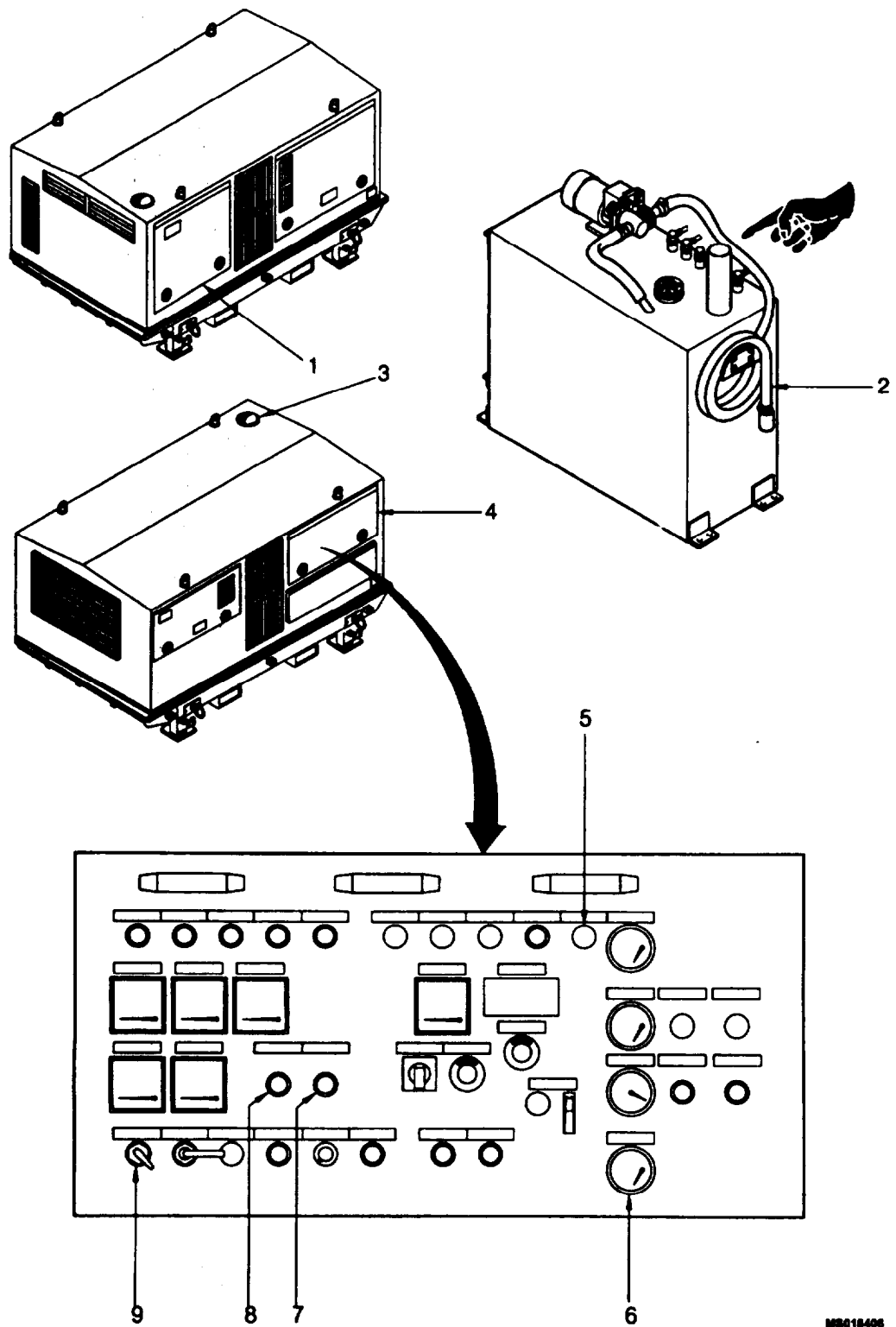


Figure 2-10 Refueling.

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2.3.5 Installation Instructions.

2.3.5.1 Connect Battery Cable.

Below 32 °F (0 °C) the battery sets of two Generator Sets 150kW can be connected in parallel to increase capacity; below -22 °F (-30 °C) the battery sets must be connected in parallel. The battery cable is used to connect the two sets

a. Connect battery cable as follows:

(1) Remove protective cap (1, figure 2-11) from J3 SLAVE RECEPTACLE 24 VOLTS.

(2) Connect battery cable (2) to the J3 SLAVE RECEPTACLE 24 VOLTS of each Generator Set 150 kW.

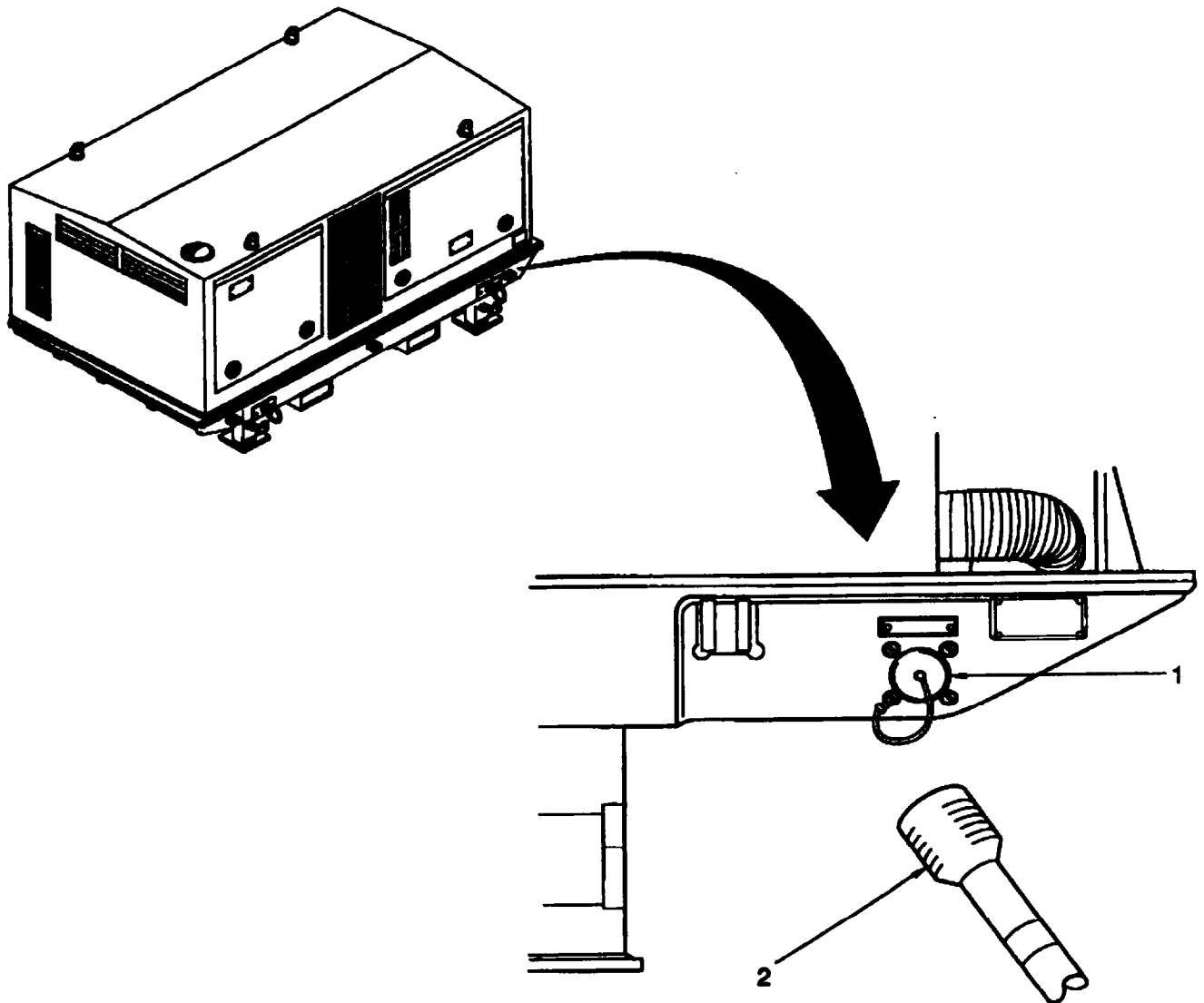


Figure 2-11 Connect Battery Cable.

2.3.6 Connecting Control and Power Cables

WARNING

- **Potential 208 VAC shock hazard. Do not disconnect or connect control or power cables while Generator Set 1 or 2 is running.**
- **Always install protective covers on control and power cables when cables are disconnected. Failure to observe this warning could result in severe personal-injury or death by electrocution.**

The Generator Set 150 kW is connected to the EPP III by one control cable and four power cables. At the EPP III, the cables are permanently connected to the power distribution unit. At the Generator Set 150 kW, the cables are coupled to receptacles on the control cabinet assembly.

a. Connect control cable as follows:

- (1) Remove protective cap (1, figure 2-1 2) from control cable connector.
- (2) Remove protective cap (2) from J9 PARALLEL OPERATION receptacle.
- (3) Insert control cable into J9 PARALLEL OPERATION receptacle and tighten threaded coupling.

NOTE

The locking switches for receptacles L1 (ØA), L2 (ØB), L3 (ØC) and N cannot be closed unless the cable connector threaded couplings have been properly tightened.

b. Connect control cables as follows:

- (1) Remove protective covers (11), (12), (13), and (14) from power cable connectors L1, L2, L3 and N.
- (2) Insert power cable L1 (3, figure 2-12) into L1 (ØA) receptacle (4) and tighten threaded coupling.
- (3) Insert power cable L2 (5) into L2 (ØB) receptacle (6) and tighten threaded coupling.
- (4) Insert power cable L3 (7) into L3 (ØC) receptacle (8) and tighten threaded coupling.
- (5) Insert power cable N (9) into N receptacle (10) and tighten threaded coupling.

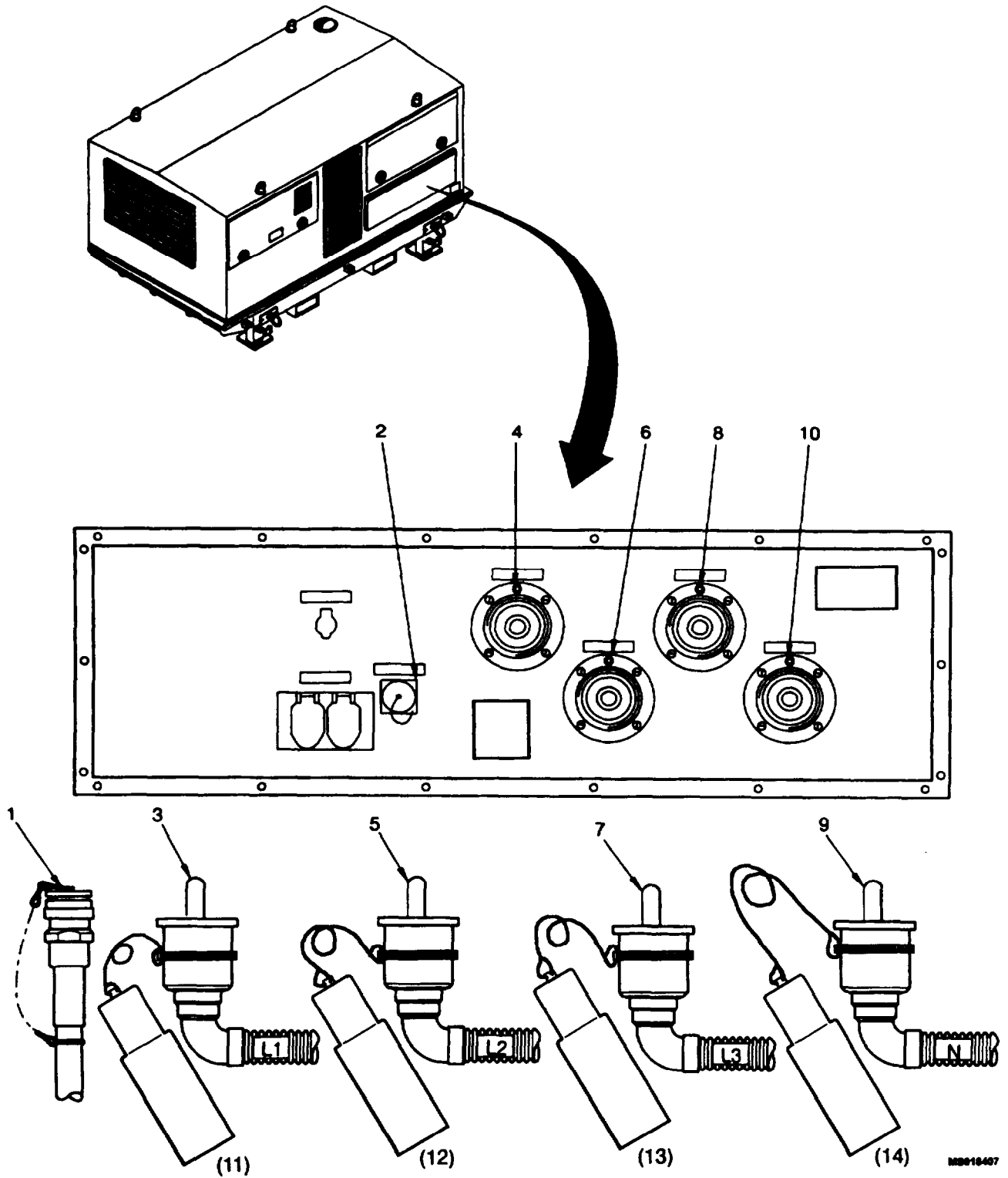


Figure 2-12 Connecting Control and Power Cables.

2.4 DECALS AND INSTRUCTION PLATES.

NSN: 6115-1 2-337-8494
 ELECTRICAL GENERATOR
 150 KW/400 HZ
 TKZ: 010.04.0037
 SERIAL NO. XXXXXX
 TECH. MANUAL: TM 9-6115-668-13

Figure 2-13 Generator Set 150 kW Identification Plate.

X: - - - in.
 Y: - - - in.
 Z: - - - in.

Figure 2-14 Generator Set 150 kW CG Plate.

OPERATIONAL WEIGHT: 6608 pounds
 SHIPPING WEIGHT: 8139 pounds
 LENGTH: 124 in.
 WIDTH: 79.5 in.
 HEIGHT: 79.5 in.

Figure 2-15 Generator Set 150 kW Transportation Data Plate.

SHORT OPERATING INSTRUCTIONS

EG 150KW / EPP 2 x 150KW / 400HZ, 120/208V

NSN:

Ambient temperature <-30°C.

1. Connect external battery to external starting plug socket.
2. Switch on the cold-start heater - push the HEATING ON button.

NOTE

If HEATING FAILURE lamp lights up, first push HEATING OFF button, then turn on cold-start heater again.

3. Wait for READY TO START lamp to light up (approx. 25 minutes), then start the engine.

NOTE

For extended engine service life, always use the cold-start heater whenever ambient temperature is less than -10 °C.

4. **WARNING:** Always wear gloves!
During engine start, a second person must pull the actuator lever as far as it will go.

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Figure 2-16 Engine Preheating Plate.

SHORT OPERATING INSTRUCTIONS

EG 150KW / EPP 2 x 150KW / 400Hz,120/208V

NSN:

Preparation

1. Check all cable connections between EPP and power distribution unit (PDU).
2. Connect EPP to ground.
3. Connect potential equalization cables to PDU and to the load.
4. Connect exhaust hoses.
5. Perform a visual check of the engine and generator.
6. Check oil level and top up to maximum if required.
7. Turn MASTER SWITCH to ON.
8. Perform lamp test.
9. Check fuel level and top up if necessary.
10. Check gauges and meters.
11. Uncoil and connect power supply and control cables.

Starting the generator

Ambient temperature >0 ° C

Turn GLOWPLUGSTART switch to the far right position, and hold (max. 30 seconds) until engine is running.

Ambient temperature between 0 ° C and -30 ° C

Turn GLOWPLUGSTART switch to center position and hold until GLOWPLUG ON lamp lights up (approx. 90 sec.); then turn GLOWPLUGSTART switch to extreme right position until engine is running.

Function Check

After starting the unit

1. All fault indicators must be OFF.
2. Hourmeter is ON.
3. Oil pressure indication must be within the range of 3 - 5 bar.

30 sec. after the unit is running

1. Check the frequency indication (400 Hz).
2. Check output voltage by using the voltage selector switch.
L1-N; L2-N; L3-N = 120 V
L1-L2; L2-L3; L3-L1 = 208 V

Figure 2-17 Generator Set 150 kW Short Operating Instructions Plate (sheet 1 of 2).

<p>LECHMOTOREN</p> <p>Lechmotoren GmbH</p> <p>Südl. Römerstr. 12-16 * D-86972 Altenstadt/Schongau, Germany</p> <p>Telephone: +49 (8861) 710-0 * Telex: 59717</p> <p>Telefax: +49 (8861) 710-180/-181</p>
<p>Switching on Generator Output (AC Circuit) Press AC CIRCUIT INTERRUPTER ON pushbutton switch.</p> <p>Parallel Operation (EPP)</p> <ol style="list-style-type: none"> 1. Start one of the Generator Sets 150 kW and perform Function Check; press AC CIRCUIT INTERRUPTER ON pushbutton switch. 2. Start second Generator Set 150 kW and perform Function Check. 3. Compare output voltages and frequency values for the two Generator Sets 150 kW. (max. frequency deviation $\leq 0,2$ Hz) (max. voltage deviation ≤ 2 V) 4. Press SYNCHRONIZATION ON pushbutton switch. (Generator Sets 150 kW will be automatically synchronized.) Synchronization of the two Generator Sets 150 kW is complete when AC CIRCUIT INTERRUPTER ON lamp lights up. AMPS and KILOWATT meter readings for the two Generator Sets 150 kW must be almost identical. (max. KILOWATT difference ≤ 20 kW) (max. AMPS difference ≤ 40 A) 6. If actual differences exceed the allowable range, press AC CIRCUIT INTERRUPTER OFF pushbutton switch and recheck frequency and voltage settings (item 3) for the Generator Sets 150 kW. <p>Power Distribution Unit (PDU) After switching ON the EPP AC circuit, the PDU will be supplied with control voltage and 400 Hz voltage. Perform the lamp test. If RS is switched ON, output indicators J1, J2, and J3 are on. If ECS is switched ON, output indicator J4 is on.</p> <p>Converter Operation Preparation</p> <ol style="list-style-type: none"> 1. Connect EPP to ground. 2. Connect all power supply cables and control cables between converter control cabinet and PDU. 3. See converter operating instructions for subsequent procedures.

Figure 2-17 Generator Set 150 kW Short Instructions Plate (sheet 2 of 2).

2.5 OPERATING PROCEDURES.

2.51 Operating the Generator Set 150 kW

WARNING

Do not operate Generator Set 150 kW unless it is properly grounded and all load terminals are not shorted. Failure to observe this warning can result in severe personal injury or death.

CAUTION

Before starting the Generator Set, note the ambient temperature and refer to figs. 2-16 and 2-17 as applicable. Do not use Glow Plug/ Start procedures when temperatures are above 32°F. Use Glow Plug/ Start procedures when temperatures are below 32° F, -0° C and -12° F, - 30° C. Use Engine Pre-start procedures when temperatures are below -12' F, -32' C.

NOTE

- Before operating Generator Set 150 kW, all connections must be made to the PDU. See also 150 kW Short operating Instructions plate (figure 2-17).
- If the diesel engine does not run smoothly or emits dense whitish gray-smoke, set the GLOWPLUG/START rotary switch (19) back to GLOWPLUG and repeat the glowplug procedure (maximum duration: 3 minutes).

2.5.1.1 Starting the Diesel Engine and Synchronous Generator.

- a. Open flap (1, figure 2-18) and turn MASTER SWITCH (21) to ON
- b. Turn GLOWPLUG/START rotary switch (19) to START and hold:

Diesel engine must start and begin accelerating within 20 seconds.

BATTERY CHARGING CONTROL and OIL PRESSURE lamps (5 and 7) go out 2-3 seconds after engine starts.

If the diesel engine does not start within 20 seconds, wait approximately 30 seconds and repeat the starting procedure.

- c. Troubleshoot using figure 4-9 if the diesel engine does not start.

NOTE

The synchronous generator is activated in approximately 90 seconds.

NOTE

If the diesel engine or the synchronous generator malfunctions during operation, the main contactor K1 or Generator Set 160 kW will shut down.

- d. Read OIL PRESSURE meter (11, figure 2-18): 3 - 5 bars.
- e. Troubleshoot using figure 3-4 if oil pressure is too low or no oil pressure is indicated.
- f. Read BATTERY CHARGE meter (22): 10 - 66 A.
- g. Troubleshoot using figure 4-11 if battery set is not being charged or no charging current is indicated.
- h. Read FREQUENCY meter (8): $400.0 \pm 0.0.2$ Hz if reading is different, set frequency with the FREQUENCY ADJUST potentiometer (13) and lock in place with locking lever (12).
- i. Troubleshoot using figure 3-5 if frequency cannot be adjusted or no frequency is indicated.
- j. Set VOLTAGE SELECTOR SWITCH (17) to L1 -L2, then L2-L3, then L3-L1+. and read VOLTAGE meter (6): 208 ± 2 V. If reading is different, set voltage with the VOLTAGE ADJUST potentiometer (16) and lock in place with locking lever (15).
- k. Troubleshoot using figure 3-6 if voltage cannot be adjusted or no voltage is indicated.
- l. Set VOLTAGE SELECTOR SWITCH (17) to L1-N, then L2-N, then L3-N, and check VOLTAGE meter (6): 120 ± 1 V.
- m. At temperatures below 32 °F (0 °C), allow the diesel engine to warm up for approximately 10 minutes before actuating the AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch (14).

2.5.1.2 Switching Voltage to the Control Cabinet Assembly Receptacles.

- a. Press AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch (14, figure 2-18):
AC CIRCUIT INTERRUPTOR ON lamp (14) lights up.
Power system (main contactor K1) is turned on.
- b. Troubleshoot using figure 3-7 if AC CIRCUIT INTERRUPTER ON lamp does not light up.

NOTE

Maximum difference between current readings: ≤ 40 A.

- c. Read AMPS L1 (ØA), AMPS L2 (ØB), and AMPS L3 (ØC) meters (2,3, and 4): 0 - 600 A.
- d. Troubleshoot using figure 4-15 if currents are not present or are not indicated.
- e. Read KILOWATTS meter (22): 0 - 206 kW.
- f. Troubleshoot using figure 4-16 if no power is being indicated.

CAUTION

if the fuel tank is ran completly empty, the fuel system will draw in air and will need to be bled (table 2-4).

- g. Add fuel (paragraph 2.3.4) if the LOW FUEL lamp (10) lights up.

CAUTION

Failure to service the air fliter will reduce the power output or cause the diesel engine to overheat. This may damage cylinders or the diesel engine itself.

- h. If the AIR FILTER lamp (9) lights up, clean or replace the air filter insert (paragraph 4.29) and empty the dust collector (paragraph 3.4). If the air filter needs replacing, refer to the next higher level of maintenance.

Faults that will be displayed until the MASTER SWITCH is turned OFF:

OIL PRESSURE: use Chapter 3 to troubleshoot.

BATTERY CHARGING CONTROL: Refer to next higher level of maintenance.

OIL TEMP-CYLINDER HEAD: Refer to next higher level of maintenance.

UNDER/OVER VOLTAGE: Refer to next higher level of maintenance.

GENERATOR OVER TEMPERATURE: Refer to next higher level of maintenance.

UNDER/OVER FREQUENCY: Refer to next higher level of maintenance.

OVERLOAD: Refer to next higher level of maintenance.

REVERSE POWER: Refer to next higher level of maintenance.

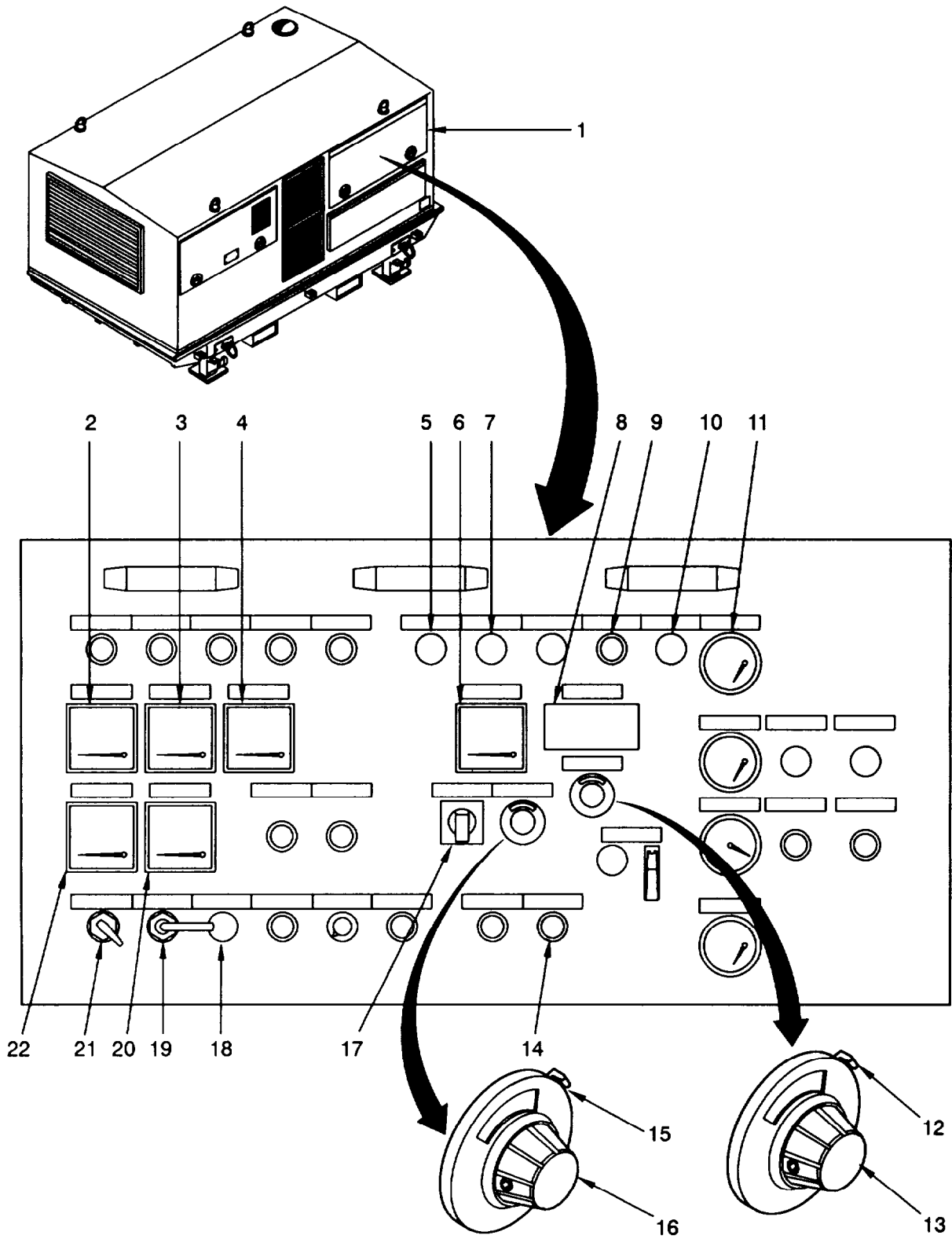


Figure 2-18 Operating the Generator Set 150 kW.

2.6 EMERGENCY PROCEDURES.

2.6.1 EMERGENCY Shutdown.

- a. Remove key from MASTER SWITCH (11, figure 2-20).

2.6.2 BATTLE SHORT Operation.

2.6.2.1 Fault indication and Shutdown.

If the BATTLE SHORT switch (9, figure 2-20) is turned on during operation (BATTLE SHORT lamp (10) lights up), the Generator Set 150 kW will not shut down if the following faults are indicated:

- BATTERY CHARGING CONTROL (6),
- OIL PRESSURE (7),
- OIL TEMP-CYLINDER HEAD (8),
- UNDER/OVER VOLTAGE (2),
- GENERATOR OVER TEMPERATURE (3).

The Generator Set 150 kW will shut down if the following faults are indicated:

- UNDER/OVER FREQUENCY (1),
- OVERLOAD (4),
- REVERSE POWER (5).

2.6.2.2 Damage to System Components.

If operation continues for long periods despite the presence of suppressed faults, system components can be damaged or destroyed:

BATTERY CHARGING CONTROL

Insufficient charging can cause deep discharge and damage to the battery set.

OIL PRESSURE

Insufficient oil pressure can damage or destroy the diesel engine.

OIL TEMP-CYLINDER HEAD

The diesel engine can be damaged or destroyed if oil and/or cylinder head temperature is too high.

UNDER/OVER VOLTAGE

Voltages received by load units (ECS and RCS) will be too high or too low.

GENERATOR OVER TEMPERATURE

Overheating of the stator winding can damage or destroy the synchronous generator.

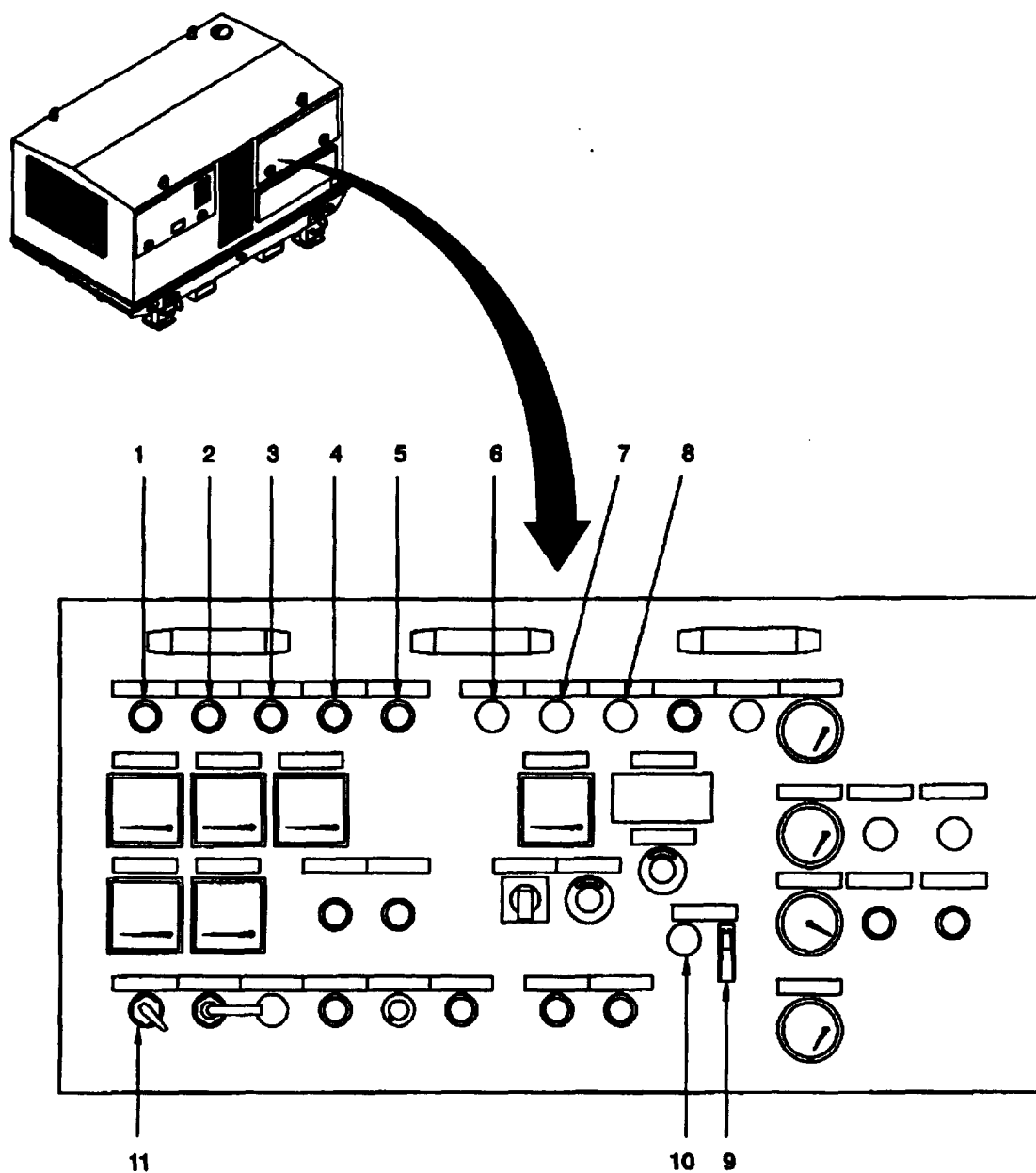


Figure 2-20 BATTLE SHORT Mode.

2.7 PREPARATION FOR MOVEMENT.

2.7.1 Shut Down Generator Set 150 kW,

Refer to paragraph 25.2

2.7.2 Disconnecting Control Power Cables.

WARNING

- Potential 205 VAC shock hazard. Do not disconnect or connect control or power cables while Generator Set 1 or 2 is running.
- Always install protective covers on control and power cables when cables are disconnected. Failure to observe this warning could result in severe personal injury or death by electrocution.

a. Disconnect control cable as follows:

- (1) Unscrew control cable (2, figure 2-21) and pull out of J9 PARALLEL OPERATION receptacle.
- (2) Place protective cap (1) on control cable connector.
- (3) Place protective cap (3) on J9 PARALLEL OPERATION receptacle.

b. Disconnect power cable as follows:

- (1) Unscrew connector (4, figure 2-21) and pull power cable L1 out of receptacle L1 (ØA).
- (2) Place protective cover (8) on cable connector.
- (3) Unscrew connector (5) and pull power cable L2 out of receptacle L2 (ØB).
- (4) Place protective cover (9) on cable connector.
- (5) Unscrew connector (6) and pull power cable L3 out of receptacle L3 (ØC).
- (6) Place protective cover (10) on cable connector.
- (7) Unscrew connector (7) and pull power cable N out of receptacle N.
- (8) Place protective cover (11) on cable connector.

2.7.3 Disconnect Battery Cable.

a. Disconnect battery cable as follows:

- (1) Pull battery cable (1, figure 2-22) out of SLAVE RECEPTACLE 24 VOLTS on each Generator Set 150 kW.
- (2) Place protective cap (2) on J3 SLAVE RECEPTACLE 24 VOLTS.

2.7.4 Disconnect Ground Cable.

a. Disconnect ground cable as follows:

- (1) Remove nut (1, figure 2-23), serrated washer (2) washer (3), and detach ground cable (4) and washer (5) from connector bolt (6).
- (2) Install washers (2,3 and 5) and nut (1) onto bolt (6) and tighten nut (1).

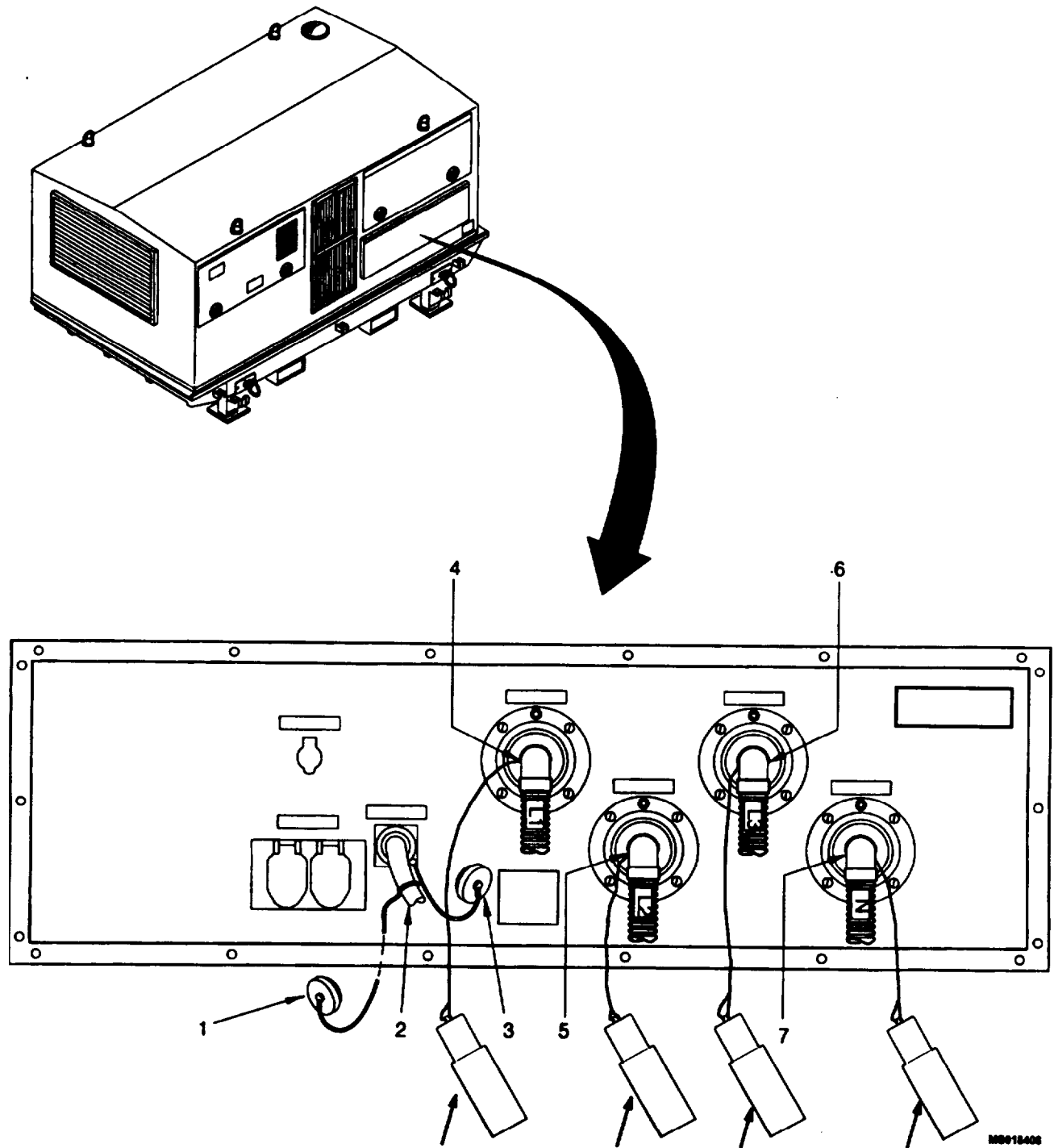


Figure 2-21 Disconnecting Control and Power Cables.

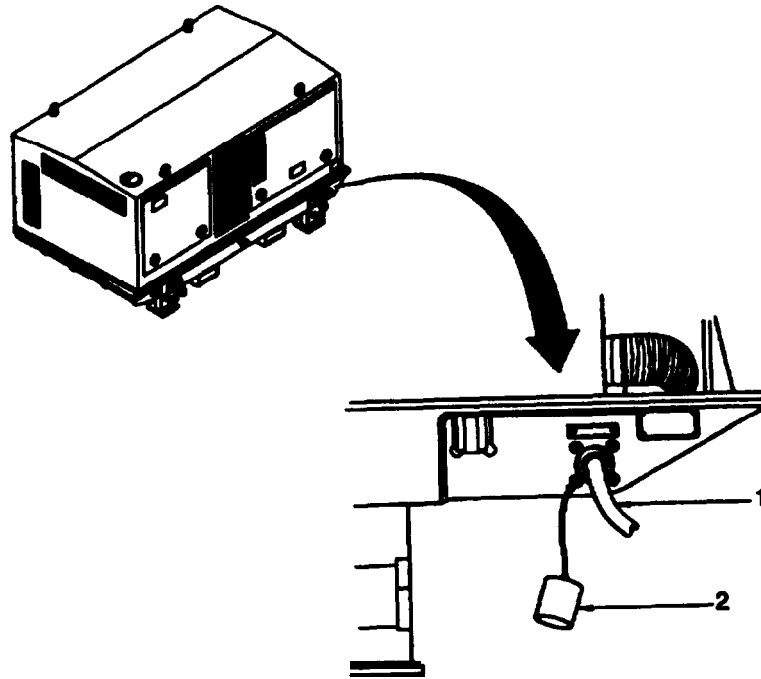


Figure 2-22 Disconnect Battery Cable.

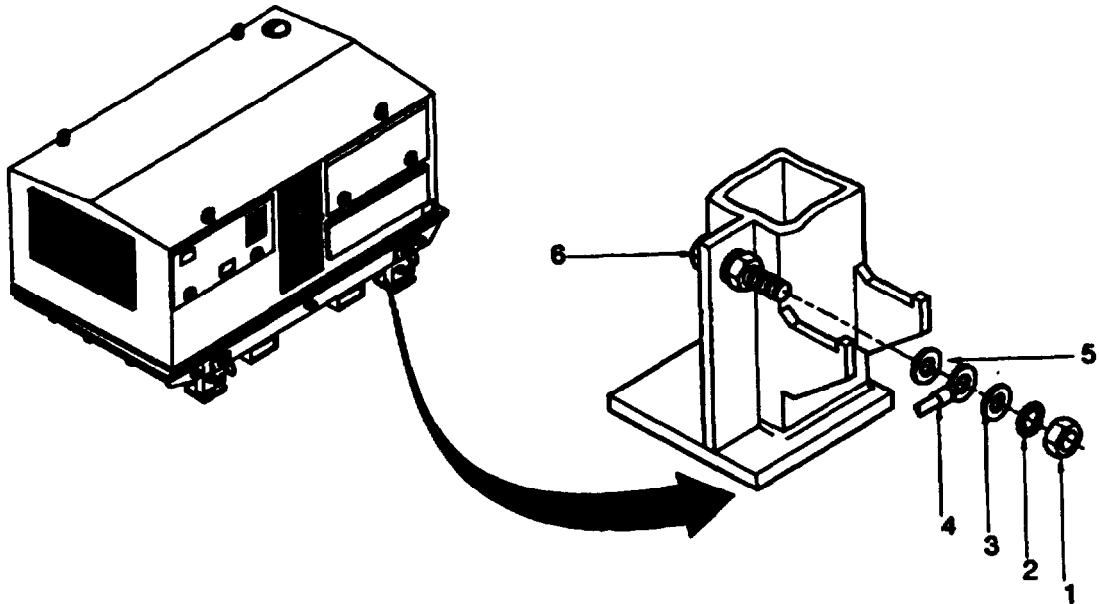


Figure 2-23 Disconnect Ground Cable.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

WARNING

Do not operate Generator Set 150 kW unless it is properly grounded and all load terminals are not shorted. Failure to observe this warning can result in severe personal injury or death.

NOTE

Before operating Generator Set 150 kW, all connections must be made to the PDU. See also SEA 150 kW Short Operating Instructions plate (figure 2-17).

2.8 OPERATING THE ENGINE PREHEATING ASSEMBLY.

The Engine Preheating Assembly can be used at 14 °F (-10 °C) or below and must be used at -22 °F (-30 °C) or below.

- a. Perform the Preventive Maintenance Checks and Services (PMCS) listed as "Before" in table 2-4.
- b. Open flap (1, figure 2-24) Control cabinet assembly controls and indicators are accessible.
- c. Set MASTER SWITCH (8) to ON. BATTERY CHARGING CONTROL (2) and OIL PRESSURE (3) lamps light up.

Troubleshoot using figure 3-1 if BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up.

- d. Press HEATING ON illuminated pushbutton switch (6):
Heating unit begins operating, and HEATING ON lamp lights up.

NOTE

The READY TO START IF HEATING IS ON lamp (4) may not light up at temperatures above 14 ° F (-10 ° C), since the temperature switch monitoring the oil temperature may perform a shutdown.

- e. The READY TO START IF HEATING IS ON lamp (4) lights up after about 13 minutes.
The diesel engine can be started (the fan motor will continue to run for about 90 seconds).
- f. If the HEATING ON lamp lights up before the READY TO START IF HEATING IS ON lamp (4) lights up, press the HEATING ON illuminated pushbutton switch (6) again.
- g. If the diesel engine is started before the READY TO START IF HEATING IS ON lamp lights up, shut down the heating system with the HEATING OFF pushbutton switch (7).

Troubleshoot using figure 3-2 if the HEATING FAILURE lamp (5) lights up, or if the READY TO START IF HEATING IS ON lamp does not light up (i.e. the engine preheating assembly is not operating properly).

2.9 OPERATING THE FLAME GLOWPLUG SYSTEM (BELOW 32 °F (0 °C)).

- a. Perform the Preventive Maintenance Checks and Services (PMCS) listed as “Before” in table 2-4.
- b. Open flap (1, figure 2-25): control cabinet assembly controls and indicators are accessible.

NOTE

The MASTER SWITCH (6) is a five position switch:

- Position One - Locked and Gen Set 150 kW will not run in this position.
- Position Two - Off with the key fully inserted (pushed in); Gen Set 150 kW will run in this position but cannot be started.
- Position Three - Off with the key in the half-way inserted position; this is the “NORMAL” shut down position.
- Position Four - Switch is on with key fully inserted; this is the “NORMAL” start and run position.
- Position Five - Switch is on with key inserted half way; this is the EMERGENCY shut down position.

- c. Set MASTER SWITCH (6) to ON (Position Four):
BATTERY CHARGING CONTROL (2) and OIL PRESSURE (3) lamps light up.
- d. Troubleshoot using figure 3-1 if BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up.
- e. Turn GLOWPLUG/START rotary switch (5) to GLOWPLUG and hold:
GLOWPLUG ON lamp (4) must light up within 90 seconds.
- f. Troubleshoot using figure 3-3 if GLOWPLUG ON lamp does not light up.

CAUTION

- **Do not turn the GLOWPLUG/START rotary switch (5) to the START position until the GLOWPLUG ON lamp (4) lights.**
- **Release the GLOWPLUG/START rotary switch (5) as soon as the diesel engine is running under its own power.**

- g. Turn GLOWPLUG/START rotary switch (5) to START and hold:
Diesel engine must start and begin accelerating within 20 seconds.
BATTERY CHARGING CONTROL and OIL PRESSURE lamps (2, 3) go out 2-3 seconds after engine starts.

If the diesel engine does not start within 20 seconds, wait approximately 30 seconds and repeat the starting procedure. Troubleshoot using figure 4-9 if the diesel engine does not start.

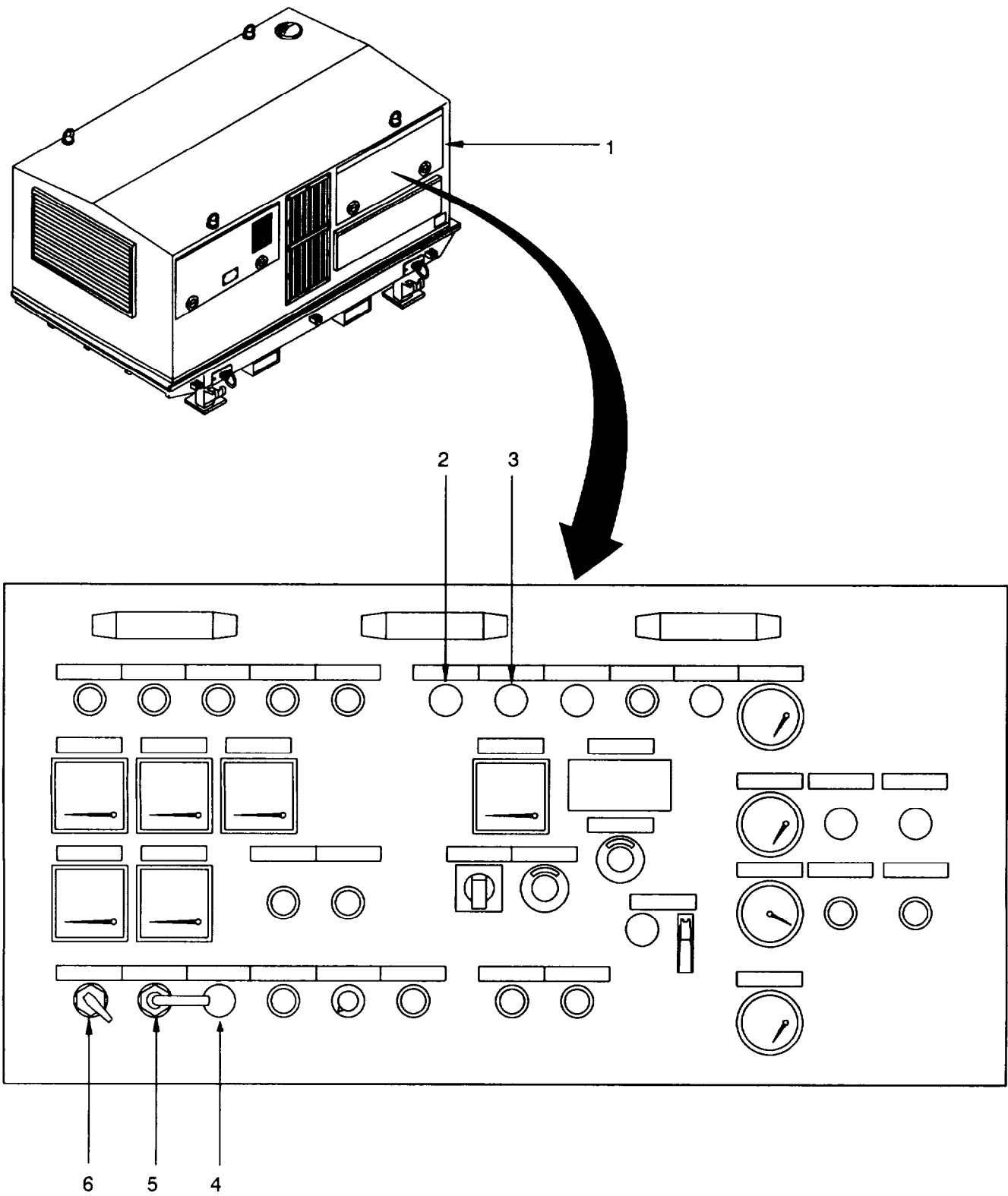


Figure 2-25 Operating the Flame Glowplug System.

2.10 OPERATION IN EXTREME COLD (BELOW -22 °F (-30 °C))

1. Fill tank with winter diesel fuel with appropriate additive or flow improver (paragraph 2.3.4).
2. Use engine oil of the appropriate viscosity class (paragraph 2.3.3).
3. Check generator V belts: winter type is smooth.
If a toothed belt is installed, refer to the next higher level of maintenance to install proper belt.

NOTE

SW also Engine Preheating plate (figure 2-16).

4. Connect battery sets in parallel to start diesel engine (paragraph 2.351).
5. Start engine preheating assembly (paragraph 2.8).

WARNING

Failure to wear gloves when operating actuator, could result in severe personal injury.

6. Have a second person open flap (1, figure 2-26) and pull the fuel injection pump actuator rod (2) in the direction of the arrow.
7. Start flame glowplug system (paragraph 2.9).
8. Start diesel engine and release actuator/fuel injection pump linkage (paragraph 2.5.1.1).
9. Allow diesel engine to warm up for approximately 10 minutes.
10. Turn on power system (main contactor K1) (paragraph 2.5.1.2). ■

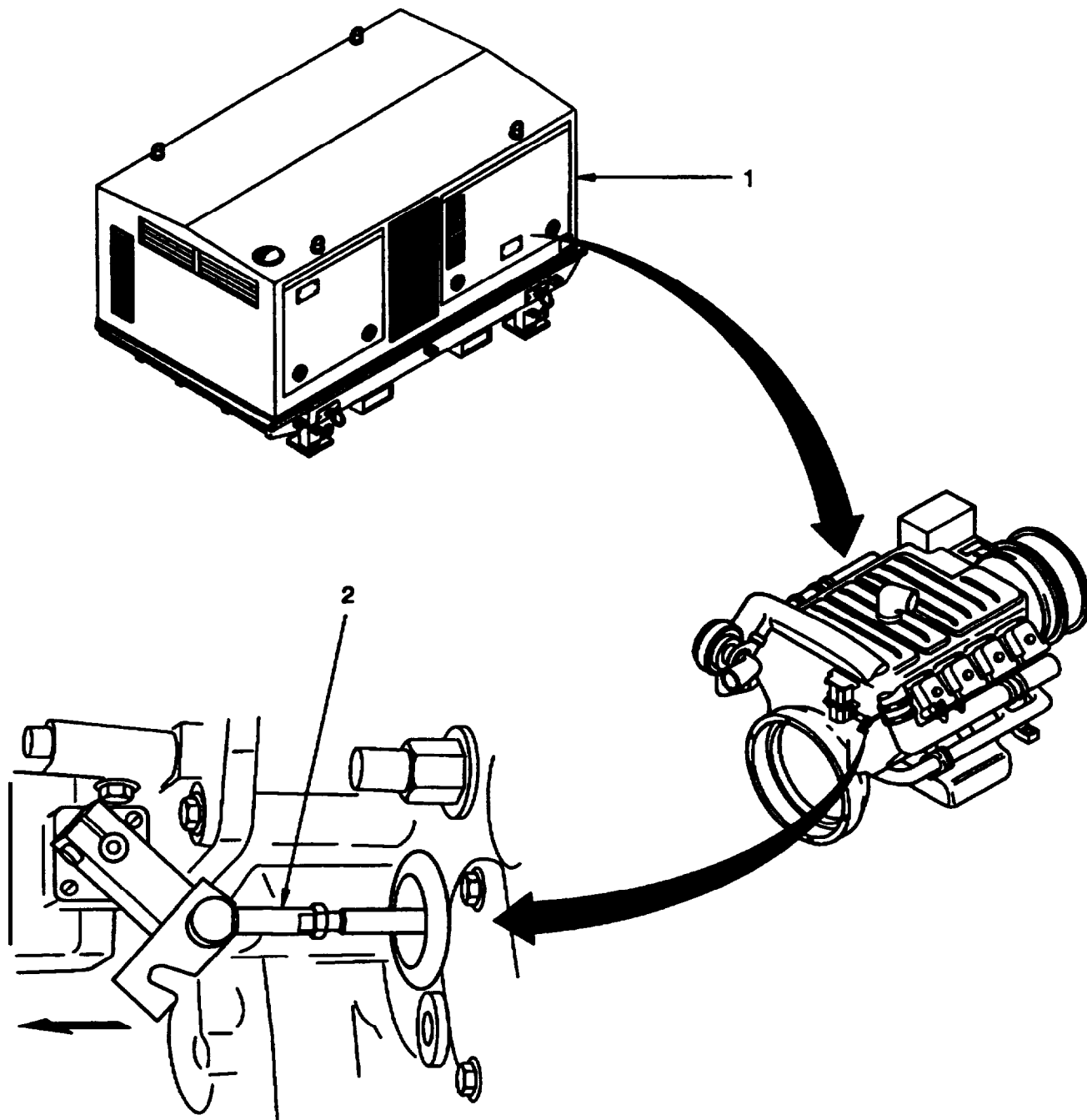


Figure 2-26 Fuel Injection Pump Actuator Linkage.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

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Section I. OPERATOR LUBRICATION

3.1 GENERAL.

Refer to appendix F and paragraph 2.3.3.

Section II. TROUBLESHOOTING

3.2 GENERAL.

The symptom index for the generator set 150 kW lists faults associated with control cabinet assembly operation. figures 3-1 through 3-7 provide a go/no-go flowchart for each malfunction. Each malfunction listed includes a reference to the applicable figure that contains a chart to help you determine probable causes and corrective actions to take. The symptom index cannot list all faults that may occur, or all the tests, inspections, and corrective actions. If a malfunction is not listed or cannot be corrected by listed corrective actions, notify next higher level of maintenance for assistance.

SYMPTOM INDEX	Troubleshooting Procedure
BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up.	Figure 3-1
HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light u p.	Figure 3-2
GLOWPLUG ON lamp does not light up	Figure 3-3
Oil pressure too low, or no oil pressure indication	Figure 3-4
Generator frequency cannot be adjusted, or no frequency indication	Figure 3-5
Generator voltage cannot be adjusted, or no voltage indication	Figure 3-6
AC CIRCUIT INTERRUPTER ON lamp does not light up.	Figure 3-7

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE REPLACING INDICATOR LAMPS. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

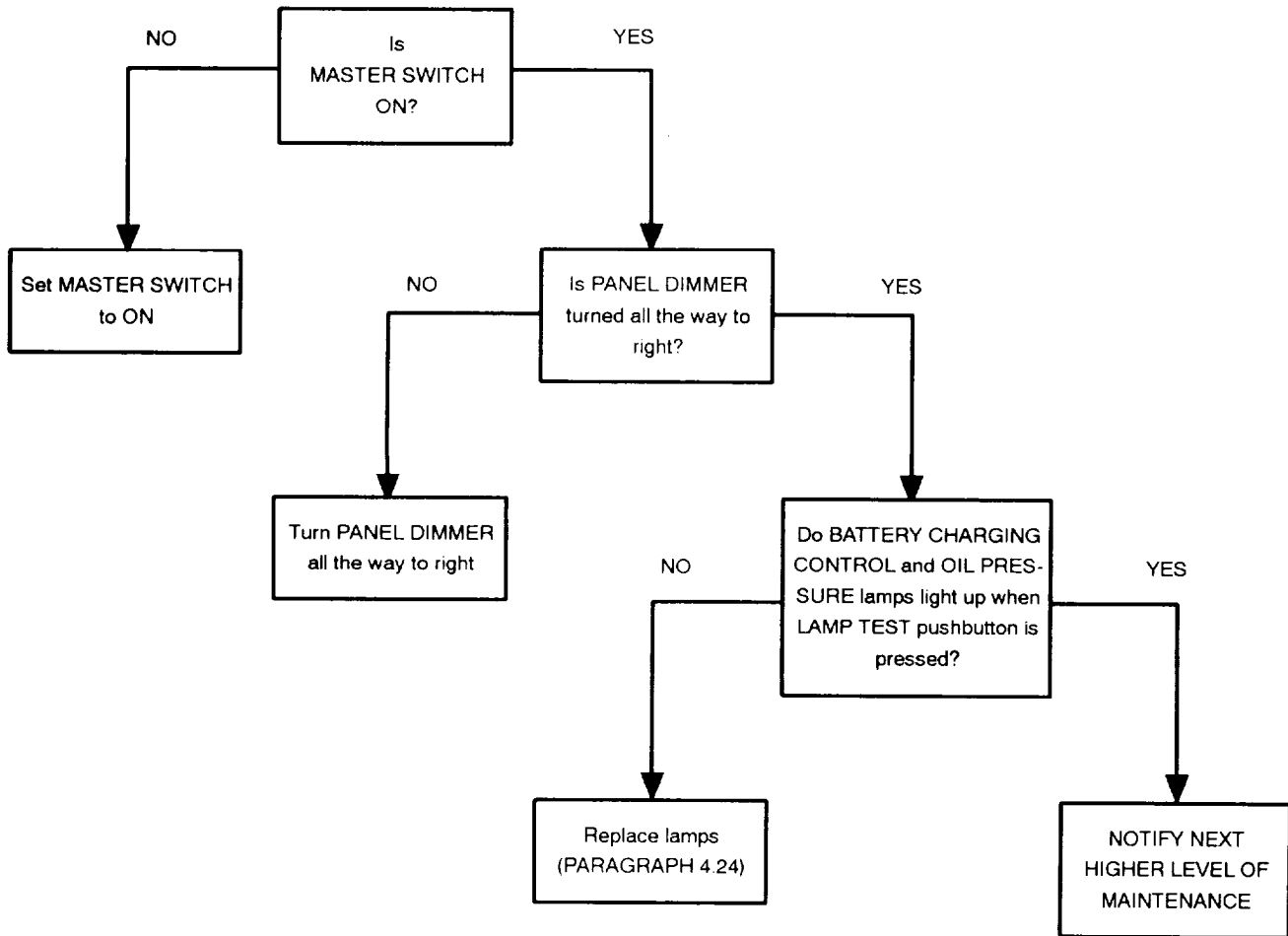


Figure 3-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE OPENING CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

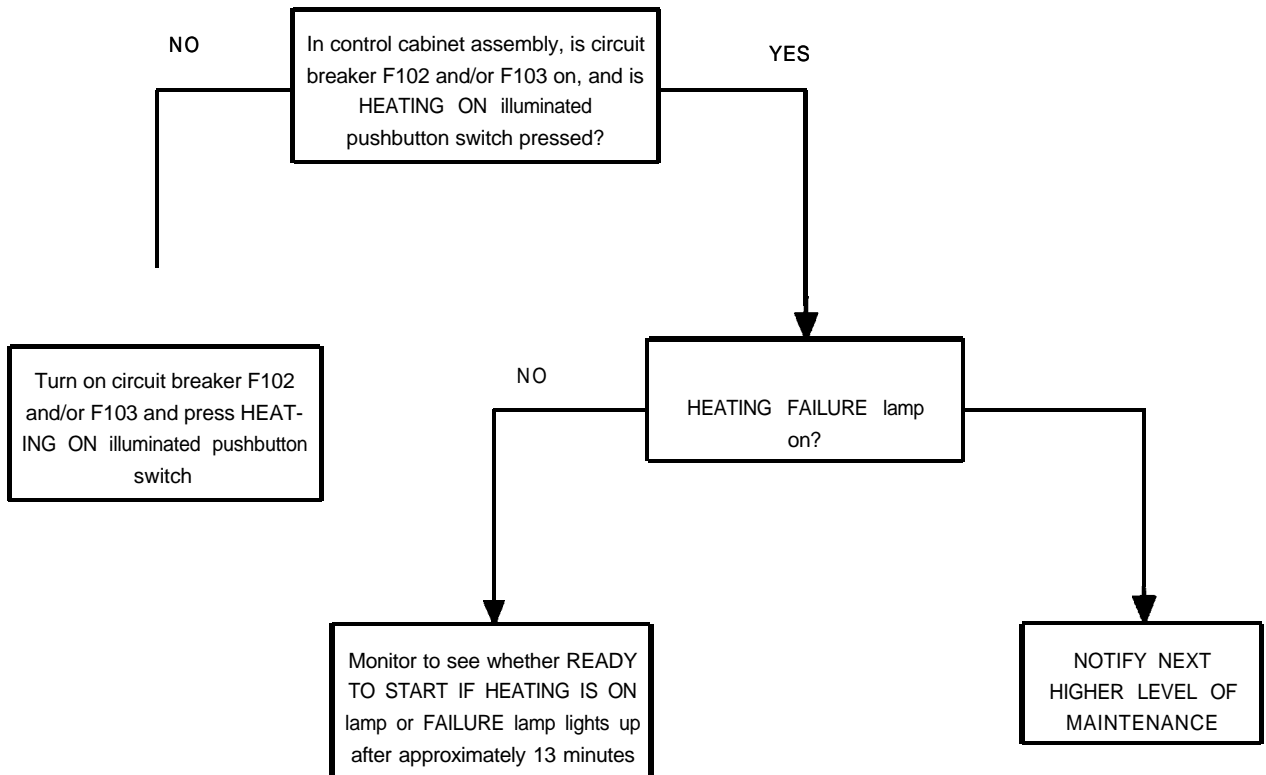


Figure 3-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up.

WARNING

SHUT DOWN GENERATOR SET 150 kW
BEFORE REPLACING INDICATOR LAMP.
FAILURE TO OBSERVE THIS WARNING
COULD RESULT IN SEVERE PERSONAL
INJURY OR DEATH.

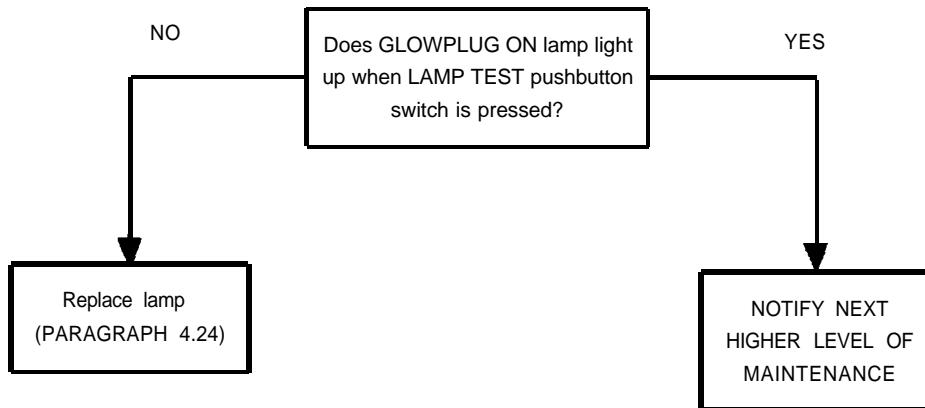


Figure 3-3 GLOWPLUG ON lamp does not light up.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE OPENING CONTROL CABINET ASSEMBLY OR CHECKING OIL LEVEL. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

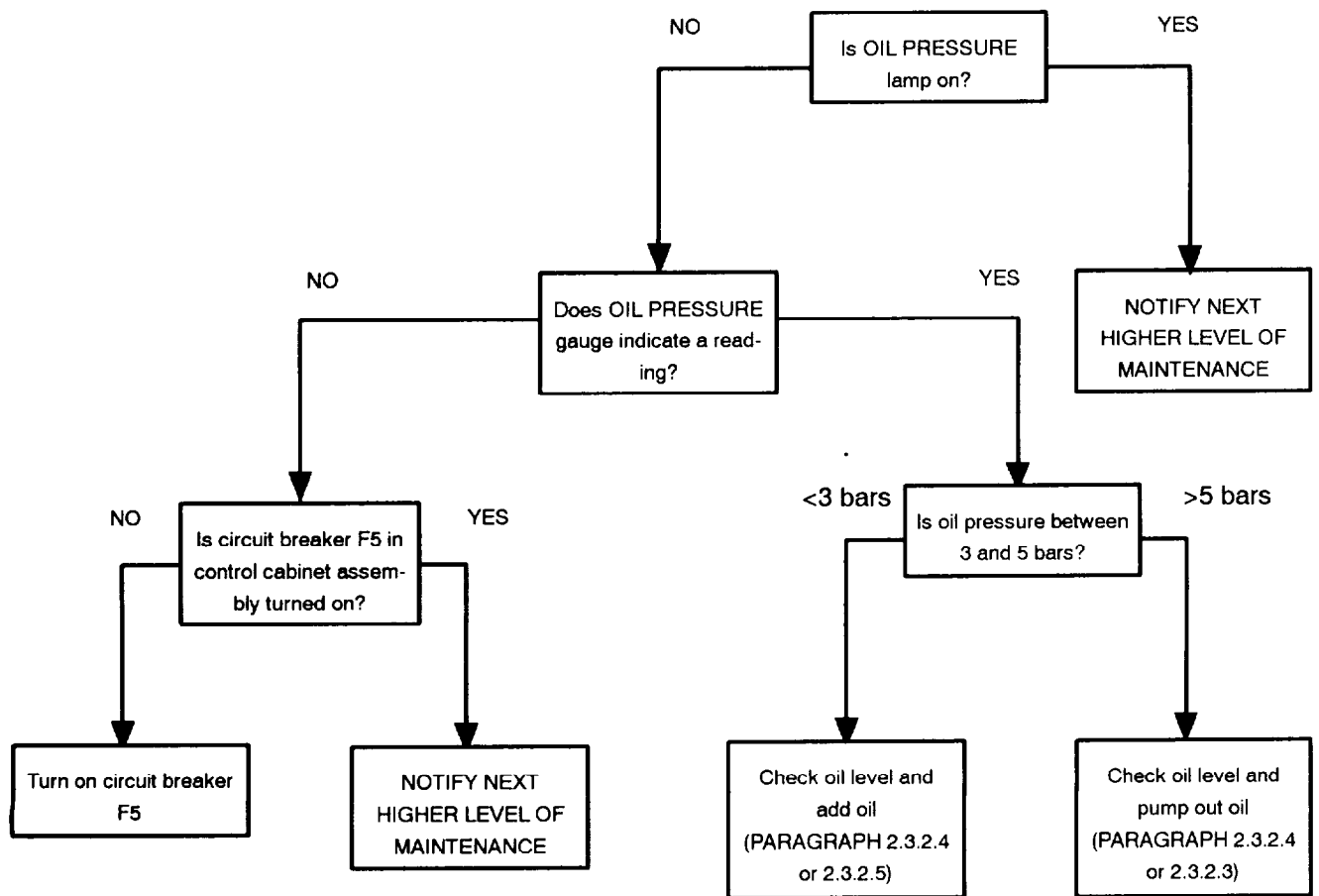


Figure 3-4 Oil pressure too low, or no oil pressure indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE OPENING CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

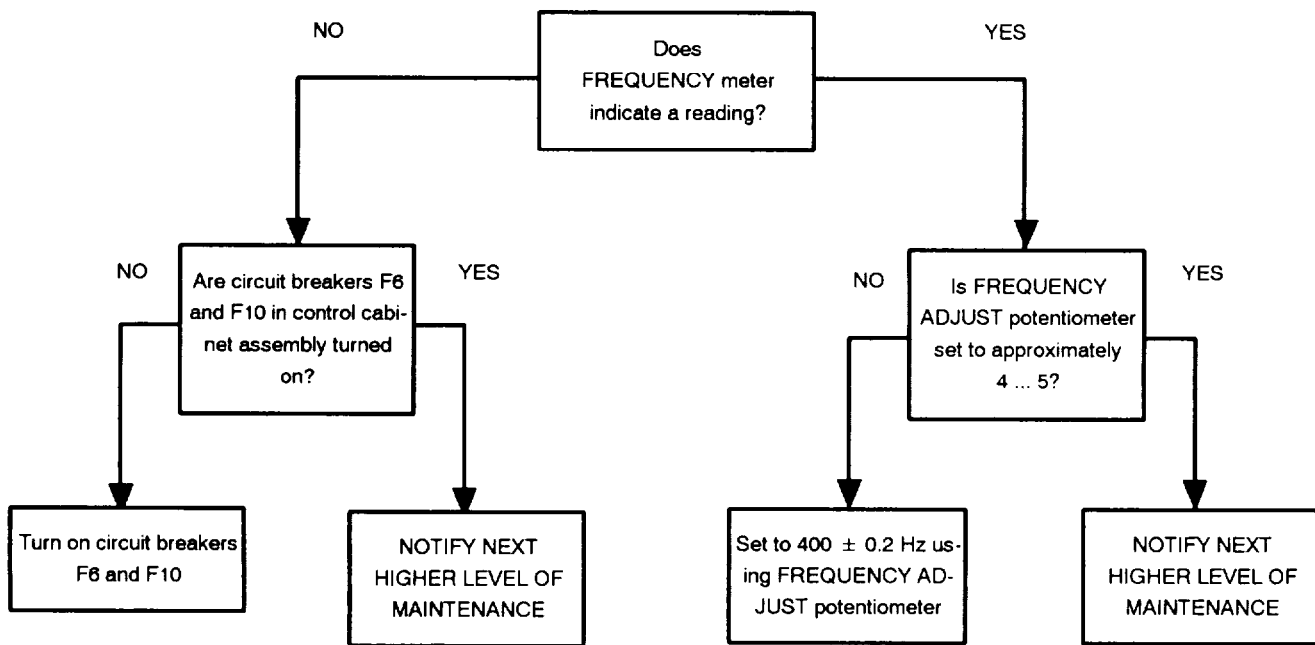


Figure 3-5 Generator frequency cannot be adjusted, or no frequency indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE OPENING CONTROL CABINET ASSEMBLY, FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

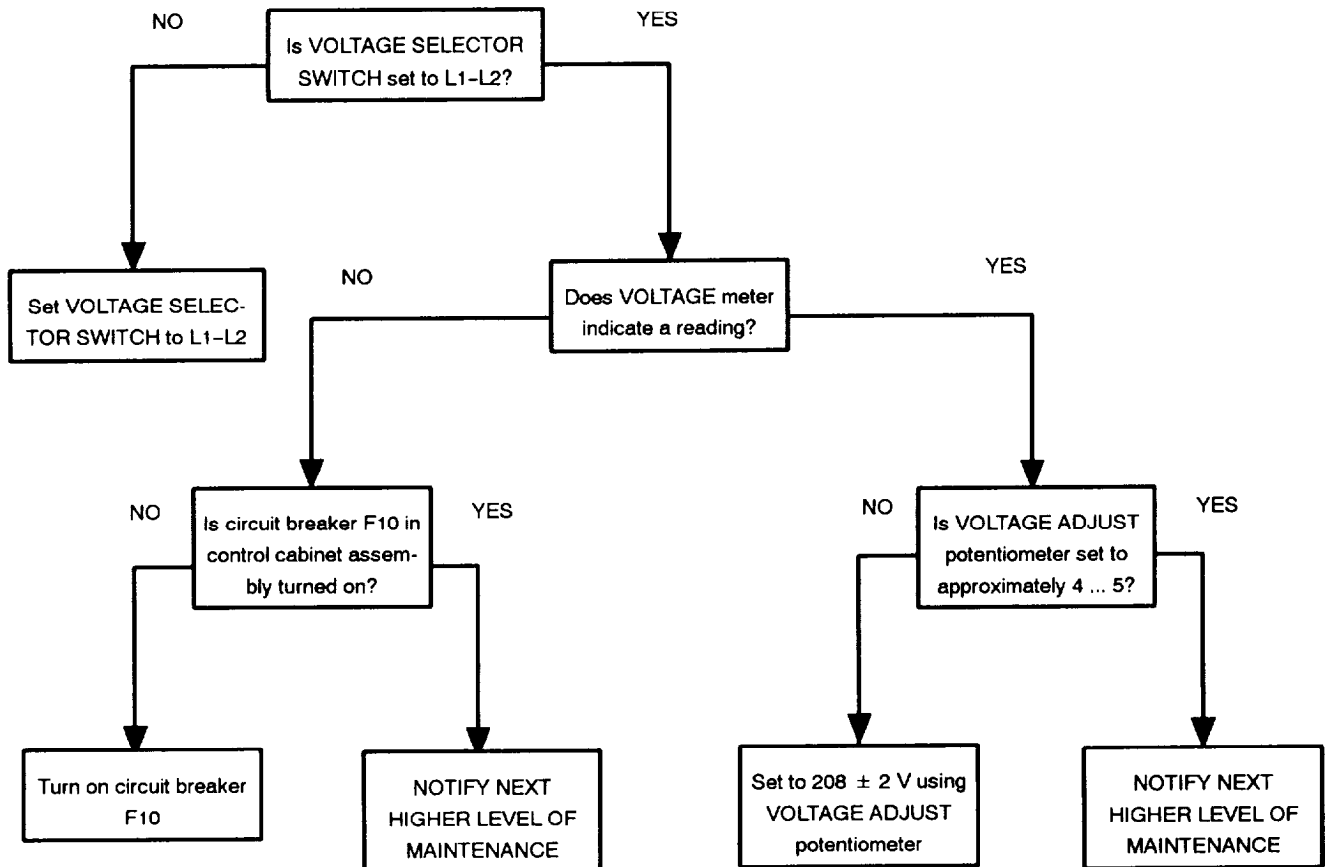


Figure 3-6 Generator voltage cannot be adjusted, or no voltage indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE REPLACING INDICATOR LAMP. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

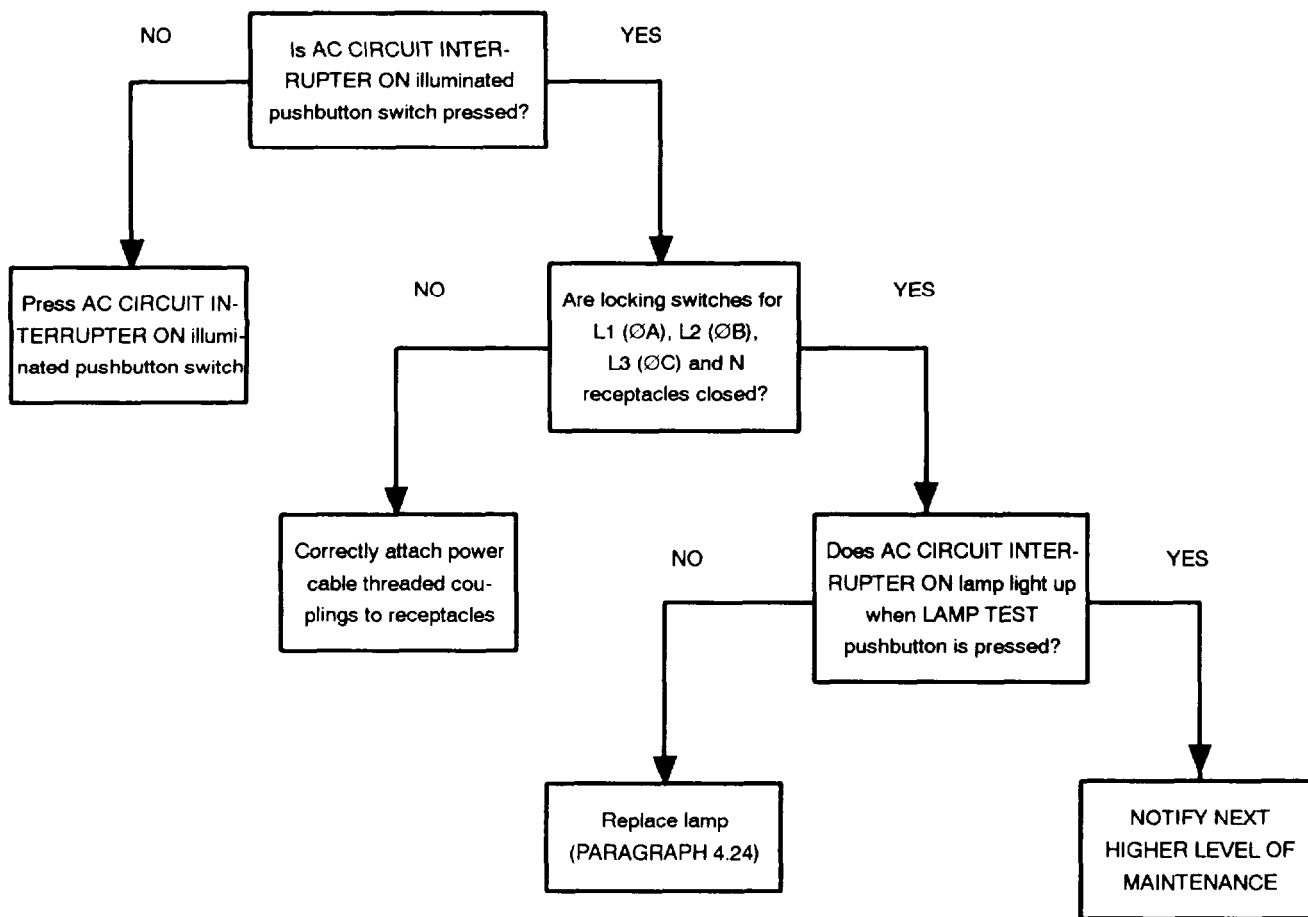


Figure 3-7 AC CIRCUIT INTERRUPTER ON lamp does not light up.

Section III. MAINTENANCE PROCEDURES

3.3 GENERAL.

Operator maintenance procedures for the Generator Set 150 kW are described in paragraph 3.4.

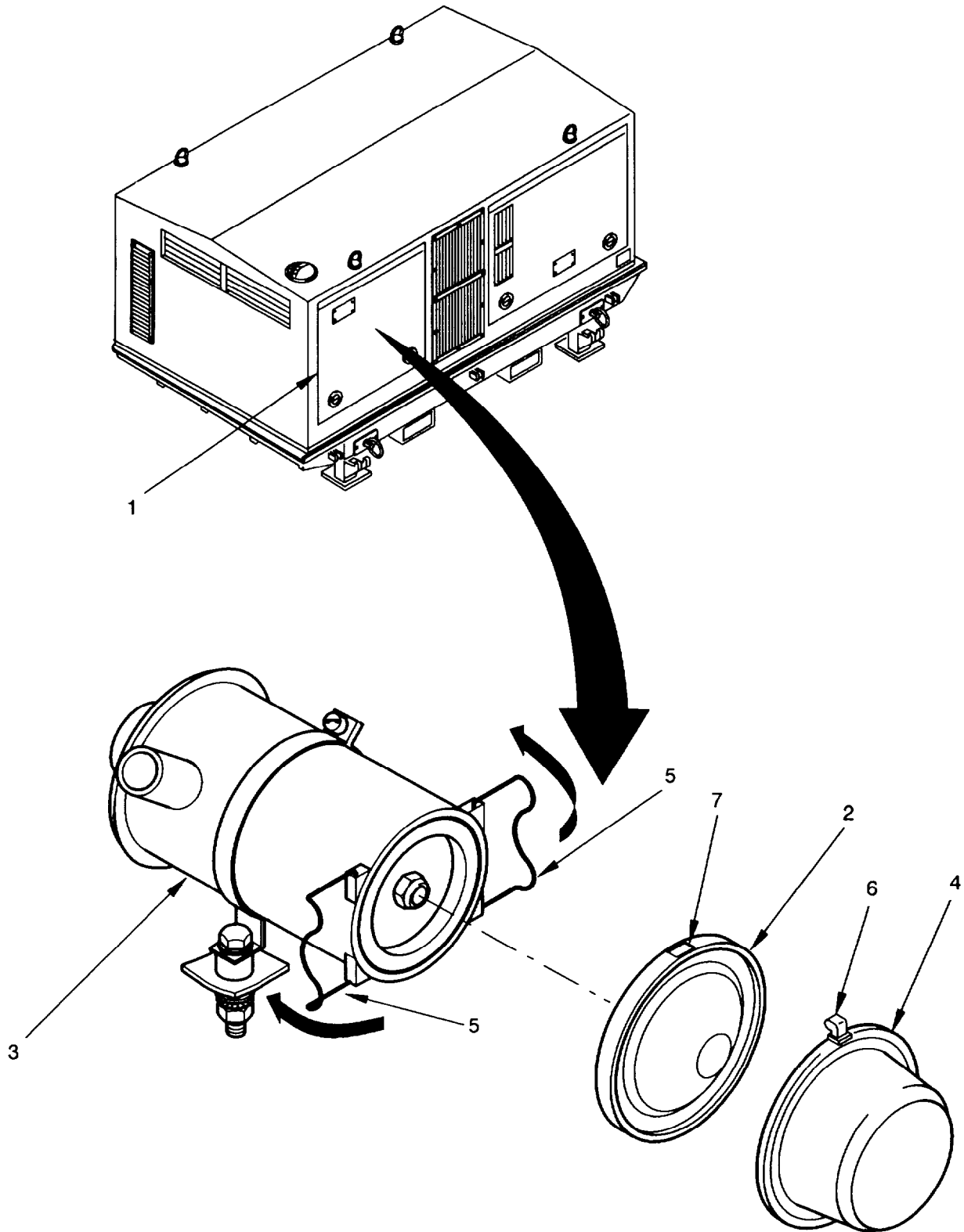


Figure 3-8 Air Filter Assembly Maintenance.

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

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Section I. REPAIR PARTS; TOOLS; SPECIAL TOOLS; TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

4.1 COMMON TOOLS AND EQUIPMENT.

A list of recommended tools and test equipment required to maintain the Generator Set 150 kW is contained in Appendix B, SECTION III.

4.2 SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Refer to TM 9-6115-668-23P for Generator Set 150 kW special tools.

4.3 REPAIR PARTS.

Refer to TM 9-6115-668-23P for Generator Set 150 kW repair parts.

Section II. SERVICE UPON RECEIPT OF EQUIPMENT

4.4 SERVICE UPON RECEIPT OF MATERIEL.

4.4.1 Storage and Transport in Original Packaging.

The Generator Set 150 kW is packed in a wooden container (figure 4-1). The container is covered at the top by rainwater protection film (1). The packing list is located below the plate (2). The container is labeled with the necessary logistical identifiers (5).

4.4.1.1 Transport.

CAUTION

The container is designed for transportation in a horizontal position only.

- a. When transporting with a forklift, insert forks into sockets (6).
- b. When transporting with a crane, attach lifting cables as indicated (3).

WARNING

- **Do not stand in the operating area of the crane or forklift. Do not walk under the suspended load.**
- **Move the container slowly so that it remains in the horizontal position.**

4.4.1.2 Storage.

The container can be stored in the original packaging for up to two years. The unit is packaged in airtight materials meeting MIL standards. The packaging can be checked at regular intervals using the moisture indicator (8), as follows:

- a. Open protective grill (7).
- b. The indicator must be blue in color. If the indicator is entirely or partly pink, proceed as indicated for 30 %, 40 %, and 50 % relative humidity.
- c. Close protective grill (7).

NOTE

The Generator Set 150 kW is packaged with a residual amount of fuel and with battery terminals detached.

4.4.2 Unpacking Equipment.**4.4.2.1 Unpacking Generator Set 150 kW using a Forklift.**

- a. Remove cover (1, figure 4-2) and square wooden members (2).
- b. Remove one side (wide side).
- c. Detach film at points (3). The forklift sockets (1, figure 4-3) are located here.

NOTE

- The unit is secured to the bottom of the container with square wooden members only (no threaded fasteners), and can be lifted up.
- Separate the unit from the container using a forklift.

- d. Insert forks, lift unit with packaging, and lower onto a solid surface.
- e. Remove all film material from the unit.
- f. Prepare the Generator Set 150 kW for start-up as instructed in chapter 2.

4.4.2.2 Unpacking Generator Set 150 kW using a Crane.

- a. Remove cover and four sides of the container (figure 4-1).
- b. Detach film so the four eyebolts (2, figure 4-3) at the corners are accessible.
- c. Suspend the sling assembly from the crane and position the crane approximately above the center of Generator Set 150 kW as shown in figure 4-3.
- d. Insert the four cable hooks of the sling assembly into the lifting rings (2). Lift up the Generator Set 150 kW with the crane and lower it onto a solid surface.

WARNING

- Do not stand in the operating area of the crane. Do not walk under the suspended load.
 - Move the Generator Set 150 kW slowly so that it remains in the horizontal position.
- e. Detach the sling assembly from the Generator Set 150 kW.

4.4.3 Checking Unpacked Generator Set 150 kW.

- a. Inspect the Generator Set 150 kW for damage incurred during shipment. If the Generator Set 150 kW has been damaged, report the damage on SF 364, Report of Discrepancy (ROD).
- b. Check the Generator Set 150 kW against the packing list to see if the Generator Set 150 kW is complete. Report all discrepancies in accordance with the instructions in DA Pam 738-750.
- c. Check to see whether the Generator Set 150 kW has been modified.

4.4.4 Deprocessing Unpacked Generator Set 150 kW.

Refer to DA Form 2258, Depreservation Guide for Vehicles and Equipment, packed with the Generator Set 150 kW. The depreservation guide explains what was done to the Generator Set 150 kW prior to packaging. It also explains what has to be done before placing the Generator Set 150 kW in operation. Perform all depreservation actions required by the depreservation guide.

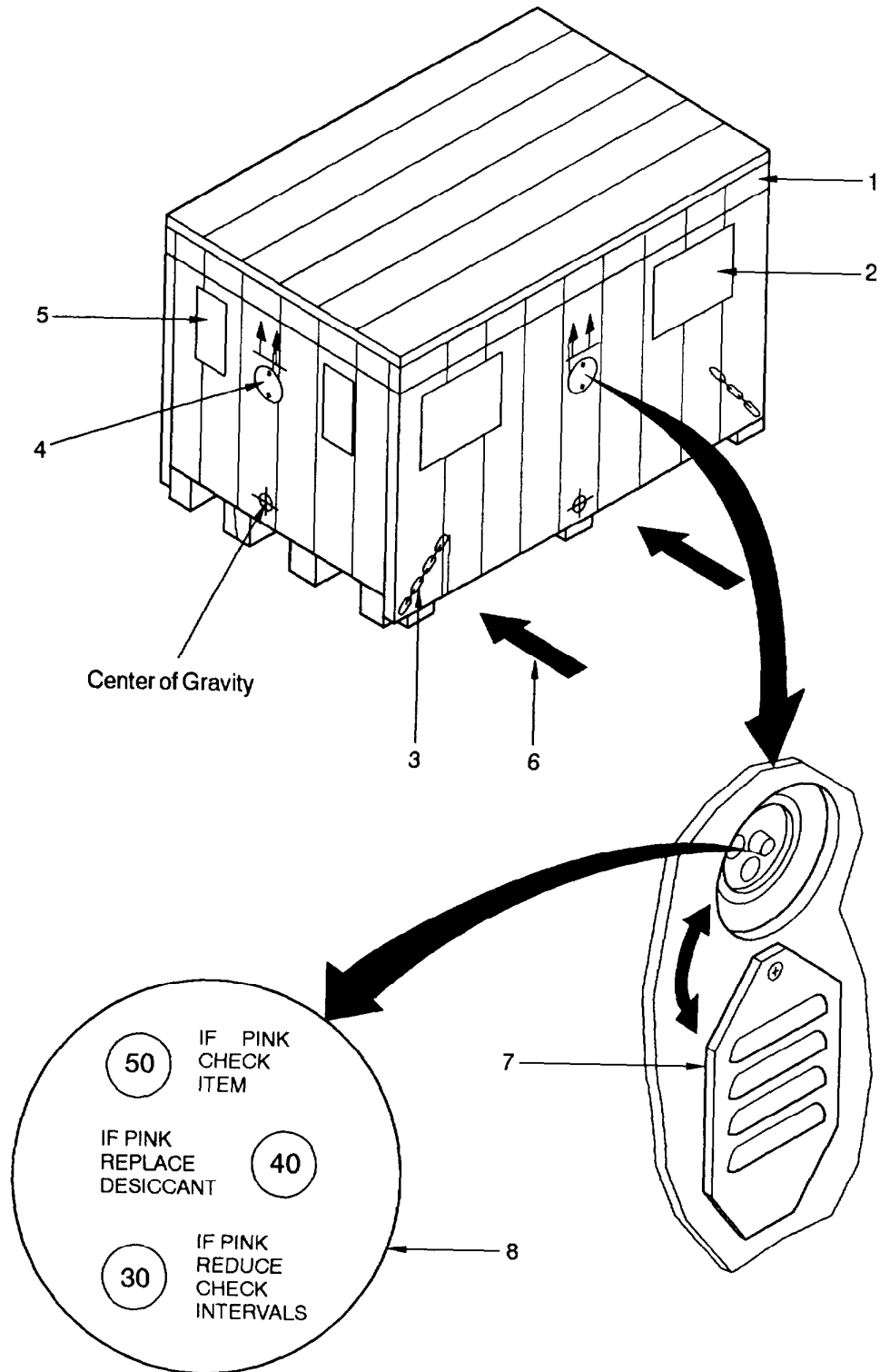


Figure 4-1 Original Packaging in Container.

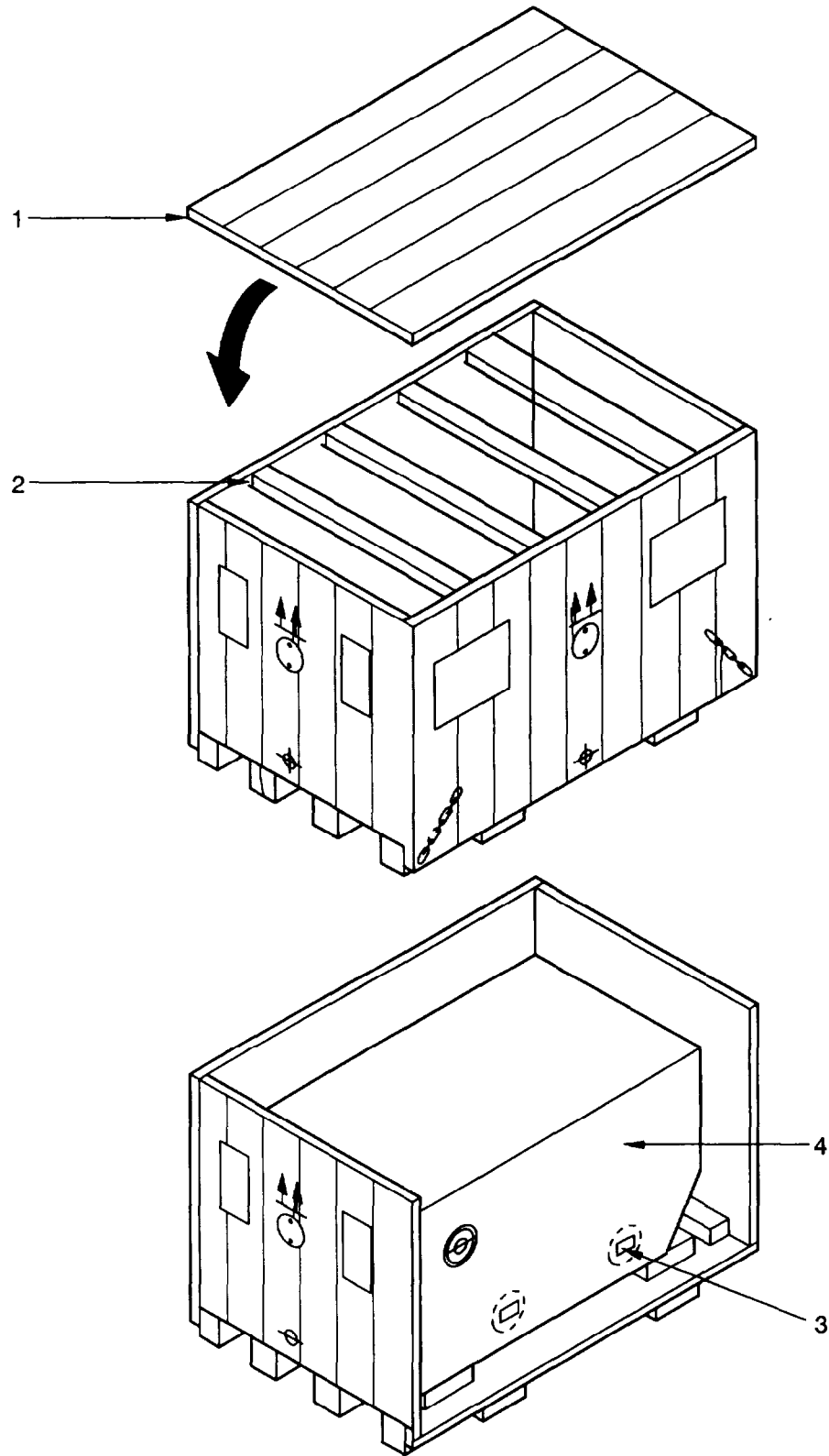


Figure 4-2 Unpacking the Container.

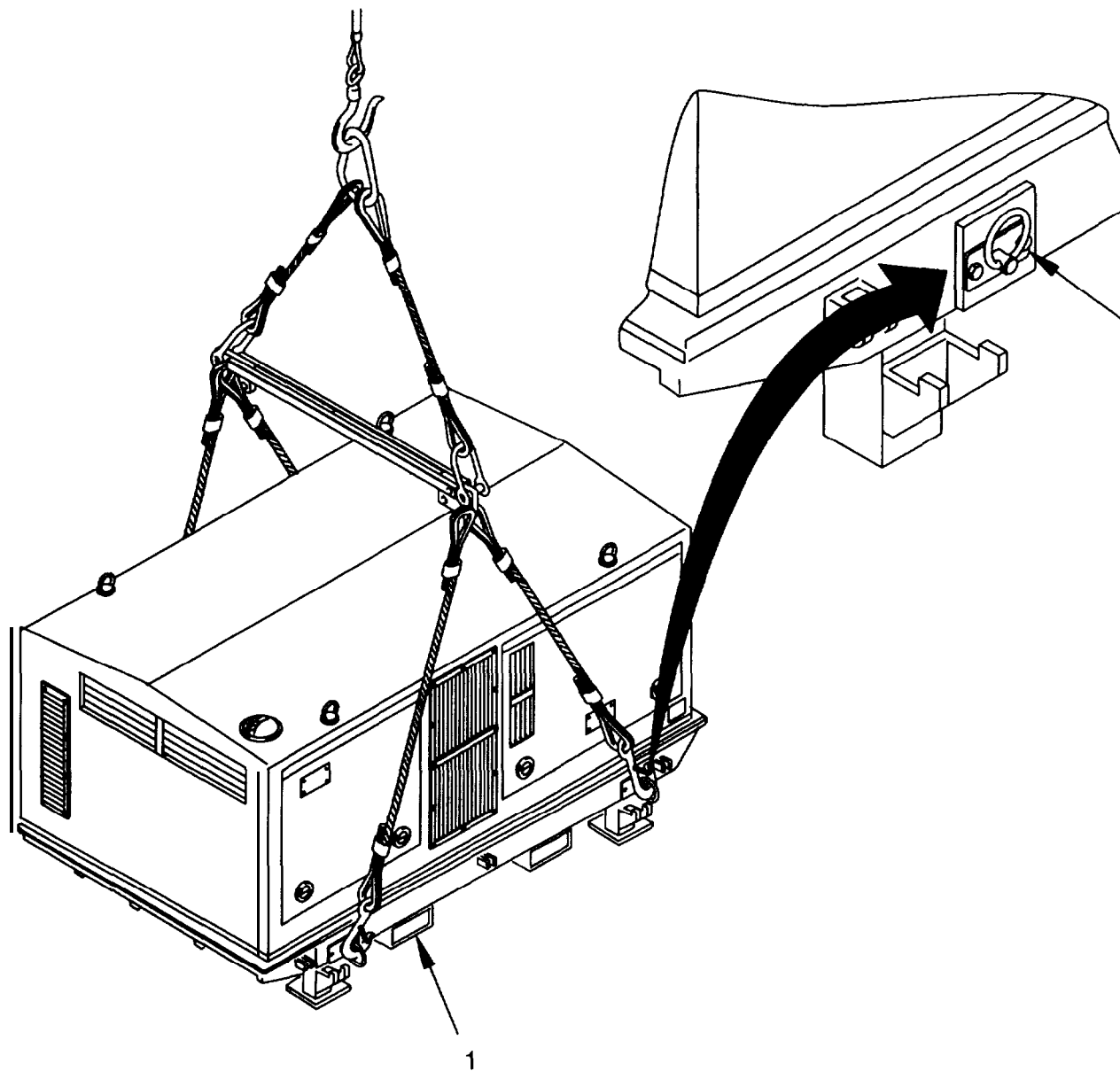


Figure 4-3 Generator Set 150 kW, Unpacked.

4.5 INSTALLATION INSTRUCTIONS.

Refer to paragraph 2.3.5

4.6 PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT.

CAUTION

At temperatures below 32° F (0 ° C), if the batteries are not fully charged they will be damaged or destroyed.

4.6.1 Batteries.

The batteries in the battery set assembly are maintenance free.

- No electrolyte can leak out during proper operation; there is no need to top up with distilled water;
- The batteries exhibit very little self-discharge, so there is no need for frequent recharging to make up for self-discharge losses.

4.6.2 Fuel Tank.

Fill fuel tank (paragraph 2.3.4) with fuel type in accordance with table 4-1. Fuel tank capacity is 101.7 gallons (385 liters).

Table 4-1 Fuel

AMBIENT TEMPERATURE	DIESEL FUEL
+20 °F TO +120 °F (-6 °C TO 49 °C)	W-F-800 GRADE DF-2, JP4, JP5, OR JP8
0 °F TO +20 °F (-17 °C TO -6 °C)	W-F-800 GRADE DF-1, JP4, JP5, OR JP8
-25 °F TO 0 °F (-32 °C TO -17 °C)	W-F-800 GRADE DF-1
-25 °F TO 0 °F (-32 °C TO -17 °C)	W-F-800 GRADE DF-A

4.6.3 Lubricating Oil.

Fill diesel engine (paragraph 2.3.3) with lubricating oil in accordance with table 4-2. Lubrication system capacity is 23.25 quarts (22 liters).

Table 4-2 Lubricating Oil.

NOTE

- \geq Greater than or equal to
 \leq Less than or equal to

AMBIENT TEMPERATURE	LUBRICATING OIL
≥ 32 °F (0 °C)	SAE 15 W/40
≤ 32 °F (0 °C)	SAE 5 W/30

Section III. Unit Lubrication

4.7 SYNCHRONOUS GENERATOR ASSEMBLY.

4.7.1 Lubricate synchronous generator bearings.

- a. Open flap (1, figure 4-4).
- b. Place grease gun on grease nipple (3) and (4) and inject approximately 1.4 ounces (40 g) bearing grease (item 4, appendix E) into synchronous generator (2) bearing.

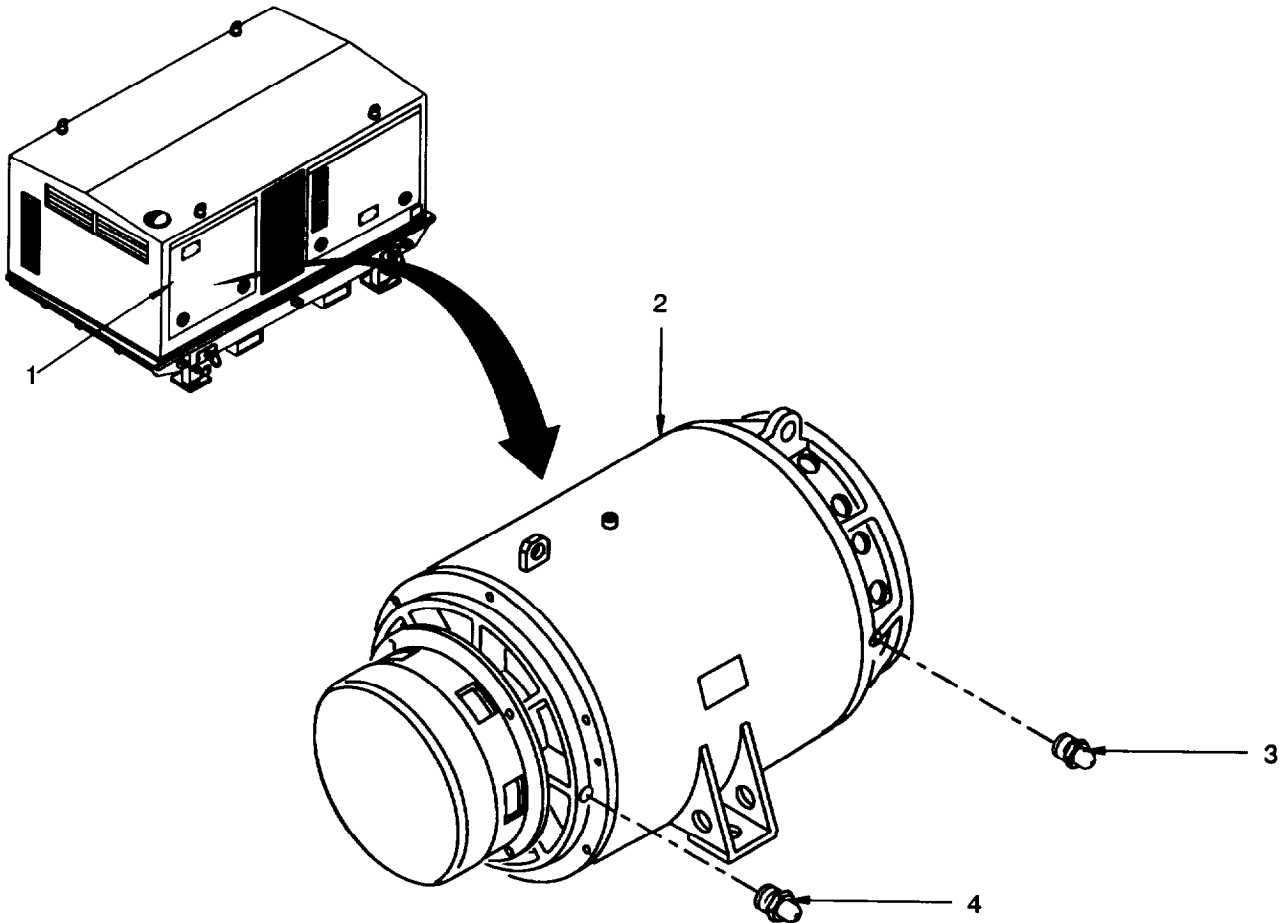


Figure 4-4 Lubricate synchronous generator bearings.

Section IV. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4.8 INTRODUCTION TO UNIT PMCS TABLE.

Table 4-3 (PMCS table) has been provided so you can keep your equipment in good operating condition and ready for its primary mission.

4.8.1 Warnings, Cautions, and Notes. Always observe the **WARNINGS, CAUTIONS** and **NOTES** appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe **WARNINGS** to prevent serious injury to yourself and others. You must observe **CAUTIONS** to prevent your equipment from being damaged. You must observe **NOTES** to ensure procedures are performed properly.

4.8.2 Explanation of Table Entries.

4.8.2.1 Item No. Column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

4.8.2.2 Interval Column. This column tells you when you must do the procedure in the procedure column. Perform procedures such as Monthly or Quarterly at the listed calendar interval. Perform procedures designated by number of hours when the equipment has been operated for that many hours.

4.8.2.3 Location, Item to be Checked or Serviced Column. This column lists the item to be checked or serviced.

4.8.2.4 Procedure Column. This column gives the procedure for checking or servicing the item listed in the item to check/service column. You must perform the procedure to know if the generator set 150 kW is ready or available for its intended mission or operation. You must do the procedure at the time stated in the interval column.

4.8.2.5 Not Fully Mission Capable if: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you make checks or services that show faults listed in this column, do not operate the equipment.

4.8.3 Other Table Entries. Be sure to observe all special information and notes that appear in your table.

4.8.4 Special Instructions. Preventive maintenance is not limited to performing the checks and services listed in the PMCS table. Refer to figure 4-5 for PMCS routing. Covering unused receptacles, stowing unused accessories, and other routine procedures such as equipment inventory, cleaning components, and touch-up painting are not listed in the table. These are things you should do any time you see that they need to be done. If a routine check is listed in the PMCS table, it is because experience has shown that problems may occur with this item. Take along the tools and cleaning cloths needed to perform the required checks and services.

Use the information in the following paragraphs to help you identify problems at any time. Use the following information to help identify potential problems before and during checks and services.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes. Wear goggles and rubber gloves to protect eyes and skin. Wash exposed skin thoroughly. Do not smoke or use near open flame or excessive heat. Failure to observe this warning can cause severe personal injury or death.

CAUTION

Keep cleaning solvents, gasoline and lubricants away from rubber or soft plastic parts. They will deteriorate material.

- a. Keep it clean. Dirt, grease, and oil get in the way and may cover up a serious problem. Use dry cleaning solvent to clean metal surfaces.
- b. Use soap and water to clean rubber or plastic parts and material.
- c. Check all bolts, nuts, and screws to make sure they are not loose, missing, bent, or broken. Do not try to check them with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one loose, report it to the next higher level of maintenance.
- d. Inspect welds for loose or chipped paint, rust, or gaps where parts are welded together. If a broken weld is found, report it to the next higher level of maintenance.
- e. Inspect electrical wires, connectors, terminals, and receptacles for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors. Examine terminals and receptacles for serviceability. If deficiencies are found, report them to the next higher level of maintenance.
- f. Inspect hoses and fluid lines. Look for wear, damage, and leaks. Make sure that clamps and fittings are tight. Wet spots and stains around a fitting or connector can mean a leak. If a leak comes from a loose connector, or if something is broken or worn out, report it to the next higher level of maintenance.

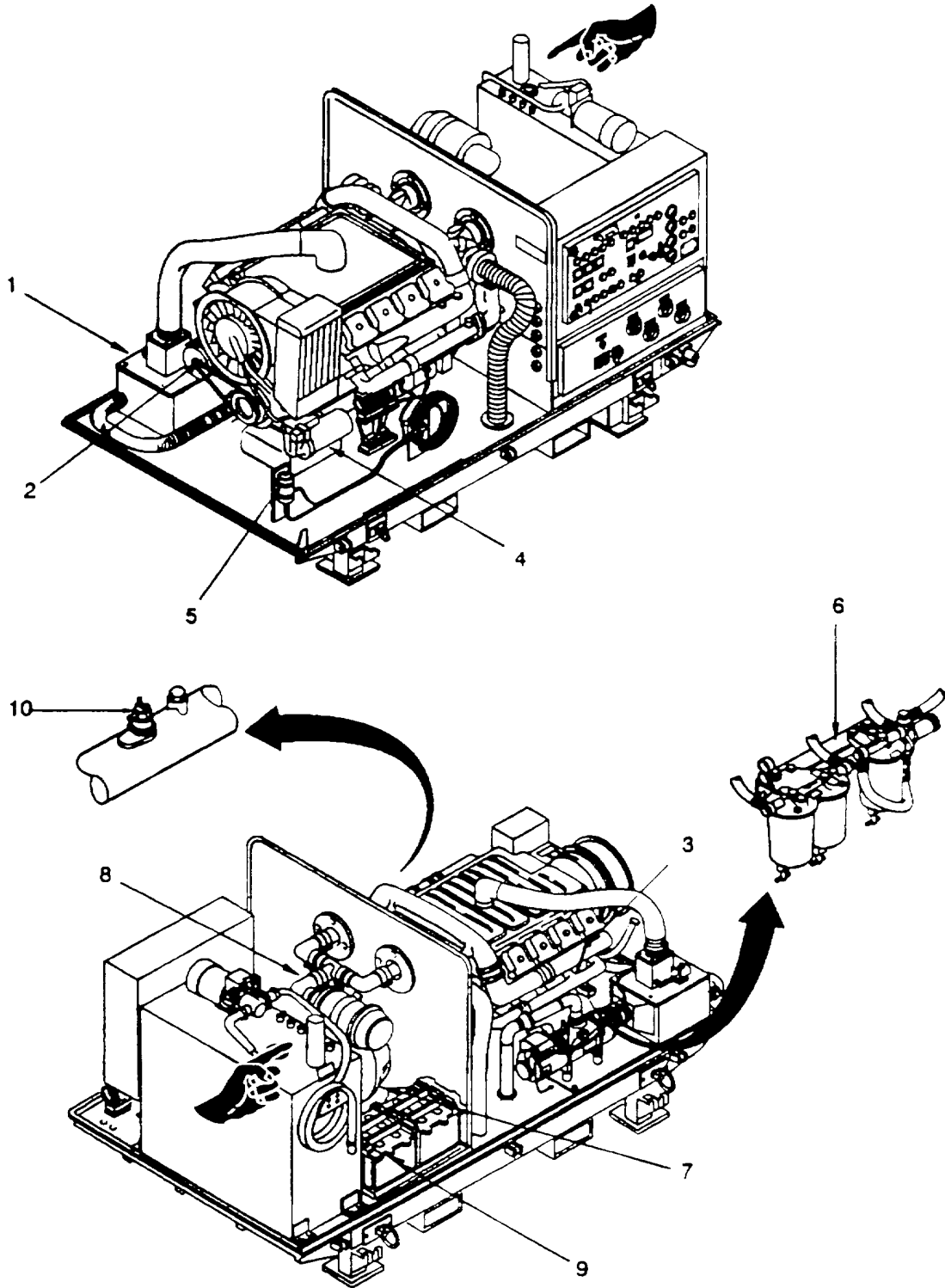


Figure 4-5. Unit PMCS Routing Diagram.

Table 4-3. Unit Preventive Maintenance Checks and Services for Generator Set 150 kW.

Item No.	Interval	Item to be Checked or Serviced	Procedure	Not Fully Mission Capable if:
1	125 Hours	Engine Preheating Assembly	Check operation. Refer to paragraph 2.8	Diesel engine cannot be preheated.
2	250 Hours/ Semi Annual	V Belts (Battery Charging Alternator)	a. Check V belt tension and readjust if necessary. Check V belts for damage, and replace defective V belts. Refer to paragraphs 4.34 and 4.35. b. Below 23 °F (-5 °C), install V belts for winter operation. Refer to paragraph 4.35.	V belts are loose, frayed, or damaged.
3	250 Hours/ Semi Annual	Engine Oil	Change Engine Oil (Refer to paragraph 2.3.3.3) for oil change intervals under unusual conditions.	Class III oil leak.
4	250 Hours/ Semi Annual	Oil Filter	Replace oil filter at every other oil change, or at intervals of 250 hours or less. Refer to paragraph 4.30.	Class III oil leak.
5	250 Hours/ Semi Annual	Subcurrent Filter Assembly	Replace filter cartridge at every other oil change, or when subcurrent filter does not get hot during operation (250 Hours or less). Refer to paragraph 4.31.	Class III oil leak.
6	250 Hours/ Semi Annual	Fuel Prefilter and Two Step Fuel Filter Assembly	a. Clean or replace filter cartridges. Refer to paragraph 4.32 and 4.33. b. Bleed fuel filter after filter insets are cleaned or replaced. Refer to paragraphs 4.38 and 4.39.	Diesel engine runs roughly with poor output or any fuel leak. Any fuel leak.
7	1000 Hours/ Annual	Synchronous Generator Assembly	Lubricate bearings. Refer to paragraph 4.7. Perform load bank procedures in accordance with paragraph 5.53.	

Table 4-3. Unit Preventive Maintenance Checks and Services for Generator Set 150 kW-continued.

Item No.	Interval	Item to be Checked or Serviced	Procedure	Not Fully Mission Capable if:
8	1000 Hours/Annual	Air Filter Assembly	Clean or replace filter cartridge annually or when AIR FILTER lamp is on. Refer to paragraph 4.29.	If AIR FILTER lamp is on.
9	1000 Hours/Annual	Battery Set Assembly	<p style="text-align: center;">CAUTION</p> <p>Do not use a lead acid battery charger to recharge conventional, gal battery, or damage to battery may occur.</p> <p>Remove and clean battery set assembly. At temperatures below 32 °F (0° C) or if starting is difficult, check battery charge. Refer to the next higher level of maintenance. See TM 9-6150-200-14.</p>	Batteries will not hold charge.
10	1000 Hours/Annual	Flame Glowplug System	At temperatures below 32 °F (0° C) or if starting is difficult, check operation of flame glowplug system. Refer to paragraph 5.30.	
11	Semi-annually	EPP III	Perform load bank procedures in accordance with paragraph 5.53.	
12	1000 Hours/Annual	Valves	Refer to paragraph 5.54	Diesel engine runs roughly with poor output.
13	1000 hours/Annual	Cooling Blower Assembly	Refer to paragraph 5.55	

Section V. TROUBLESHOOTING

4.9 GENERAL

The symptom index for the generator set 150 kW lists faults associated with control cabinet assembly operation. Figures 4-6 through 4-23 provide a go/no-go flowchart of each malfunction. Each malfunction listed includes a reference to the applicable figure that contains a chart to help you determine probable causes and corrective actions to take. The symptom index cannot list all faults that may occur, nor all the tests or inspections and corrective actions. If a malfunction is not listed or cannot be corrected by listed corrective actions, notify next higher level of maintenance for assistance.

WARNING

- **Potential 150 kW/208 VAC shock hazard with failure to adhere to this warning. Contact with this high power could result in death or severe injury. If the removal of one generator from the EPP III is required, replace it with an extra generator. Always make sure that two generators are mounted to the EPP IN. Continued use of the EPP II with only one generator could result in a catastrophic shock hazard.**
- **Prior to energizing the equipment the operator must check for exposed electrical terminals.**
- **Always install protective covers on control and power cables when cables are not connected.**
- **Be sure to observe all warning signs on equipment.**
- **Potential 208 VAC shock hazard. Do not disconnect or connect control or power cables while Generator Set 1 or 2 is running.**

NOTE

Before performing troubleshooting procedures:

- **Ensure that operator level troubleshooting steps have been performed.**
- **Be sure you have performed your PMCS.**
- **Refer to the Wiring Diagram FO-1 and FO-2 as troubleshooting aids.**

SYMPTOM INDEX

	Troubleshooting Procedure
BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up	Figure 4-6
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Desel engine cannot be started	Figure 4-9
Oil pressure too low, or no oil pressure indication	Figure 4-10
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UNDER/OVER FREQUENCY lamp lights up during operation	Figure 4-20
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GENERATOR OVER TEMPERATURE lamp lights up during operation	Figure 4-22
OVERLOAD lamp lights up during operation	Figure 4-23

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY, DIESEL ENGINE OR BASE FRAME ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

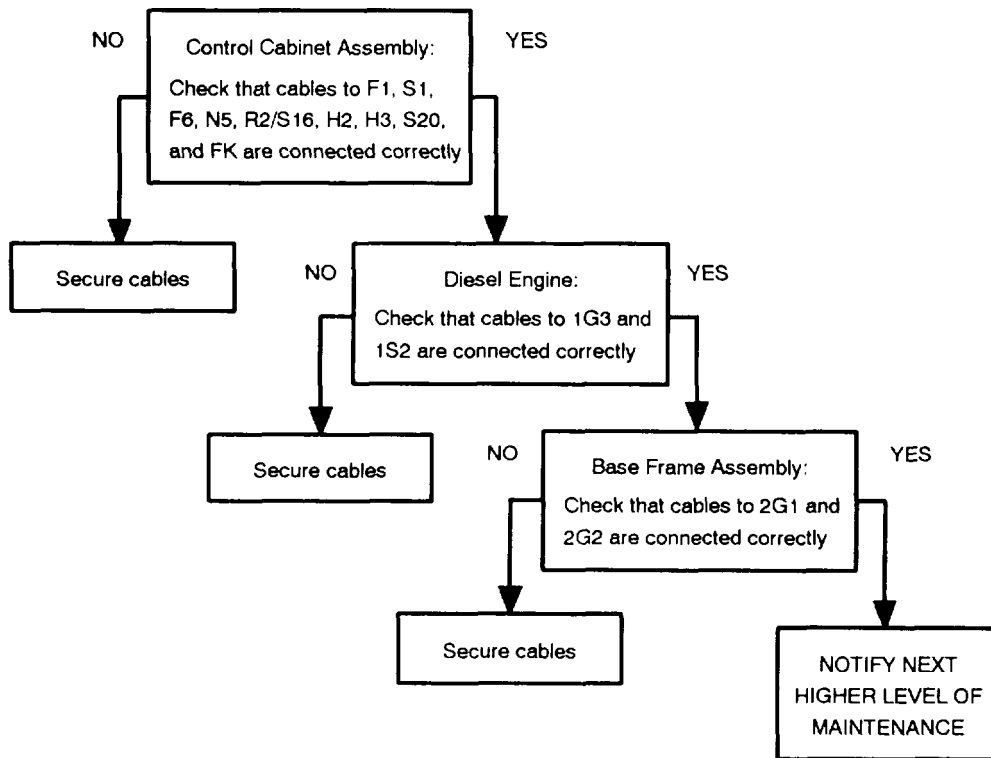


Figure 4-6 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY OR ENGINE PREHEATING ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

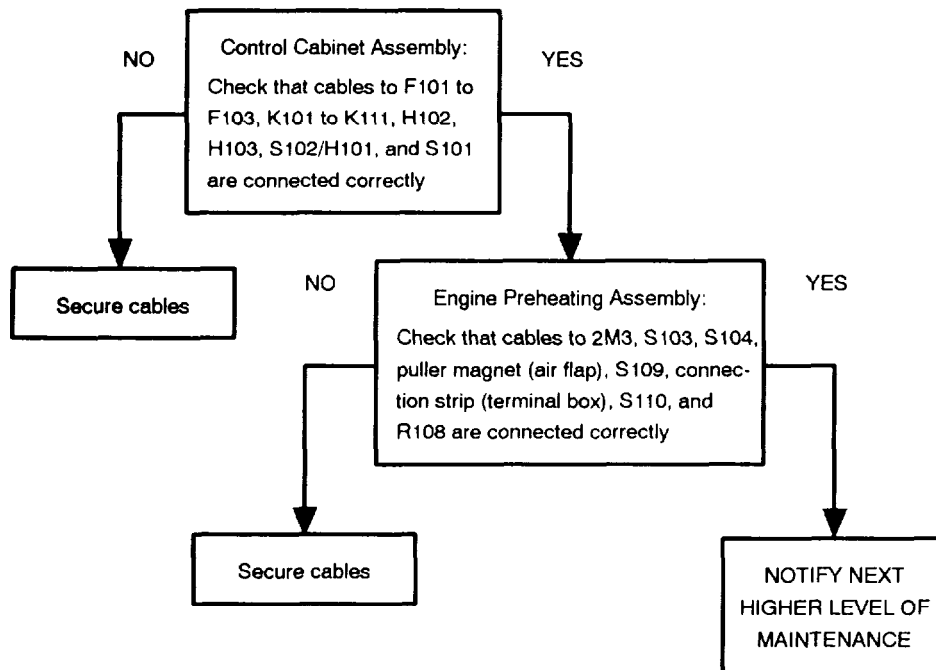


Figure 4-7 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up.

WARNING

SHUT DOWN GENERATOR SET 150 KW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY OR DIESEL ENGINE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

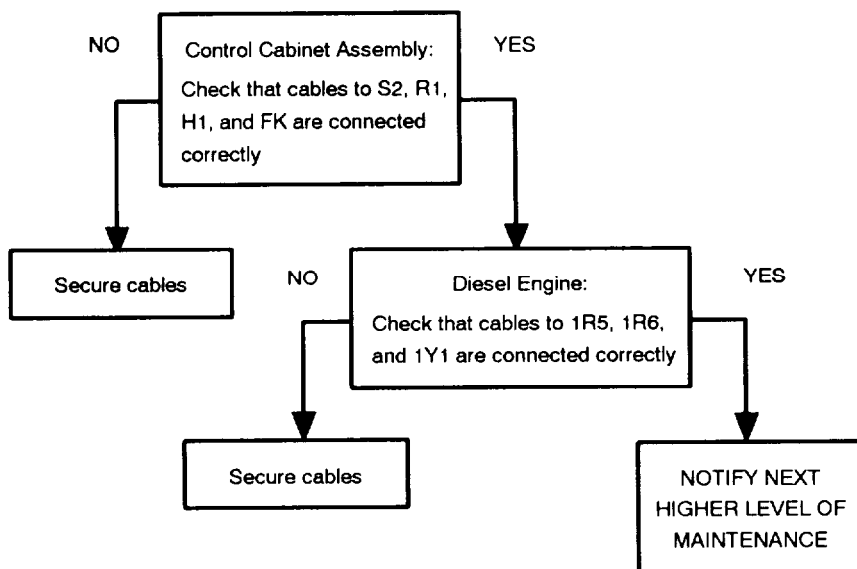


Figure 4-8 GLOWPLUG ON lamp does not light up.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY, DIESEL ENGINE OR BASE FRAME ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

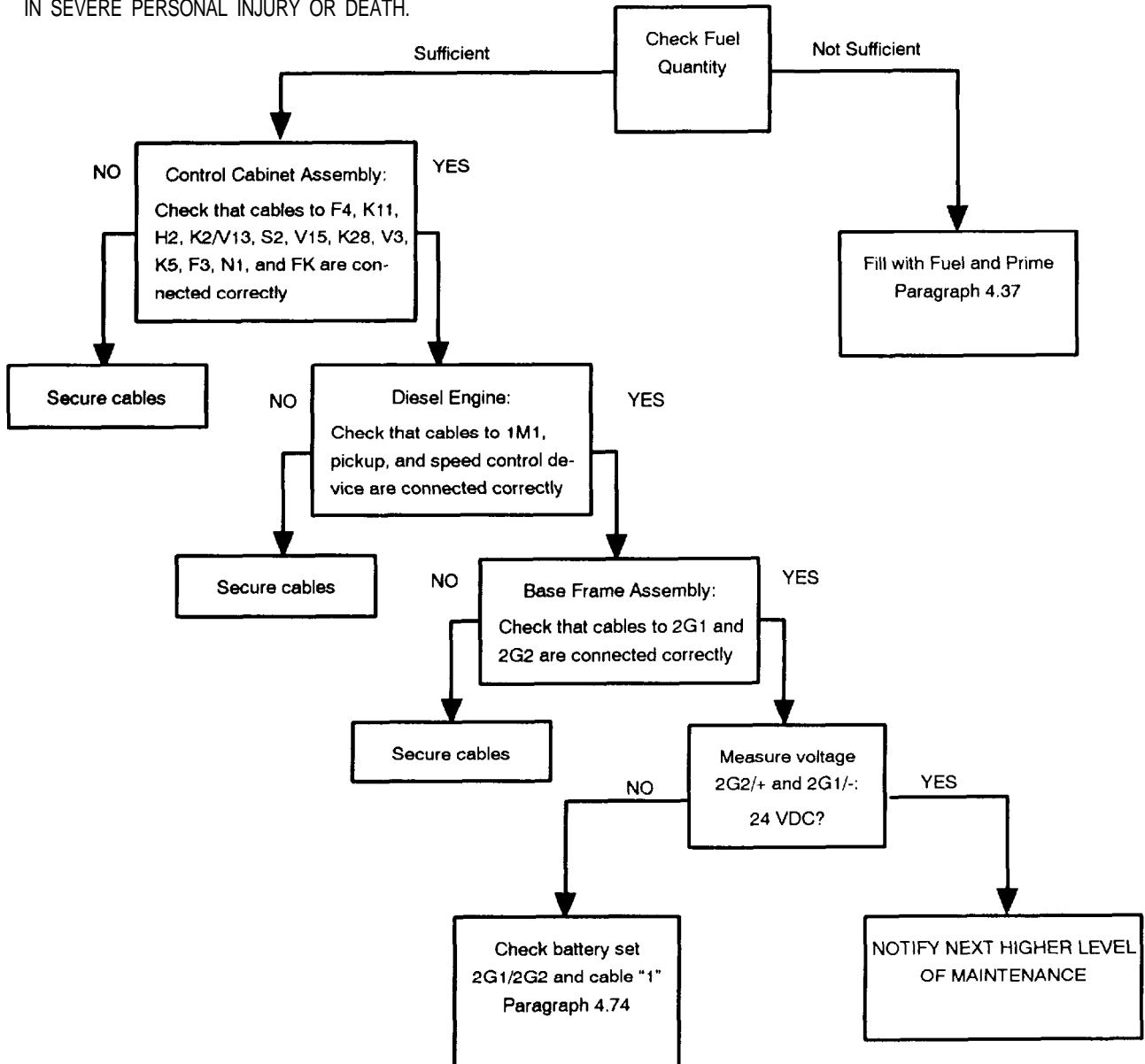


Figure 4-9 Diesel engine cannot be started.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY OR DIESEL ENGINE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

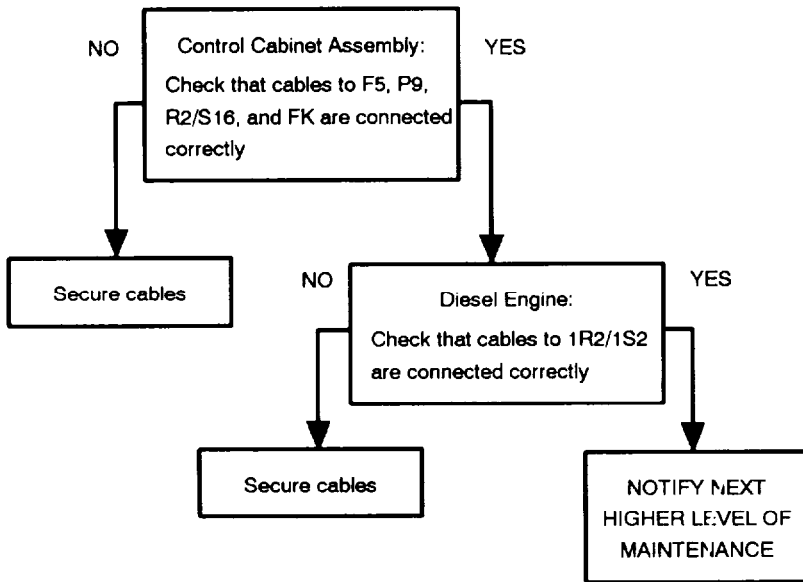


Figure 4-10 Oil pressure too low, or no oil pressure indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY OR DIESEL ENGINE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

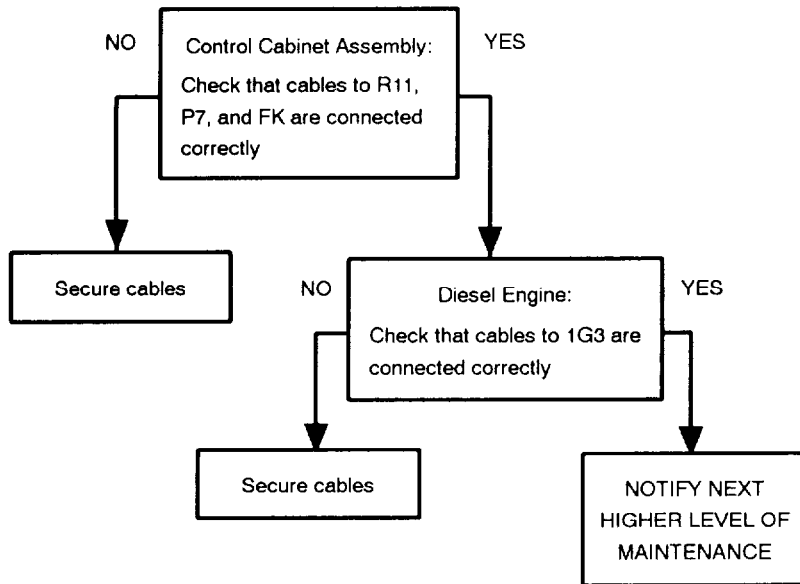


Figure 4-11 Battery set is not being charged, or no charging current indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

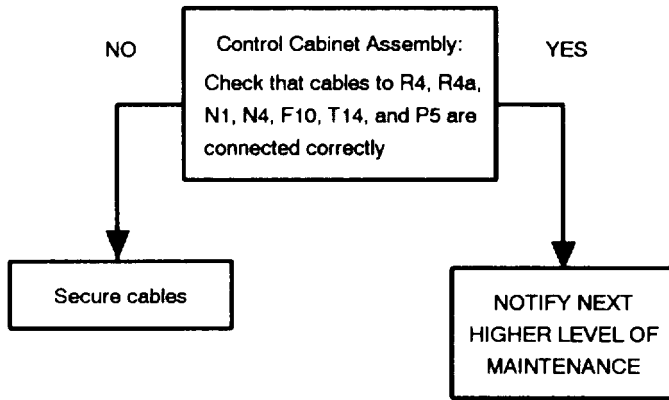


Figure 4-12 Generator frequency cannot be adjusted, or no frequency indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

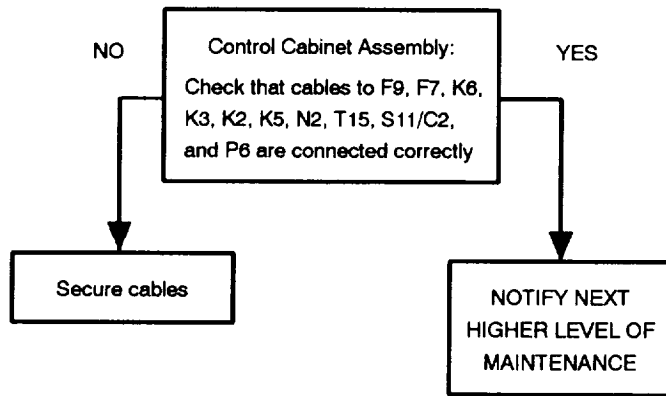


Figure 4-13 Generator voltage cannot be adjusted, or no voltage indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

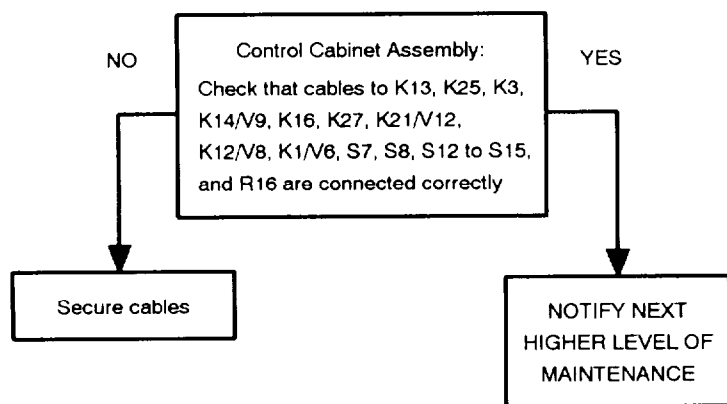


Figure 4-14 AC CIRCUIT INTERRUPTER ON lamp does not light up.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

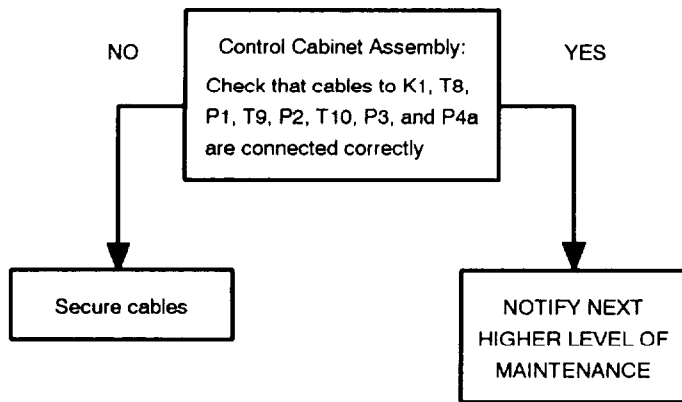


Figure 4-15 No line currents are flowing, or no line current indication.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

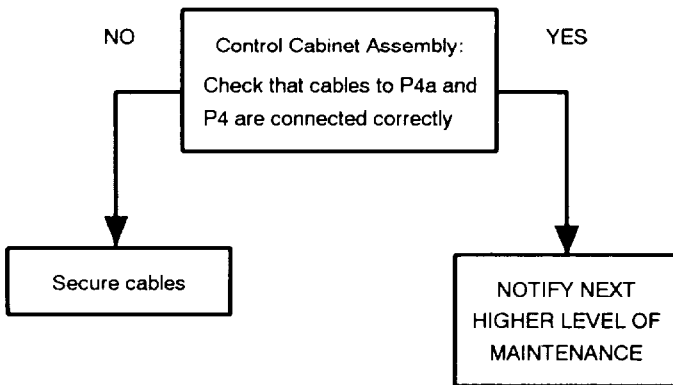


Figure 4-16 No power indication.

WARNING

SHUT DOWN GENERATOR SET 150 KW BEFORE PERFORMING TEST OR INSPECTION OF GENERATOR OR FUEL TANK ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

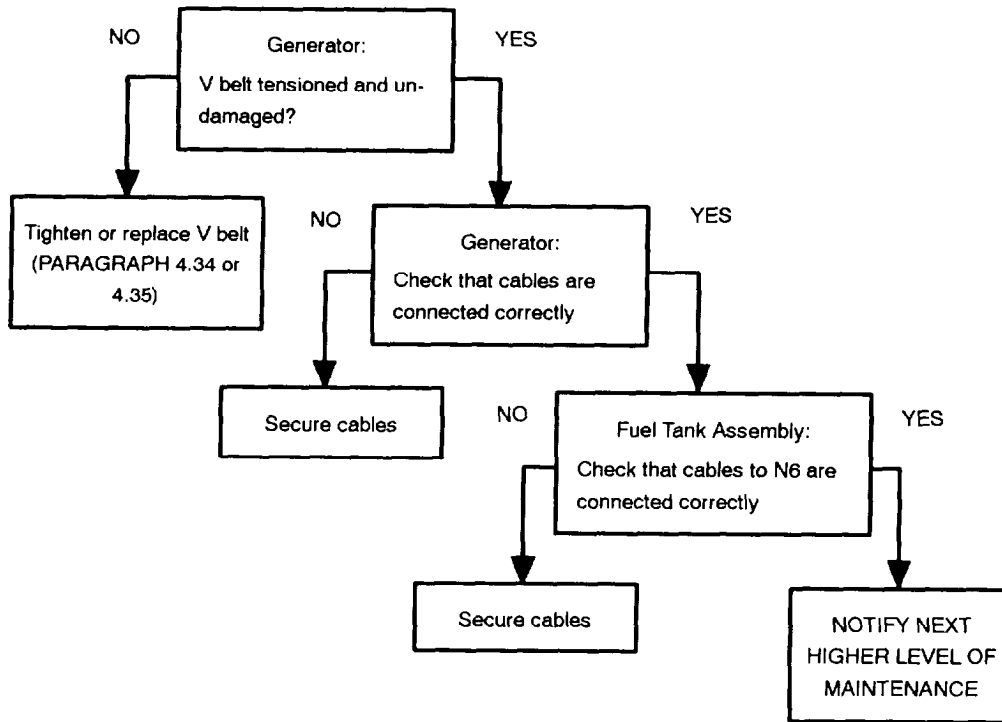


Figure 4-17 BATTERY CHARGING CONTROL lamp lights up during operation.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF DIESEL ENGINE OR BASE FRAME ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

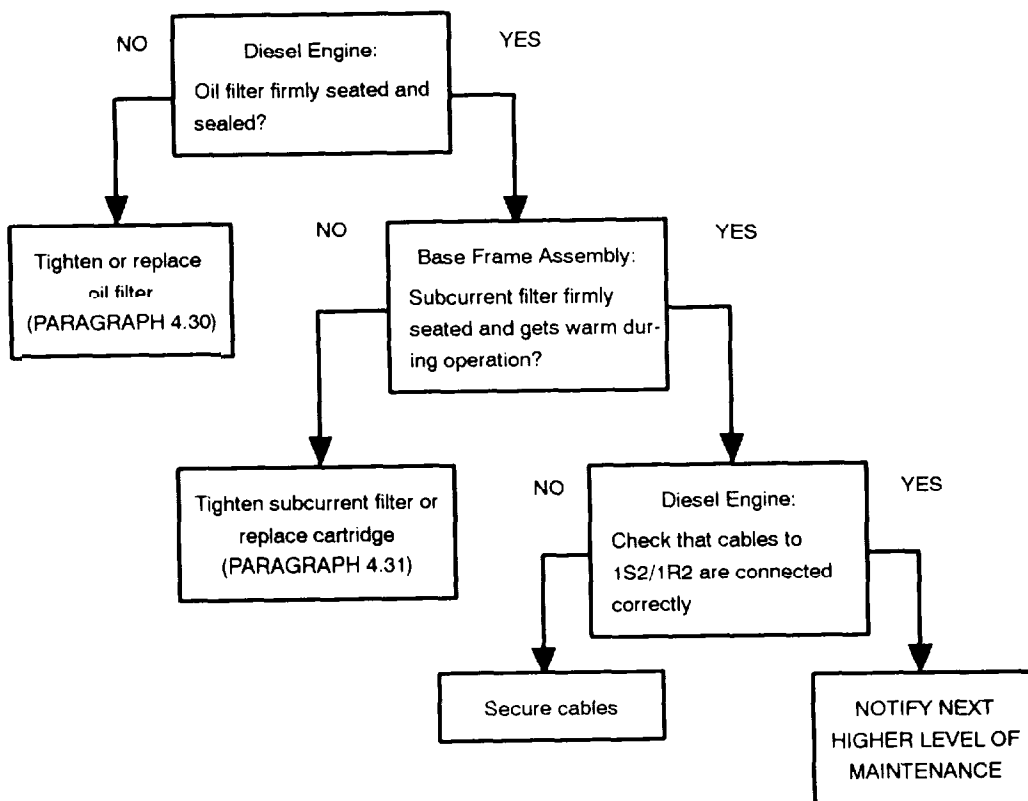


Figure 4-18 OIL PRESSURE lamp lights up during operation.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF UNIT HOOD ASSEMBLY, DIESEL ENGINE OR CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

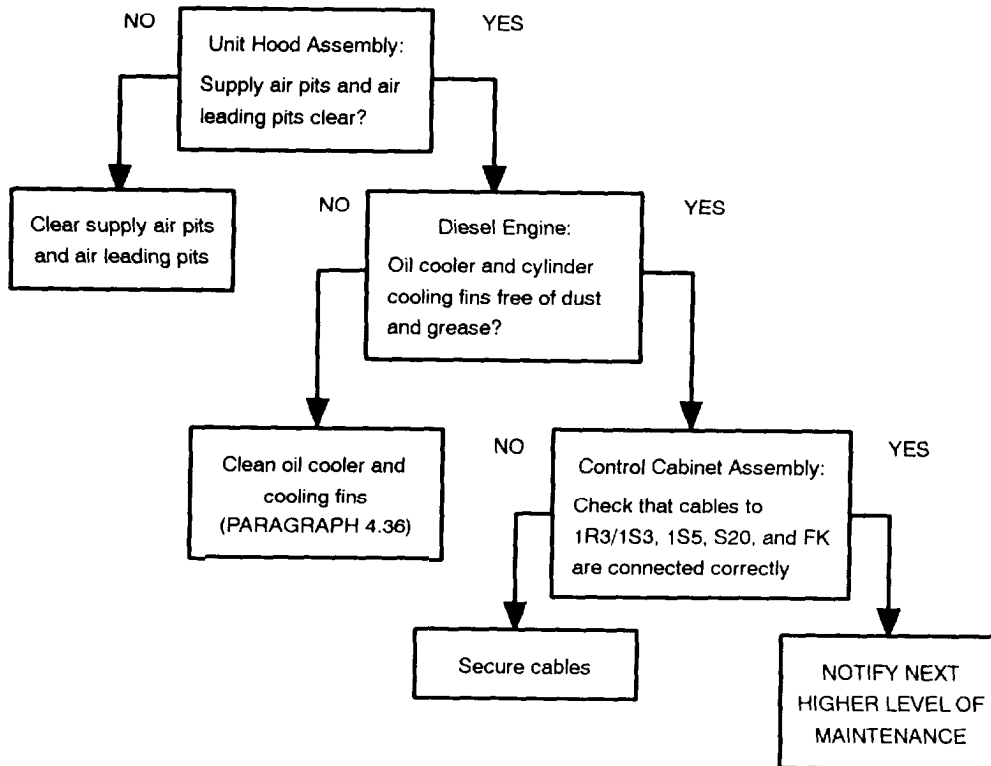


Figure 4-19 OIL TEMP-CYLINDER HEAD lamp lights up during operation.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF FUEL TANK ASSEMBLY, AIR FILTER ASSEMBLY OR CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

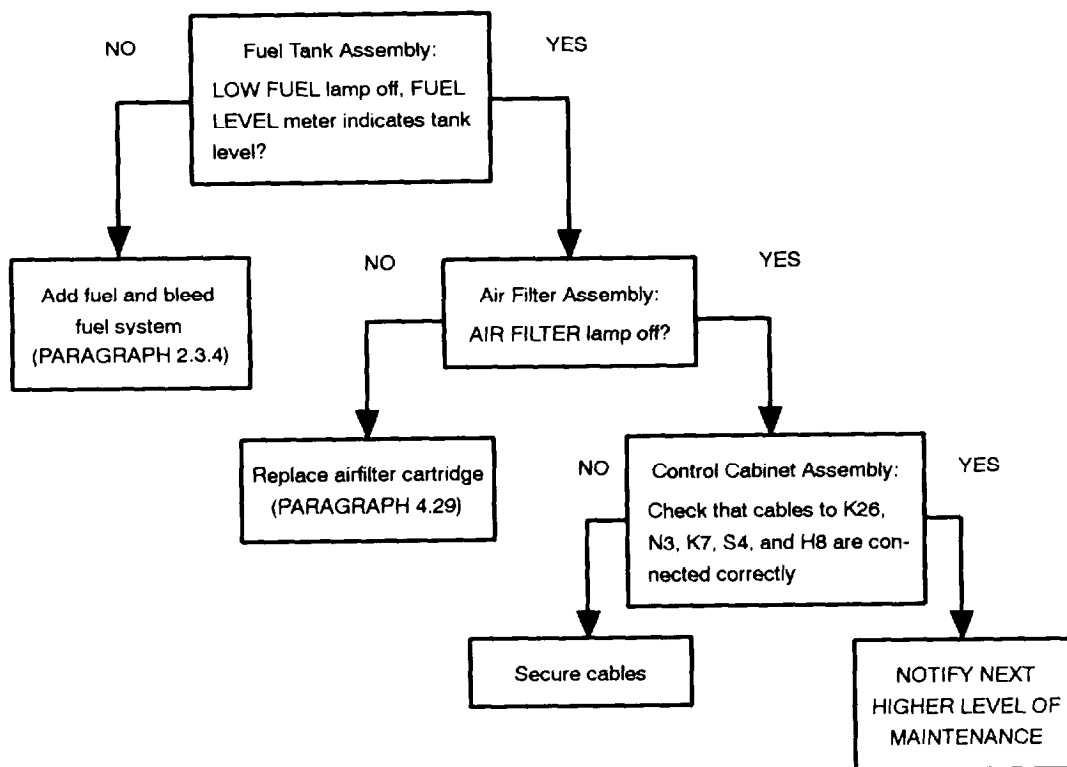


Figure 4-20 UNDER/OVER FREQUENCY lamp lights up during operation.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF FUEL TANK ASSEMBLY, AIR FILTER ASSEMBLY OR CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

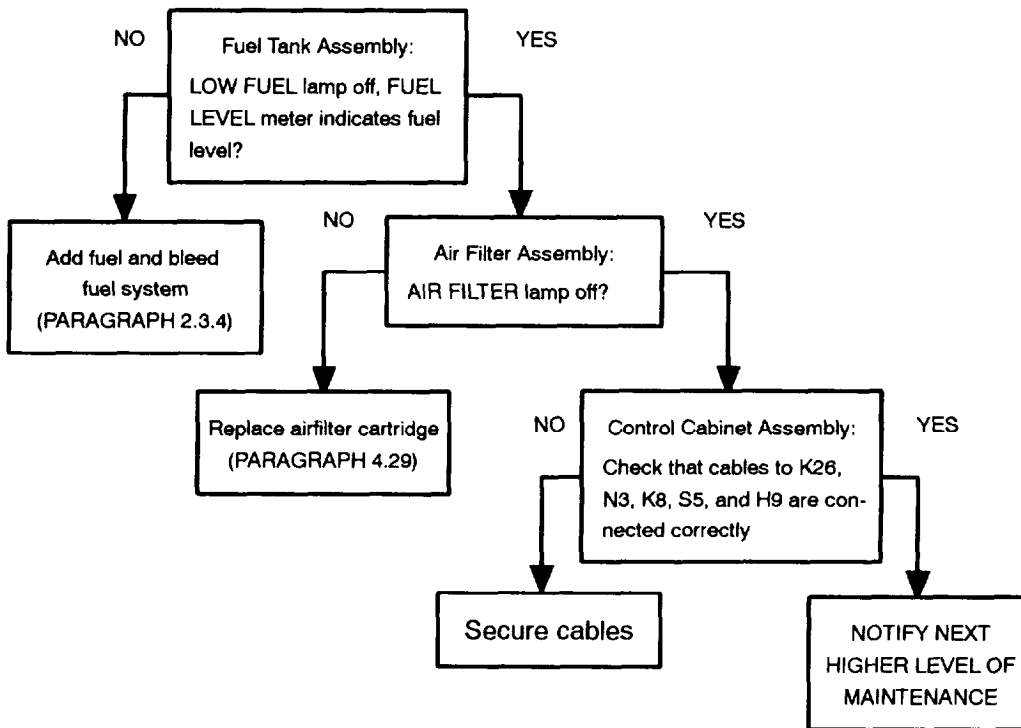


Figure 4-21 UNDER/OVER VOLTAGE lamp lights up during operation.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF SYNCHRONOUS GENERATOR OR CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

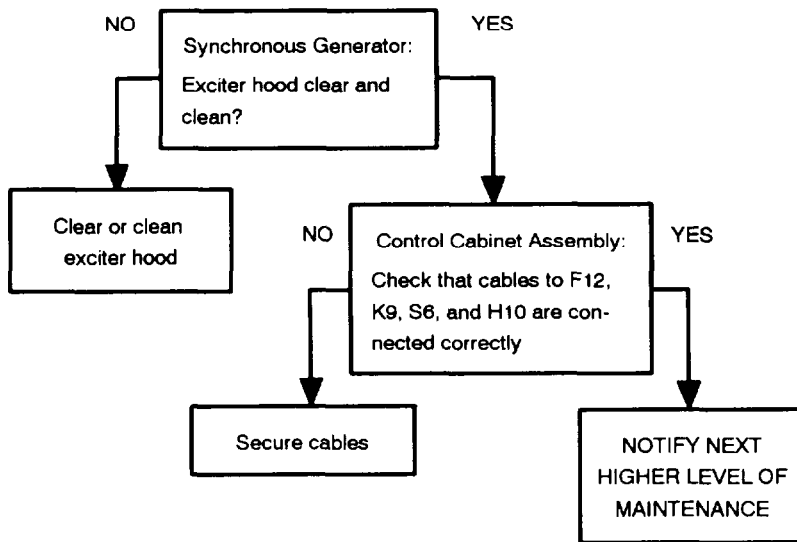


Figure 4-22 GENERATOR OVER TEMPERATURE lamp lights up during operation.

WARNING

SHUT DOWN GENERATOR SET 150 kW BEFORE PERFORMING TEST OR INSPECTION OF CONTROL CABINET ASSEMBLY. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

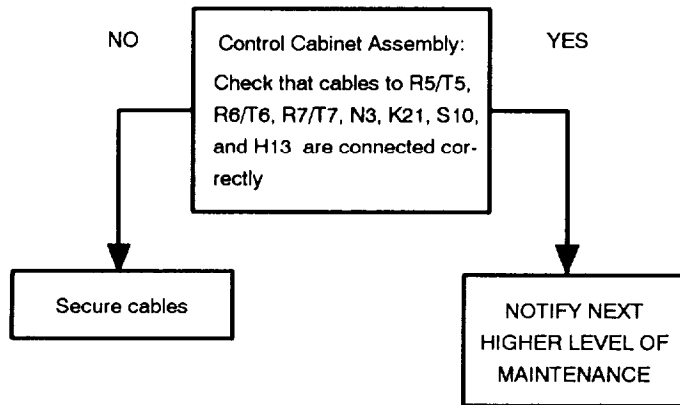


Figure 4-23 OVERLOAD lamp lights up during operation.

Section VI. RADIO INTERFERENCE SUPPRESSION

4.10 GENERAL METHODS USED TO ATTAIN PROPER SUPPRESSION.

Suppression is attained by providing a low resistance path to ground for stray currents. The methods used include shielding the ignition and high-frequency wires, grounding the frame with grounding straps, and using filtering systems.

4.11 INTERFERENCE SUPPRESSION COMPONENTS.

4.11.1 Primary Suppression Components.

Primary suppression components are those whose primary function is to suppress electromagnetic interference. The primary suppression components on this Generator Set 150 kW are:

- Rubber HF sealing on front panel doors of Control Cabinet Assembly,
- Rubber HF sealing on connection panel of Control Cabinet Assembly,
- Filter capacitors FK in Control Cabinet Assembly.

4.11.2 Secondary Suppression Components.

Secondary suppression components have electromagnetic interference suppression functions which are incidental or secondary to their primary function. The secondary suppression components for the Generator Set 150 kW are the unit hood assembly and the base frame assembly.

SECTION VII. MAINTENANCE PROCEDURES

4.12 GENERAL

The section will provide authorized unit level maintenance instructions for the Electrical Generator Assembly and its components. Each major component will be covered under its own paragraph heading. Each paragraph will be further divided into specific maintenance tasks, as directed by the Maintenance Allocation Chart (MAC). These tasks will include inspection, testing, service, adjustment, removal, disassembly, assembly, repair, replacement, and installation, as applicable. Step-by-step instructions and illustrations will guide personnel through each maintenance task.

WARNING

- Potential 150 kW/209 VAC shock hazard with failure to adhere to this warning. Contact with this high power could result in death or severe injury. If the removal of one generator from the EPP III is required, replace it with an extra generator if available. If the EPP III must be operated with only one generator installed, insure that all cables for the removed generator have the protective caps properly installed prior to starting the remaining generator set.
- Prior to energizing the equipment the operator must check for exposed electrical terminals.
- Always install protective covers on control and power cables when cables are not connected.
- Be sure to observe all warning signs on equipment.
- Potential 208 VAC shock hazard. Do not disconnect and connect control or power cables while Generator Set 1 or 2 is running.

WARNING

- When working around the engine, remove the ignition key; if necessary, also detach the negative terminal of the battery set.
- For safety reasons, work on the Generator Set 150 kW must always be performed by two persons.

NOTE

The following should generally be performed after any removal/
Installation operation, if applicable:

Functional test

Lamp test

Leak check

Bleeding

Oil pressure check

Oil level Check

Observe all regulations when disposing of oil filters, used oil, and
rags.

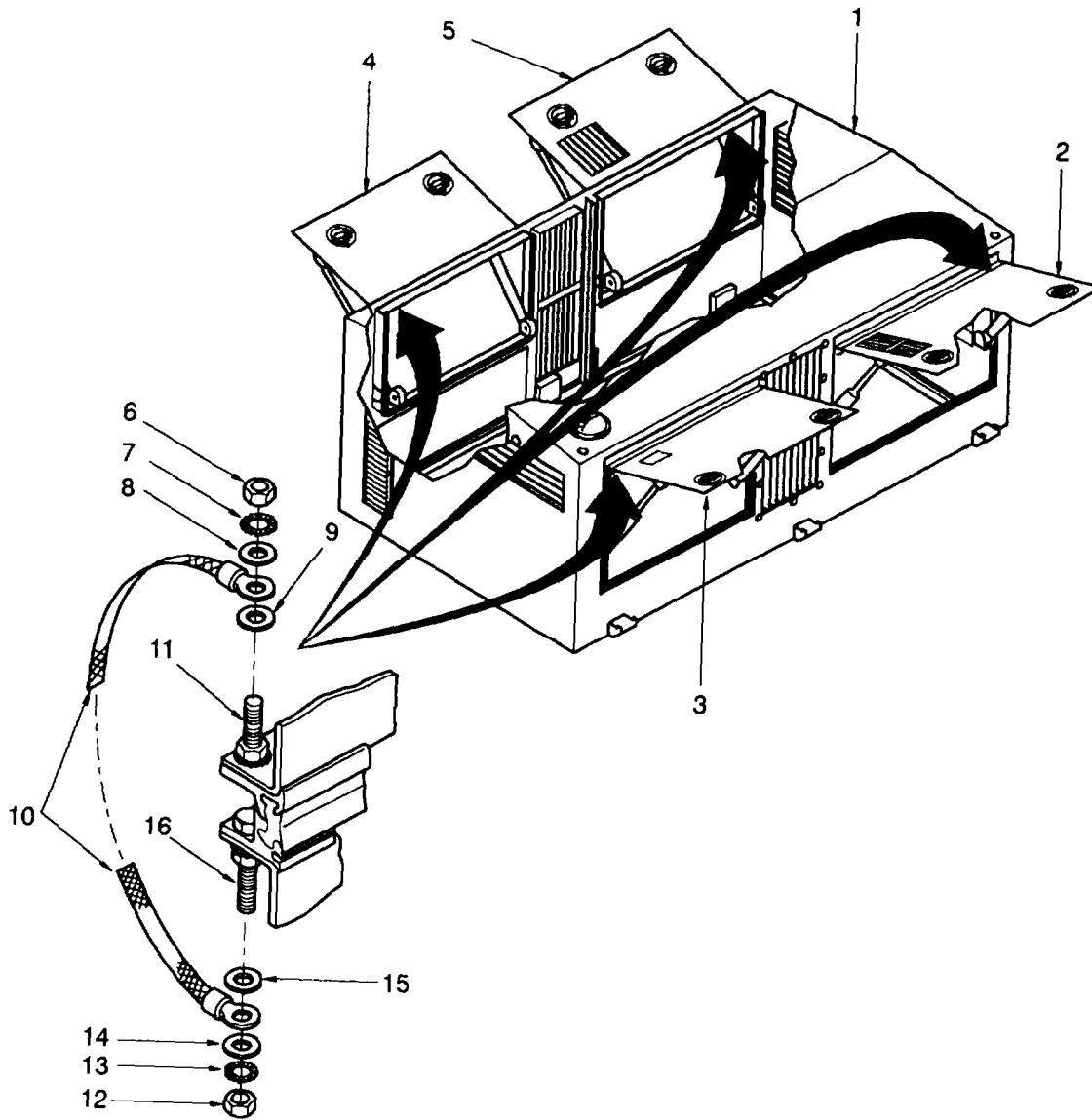


Figure 4-24 Unit Hood Flap Ground Strap Maintenance.

CAUTION

Assure ground strap is free and will not snag when removing hood.

9. Secure hoisting device to eye bolts (31 to 34), lift unit hood (1) off base frame assembly (12) and place on a flat surface.

INSTALLATION

WARNING

Note the sequence of attaching hardware for installation to ensure proper grounding. Failure to observe this warning could cause severe personal injury or death.

CAUTION

Ensure fuel hose is secure and properly stowed inside the hood prior to installation to prevent damage to the hose.

1. Align rubber sealing strip (20) in U-profile on bottom plate.
2. Coat rubber seal (21) on partition wall with assembly lubricant.
3. Insure rubber fuel fill hose (38) and two metal band hose clamps (37) have been installed on fuel tank inlet.
4. Attach hoisting device to eye bolts (31 to 34), lift up unit hood (1), and position above base frame assembly (12) so the U-profile on the inside of the unit hood is located above rubber seal (21) on partition wall.

NOTE

The rubber seal (21) and insulating mat on the partition wall must slide into the U-profile.

5. Lower unit hood (1) until it rests evenly on rubber sealing strip (20) in the U-profile on the base frame assembly (12), and on the partition wall rubber seal (21). Insure fuel filler neck slides down into rubber fill hose (38).
6. Detach hoisting device from eyebolts (31 to 34).
7. Swing up eye screws (14) with nuts (18), washers (16), and plates (15), and set plates (15) in retainers (13).
8. Tighten nuts (17) and secure with lock nuts (18).
9. Install grounding strap (8) on stud (11) with nut (6), serrated lock washer (7), and washers (9,10).
10. Place case for connection panel (30) with seal, in unit hood (1) and attach to unit hood with ten bolts (22), ten serrated lock washers (23), and ten washers (24).
11. Align attachment rail (28) and rubber cover (19) on unit hood (1) and secure with six bolts (25), six serrated lock washers (26), and six washers (27).
12. Open flap (36), tighten the two metal band hose clamps (37).

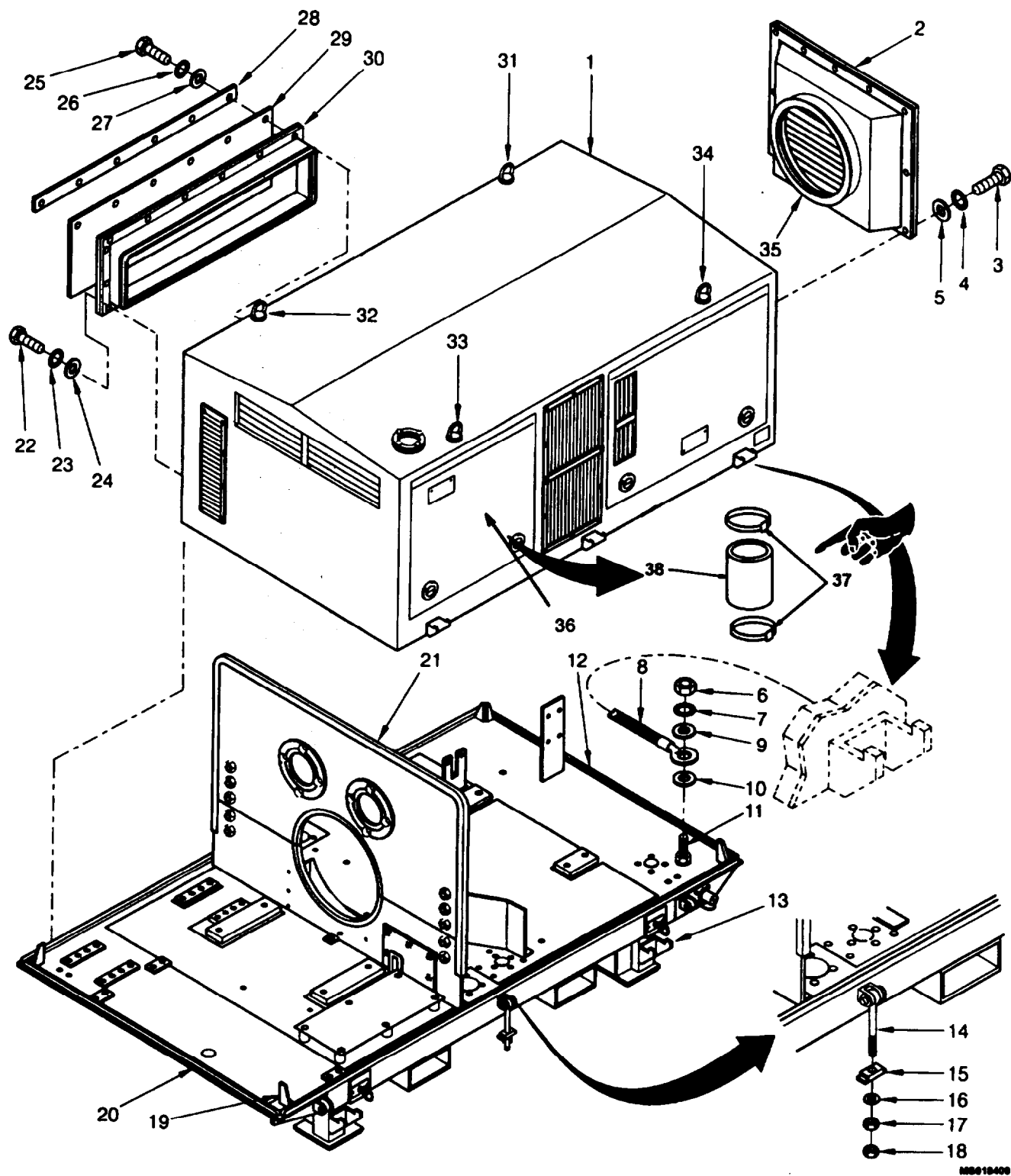


Figure 4-25. Unit Hood Assembly Maintenance.

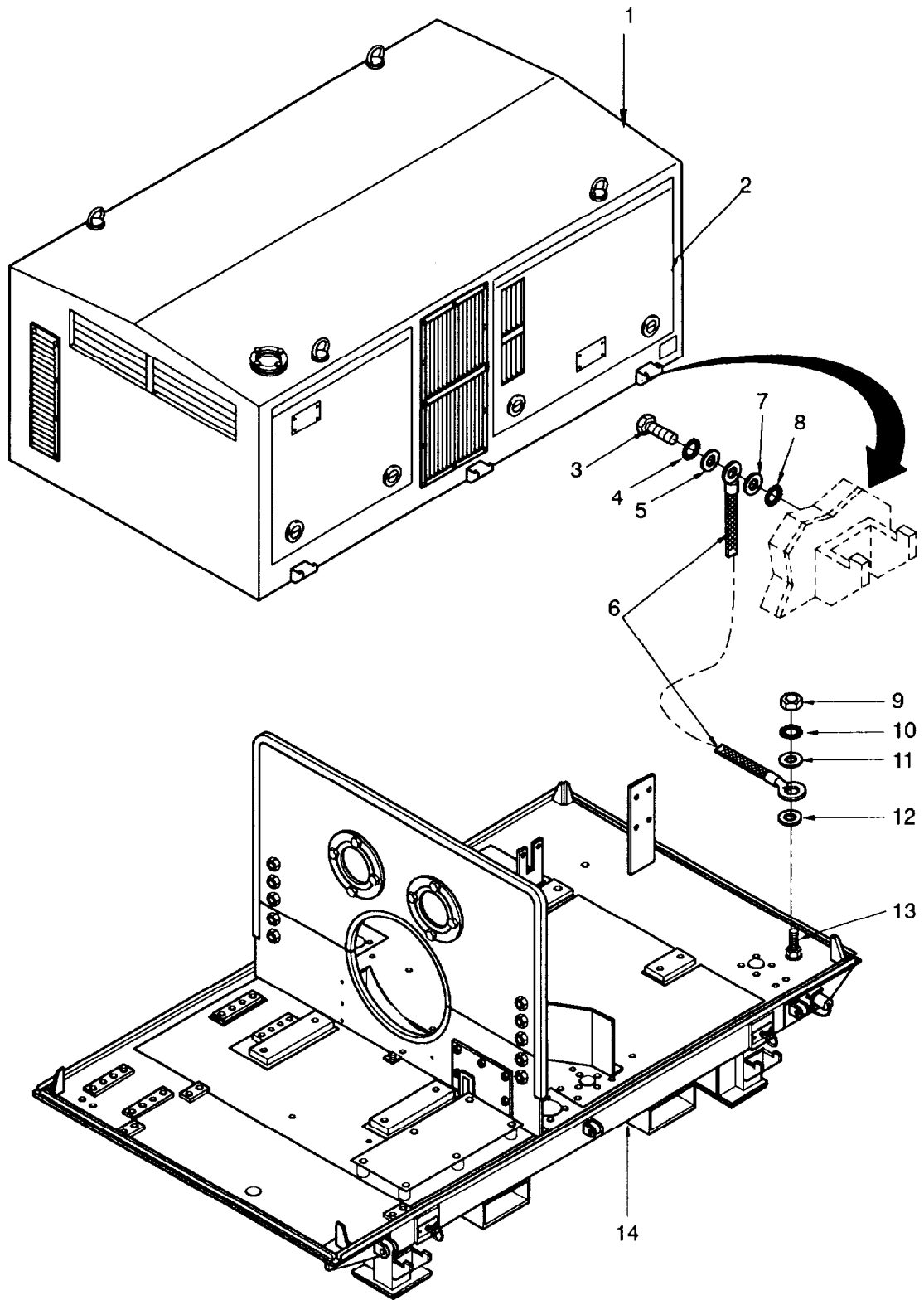


Figure 4-26 Unit Hood-Base Frame Ground Strap Maintenance.

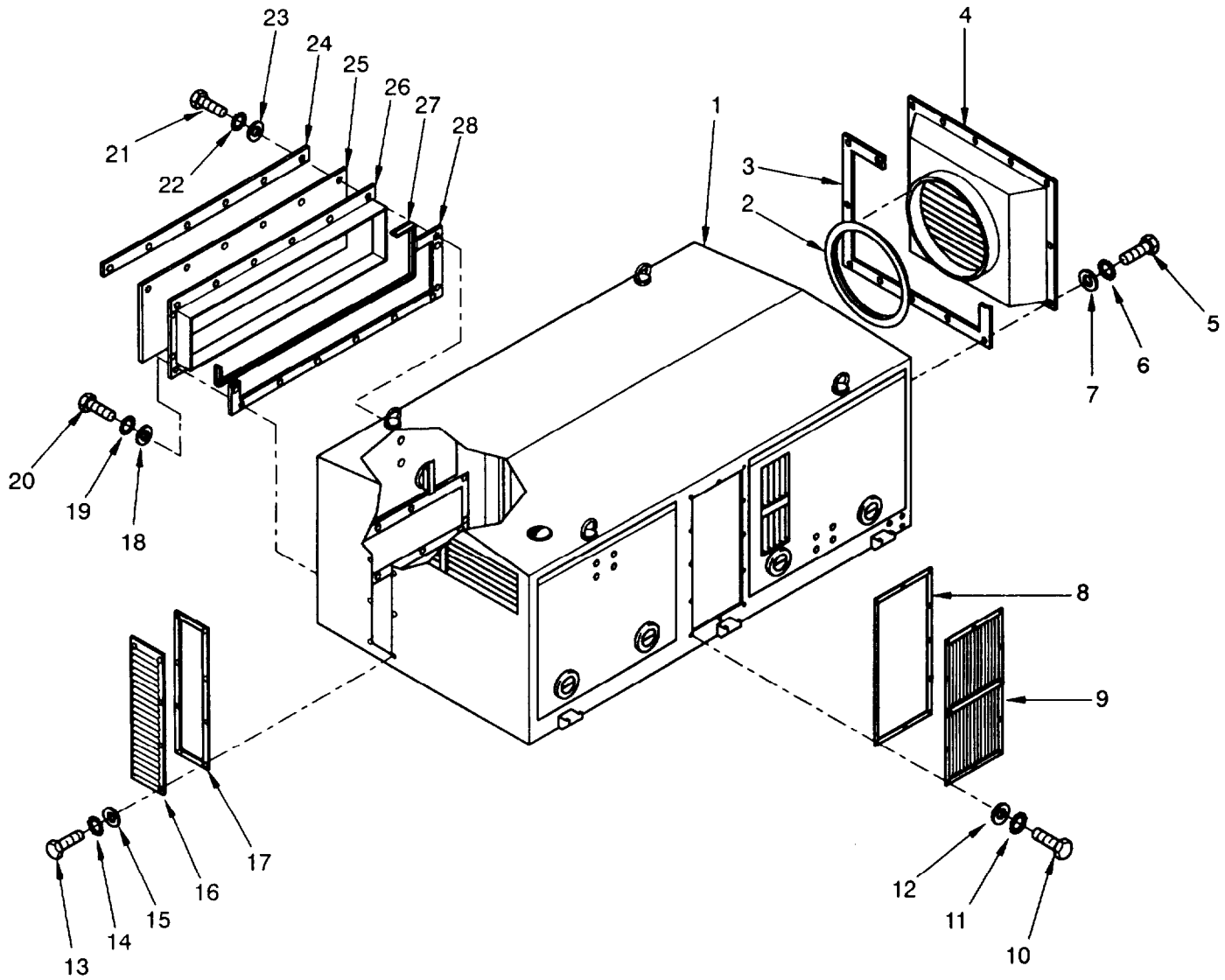


Figure 4-27 Unit Hood Assembly Air Ducts and Air Cooling Inlet Grate Maintenance.

4.22 FLAP MOUNT MAINTENANCE.

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)
Driver, Blind Rivet
(item 4, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down, paragraph 2.5.2

Materials/Parts

Rivets
Talc, technical grade (item 5, appendix E)

REMOVAL

1. Open flap (2, figure 4-28) and prop open.
2. Remove ground strap (refer to paragraph 4.13).
3. Drill out blind rivets (25) and remove flap (2) with hinge (22), rubber sealing strip (23), and hinge profile (24) from unit hood assembly (1).

REPAIR

1. Pull hinge (24) off rubber sealing strip (23).
2. Pull damaged rubber sealing strip (23) from hinge (22).
3. Cut identical length of rubber sealing strip (23) from rubber sealing strip stock (P/N 405K0099-00-00.2).
4. Coat rubber sealing strip (23) with talc and set into hinge (22).
5. Slide hinge (24) onto rubber sealing strip (23).

INSTALLATION

1. Install flap (2), with hinge profile (22), rubber sealing strip (23), and hinge (24), on unit hood assembly (1).
2. Install blind rivets (25) into hinge (24) and unit hood (1) using blind rivet driver.
3. Install ground strap (refer to paragraph 4.13).
4. Close flap (2).

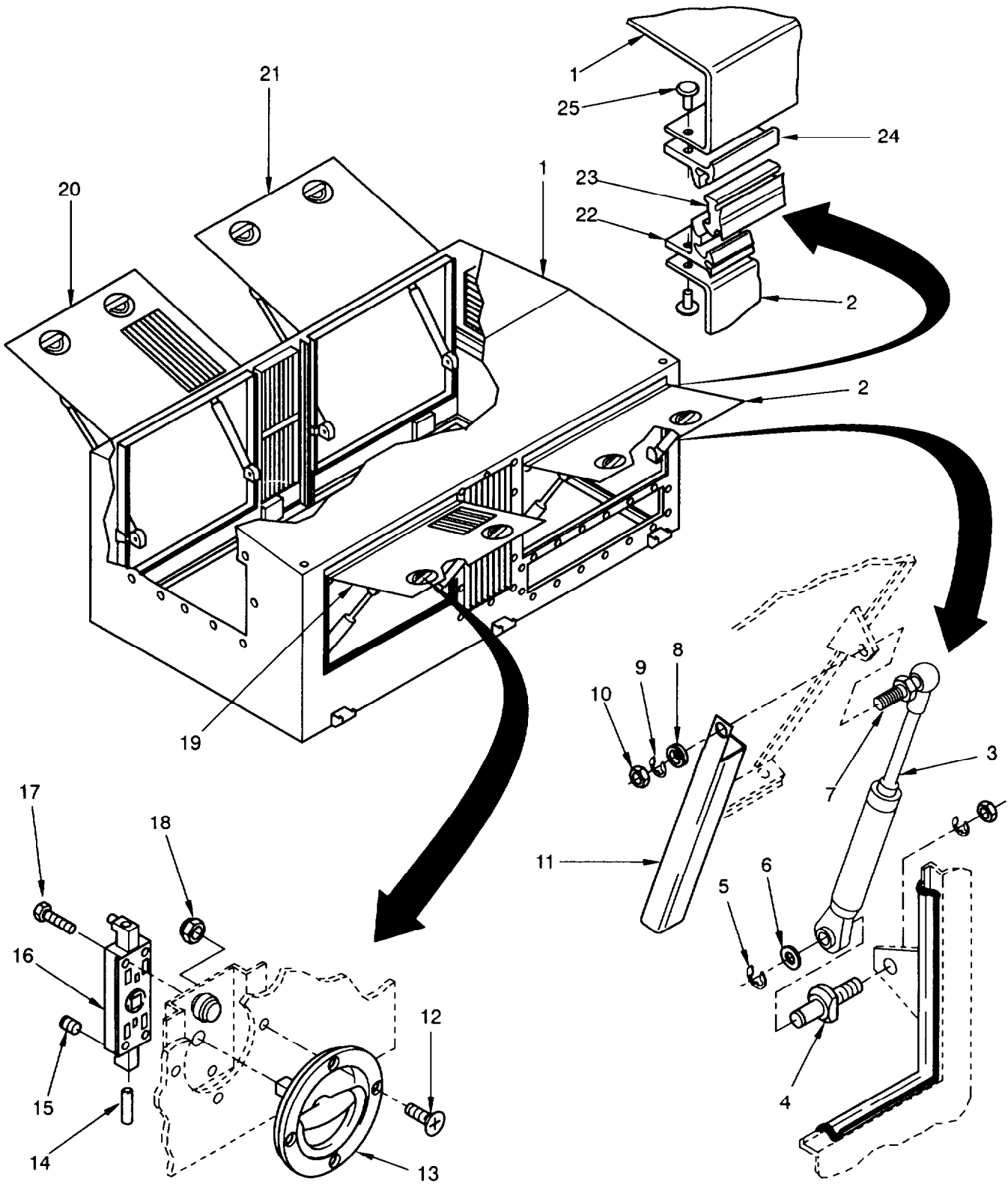


Figure 4-28 Unit Hood Flap Maintenance.

7. Unlock lamp cap (14) and housing (15) with sealing ring (16) from front of front panel by turning counterclockwise.
8. Pull lamp cap (14) and housing (15) with sealing ring (16) out of front of front panel (4) and remove base (18) from back of front panel (4).

NOTE

The diode holders next to light indicator assembly H2 to H4 (10 to 12) are to be removed separately.

9. To remove diode holders next to light indicator assembly H2 to H4 (12 to 10), perform steps 1 to 5.

INSTALLATION

CAUTION

Reinstall the same type of bulb holder that was removed.

NOTE

The procedure for removing light indicator assembly H103 (6), H102 (7), H17 (8), H15 (9), H4 (10), H3 (11), H2 (12) is the same as for light indicator assembly H1 (13), described below.

1. Install housing (15), sealing ring (16) and lamp cap (14) into front panel (4) from the front and hold base (18) against front panel (4) from the rear.
2. Push lamp cap (14), housing (15) and sealing ring (16) into base (18) and turn clockwise to secure to base (18).
3. Tighten screws (19) on base (18).
4. Clip bulb holder (21) with bulb (17) into base (18).
5. Connect cables to terminals (22, 23) of bulb holder (21), noting correct labeling and position.

NOTE

The diode holders next to light indicator assembly H2 to H4 (10 to 12) are to be installed separately.

6. To install diode holders next to light indicator assembly H2 to H4 (12 to 10), perform steps 1 to 5.
7. Stow prop (5) and close front panel (4).
8. Close flap (2).

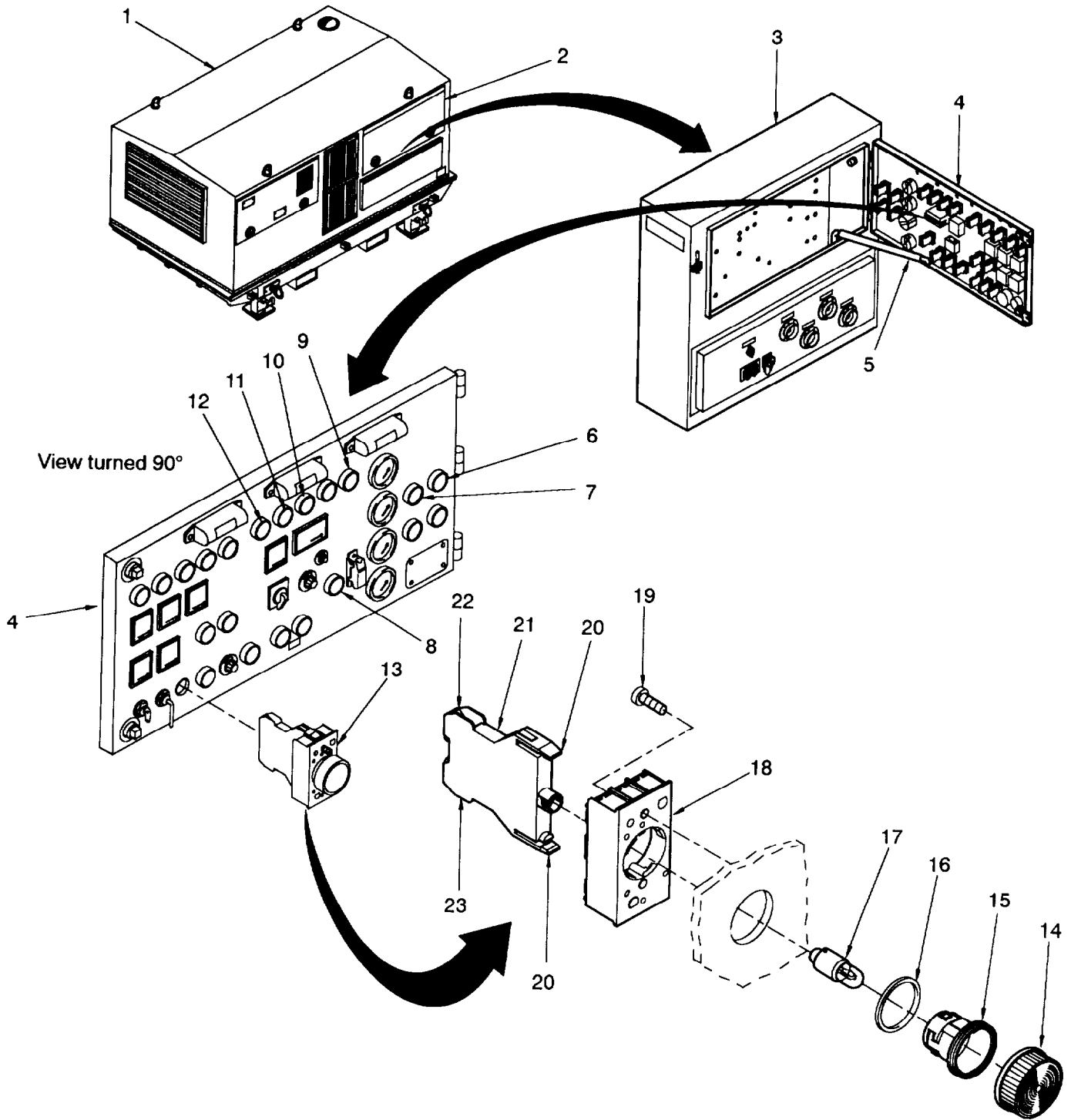


Figure 4-29 Control Cabinet Assembly, Light Indicator Assembly Maintenance.

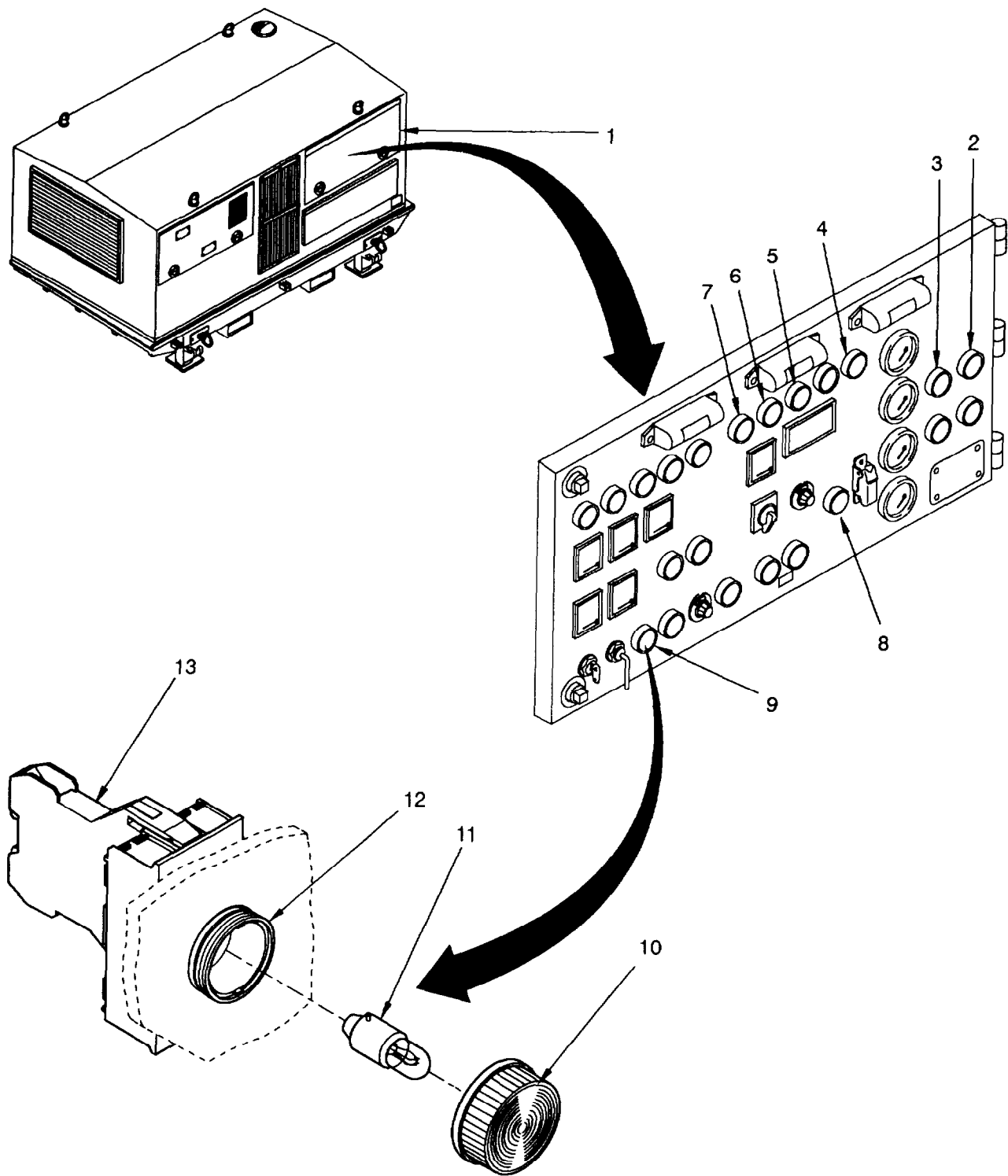


Figure 4-30 Bulb in Indicator Lamps Maintenance.

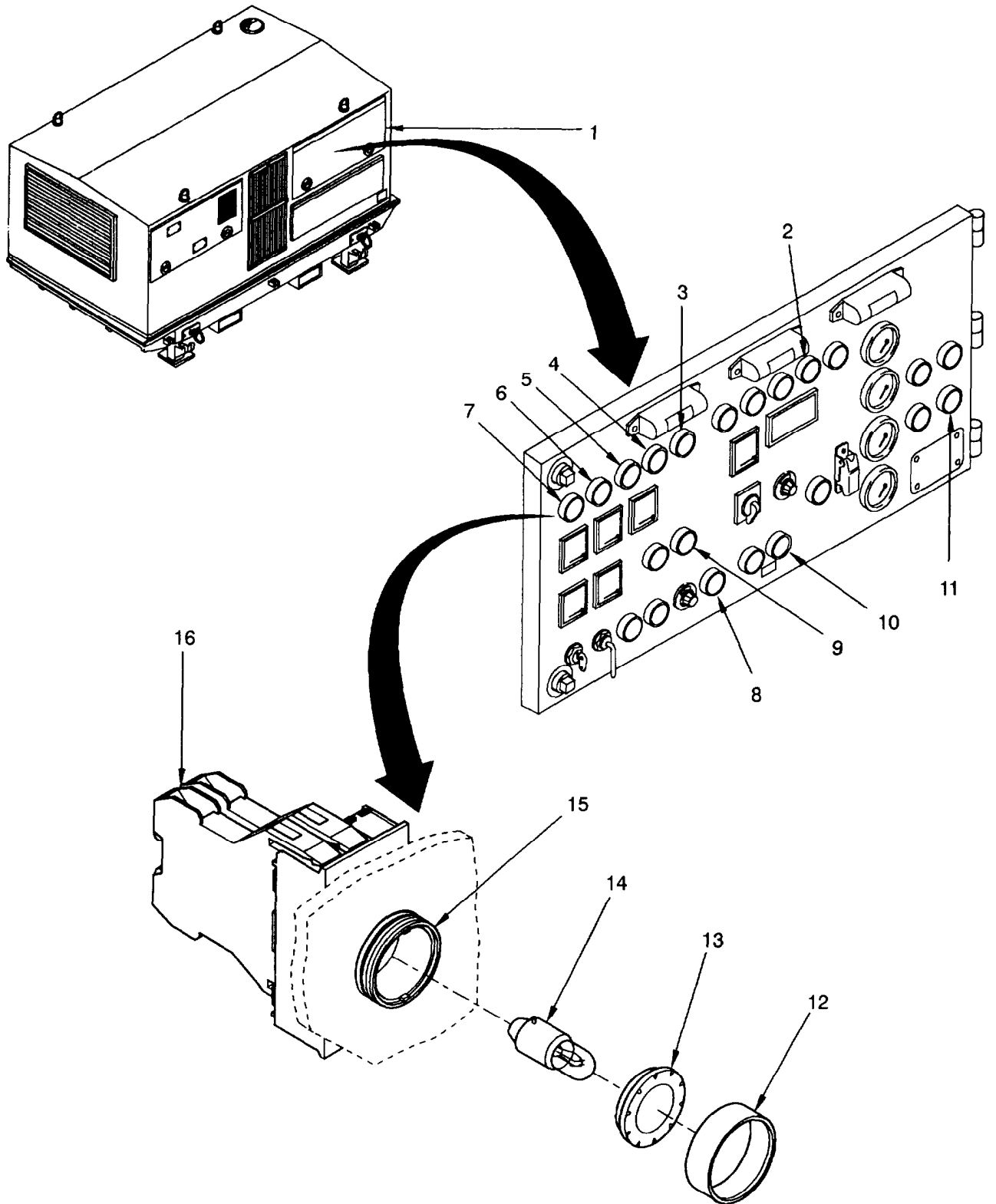


Figure 4-31 Bulb in Illuminated Switch Maintenance.

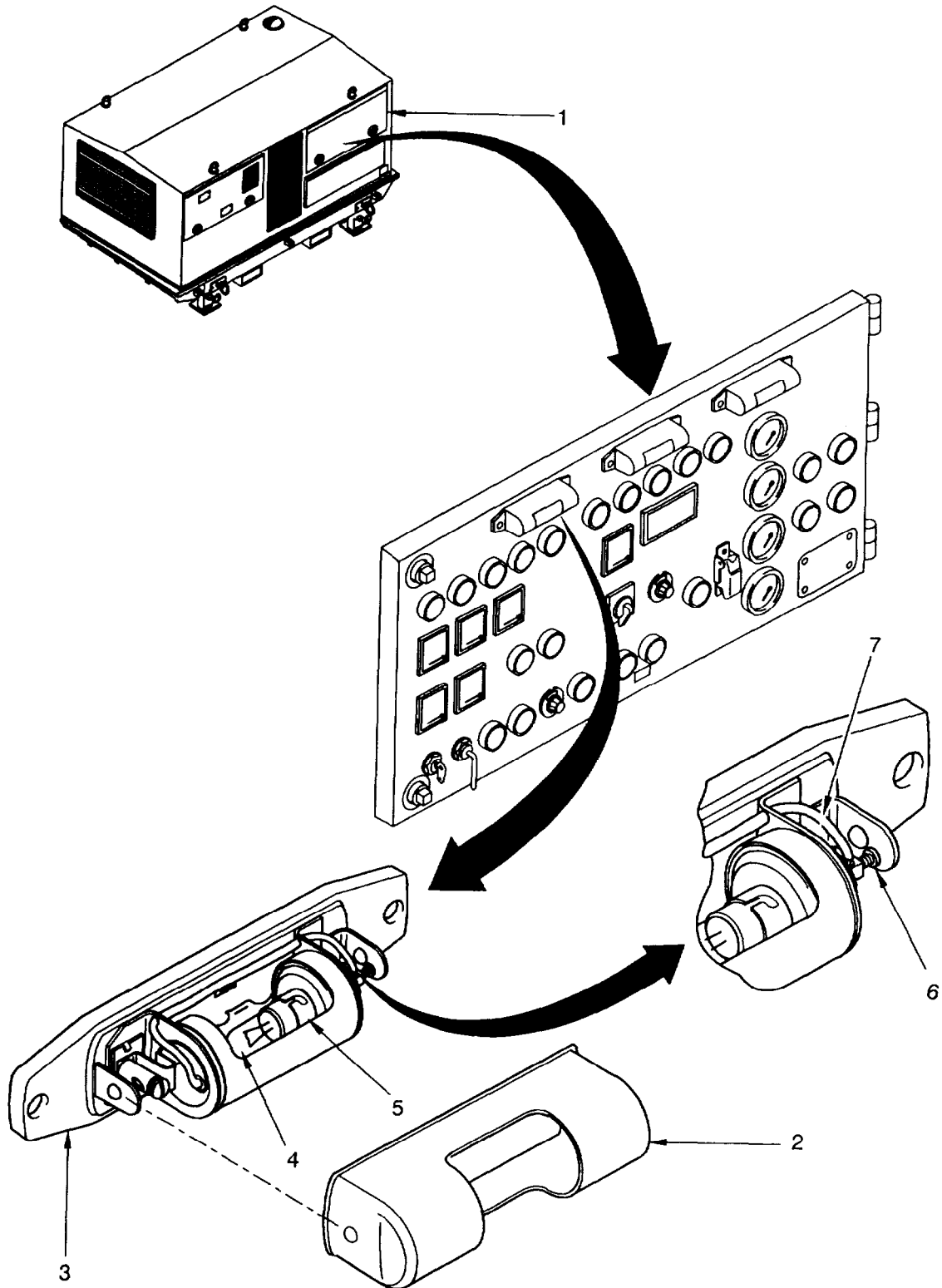


Figure 4-32 Panel Light H6 Maintenance.

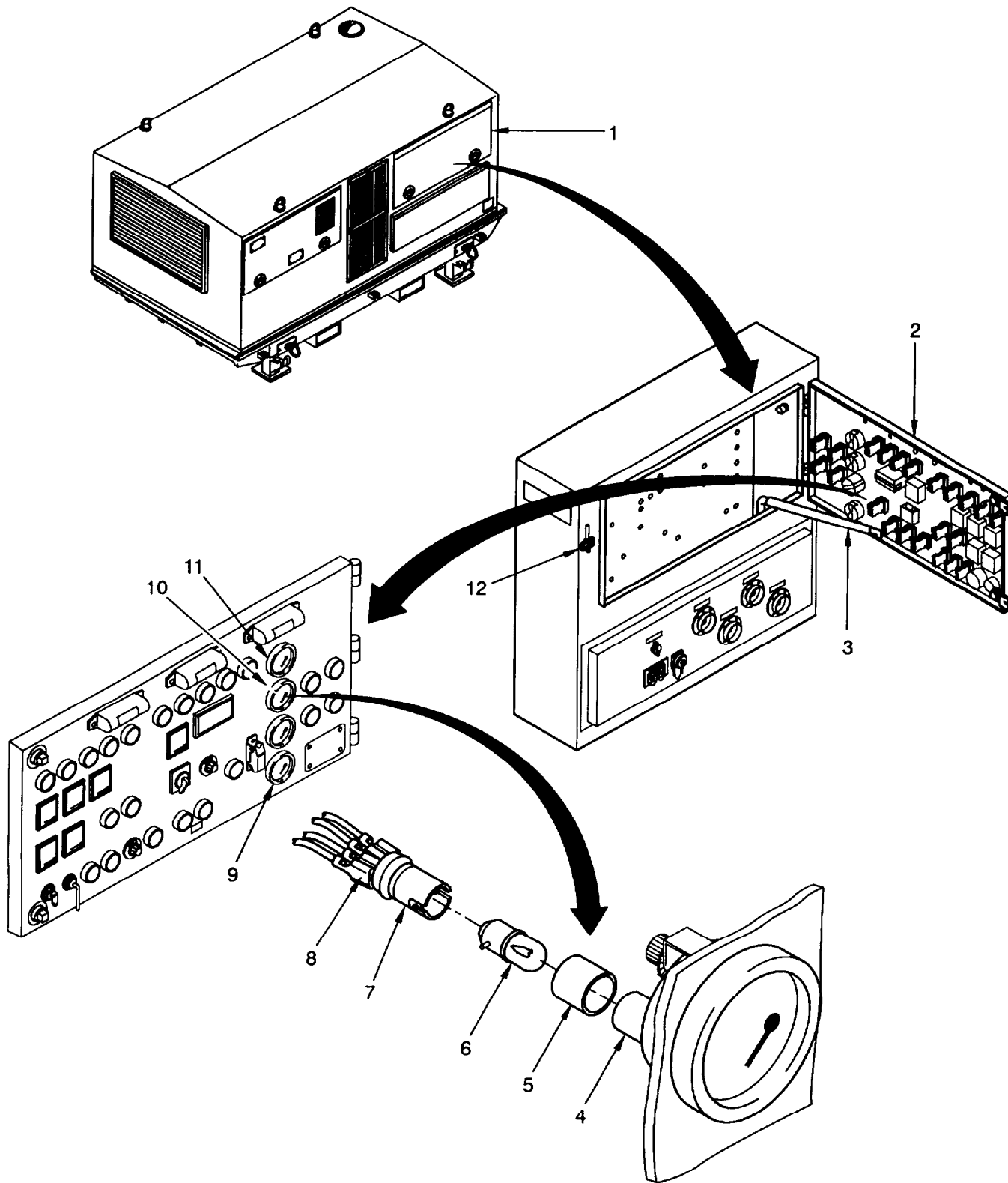


Figure 4-33 Illuminated Meter Maintenance.

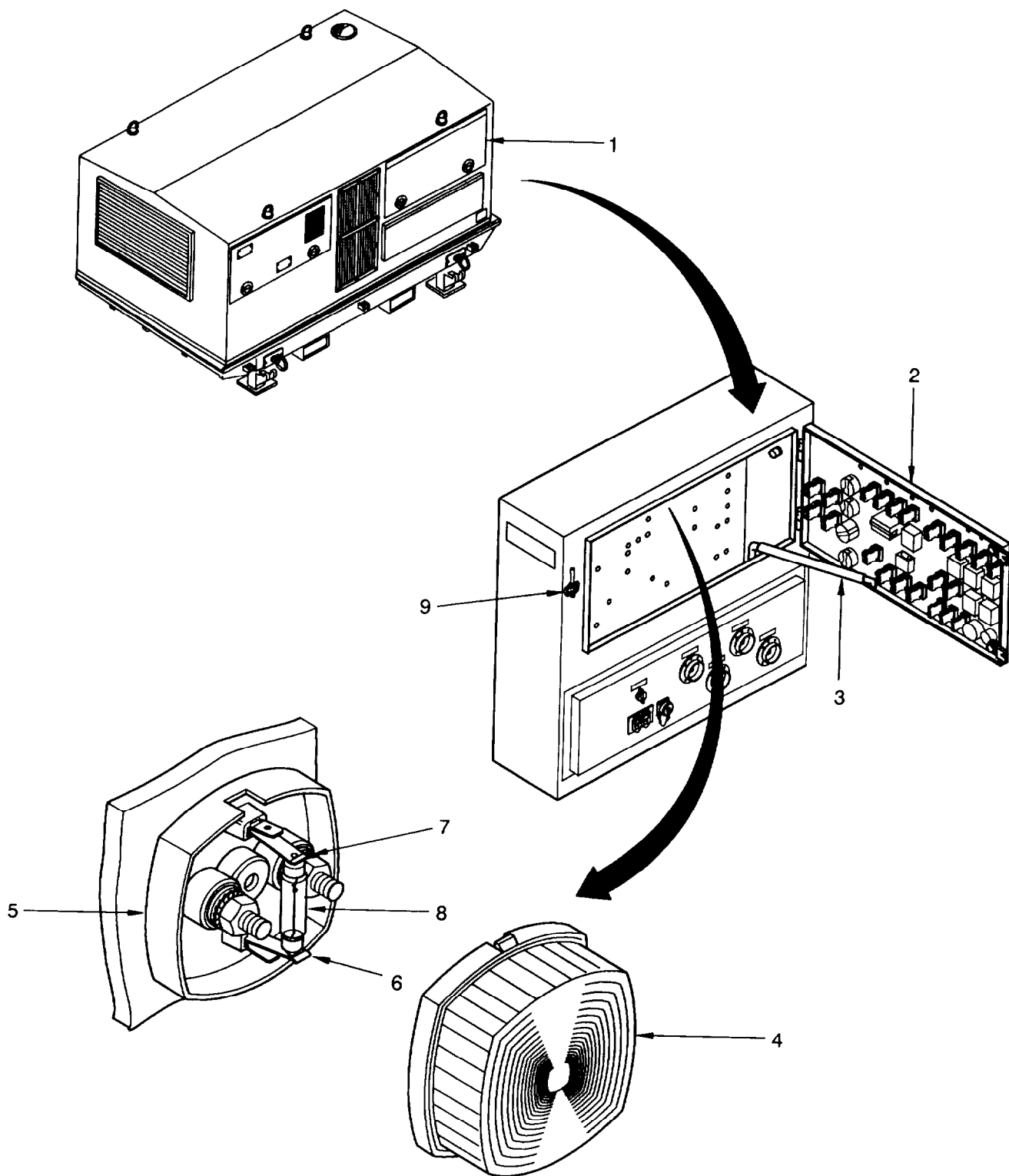


Figure 4-34 Cabinet Light Maintenance.

4.29 AIR FILTER CARTRIDGE MAINTENANCE.

This task covers: a. Removal b. Service c. Installation

INITIAL SETUPTools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down, paragraph 2.5.2

Materials/Parts

Lubricant (item 6, appendix E)
Light-duty detergent, commercial
(item 7, appendix E)

REMOVAL

1. Open flap (2, figure 4-35) on unit hood assembly (1).
2. Swing clamping clip (6) on air filter housing in direction of arrow, and remove dust collector (4) with cover from air filter housing (9) of air filter assembly (3).
3. Remove self-locking nut (5) from threaded rod (7) and pull air filter cartridge (6) out of air filter housing (9).

SERVICE***NOTE***

Do not damage the end of the air filter cartridge when cleaning it.

1. To dislodge dust, hold air filter cartridge (6) vertically and tap the end several times against your hand or a flat, soft surface.
2. Clean air filter cartridge (6) by swishing back and forth in lukewarm water with a commercial light-duty detergent; rinse in clean water, shake out excess water, and allow to dry thoroughly.
3. Clean air filter dust collector (refer to paragraph 3.4).

INSTALLATION

NOTE

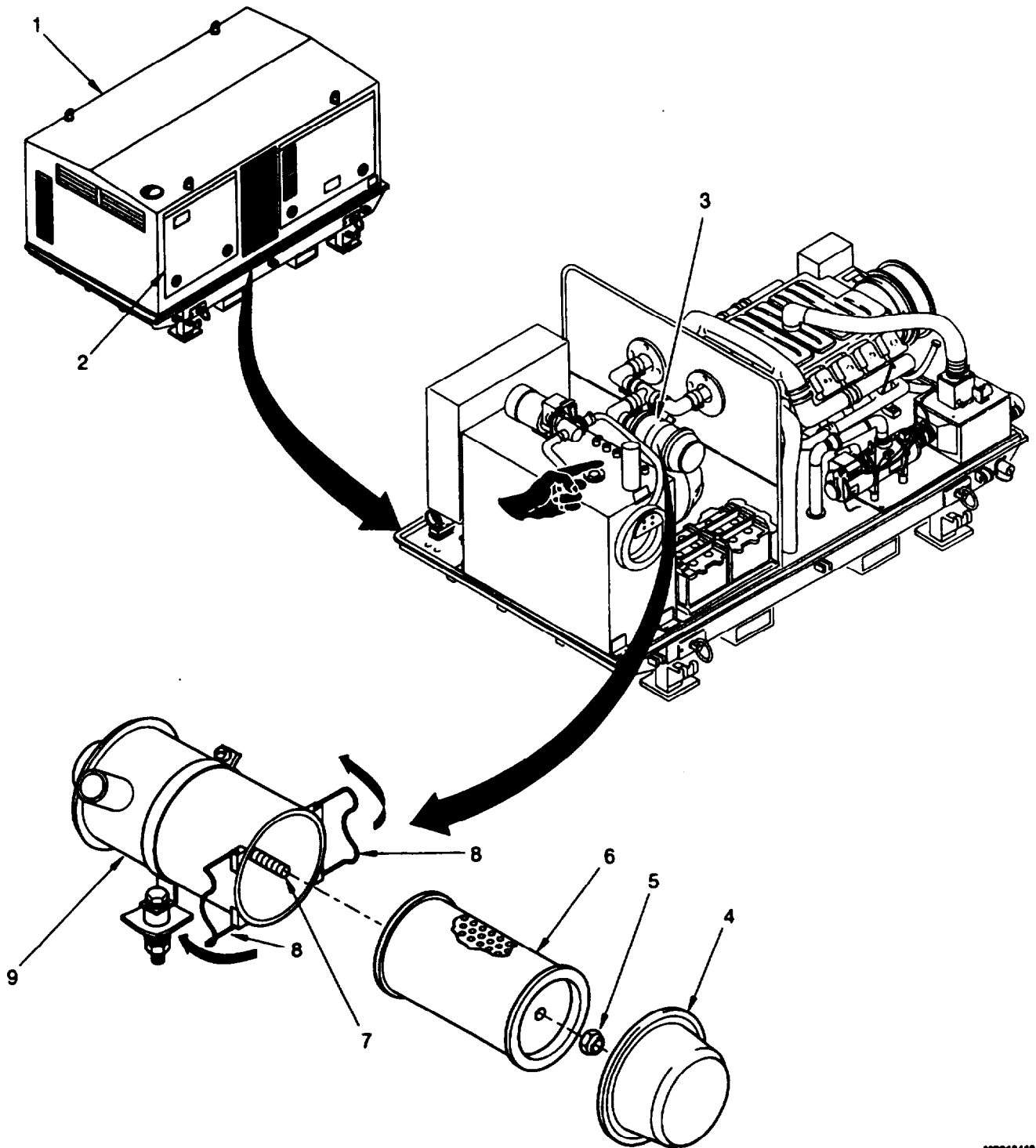
- Before installing the clean air filter cartridge, shine a flashlight through it to check for damage.
- if the air filter cartridge is damaged, replace it with a new one.
- Use a new self-locking nut.

1. install air filter cartridge (6) in air filter housing (9) of air filter assembly (3) and screw self-locking nut (5) onto threaded rod (7).

CAUTION

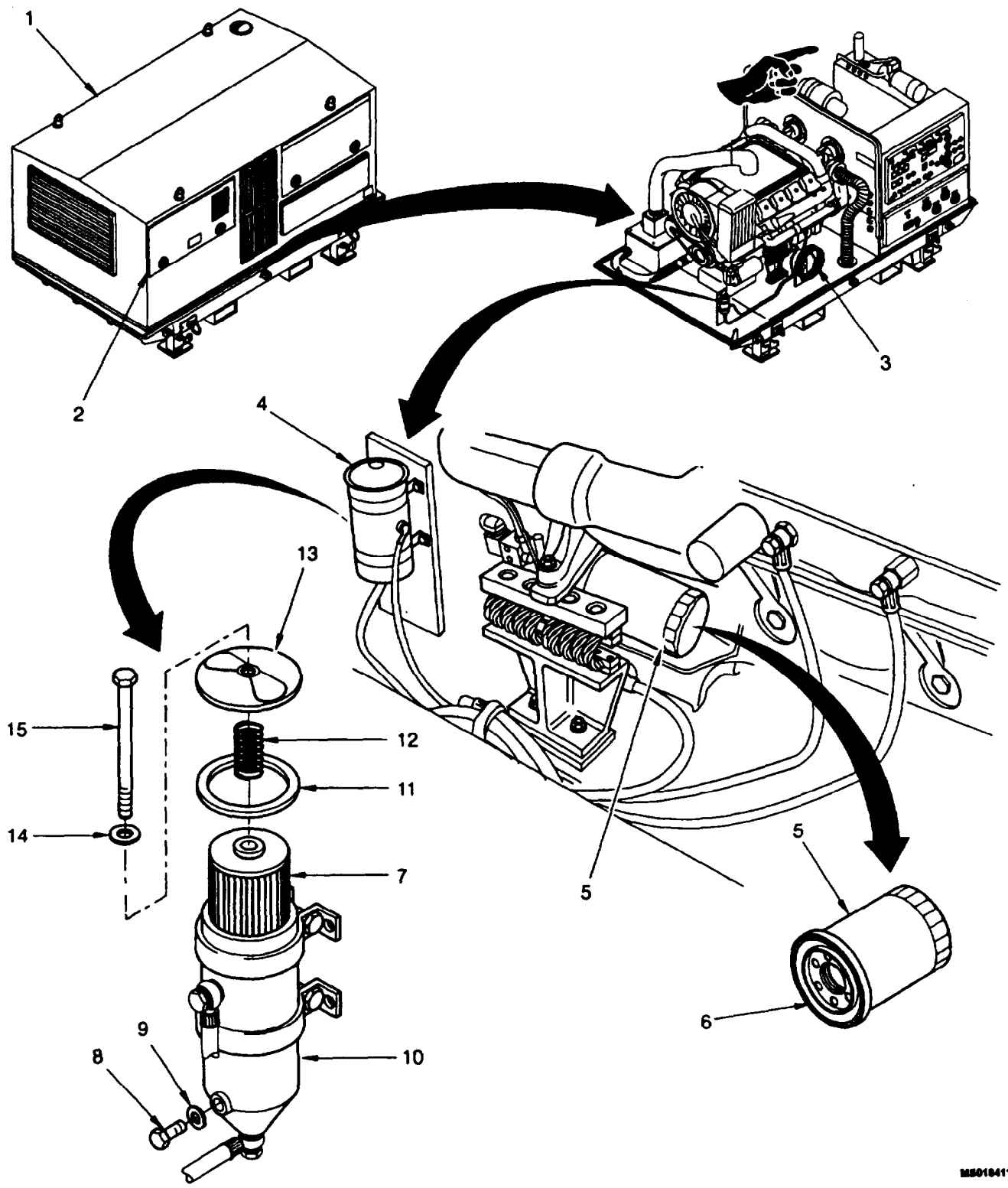
Note “OBEN ↑ TOP” mark on cover (4) to prevent damage to equipment.

2. Install dust collector with cover (4) on air filter housing (9) so that “OBEN ↑ TOP” marking faces upward.
3. Swing clamping clip (8) into place.
4. Close flap (2).



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Figure 4-35. Air Filter Cartridge Maintenance.



MB016411

Figure 4-36. Oil Filter, Subcurrent Filter Maintenance.

4.32 FUEL PREFILTER CARTRIDGE MAINTENANCE.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Condition

Reference
Generator Set 150 kW shut
down, paragraph 2.5.2

Materials/Parts

Sealing rings
Filter insert
Lubricating grease
(item 9, appendix E)

REMOVAL

WARNING

The fuel in this generator set 150 kW is highly explosive. Do not smoke or use open flame when performing maintenance. Fire and explosion could occur, resulting in severe personal injury or death.

1. Open flap (1, figure 4-37).

CAUTION

Place a drain pan under the fuel prefilter set to collect fuel.

2. Remove drain plug (11) from filter cup (9) and sealing ring (10) and discard sealing ring(10).
3. Remove bleed screw (5), sealing ring (4) and allow all fuel to flow out of filter cup (9). Discard sealing ring(4).
4. Remove screw (3) and washer (3) from top (6) of fuel prefilter.

NOTE

Hold cup (9) tightly.

5. Remove filter cup (9), sealing ring (7) and filter insert (8).
6. Empty remaining fuel from filter cup (9) into drain pan.
7. Pull filter insert (8) out of filter cup (9) and discard filter insert (8).

INSTALLATION

1. Place new sealing ring (10) on drain plug (11) and screw drain plug (11) into filter cup (9)
2. Install new filter insert (8) into filter cup (9).

CAUTION

To prevent leaks, apply a thin coating of lubricating grease to the top of sealing ring (7), insert into top (6) of fuel filter, and push firmly in.

3. Align filter cup (9) containing filter insert (8) and new sealing ring (7) below top (6) and secure with screw (2) and washer (3).

NOTE

Bleed screw (5) must not be tightened prior to bleeding fuel prefilter.

4. Install bleed screw (5) and new sealing ring (4).
5. Bleed fuel prefilter (see paragraph 4.38).
6. Close flap (1).

7. Remove screw (28), washer (27) from top (17) of two step fuel filter.
8. Remove filter cup (24), sealing ring (26) and filter insert (25). Discard sealing ring (26) and filter insert (25).
9. Empty remaining fuel from filter cup(24) into drain pan.

INSTALLATION

NOTE

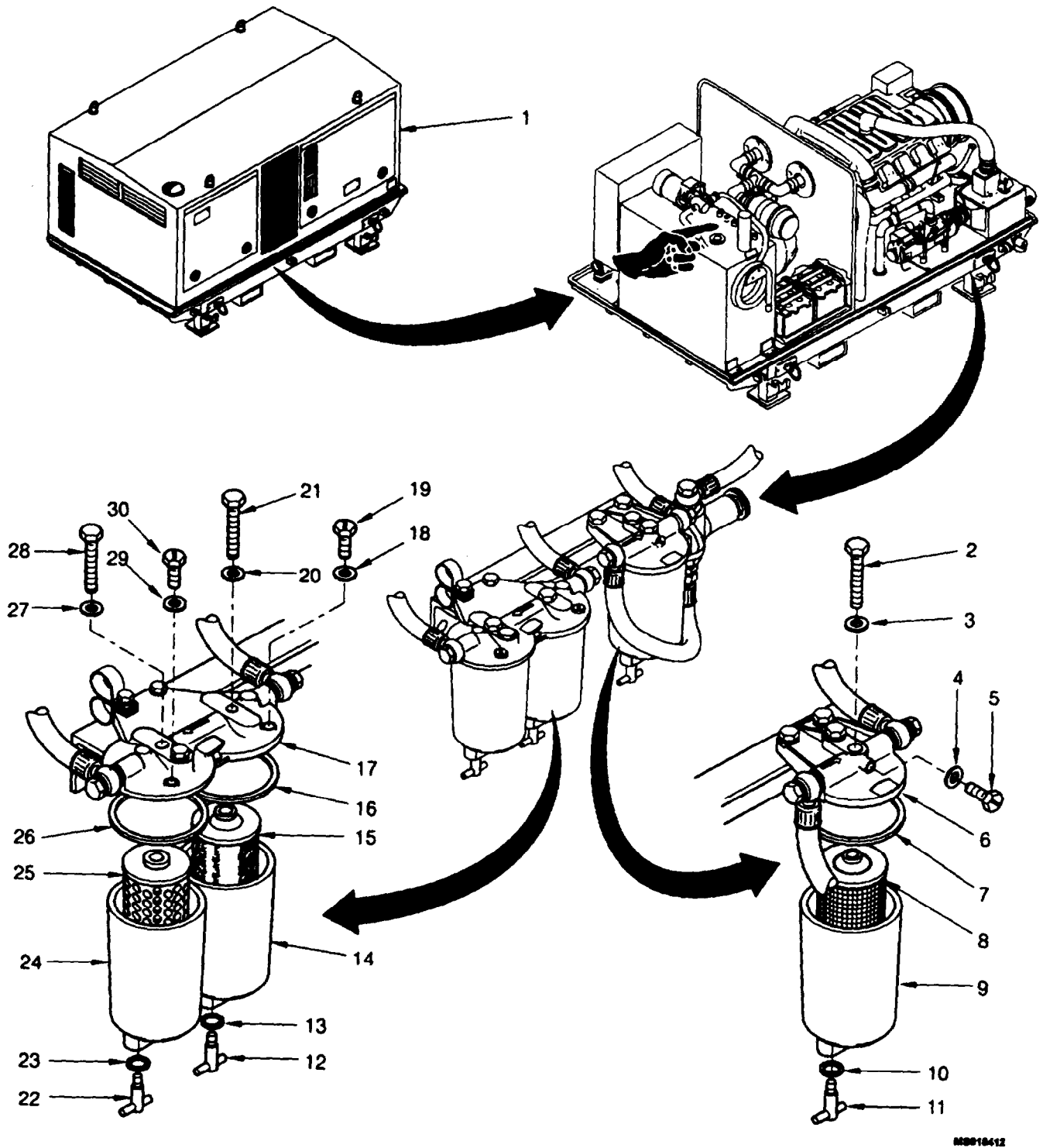
Item (15) Is felt filter element and Item (25) Is paper filter element.

1. Place new sealing ring (23) on drain plug (22) and install drain plug (22) in filter cup (24).
2. Place filter insert (25) into filter cup (24).

NOTE

Bleed screws (19) and (30) should not be tightened prior to bleeding two step fuel filter.

3. To prevent leaks, apply a thin coating of lubricating grease to the tops of new sealing rings (16, 26), insert into top (17) of two step fuel filter, and push firmly in.
4. Fill filter cup (24) with fuel to within 1 inch (2.5 cm) of rim.
5. Align filter cup (24) with filter insert (25) directly below top (17) and secure with screw (28) and washer (27).
6. Install bleed screw (30) and new sealing ring (29).
7. Place new sealing ring (13) on drain plug (12) and install filter cup (14).
8. Insert filter insert (15) into filter cup (14).
9. Fill filter cup (14) with fuel to within 1 inch (2.5 cm) of rim.
10. Align filter cup (14) with filter insert (15) directly below top (17) and secure with screw (21) and washer (20).
11. Install bleed screw (19) and new sealing ring (18).
12. Bleed two step fuel filter set (see paragraph 4.39).
13. Close flap (1).



MSB10412

Figure 4-37 Fuel Prefilter Cartridge, Two Step Fuel Filter Cartridges Maintenance.

4.34 BATTERY CHARGING ALTERNATOR V BELT

This task covers: a. Service

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down, paragraph 2.5.2

SERVICE

1. Open flaps (1, 2 figure 4-38).
2. Loosen screw (3) on clamping bracket (4) of battery charging alternator (9).
3. Loosen screw (5) on clamping bracket (4).
4. Loosen screw (8) on battery charging alternator bracket.

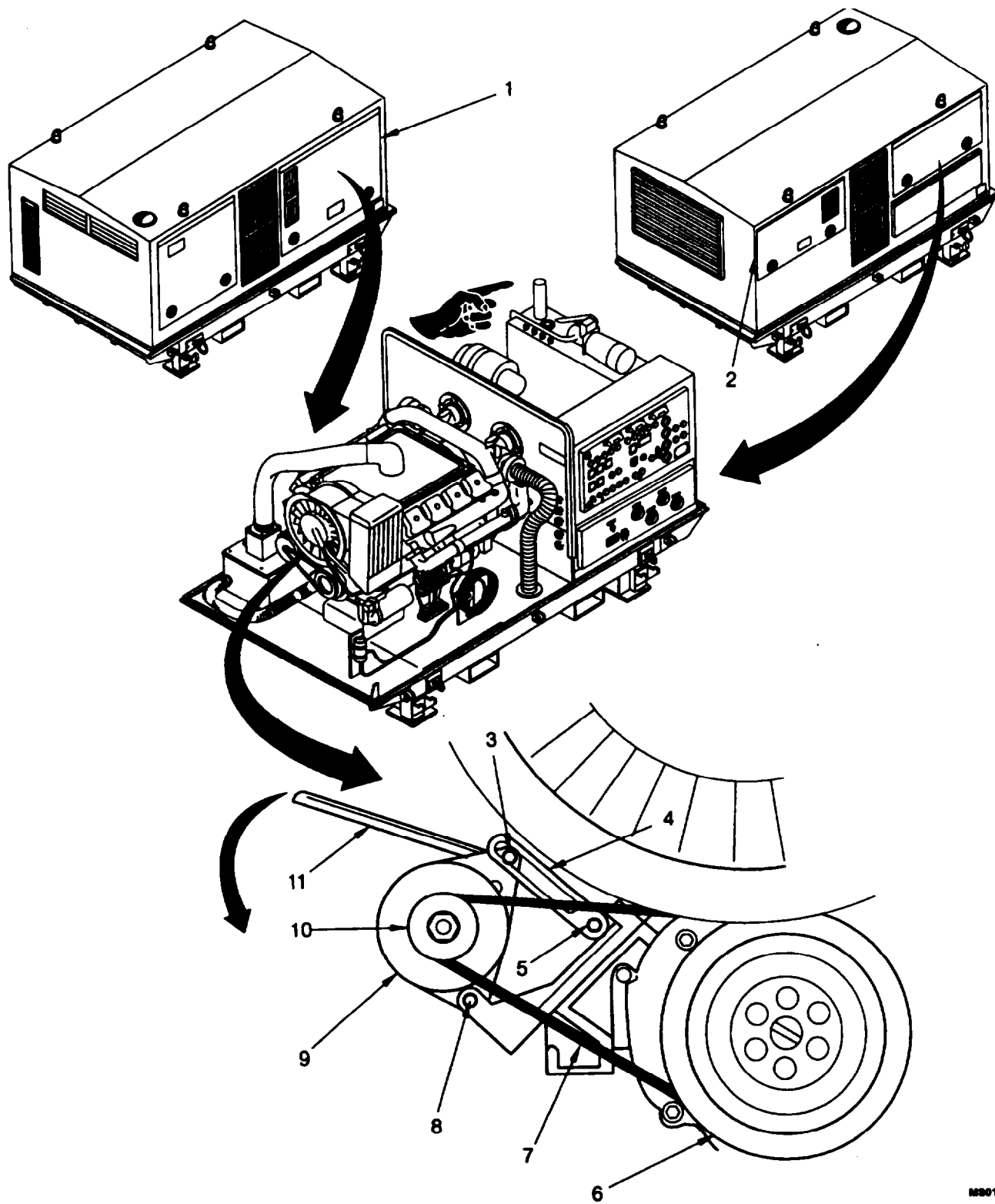
CAUTION

- **When using a suitable tensioning device be careful not to bend the oil line located between the engine block and battery charging alternator.**
 - **At correct tension, belt should deflect no more than 0.6 inches (15 mm) when pressed with the thumb at a point between the pulleys.**
5. Insert a suitable tensioning device as lever (11) between battery charging alternator (9) and engine block.
 6. Use lever (11) to push battery charging alternator (9) in the direction of the arrow.
 7. When V belt tension is correct, tighten screw (3) on clamping bracket (4).
 8. Tighten screw (5) on clamping bracket (4).
 9. Tighten screw (8) on battery charging alternator bracket.
 10. Close flaps (1, 2).

NOTE

Bleed screws (19) and (30) should not be tightened prior to bleeding two step fuel filter.

1. Install V belts (7) on battery charging alternator pulley (10) and engine pulley (6).
2. Tension V belts (7) (paragraph 4.34).
3. Install air leading duct (paragraph 4.17), if removed.
4. Close flaps (1, 2).



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Figure 4-38. Battery Charging Alternator of V Belt Maintenance.

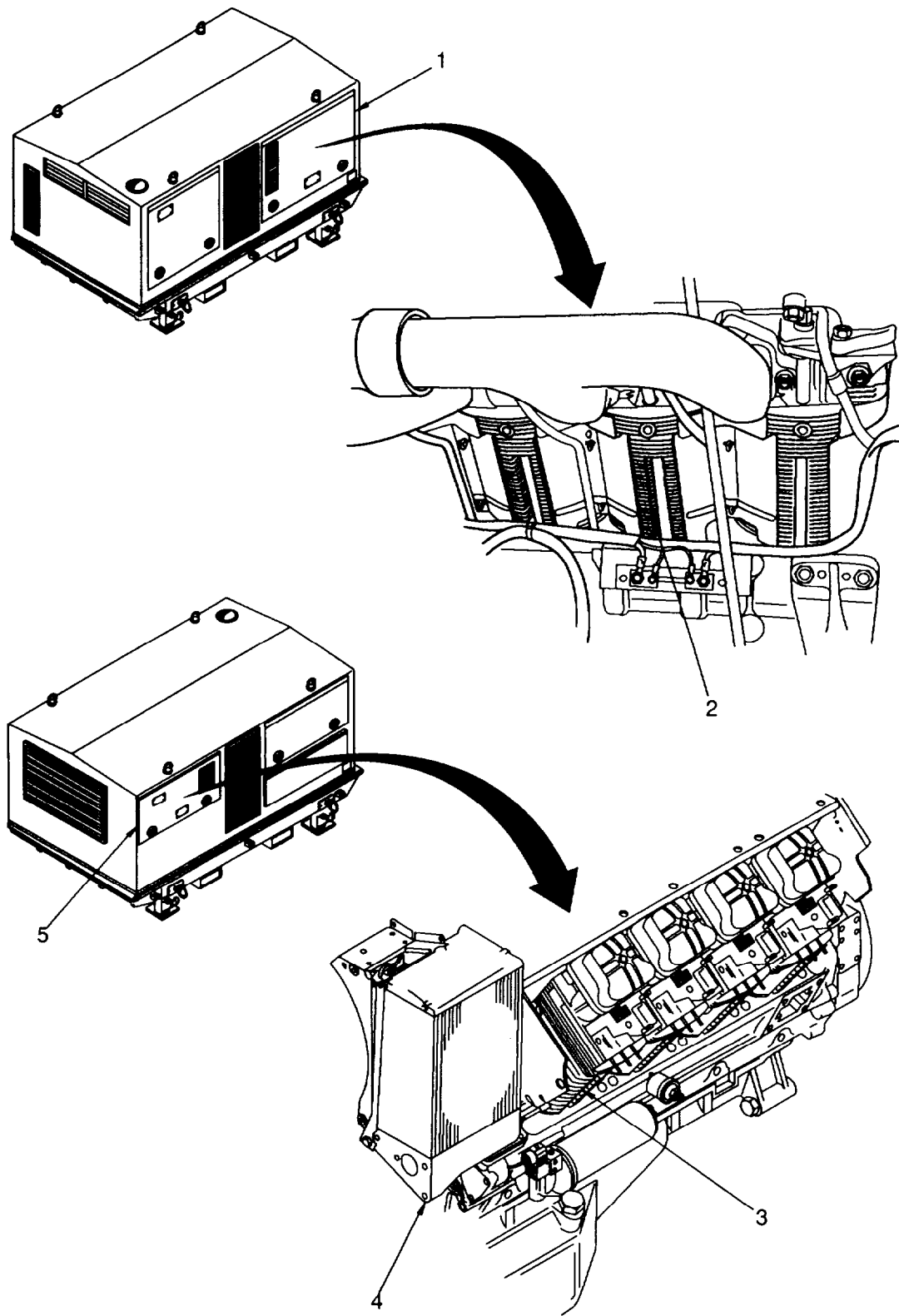
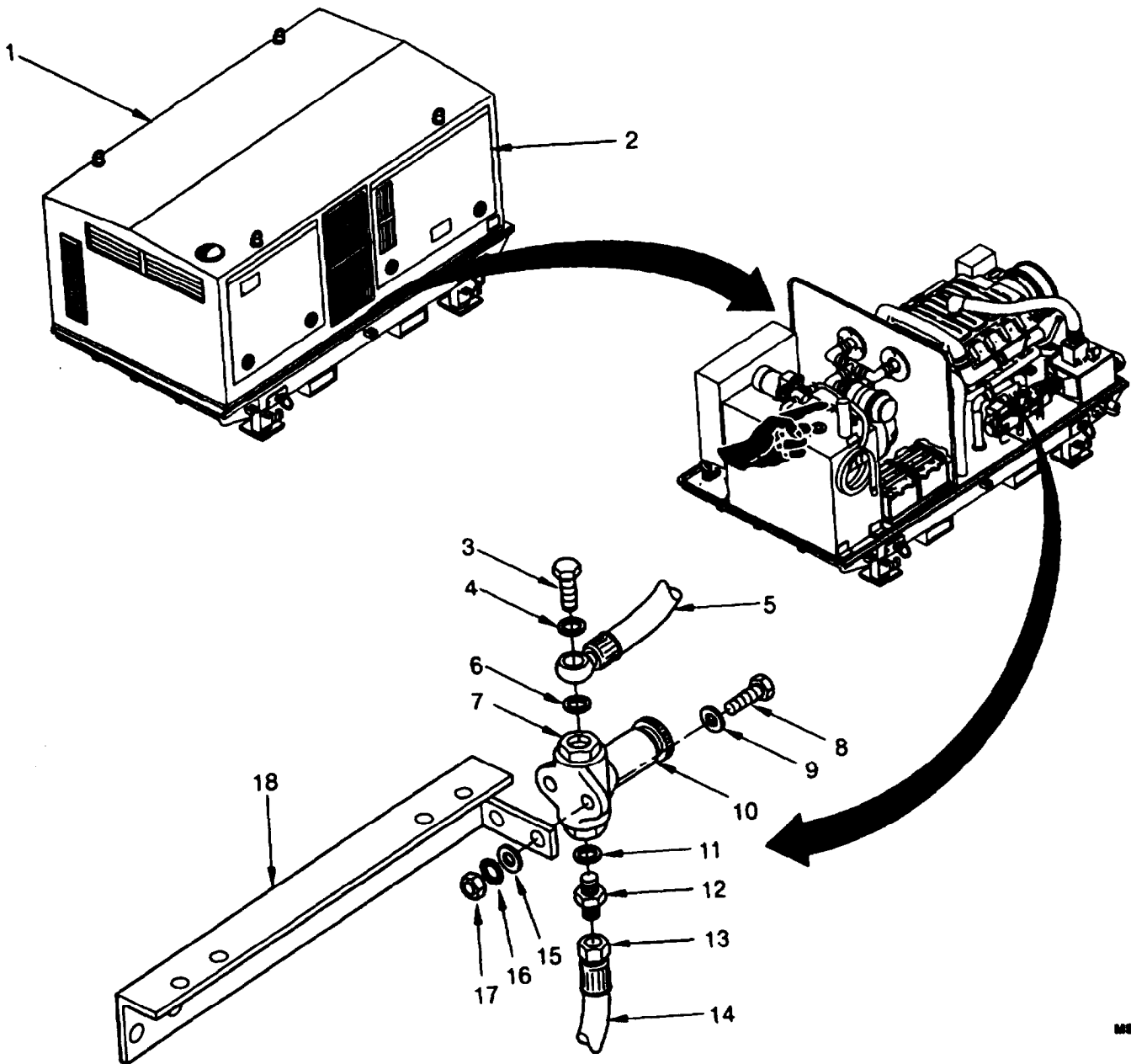


Figure 4-39 Diesel Engine Cylinder Cooling Fins and Oil Cooler Maintenance.



MS010414

Figure 4-40. Priming Pump Assembly Maintenance.

4.38 FUEL LINES AND PREFILTER ASSEMBLY MAINTENANCE.

This task covers: a. Removal b. Service c. Installation

INITIAL SETUP
Materials/Parts

Sealing rings

Equipment Conditions

Reference

Generator Set 150 kW shut
down, paragraph 2.5.2

REMOVAL

1. Open flap (1, figure 4-41).

CAUTION

Place collection container under prefilter assembly.

2. Remove bleed screw (3) and sealing rings from prefilter assembly (2) and drain fuel into container. Discard sealing rings.

SERVICE

1. Unscrew handle (4) by turning to the left.
2. Install bleed screw (3) with new sealing ring three turns into prefilter assembly (2).
3. Pull and push handle (4) of priming pump (5) until fuel emerging from hole in screw threads of bleed screw (3) contains no bubbles and tighten bleed screw (3).

INSTALLATION

1. Remove collection container under prefilter assembly.
2. Close Flap (1).

4.39 FUEL LINES AND TWO STEP FUEL FILTER ASSEMBLY MAINTENANCE.

This task covers: a. Removal b. Service c. Installation

INITIAL SETUP

Materials/Parts

Sealing rings

Equipment Conditions

Reference

Generator Set 150 kW shut
down, paragraph 2.5.2

REMOVAL

1. Open flap (1, figure 4-41)

CAUTION

Place collection container under two step fuel filter assembly.

2. Remove bleed screws (6, 7) and sealing rings from two step fuel filter assembly (8) and drain fuel into container. Discard sealing rings.

SERVICE

1. Unscrew handle (4) by turning to the left.
2. Install bleed screws (6, 7) with new sealing ring three turns into fuel filter assembly (8).
3. Pull and push handle (4) of priming pump (5) until fuel emerging from hole in screw threads of bleed screws (6, 7) contains no bubbles and tighten bleed screws (6, 7).

INSTALLATION

1. Remove collection container under two step fuel filter assembly.
2. Close Flap (1).

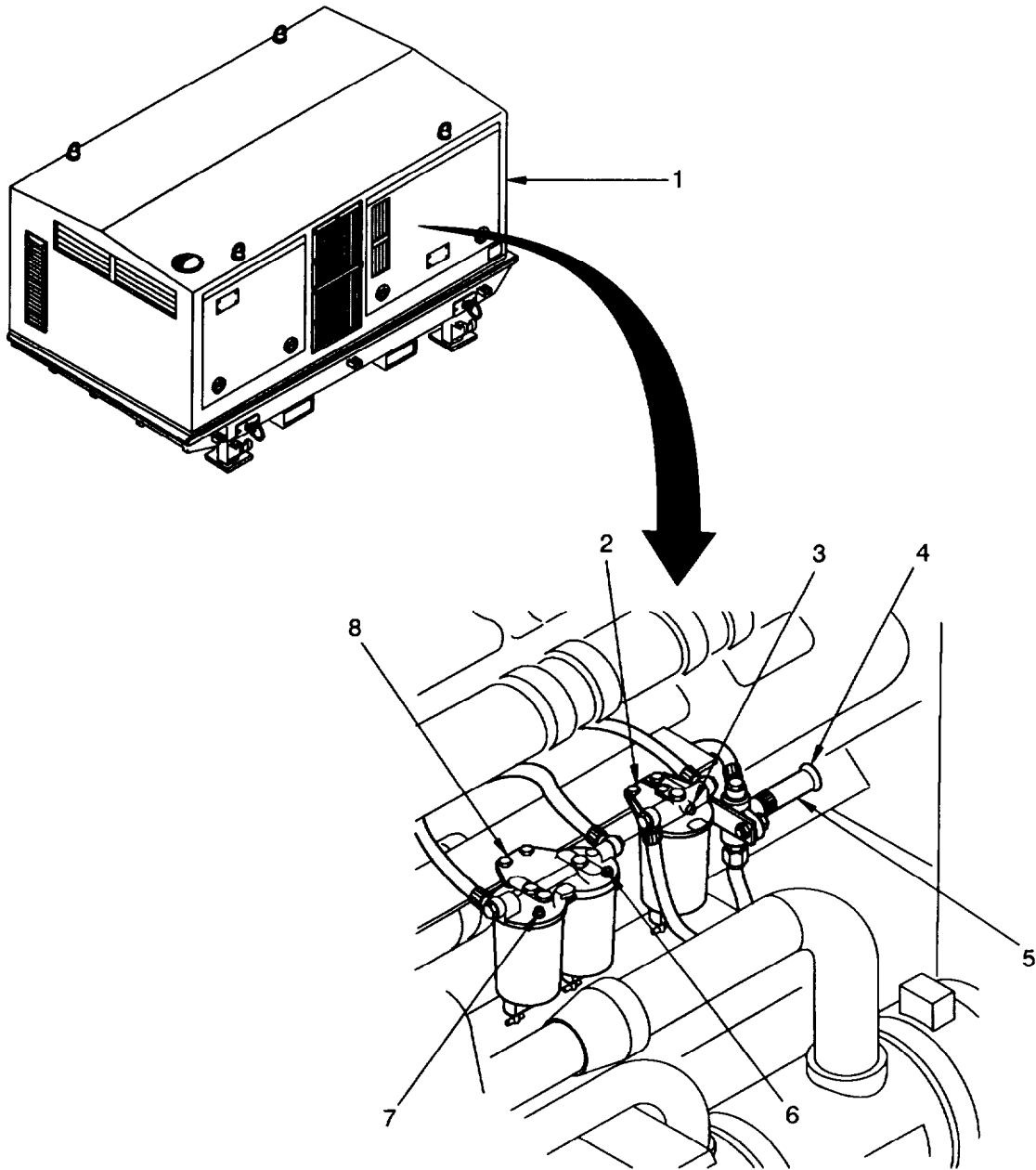


Figure 4-41 Diesel Engine Fuel Pipes and Fuel Filter Assembly Maintenance.

2. Remove condensation drain plug (11), and sealing ring (10) from fuel prefilter assembly (16) and discard sealing ring (10).
3. Remove bleed screw (9), with sealing ring (8) and drain out fuel completely. Discard sealing ring (8).

NOTE

Install bleed screw (9) and drain plug (11) finger tight for storage only.

4. Install condensation drain plug (11) with sealing ring (10) and bleed screw (9).
5. Remove hollow screw (5), with sealing ring (8), sealing rings (6, 7) and fuel outlet line (4). Discard sealing rings (6, 7)
6. Remove hollow screw (15), sealing rings (12, 14) and fuel supply line (13). Discard sealing rings (12, 14)
7. Remove two nuts (21), two serrated lock washers (20) and two washers (19) from two screws (18).
8. Remove two screws (18), two washers (17), and fuel prefilter assembly (16) from angle rail (22).

INSTALLATION

NOTE

If fuel lines have been bagged, remove bags prior to this operation

1. Install fuel prefilter assembly (16) on angle rail (22) and insert two screws (18) with two washers (17).
2. Secure with two washers (19) and two serrated lock washers (20) and two nuts (21).

NOTE

Use new sealing rings.

3. Install hollow screw (15) with new sealing rings (14, 12) and fuel supply line (13) on fuel prefilter assembly (16).
4. Install hollow screw (5) with new sealing rings (6, 7) and fuel outlet line (4) on fuel prefilter assembly (16).
5. Install condensation drain plug (11) with new sealing ring (10).

NOTE

Do not tighten bleed screw (9) with new t-sealing ring (8) until fuel system is purged.

6. Bleed fuel system as instructed in paragraph 4.38 and 4.39.
7. Install hood assembly (1) as instructed in paragraph 4.14.

7. Remove two nuts (45), two serrated lock washers (46) and two washers (47) from two screws (43) and pull out one screw (43) with lock washer (42).
8. Remove two step fuel filter (41) from angle rail (22) by holding fuel lines (39, 40), clamps (44) and screw (43) with washer (42).

INSTALLATION

1. place two step fuel filter (41) on angle rail (22) by holding fuel lines (39, 40), clamps (44), and screw (43) with washer (42).
2. Install one screw (43) with washer (42), two washers (47), two serrated lock washers (46) and two nuts (45) onto two screws (43), lighten nuts (45).

NOTE

Use new sealing rings.

3. Install hollow screw (35), new sealing rings (36, 37) and fuel return line (38) on two step fuel filter assembly (41).
4. Install hollow screw (24), new sealing rings (25, 26) and fuel inlet line (23) on two step fuel filter assembly (41).
5. Install condensation plugs (30.31) with new sealing rings (29) and (32).

NOTE

Do not tighten bleed screws (27, 34) prior to bleeding the fuel system.

6. Install bleed screws (27, 34) with new sealing rings (28, 33).
7. Bleed fuel system as instructed in paragraph 4.38 and 4.39.
8. Install unit hood assembly (1) as instructed in paragraph 4.14.

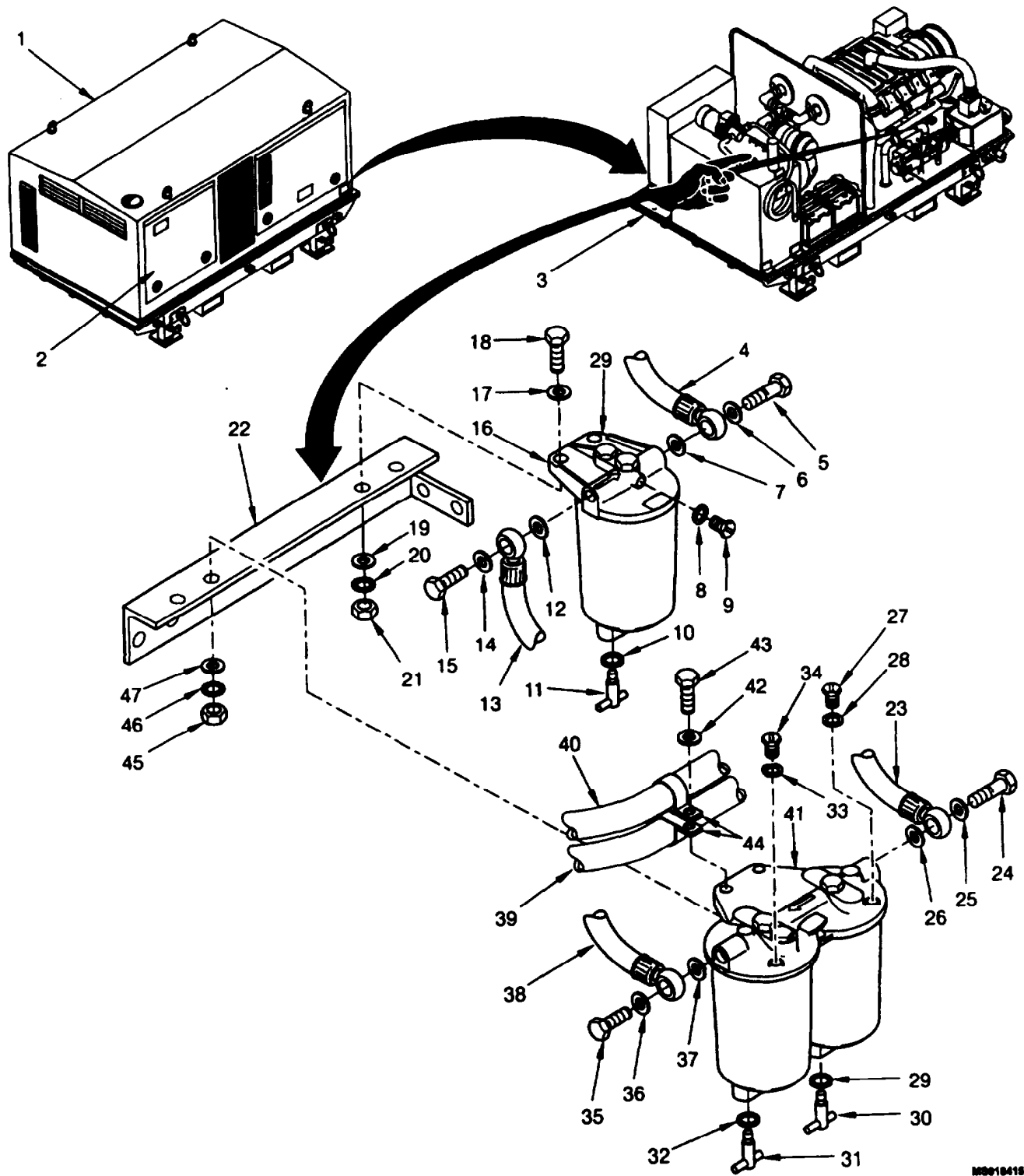


Figure 4-42. Fuel Prefilter, Two Step Fuel Filter Maintenance.

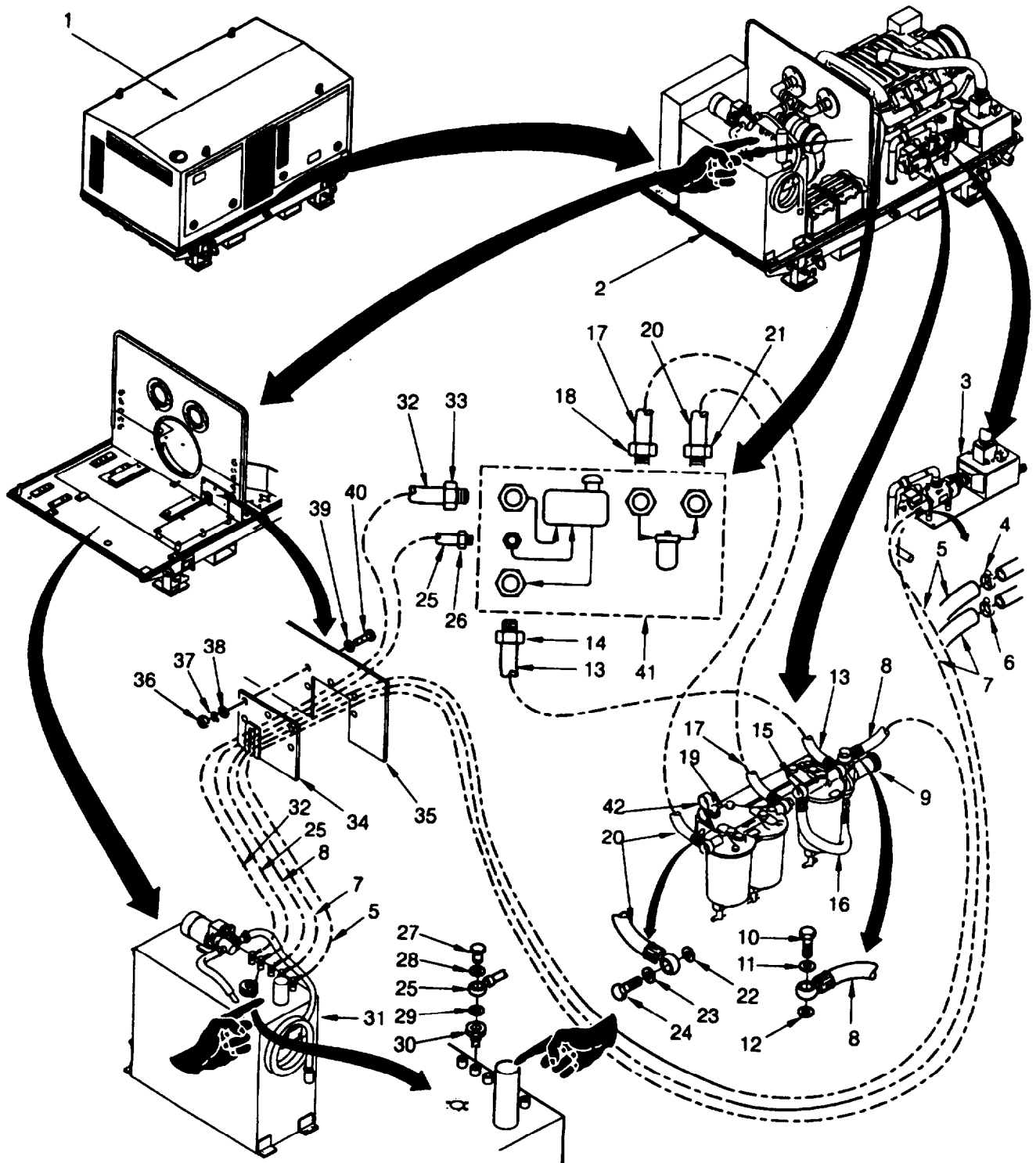
- a. Perform step 4 and remove fuel line (32).
 - b. Remove tapered screw (33) from engine block (41) with fuel line (32).
 - c. Remove fuel line (32).
7. Fuel supply line (8)
- a. Perform step 4 and remove fuel supply line (8).
 - b. Remove hollow screw (10) from priming pump (9) with sealing rings (11, 12) and discard sealing rings (11, 12).
 - c. Remove fuel supply line (8).
8. Fuel line (7)
- a. Perform step 4 and remove fuel line (7).
 - b. Loosen clamp (6) and remove fuel line (7) from preheating assembly (3).
 - c. Remove fuel line (7).
9. Fuel line (5)
- a. Perform step 4 and remove fuel line (5).
 - b. Loosen clamp (4) and remove fuel line (5) from preheating assembly (3).
 - c. Remove fuel line (5).
10. Fuel line (16)
- a. Drain fuel prefilter assembly (15) as instructed in paragraph 4.38.
 - b. Remove fuel line (16) from priming pump (9).
 - c. Remove fuel line (16) from fuel prefilter assembly (15).
 - d. Remove fuel line (16).
11. Fuel line (20)
- a. Remove hollow screw (24) from two step fuel filter set (19) with sealing rings (22, 23) and fuel line (20). Discard sealing rings (22, 23).
 - b. Remove tapered screw (21) from engine block (41) with fuel line (20).
 - c. Remove fuel line (20).
12. Fuel line (13)
- a. Drain two step fuel filter set (19) as instructed in paragraph 4.39.
 - b. Loosen clamps (42) from two step fuel filter set (19).
 - c. Remove fuel line (13).
 - d. Remove tapered screw (14) with fuel line (13).
 - e. Remove fuel line (13).

13. Fuel line (17)
 - a. Drain two step fuel filter set (19) as instructed in paragraph 4.39.
 - b. Loosen clamps (42) from two step fuel filter set (19).
 - c. Remove fuel line (17).
 - d. Remove tapered screw (18) from engine block (41) with fuel line (17).
 - e. Remove fuel line (17).

INSTALLATION

1. Fuel line (17)
 - a. Install fuel line (17) on engine block (41).
 - b. Tighten tapered screw (18).
 - c. Install hollow screw with new sealing rings and fuel line (17) on two step fuel filter assembly (19).
 - d. Bleed fuel system as instructed in paragraph 4.39.
2. Fuel line (13)
 - a. Install fuel line (13) on engine block (41).
 - b. Tighten tapered screw (14).
 - c. Install hollow screw with new sealing rings and fuel line (13) on two step fuel filter assembly (19).
 - d. Bleed fuel system as instructed in paragraph 4.39.
3. Fuel line (20)
 - a. Install fuel line (20) on engine block (41).
 - b. Tighten tapered screw (21).
 - c. Install hollow screw (24) with new sealing rings (22, 23) and fuel line (20) on two step fuel filter assembly (19).
 - d. Bleed fuel system as instructed in paragraph 4.39.
4. Fuel line (16)
 - a. Install hollow screw with new sealing rings and fuel line (16) on fuel prefilter assembly (15).
 - b. Install hollow screw with new sealing rings and fuel line (16) on priming pump (9).
 - c. Bleed fuel system as instructed in paragraph 4.38.
5. Fuel line (5)
 - a. Install fuel line (5) on preheating assembly (3) and tighten clamp (4).
 - b. Install hollow screw with new sealing rings and fuel line (5) on fuel tank (31).

6. Fuel line (7)
 - a. Install fuel line (7) on preheating assembly (3) and tighten clamp (6).
 - b. Install hollow screw with new sealing rings and fuel line (7) on fuel tank (31).
7. Fuel supply line (8)
 - a. Install hollow screw (10) with new sealing rings (11, 12) and fuel supply line (8) on priming pump (9).
 - b. Install hollow screw with new sealing rings and fuel supply line (8) on fuel tank (31).
 - c. Bleed fuel system as instructed in paragraph 4.38.
8. Fuel line (32)
 - a. Install fuel line (32) on engine block (41).
 - b. Tighten tapered screw (33).
 - c. Install hollow screw with new sealing rings and fuel line (32) on fuel tank (31).
 - d. Bleed fuel system as instructed in paragraph 4.38.
9. Fuel line (25)
 - a. Install fuel line (25) on engine block (41).
 - b. Tighten tapered screw (26).
 - c. Install hollow screw with new sealing rings and fuel line (25) on fuel tank (31).
 - d. Bleed fuel system as instructed in paragraph 4.38.
10. To install unit hood assembly (1) refer to paragraph 4.14.



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Figure 4-43. Fuel Line Assembly Maintenance.

6. Record labeling and position of cables (70) to load contactor K1 (69).
7. Remove upper covers from busbars and open cable conduit above load contactor K1 (69) and the one to the right of it.
8. Remove three nuts (74), three serrated lock washers (73), three washers (72), six cables (70), and three heat sinks (71) from terminals of load contactor K1 (69).
9. Record labeling and position of cables to terminal strip X101 (24) on preheating control board (25).
10. Remove nut (13) from cable union, and pull preheating control cable (14) out of back panel of control cabinet assembly (2).

NOTE

Hold standoffs (21) while unscrewing nuts (18).

11. Remove two nuts (18), two serrated lock washers (19), and two washers (20)
12. Swing digital isochronous load sharing module N4 (16), cover (17) and attached grounding cable (15) aside and open cable conduits below and beside speed governor assembly N1 (23).
13. Record labeling and position of cables (10, 12) to terminal strip (22).
14. Disconnect cables (12), unscrew nut (11) from cable union and pull actuator cable (12) out of back panel of control cabinet assembly (2).
15. Disconnect cables (10), unscrew nut (9) from cable union and pull pickup cable (10) out of back panel of control cabinet assembly (2).
16. Remove eight screws (33), eight serrated lock washers (32), eight washers (31) and cover (30) from filter box FK (28).
17. Record labeling and position of cables (27) to input terminal strip (29).
18. Disconnect cables of generator cable harness (27) from input terminal strip (29).
19. Remove locknut (26) from cable union and pull generator cable harness (27) out of back panel of control cabinet assembly (2).
20. Remove cable 141 (52) from terminal N of control cabinet connection panel (5).
21. Disconnect cables 163 (51) at T1, 164 (50) at T2, 76 (49) at I2 and 77 (48) at K2 from the lower terminals (47) of connection strip XI (46).

WARNING

- This procedure requires the aid of two assistants and a sling lifting device to prevent severe personal injury.
- To prevent injury from contact with filter box FK, wear gloves when unscrewing nuts from the corrugated hoses.

22. Remove nut (53) from corrugated hose (81) and remove from cables.
23. Remove nut (64), serrated lock washer (65), washer (66), and generator cable 80 (67) from load contactor K1 (69).
24. Remove nut (68) from corrugated hose (79) and remove from cables.
25. Remove nut (54), serrated lock washer (55), washer (56) and generator cable 78 (57) from load contactor K1 (69).
26. Remove nut (58) from corrugated hose (80) and remove from cables.
27. Remove nut (59), serrated lock washer (60), washer (61) and generator cable 79 (62) from load contactor K1 (69).
28. Remove nut (63) from corrugated hose (78) and remove from cables.
29. Remove nut (45), serrated lock washer (44), washers (41, 43), and grounding strap (42) from threaded pin (40) on control cabinet unit (2).
30. Remove eight bolts (77) from shock absorbers (76).
31. Place sling around control cabinet assembly (2), being careful that sling is positioned between control cabinet connection panel (5) and control cabinet (2) and attach to hoisting device.

WARNING

Stay clear of the suspended load.

CAUTION

Care must be taken to ensure cables and cable ends do not snag or become damaged during lifting.

32. Lift control cabinet assembly (2) gently off base frame (75) with one assistant feeding all cables through the back of the control cabinet (2).
33. When cables are free of the control panel (2) lift control panel completely off unit and set on a flat surface or mounting.

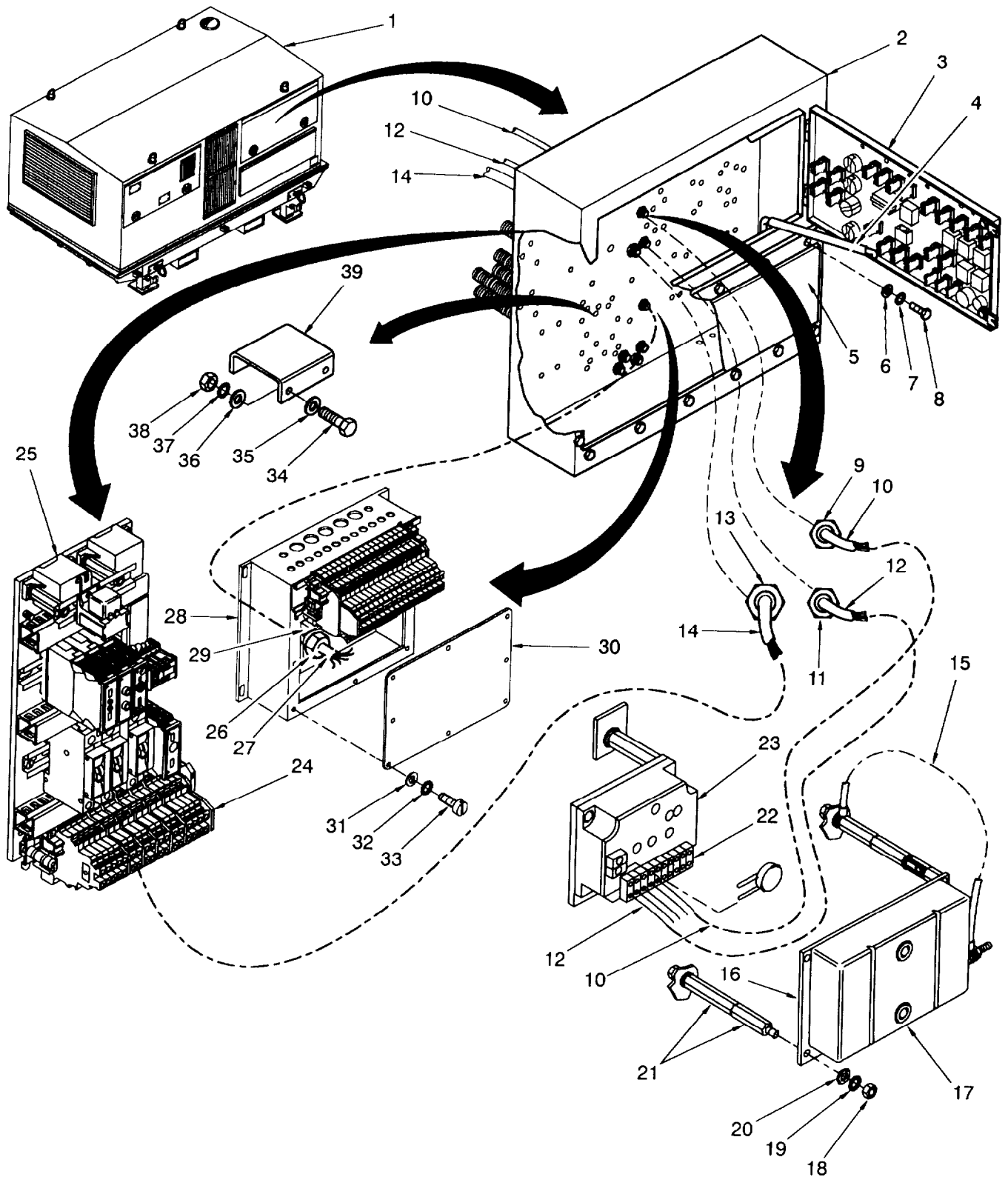


Figure 4-44 Control Cabinet Assembly Maintenance (Sheet 1 of 2).

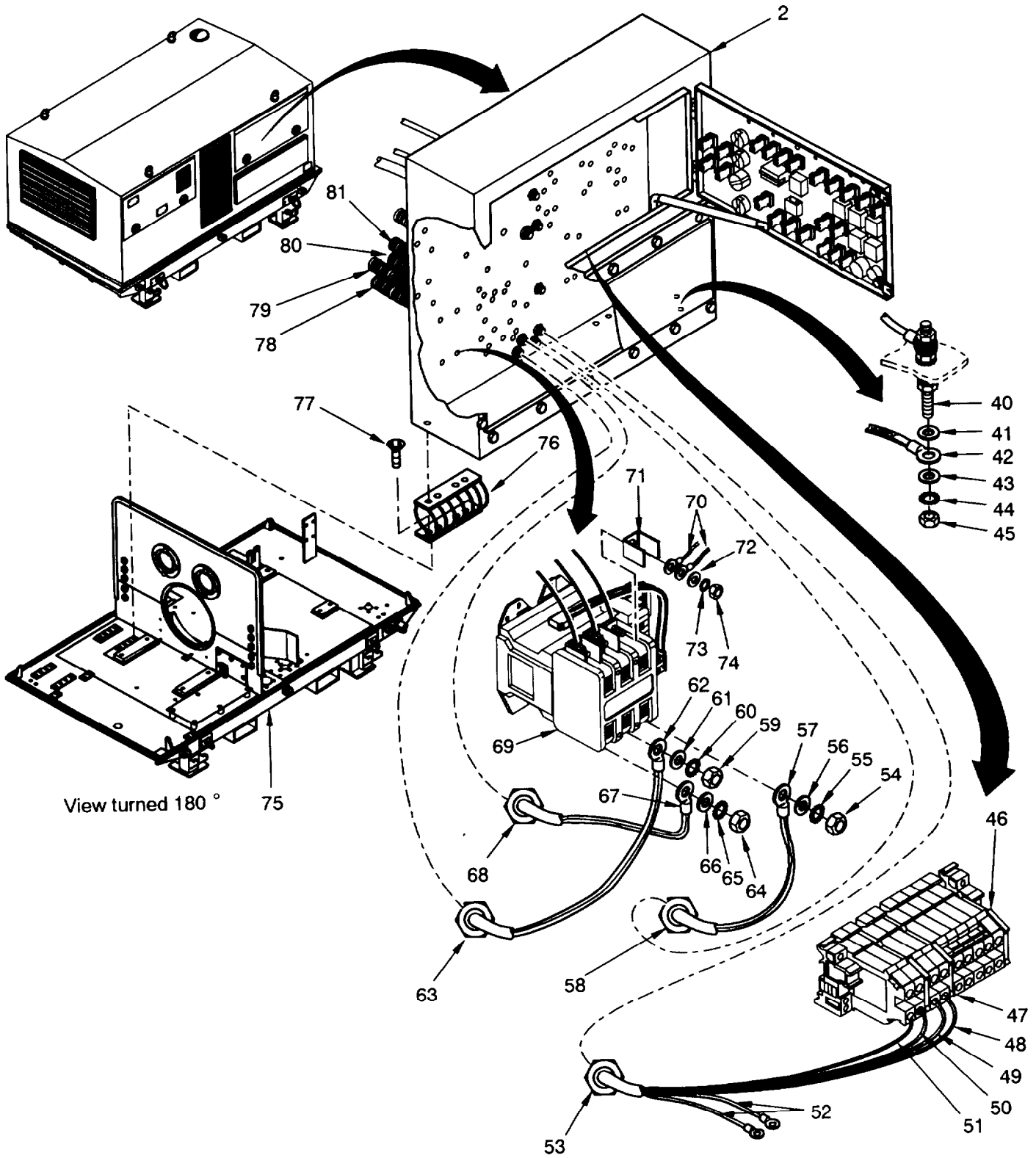


Figure 4-44 Control Cabinet Assembly Maintenance (Sheet 2 of 2).

INSTALLATION

1. Place sling around control cabinet (2) and attach to hoisting device using the same Warnings and Cautions during the installation.
2. Lift control cabinet (2) and with the aid of assistants place all cables in the back of the control cabinet and place on base frame assembly (75).
3. Install eight bolts (77) into shock absorber (76) and screw into base frame assembly (75).
4. Unhook sling from hoisting device and detach from control cabinet (2).
5. Install washer (41, 43), serrated lock washer (44) and grounding strap (42) on threaded pin (40) and install on nut (45).

CAUTION

Tighten screws at connections to contactor K1 with torque wrench to the torque value in table (Item G.1, appendix G).

NOTE

Note the correct sequence when installing the cables and corrugated hoses by observing the tags installed on cables during the removal procedure.

6. Install corrugated hose (78) with cables into back panel of control cabinet assembly (2).
7. Slide nut (63) over cable and screw onto corrugated hose (78).
8. Place generator cable 79 (62), serrated lock washer (60), and washer (61) on bolt and install nut (59) onto terminal of load contactor K1 (69).
9. Install corrugated hose (80) with cables into back panel of control cabinet assembly (2).
10. Slide nut (58) over cable and screw onto corrugated hose (80).
11. Place generator cable 78 (57), serrated lock washer (55), and washer (56) on bolt and install nut (54) onto terminal of load contactor K1 (69).
12. Install corrugated hose (79) with cables into back panel of control cabinet assembly (2).
13. Slide nut (68) over cable and screw onto corrugated hose (79).
14. Place generator cable 80 (67), serrated lock washer (65), and washer (66) on bolt and install nut (54) onto terminal of load contactor K1 (69).
15. Install corrugated hose (81) with cables into back panel of control cabinet assembly (2).
16. Slide nut (53) over cable and screw onto corrugated hose (81).
17. Connect cables 77 (48) to K1, 76 (49) to I2, 164 (50) to T2 and 163 (51) to T1 at lower terminals (47) of connection strip XI (46).
18. Install cable 141 (52) onto terminal N of control cabinet connection panel (5).
19. Insert generator cable harness (27) into back panel of control cabinet assembly (2), slide nut (26) over cable and install onto cable union.
20. Connect cables of generator cable harness (27) to input terminal strip (29).

21. Place cover (30) on filter box FK (28) and install eight washers (31), eight serrated lock washers (32), and screw eight screws (33) into filter box FK (28).
22. Install pickup cable (10) into back panel of control cabinet assembly (2), slide nut (9) over cable and install onto cable union, connect cable on terminal strip (22) of speed governor N1 (23).
23. Install actuator cable (12) into back panel of control cabinet assembly (2), slide nut (13) over cable and install onto cable union, connect cable on terminal strip (22) of speed governor N1 (23).
24. Close cable conduits below and beside speed governor assembly N1 (23) and swing digital isochronous load sharing module N4 (16) back.
25. Install two nuts (18), two serrated lock washers (19), and two washers (20).
26. Install preheating assembly control cable (10) into back panel of control cabinet assembly (2), slide nut (13) over cable and install onto cable union, connect cable on terminal strip X101 (24) on preheating control board (25).
27. Install three heat sinks (71), six cables (70), three washers (72), three serrated lock washers (73), and screw three nuts (74) onto terminals of load contactor K1 (69).
28. Install upper covers on busbar and close cable conduit above and beside load contactor K1 (69).
29. Place cover (39) on control cabinet assembly (2) and install two screws (34), two washers (35), two washers (36), two serrated lock-washers (37), and two nuts (38).
30. Close control cabinet connection panel (5).
31. Secure control cabinet connection panel (5) with eighteen bolts (8), eighteen serrated lockwashers (7), and eighteen washers (6).
32. Stow prop (4) and close front panel (3).
33. For installation of unit hood assembly (1) refer to paragraph 4.14.

4. Pushbutton Switch S4:
 - a. Record labeling and position of cables to contact block (30).
 - b. Disconnect cables from terminals (27, 29).
 - c. Use a screwdriver to push in upper and lower closures (23) on contact block (30) until they snap in, and remove contact block (30).
5. Loosen screws (22) on base (21).
6. Unlock ring (16), colored plate (17), housing (18), and sealing ring (19) on front of front panel by turning counterclockwise.
7. Pull ring (16) with colored plate (17), housing (18), and sealing ring (19) out of front of front panel (4) and remove base (21) from back of front panel (4).

INSTALLATION

NOTE

Procedure for installing pushbutton switch and light indicator H5/S17 (11), H9/S5 (9), H10/S6 (8), H11/S22 (6), H12/S9 (15), H13/S10 (7), H14/S8 (14), H16/S19 (13), H101/S102 (12) is the same as for pushbutton switch and light Indicator H8/S4 (10), described below.

1. Insert ring (16), colored plate (17), housing (18), and sealing ring (19) into front of front panel (4) and hold base (21) against front panel (4) from behind.
2. Push ring (16) with colored plate (17) and housing (18) with sealing ring (19) into base (21) and turn clockwise to secure to base (21).
3. Light indicator H8:
 - a. Clip bulb holder (25) with bulb (20) onto base (21).
 - b. Reconnect cables to terminals (27, 28) of bulb holder (25), noting correct labeling and position.
4. Pushbutton switch S4:
 - a. Clip contact block (30) onto base (21).
 - b. Reconnect cables to terminals (26, 29) of contact block (30), noting correct labeling and position.
5. Tighten screws (22) on base (21).
6. Stow prop (5) and close front panel (4).
7. Close flap (2).

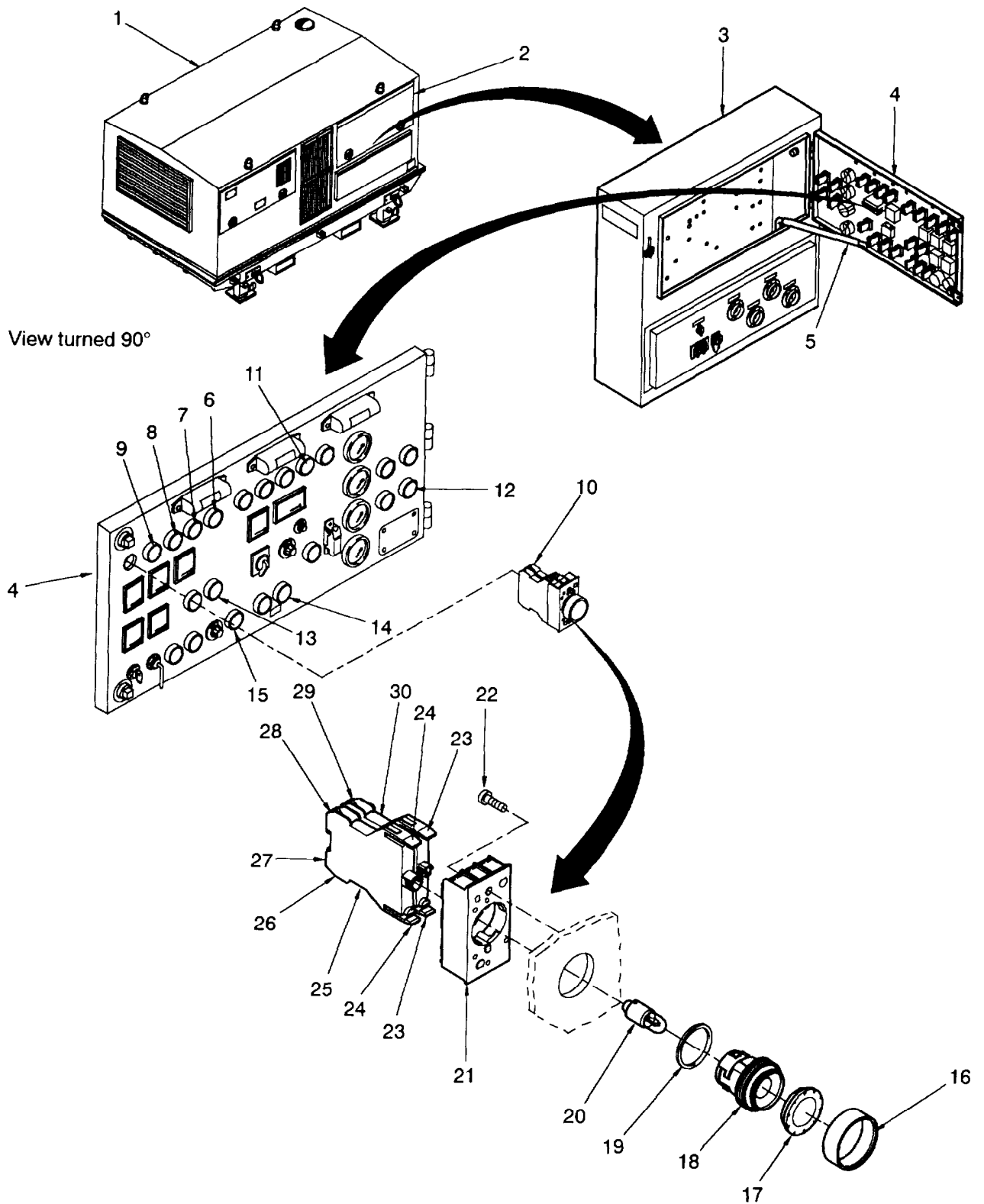


Figure 4-45 Control Cabinet Assembly, Pushbutton Switch and Indicator Assembly Maintenance.

8. Pull ring (10) with colored plate (11) and housing (12), and sealing ring (13) out from front of front panel (4) and remove base (14) from rear of front panel (4).

INSTALLATION

NOTE

Installation procedure for pushbutton switch S101 (6), S18 (7), S20 (9) is the same as for pushbutton switch S7 (8), described below.

1. Insert housing (12), sealing ring (13), colored plate (11), and ring (10) into front panel (4) from the front and hold base (14) against front panel (4) from the back.
2. Push housing (12), sealing ring (13), colored plate (11) and ring (10) into base (14) and secure to base (14) by turning clockwise.
3. Tighten screws (15) on base (14).
4. Install contact block (17) on base (14).
5. Reconnect cables to terminals (18, 19) of contact block (17), noting correct labeling and position.
6. Stow prop (5) and close front panel (4).
7. Close flap (2).

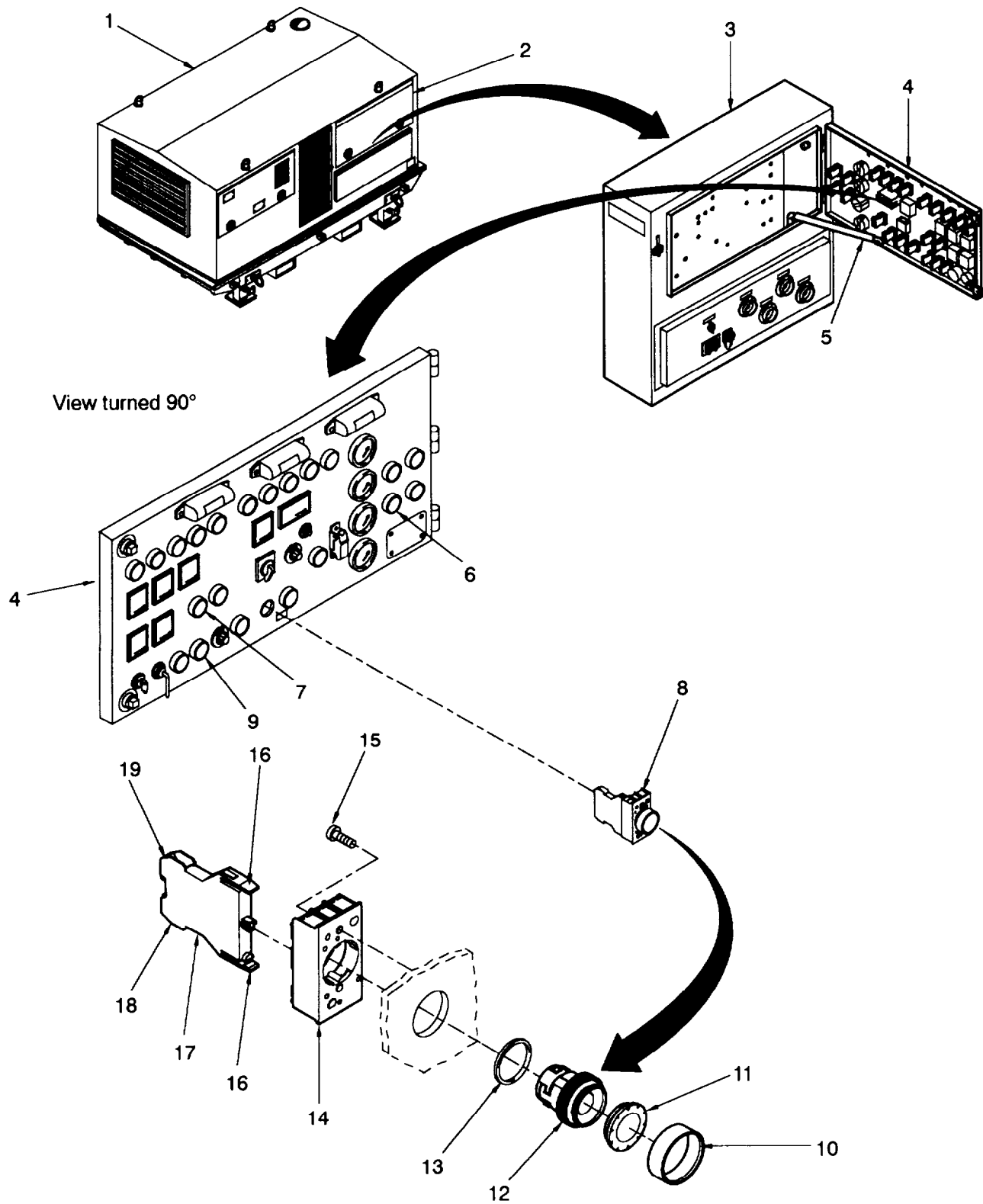


Figure 4-46 Control Cabinet Assembly, Pushbutton Switch Maintenance.

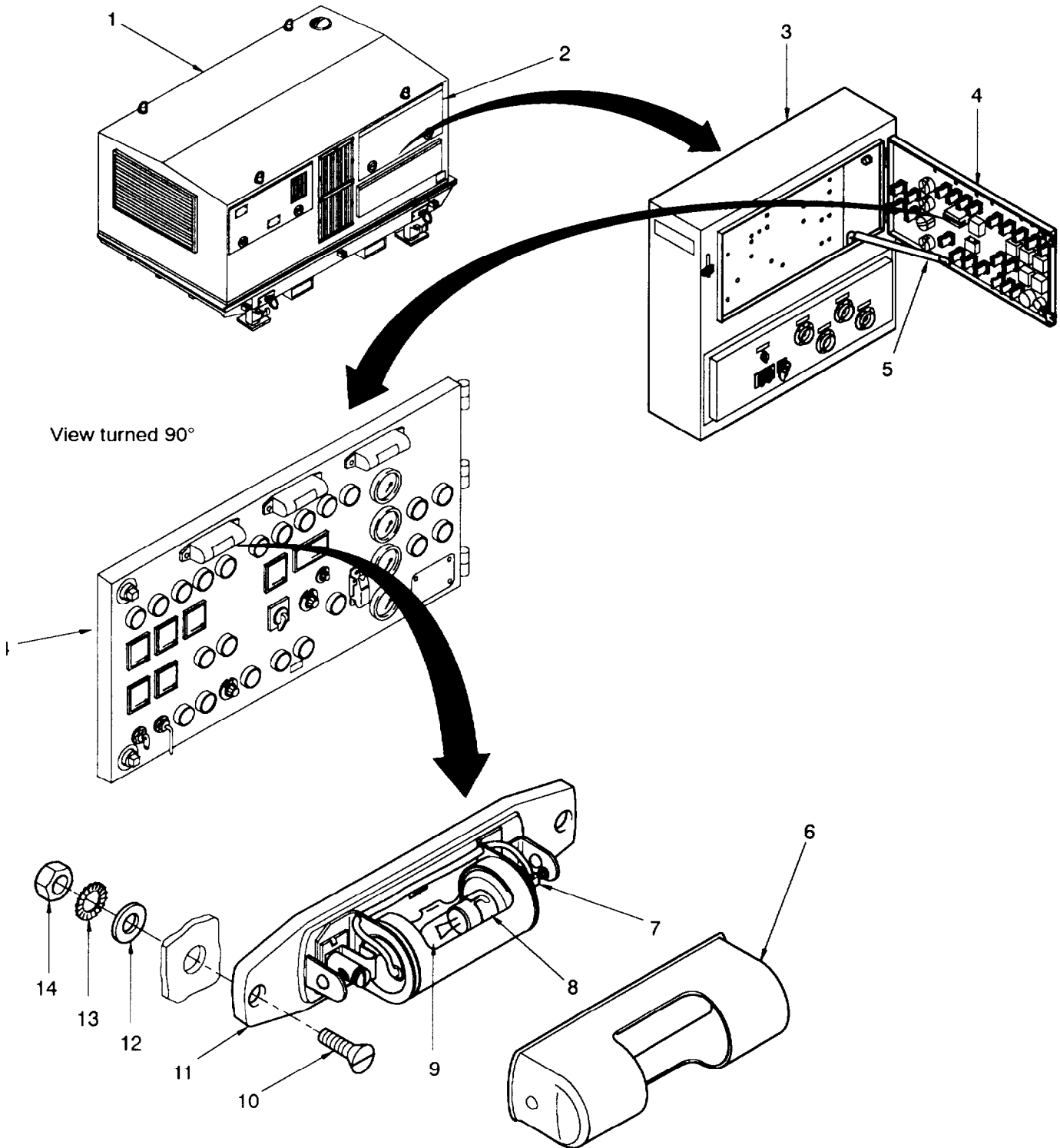


Figure 4-47 Control Cabinet Assembly, Panel Illumination H6 Maintenance.

INSTALLATION

1. Place bottom resistor (20) on studs (21)

CAUTION

Tighten screws and stand offs on studs with torque wrench to the torque value in table (Item G.2, appendix G).

2. Secure bottom resistor (20) with two washers (17), two serrated lock washers (16), and two nuts (15).
3. Install cable 23 and tighten nut (18), install cable 4 and tighten nut (19).
4. Install two standoffs (14).
5. Place top resistor (13) on standoffs (14).
6. Secure top resistor (13) with two washers (12), two serrated lock washers (11), and two nuts (10).
7. Install cable 23 and tighten nut (9).
8. Install cable 4 and tighten nut (8).
9. Install cable 48 (6) with flat connector on terminal (7).
10. Stow prop (5) and close front panel (4).
11. Close flap (2).

5. Connect cable (22) to terminals of BATTLE SHORT switch S21 (26), noting correct labeling and position.
6. Stow prop (5) and close front panel (4).
7. Close flap (2).

9. Disconnect capacitor C2 (35) from VOLTAGE SELECTOR SWITCH S11 (34), and retain for re-use.

INSTALLATION

NOTE

Connect capacitor C2 (36) to VOLTAGE SELECTOR SWITCH S11 (34) with adhesive.

1. Push VOLTAGE SELECTOR SWITCH S11 (34) with capacitor C2 (35) from the rear of front panel (4).
2. install plate (33) using screws (32) on front panel (4).
3. Push dial plate (31) into frame of plate (32) until lugs snap into place.
4. install switch knob (30) onto switch shaft and tighten screw (29).
5. Connect cable (36) to terminals of VOLTAGE SELECTOR SWITCH S11 (34), noting correct labeling and position.
6. Stow prop (5) and close front panel (4).
7. Close flap (2).

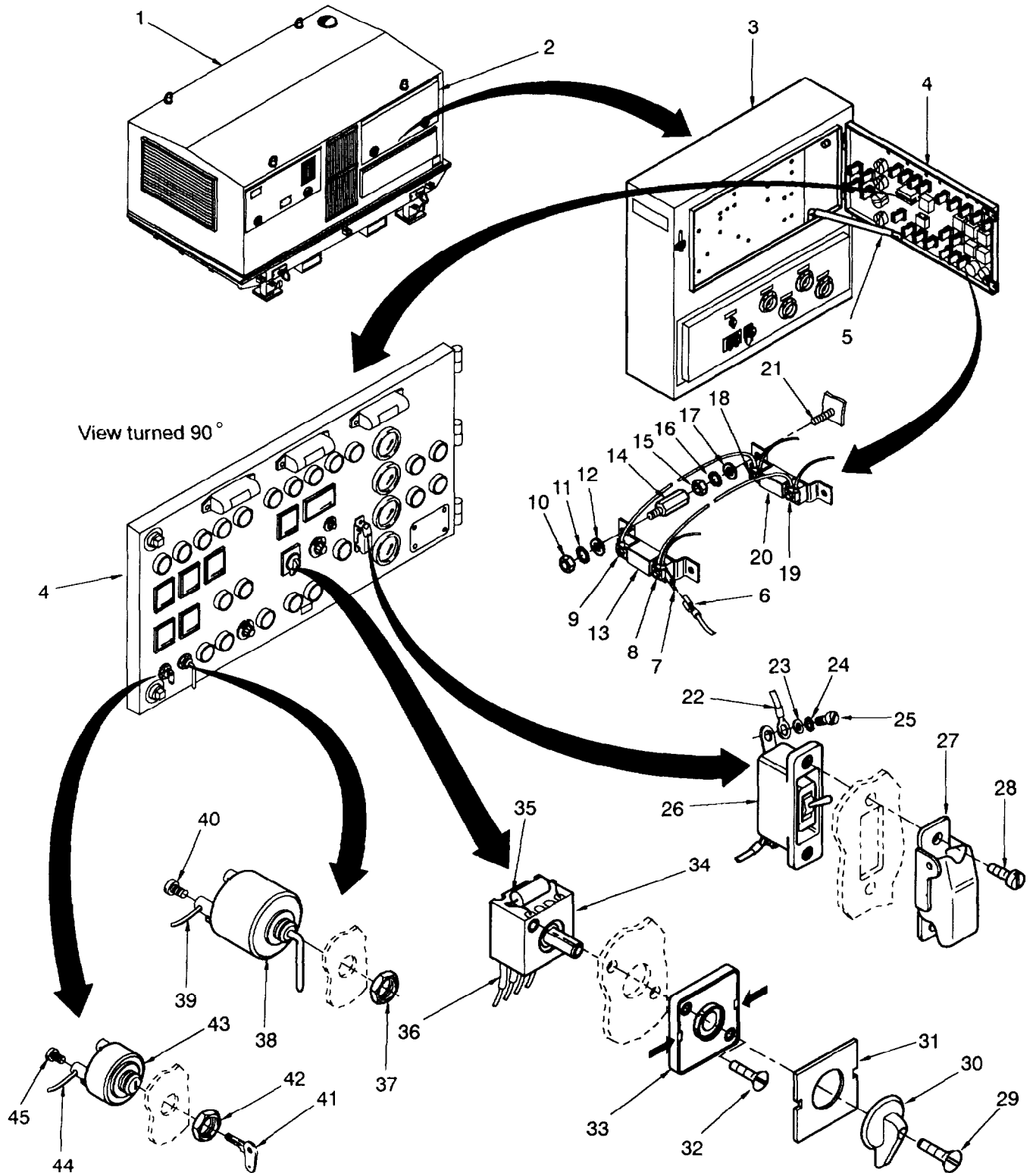


Figure 4-48 Control Cabinet Assembly, Preheating Resistor R1, BATTLE SHORT Switch S21, VOLTAGE SELECTOR SWITCH S1 GLOWPLUG/START Switch S2, MASTER SWITCH S1 Maintenance.

INSTALLATION

1. Install FREQUENCY ADJUST R4 (9) potentiometer and serrated lock washer (11) on rear of front panel (4), and install threaded element (12) on FREQUENCY ADJUST R4 (9).

NOTE

- **Turn the shaft of FREQUENCY ADJUST R4 potentiometers (9) all the way counterclockwise.**
 - **Rotate dial (14) with rotary knob (15) all the way counterclockwise.**
 - **Make sure stop plate (13) is installed in the correct position.**
2. Slide stop plate (13) on shaft of FREQUENCY ADJUST R4 (9) potentiometer so the lower tab of stop plate (13) fits into the hole in front panel (4).
 3. Install dial (14) and rotary knob (15) on shaft of FREQUENCY ADJUST R4 potentiometer (9).
 4. Secure rotary knob (15) on FREQUENCY ADJUST R4 potentiometer (9) by tightening socket head screw (16).
 5. Noting correct labeling and position, solder cables (8) on terminals (10) of FREQUENCY ADJUST R4 (9) potentiometer.
 6. Solder resistor R4A (7) on terminals (10) of FREQUENCY ADJUST R4 potentiometer (9).
 7. Stow prop (5) and close front panel (4).
 8. Close flap (2).

INSTALLATION

1. Install VOLTAGE ADJUST potentiometer R3 (23) and serrated lock washer (22) on rear of front panel (4). Install threaded element (21) on VOLTAGE ADJUST potentiometer R3 (23).

NOTE

- **Rotate shaft of potentiometers VOLTAGE ADJUST R3 (23) all the way counterclockwise.**
 - **Rotate dial (19) with rotary knob (17) all the way counterclockwise.**
 - **Make sure stop plate (20) is installed in the correct position.**
2. Slide stop plate (20) onto shaft of VOLTAGE ADJUST potentiometer R3 (23) so that lower tab of potentiometer (23) fits into hole in front panel (4).
 3. Install dial (19) and rotary knob (17) on VOLTAGE ADJUST R3 potentiometer (23).
 4. Secure rotary knob (17) onto shaft of VOLTAGE ADJUST R3 potentiometer (23) by tightening socket head screw (18).
 5. Noting correct labeling and position, solder cable (25) to terminals (24) of VOLTAGE ADJUST R3 potentiometer (23).
 6. Stow prop (5) and close front panel (4).
 7. Close flap (2).

INSTALLATION

1. Install PANEL DIMMER S16/R2 (33) and serrated lock washer (31) through the rear of front panel (4).
2. Install graduated dial (30) on PANEL DIMMER S16/R2 (33) and secure PANEL DIMMER S16/R2 (33) with nut (29).

NOTE

Rotateshaft PANEL DIMMER S16/R2 all the way counterclockwise; before tightening, set pointer of rotary knob to zero on graduated dial (OFF position of switch S16).

3. Slide rotary knob (28) on PANEL DIMMER S16/R2 (33), set pointer to zero position, and secure rotary knob (28) with slotted nut (26) on PANEL DIMMER S16/R2 (33).
4. Install cover cap (27) on rotary knob (28) and slotted nut (26).
5. Noting correct labeling and position, solder cables (34) on terminals (32) of PANEL DIMMER S16/R2 (33)
6. Stow prop (5) and close front panel (4).
7. Close flap (2).

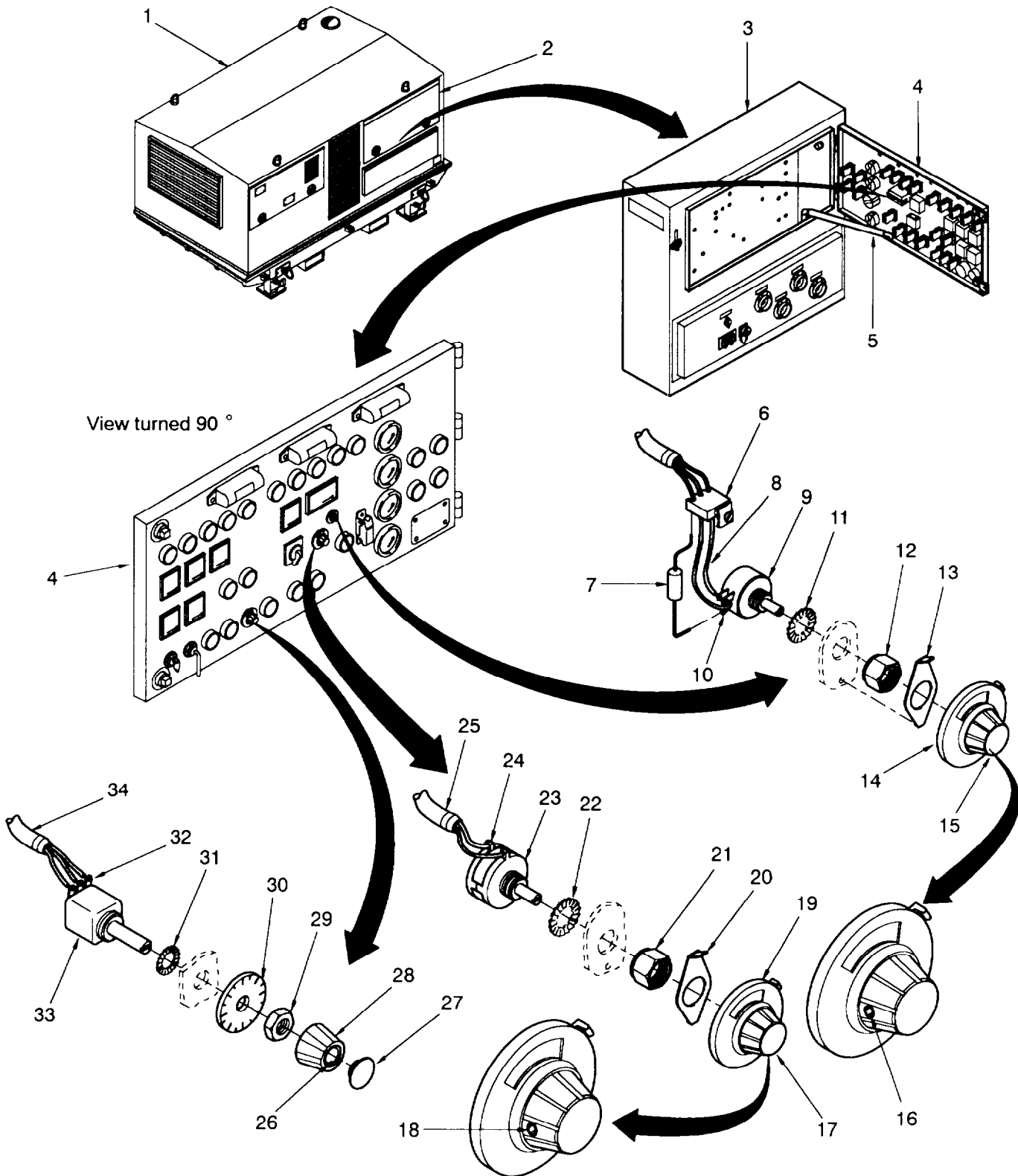


Figure 4-49 Control Cabinet Assembly, FREQUENCY ADJUST R4, VOLTAGE ADJUST R3, PANEL DIMMER S16/R2 Maintenance.

4. Install cover panel (7) over terminals (9) on FREQUENCY meter P5 (6) by pushing cover panel (7) in until it is seated properly.
5. Stow prop (5) and close front panel (4).
6. Close flap (2).

NOTE

The removal procedure for meter - AMPS L1 P1 (33), AMPS L2 P2 (34), AMPS L3 P3 (35), VOLTAGE P6 (32), and BATTERY CHARGE P7 (31) - is the same as described below.

4. Remove KILOWATTS meter P4 (25):
 - a. Record labeling and position of cables (28) and disconnect cables from terminals (27) on KILOWATTS meter P4 (25).
 - b. Remove threaded rod (30), using hook (29) from housing (26) of KILOWATTS P4 meter (25).
 - c. Remove KILOWATTS meter P4 (25) from front panel (4).

INSTALLATION

NOTE

The Installation procedure for meter - AMPS L1 P1 (33), AMPS L2 P2 (34), AMPS L3 P3 (35) VOLTAGE P6 (32), and BATTERY CHARGE P7 (26) - is the same as described below.

1. Install KILOWATTS meter P4 (25):
 - a. Install KILOWATTS meter P4 (25) on front panel (4).
 - b. Install hook (29) and threaded rod (30) on housing (26) of KILOWATTS meter P4 (25) and tighten threaded rod (30).
 - c. Noting correct labeling and position, connect cables (28) to terminals (27) on KILOWATTS meter P4 (25).

The installation procedure for meter - HOURMETER P8 (16), OIL PRESSURE P9 (14), and FUEL LEVEL P11 (16) - Is the same as described below.

2. Install OIL TEMPERATURE meter P10 (14):
 - a. Install OIL TEMPERATURE meter P10 (14) and insulation (22) on front panel (4).
 - b. Install retaining bracket (19) on OIL TEMPERATURE meter P10 (14), using serrated lock washers (18), and knurled nuts (17).
 - c. Noting correct labeling and position, install cables (20, 24) on terminals (21, 23) of OIL TEMPERATURE meter P10 (14).
3. Stow prop (5) and close front panel (4).
4. Close flap (2).

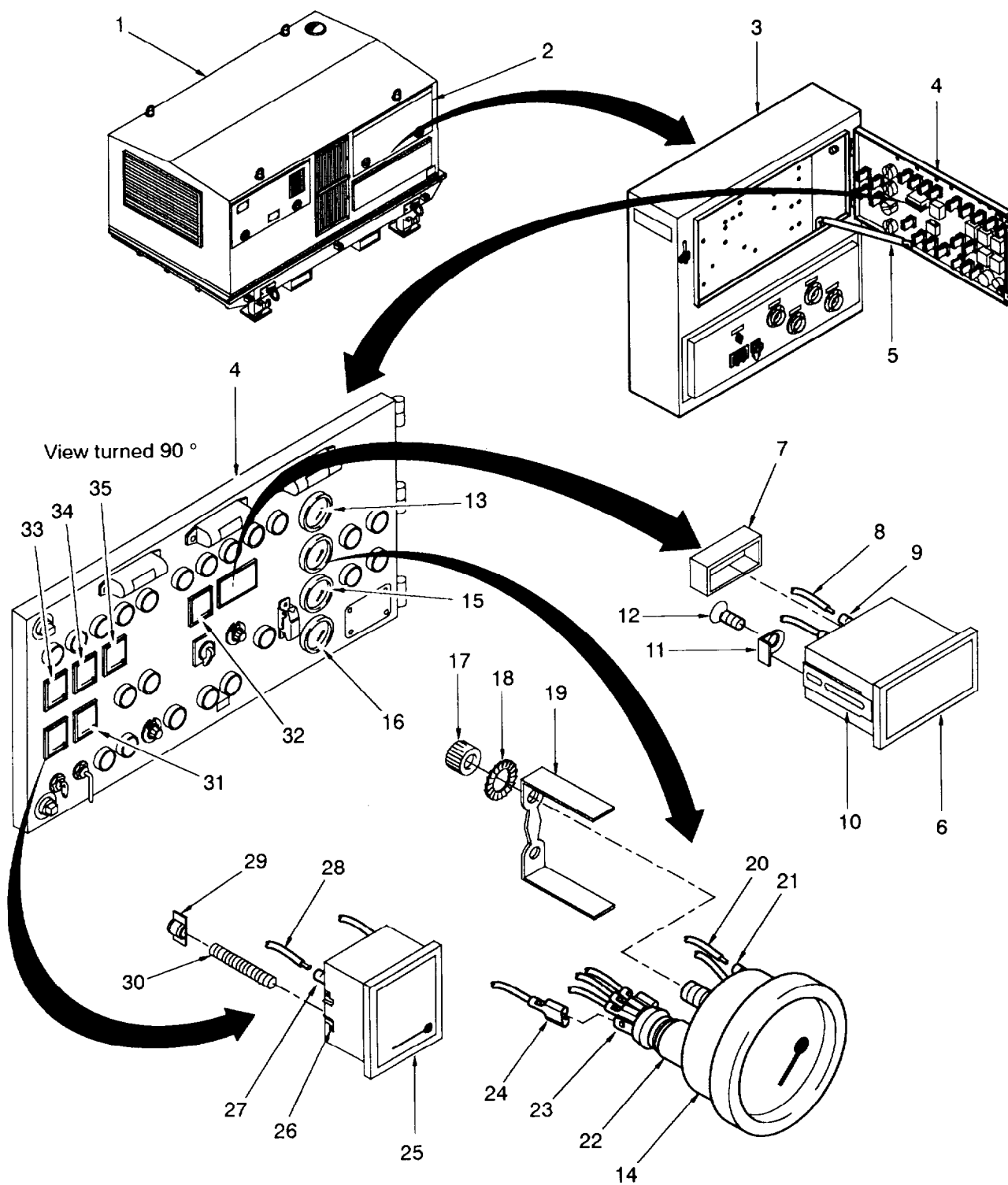


Figure 4-50 Control Cabinet Assembly, Meter Maintenance.

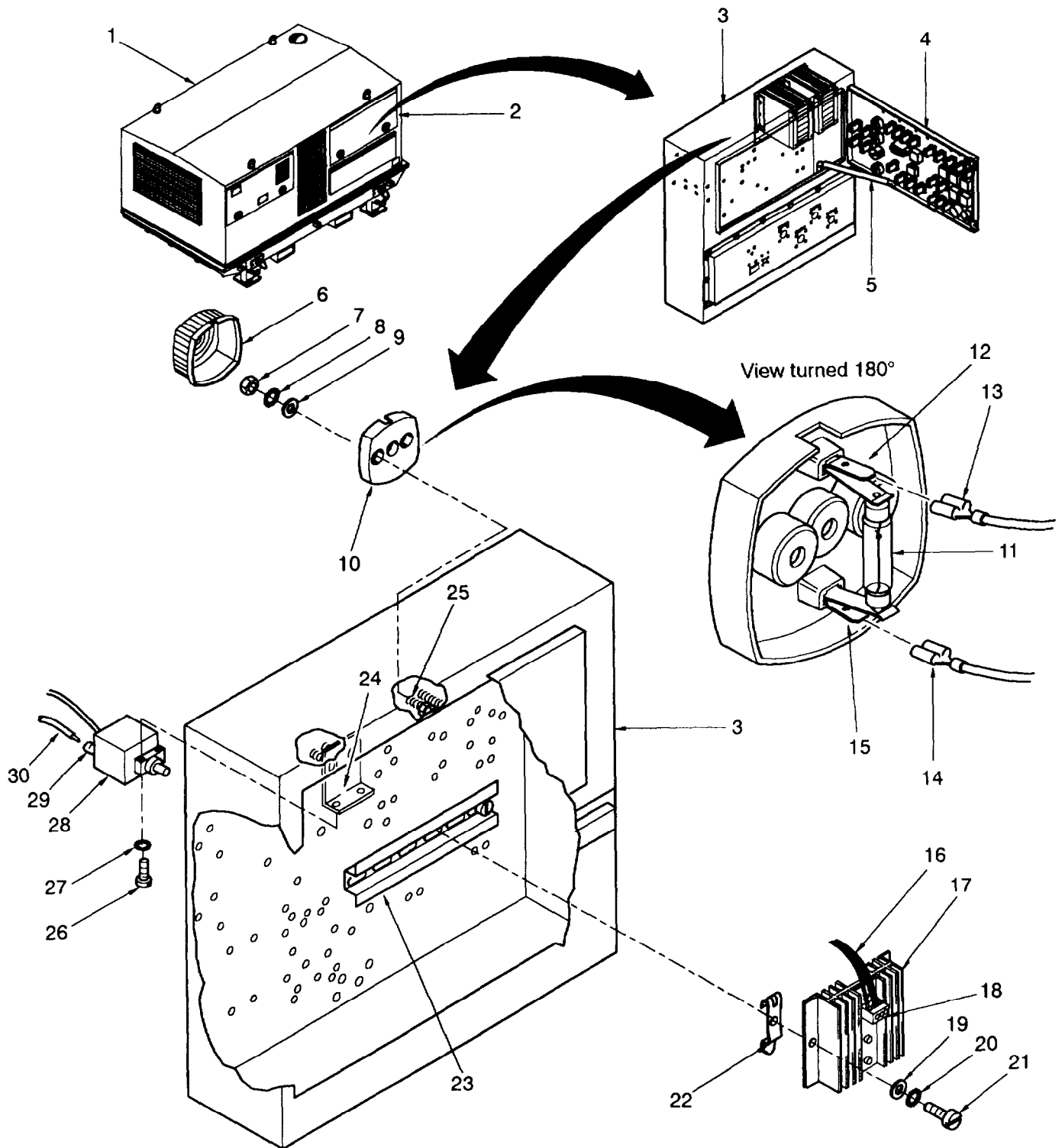


Figure 4-51 Control Cabinet Assembly, Cabinet Illumination H7, Door Contact Switch S3, Brightness Control N5 Maintenance.

INSTALLATION***NOTE***

Installation procedure for transformer T14 (6) is the same as for transformer T15 (7), described below.

1. Hook top (15) of transformer T15 (7) into mounting bar (16) and clip into place at the bottom.
2. Noting correct labeling and position, install cables (12) on lower terminals (13) of transformer T15 (7), and tighten screws (11).
3. Noting correct labeling and position. Install cables (8) on upper terminals (9) of transformer T15 (7), and tighten screws (10).
4. Stow prop (5) and close front panel (4).
5. Close flap (2).

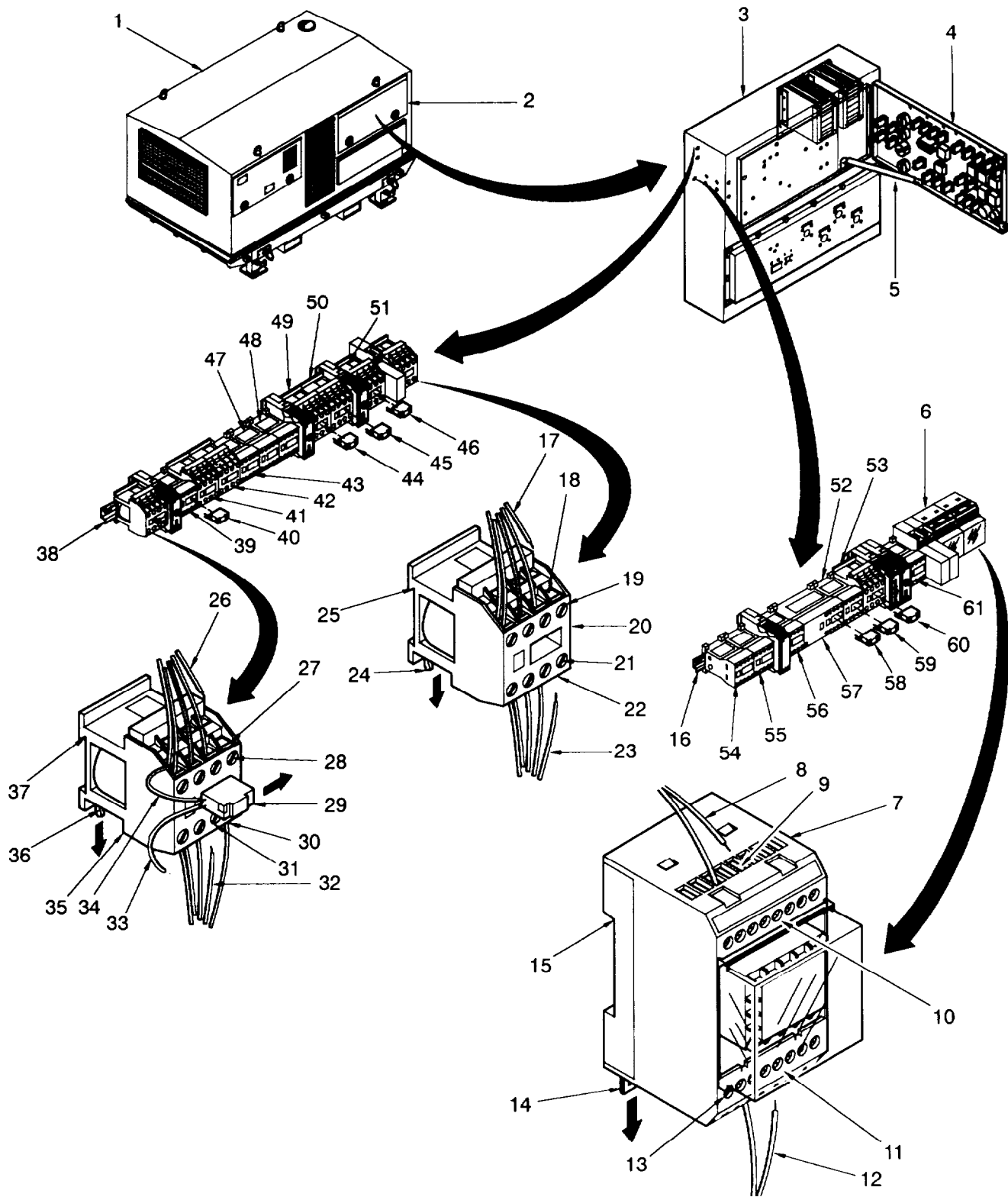


Figure 4-52 Control Cabinet Assembly, Auxiliary Contactor with Semiconductor, Auxiliary Contactor, Transformer Maintenance

INSTALLATION

NOTE

Installation procedure for diode V1 (46) and diode V2 (47) is the same as for diode V15 (31), described below.

1. Hook diode V15 (31) into top (36) of mounting bar (41) and push in at the bottom.
2. Noting correct labeling and position, install cables (33) on lower terminals (32) of diode V15 (31) and tighten screws (34).
3. Noting correct labeling and position, install cables (39) on upper terminals (38) of diode V15 (31) and tighten screws (37).
4. Stow prop (5) and close front panel (4).
5. Close flap (2).

INSTALLATION

1. Install heat sink (9) from the front on the back panel of control cabinet.
2. Install screws (6), serrated lock washers (7), and washers (8) from outside the back panel into the heat sink (9).

CAUTION

Before securing diode V3 to heat sink, apply thermoconductive paste to the contact surface.

3. Install diode V3 (12) into heat sink (9).
4. Install cables (14, 15) and (10) and secure with screws (13, 11).
5. Stow prop (5) and close front panel (4).
6. Close flap (2).

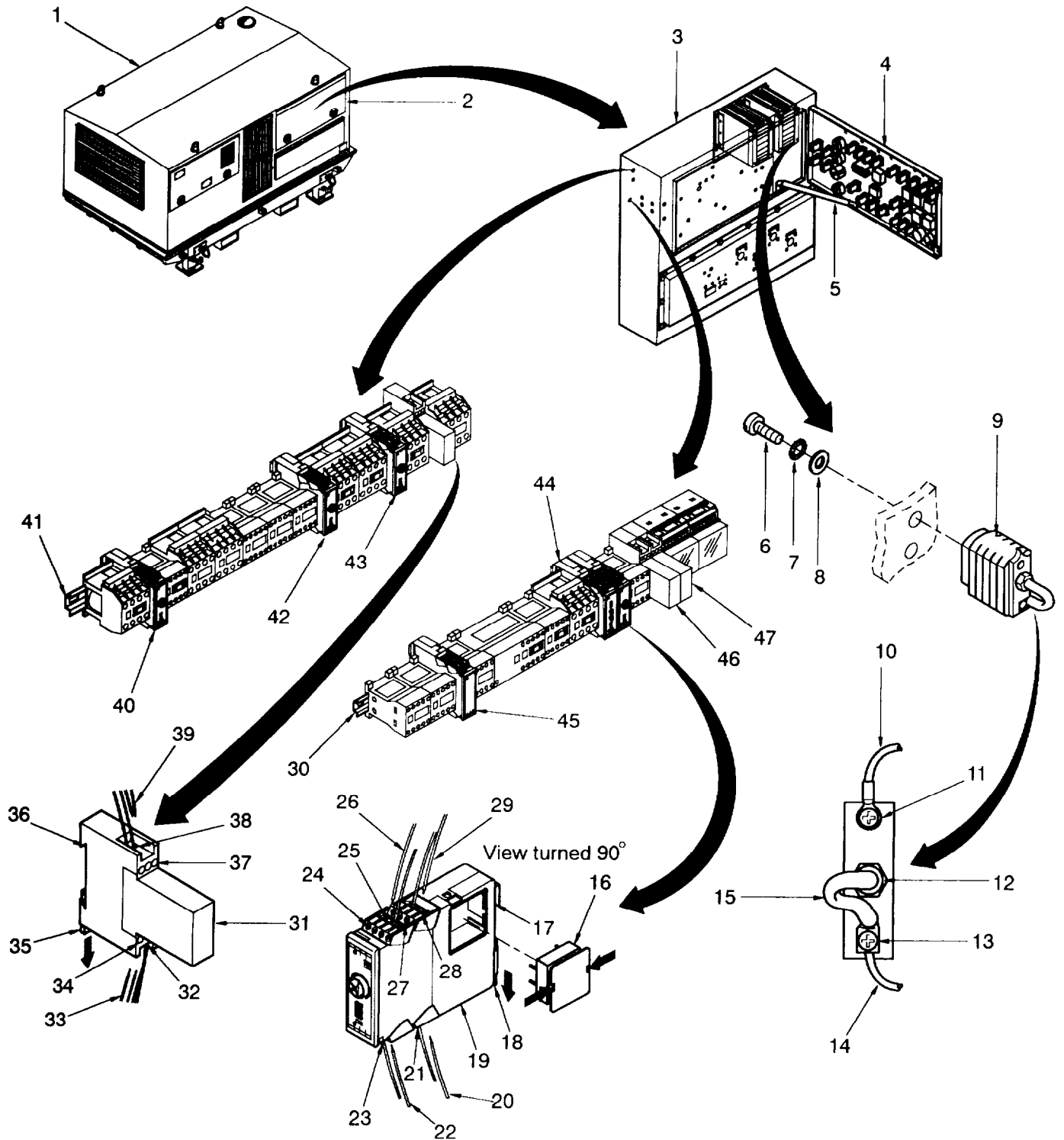


Figure 4-53 Diodes, Time Relay, Power Supply Maintenance.

- c. Use a screwdriver to push unlocking element (11) on circuit breaker F3 (8) in direction of arrow, tilt circuit breaker F3 (8) upward and remove from mounting bar (14).
6. Circuit breaker F11 (20):

NOTE

Removal procedure for circuit breaker F10/L1 (29), F10/L2 (28), F10/L3 (27) is the same as for circuit breaker F11 (20), described below.

- a. Record labeling and position of cable and disconnect cable (18) from terminal (19) of circuit breaker F11 (20).
- b. Record labeling and position of cable and disconnect cable (23) from terminal of circuit breaker F11 (20).
- c. Use a screwdriver to push unlocking element (24) on circuit breaker F11 (20) in direction of arrow, tilt circuit breaker F11 (20) upward and remove from mounting bar (14).

INSTALLATION

1. Circuit breaker F1 (32):

NOTE

Installation procedure for circuit breaker F2 (33) is the same as for circuit breaker F1 (32), described below.

- a. Hook top (44) of circuit breaker F1 (32) into mounting bar (14) and clip on locking element (43) at the bottom.
 - b. Install busbar (31) on terminals of circuit breaker F1 (32) and F2 (33) and tighten screws (41).
 - c. Install cable (46) to terminal (45) of circuit breaker F1 (32) and tighten screw (40).
2. Circuit Breakers F3 (8):

NOTE

installation procedure for circuit breaker F4 (34), F5 (35), F6 (36), F7 (37), F8 (38), F9 (39) is the same as for circuit breaker F3 (32), described below.

- a. Hook top (13) of circuit breaker F3 (8) into mounting bar (14) and clip on locking element (12) at the bottom.
 - b. Install busbar (30) on terminals of circuit breakers F3 (8) and F4 (34) to F9 (39) and tighten screws (10).
 - c. Install cable (6) to terminal (7) of circuit breaker F3 (8).
3. Circuit breaker F11 (20):

- a. Hook top (26) of circuit breaker F11 (20) into mounting bar (14) and clip on locking element (25) at the bottom.
 - b. Install cables (23) to terminal of circuit breaker F11 (20) and tighten screw (22).
 - c. Install cable (18) to terminal (19) of circuit breaker F11 (20) and tighten screw (21).
4. Close cable conduit (47) and cable conduit (60).
 5. Stow prop (5) and close front panel (4).
 6. Close flap (2).

INSTALLATION

1. Hook true power measuring transformer P4A (15) into top of mounting bar (14) and clip on at the bottom (16).
2. Noting correct labeling and position, install cables (51, 52) to terminals (50, 53) of true power measuring transformer P4A (15).
3. Noting correct labeling and position, install cables (55,56) to terminals (54, 57) of true power measuring transformer P4A (15).
4. Close cable conduit (47) and cable conduit (60).
5. Stow prop (5) and close front panel (4).
6. Close flap (2).

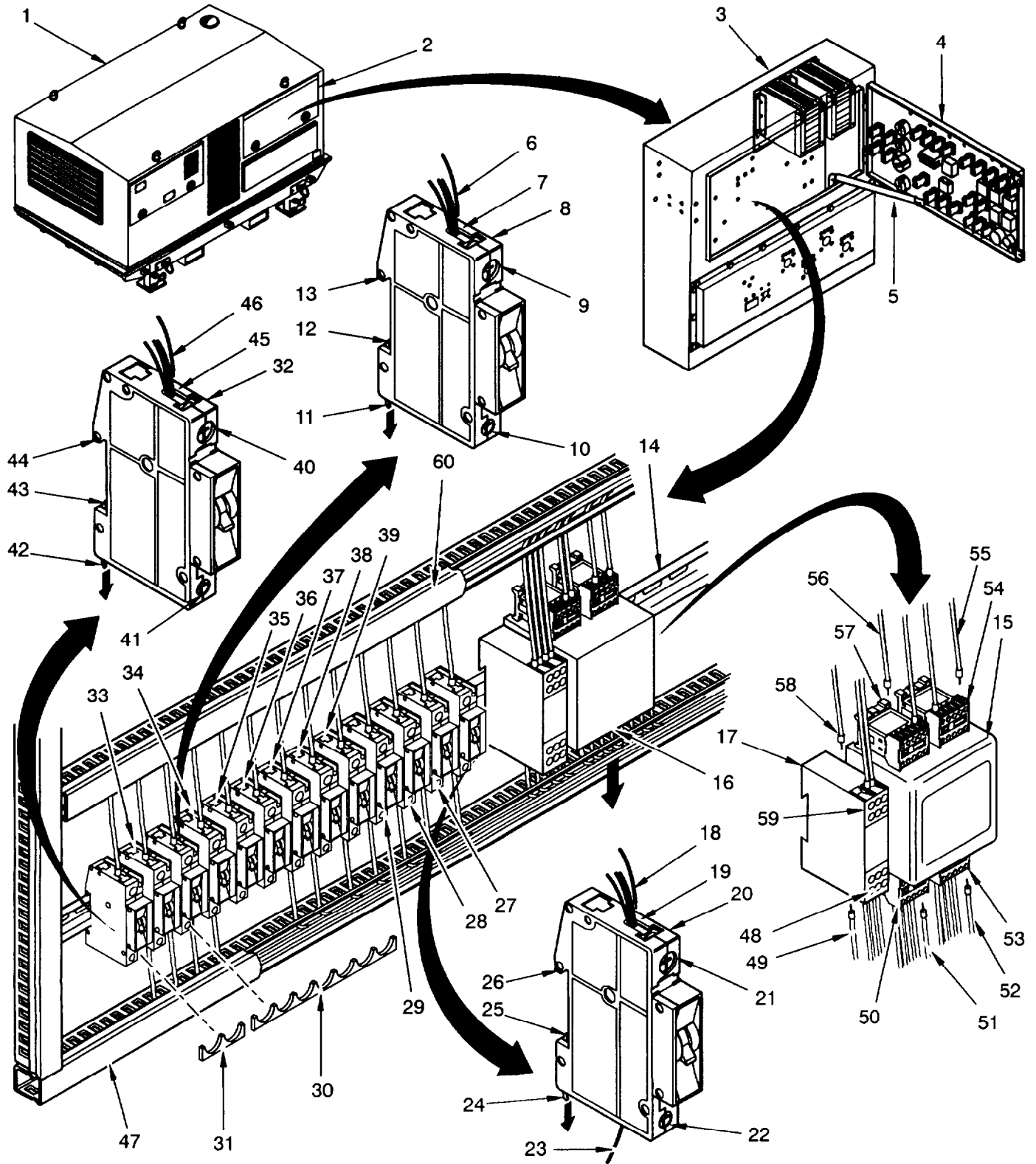


Figure 4-54 Control Cabinet Assembly, Circuit Breaker F1 to F11, Thermistor relay F12, True Power Measuring Transformer P4A Maintenance.

INSTALLATION

1. Install Resistor R100 (55)

CAUTION

Before installing each resistor, apply thermoconductive paste to the back.

NOTE

Installation procedure for resistors R101 and R102 is the same as for resistor R100, described below.

- a. Install resistor R100 (55) on mounting plate (58) using two screws (49), two serrated lock washers (50), and two washers (51).
 - b. Solder cable (52) to resistor R100 (55).
2. Install speed governor assembly N1 (43) as instructed in paragraph 5.13.
 3. Stow prop (5) and close front panel (4).
 4. Close flap (2).

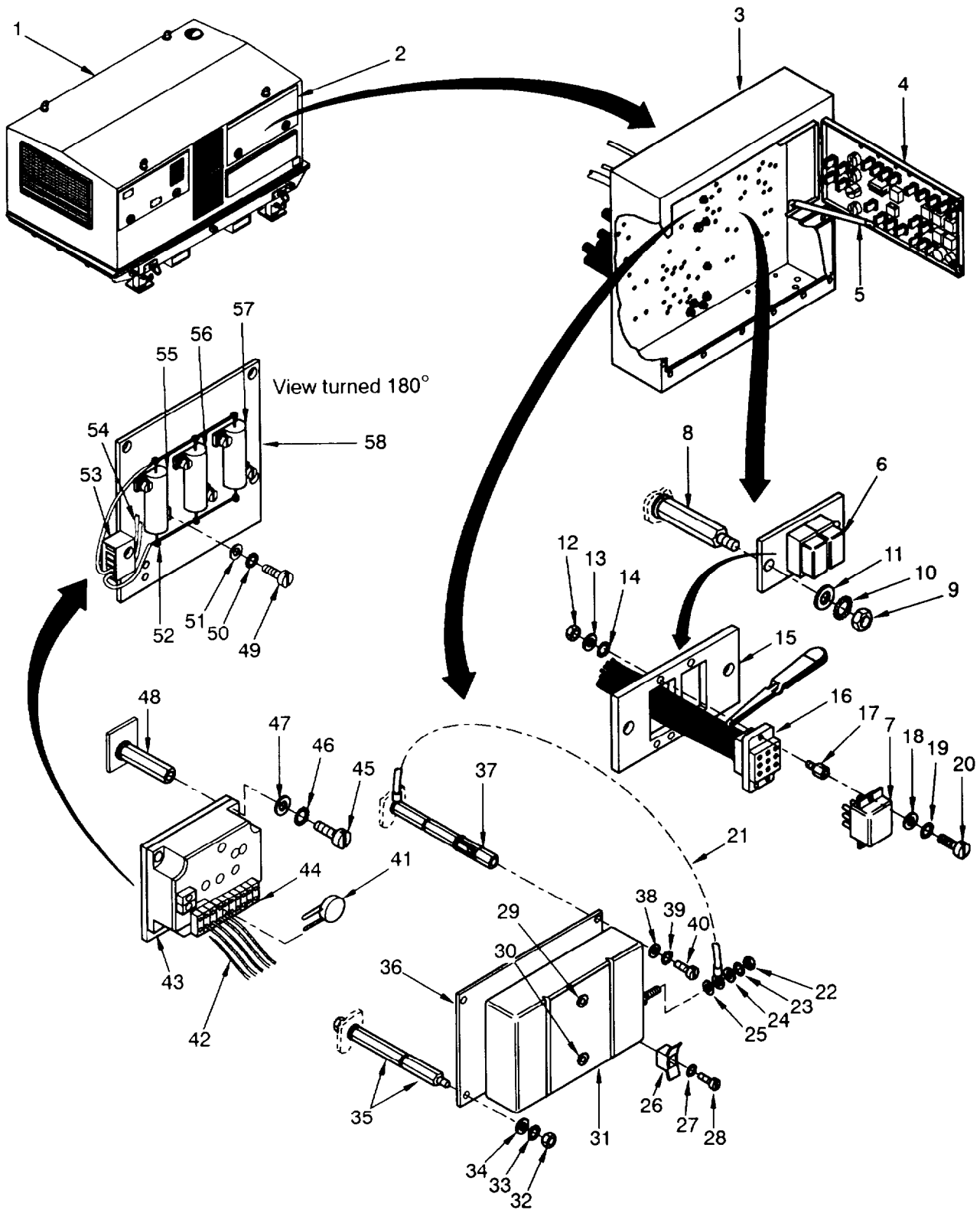


Figure 4-55 Control Cabinet Assembly, Relays K19, K20, Digital Isochronous Load Sharing Module N4, Speed Governor Assembly N1, Resistor Maintenance.

4.66 CONTACTOR K1 MAINTENANCE.

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP**Tools**

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut down,
paragraph 2.5.2

Materials/Parts

Cable ties (item 10, appendix E)
Double-sided Adhesive Tape
(item 20, appendix E)

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Open flap (2, figure 4-56) on unit hood assembly (1).
2. Open front panel (4) on control cabinet assembly (3) and secure with prop (5).
3. Remove eighteen screws (6), eighteen serrated lock washers (7), and eighteen washers (8) from panel (9).
4. Lower control cabinet connection panel (9) and prop.
5. Remove two nuts (11), two serrated lock washers (12), and two washers (13) from panel (10).
6. Remove two screws (15) two washers (14) and cover panel (10).
7. Record labeling and position of cables (31, 33, 35 and 37 to 39) and sensing cables (32, 34, 36).
8. Remove six nuts (30) and disconnect cables (31, 33, 35 and 37 to 39), six serrated lock washers (29), six washers (28) and six heat sinks (27) from terminals of load contactor K1 (20).
9. Remove sensing cables (32, 34, 36) from terminals of load contactor K1 (20).
10. Disconnect cables (40) from diode V6 (22) at terminals A1 and A2 by loosening screws (41, 42).
11. Remove four nuts (19), four serrated lock washers (18) and four washers (17).
12. Remove load contactor K1 (20) from bolts (16).

REPAIR

1. Replace 24 V coil:
 - a. Record labeling and position of cables to diode V6 (22) at terminals A1 and A2.
 - b. Disconnect cables (40) from diode V6 (22) at terminals A1 and A2 by loosening screws (41, 42).
 - c. Push down yellow locking lever (arrow, 21) and pull yoke (23) with coil (24) to the right out of load contactor K1 (20).
 - d. Remove defective coil (24) from yoke (23), insert new coil with same specifications, and push yoke (23) with coil (24) into load contactor K1 (20) until yellow locking lever (21) snaps into place.
 - e. Noting correct labeling and position, reconnect cables (40) to diode V6 (22) at terminals A1 and A2 and tighten screws (41, 42).
2. Replace auxiliary contactor:
 - a. Note correct labeling and position of all cables.
 - b. Disconnect all cables.
 - c. Disengage lock (25) by pushing toward front of contactor (26) and lift auxiliary contactor (26) upward off load contactor K1 (20).
 - d. Replace auxiliary contactor (26) (with same specifications) on load contactor K1 (20) and push down until lock (arrow, 25) snaps into place.
 - e. Noting correct labeling and position, reconnect all cables.
3. Replace diode V6:
 - a. Record labeling and position of cables (40) to diode V6 (22) at terminals A1 and A2.
 - b. Disconnect cables (40).
 - c. Pull Diode V6 (22) off double-sided adhesive tape on load contactor K1 (20).
 - d. Firmly seat diode V6 (22) on double-sided adhesive tape on load contactor K1 (20).
 - e. Noting correct labeling and position, reconnect cables (40) to Diode V6 (22) at terminals A1 and A2 and tighten screws (41, 42)

INSTALLATION

1. Place load contactor K1 (20) on bolts (16).
2. Install four washers (17), four serrated lock washers (18), and four nuts (19) on bolts (16).
3. Reconnect cables (40) to Diode V6 (22) at terminals A1 and A2 and tighten screws (41, 42).
4. Noting correct labeling and position, install heat sink (27) and sensing cables (32, 34, 36) to terminals of load contactor K1 (20).
5. Noting correct labeling and position, reconnect cables (31, 33, 35 and 37 to 39).

CAUTION

Tighten screws at terminals of contactor K1 with torque wrench to the value in table (item G.2, appendix G).

6. Install six serrated lock washers (29), six washers (28), and six nuts (30). Tighten nuts (30).

NOTE

Secure the left side of cover panel first.

7. Install cover panel (10) on control cabinet assembly (3) using two bolts (15) and two washers (14),
8. Install two washers (13), two serrated lock washers (12), and two nuts (11) on bolt (15), tighten nut (1).
9. Close control cabinet connector panel (9) and remove props.
10. Install eighteen bolts (6), eighteen serrated lock washers (7) and eighteen washers (8) on control cabinet assembly (3).
11. Stow prop (5) and close front panel (4).
12. Close flap (2).

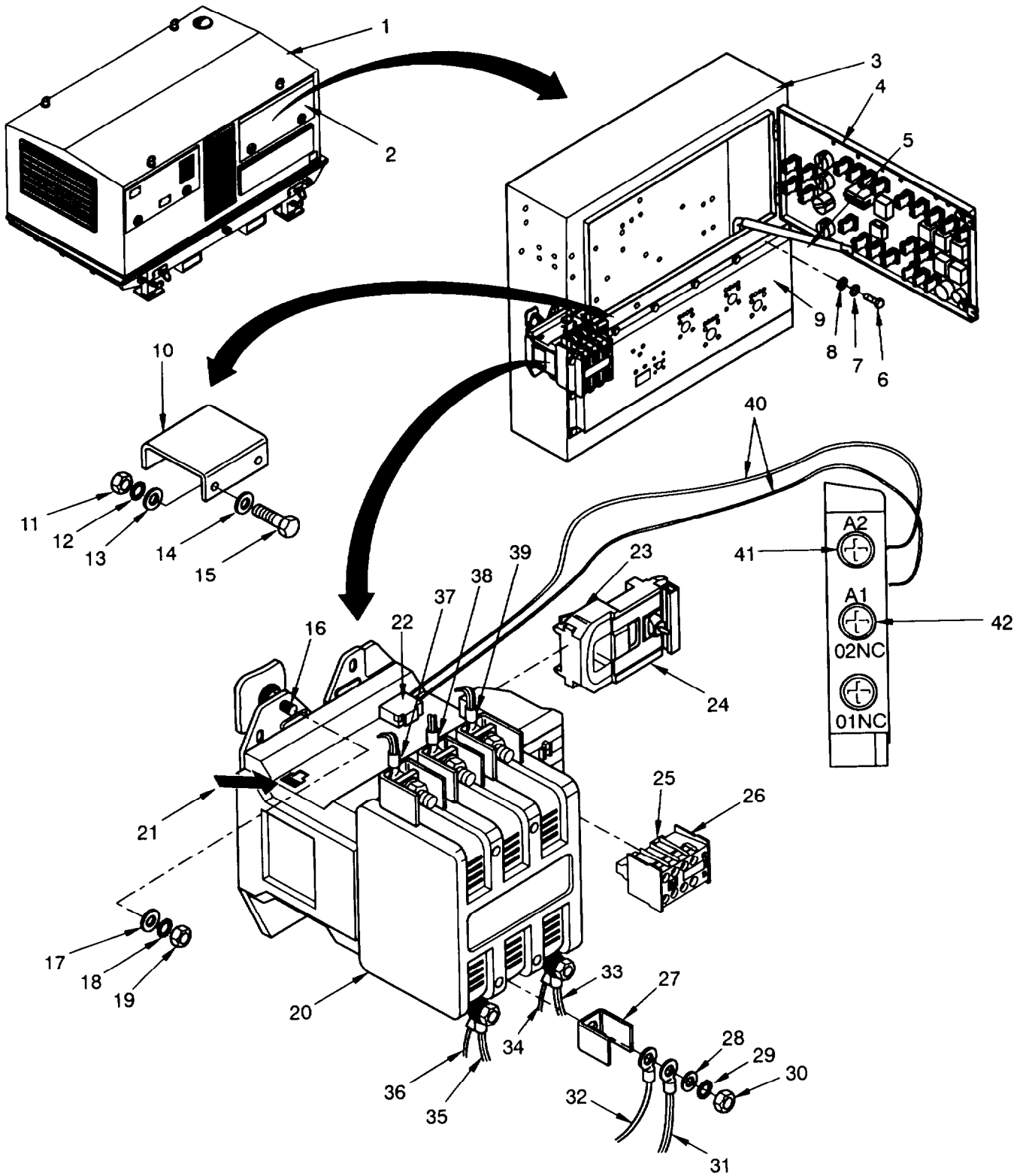


Figure 4-56 Control Cabinet Assembly, Contactor K1 Maintenance.

INSTALLATION

NOTE

Use new self-locking nuts when installing the engine preheating control board.

1. Place engine preheating control board in control cabinet (3) and install four new self-locking nuts (55) on bolts (56).
2. Noting correct labeling and position, install cables on terminal strip X101 (54).

CAUTION

Tighten nut on threaded pin with torque wrench to torque values in table (item G.2, appendix G).

3. Install washer (16), grounding strap (15), washer (14), serrated lock washer (13) and new nut (12) on threaded pin (17). Torque nut (12)
4. Close cable conduit next to terminal strip X101 (54).
5. Install cover (11) using two screws (9) and two washers (10).
6. Install two washers (6), two serrated lock washers (7) and tighten two nuts (8).
7. Stow prop (5) and close front panel (4).
8. Close flap (2).

2. Circuit breaker assembly F102 (42) and F103 (41):

NOTE

Removal procedure for circuit breaker assembly F102 (42) is the same as for circuit breaker F103 (41), described below.

- a. Open flap (2, figure 4-57) on unit hood assembly (1).
- b. Open front panel (4) of control cabinet assembly (3) and secure with prop (5).
- c. Open cable conduit (40) and cable conduit (43).
- d. Record labeling and position of cables (18, 20, 32) to upper terminals (19, 21, 31) of circuit breaker assembly parts (24, 39), loosen screws (22, 34) and remove cables.
- e. Record labeling and position of cables (27, 29, 36) to lower terminals (26, 28, 37) of circuit breaker assembly parts (24, 39), loosen screws (26, 38) and remove cables.
- f. Use a screwdriver to push locking element (35) on circuit breaker assembly part (39) in direction of arrow, tilt circuit breaker assembly parts (24, 39), and remove from mounting bar (53).
- g. Separate circuit breaker (39) from auxiliary switch (24):
Lift upper locking clip (23) and lower locking clip (30) with screwdriver.
Pull circuit breaker (39) and auxiliary switch (24) apart.

INSTALLATION

1. Circuit breaker F101 (46):
 - a. Hook top (52) of circuit breaker F101 (46) into mounting bar (53) and push in at the bottom.
 - b. Noting correct labeling and position, install cables (50) to lower terminal (49) of circuit breaker F101 (46) and tighten screw (48).
 - c. Noting correct labeling and position, install cables (44) to upper terminal (45) of circuit breaker F101 (46) and tighten screw (47).
 - d. Close cable conduit (40) and cable conduit (43).
 - e. Stow prop (5) and close front panel (4).
 - f. Close flap (2).

2. Circuit breaker assembly F102 (42) and F103 (41):

NOTE

Installation procedure for circuit breaker assembly F102 is the same as for circuit breaker F103, described below.

- a. Assemble circuit breaker assembly parts (39) and auxiliary switch (24) by placing circuit breaker (39) and auxiliary switch (24) together.
- b. Use a screwdriver to push down upper locking clip (23) and lower locking clip (30) until they snap into place.
- c. Hook top (33) of circuit breaker assembly parts (24, 39) into mounting bar (53) and push in at the bottom.
- d. Noting correct labeling and position, install cables (27, 29, 36) to lower terminals (26, 28, 37) of circuit breaker assembly parts (24, 39).
- e. Noting correct labeling and position, install cables (18, 20, 32) to upper terminals (19, 21, 31) of circuit breaker assembly parts (24, 39).
- f. Close cable conduit (40) and cable conduit (43).
- g. Stow prop (5) and close front panel (4).
- h. Close flap (2).

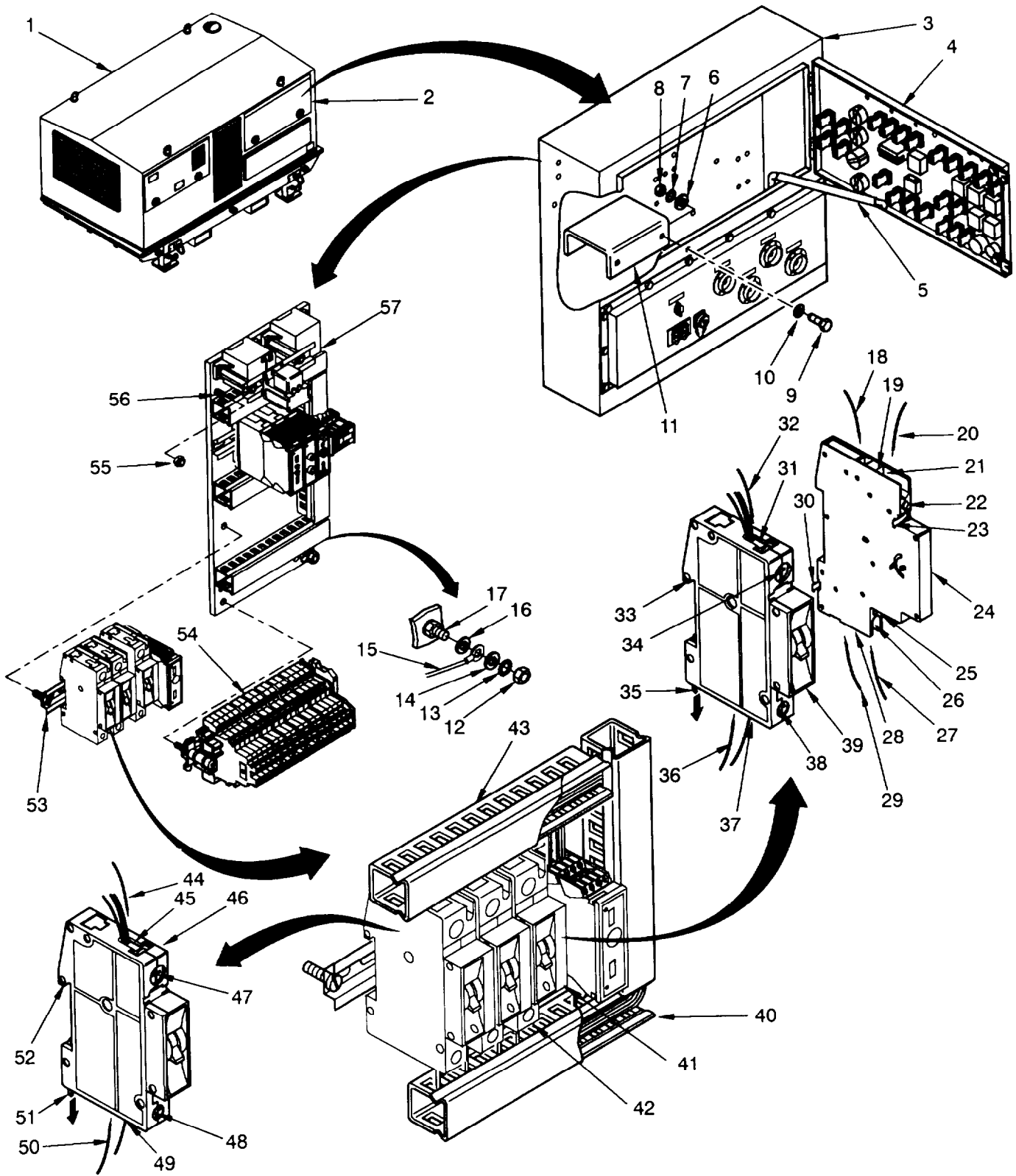


Figure 4-57 Control Cabinet Assembly, Engine Preheating Control Board, Circuit Breaker Maintenance.

CAUTION

Use only removal tool to push out contact bushings.

- a. Insert removal tool into contact bushing from the front, and push contact bushing with cable out of connector J9 (15).

INSTALLATION

1. Install contact bushings:

CAUTION

Use only installation tool to insert contact bushings.

- a. Place installation tool over cable (10) and insert contact bushing into contact carrier of connector J9 (15) from behind.
2. Screw protective cap (16) on connector J9 (15).
3. Install connector J9 (15), protective cap (16) and seal (14) control cabinet connection panel (9).
4. Install screws (18) and washer (17) on control cabinet connection panel (9).
5. Install washers (13), serrated lock washers (12), and nuts (11) on screws (18).
6. Install cover (43) on spacer (41) and secure using two nuts (42). Tighten nuts (41).
7. Stow prop (5) and close front panel (4).
8. To install unit hood assembly refer to paragraph 4.14.

INSTALLATION

1. Insert J1/120 V 400 Hz double receptacle (26), with two screws (22), into front of control cabinet connection panel (9).
2. Install two washers (23), two serrated lock washers (24) and two nuts (25) on two screws (22). Tighten nuts (25).
3. Using screws (30) connect cable (27, 29) and varistor R9 (28) to terminals of J1/120 V 400 Hz double receptacle (26).
4. Put seal (21) and cover (19) in place and install and tighten screw (20).
5. Install cover (43) on spacer (41) and secure with two nuts (42).
6. Stow prop (5) and close front panel (4).
7. To install unit hood assembly refer to paragraph 4.14.

INSTALLATION

CAUTION

Tighten nuts on threaded pin with torque wrench to torque values indicated in table (item G.2, appendix G).

1. Install ground terminal of varistor R8 (35), washer (38), serrated lock washer (39), and nut (40) on threaded pin (36). Torque nut (40).
2. Insert J2/24 V connector receptacle (31) and sealing ring (33) into front of control cabinet connection panel (9).
3. Install nut (37) onto J2/24 V connector receptacle (31).
4. Connect cable (34) and varistor R8 (32) to terminal (32) of J2/24 V connector receptacle (31).
5. Stow prop (5) and close front panel (4).
6. To install unit hood assembly refer to paragraph 4.14.

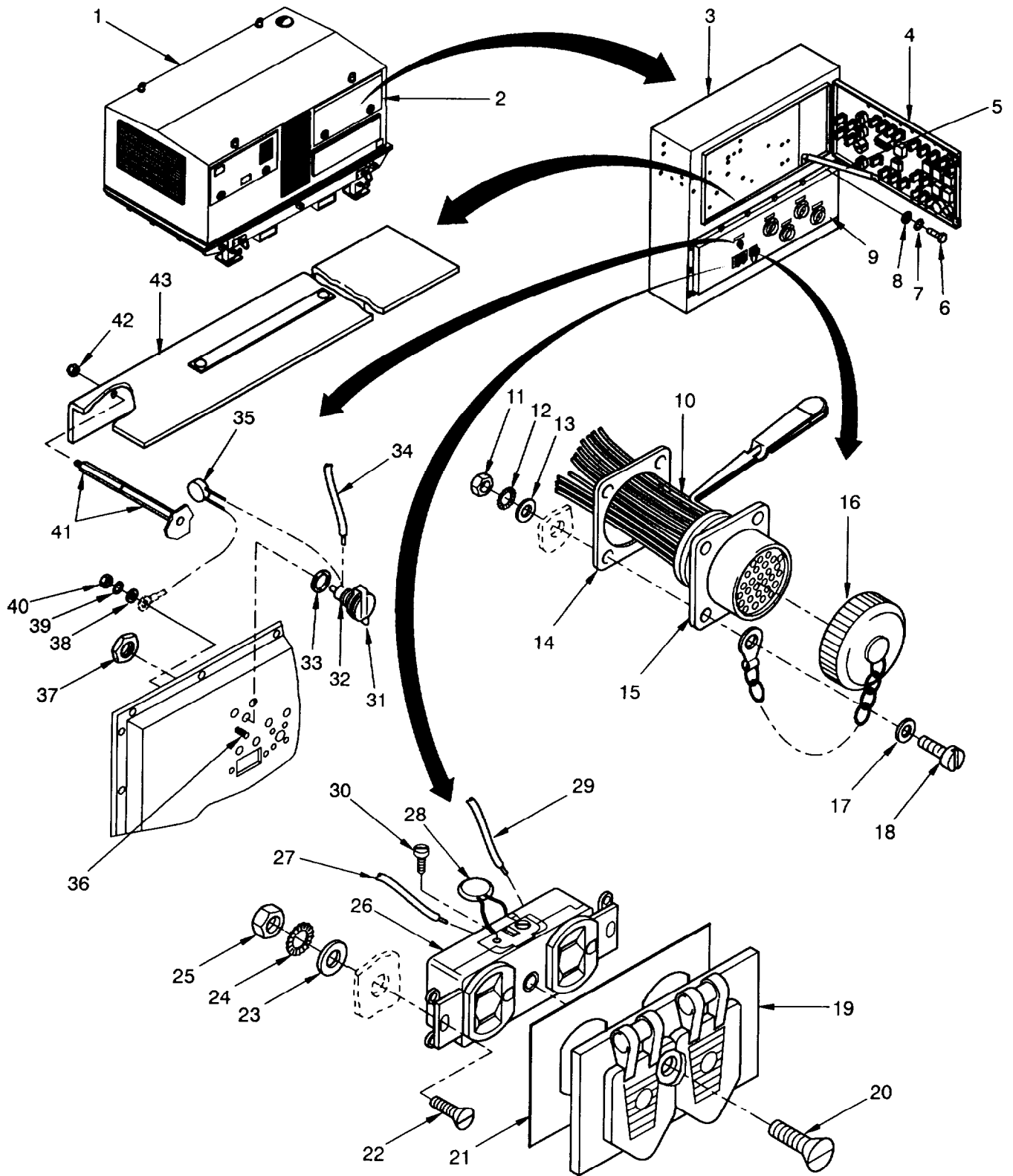
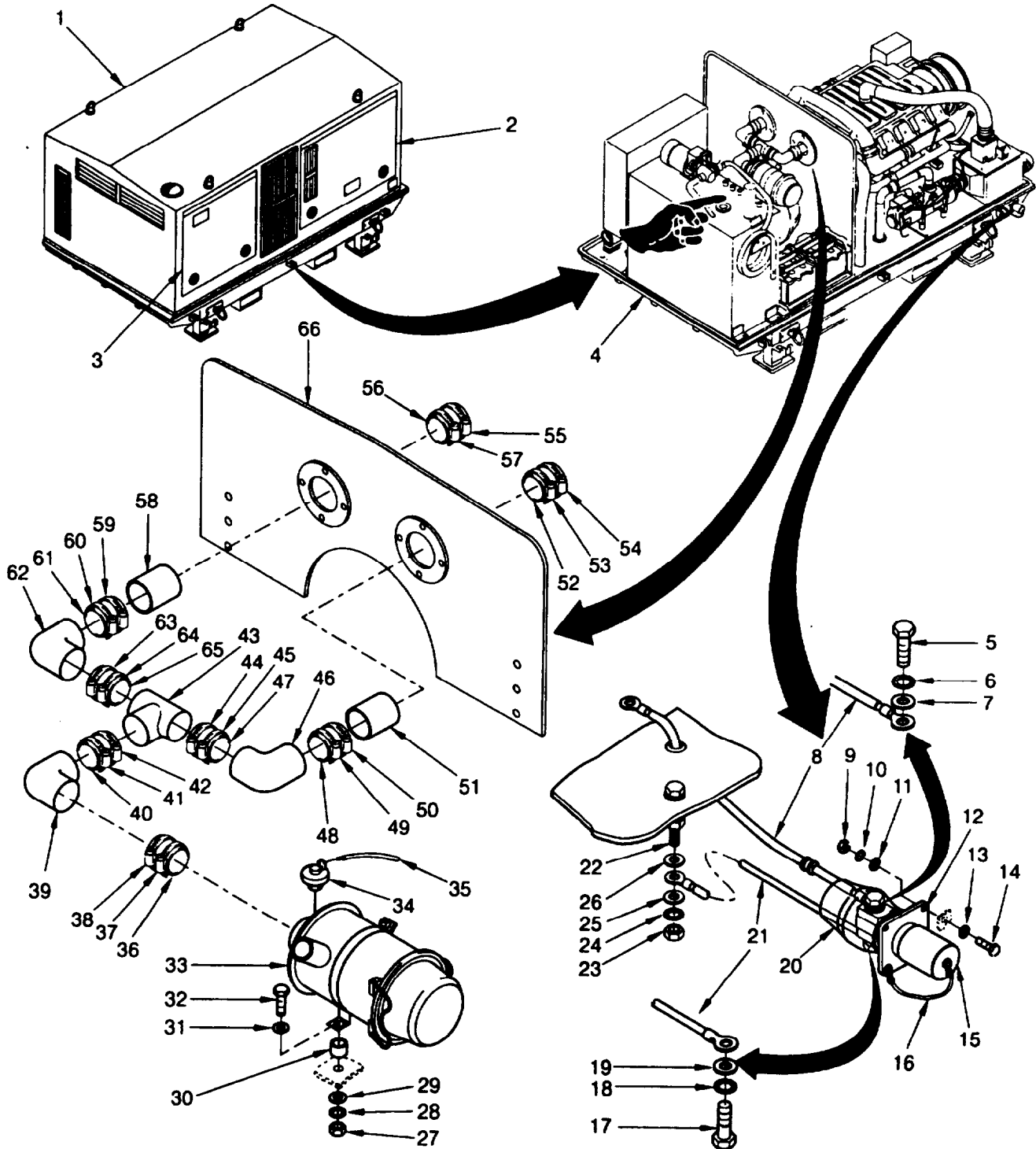


Figure 4-58 Control Cabinet Assembly, Connection Panel, Connector Maintenance.



MD618417

Figure 4-59. Air Filter Assembly, J3 Slave Receptacle 24 V Connector Maintenance.

4.74 BATTERY SET MAINTENANCE.

This task covers: a. Removal b. Test c. Installation

INITIAL SETUP**Tools**

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down,
paragraph 2.5.2

WARNING

Before removing the batteries, disconnect first the negative terminal and then the positive terminal of the battery set. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Open flap (3, figure 4-60) on unit hood assembly (1).
2. Remove terminal cover cap (25).
3. Loosen nut (27) on terminal connector of negative terminal and remove terminal connector with battery cable (26).
4. Remove terminal cover cap (28).
5. Loosen nut (30) on terminal connector of positive terminal and remove terminal connector with battery cable (29).
6. Loosen nuts (42) on clamping device (41) and swing clamping device (41) aside.
7. Remove upper part (37) of battery set holder from batteries (38, 39).
8. Remove terminal cover caps (31, 32).
9. Loosen nut (35) at terminal connector of positive terminal of battery (39) and nut (34) at terminal connector of negative terminal of battery (38) and remove battery cable (33).
10. Grasp batteries (38, 39) individually by lifting handles (36) and lift out of lower part (40) of battery set holder.

TEST

1. Measure no load voltage U_o :
 - a. Switch off load resistors of lead battery tester.
 - b. Apply test probes with correct polarity to terminals (+ and -) of battery (38, 39).
 - c. Read off no load voltage U_o value displayed on lead battery tester.

NOTE

- **if no load voltage $U_o < 12.5$ V, charge battery with charger vi J3 slave receptacle 24 V Connector.**
- **if the battery gets very hot during charging, It is defective and must be replaced.**
- **When no load voltage $U_o \geq 12.5$ V, measure load voltage U_B .**

2. Measure load voltage U_B :
 - a. On the lead battery tester, activate the number of load resistors required for the particular type of battery.
 - b. Apply test probes with correct polarity to terminals (+ and -) of battery (38, 39).
 - c. Read off load voltage U_B value displayed on lead battery tester.

NOTE

- **if load voltage $U_B > 10.0$ V, battery is at least 40% charged, and its high current load capability is sufficient for starting.**
- **if load voltage $U_B \leq 10.0$ V, charge battery with charger via J3 slave receptacle 24 Connector.**

INSTALLATION

1. Using lifting handles (36), insert batteries (38, 39) individually into lower part (40) of battery set holder.
2. Install terminal connector of battery cable (33) on negative terminal of battery (38) and tighten nut (34)
3. Install terminal connector of battery cable (33) on positive terminal of battery (39) and tighten nut (35).
4. Install terminal cover caps (31, 32).
5. Place upper part (37) of battery set holder on batteries (38, 39).
6. Swing clamping device (41) into place, hook into upper part (37) of battery set holder, and tighten screws (42).

WARNING

Attach the positive terminal of the battery set first, then the negative terminal.

7. Install terminal connector of battery cable (26) on positive terminal of battery (38) and tighten nut (27).
8. Install terminal connector of battery cable (29) on negative terminal of battery (39) and tighten nut (30) .
9. Install terminal cover caps (31, 32).
10. Close flap (3).

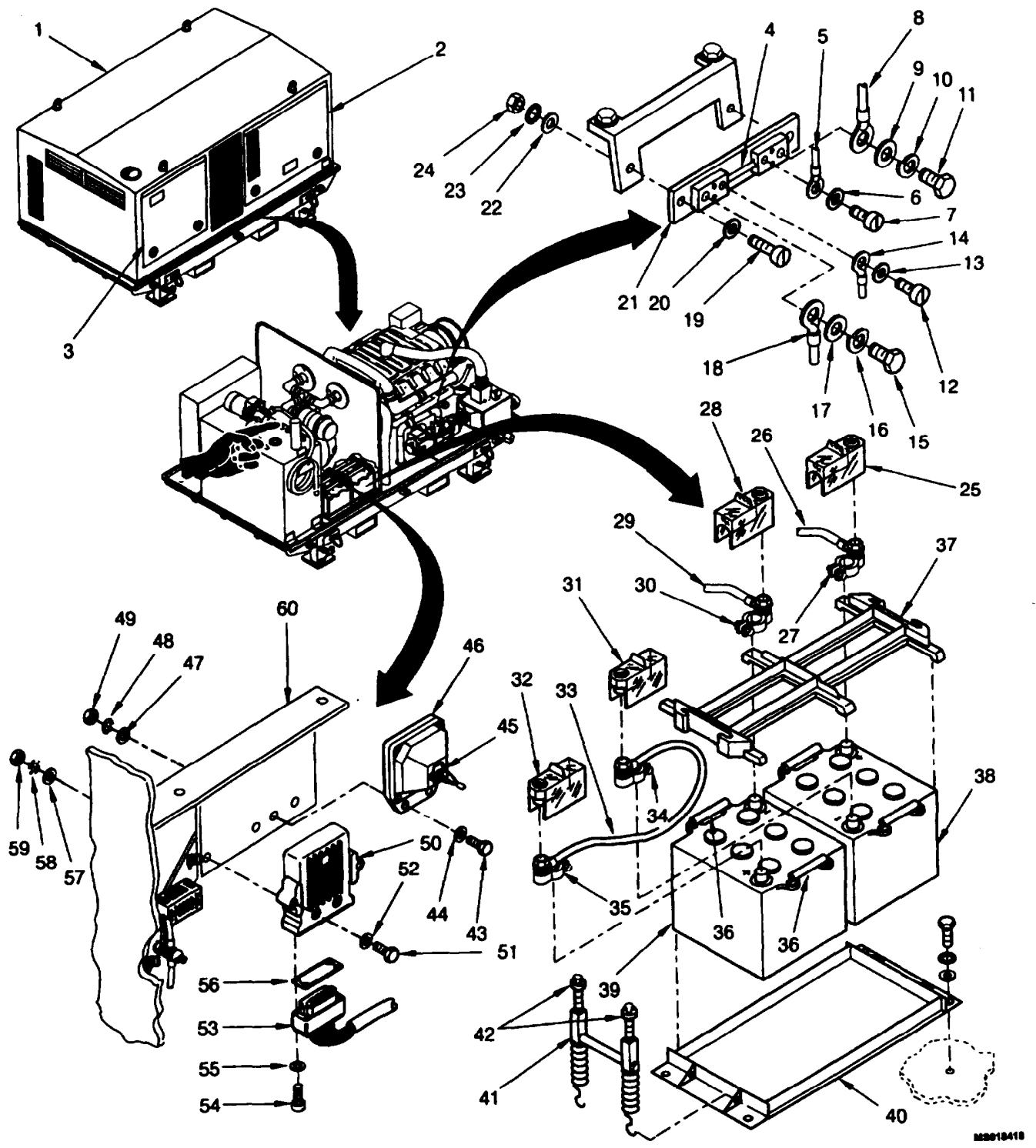


Figure 4-60. Shunt Resistor R11, EHG Regulator N7, Generator Regulator N6, Battery Set Maintenance.

CAUTION

To prevent contamination, install plastic bags on all fuel supply and return lines removed from fuel tank and all ports on the tank and secure the bags with rubber bands.

NOTE

Provide a suitable container to hold the drained fuel, maximum 101.7 gallons (385 liters).

REMOVAL

1. Remove unit hood assembly (1, figure 4-61) as instructed in paragraph 4.14.
2. Deleted.
3. Insert fuel hose assembly (38) into filler neck (33) of fuel tank (49) slowly until it hits the bottom of the tank.
4. Loosen damp (53) and remove fuel hose (52) from delivery side of electrical fuel pump (60); leave fuel hose (52) with clamp (53) on fuel tank (49).

CAUTION

Provide a suitable fuel hose for pumping out the fuel.

5. Connect fuel hose (52) to delivery side of electrical fuel pump (60).
6. Switch on electrical fuel pump (60) with FUEL TANK PROP ON switch on control cabinet assembly.
7. Extract as much fuel as possible, then switch off electrical fuel pump (60) with FUEL TANK PUMP OFF switch on control cabinet assembly.

NOTE

Provide a suitable container for the remaining fuel.

8. Place a suitable container under bottom plate of base frame (2), remove drain plug (47), and sealing ring (48). Allow remaining fuel to flow out of fuel tank (49) into container.

CAUTION

Use a new sealing ring.

9. Place a new sealing ring (48) and drain plug (47) on fuel tank (49).
10. Remove electrical fuel pump (60) as instructed in paragraph 4.78.

CAUTION

Tag fuel lines before removing them noting position for proper installation.

11. Remove hollow screw (3), sealing ring (4), fuel return line (5), sealing ring (6), nipple (7), and sealing ring (8). Discard sealing rings (4, 6 and 8).

12. Remove hollow screw (14), sealing ring (13), fuel leakage line (12), sealing ring (11), nipple (10), and sealing ring (9). Discard sealing rings (9, 11 and 13).
13. Remove hollow screw (15), sealing ring (16), fuel supply line (17), sealing ring (18), immersion tube adapter (19), and sealing ring (20). Discard sealing rings (16, 18 and 20).
14. Remove hollow screw (26), sealing ring (25), fuel return line (24), sealing ring (23), nipple (22), and sealing ring (21). Discard sealing rings (21, 23 and 25).
15. Remove hollow screw (27), sealing ring (28), fuel supply line (29), sealing ring (30), immersion tube adapter (31), and sealing ring (32). Discard sealing rings (28, 30 and 32).
16. Remove air filter as instructed in paragraph 5.27.
17. Remove battery charging alternator regulator N6 as instructed in paragraph 4.75.
18. Remove EHG regulator N7 as instructed in paragraph 4.76.
19. Record labeling and position of cables and disconnect cables from terminal strip 2X50 (10, figure 4-62) and grounding cables (12, 13 and 22).
20. Remove plug connector 2J2 (61, figure 4-61) from electrical fuel pump (60).
21. Remove fuel level sensor (54) as instructed in paragraph 4.81.
22. Remove rubber sealing strip (50) from fuel tank (49).
23. Remove upper fuel level switch (36) and lower fuel level switch (37) as instructed in paragraph 4.79 and 4.80.
24. Remove seven screws (45), seven serrated lock washers (44), and seven washers (43).
25. Remove screw (41), serrated lock washer (40, and washer (39).
26. Place sling around fuel tank (49) and attach to lifting device.

WARNING

This procedure requires the aid of an assistant. Stay clear of the suspended load. Failure to observe this warning could result in severe personal injury or death.

27. Lift fuel tank (49) off base frame (2) and place on a flat surface or support blocks.
28. Remove serrated lock washer (42) from base frame (2).

INSTALLATION

1. Place sling around fuel tank (49) and attach to lifting device.
2. Lift fuel tank (49) off the flat surface or support blocks, and position over base frame (2).

CAUTION

Provide a ground connectton between the fuel tank and the base frame.

3. Install serrated lock washer (42) on base frame (2).
4. Lower fuel tank (49) onto base frame (2).
5. Remove sling from lifting device and fuel tank (49).
6. Install screw (41), serrated lock washer (40, and washer (39).

7. Install seven screws (45), seven serrated lock washers (44). and seven washers (43).

NOTE

Apply Hylomar to seating surfaces of fuel level switches (38, 37).

8. Install upper fuel level switch (36) and lower fuel level switch (37) as instructed in paragraph 4.79 and 4.80.
9. Noting correct labeling and position, install cables to terminal strip 2X50, (10, figure 4-62).
10. Install rubber sealing strip (50, figure 4-61) on fuel tank (49).
11. Install fuel level sensors (54) as instructed in paragraph 4.76.
12. Install plug connector 2J2 (61) on electrical fuel pump (60).
13. Install EHG regulator N7 as instructed in paragraph 4.76.
14. Install battery charging alternator regulator N6 as instructed in paragraph 4.75.
15. Install air filter as instructed in paragraph 5.27.

CAUTION

- Collect any fuel that leaks out.
- Apply Loctite 243 to nipples and immersion tubes when inserting.
- Reinstall fuel lines as tagged during removal.
- **Wall new sealing rings.**

16. Install nipple (7) and new sealing ring (8).
17. Install hollow screw (3), new sealing ring (4), fuel return line (5), new sealing ring (6), nipple (10), and sealing ring (9).
18. Install hollow screw (14), new sealing ring (13), fuel leakage line (12), new sealing ring (11), immersion tube adapter (19), new sealing ring (20).
19. Install hollow screw (15), new sealing ring (16), fuel supply line (17), new sealing ring (18), nipple (22), new sealing ring (20).
20. Install hollow screw (26), new sealing ring (25), fuel return line (24), new sealing ring (23), immersion tube adapter (31), new sealing ring (32).
21. Install hollow screw (27), new sealing ring (28), fuel supply line (29), new sealing ring (30).
22. Using cable ties bundle fuel lines as shown in figure 4-62.
23. Remove fuel hose from delivery side of fuel pump (60).
24. Slide fuel hose (52) onto delivery side of fuel pump (66) and tighten damp (53).
25. Slowly remove fuel hose (38) out of filler neck (33) and hang on bracket (46).
26. Install electrical fuel pump (60) as instructed in paragraph 4.78.
- 27. Install unit hood assembly (1) as instructed in paragraph 4.14.

4.78 ELECTRICAL FUEL PUMP ASSEMBLY MAINTENANCE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down,
paragraph 2.5.2

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

WARNING

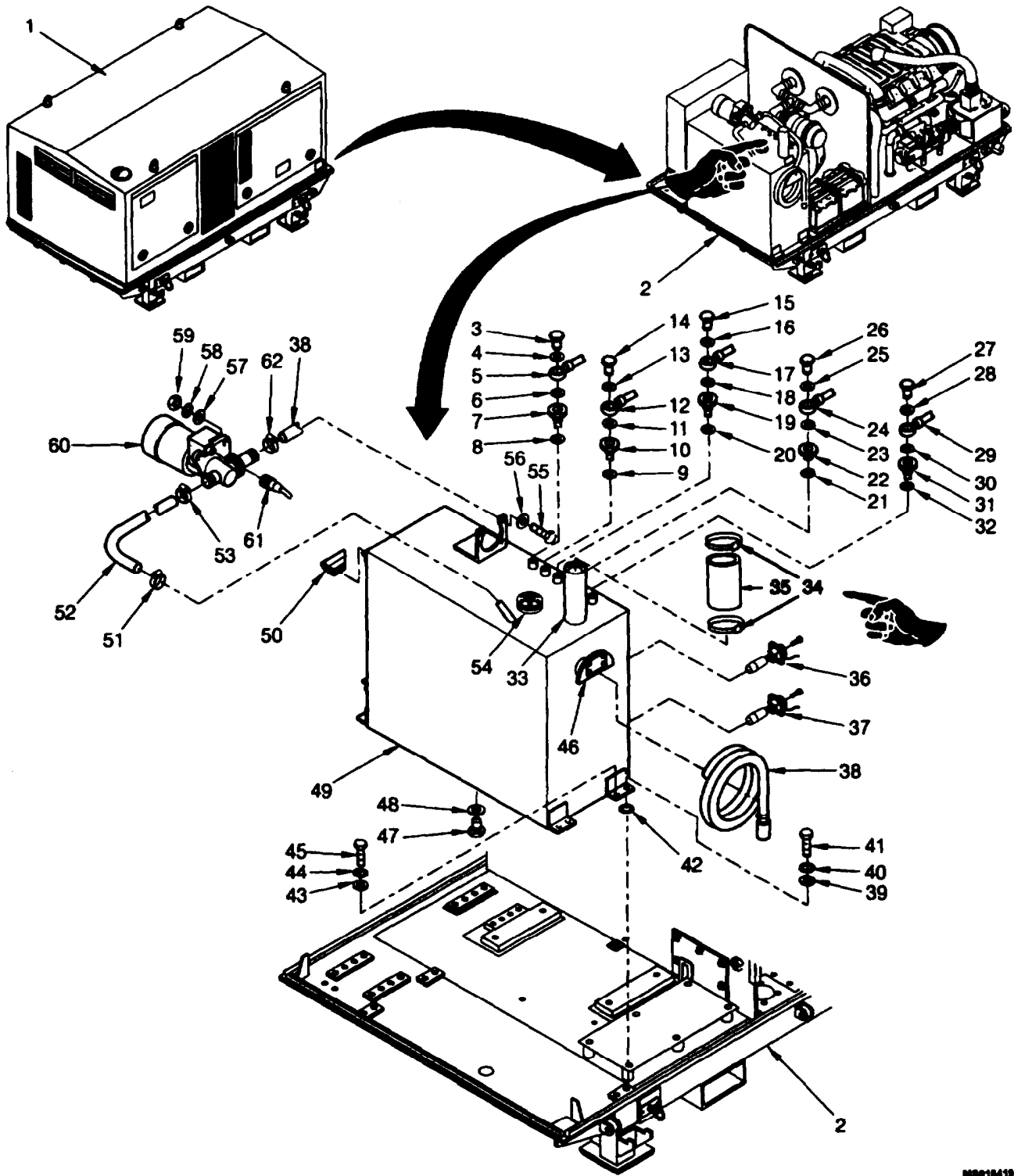
The fuel in this Generator Set 150 KW is highly explosive. Do not smoke or use open flame when performing maintenance. Fire and explosion could occur, resulting in severe personal injury or death.

REMOVAL

1. Remove unit hood assembly (1, figure 4-61) as instructed in paragraph 4.14.
2. Remove plug connector 2J2 (61) from electrical fuel pump (60).
3. Loosen damp (62) and remove fuel hose (38).
4. Loosen clamp (53) and remove fuel hose (52).
5. Remove three nuts (59), three serrated lock washers (58), three washers (57), three screws (55), three washers (56), and electrical fuel pump (60) from mount.

INSTALLATION

1. Install electrical fuel pump (60) on mount using three screws (55), three washers (56), three washers (57), three serrated lock washers (58), and three nuts (59). Tighten nuts (59).
2. Install fuel hose (38) and tighten damp (62).
3. Install fuel hose (52) and tighten damp (53).
4. Install plug connector 2J2 (61) on electrical fuel pump (60).
5. Install unit hood assembly (1) as instructed in paragraph 4.14.



MSB10419

Figure 4-61. Fuel Tank Assembly, Electrical Fuel Pump Maintenance.

NOTE

If upper switch is to be changed, fuel should be drained to a level below the half way point of the tank.

2. Drain fuel tank (36) as instructed in paragraph 4.77.
3. Cut cable ties (37, 38) on the fuel and return lines.
4. Tag location of blue cable on terminal strip 2X50 (10), disconnect blue cable from terminal strip 2X50 (10), terminal 16, and cut bushing from blue cable.
5. Remove nut (18) from grounding stud (24) with serrated lock washer (19), washer (20), and cable lug (21) with grounding cable (11).
6. Remove cable lug (22) with grounding cables (12 to 17), and washer (23) from grounding stud (24).

NOTE

Brown cables (12,13) are from the upper and lower fuel level switches respectively. Care must be taken to cut only the proper cable when changing either fuel level switch.

7. Cut off brown cable (12 or 13) from cable lug (22).
8. Remove four screws (3) and upper fuel level switch (2) from fuel tank (36).
9. Remove protective covering (5).

INSTALLATION

1. Using a fish wire and adhesive tape, install protective covering (5) on cable of upper fuel level switch (2).

NOTE

Apply Hylomar to seating surface of fuel level switch prior to installation.

2. Install fuel level switch (2) on fuel tank (36) and secure upper fuel level switch (2) with four screws (3).
3. Cut all grounding cables (12 or 13 and 14 to 17) from cable lug (22).
4. Install new cable lug (22), 0,16 square inch with 0,2 inch hole (10 mm² with 5 mm hole), on grounding cables (12 to 17).
5. Install washer (23), cable lug (22) with grounding cables (12 to 17), cable lug (21) with grounding cable (11) on grounding stud (24) and secure with washer (20), serrated lock washer (19), and nut (18) on grounding stud (24).
6. Install new cable bushing on blue cable and install blue cable into marked space in terminal strip 2X50 (10), terminal 16.
7. Install new cable ties (37, 38) on fuel lines and protective coverings.
8. Reconnect battery as instructed in paragraph 4.74.
9. Install unit hood assembly (1) as instructed in paragraph 4.14.

NOTE

If upper fuel level switch is to be changed, fuel should be drained to a level below the half way point of the tank.

2. Drain fuel tank (36) as instructed in paragraph 4.77.
3. Cut cable ties (37, 38) on the fuel and return lines.
4. Tag location of blue cable on terminal strip 2X50 (10), disconnect blue cable from terminal strip 2X50 (10), terminal 15, and cut bushing from blue cable.
5. Remove nut (18) from grounding stud (24) with serrated lock washer (19), washer (20), and cable lug (21) with grounding cable (11).
6. Remove cable lug (22) with grounding cables (12 to 17), and washer (23) from grounding stud (24).

NOTE

Brown cables (12,13) are from the upper and lower fuel level switches respectively. Care must be taken to cut only the proper cable when changing either fuel level switch.

7. Cut brown cable (12 or 13) from cable lug (22).
8. Remove four screws (7) and remove fuel level switch (6) from fuel tank (36).
9. Remove protective covering (9) from cable of switch (6).

INSTALLATION

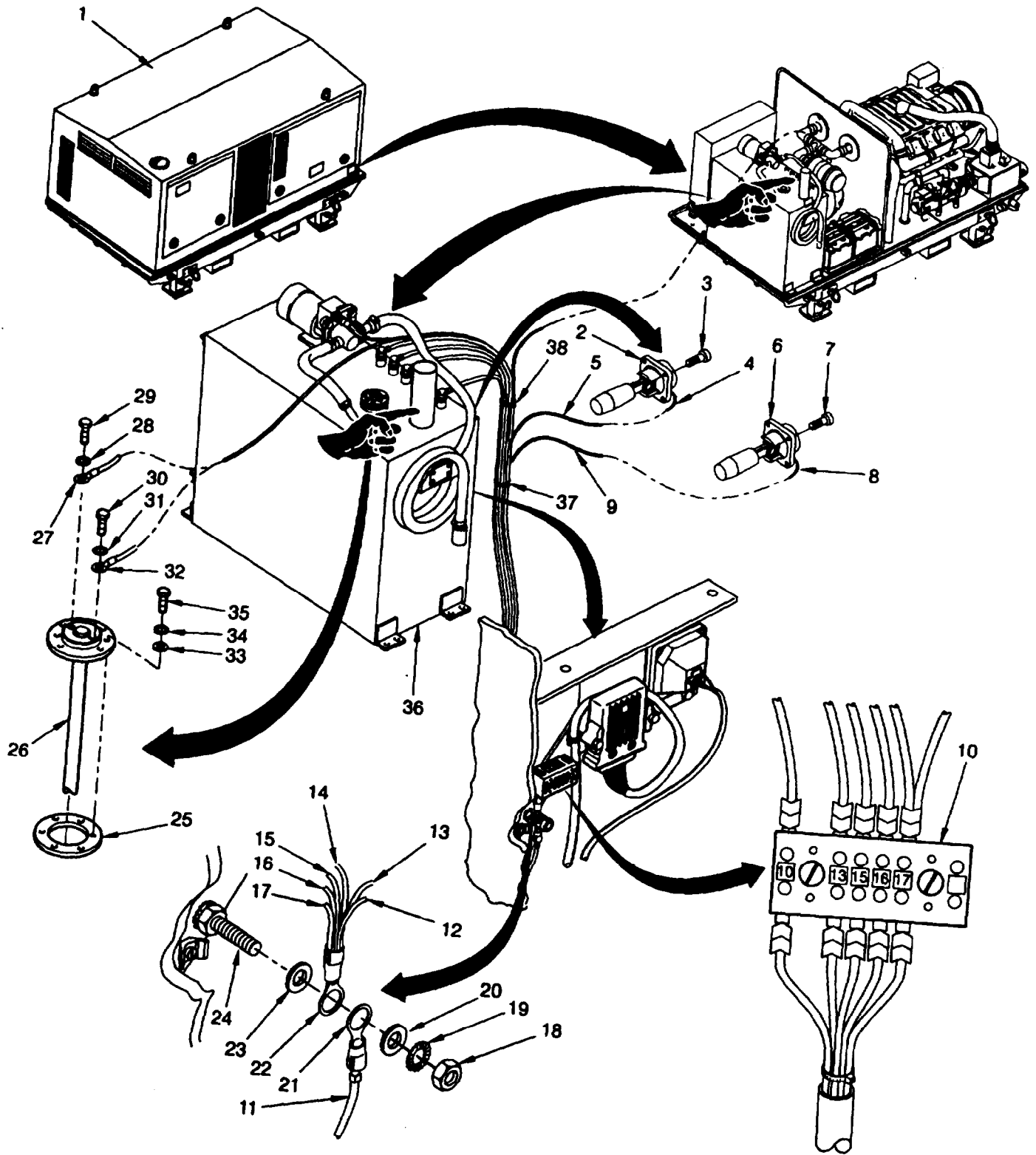
1. Using a fish wire and adhesive tape install protective covering (9) on cable of lower fuel level switch (6).

NOTE

Apply Hylomar to seating surface of fuel level switch prior to installation.

2. Cut all grounding cables (12 or 13 and 14 to 17) from cable lug (22).
3. Install new cable lug (22), 0,16 square inch with 0,2 inch hole (10 mm² with 5 mm hole), on grounding cables (12 to 17).
4. Install fuel level switch (6) and secure with four screws (7).
5. Install washer (23), cable lug (22) with grounding cables (12 to 17), and cable lug (21) with grounding cable (11) on grounding stud (24).
6. Install new cable bushing on blue cable and install blue cable into marked space in terminal strip 2X50 (10), terminal 15.
7. Install new cable ties (37, 38) on fuel lines and protective covering.
8. Reconnect battery as instructed in paragraph 4.74.
9. Install unit hood assembly (1) as instructed in paragraph 4.14.

2. Noting correct labeling and position, install cable (27), serrated lock washer (28), and screw (29) to fuel level sensor 2R4 (26), and tighten screw (29).
3. Noting correct labeling and position, install cable (32), serrated lock washer (31), and screw (30) to fuel level sensor 2R4 (26), and tighten screw (30).
4. Install unit hood assembly (1) as instructed in paragraph 4.14.



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Figure 4-62. Fuel level Switch and Sensor Maintenance.

4.82 SILENCER ASSEMBLY, LEFT SIDE MAINTENANCE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down,
paragraph 2.5.2

Materials/Parts

Heat shielding tape (Hesiflex, white, 020.05.003)
(item 18, appendix E)

Personnel Required

Three

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

REMOVAL

1. Remove unit hood assembly (1, figure 4-63) as instructed in paragraph 4.14.

WARNING

- When Generator Set 150 kW is supported, secure to prevent tipping.
 - When working on silencer assembly, allow to cool first or wear gloves.
 - To work on underside of base frame, support Generator Set 150 kW on stands.
 - Provide at least 19.7 inches (50 cm) of working space.
2. Raise Generator Set 150 kW:
 - a. Attach cables to lifting device and ring bolts (3) on base frame (2) and lift Generator Set 150 kW onto supports.
 3. Remove silencer assembly, left side.

WARNING

This task requires three persons: some parts weigh up to 66.15 pounds (30 kg).

CAUTION

Using a suitable device support the silencer during removal.

- a. Remove four nuts (33) and four serrated lock washers (32) while holding four screws (29).
 - b. Remove screws (29) from flange and bottom plate of base frame (2).
 - c. Remove nut (4), serrated lock washer (5), and washer (6).
 - d. Remove nut (13), serrated lock washer (14), washer (15), and connector pipe (22) and elbow (28), fasteners (7 to 12, 16 to 21, 23, 24, 26, 27) and seal (30).
 - e. Remove silencer assembly (25) from base frame (2).
4. Remove connector pipes and brackets:
 - a. Remove washer (7) and nut (8) from holder (9).
 - b. Hold screw (27) and remove nut (12), serrated lock washer (11), washer (10), nut (8), and holder (9).
 - c. Remove screw (27) and washer (26).
 - d. Pull elbow (28) off silencer (25).
 - e. Remove washer (16) and nut (17) from holder (18).
 - f. Hold screw (24) and remove nut (19) serrated lock washer (20), washer (21) nut (17) and holder (18).
 - g. Remove screw (24) and washer (23).
 - h. Remove endpipe (22) from silencer (25).
 5. Remove exhaust pipe with header:
 - a. Loosen locknuts, turn screws on heat shield above header at turbocharger outlet a few turns, push angle bracket to one side and loosen heat shield.
 - b. Remove four nuts (40) and four washers (39).
 - c. Remove exhaust pipe with header (34) from turbocharger outlet.
 - d. Remove gasket (35) and discard.

CAUTION

Close off turbocharger outlet with cover.

6. Remove heat shielding tape (37) from exhaust pipe with header (34):
 - a. Remove clamps (36, 38) from exhaust pipe with header (34) and set aside for re-use.

- b. Unwrap heat shielding tape (37) from exhaust pipe with header (34).

INSTALLATION

WARNING

This task requires three persons: some parts weigh up to 66.15 pounds (30 kg).

1. Apply heat shielding tape (37) to exhaust pipe with header (34):
 - a. Wrap heat shielding tape (37) over exhaust pipe with header (34) with overlapping turns, starting from the header.
 - b. Secure heat shielding tape (37) with clamps (36, 38).
2. Install exhaust pipe with header (34):

CAUTION

Remove cover from turbocharger outlet.

NOTE

Use new gaskets.

- a. Install new gasket (35) on turbocharger outlet and press on exhaust pipe with header (34).
- b. Install screws (29) between bottom plate of base frame (2) and exhaust pipe with header (34).
- c. Install four washers (39) and four nuts (40) on threaded pins and tighten four nuts (40).
- d. Position heat shield and angle bracket over header, and tighten heat shield screws and locknuts.
3. Install connector pipes and brackets:
 - a. Install endpipe (22) on silencer (25).
 - b. Install screw (24) and washer (23) through clamp and put holder (18) in place.
 - c. Install washer (21), serrated lock washer (20), and nut (19). Tighten nut (19).
 - d. Install elbow (28) onto silencer (25).
 - e. Install screw (27) and washer (26) through clamp and put holder (9) in place.
 - f. Install washer (10) and serrated lock washer (11) and nut (12). Tighten nut (12).
4. Install silencer assembly, left side:
 - a. Install nuts (8, 17) and washers (7, 16) on brackets (9, 18) through holes in bottom plate of base frame from below.
 - b. Install washer (6), serrated lock washer (5) and nut (4). Do not tighten nut (4).
 - c. Install washer (15), serrated lock washer (14), and nut (13). Do not tighten nut (13).
 - d. Install screws (29) through flange and bottom plate of base frame (2).
 - e. Install four serrated lock washers (32) and four nuts (33). Tighten nuts (33)

- f. Align exhaust pipe with header (34), gaskets (31, 30), silencer (25), elbow (28), and endpipe (22), and tighten nuts (33) in a crosswise pattern.
- g. Tighten nuts (4, 13).
- h. Install unit hood assembly (1) as instructed in paragraph 4.14.

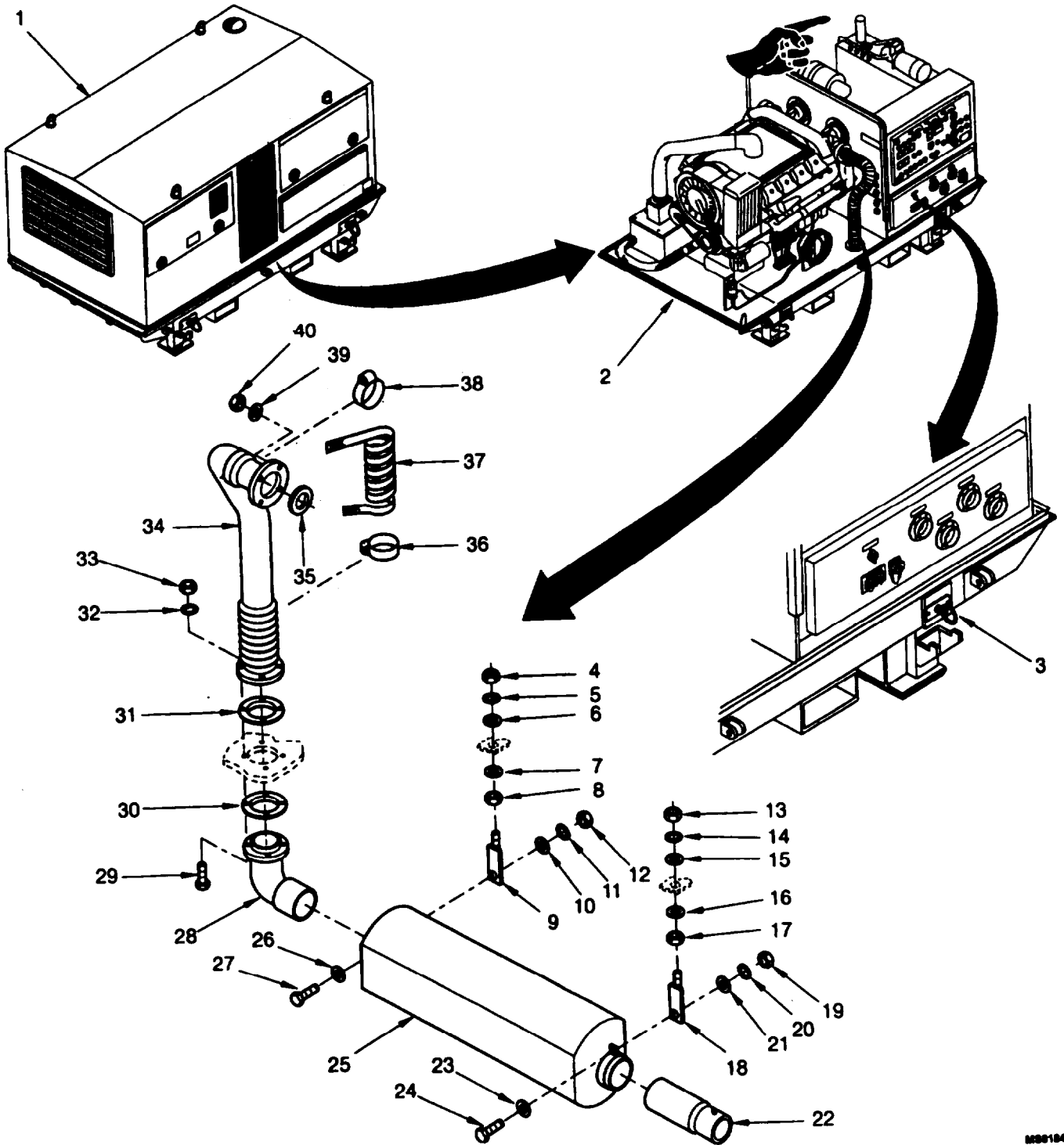


Figure 4-63. Silencer Assembly, Left Side Maintenance.

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CAUTION

Using a suitable device support the silencer during removal.

- a. Remove four nuts (11) and four serrated lock washers (12) while holding four screws (16).
 - b. Remove four screws (16) from flange and bottom plate of base frame (2).
 - c. Remove nut (51), serrated lock washer (50), and washer (49).
 - d. Remove nut (39), serrated lock washer (38), and washer (37).
 - e. Remove nut (27), serrated lock washer (26), washer (25), and connector pipe (15), elbow (46), and fasteners (40 to 45, 47, 48, 29 to 36, 17 to 24) and seal (14).
 - f. Remove silencer assembly (28) from base frame (2)
4. Remove connector pipes and brackets:
- a. Remove washer (48) and nut (47) from holder (42).
 - b. Hold screw (40) and remove nut (45), serrated lock washer (44), washer (43), nut (47) and holder (42).
 - c. Remove screw (40) and washer (41).
 - d. Remove washer (37) and nut (35) from holder (31).
 - e. Hold screw (29) and remove nut (34), serrated lock washer (33), washer (32), and holder (31) with nut (35).
 - f. Remove screw (29) and washer (30).
 - g. Pull endpipe (46) off silencer (28).
5. Remove exhaust pipe with header:
- a. Loosen locknuts, turn screws on heat shield over header at turbocharger outlet a few turns, push angle bracket to one side and loosen heat shield.
 - b. Remove nuts (9) and washers (8).
 - c. Pull exhaust pipe with header (10) and gasket (4) off turbocharger outlet. Discard gasket (4).
 - d. Remove gasket (13) and discard.

CAUTION

Close off turbocharger outlet with cover.

6. Remove heat shielding tape (6) from exhaust pipe with header (10):
 - a. Remove clamps (5, 7) from exhaust pipe with header (10) and set aside for re-use.

- b. Unwrap heat shielding tape (6) from exhaust pipe with header (10).

INSTALLATION

WARNING

This task requires three persons: some parts weigh up to 68.2 pounds (40 kg).

1. Apply heat shielding tape (6) to exhaust pipe with header (10):
 - a. Wrap heat shielding tape (6) over exhaust pipe with header (10) with overlapping turns, starting from the header.
 - b. Secure heat shielding tape (6) with clamps (5, 7).
2. Install exhaust pipe with header (10):

CAUTION

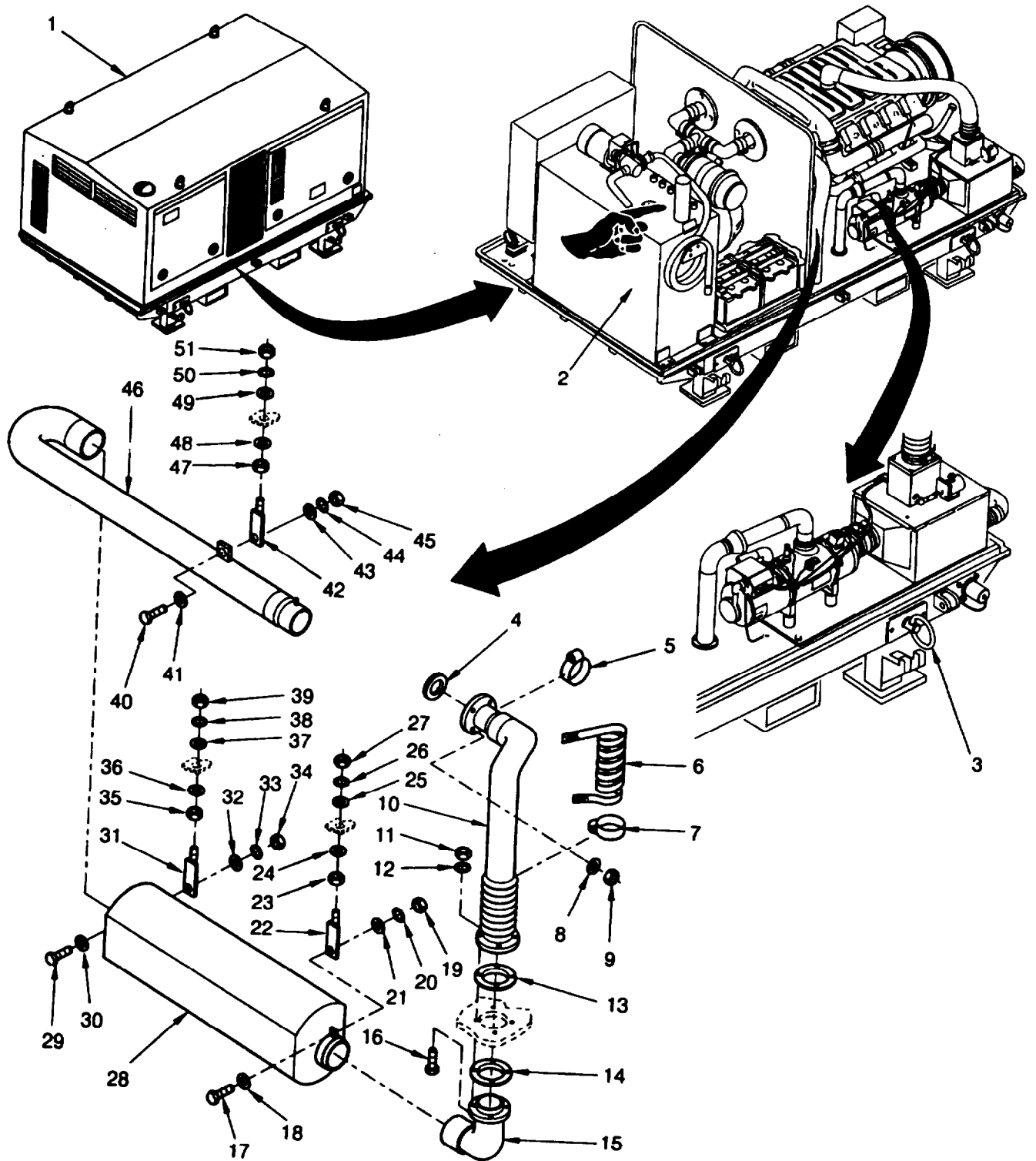
Remove cover from turbocharger outlet.

NOTE

Use new gaskets.

- a. Place new gasket (4) on turbocharger outlet and press on exhaust pipe with header (10).
- b. Install new gasket (13) between bottom plate of base frame (2) and exhaust pipe with header (10).
- c. Install four washers (8) and four nuts (9) on threaded pins and tighten four nuts (9).
- d. Position heat shield and angle bracket over header, and tighten heat shield screws and locknuts.
3. Install connector pipes and brackets:
 - a. Install screw (40) and washer (41) through holder on endpipe (46).
 - b. Install holder (42), nut (47), washer (43), serrated lock washer (44), and nut (45). Tighten nut (45).
 - c. Slide endpipe (46) onto silencer (28).
 - d. Install screw (29) and washer (30) through clamp and put holder (31) in place.
 - e. Install washer (32), serrated lock washer (33) and nut (34). Tighten nut (34).
 - f. Slide elbow (15) onto silencer (28).
 - g. Install screw (17) and washer (18) through clamp and put holder (22) in place.
 - h. Install washer (21), serrated lock washer (20) and nut (19). Tighten nut (19).
4. Install silencer assembly, right side:
 - a. Install washers (49, 37, 25) and insert brackets (42, 31, 22) for silencer (28), with fasteners, through holes in bottom plate of base frame (2) from below.
 - b. Install washer (37), serrated lock washer (38), and nut (39).
 - c. Install washer (25), serrated lock washer (26), and nut (27).

- d. Install washer (49), serrated lock washer (50), and nut (51).
 - e. Install screws (16) through flange and bottom plate of base frame (2).
 - f. Holding four screws (16), install four serrated lock washers (12) and four nuts (11). Tighten nuts (11).
 - g. Align exhaust pipe with header (10), gaskets (13, 14), silencer (28), elbow (15), and endpipe (46), and tighten nuts (11) in a crosswise pattern.
 - h. Tighten nuts (51, 39, 27).
5. Install unit hood assembly (1) as instructed in paragraph 4.14.

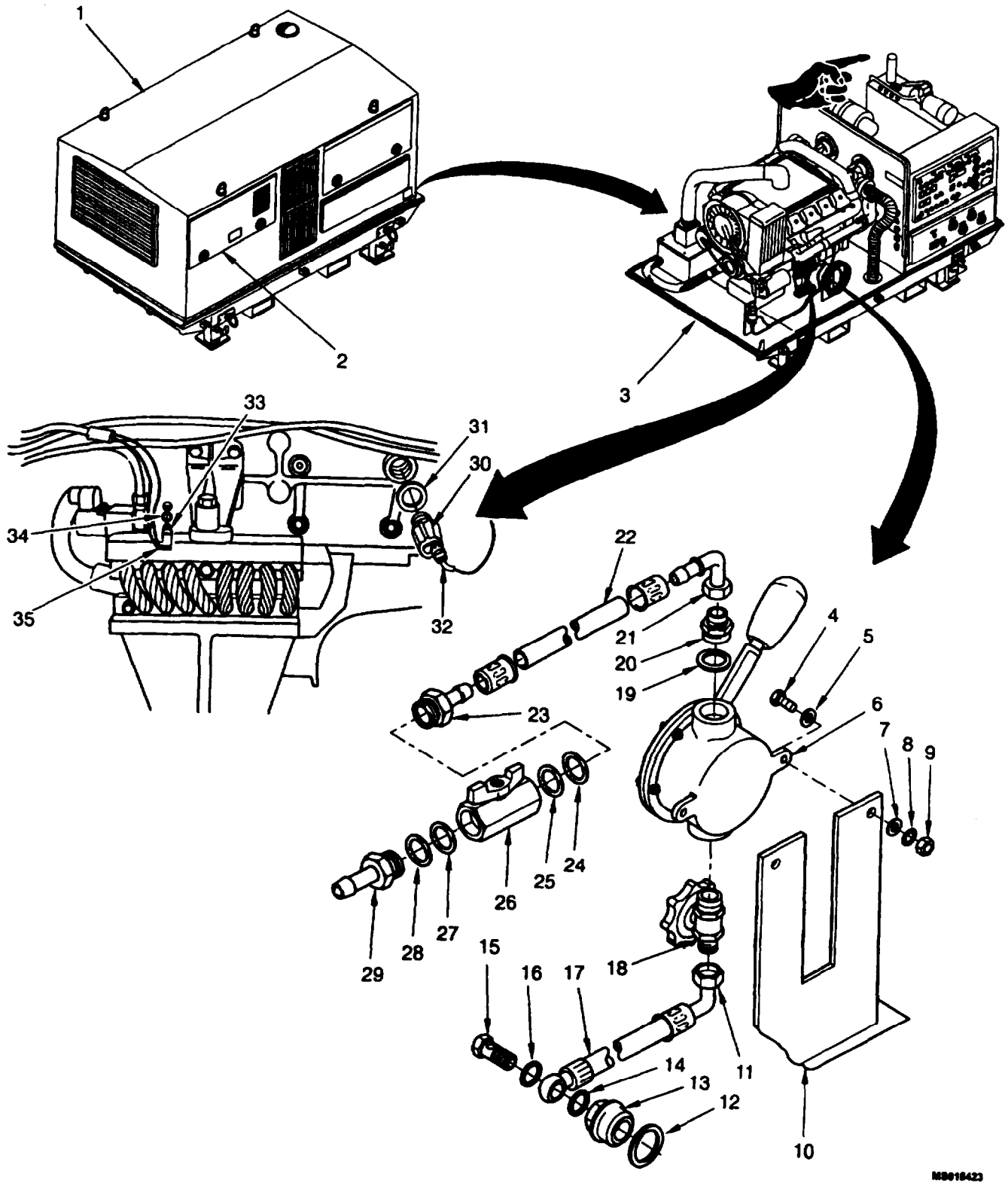


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Figure 4-64. Silencer Assembly, Right Side Maintenance.

2. Insert new sealing ring (19) and screw threaded bushing (20) into scavenge pump (6).
3. Place scavenge pump (6) on holder (10).
4. Install two screws (4) with two washers (5). Tighten screws (4).
5. Install two washers (7), two serrated lock washers (8) and two nuts (9). Tighten nuts (9).
6. Install oil line (17) on shutoff valve (18) and tighten collar nut (11).
7. Install oil outlet pipe assembly (21 to 29) on scavenge pump (6) and tighten collar nut (21).
8. Coil up oil outlet pipe assembly (21 to 29) and secure with VELCRO strap.
9. Close flap (2).

2. Install oil temperature switch 1S3 and oil temperature sensor (35) with sealing ring into engine block.
3. Install plug connector 1J3 (33) with cable on oil temperature switch and oil temperature sensor (35).
4. Close flap (2).



MD916423

Figure 4-65. Scavenge Pump Assembly, Oil Outlet Pipe Oil Pressure Switch 1S2 and Oil Pressure Sensor 1R2, Oil Temperature Switch 1S3 and Oil Temperature Sensor 1R3 Maintenance.

4.89 BATTERY CHARGING ALTERNATOR MAINTENANCE.

This task covers: a. Removal b. Test c. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down,
paragraph 2.5.2

Materials/Parts

Hardwood board

REMOVAL

1. Open flap (2, figure 4-66) on unit hood assembly.

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cable. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

2. Loosen clamp (15) and remove air hose (16).
3. Remove two screws (17), serrated lock washers (18), and side plate (19) away from cover (11) on battery charging alternator.
4. Remove screw (3) from bracket (4) by holding nut (not shown).
5. Remove screw (8) and loosen screw (5).
6. Remove V belts (7) from V belt pulleys (6, 10).
7. Support battery charging alternator (9) (pulley down) and remove four nuts (12), four lock washers (13), and four washers (14).
8. Remove cover (11) by sliding along cable (20).
9. Remove plug (22) by removing locking dip (21) and unplugging.
10. Record labeling and position of cables (27, 31, 35) including those (23 to 25) to the plug (22).
11. Remove nut (30), serrated lock washer (29), washer (28) and cable 02 (27).

12. Remove nut (34), serrated lock washer (33), washer (32) and cable 0 (31).
13. Remove nut (38), serrated lock washer (37), washer (36) and cable 7 (35).
14. Remove flat connectors with three cables (23 to 25) from plug (22), by using a screwdriver and holding down snap in hook (26).
15. Remove cover (11) from cable (20) by sliding along cable (20).
16. Remove battery charging alternator (9) from diesel engine (2).

TEST

CAUTION

- **Do not operate battery charging alternator without battery set (load) and do not reverse polarity.**
- **Do not short-circuit terminals of battery charging alternator regulator N6.**

NOTE

- **Check battery charging alternator after installation, and with diesel engine at rated speed.**
- **Battery set must be connected and fully charged.**

1. Measure charging voltage:
 - a. To measure voltage, connect multimeter to terminal B+ of battery charging alternator (9) or to cable 2 on right side of Shunt R11 (4, figure 4-66), and to ground.
 - b. Start diesel engine as instructed in paragraph 2.5.1 and read off charging voltage on multimeter (10):
Reading: 27 - 28.2 V at charging current of 10 - 15 A indicated on BATTERY CHARGE P7.
 - c. If charging voltage <27 V, replace battery charging alternator regulator N6 as instructed in paragraph 4.75.

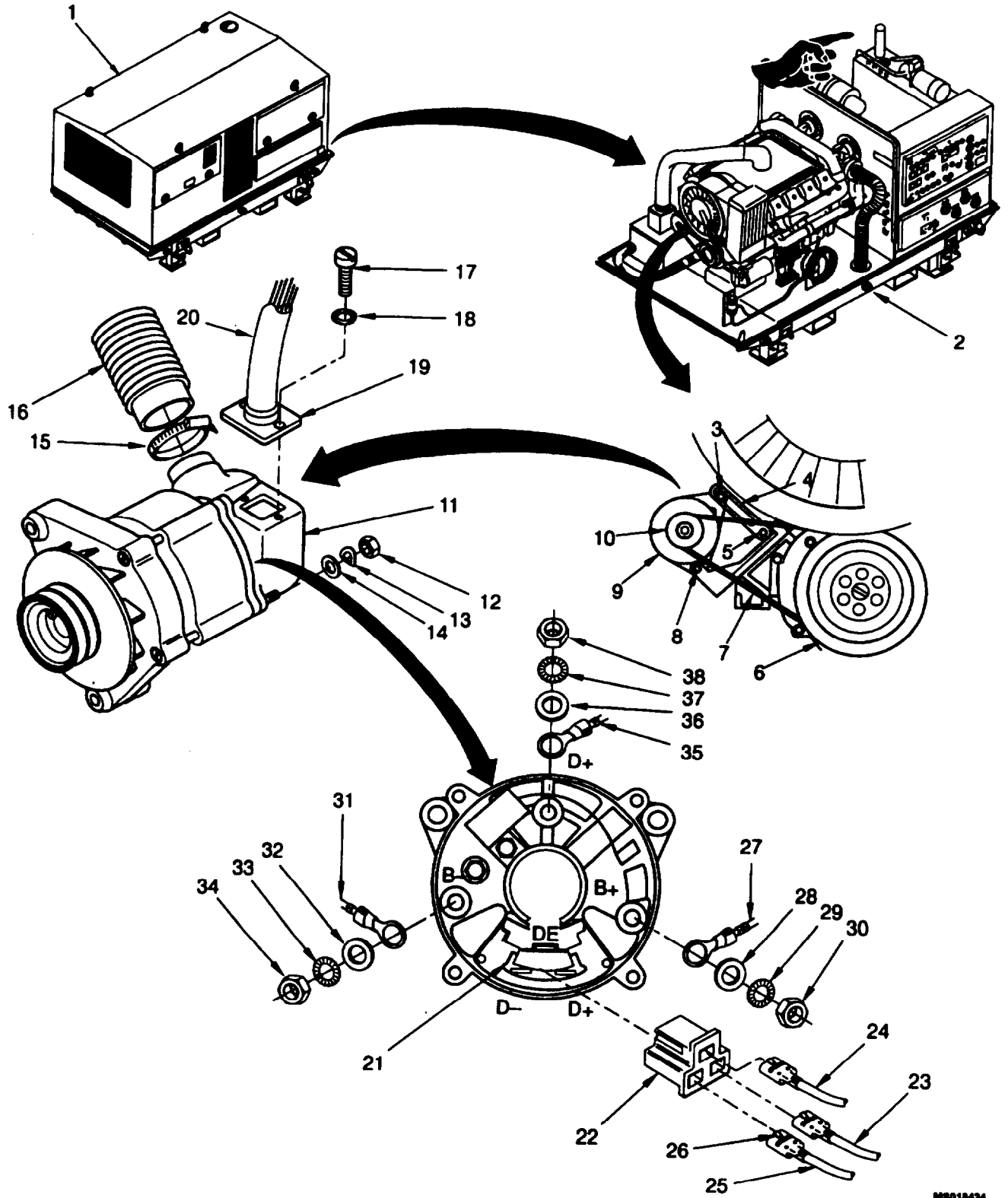
INSTALLATION

1. Install cover (11) on cable (20) by sliding on cable (20).
2. Place battery charging alternator (9) on diesel engine (2) and support.

NOTE

Before installing in plug, push up snap in hooks (26) of flat connectors.

3. Noting correct labeling and position, install flat connectors with three cables (23 to 25) on plug (22).
4. Noting correct labeling and position, install cable 7 (35), washer (36), serrated lock washer (37), nut (38), and tighten nut (38).
5. Noting correct labeling and position, install cable 0 (31), washer (32), serrated lock washer (33), nut (34), and tighten nut (34).
6. Noting correct labeling and position, install cable 02 (27), washer (28), serrated lock washer (29), nut (30), and tighten nut (30).
7. Install plug (22) by plugging on terminals, and secure with locking clip (21).
8. Install cover (11) on battery charging alternator (9) by sliding along cable (20)
9. Install four lock washers (13), four washers (14) and four nuts (12) on battery charging alternator (9) and tighten nuts (12).
10. Install V belts (7) on V belt pulleys (6, 10).
11. Install screw (8). Install screw (3) on bracket (4) (not shown).
12. Tension V belt as instructed in paragraph 4.34.
13. Slide plate (19) on cover (11) of battery charging alternator (9), and install two screws (17) and serrated lock washers (18).
14. Install air hose (16) and tighten clamp (15).
15. Connect the negative battery cable first and then the positive battery cable.
16. Install unit hood assembly (1) as instructed in paragraph 4.14.



MS018434

Figure 4-66. Battery Charging Alternator Maintenance.

4.90 STARTER MAINTENANCE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down,
paragraph 2.5.2

Materials/Parts

Cable ties
(item 10, appendix F)

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cable. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Remove unit hood assembly (1, figure 4-67) as instructed in paragraph 4.14.
2. Remove screw (9), serrated lock washer (8), washer (7), clamp (6), molded part (5) with sealing ring (4), from positive cable (3).
3. Remove nut (19), serrated lock washer (18), washer (17), and cable (3) from stud (16).
4. Remove nut (25), serrated lock washer (24), washer (23), and cables (21, 22), from stud (20).
5. Remove nut (29), serrated lock washer (28), washer (27), and cable (11) from stud (26) on starter terminal board (15).

WARNING

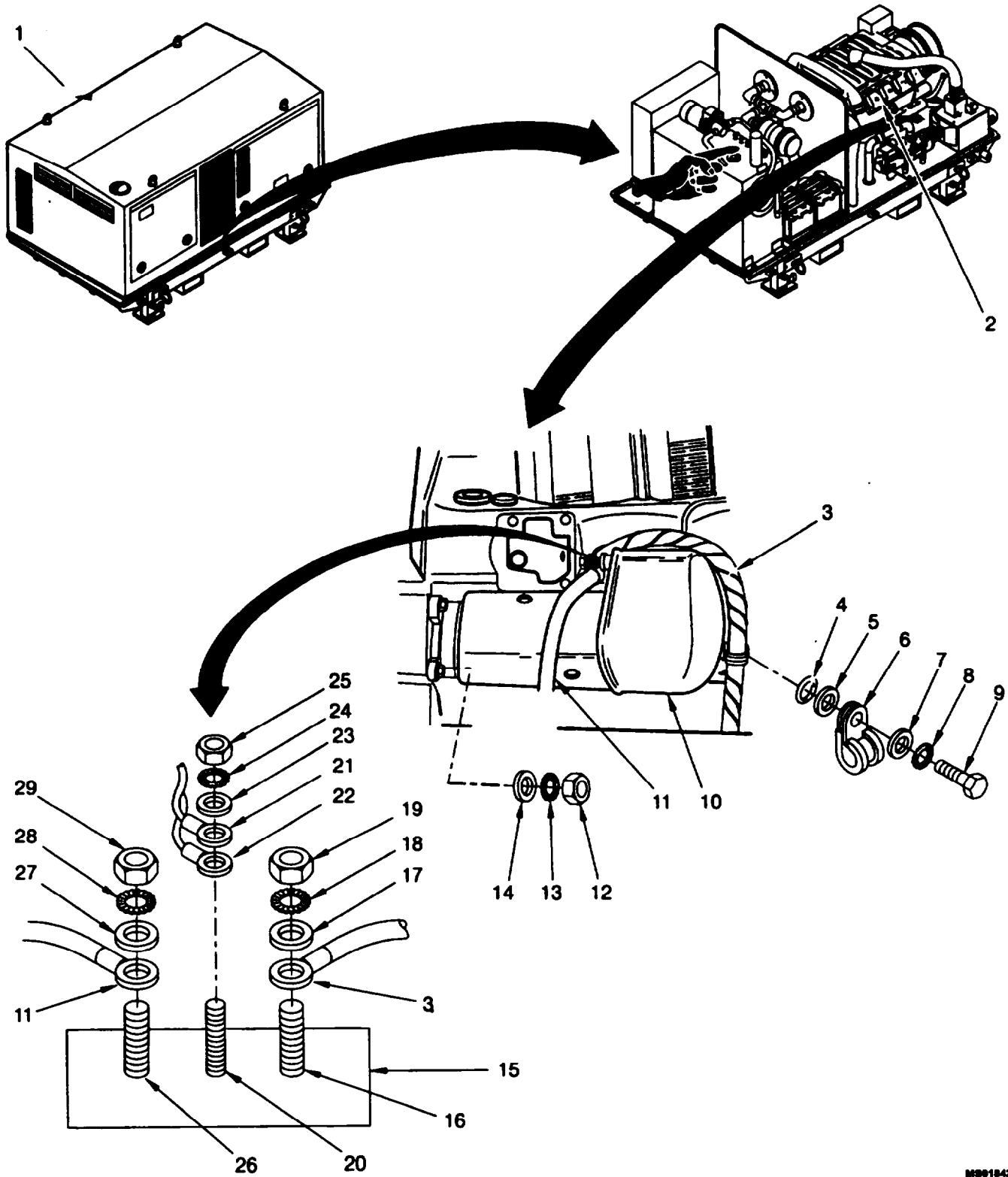
Provide support for the starter. Failure to observe this warning could result in severe personal injury.

6. Remove three nuts (12), serrated lock washer (13), and washers (14).
7. Remove starter (10) from flange of diesel engine (2).

INSTALLATION**WARNING**

Provide support for the starter.

1. Install starter (10) on flange of diesel engine (2) using three serrated lock washers (13), three washers (14), and three nuts (12). Tighten nuts (12).
2. Install screw (9), serrated lock washer (8), washer (7), clamp (6), positive cable (3), molded part (5), and sealing ring (4) on starter (10). Tighten screw (9).
3. Install cable (11), washer (27), serrated lock washer (28), on stud (26) on starter terminal board (15), and install nut (29). Tighten nut (29).
4. Install cables (22, 21), washer (23), serrated lock washer (24), on stud (20) on starter terminal board (15), and install nut (25). Tighten nut (25).
5. Install cable (3), washer (17), serrated lock washer (18), on stud (16) on starter terminal board (15), and install nut (19). Tighten nut (19).
6. Connect the negative battery cable first and then the positive battery cable.
7. Install unit hood assembly (1) as instructed in paragraph 4.14.



MS918425

Figure 4-67. Generator, Starter Maintenance.

CHAPTER 5
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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5.51	Synchronous Generator Maintenance.	5 - 230
5.52	Clutch Assembly Maintenance.	5 - 233

**Section I. REPAIR PARTS; TOOLS; SPECIAL TOOLS; TEST, MEASUREMENT
AND
DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT**

5.1 COMMON TOOLS AND EQUIPMENT.

A list of recommended tools and test equipment required to maintain the Generator Set 150 kW is contained in Appendix B, SECTION III.

5.2 SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Refer to TM 9-6115-668-23P for Generator Set 150 kW special tools.

5.3 REPAIR PARTS.

Refer to TM 9-6115-668-23P for Generator Set 150 kW repair parts.

Section II. TROUBLESHOOTING

5.4 GENERAL.

The symptom index for the generator set 150 kW lists faults associated with control cabinet assembly operation. Figures 5-1 through 5-18 provide a go/no-go flowchart of each malfunction. Each malfunction listed includes a reference to the applicable figure that contains a chart to help you determine probable causes and corrective actions to take. The symptom index cannot list all faults that may occur, nor all the tests or inspections and corrective actions. If a malfunction is not listed or cannot be corrected by listed corrective actions, notify next higher level of maintenance for assistance.

WARNING

- **Potential 150 kw shock hazard with failure to adhere to this warning. Contact with this high power could result in death or severe injury. If the removal of one generator from the EPP III is required, replace it with an extra generator. Always make sure that two generators are mounted to the EPP III. Continued use of the EPP III with only one generator could result in a catastrophic shock hazard.**
- **Do not operate one of the EPP-III generators when the other generator is dismantled.**
- **Prior to energizing the equipment the operator must check for exposed electrical terminals.**
- **Always install protective covers on control and power cables when cables are not connected.**
- **Be sure to observe all warning signs on equipment.**

WARNING

Any wire indicated with a “0” is a ground wire. Disconnecting any “0” indicated wire will lose the ground to the rest of the circuit.

NOTE

- **Before using this table, ensure that unit level troubleshooting steps have been performed.**
- **Refer to the Wiring Diagram FO-1 and Engine Preheating Assembly Diagram FO-2 as troubleshooting aids.**
- **24 VDC operating voltage: Depending on the operating state of the Generator Set 150 kW and the charging state of the battery set, the 24 VDC operating voltage can fluctuate between 22.8 VDC and 28.2 VDC: The higher value (28.2 VDC) occurs when the battery set is charged and is being buffered by the generator. The lower value (22.8 VDC) occurs when the battery set is discharged and the generator is idle. The voltage may drop below this value at temperatures below 32 °F (0 °C), and/or at high currents (e.g. during starting).**

SYMPTOM INDEX	Troubleshooting Procedure
BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up.	Figure 5-1
HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up	Figure 5-2
GLOWPLUG ON lamp does not light up.	Figure 5-3
Diesel engine cannot be started	Figure 5-4
Oil pressure too low, or no oil pressure indication	Figure 5-5
Battery set is not being charged, or no charging current indication	Figure 5-6
Generator frequency cannot be adjusted, or no frequency indication	Figure 5-7
Generator voltage cannot be adjusted, or no voltage indication	Figure 5-8
AC CIRCUIT INTERRUPTER ON lamp does not light up.	Figure 5-9
No line currents are flowing, or no line current indication	Figure 5-10
No power indication	Figure 5-11
BATTERY CHARGING CONTROL lamp lights up during operation	Figure 5-12
OIL PRESSURE lamp lights up during operation.	Figure 5-13
OIL TEMP-CYLINDER HEAD lamp lights up during operation.	Figure 5-14
UNDER/OVER FREQUENCY lamp lights up during operation.	Figure 5-15
UNDER/OVER VOLTAGE lamp lights up during operation	Figure 5-16
GENERATOR OVER TEMPERATURE lamp lights up during operation	Figure 5-17
OVERLOAD lamp lights up during operation	Figure 5-18

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

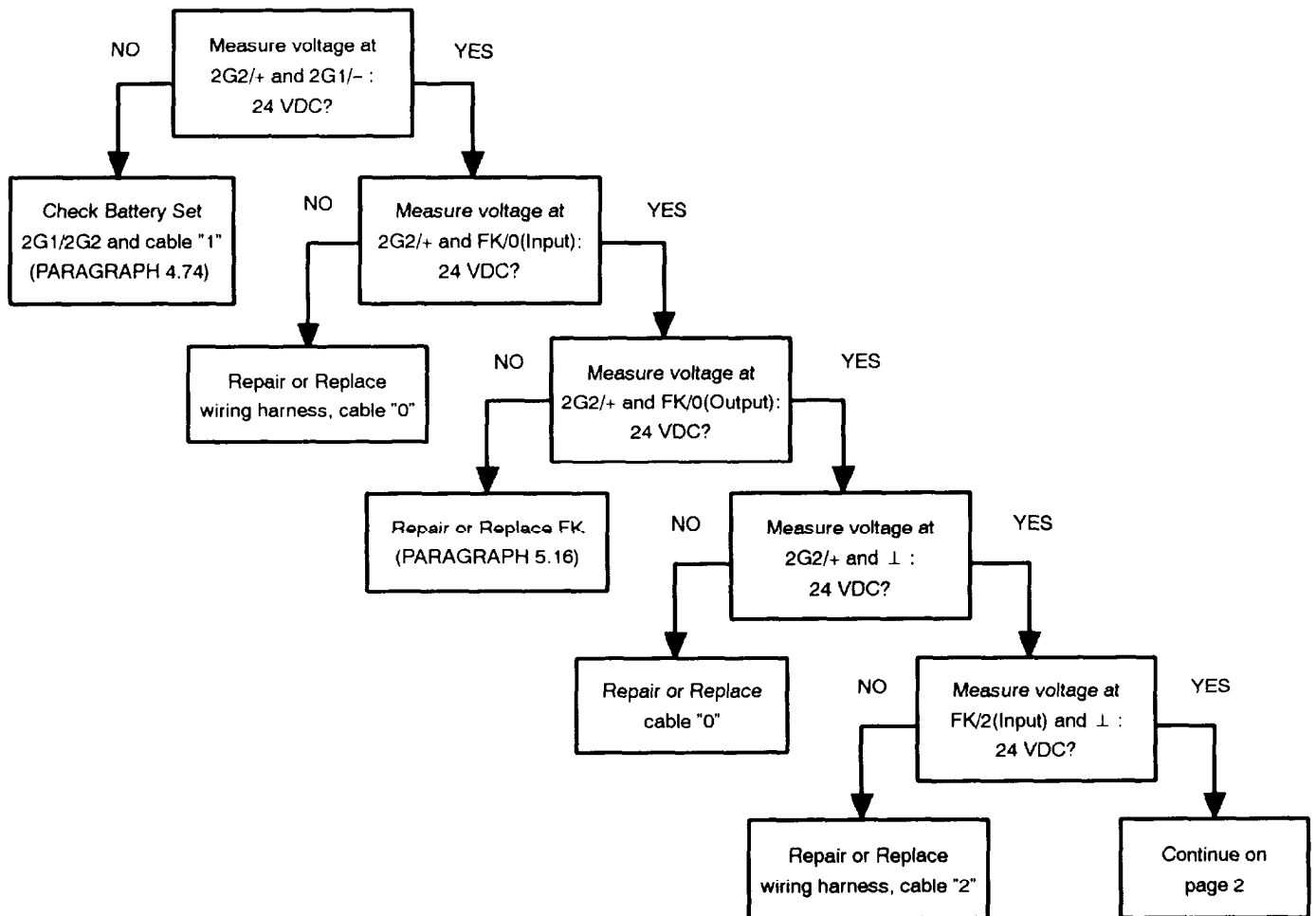


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 1 of 7).

WARNING

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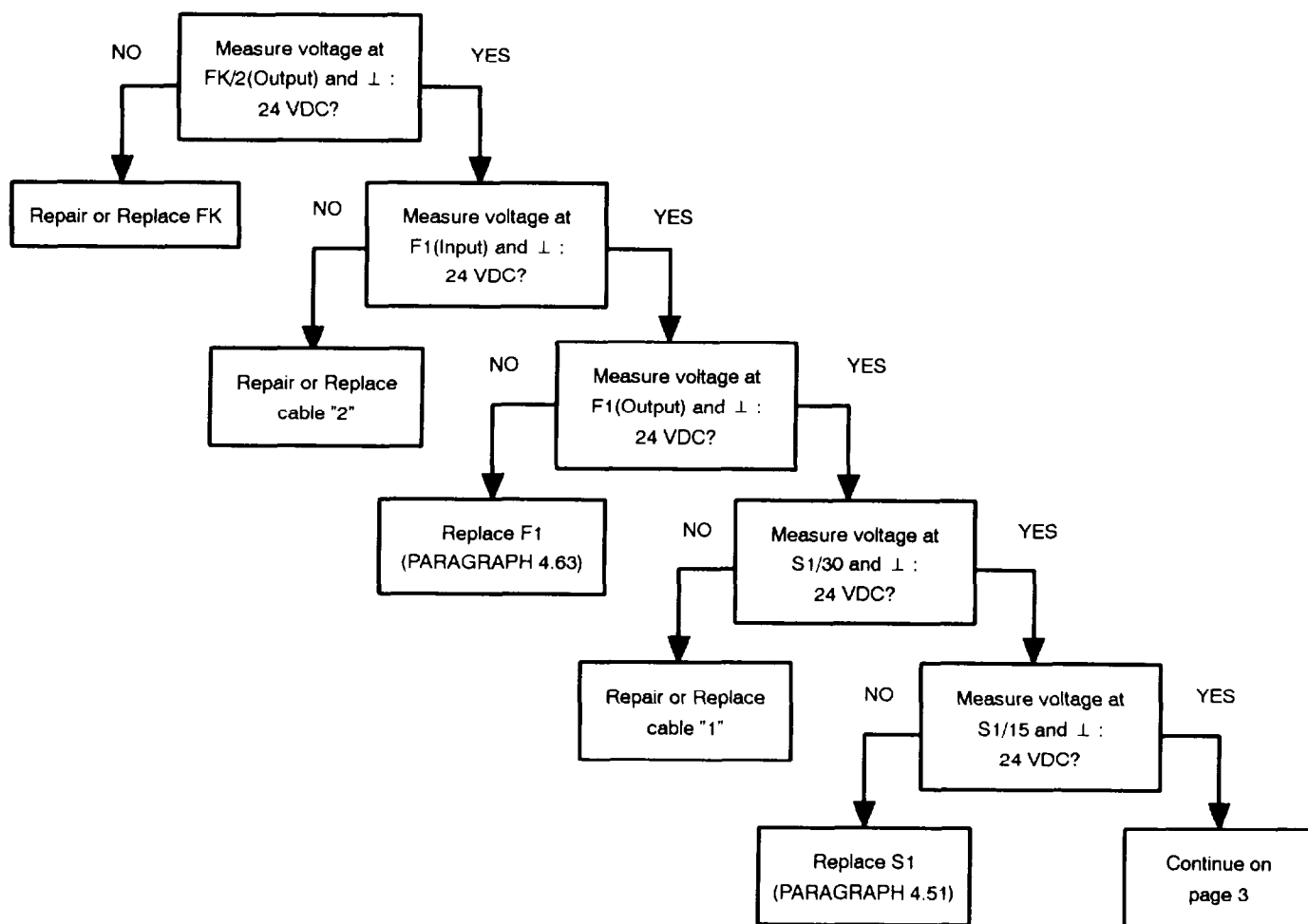


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 2 of 7).

WARNING

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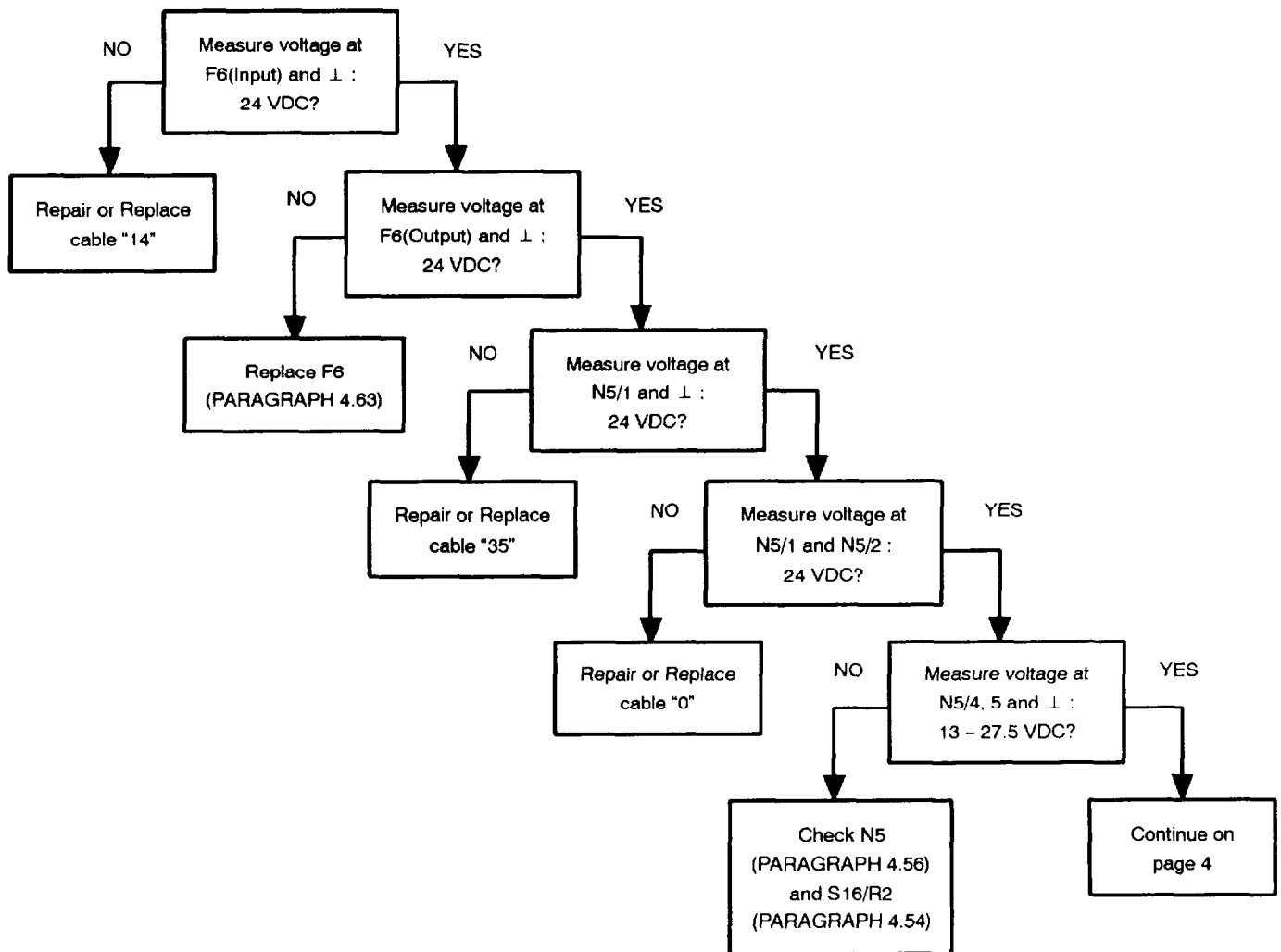


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 3 of 7).

WARNING

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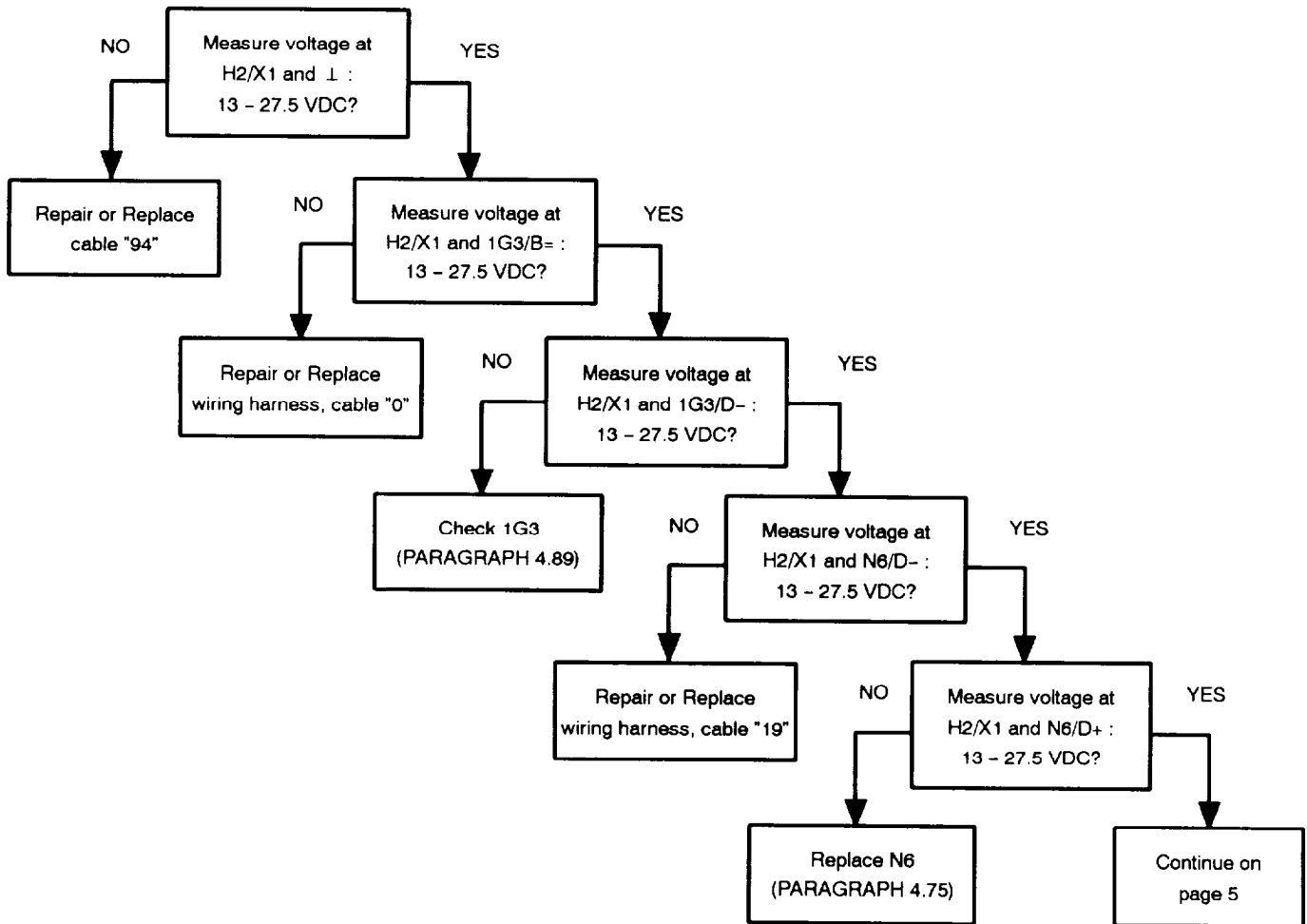


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 4 of 7).

WARNING

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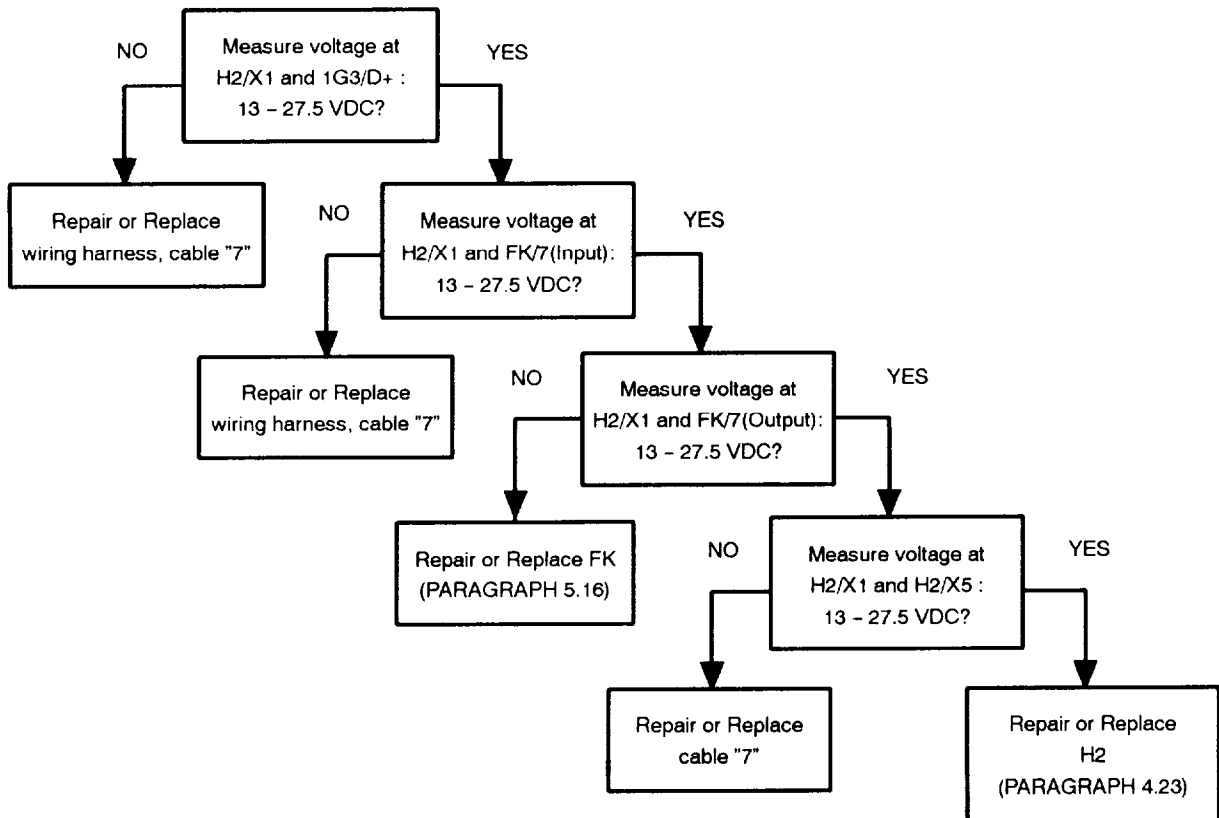


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 5 of 7).

WARNING

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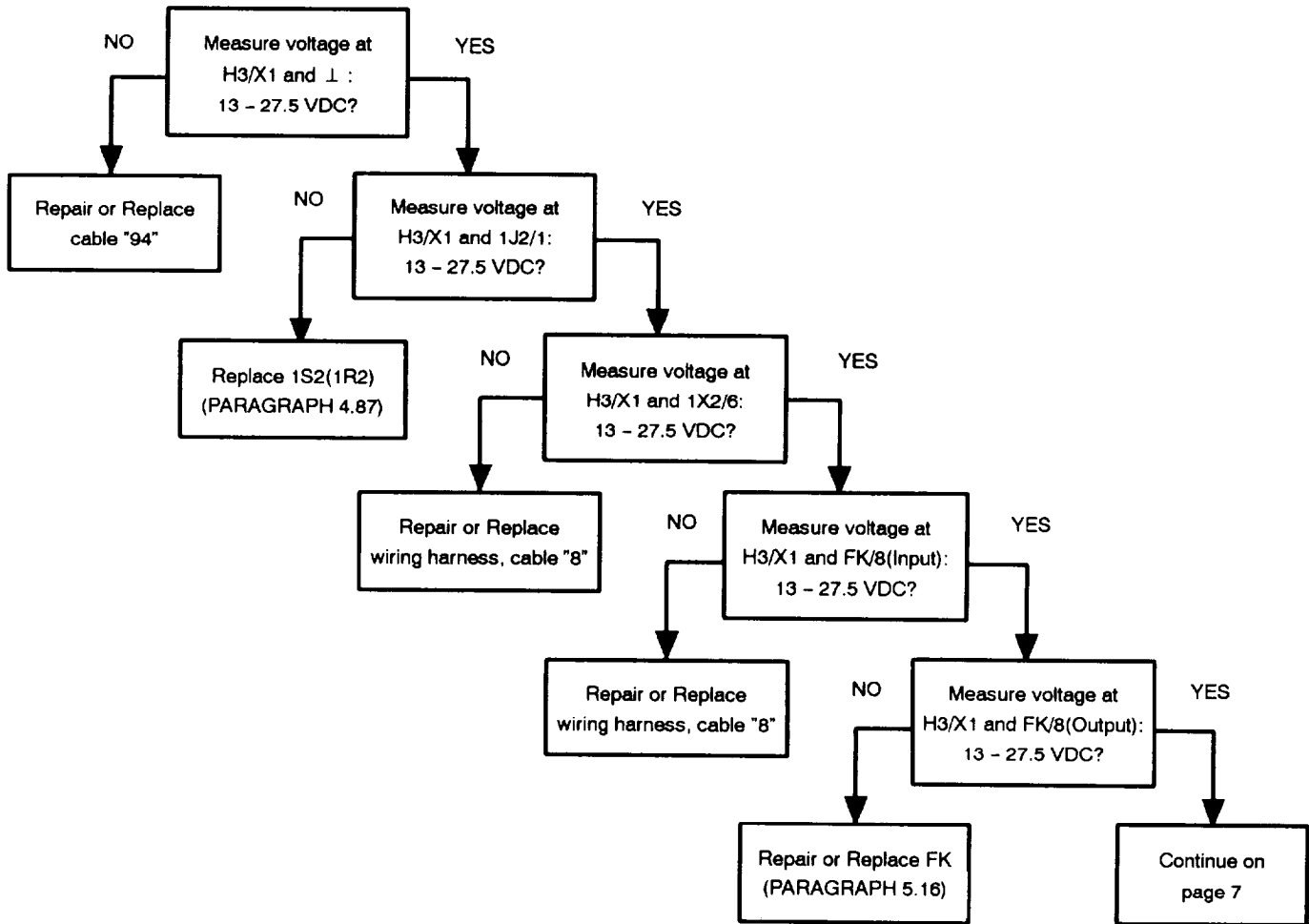


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 6 of 7).

WARNING

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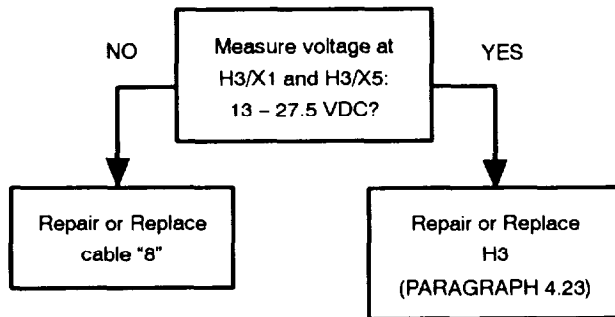


Figure 5-1 BATTERY CHARGING CONTROL and OIL PRESSURE lamps do not light up (sheet 7 of 7).

WARNING

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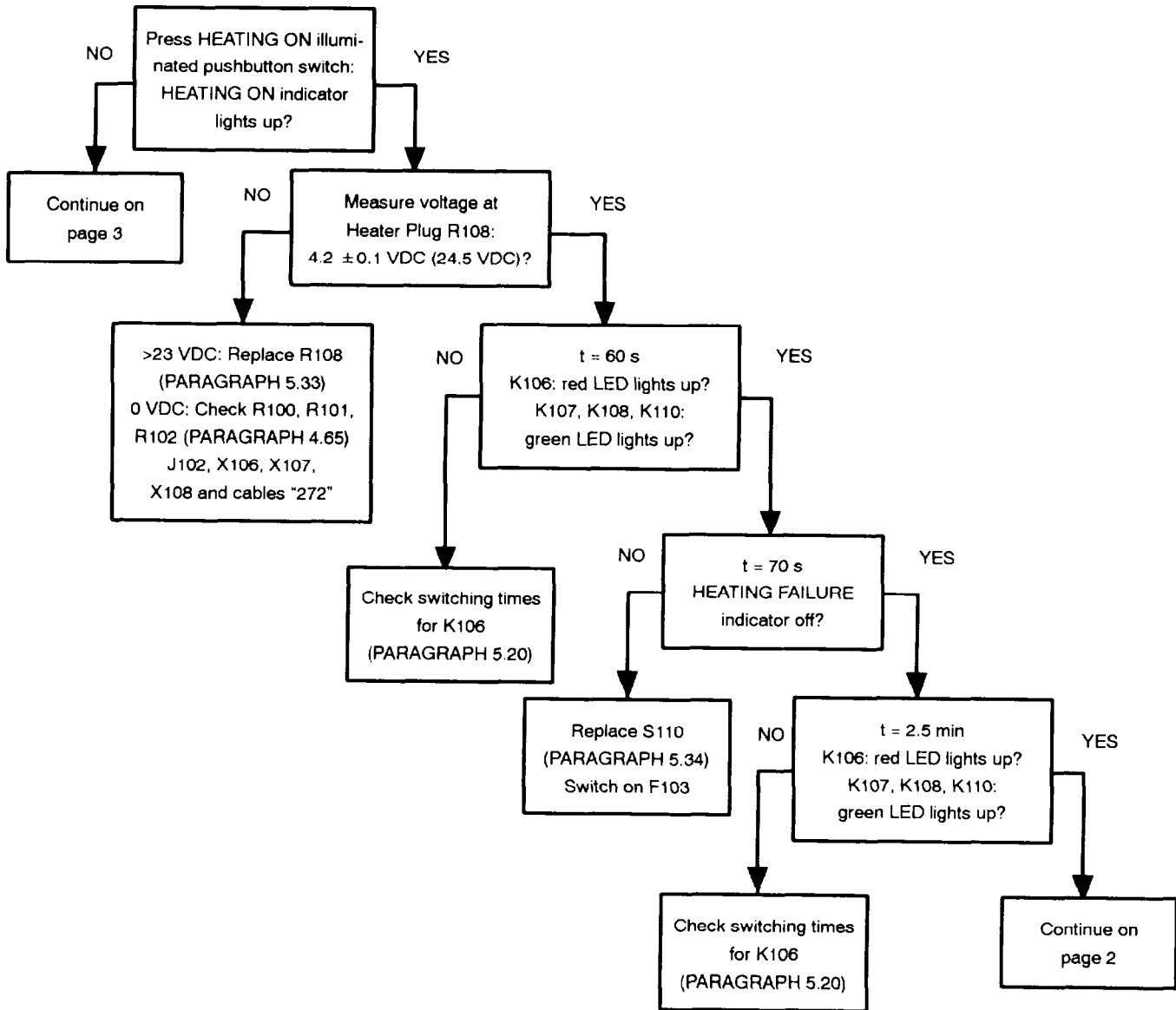


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 1 of 7).

WARNING

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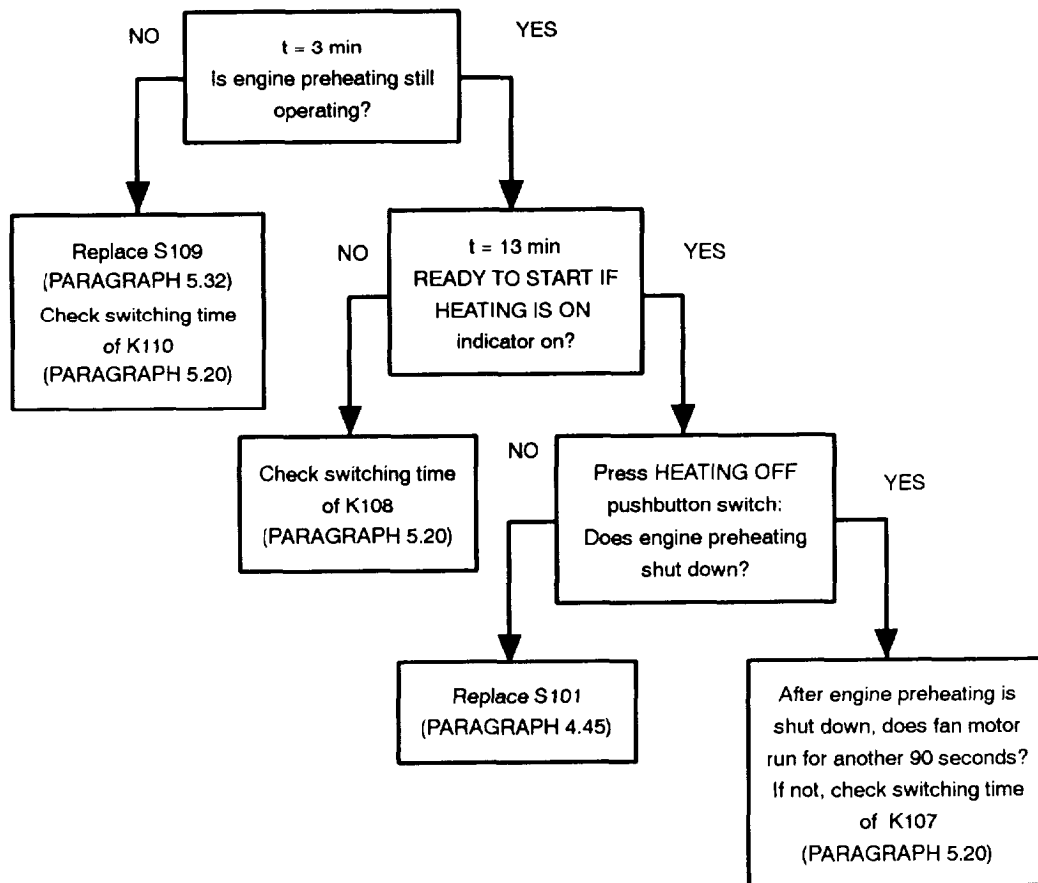


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 2 of 7).

WARNING

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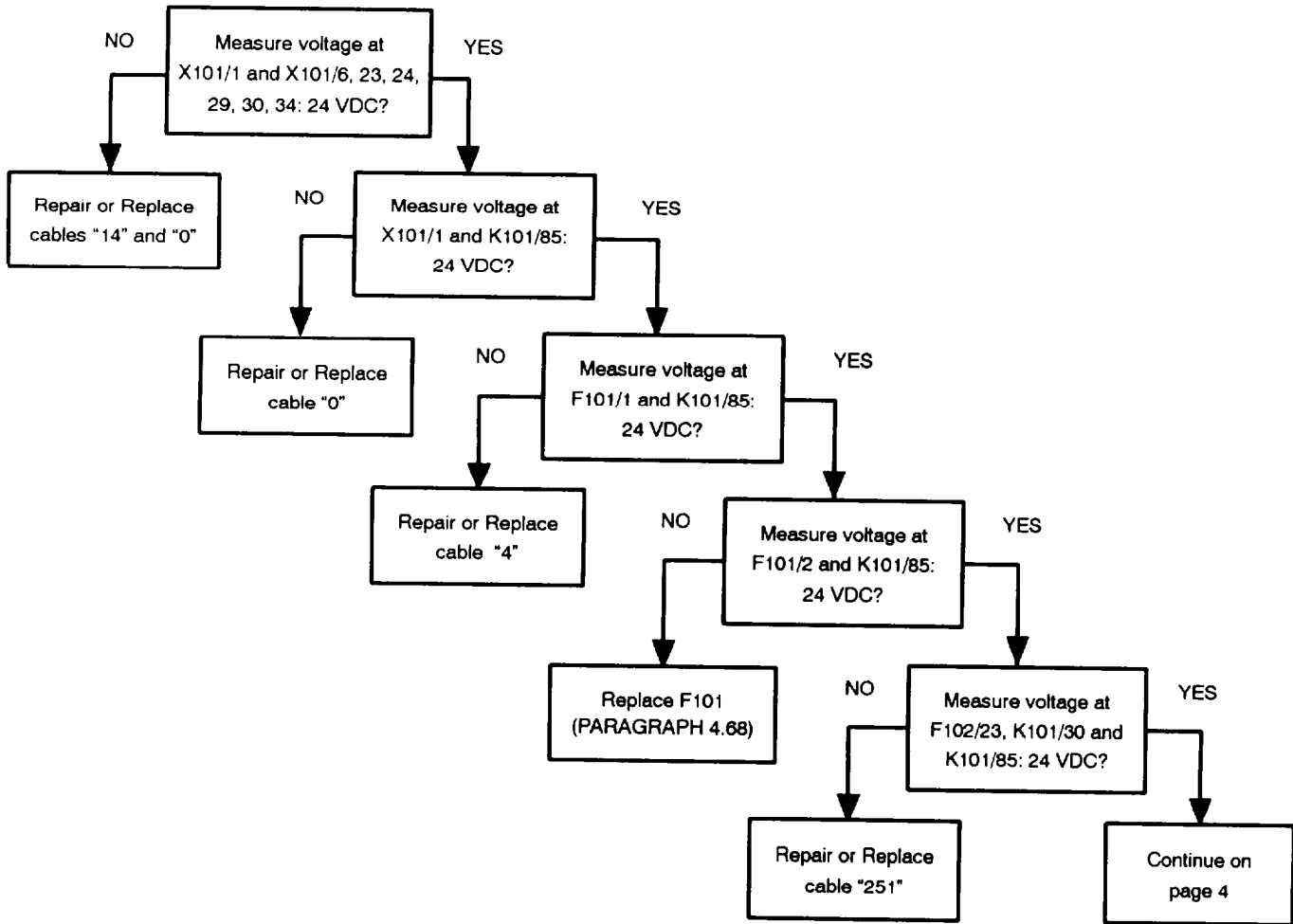


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 3 of 7).

WARNING

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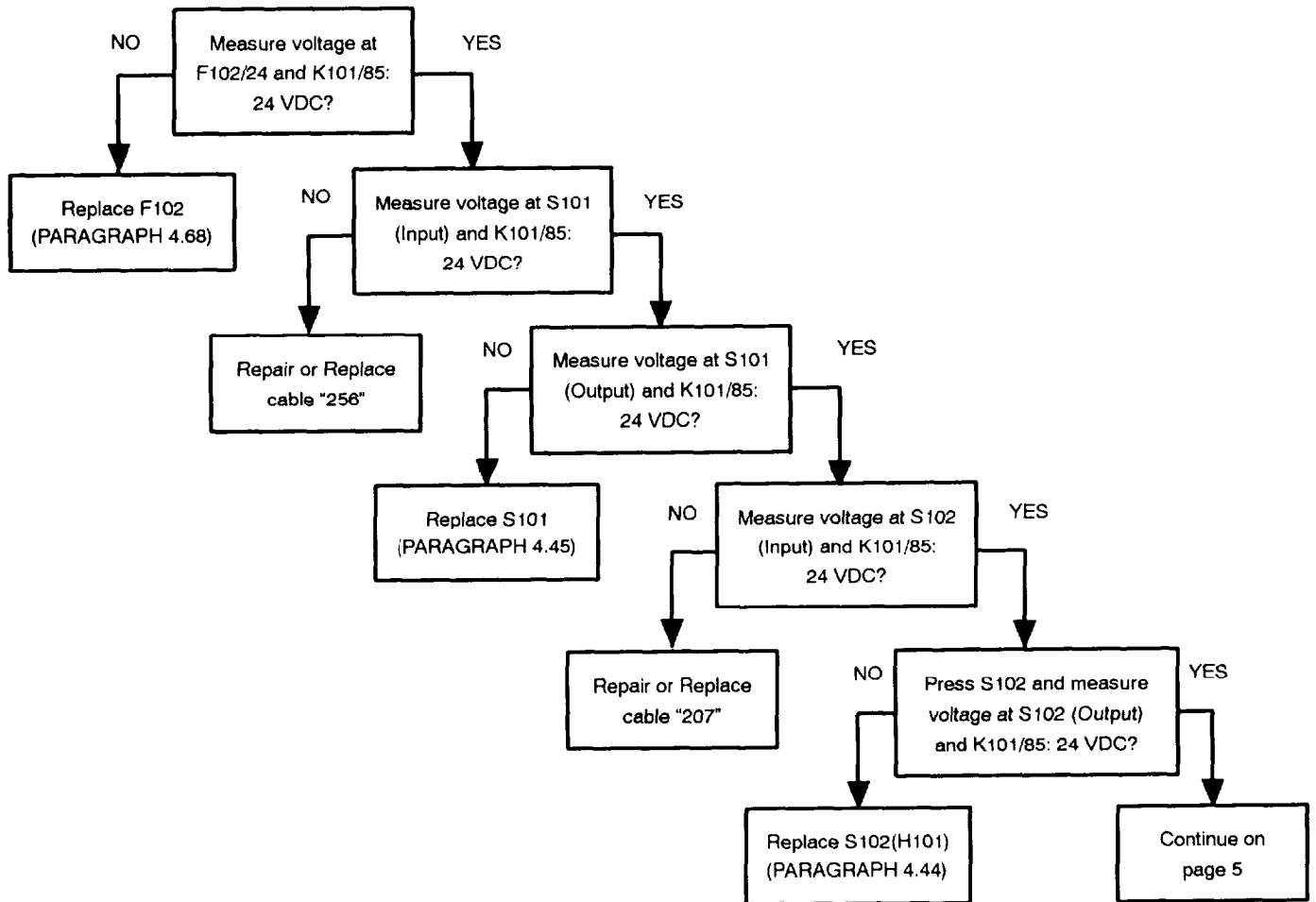


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 4 of 7).

WARNING

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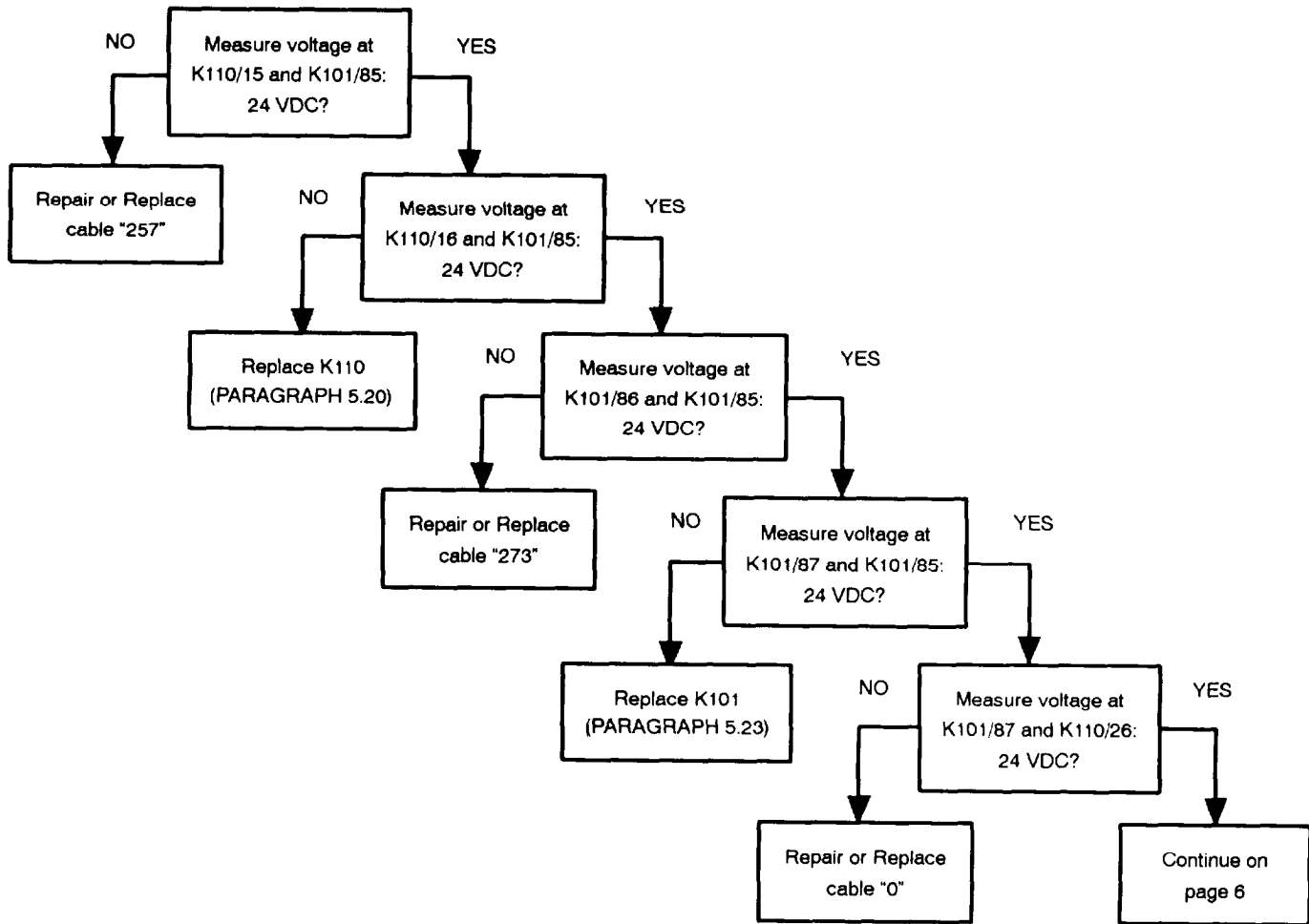


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 5 of 7).

WARNING

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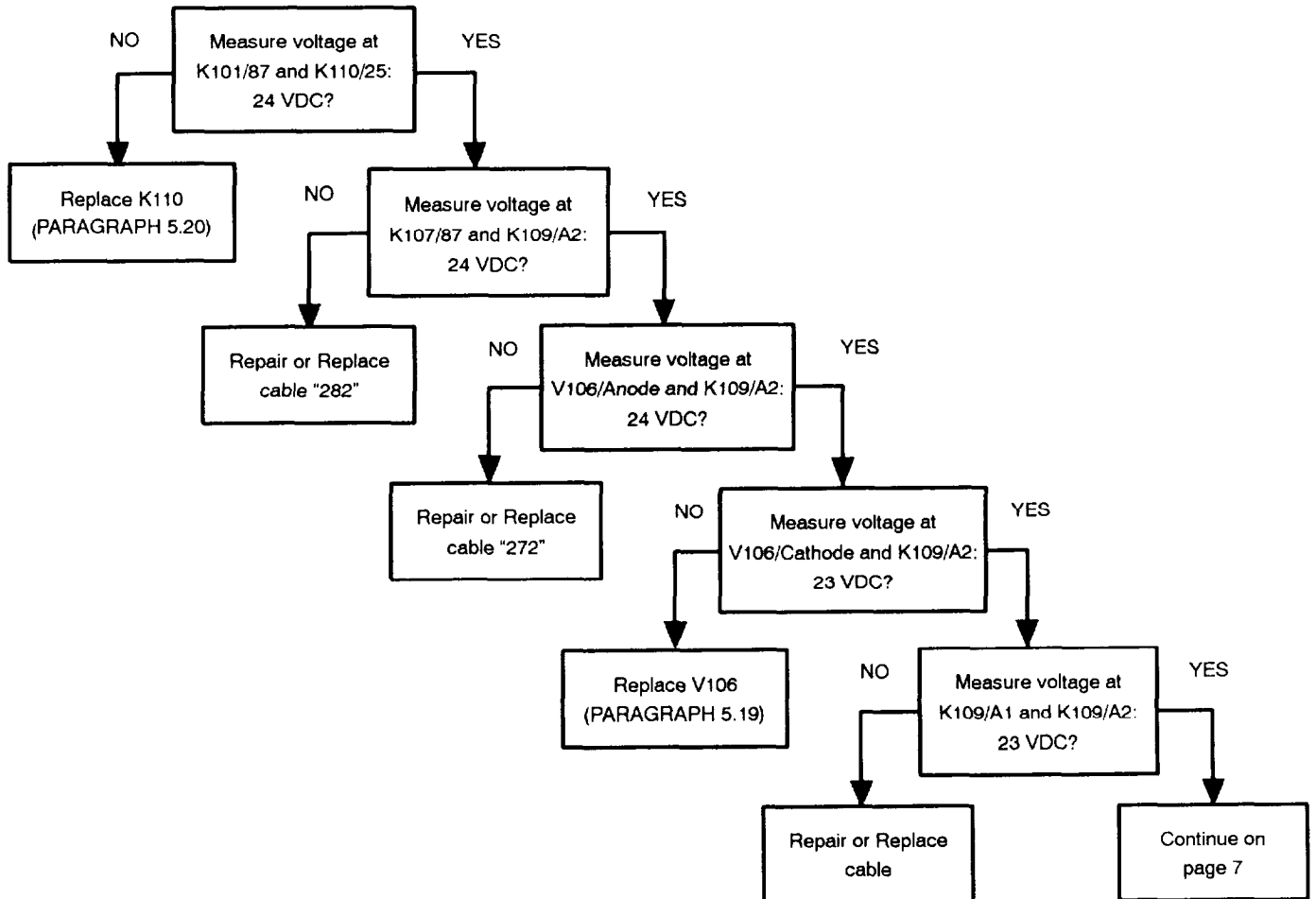


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 6 of 7).

WARNING

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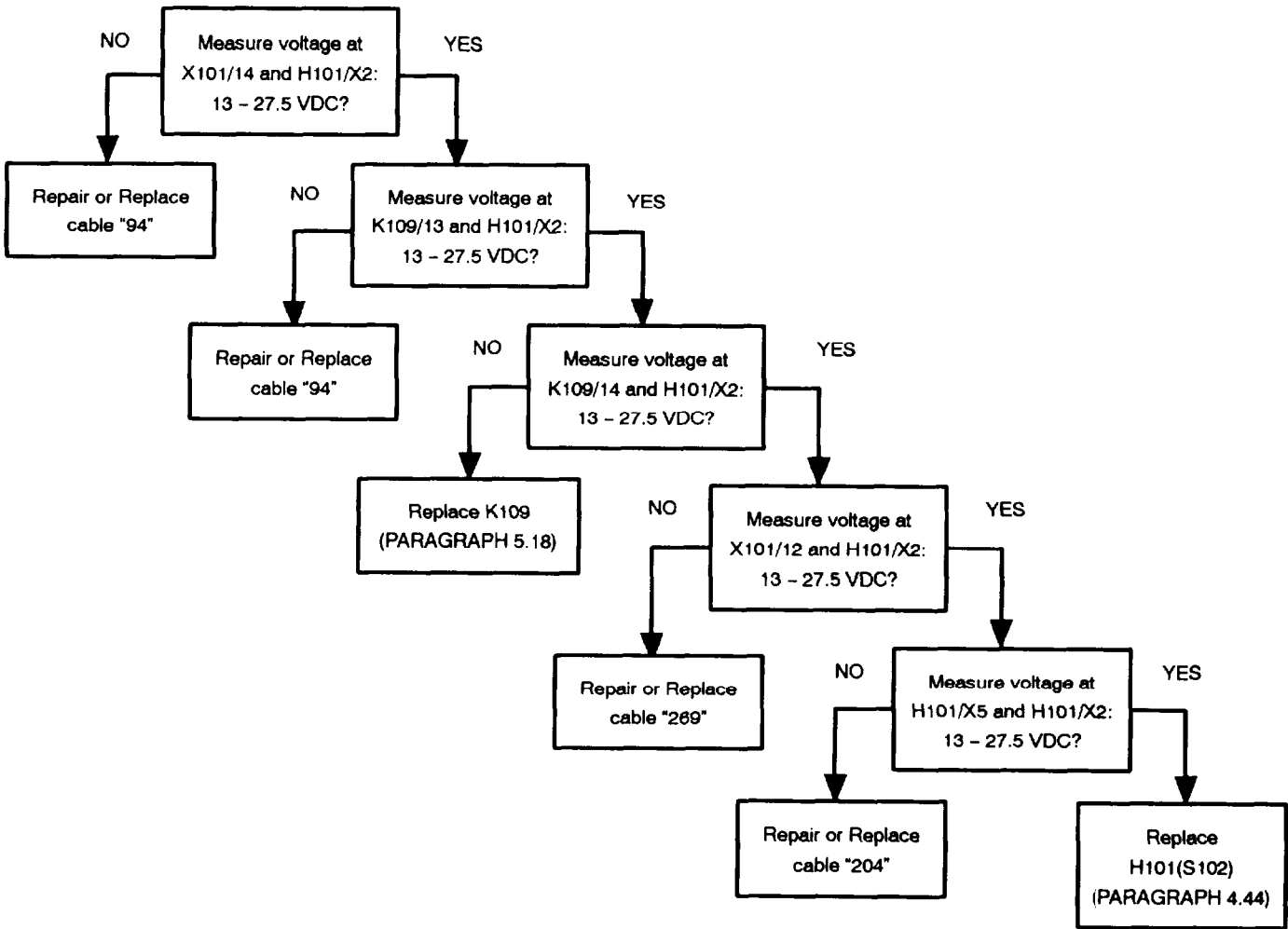


Figure 5-2 HEATING FAILURE lamp lights up or READY TO START IF HEATING IS ON lamp does not light up (sheet 7 of 7).

WARNING

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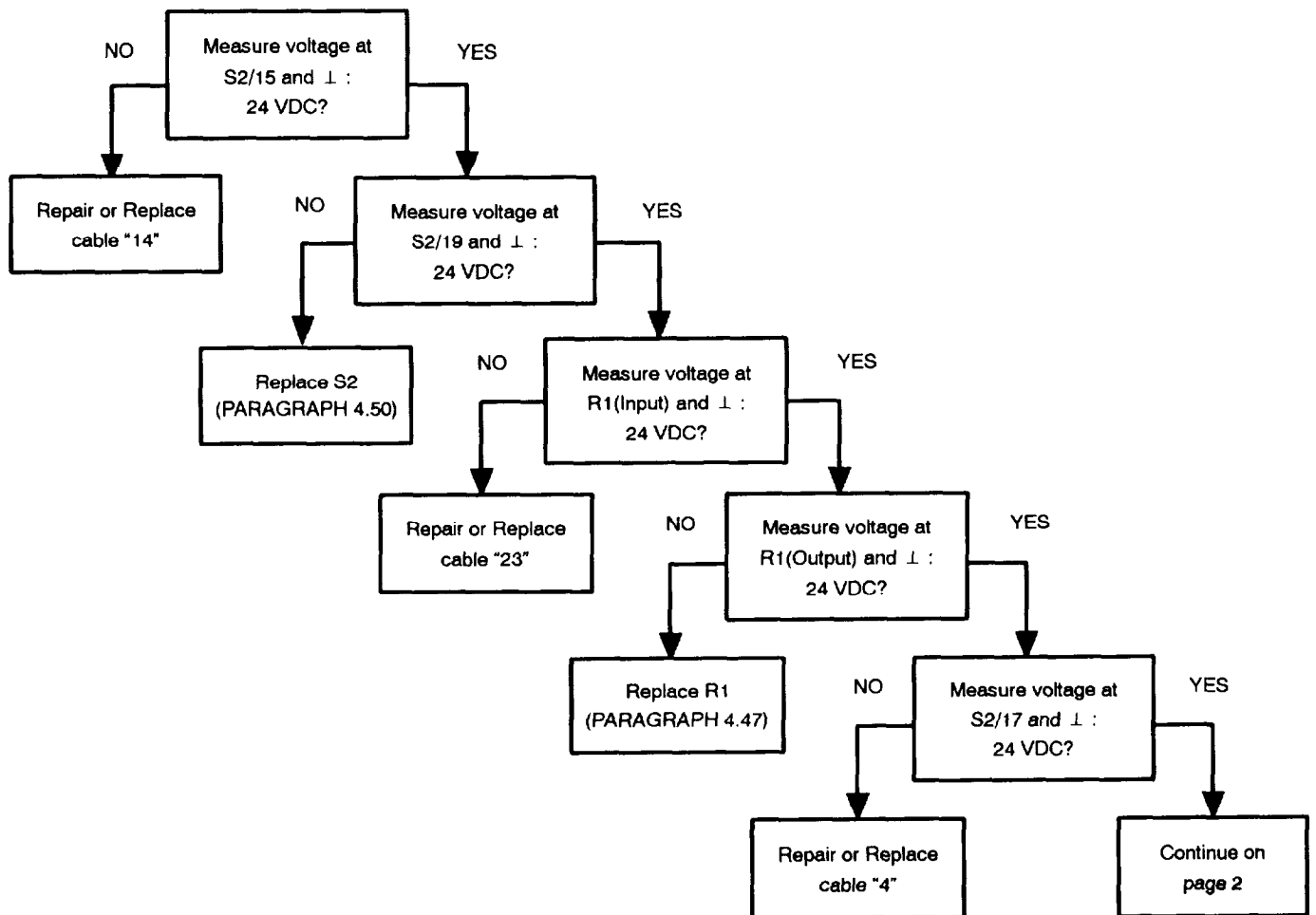


Figure 5-3 GLOWPLUG ON lamp does not light up (sheet 1 of 4).

WARNING

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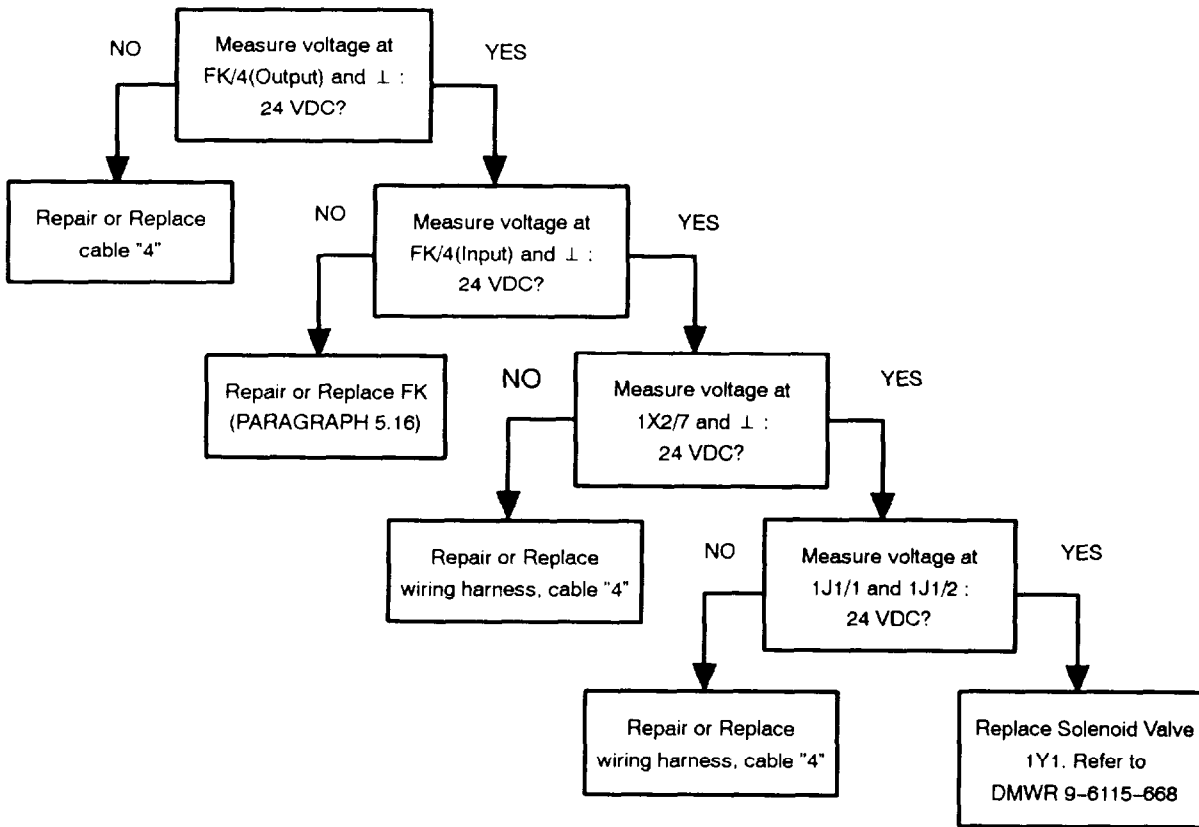


Figure 5-3 GLOWPLUG ON lamp does not light up (sheet 2 of 4).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

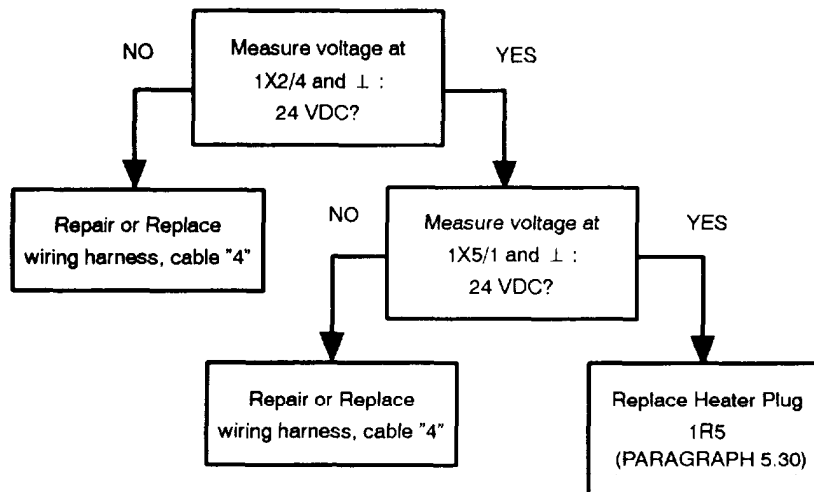
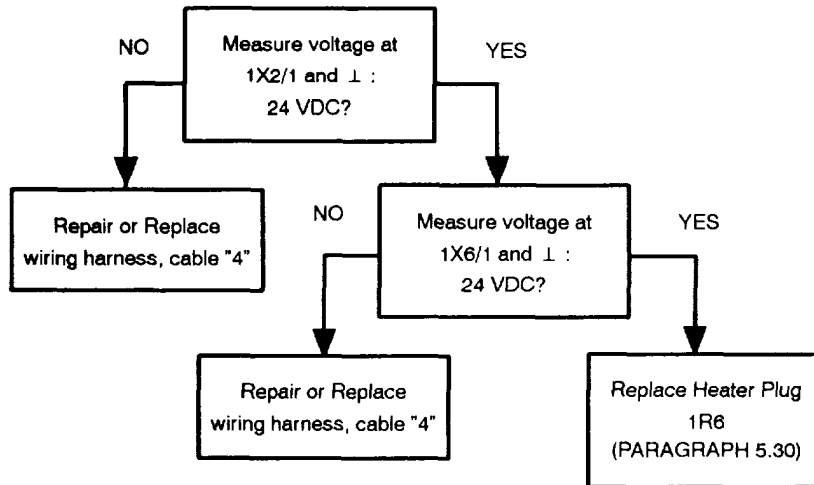


Figure 5-3 GLOWPLUG ON lamp does not light up (sheet 3 of 4).

WARNING

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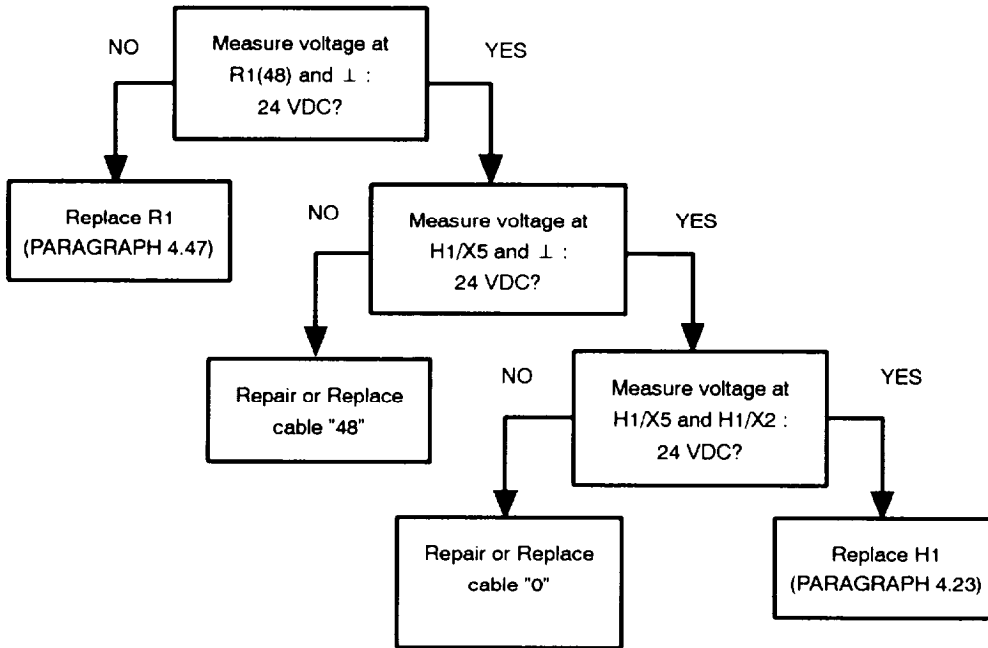


Figure 5-3 GLOWPLUG ON lamp does not light up (sheet 4 of 4).

WARNING

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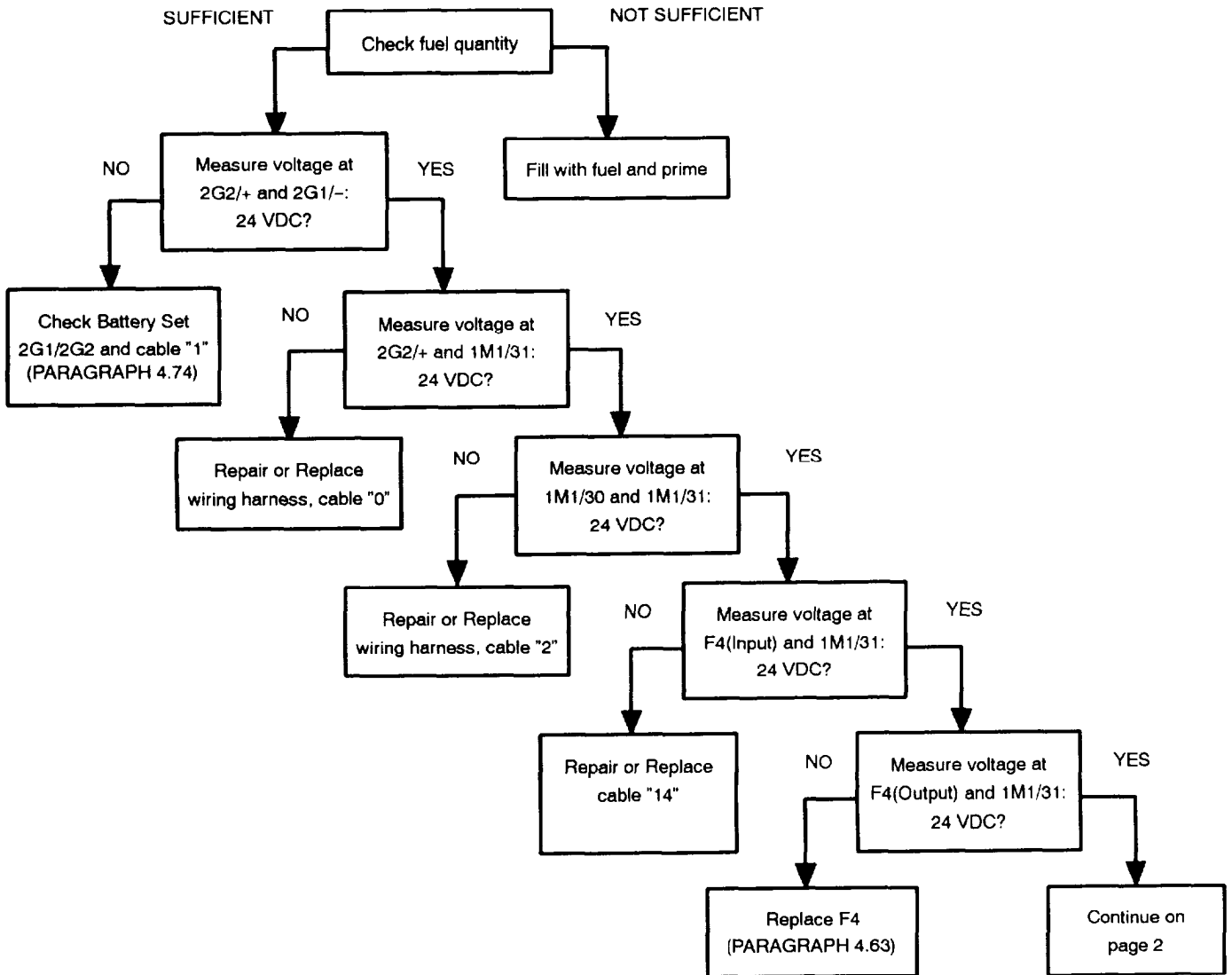


Figure 5-4 Diesel engine cannot be started (sheet 1 of 10).

WARNING

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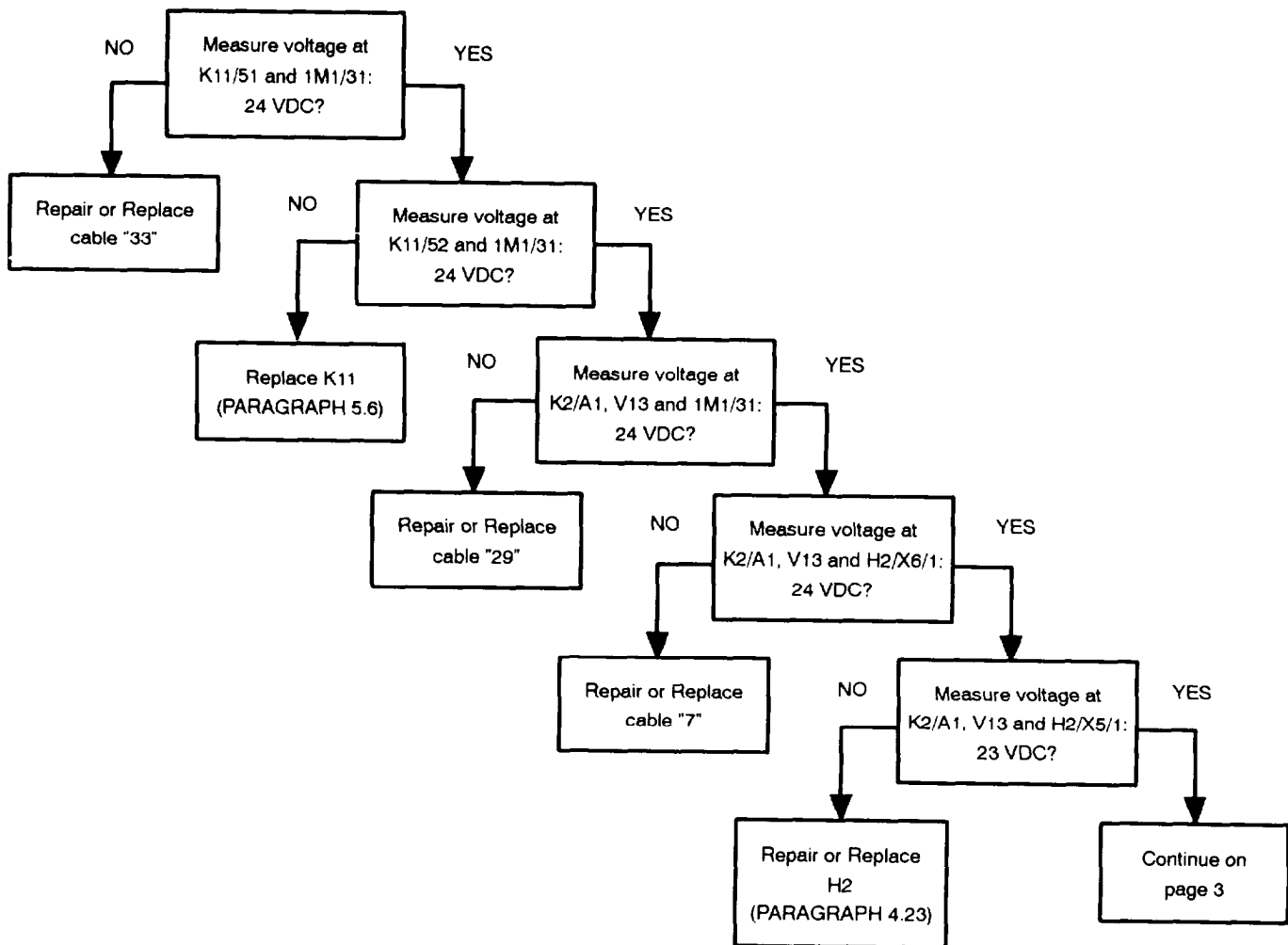


Figure 5-4 Diesel engine cannot be started (sheet 2 of 10).

WARNING

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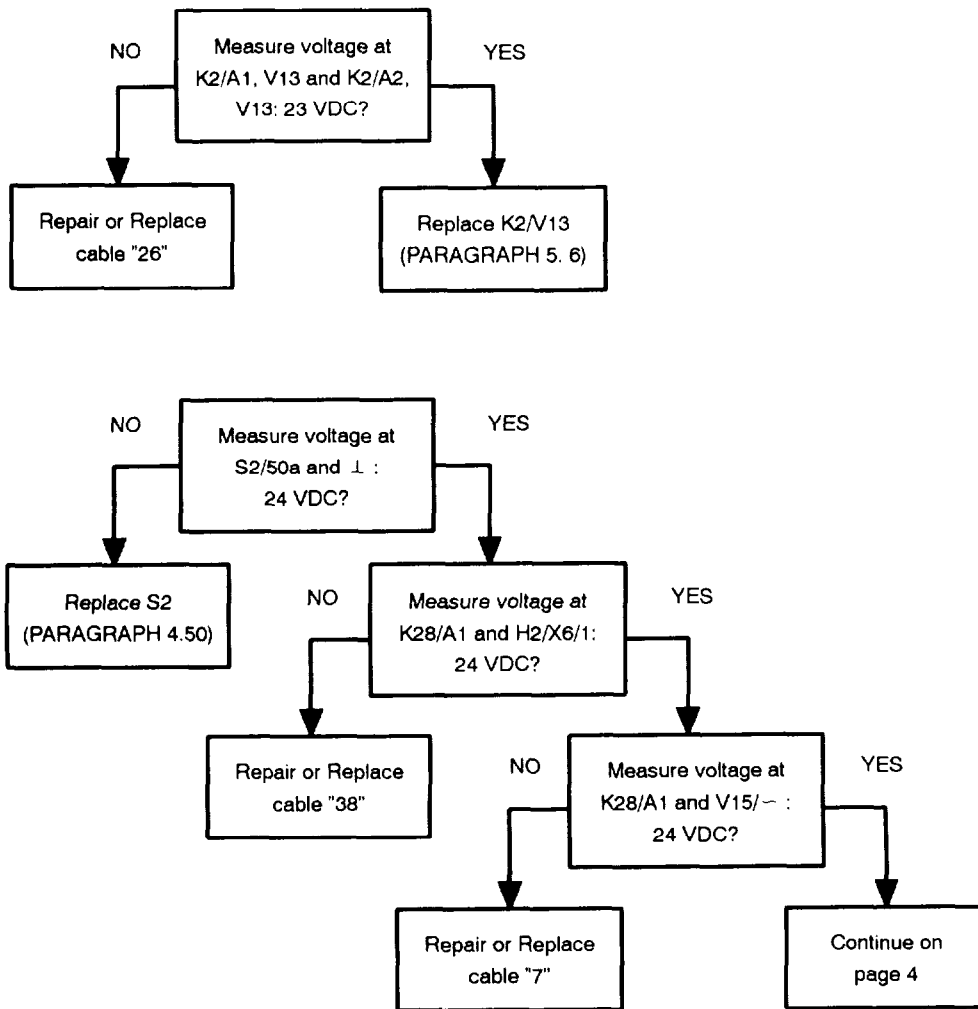


Figure 5-4 Diesel engine cannot be started (sheet 3 of 10).

WARNING

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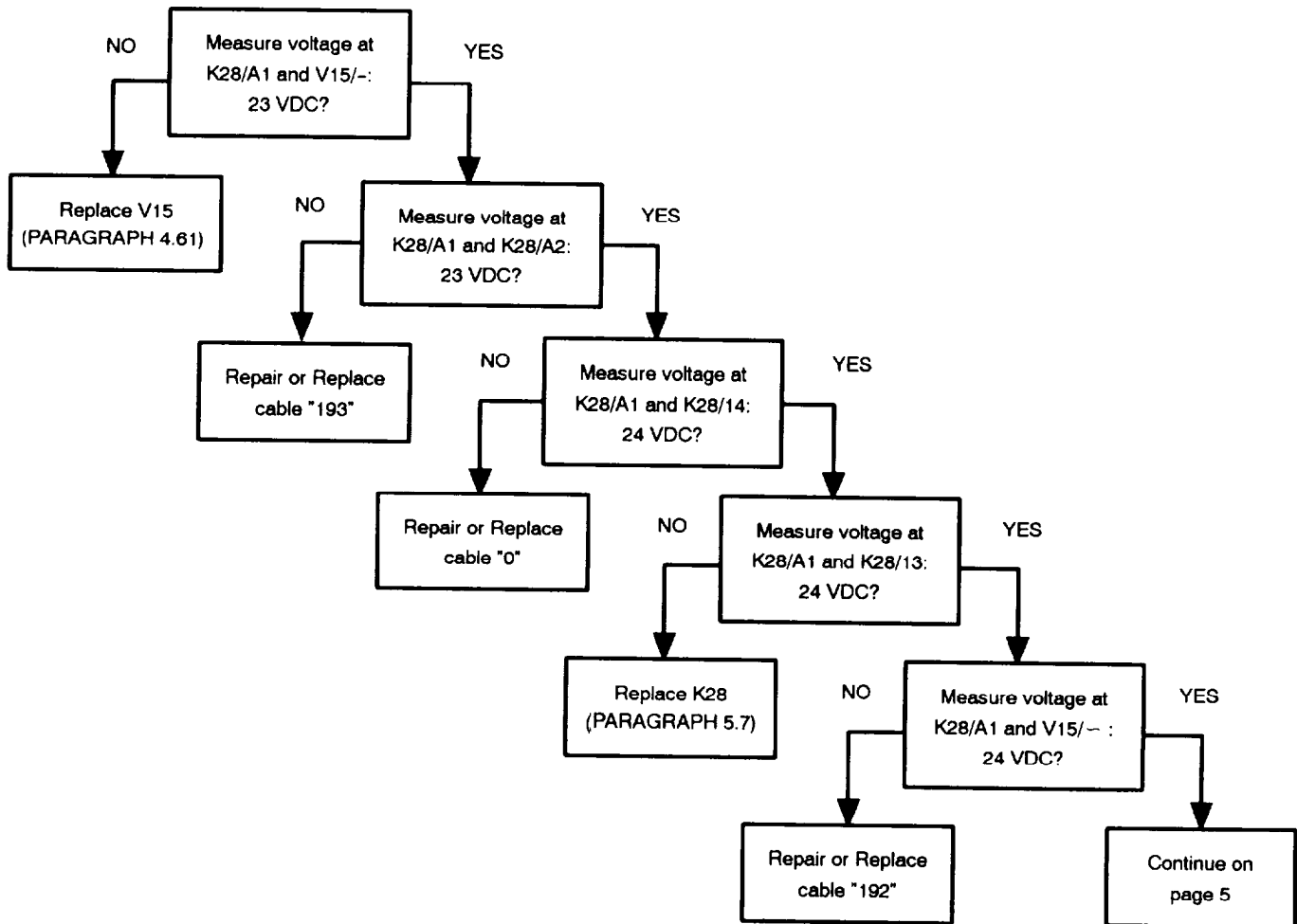


Figure 5-4 Diesel engine cannot be started (sheet 4 of 10).

WARNING

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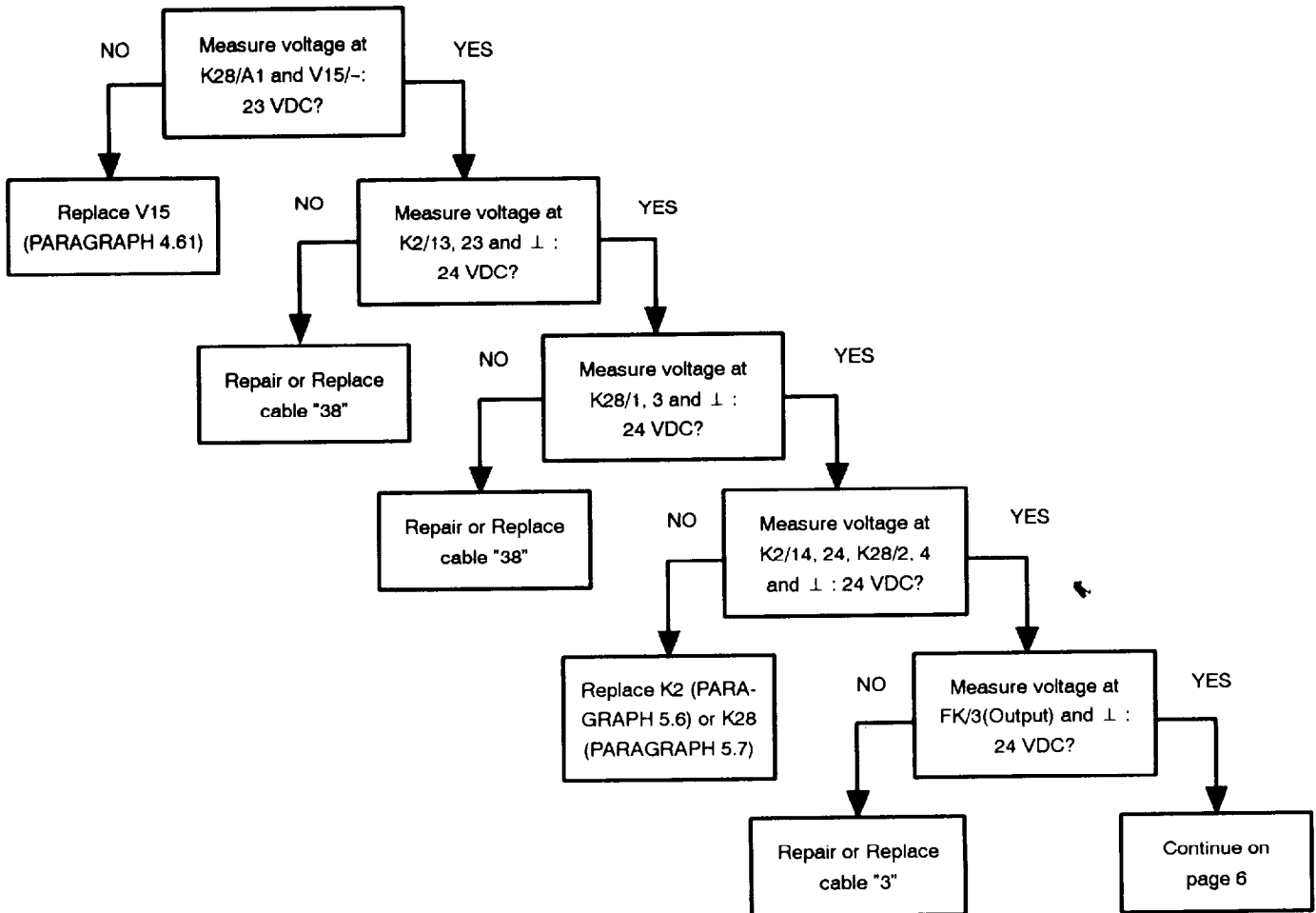


Figure 5-4 Diesel engine cannot be started (sheet 5 of 10).

WARNING

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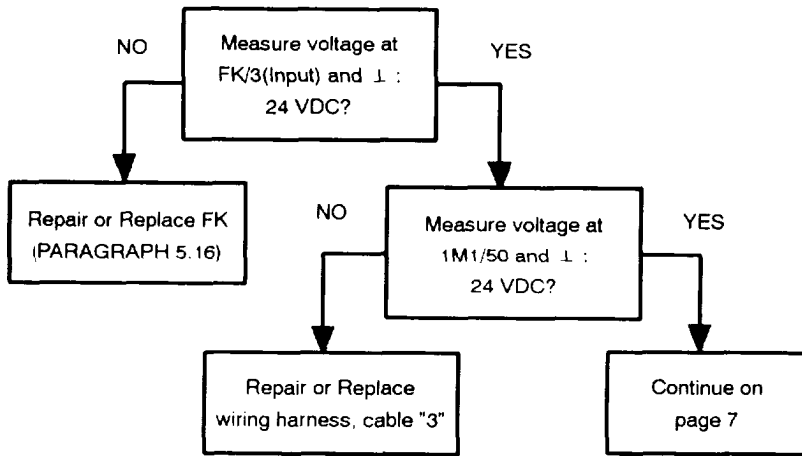


Figure 5-4 Diesel engine cannot be started (sheet 6 of 10).

WARNING

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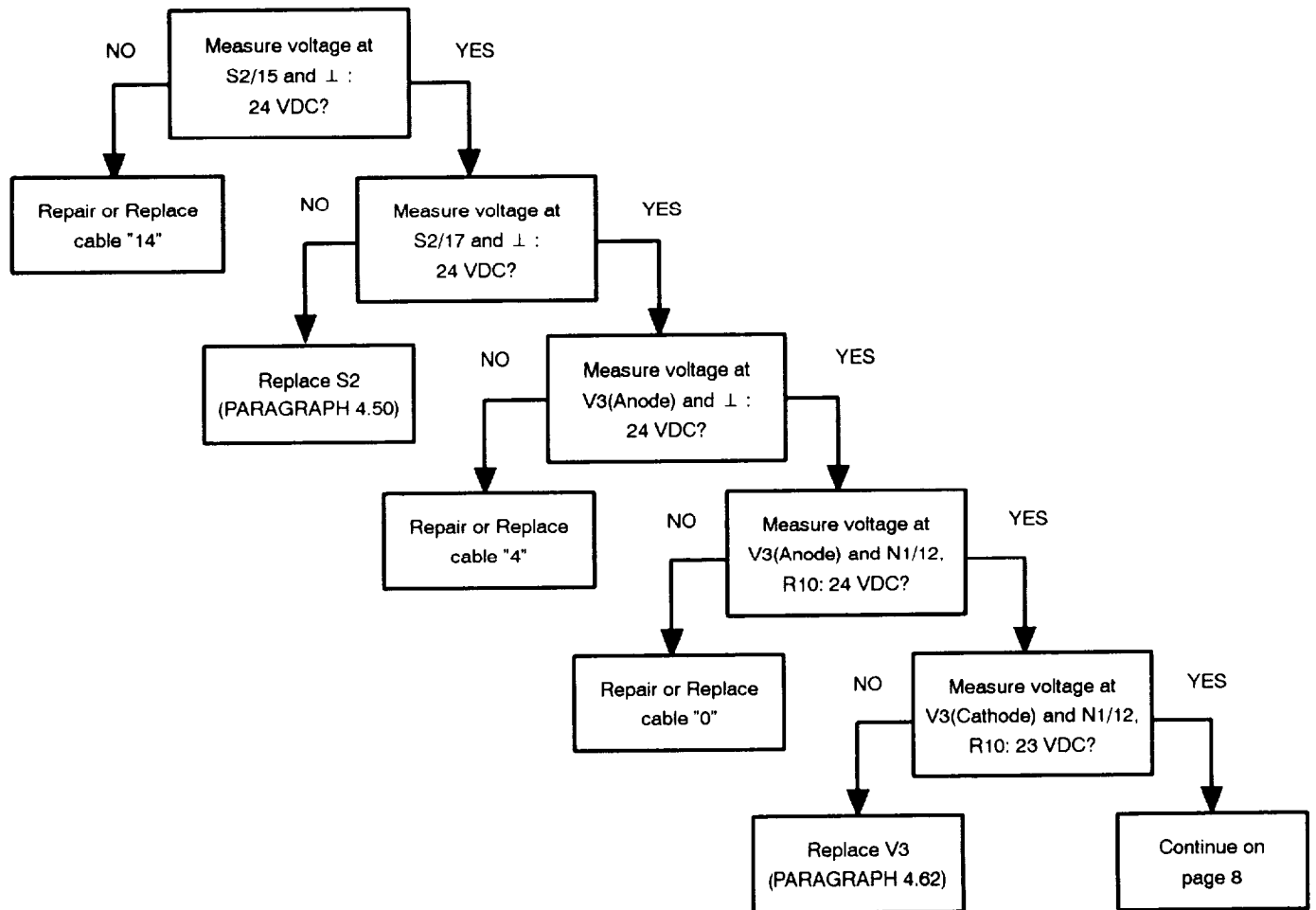


Figure 5-4 Diesel engine cannot be started (sheet 7 of 10).

WARNING

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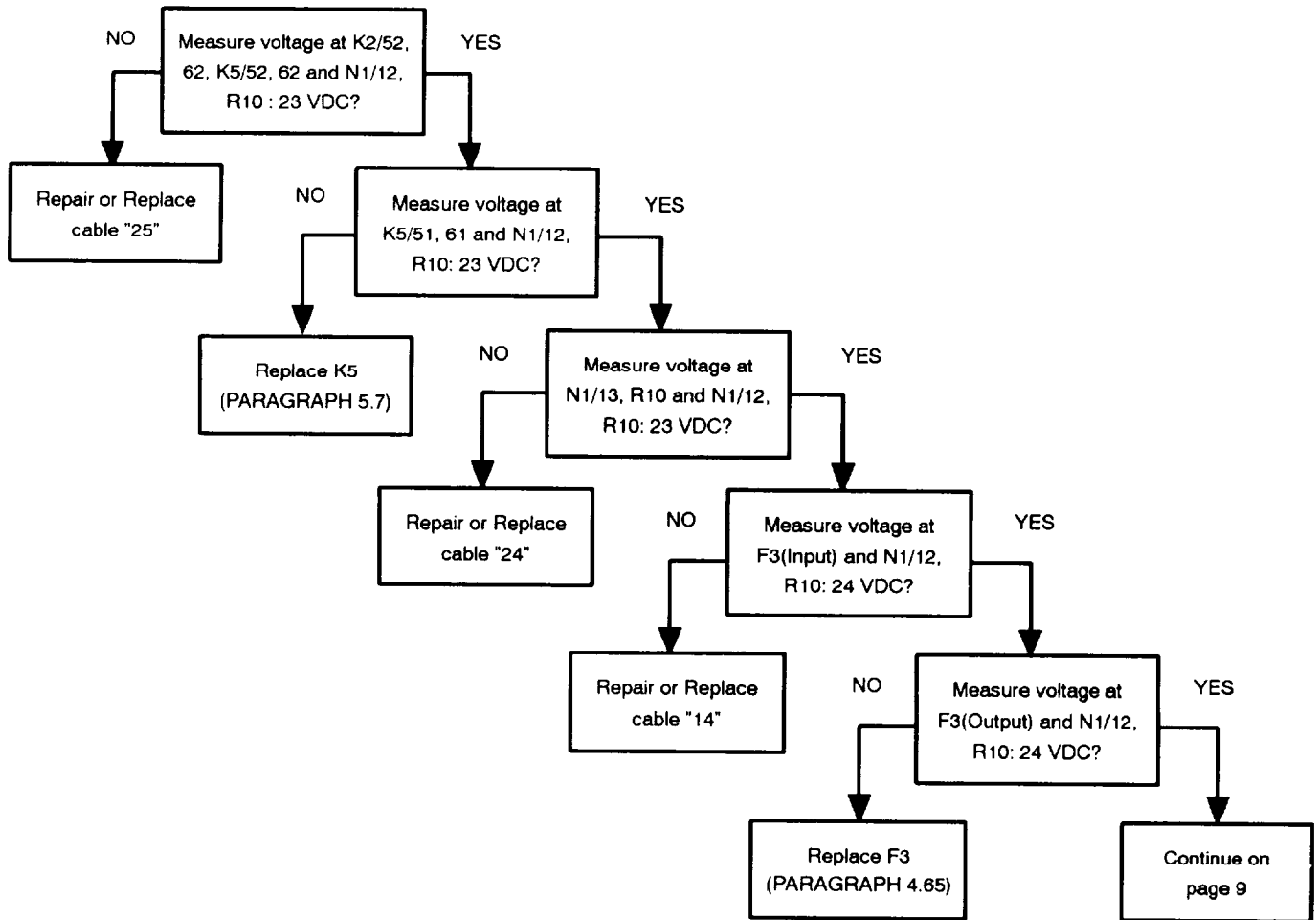


Figure 5-4 Diesel engine cannot be started (sheet 8 of 10).

WARNING

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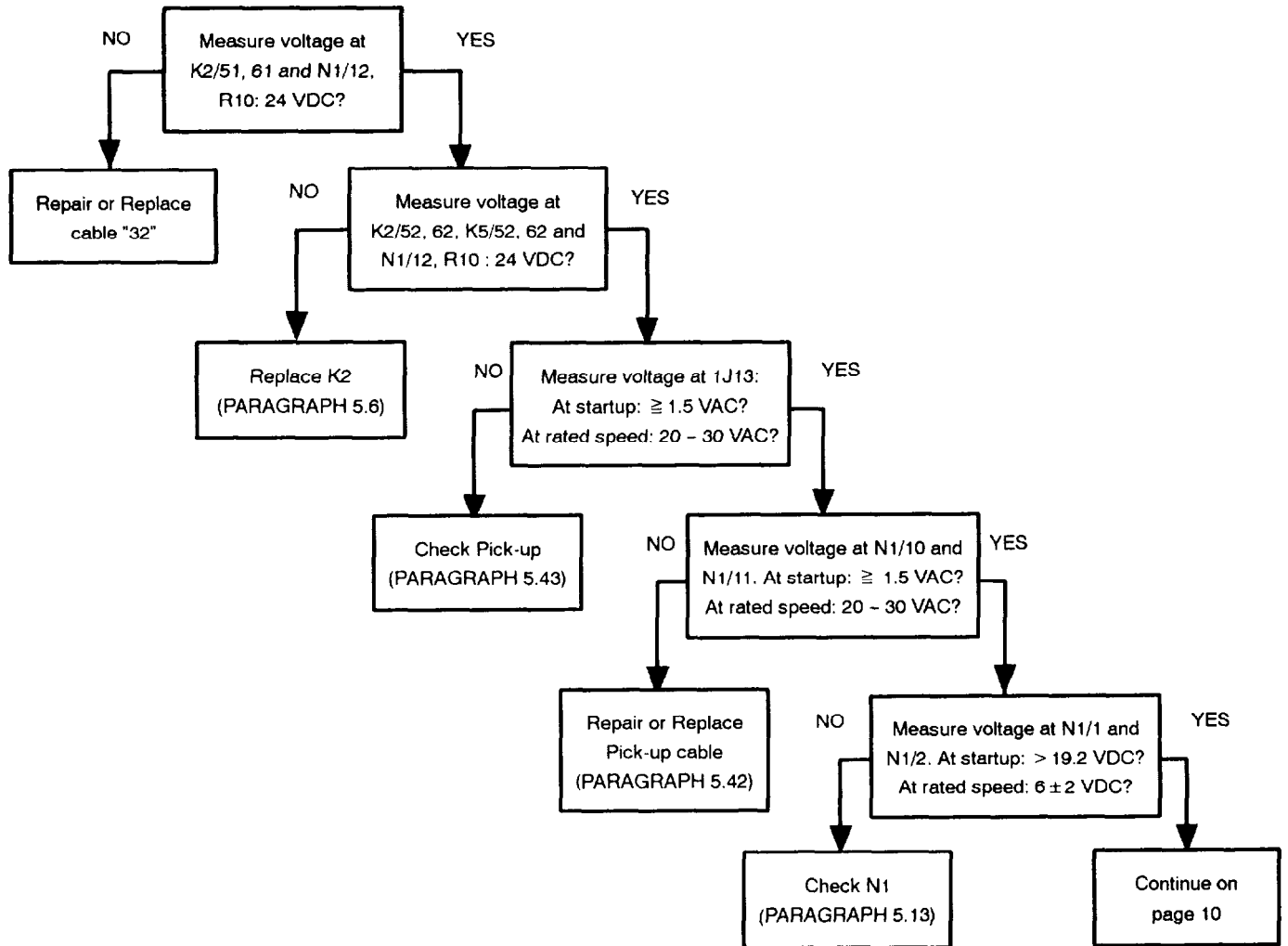


Figure 5-4 Diesel engine cannot be started (sheet 9 of 10).

WARNING

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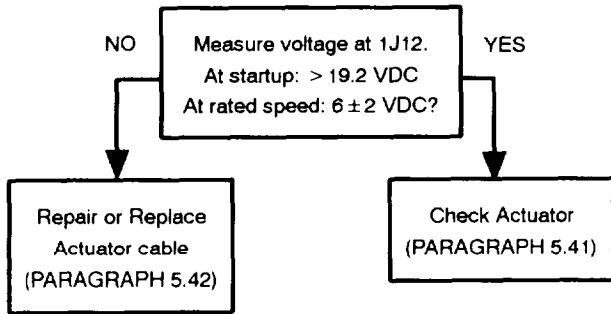


Figure 5-4 Diesel engine cannot be started (sheet 10 of 10).

WARNING

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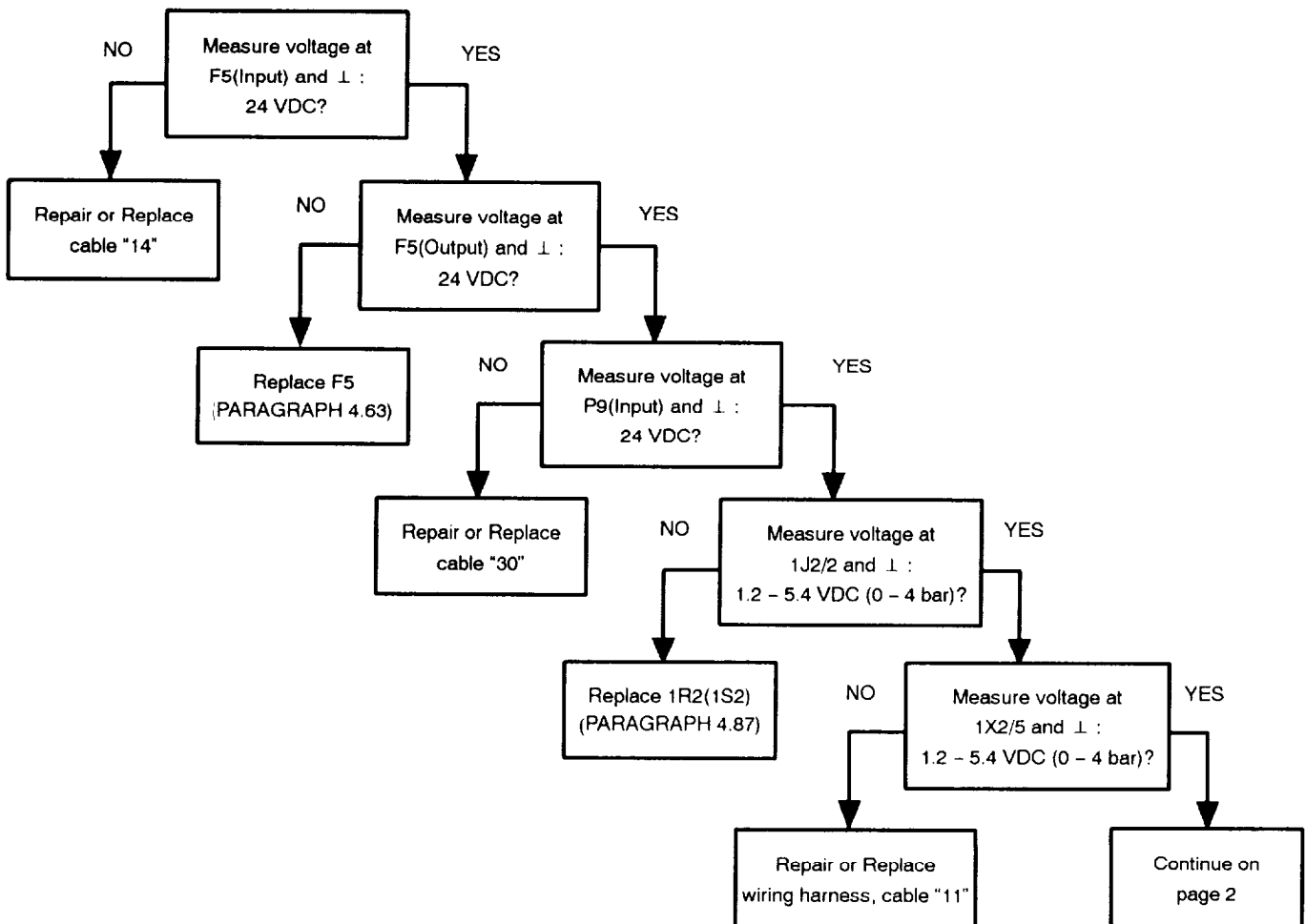


Figure 5-5 Oil pressure too low, or no oil pressure indication (sheet 1 of 3).

WARNING

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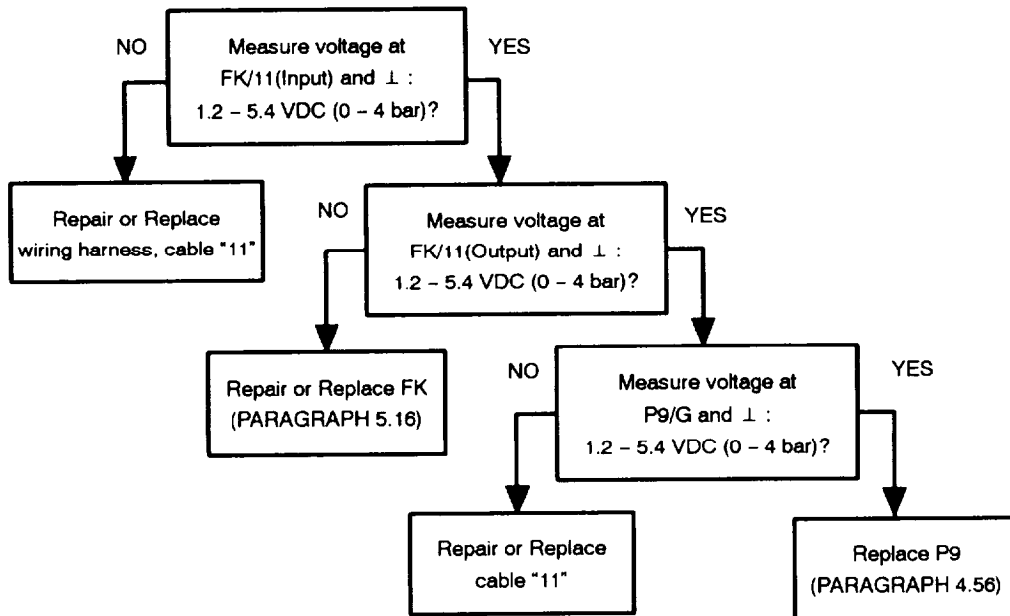


Figure 5-5 Oil pressure too low, or no oil pressure indication (sheet 2 of 3).

WARNING

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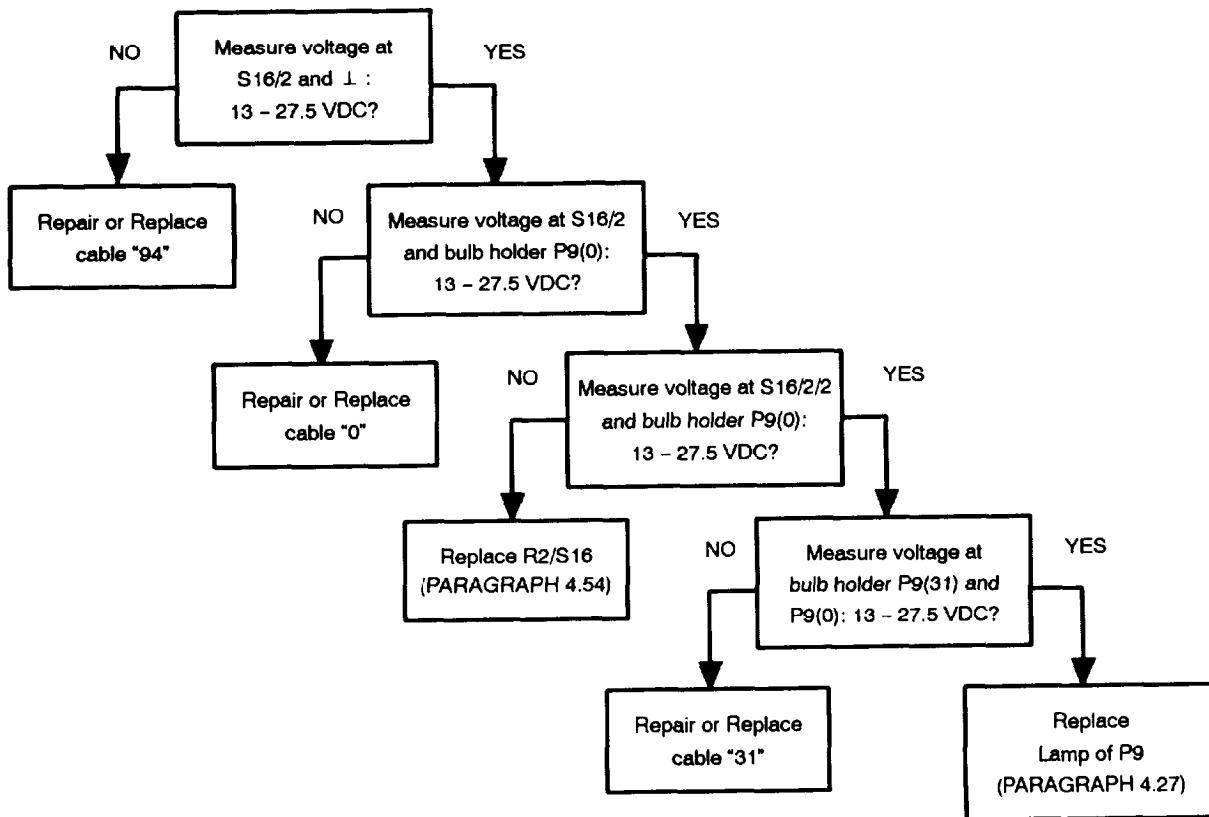


Figure 5-5 Oil pressure too low, or no oil pressure indication (sheet 3 of 3).

WARNING

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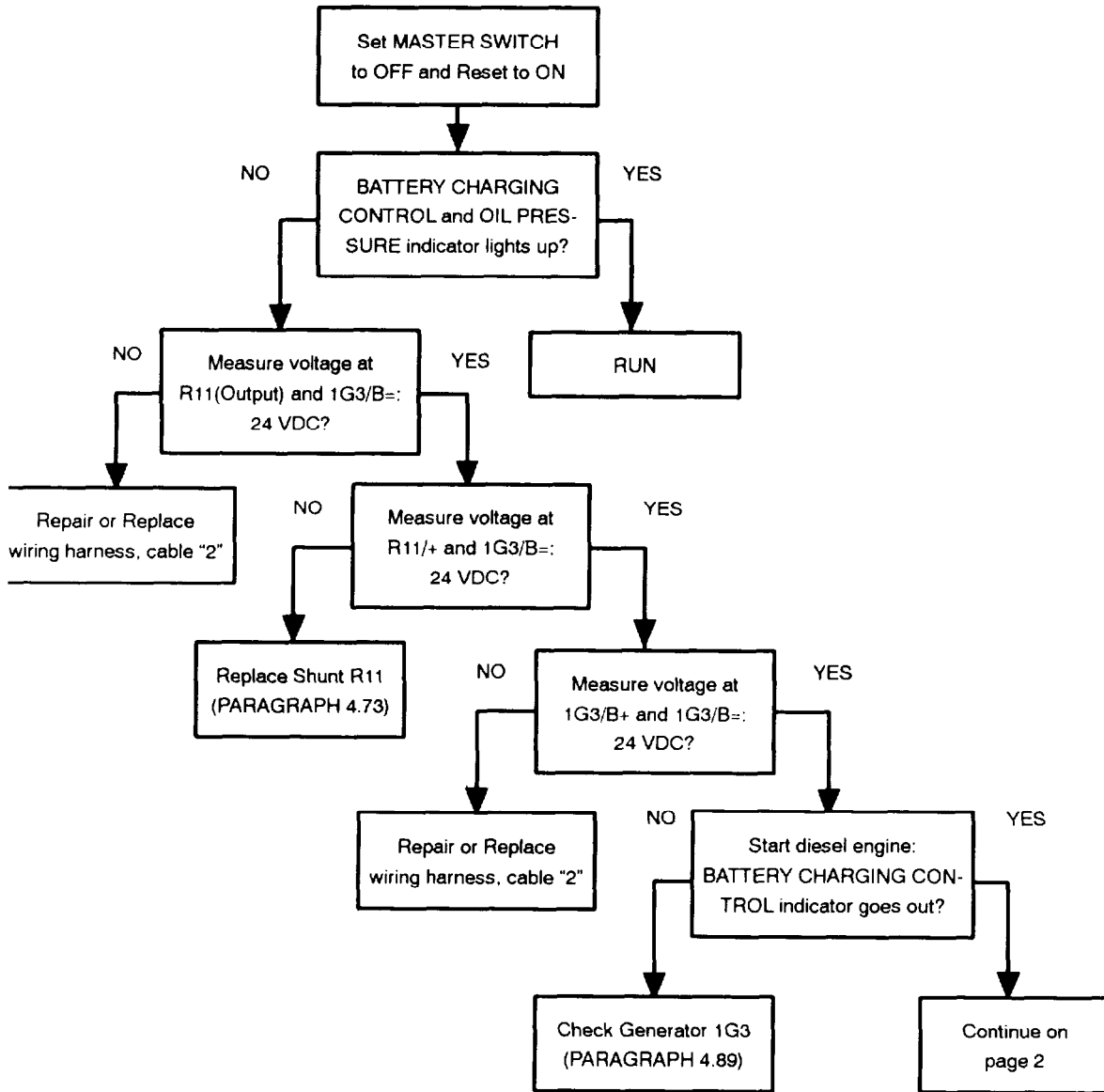


Figure 5-6 Battery set is not being charged, or no charging current indication (sheet 1 of 2).

WARNING

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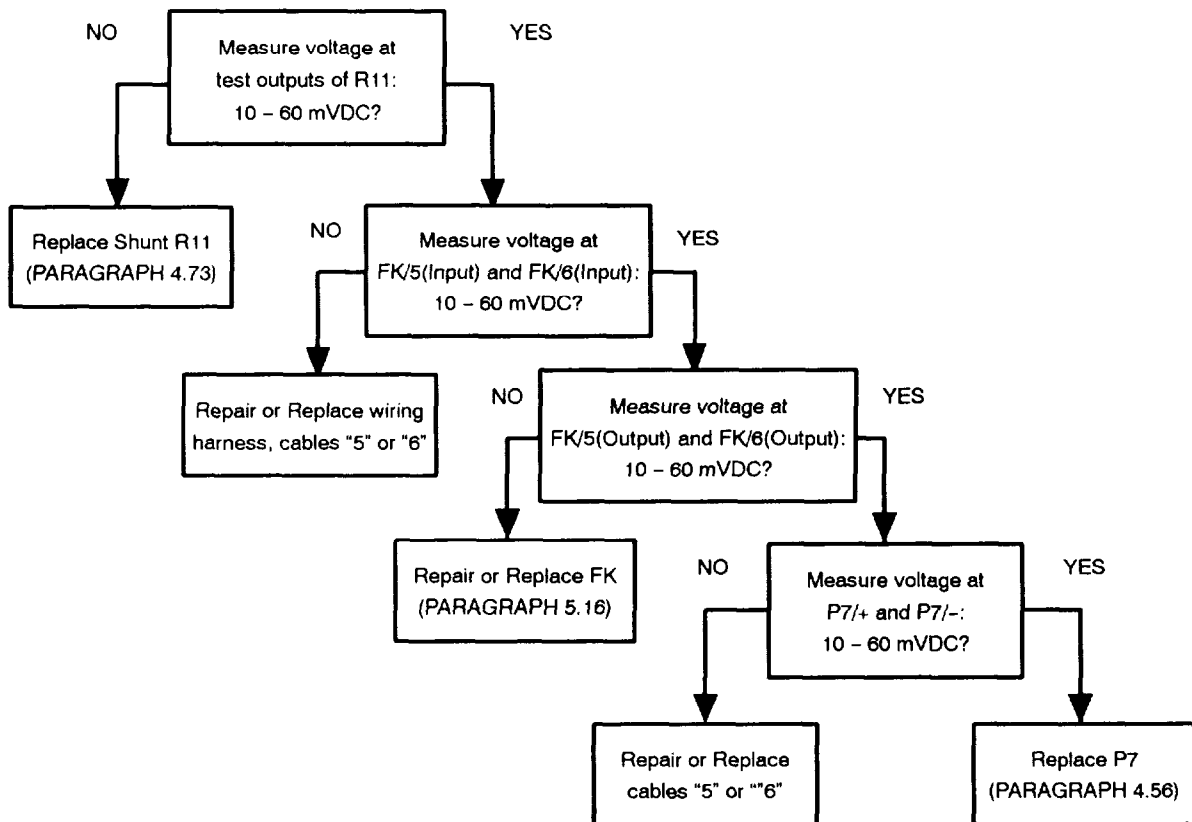


Figure 5-6 Battery set is not being charged, or no charging current indication (sheet 2 of 2).

WARNING

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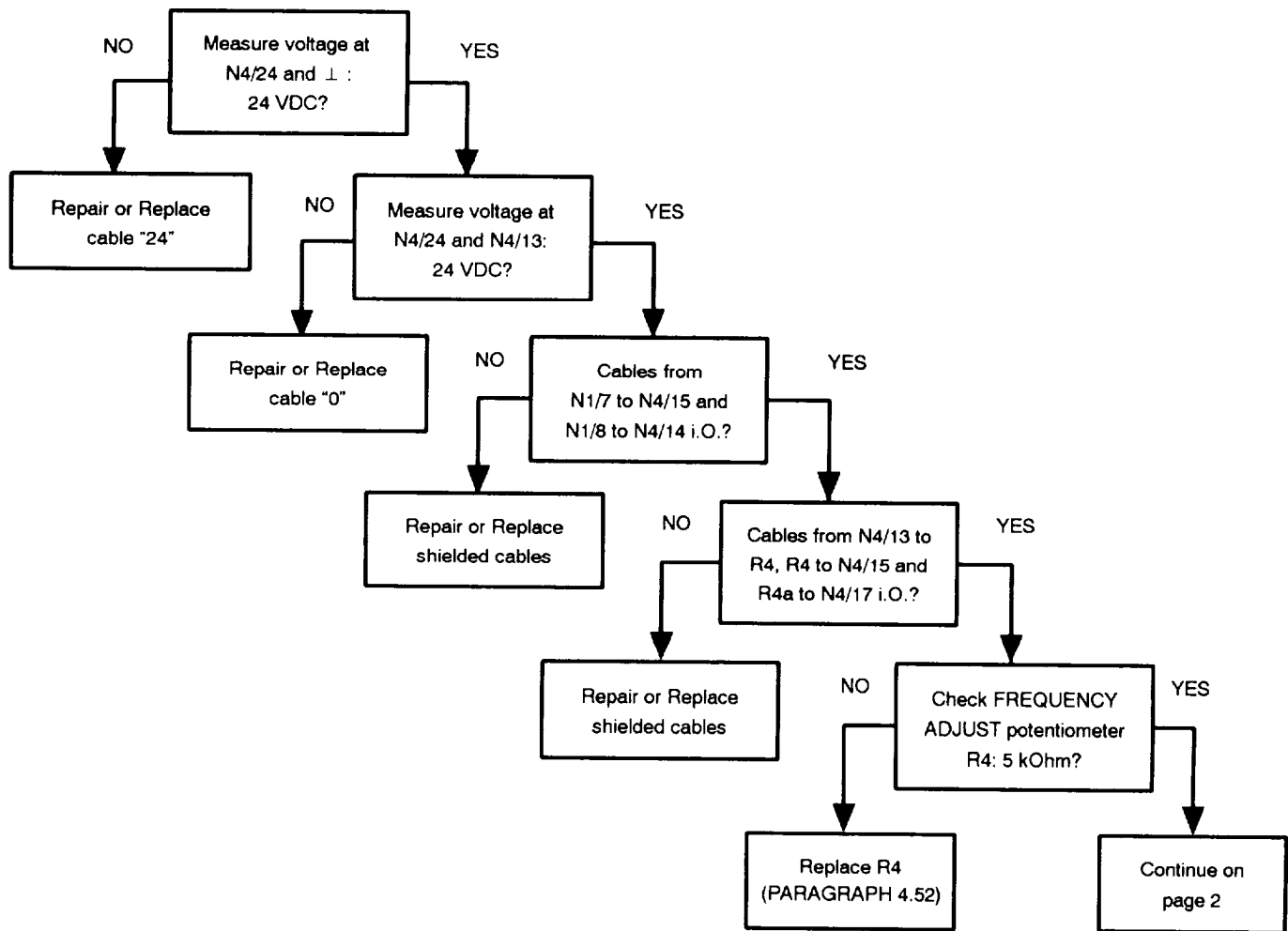


Figure 5-7 Generator frequency cannot be adjusted, or no frequency indication (sheet 1 of 5).

WARNING

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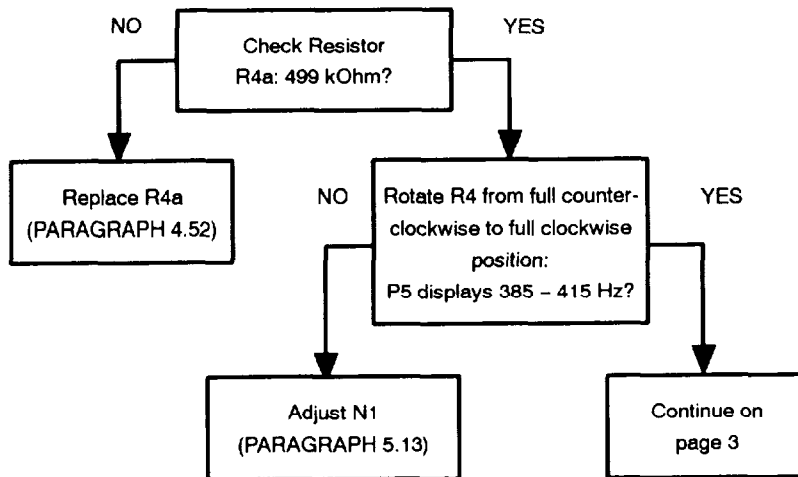


Figure 5-7 Generator frequency cannot be adjusted, or no frequency indication (sheet 2 of 5).

WARNING

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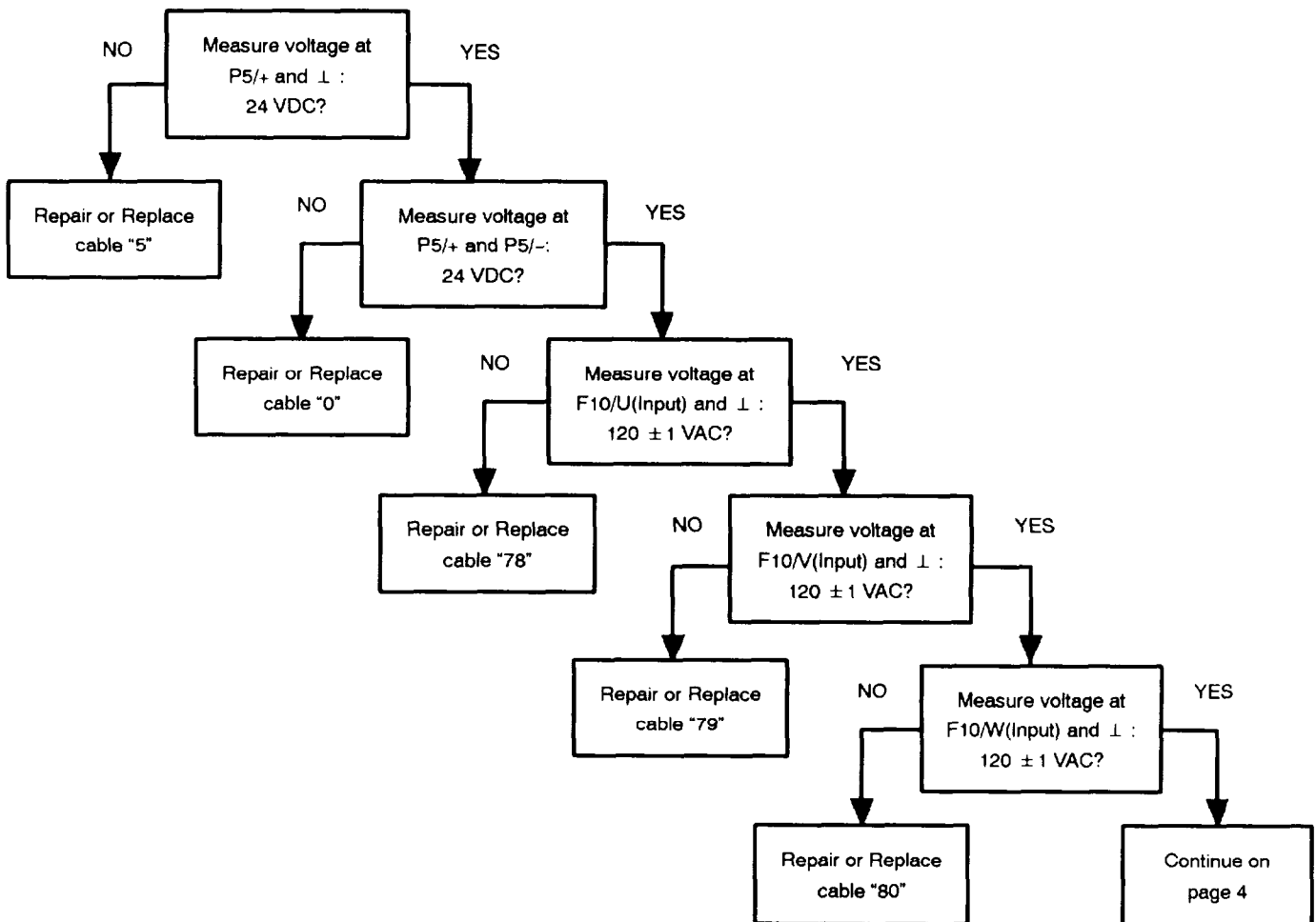


Figure 5-7 Generator frequency cannot be adjusted, or no frequency indication (sheet 3 of 5).

WARNING

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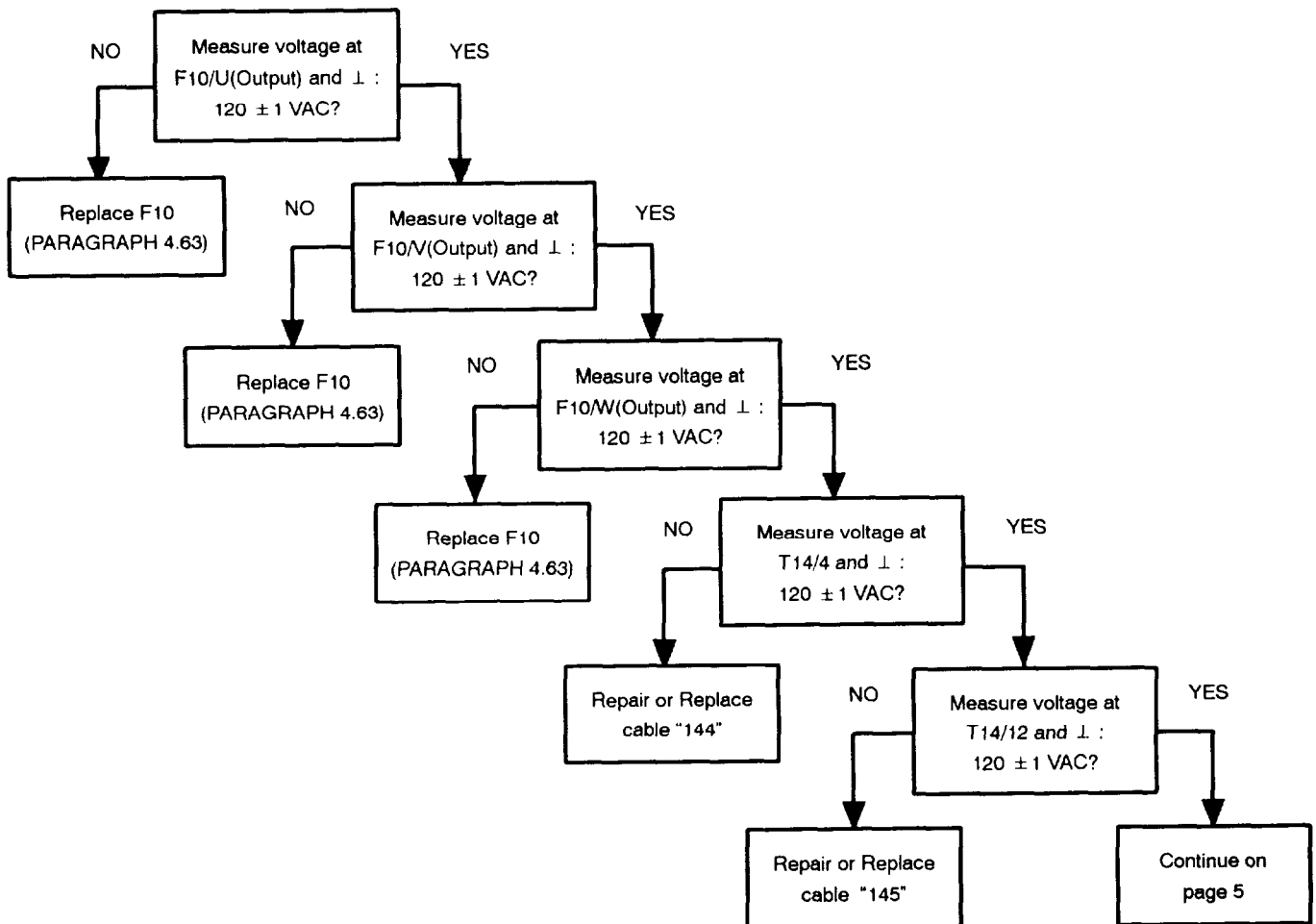


Figure 5-7 Generator frequency cannot be adjusted, or no frequency indication (sheet 4 of 5).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

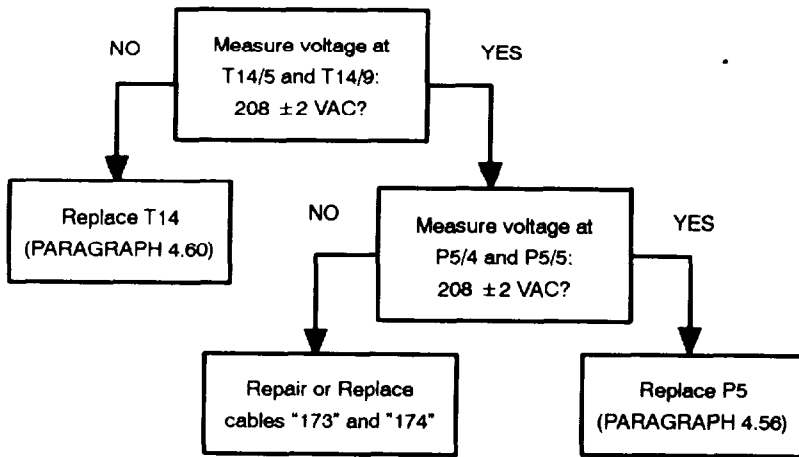


Figure 5-7 Generator frequency cannot be adjusted, or no frequency indication (sheet 5 of 5).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

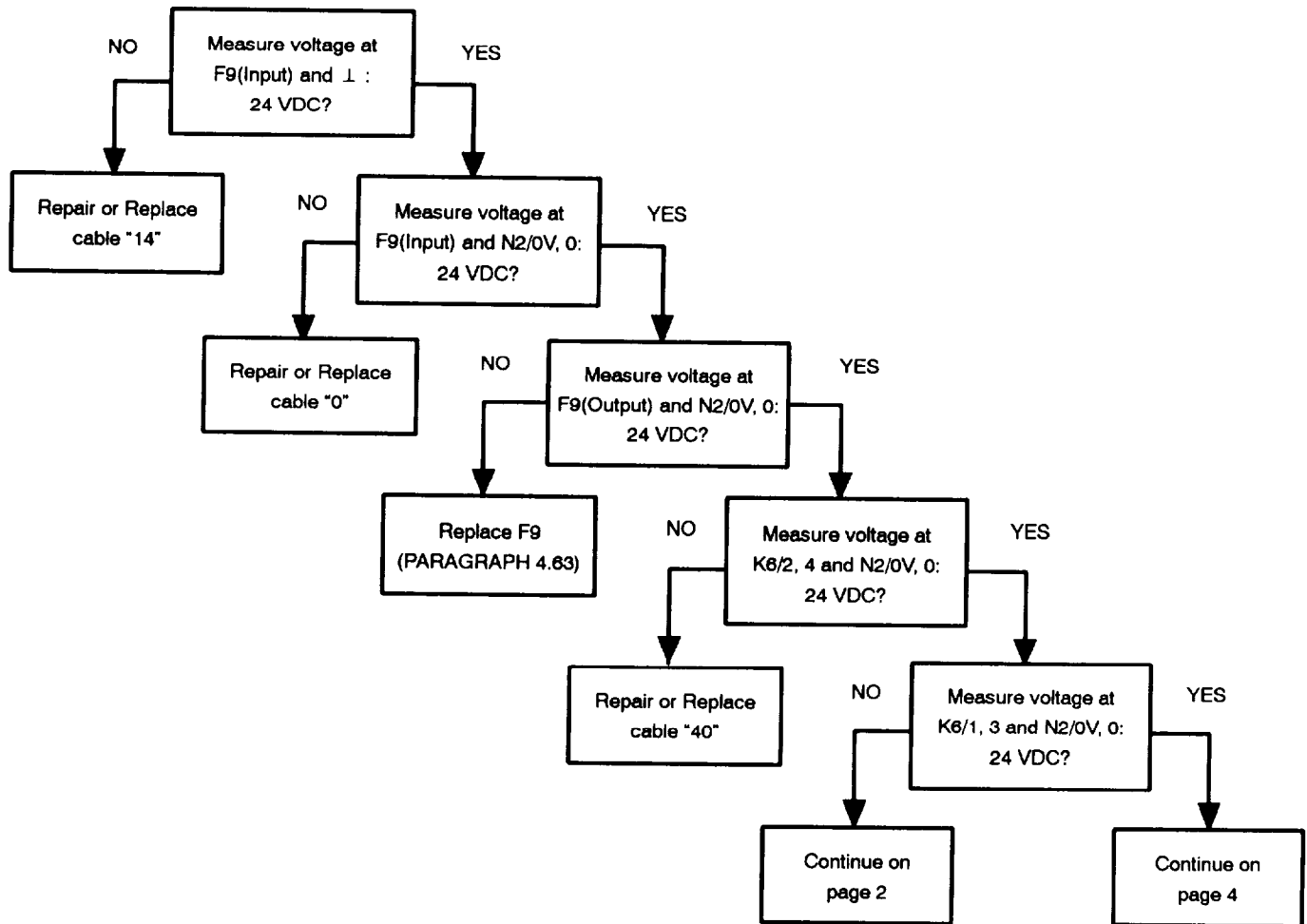


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 1 of 7).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

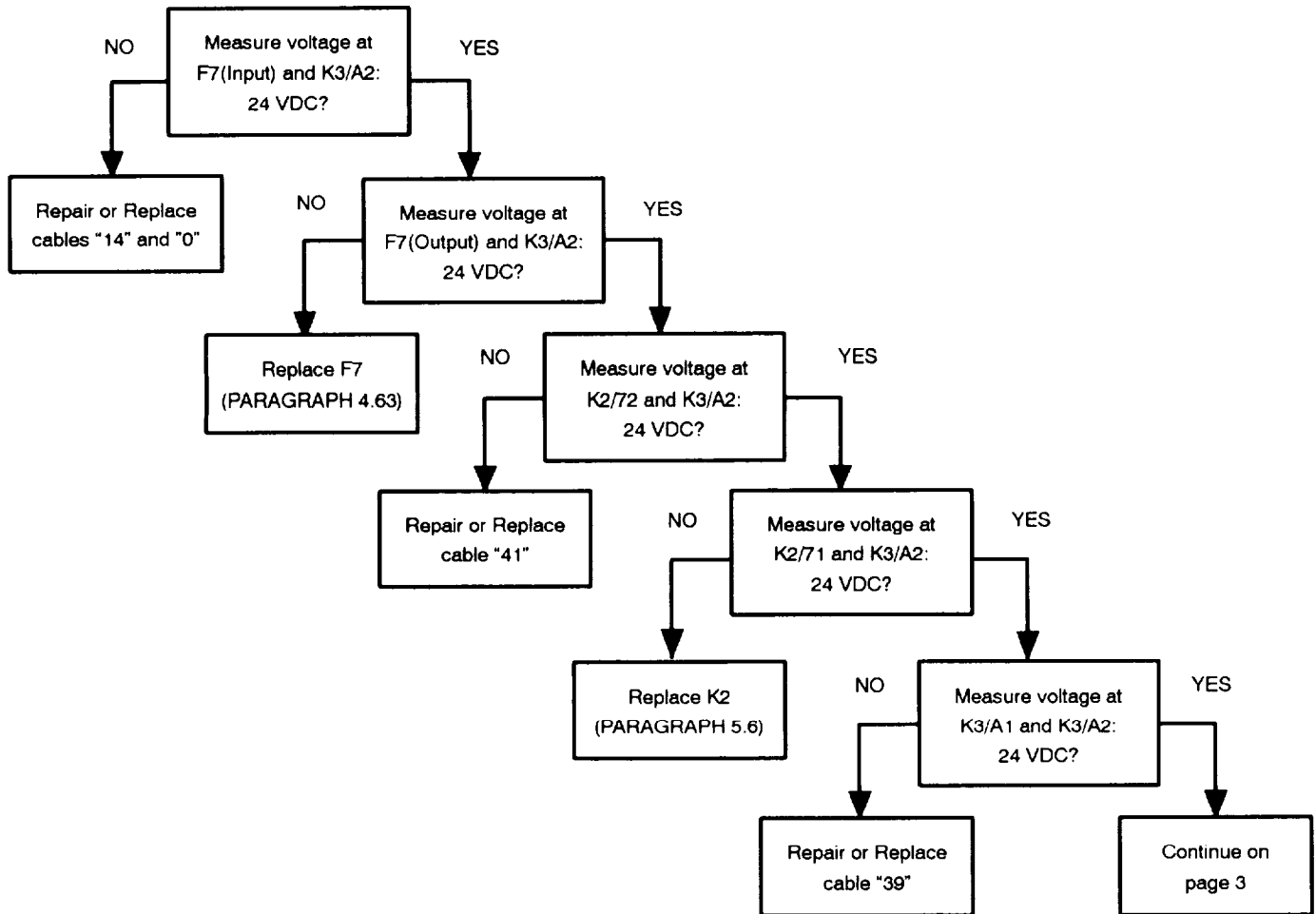


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 2 of 7).

WARNING

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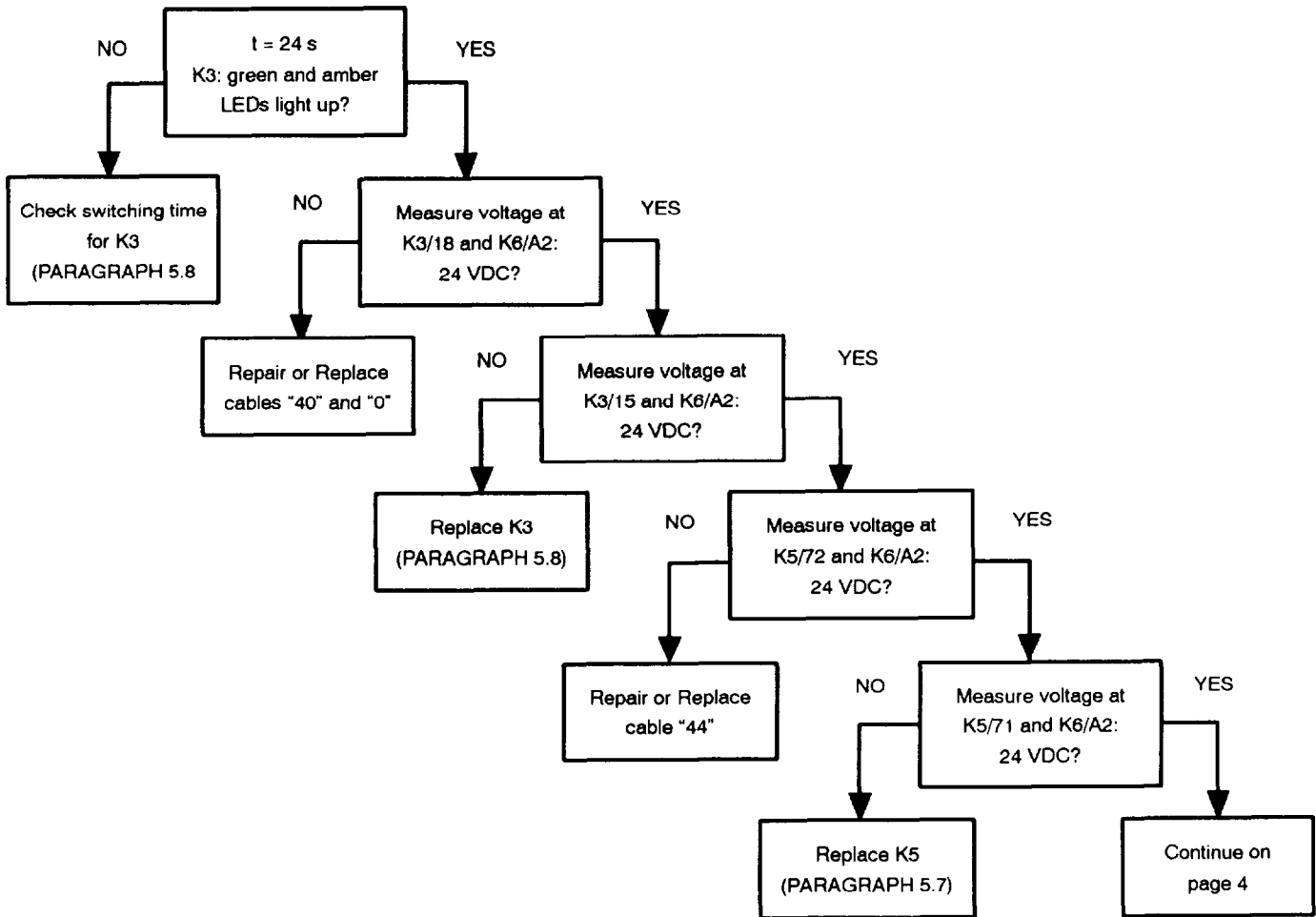


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 3 of 7).

WARNING

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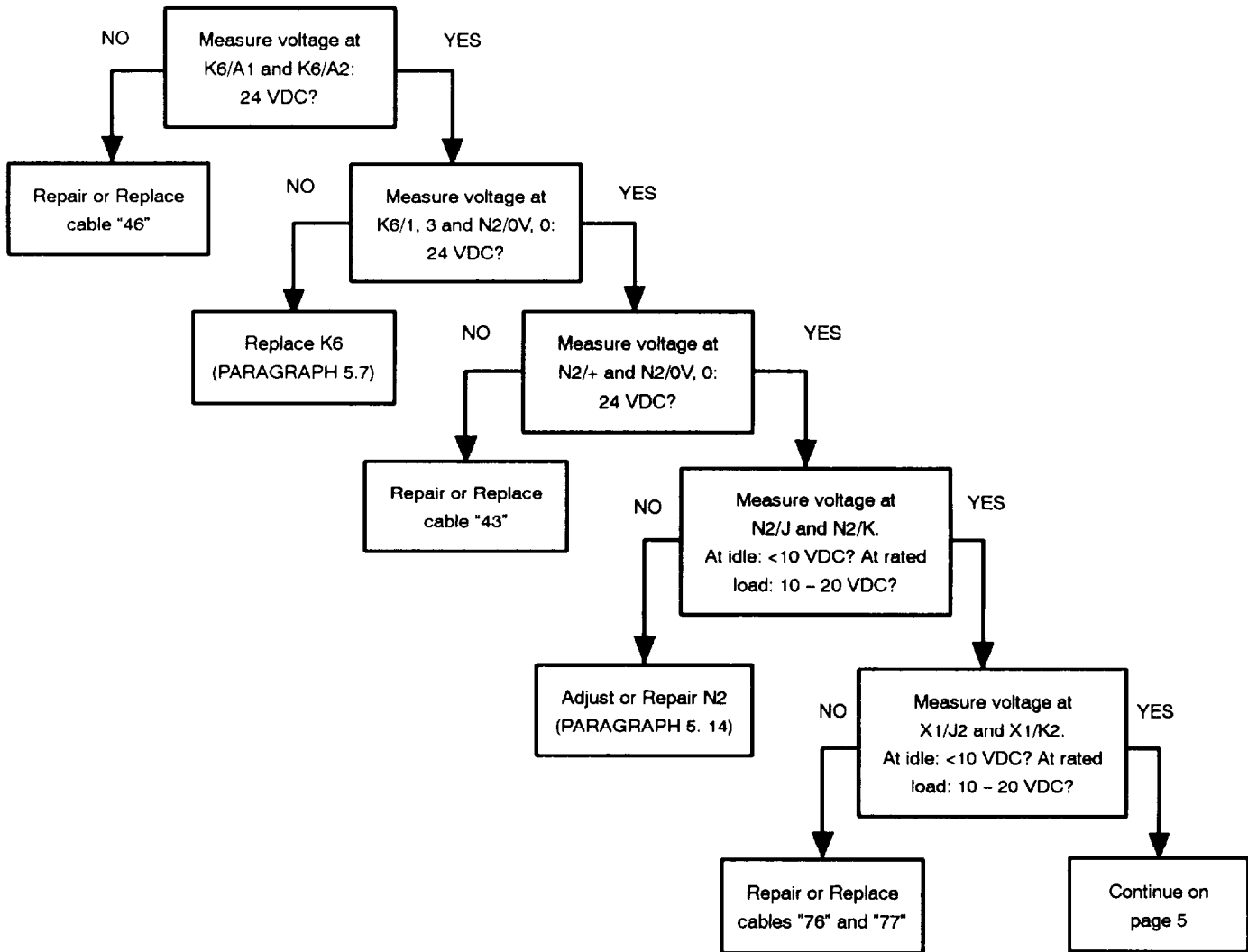


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 4 of 7).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

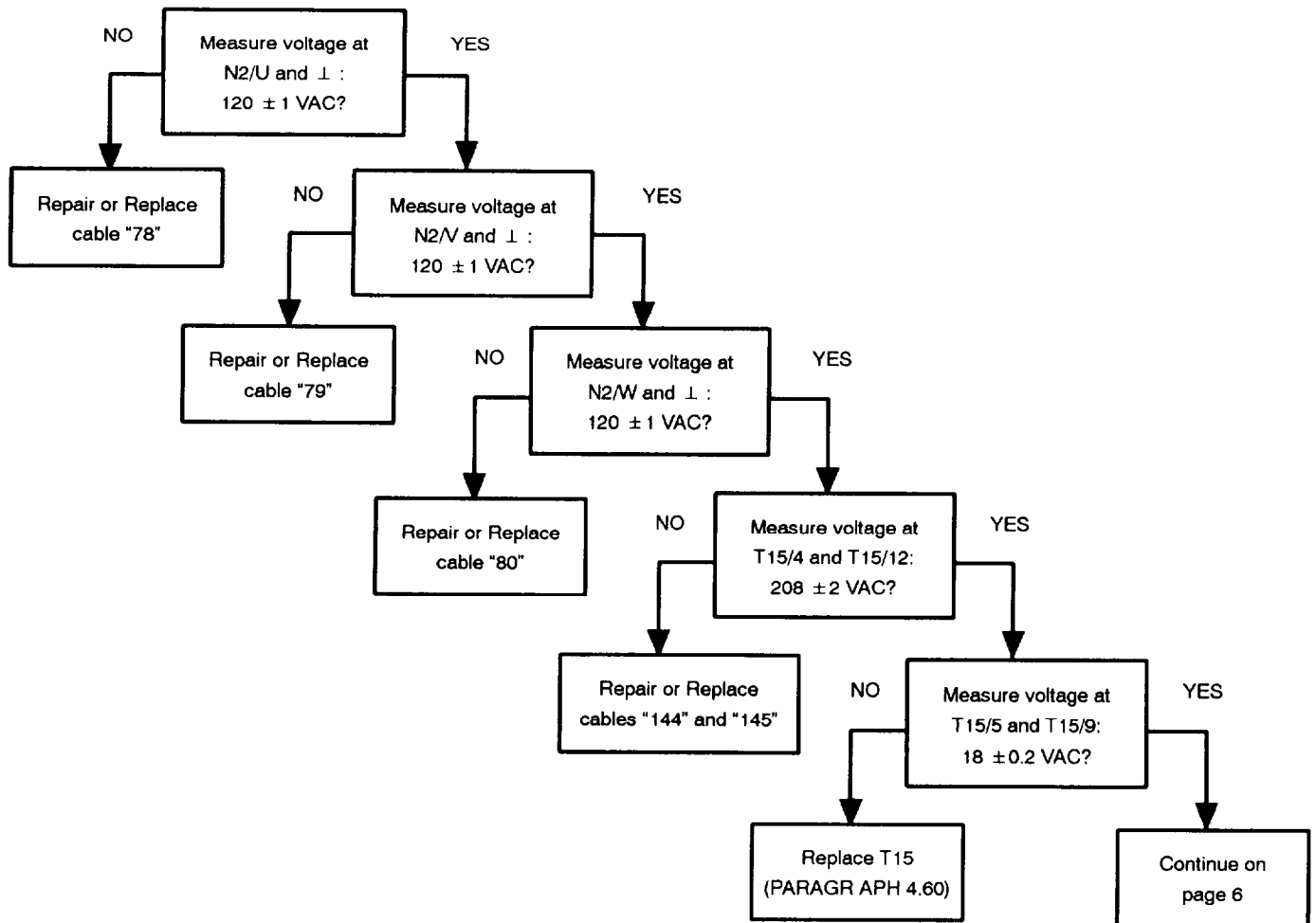


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 5 of 7).

WARNING

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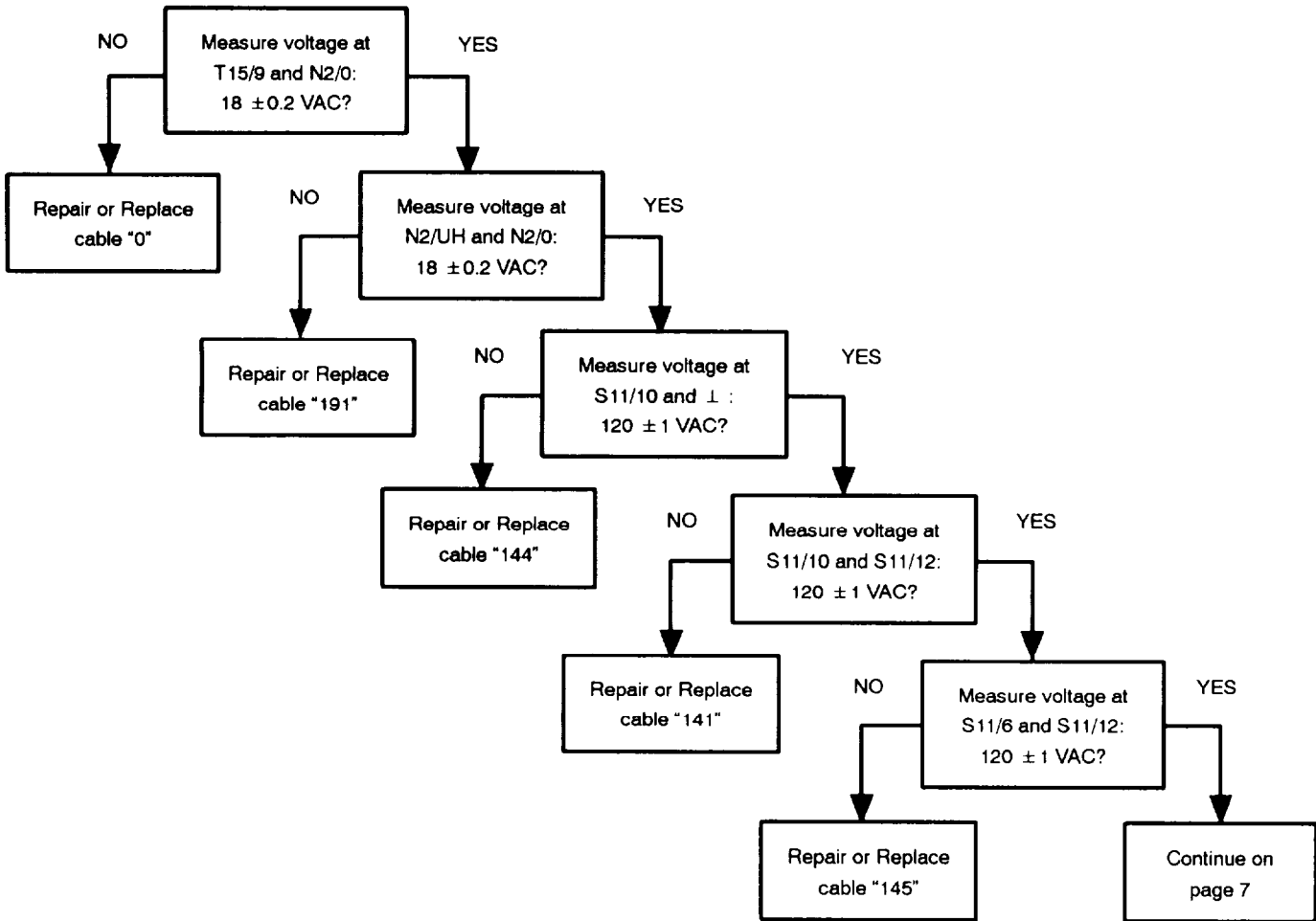


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 6 of 7).

WARNING

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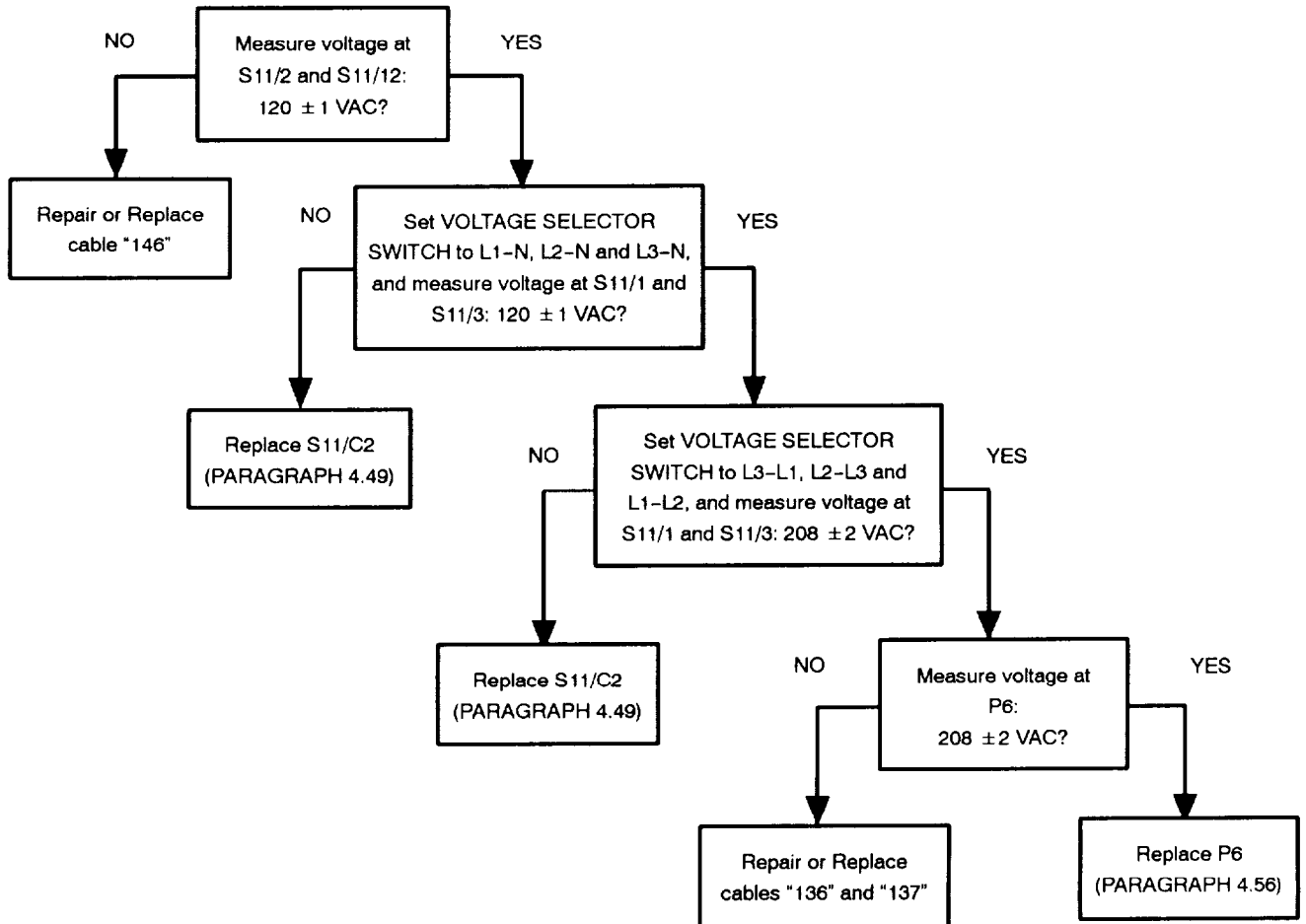


Figure 5-8 Generator voltage cannot be adjusted, or no voltage indication (sheet 7 of 7).

WARNING

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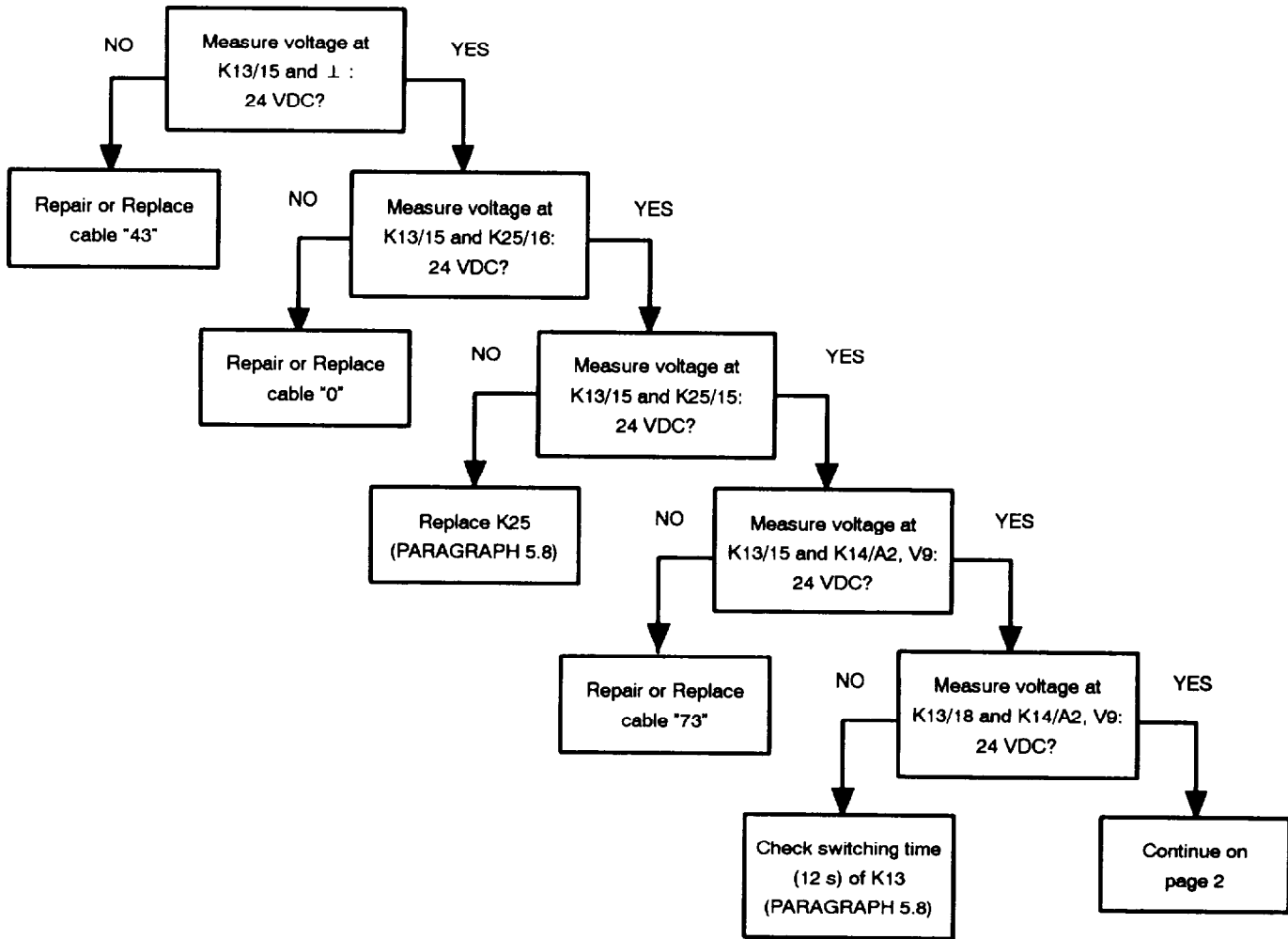


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 1 of 11).

WARNING

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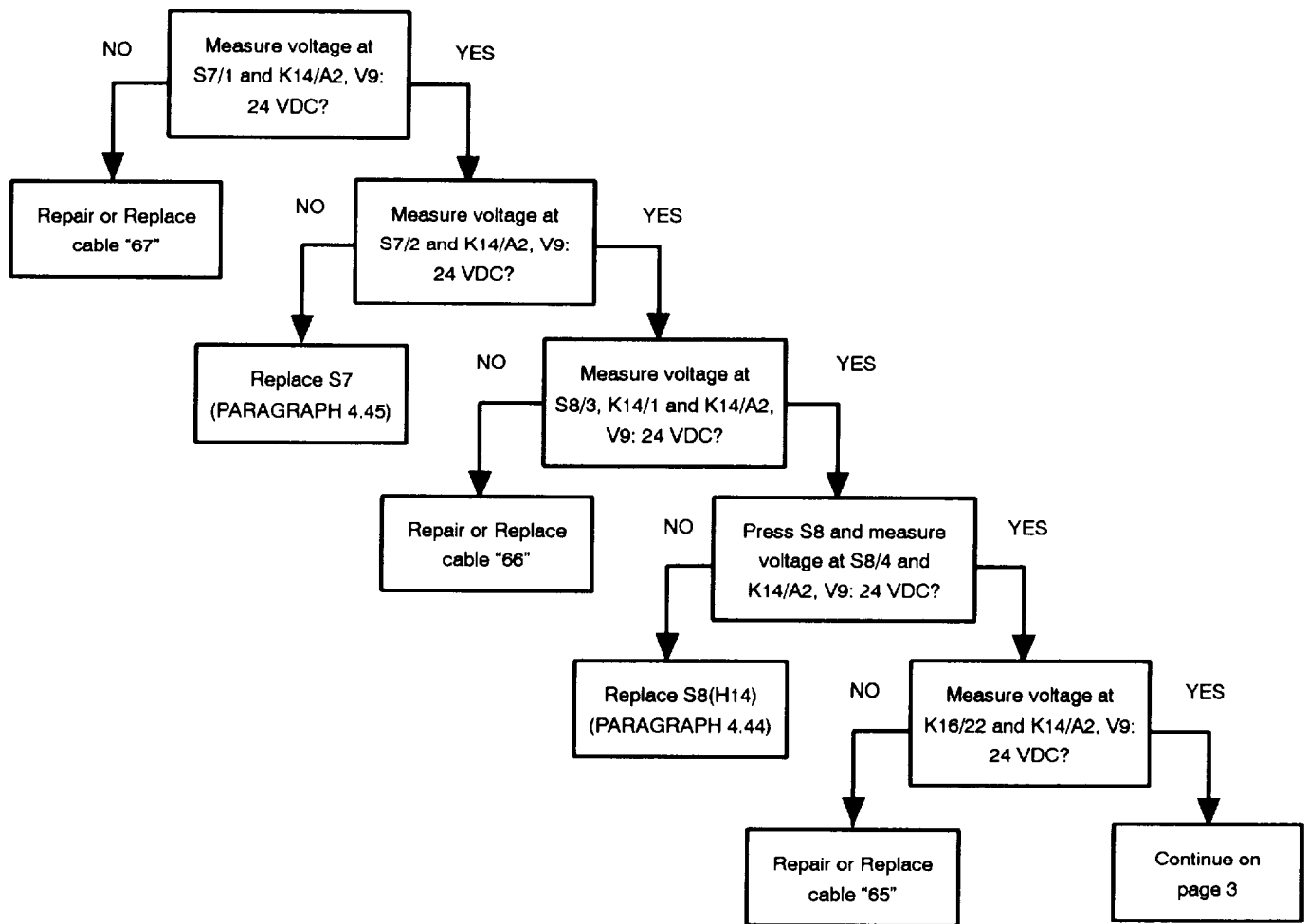


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 2 of 11).

WARNING

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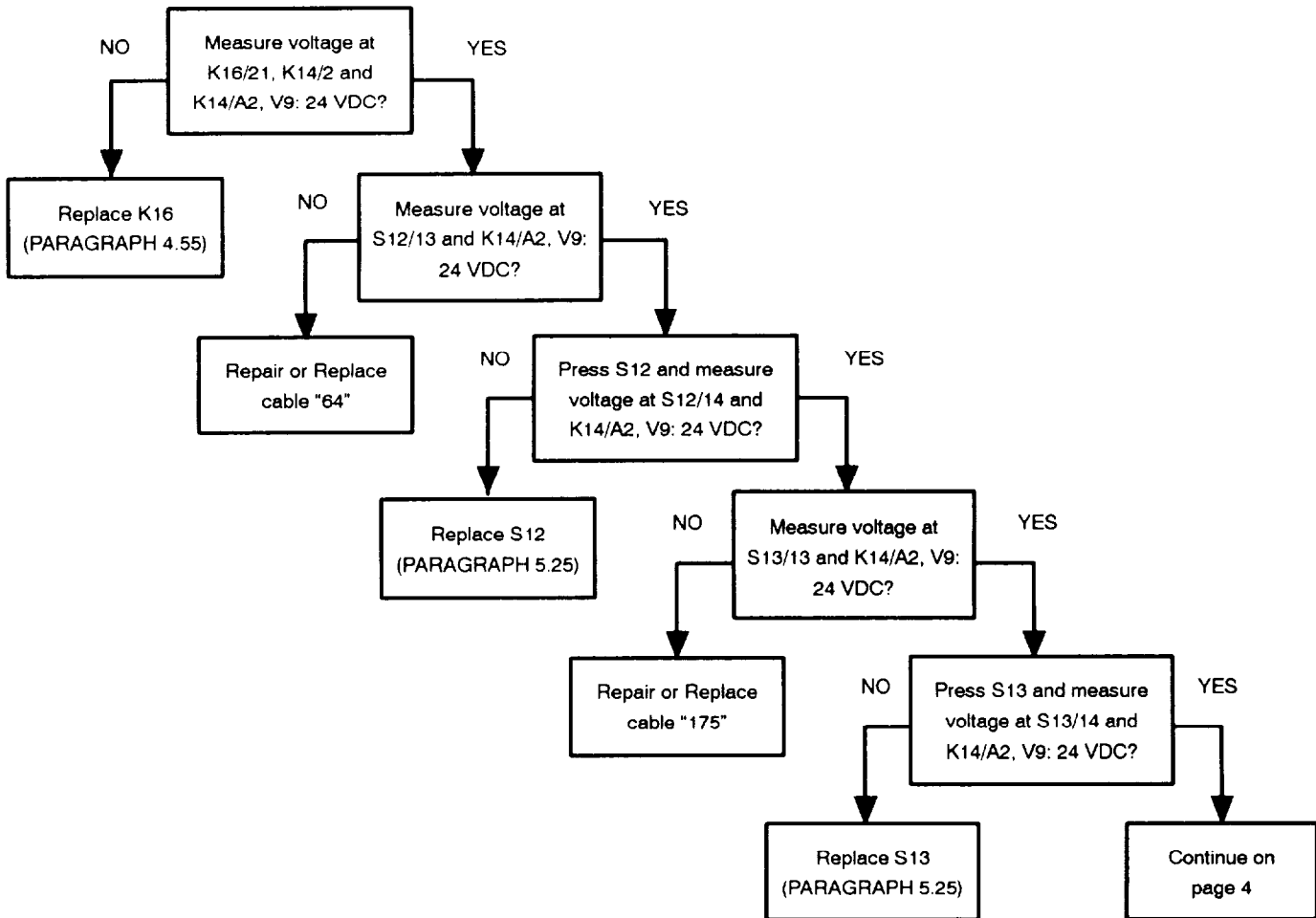


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 3 of 11).

WARNING

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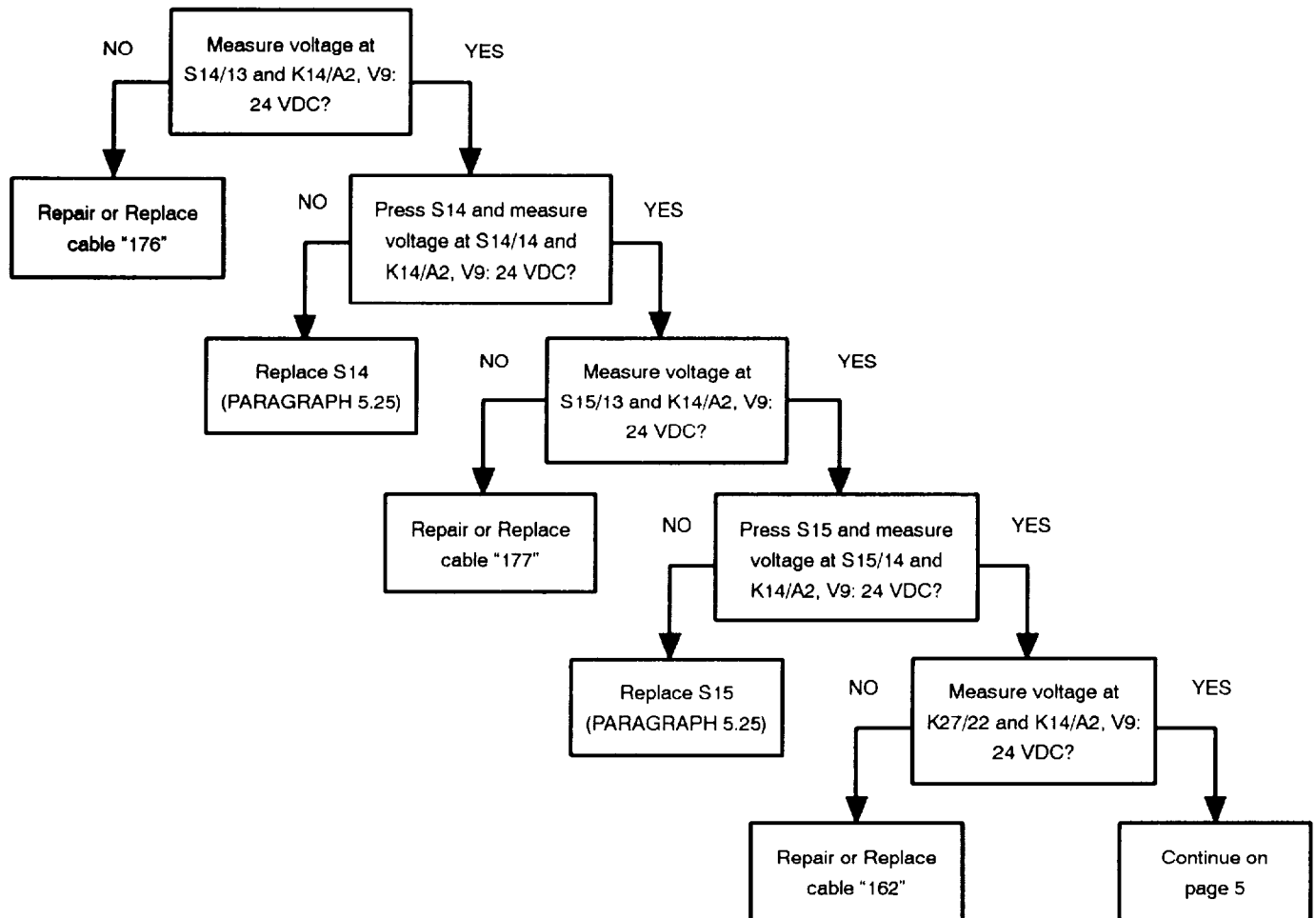


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 4 of 11).

WARNING

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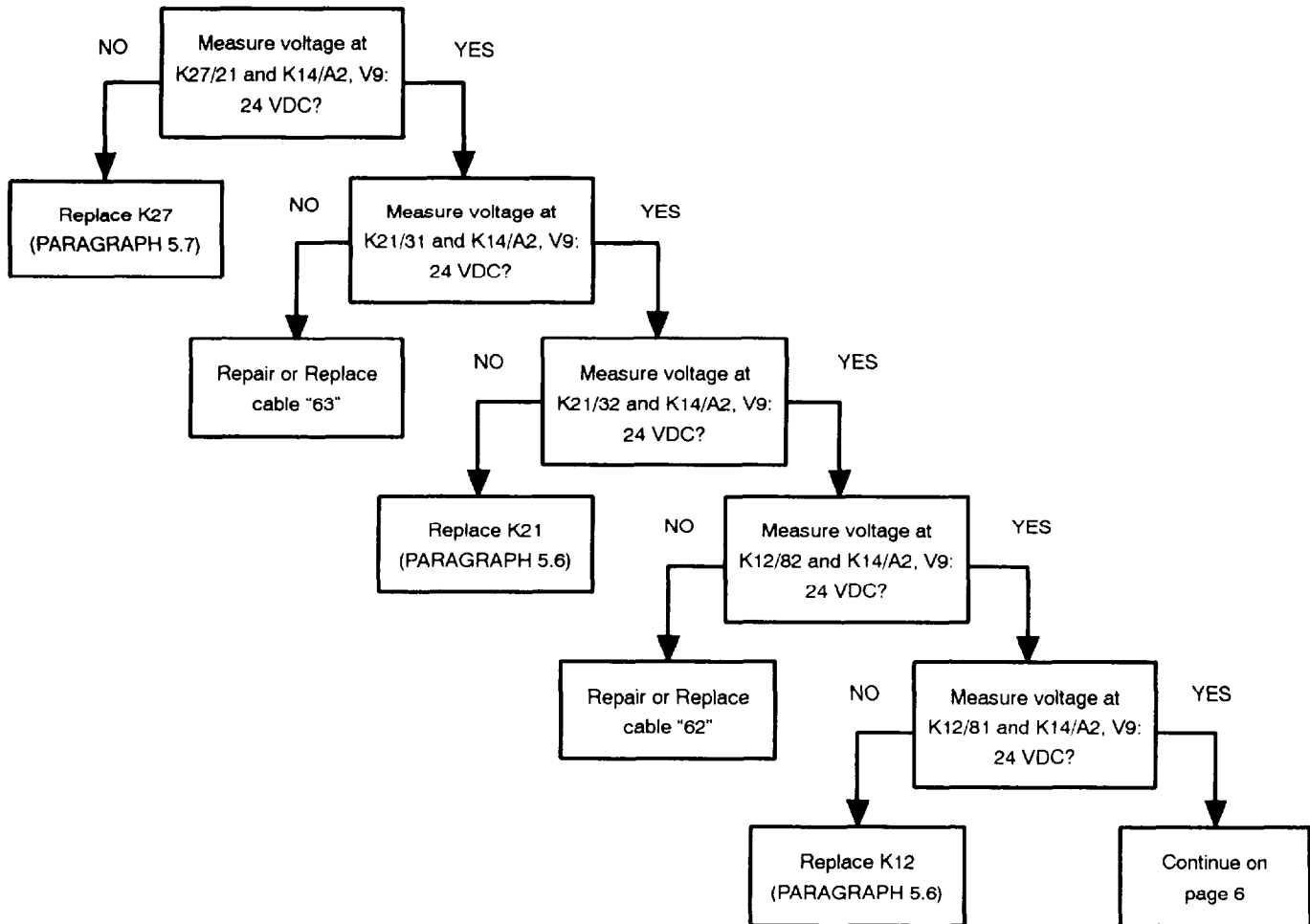


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 5 of 11).

WARNING

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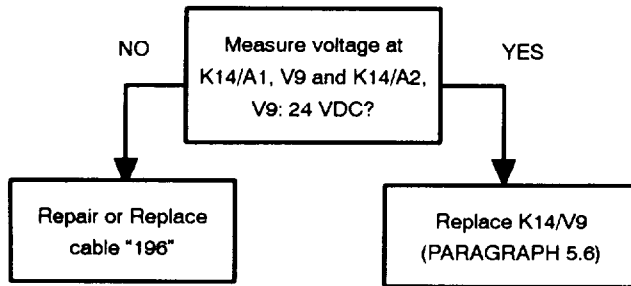


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 6 of 11).

WARNING

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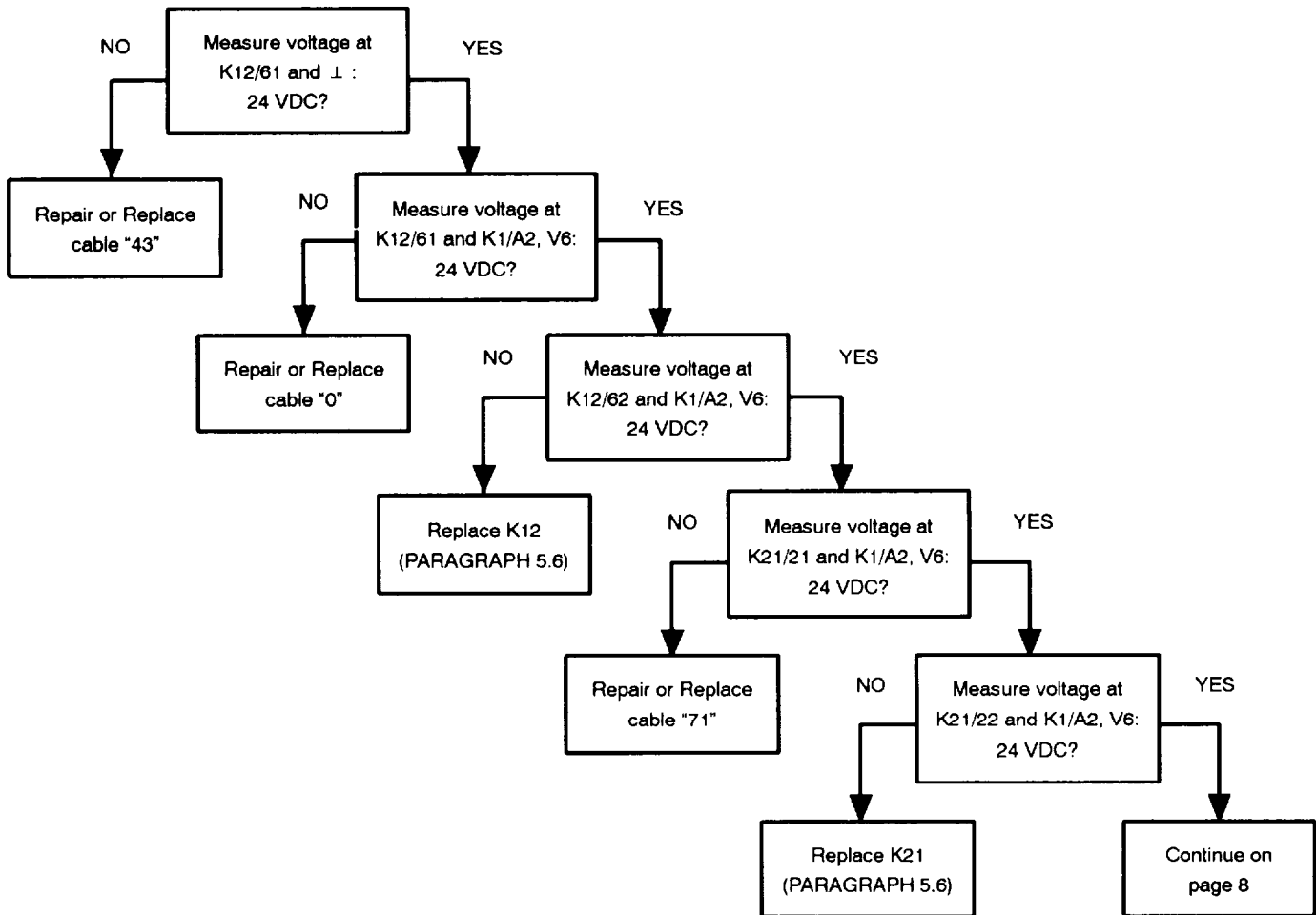


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 7 of 11).

WARNING

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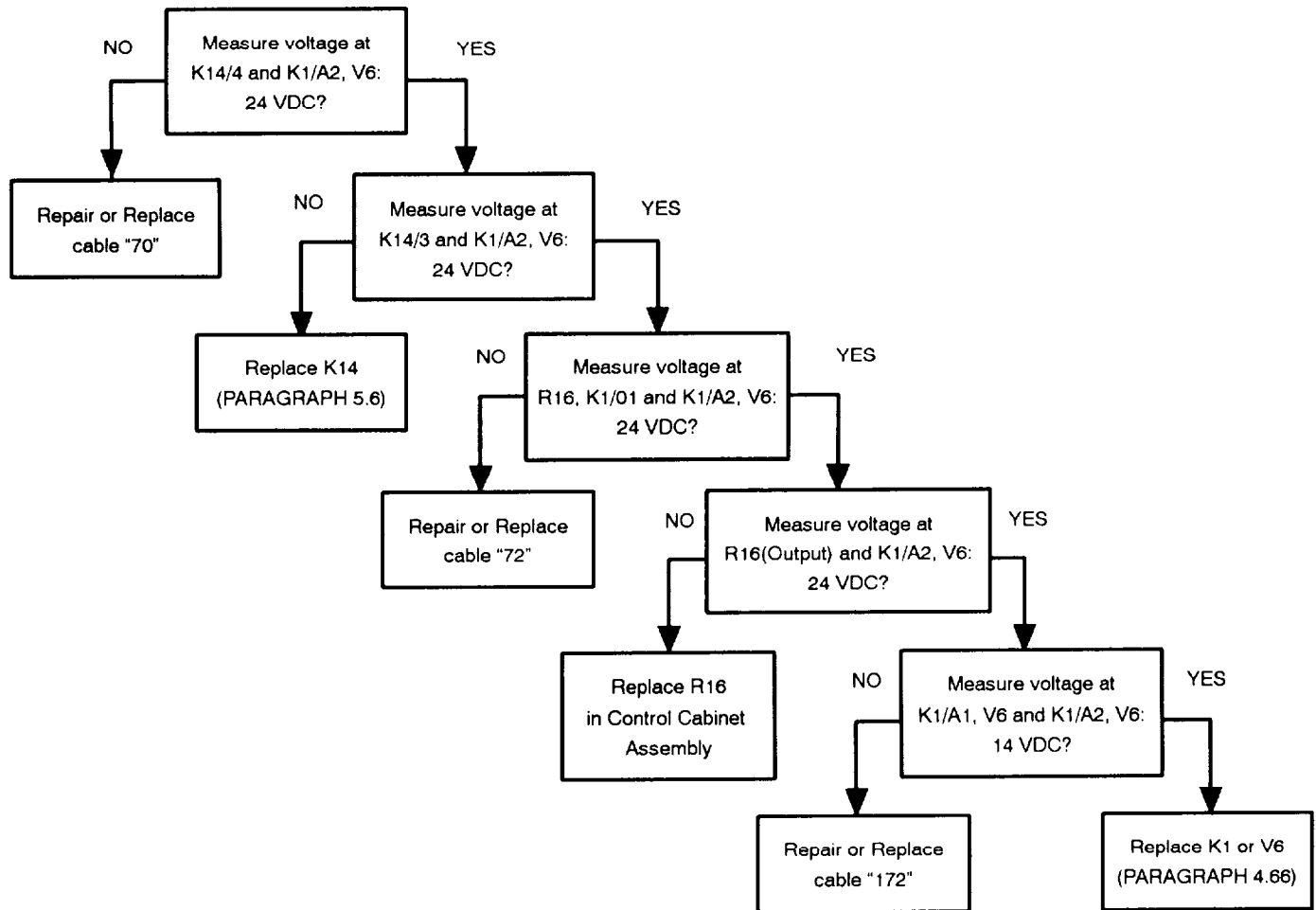


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 8 of 11).

WARNING

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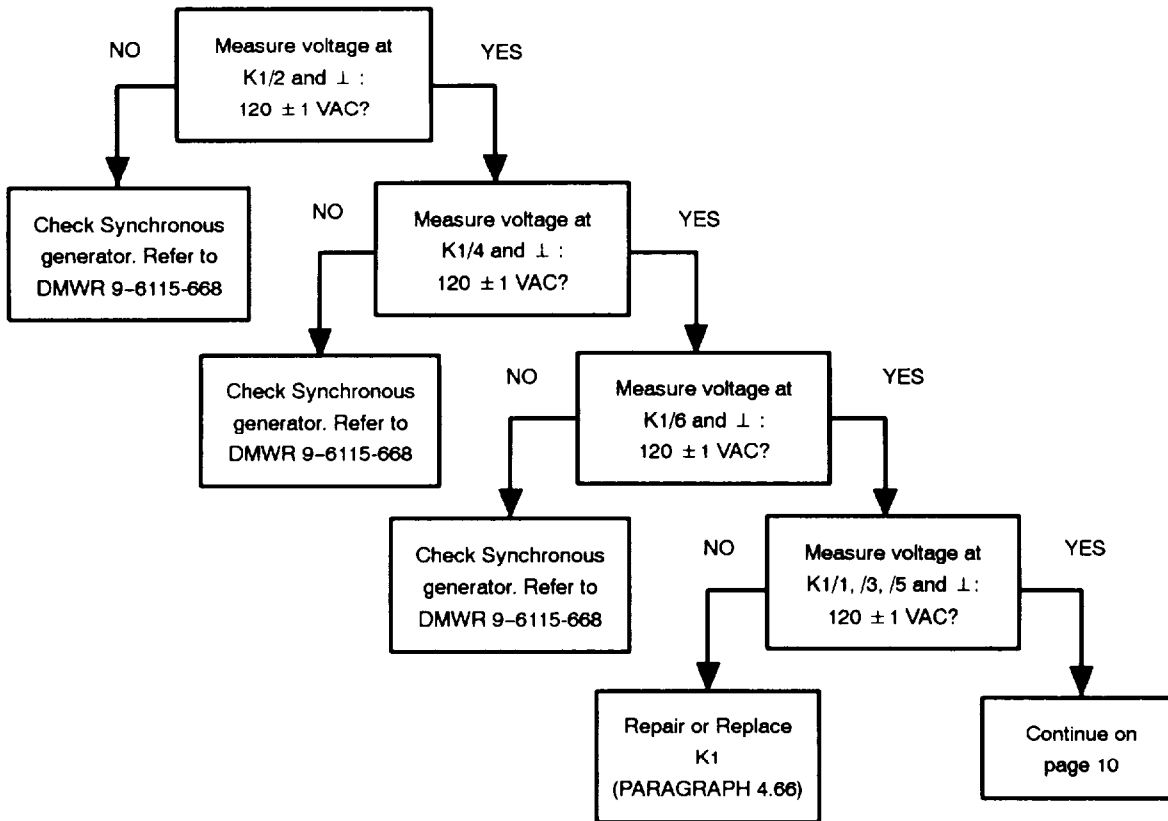


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 9 of 11).

WARNING

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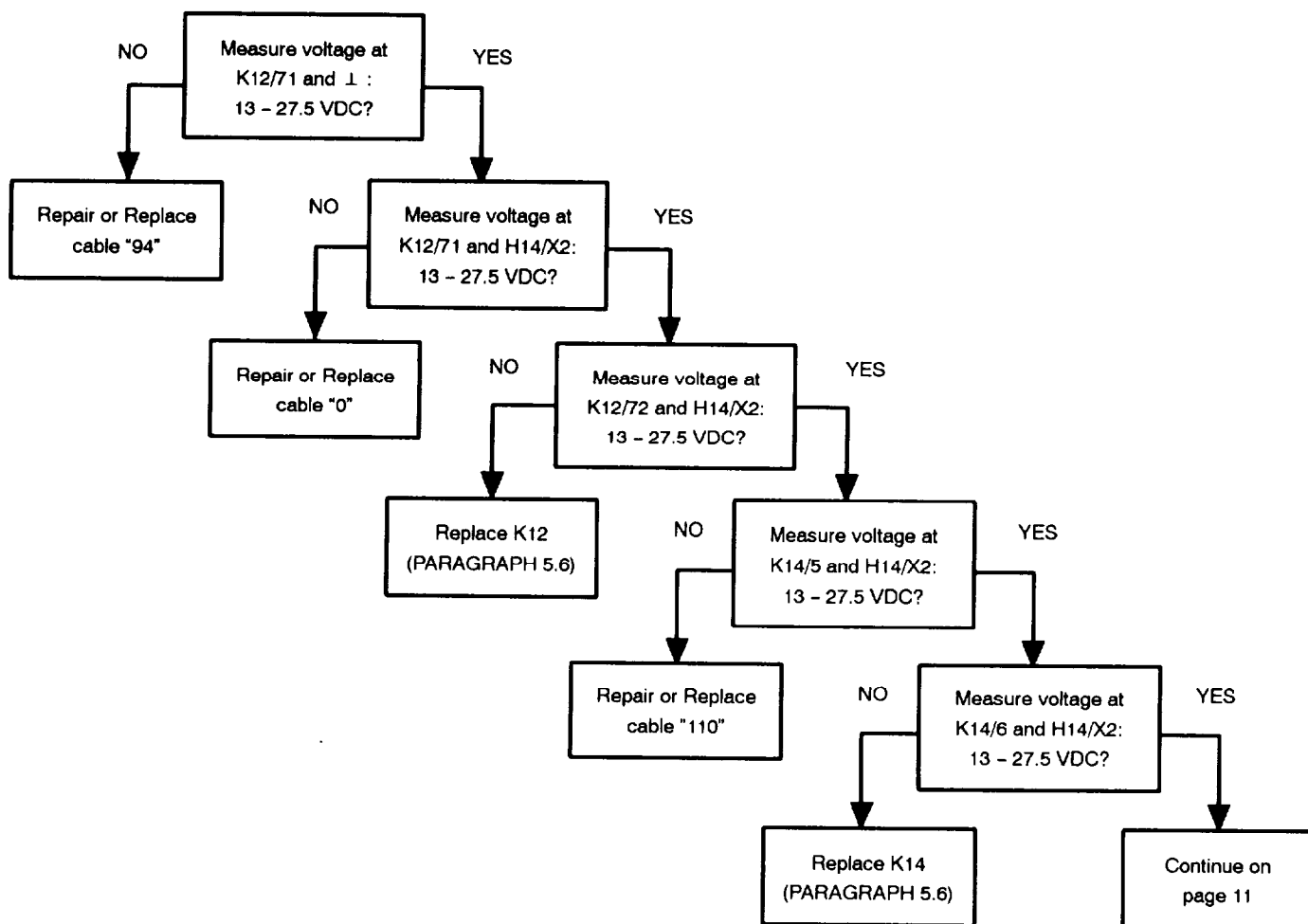


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 10 of 11).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

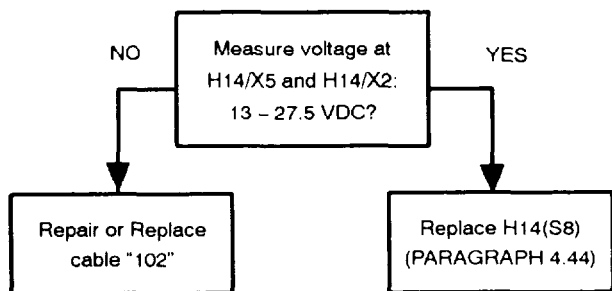


Figure 5-9 AC CIRCUIT INTERRUPTER ON lamp does not light up (sheet 11 of 11).

WARNING

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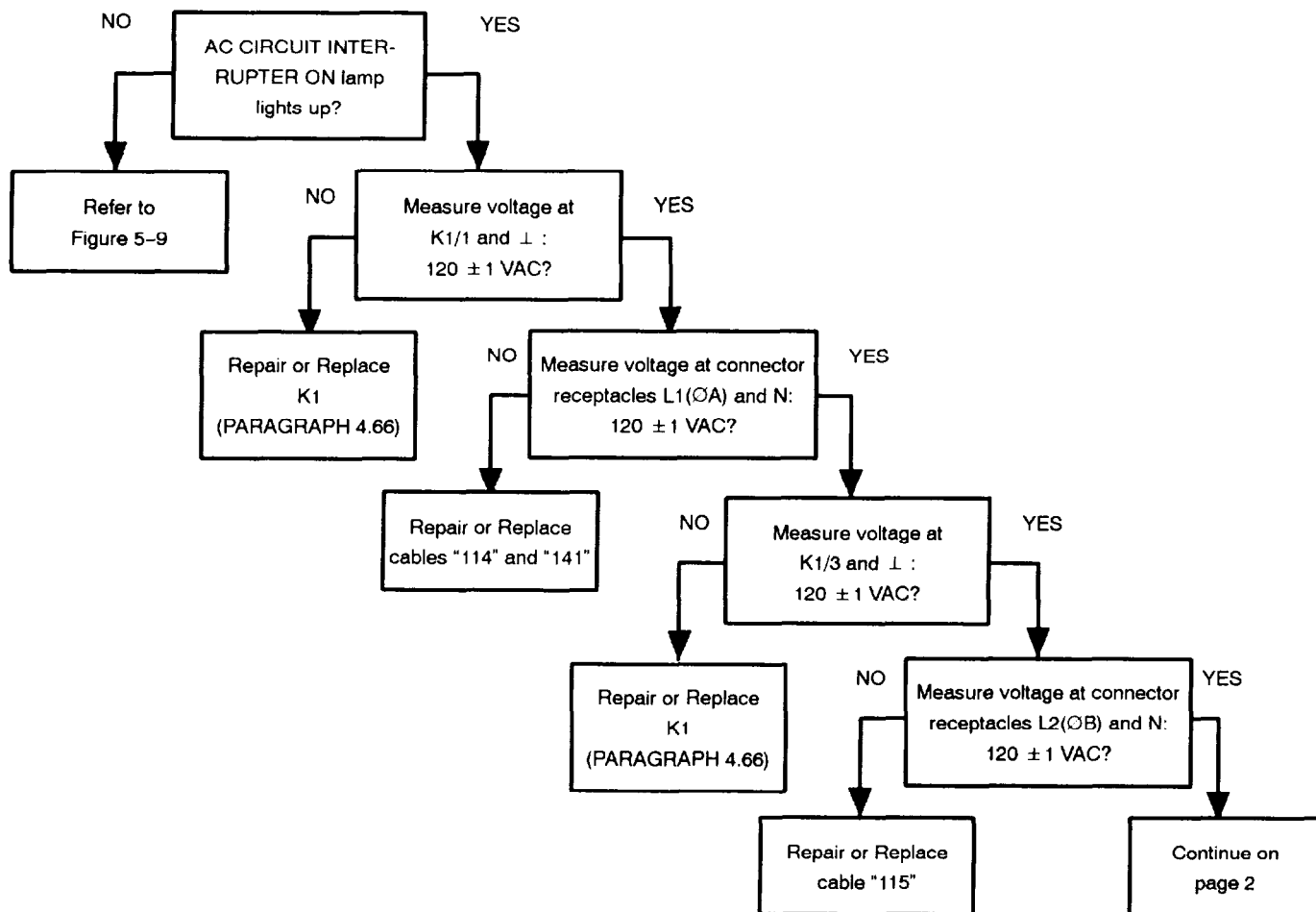


Figure 5-10 No line currents are flowing, or no line current indication (sheet 1 of 5).

WARNING

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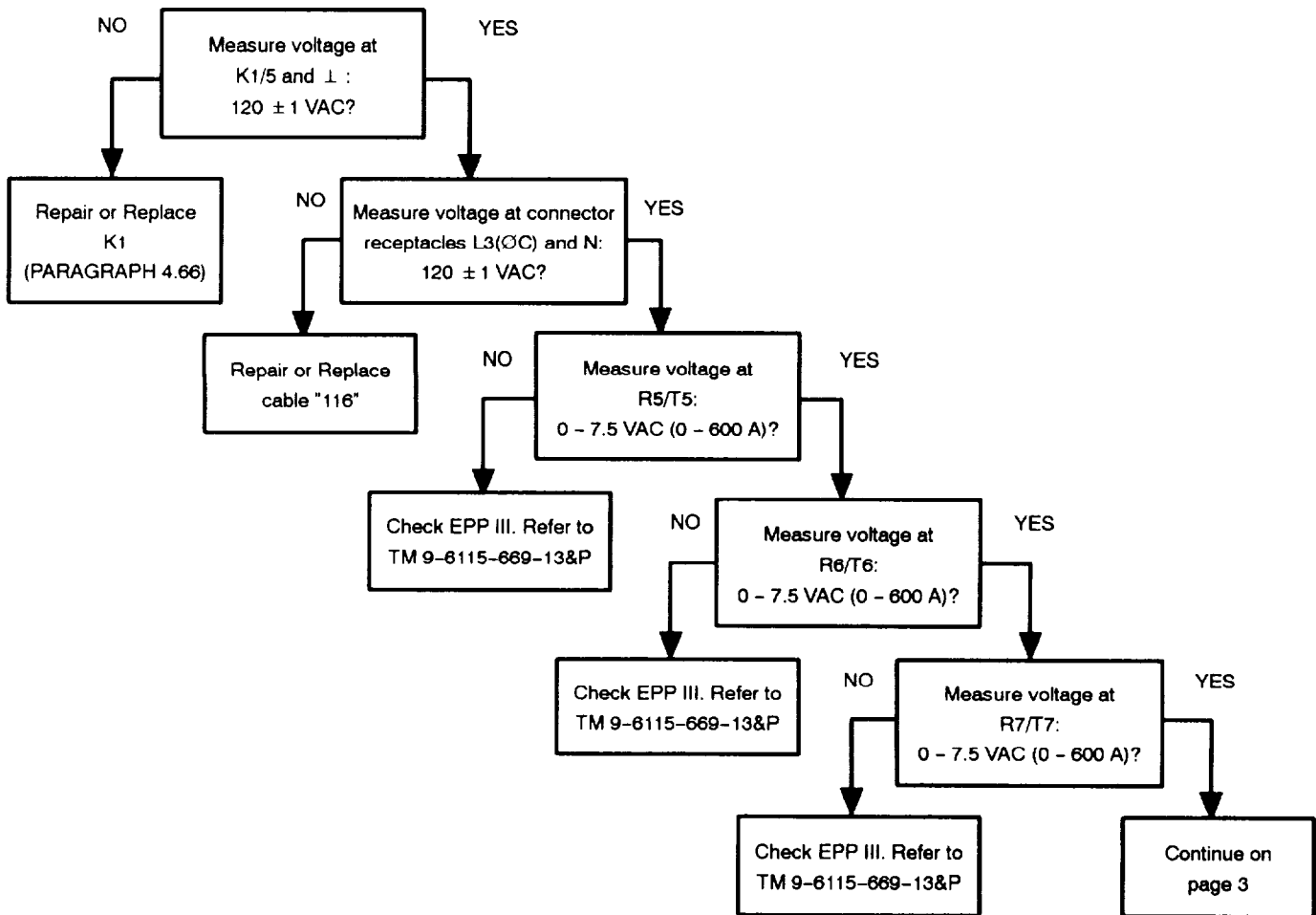


Figure 5-10 No line currents are flowing, or no line current indication (sheet 2 of 5).

WARNING

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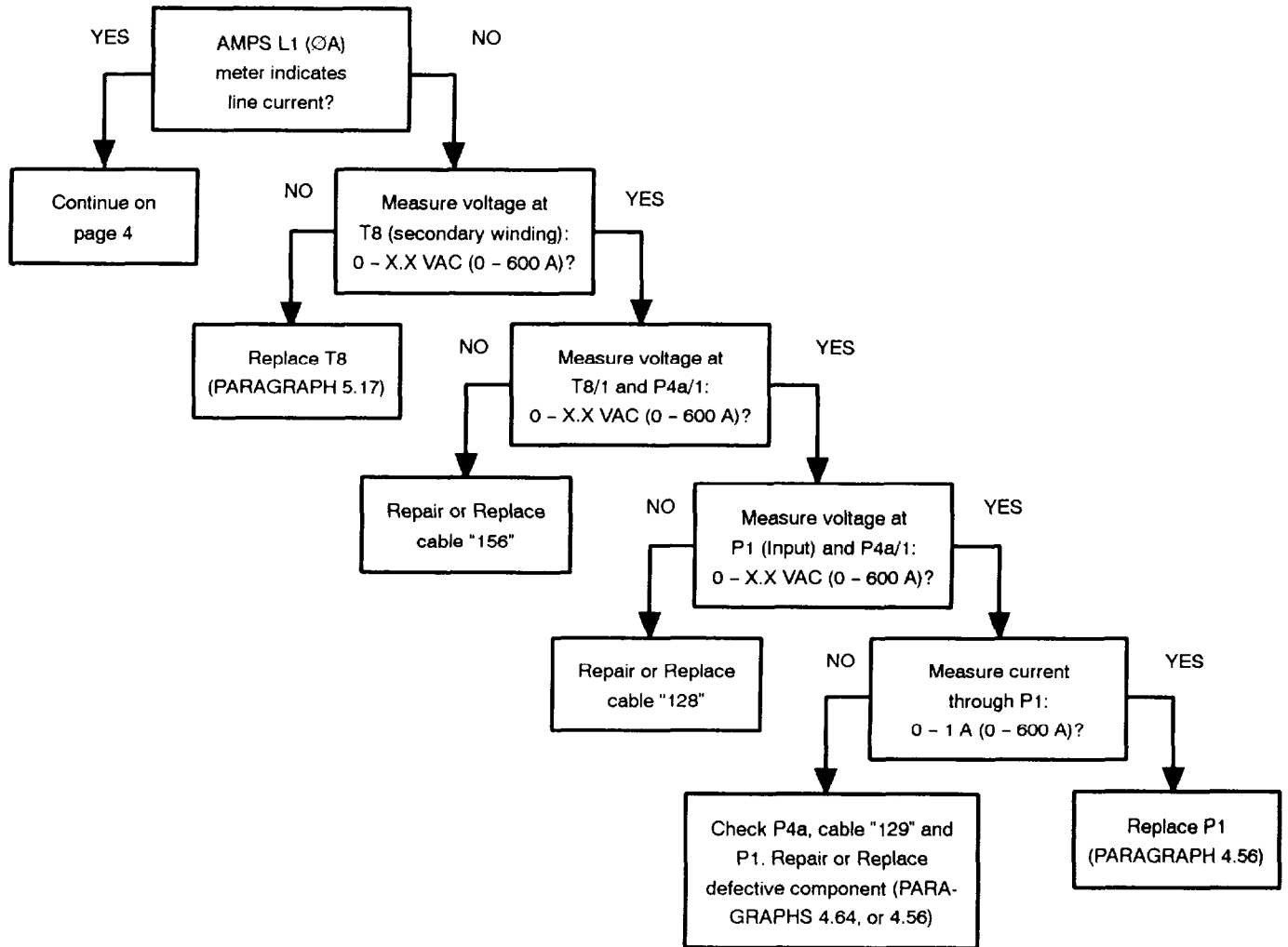


Figure 5-10 No line currents are flowing, or no line current indication (sheet 3 of 5).

WARNING

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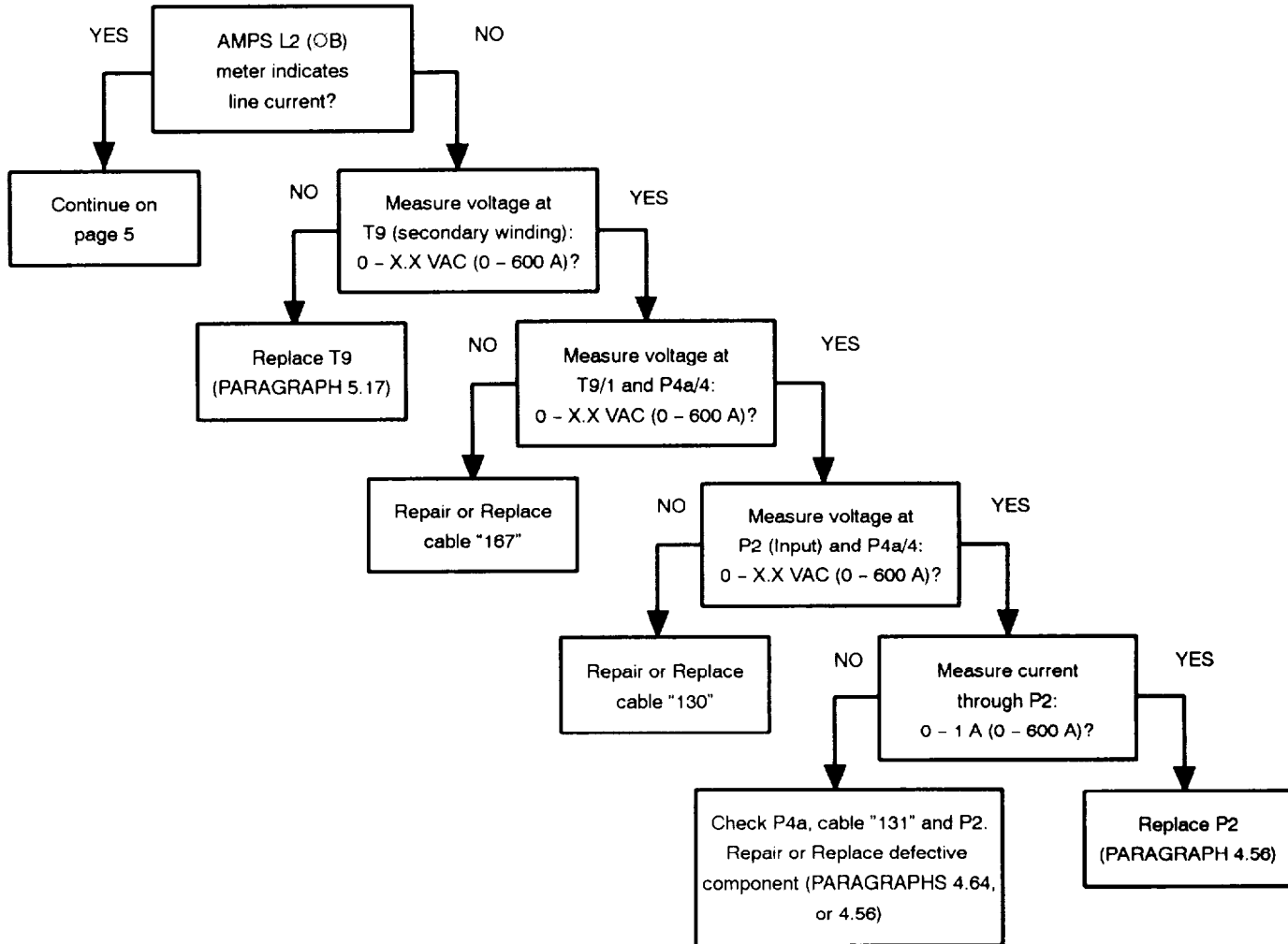


Figure 5-10 No line currents are flowing, or no line current indication (sheet 4 of 5).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

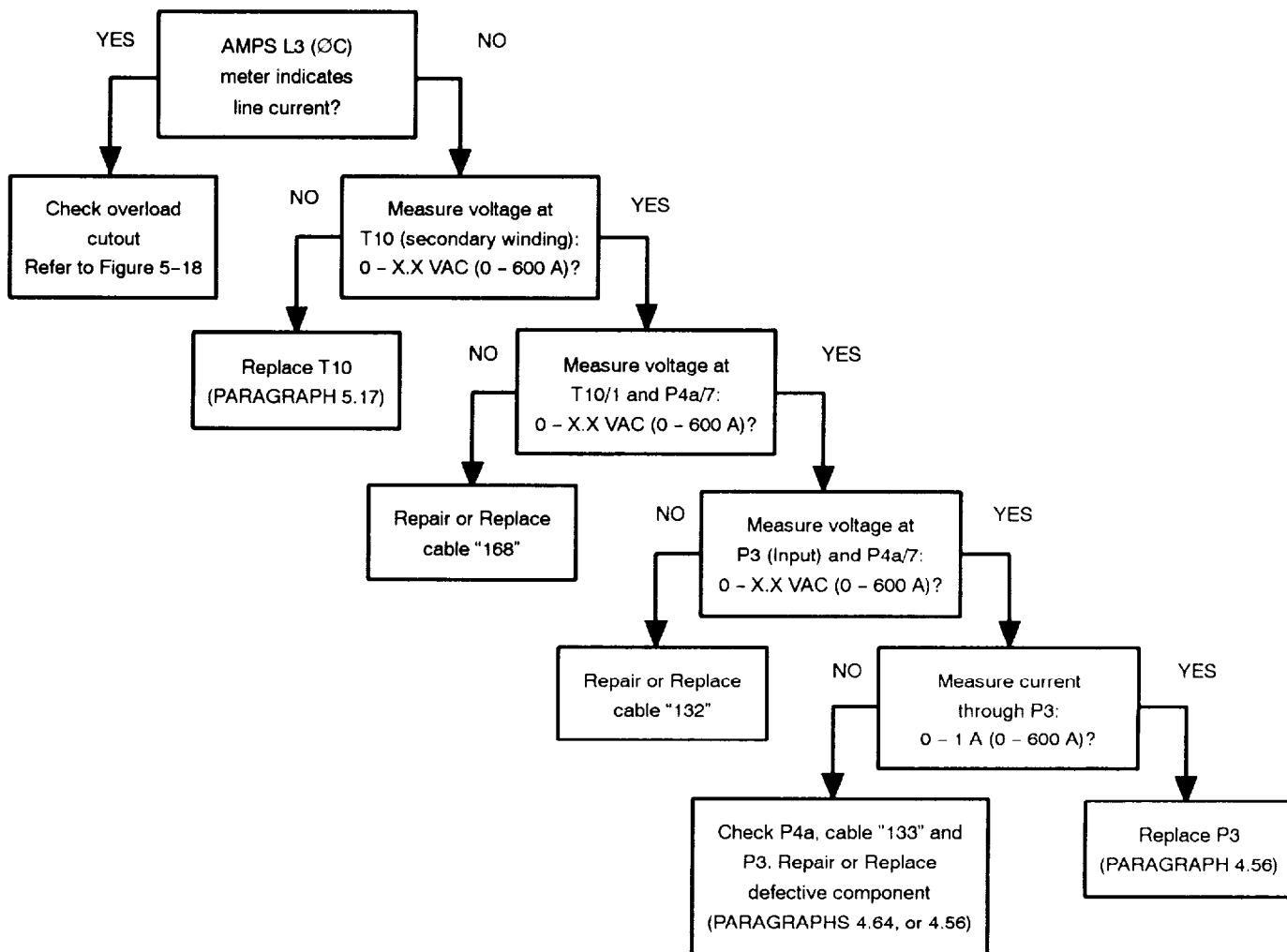


Figure 5-10 No line currents are flowing, or no line current indication (sheet 5 of 5).

WARNING

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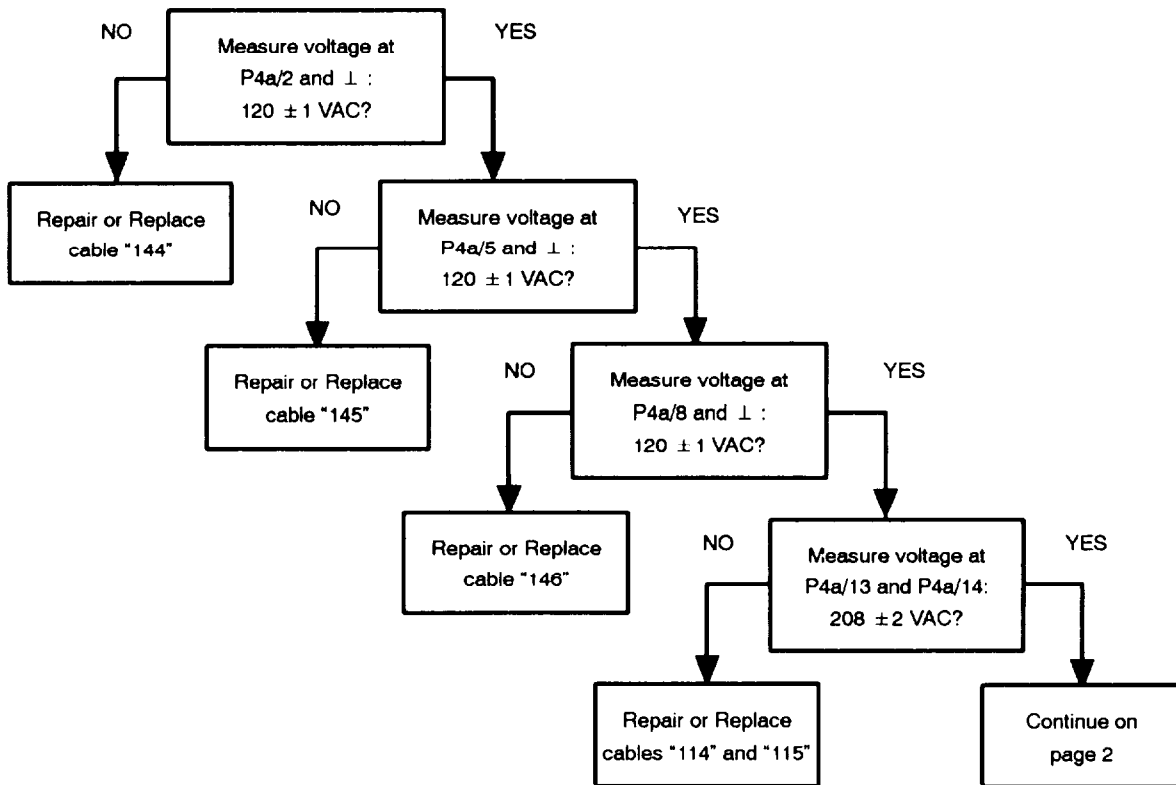


Figure 5-11 No power indication (sheet 1 of 2).

WARNING

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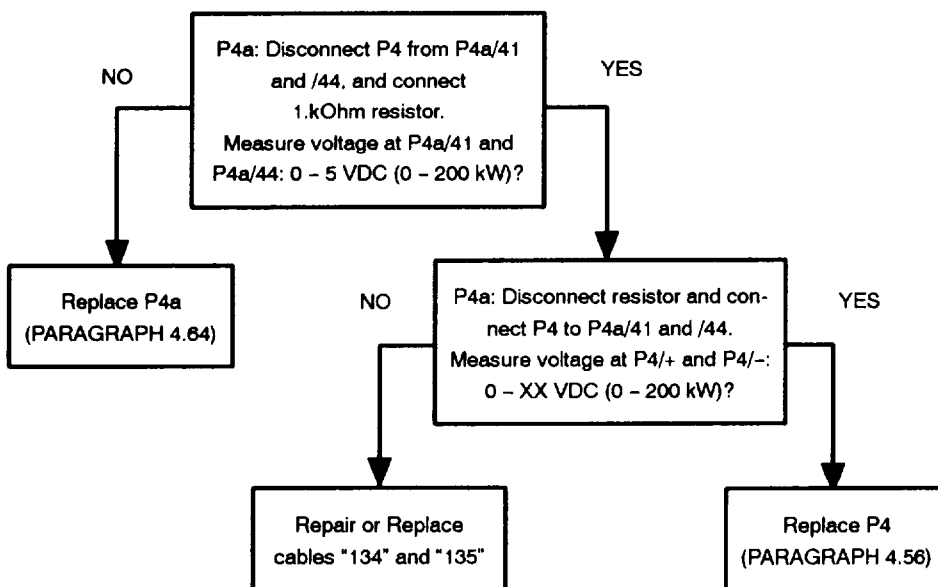


Figure 5-11 No power indication (sheet 2 of 2).

WARNING

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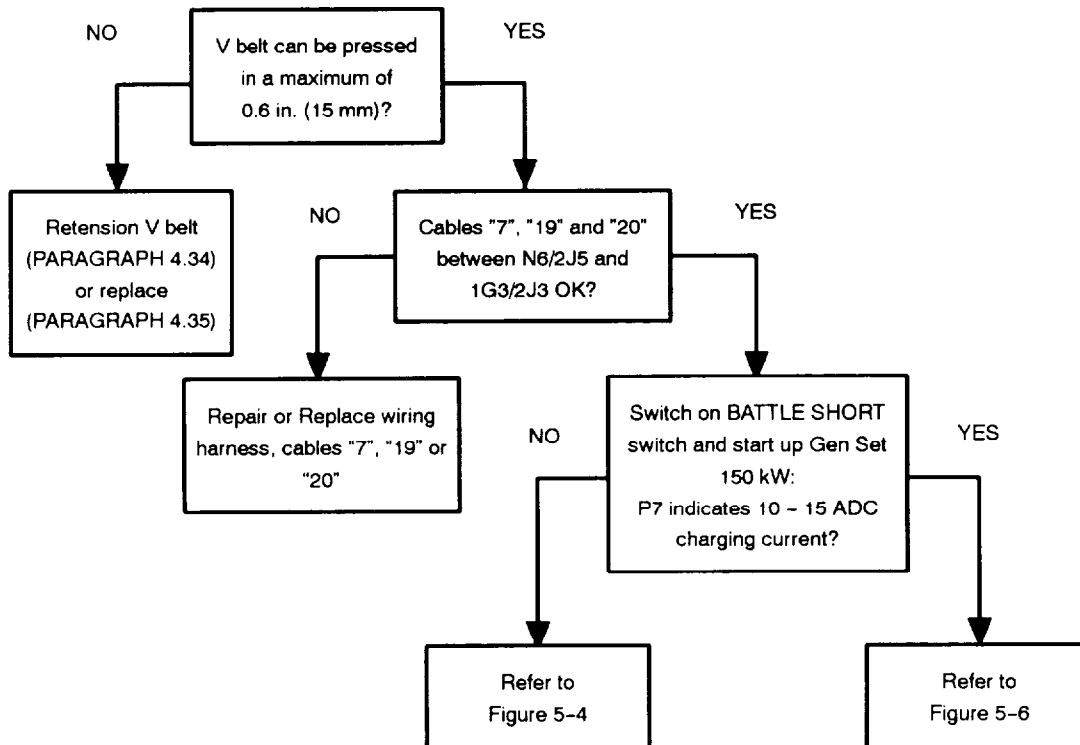


Figure 5-12 BATTERY CHARGING CONTROL lamp lights up during operation.

WARNING

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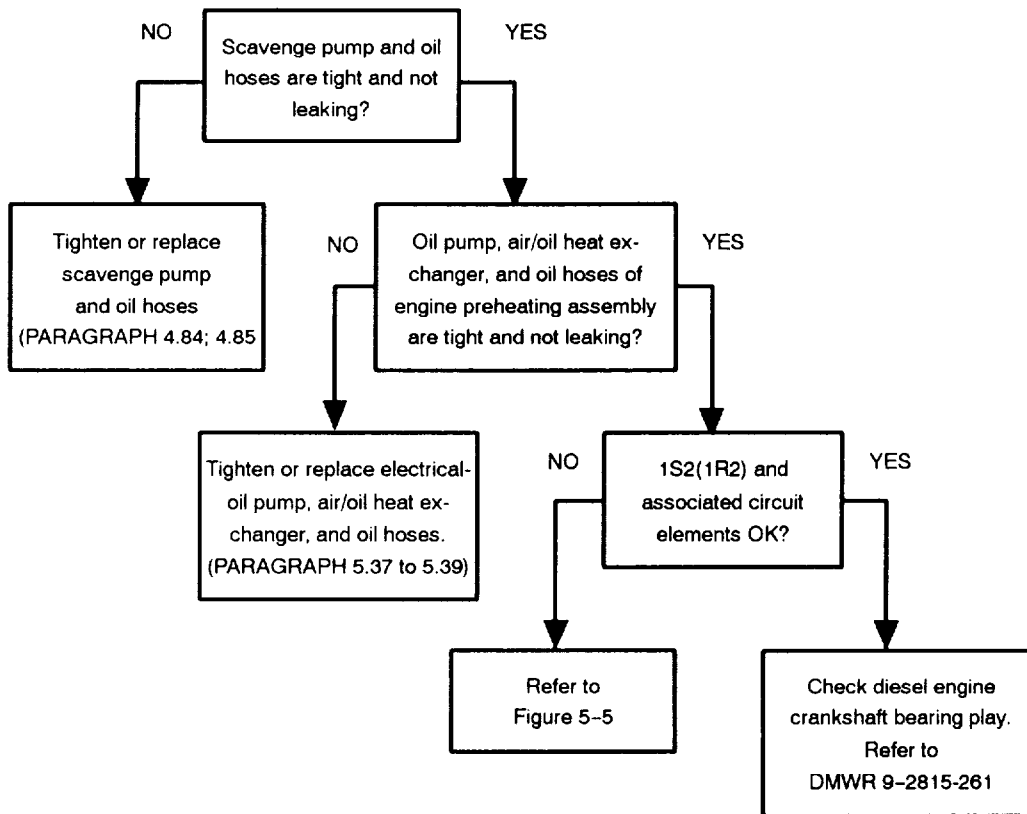


Figure 5-13 OIL PRESSURE lamp lights up during operation.

WARNING

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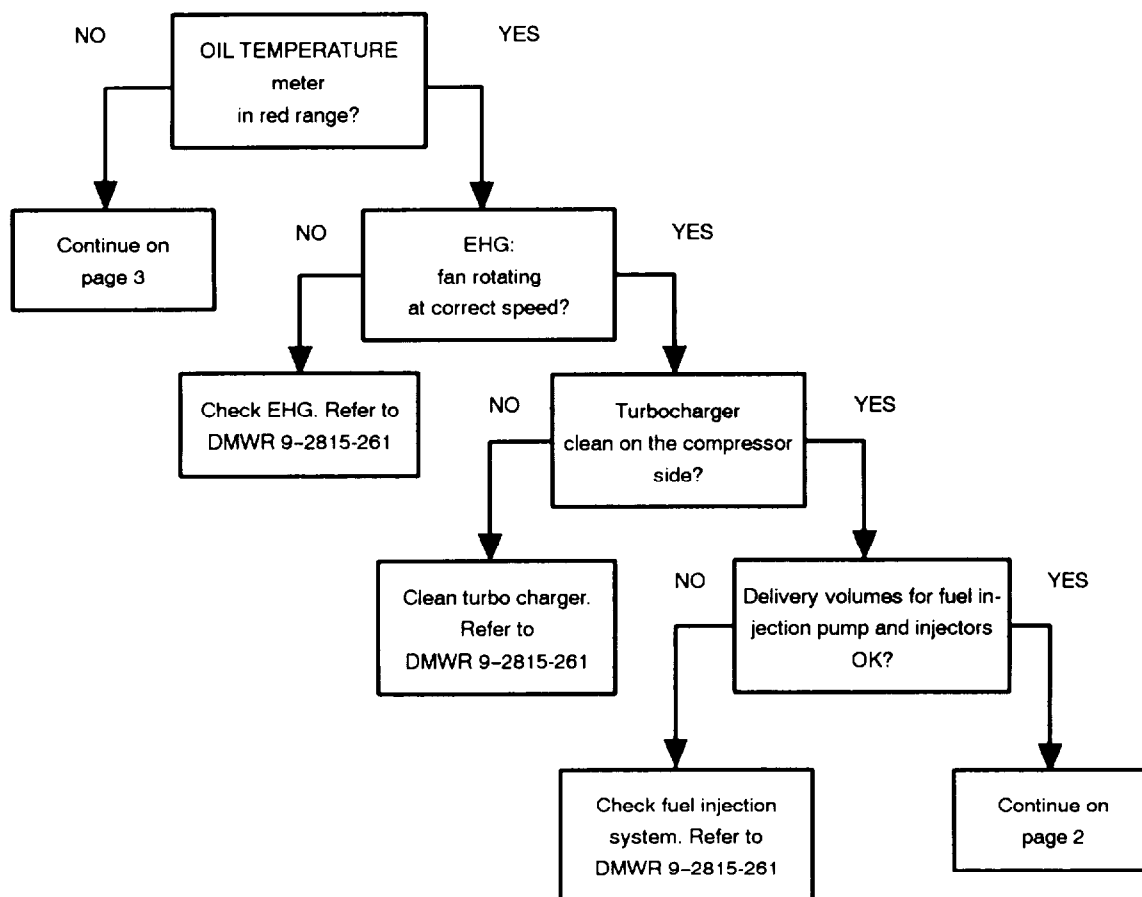


Figure 5-14 OIL TEMP-CYLINDER HEAD lamp lights up during operation (sheet 1 of 3).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

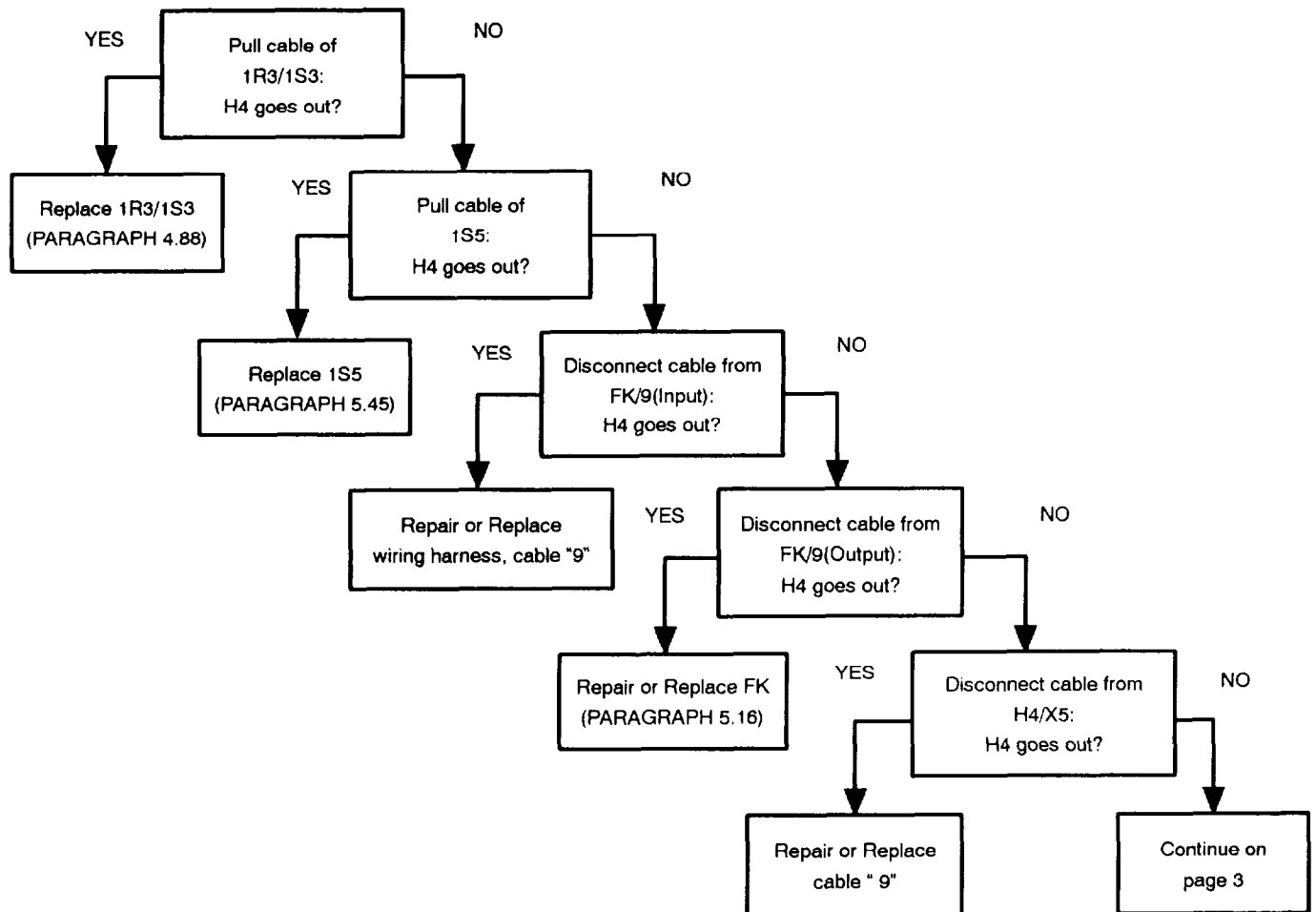


Figure 5-14 OIL TEMP-CYLINDER HEAD lamp lights up during operation (sheet 2 of 3).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

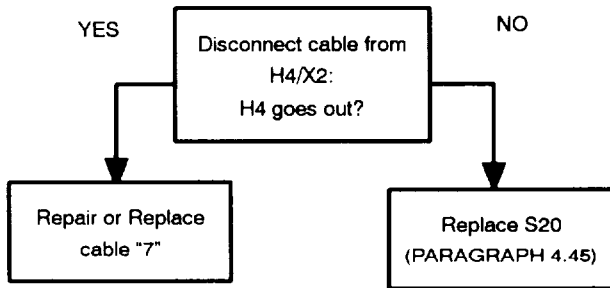


Figure 5-14 OIL TEMP-CYLINDER HEAD lamps lights up during operation (sheet 3 of 3).

WARNING

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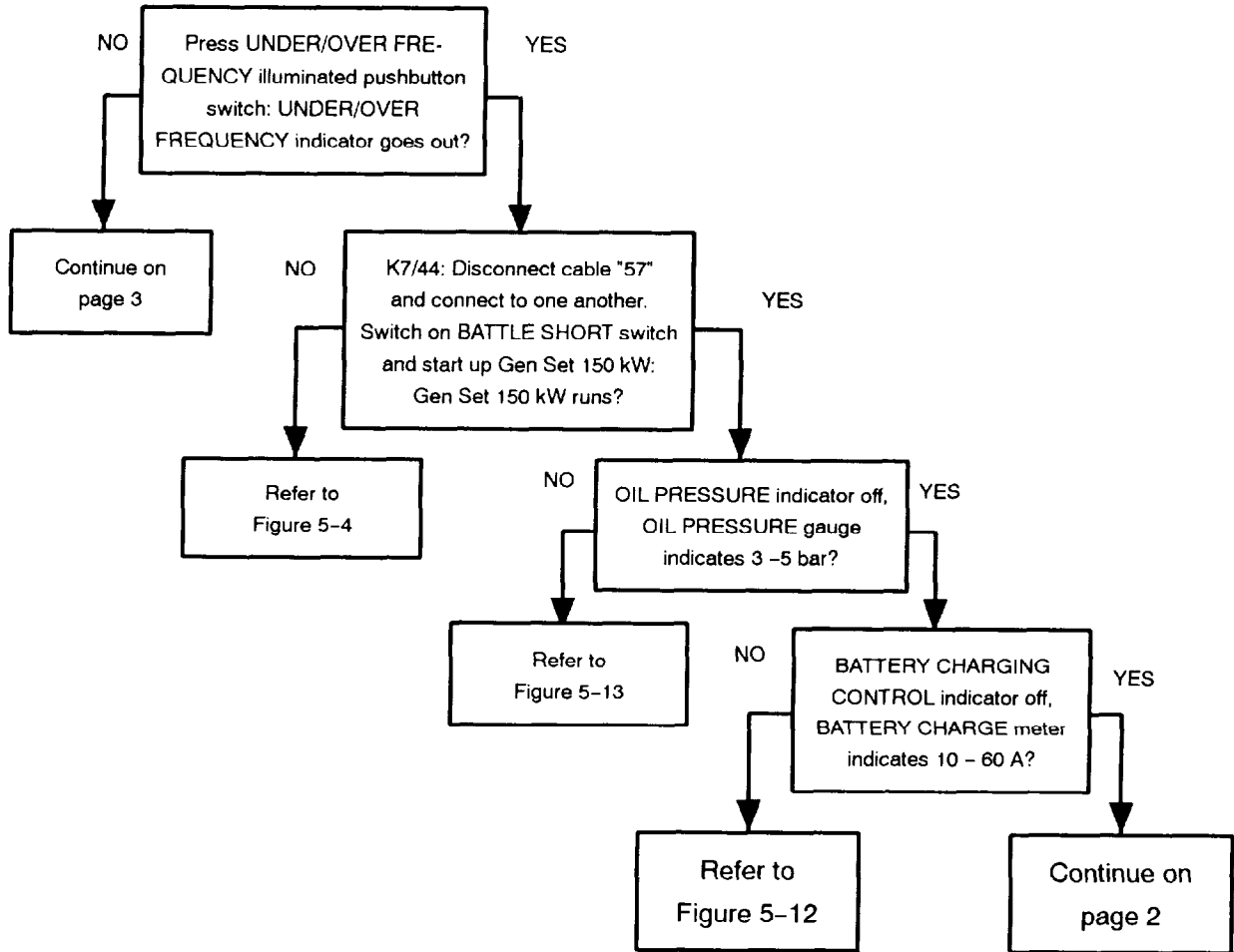


Figure 5-15 UNDER/OVER FREQUENCY lamp lights up during operation (sheet 1 of 6).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

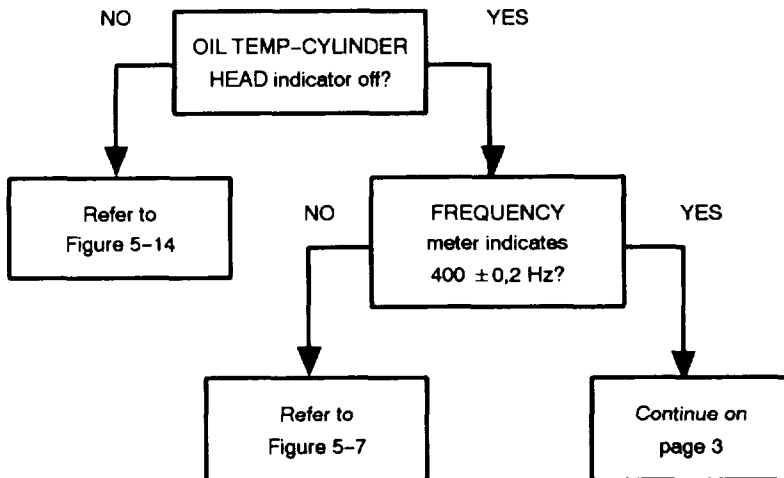


Figure 5-15 UNDER/OVER FREQUENCY lamp lights up during operation (sheet 2 of 6).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

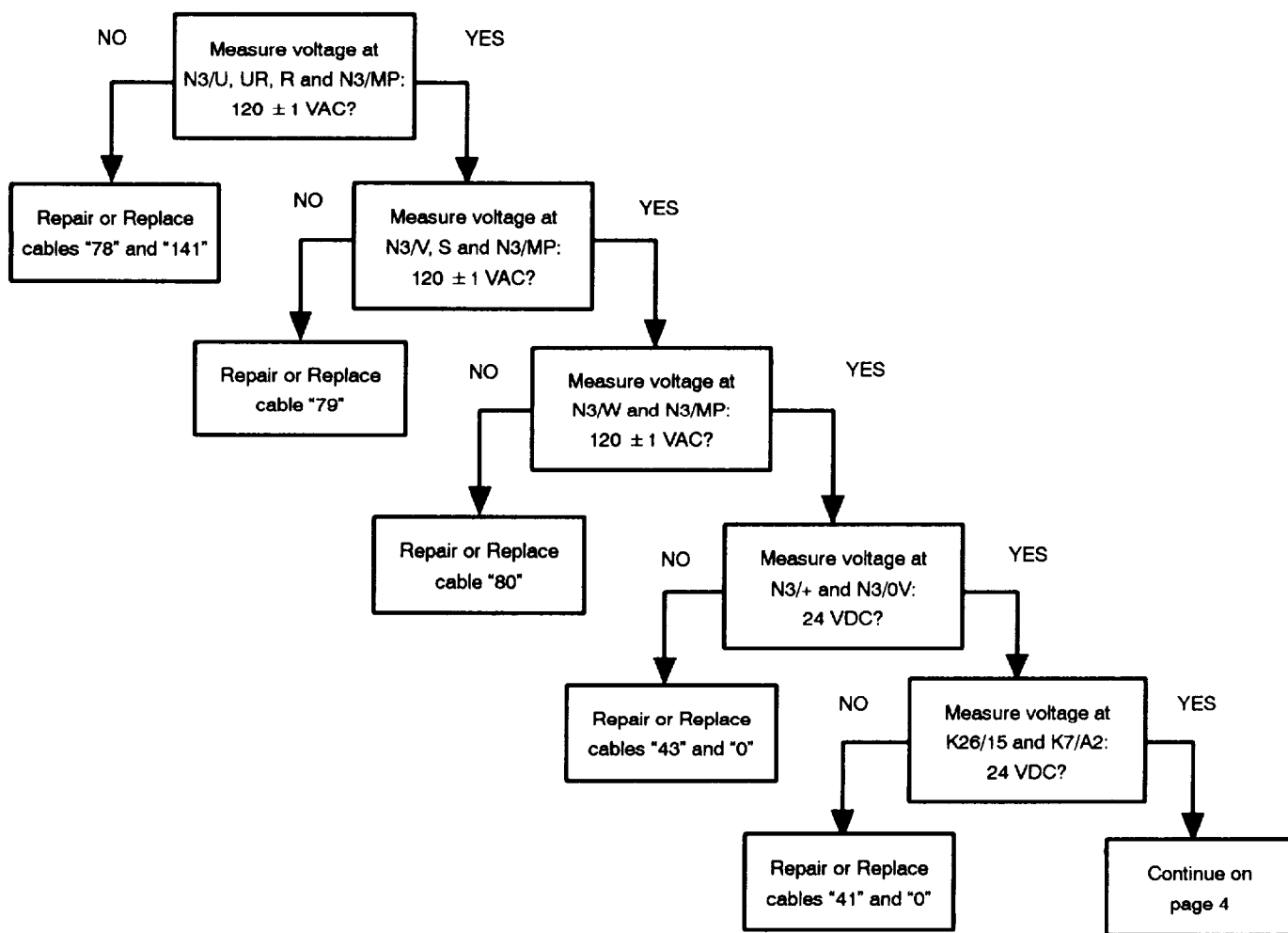


Figure 5-15 UNDER/OVER FREQUENCY lamp lights up during operation (sheet 3 of 6).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

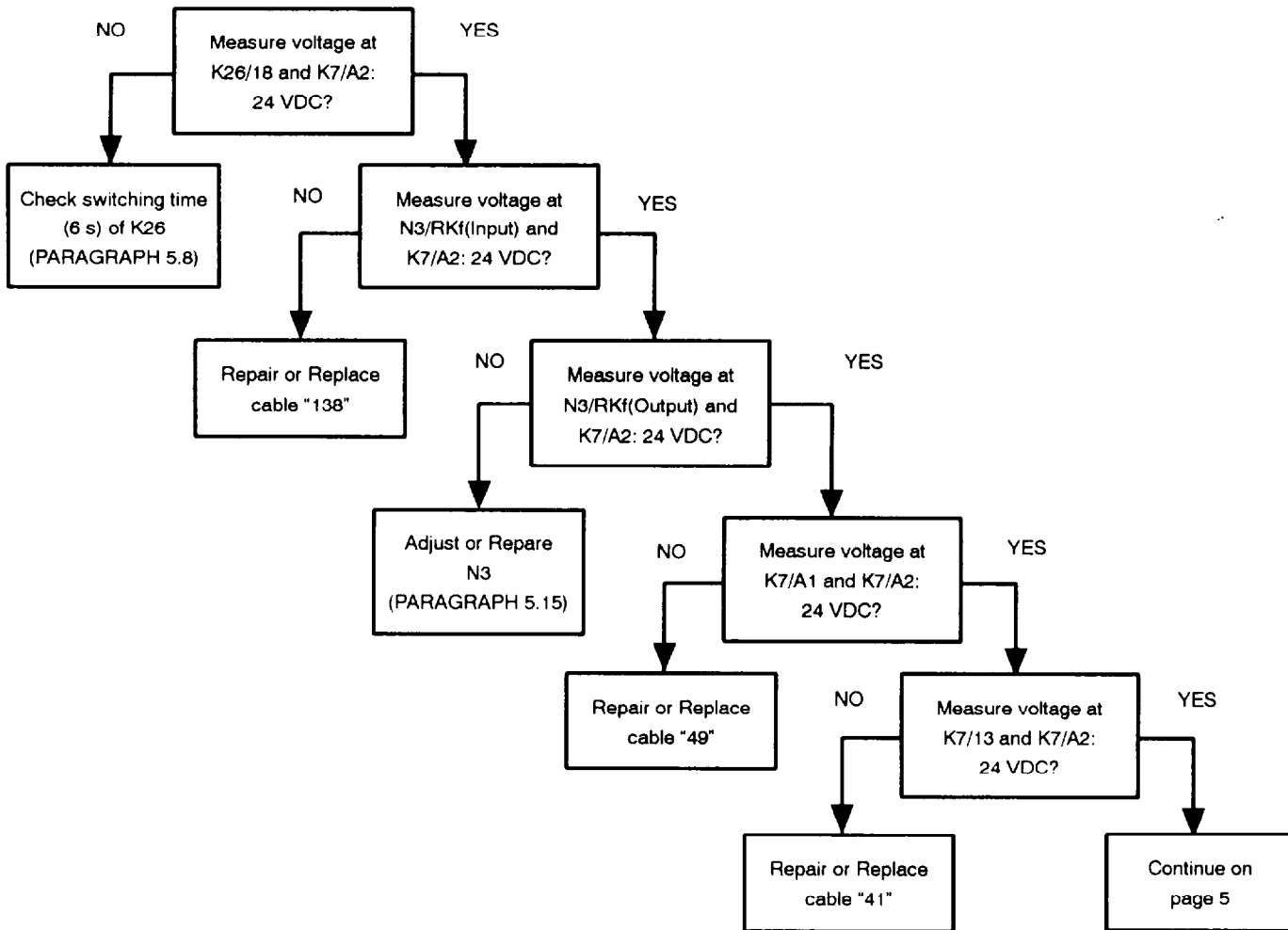


Figure 5-15 UNDER/OVER FREQUENCY lamp lights up during operation (sheet 4 of 6).

WARNING

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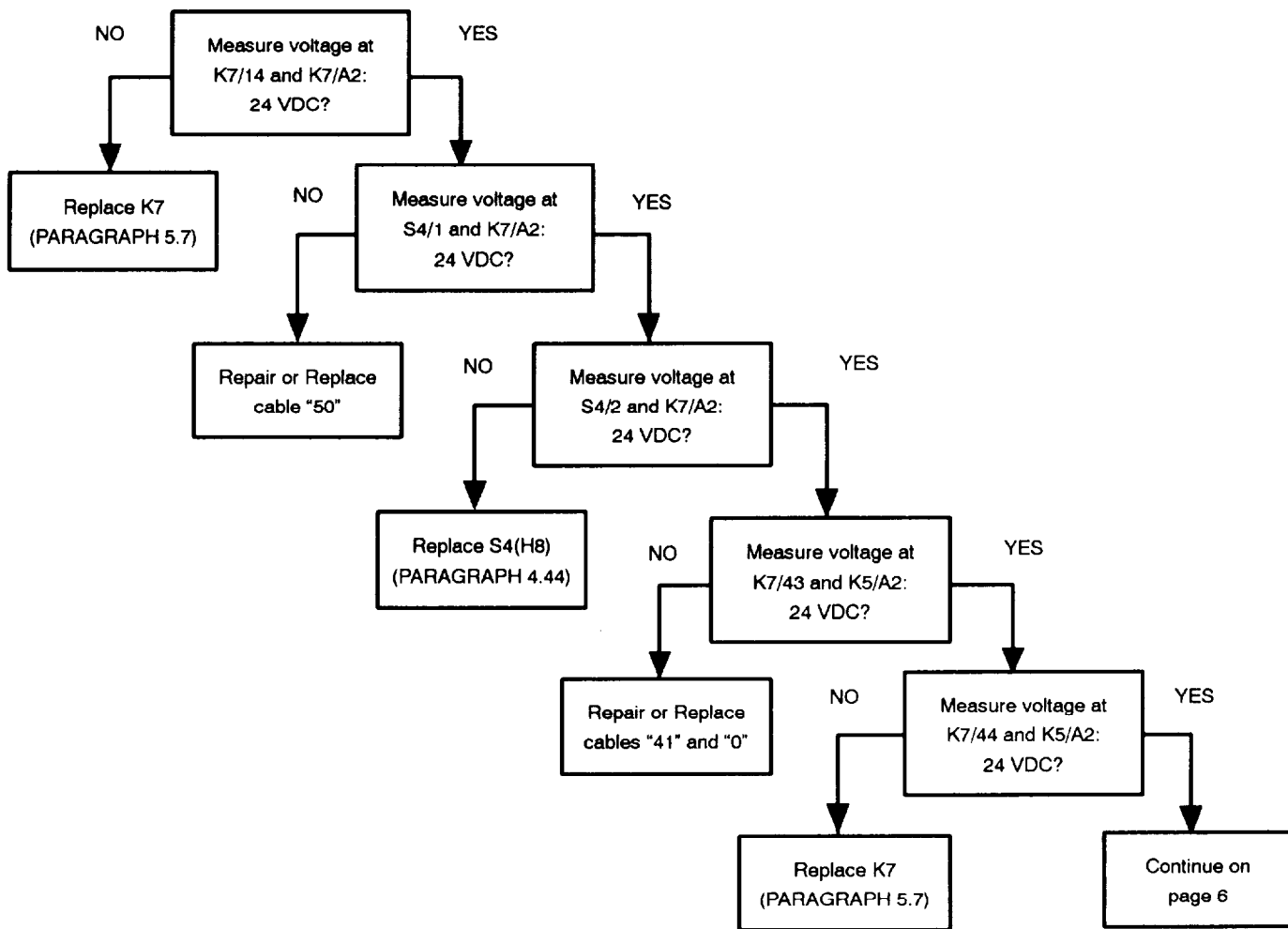


Figure 5-15 UNDER/OVER FREQUENCY lamp lights up during operation (sheet 5 of 6).

WARNING

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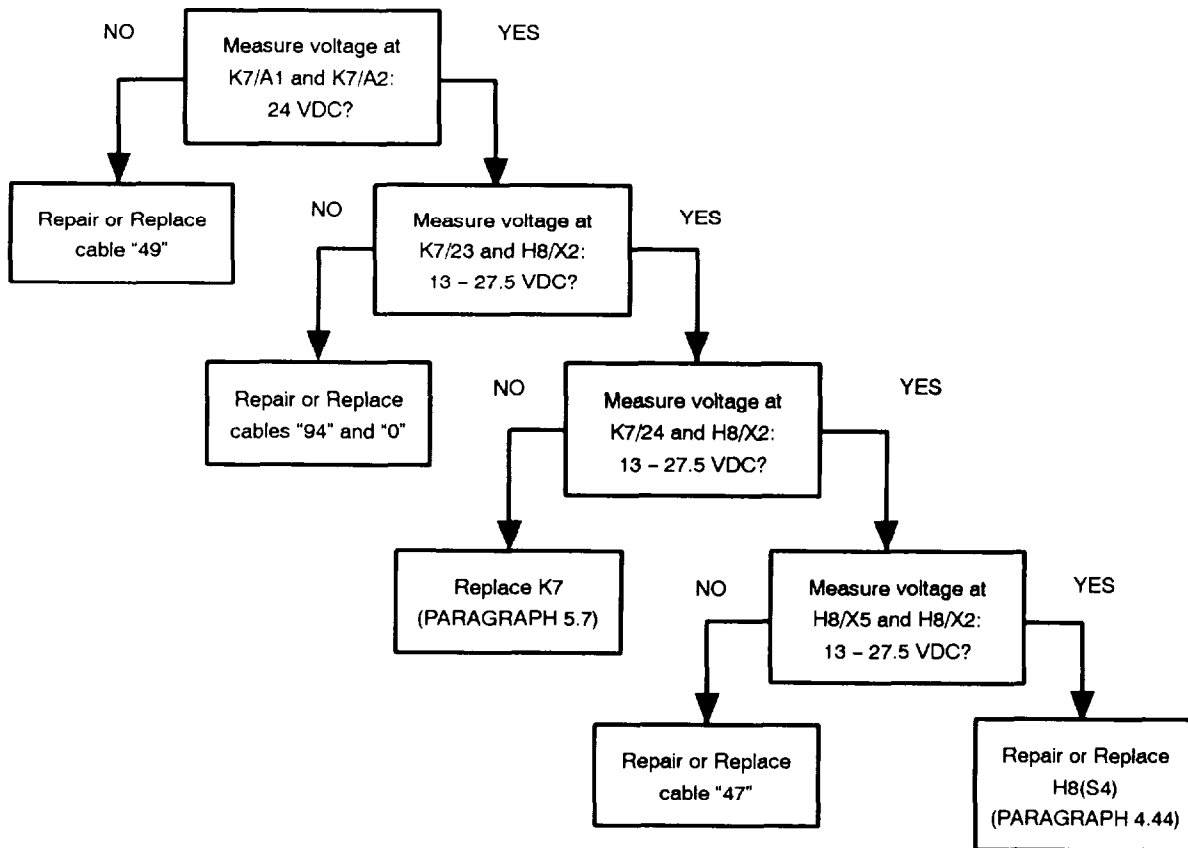


Figure 5-15 UNDER/OVER FREQUENCY lamp lights up during operation (sheet 6 of 6).

WARNING

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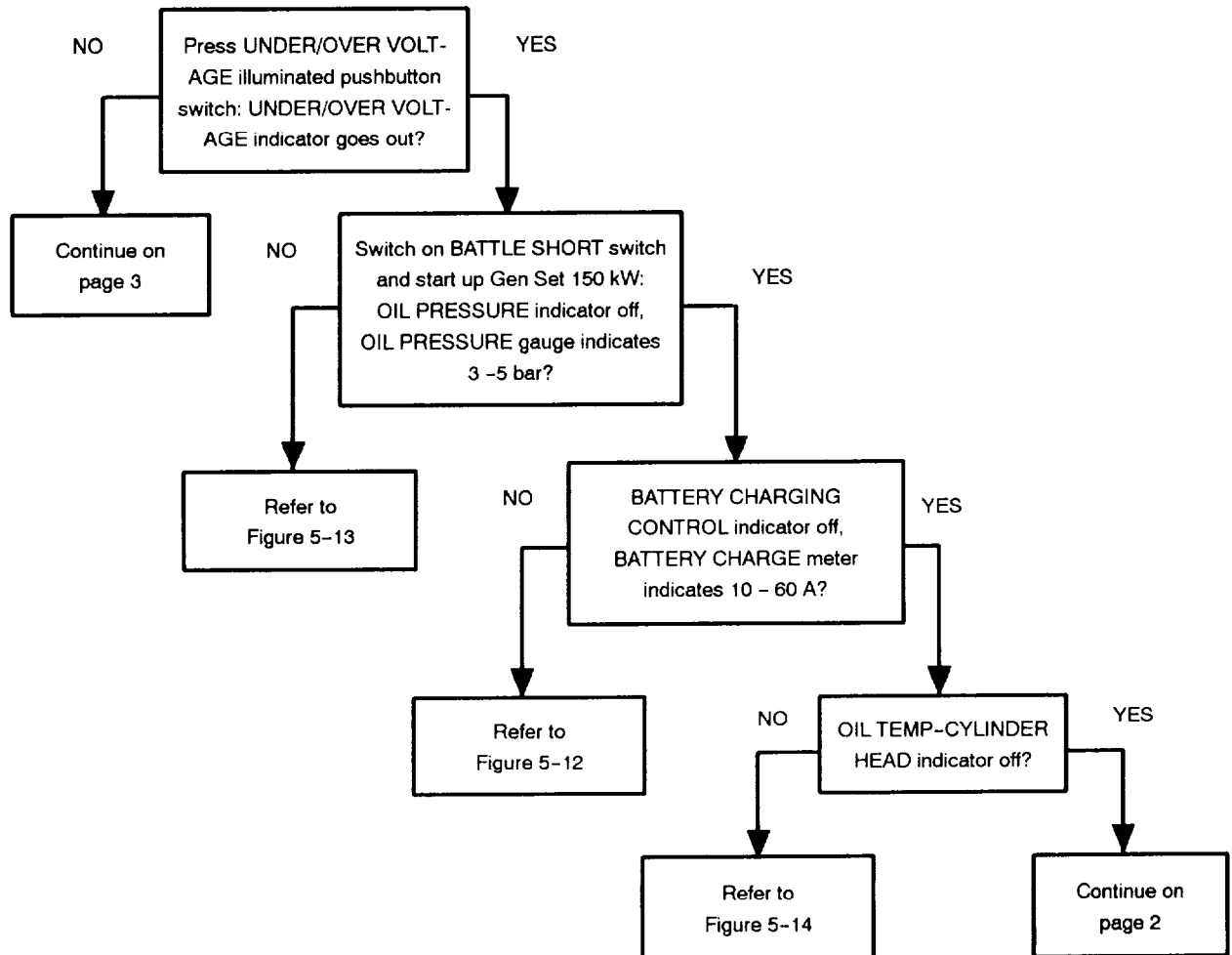


Figure 5-16 UNDER/OVER VOLTAGE lamp lights up during operation (sheet 1 of 6).

WARNING

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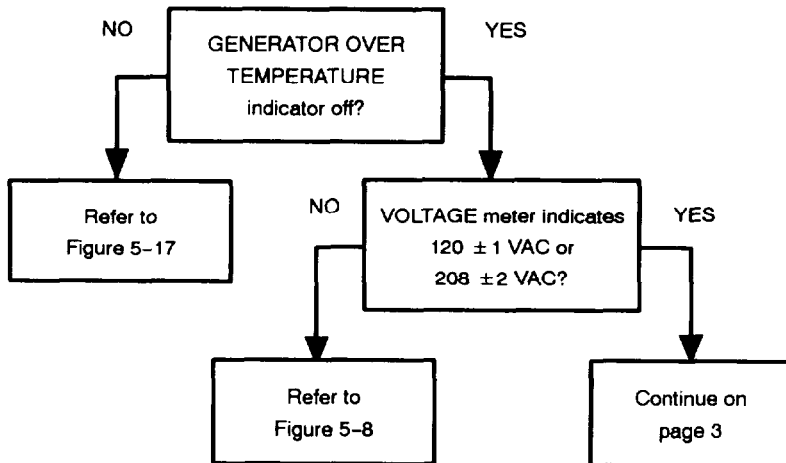


Figure 5-16 UNDER/OVER VOLTAGE lamp lights up during operation (sheet 2 of 6).

WARNING

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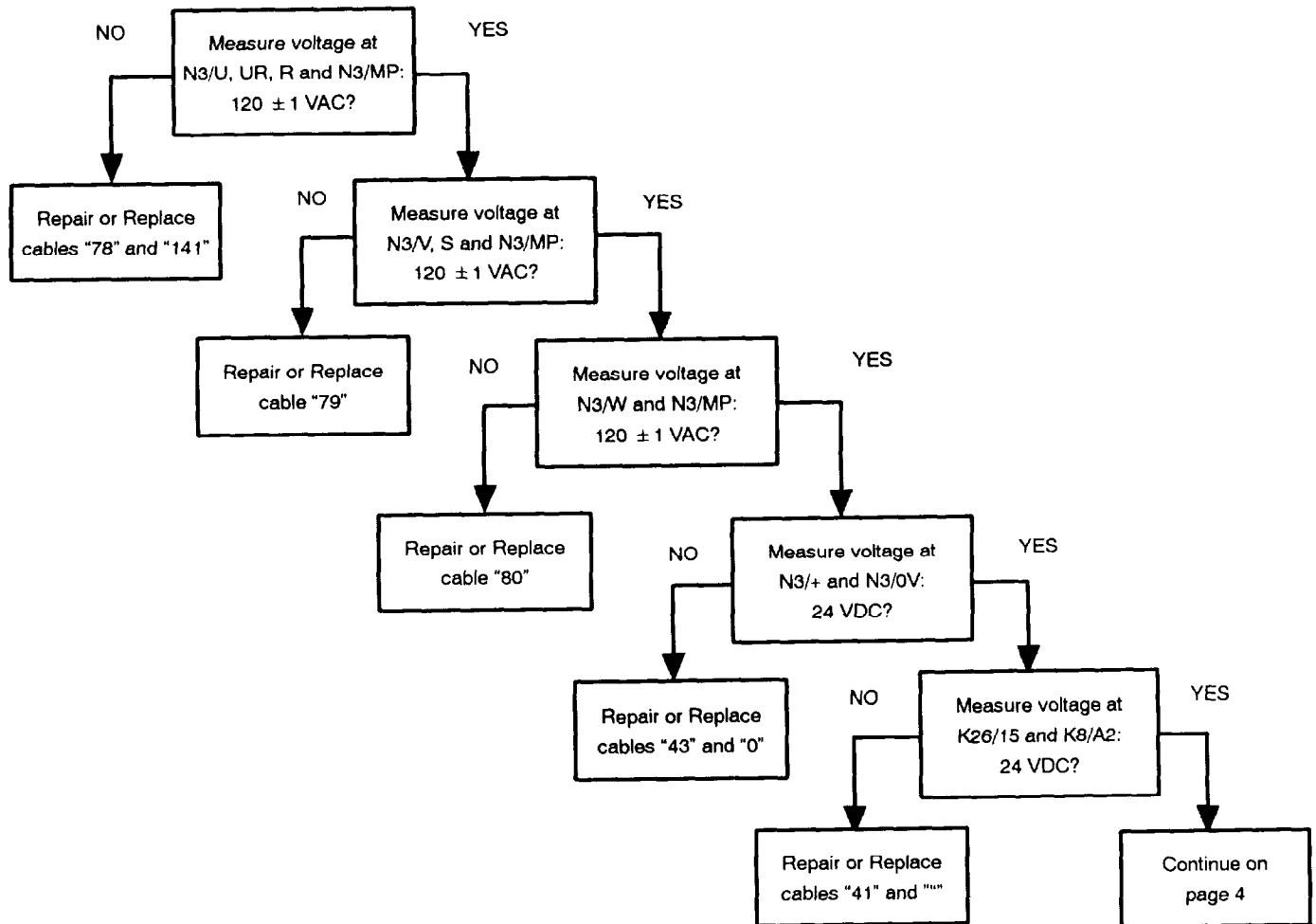


Figure 5-16 UNDER/OVER VOLTAGE lamp lights up during operation (sheet 3 of 6).

WARNING

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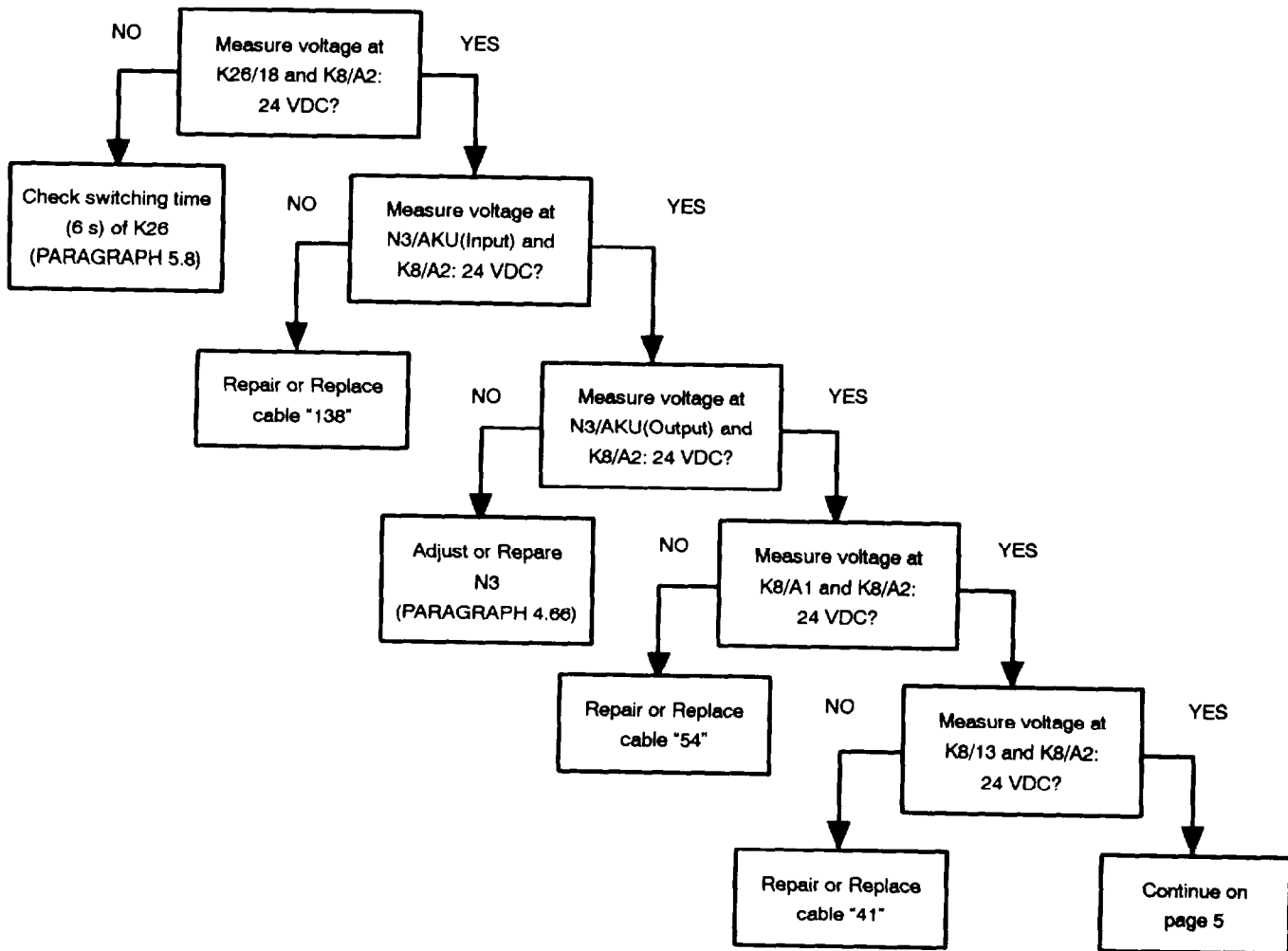


Figure 5-16 UNDER/OVER VOLTAGE lamp lights up during operation (sheet 4 of 6).

WARNING

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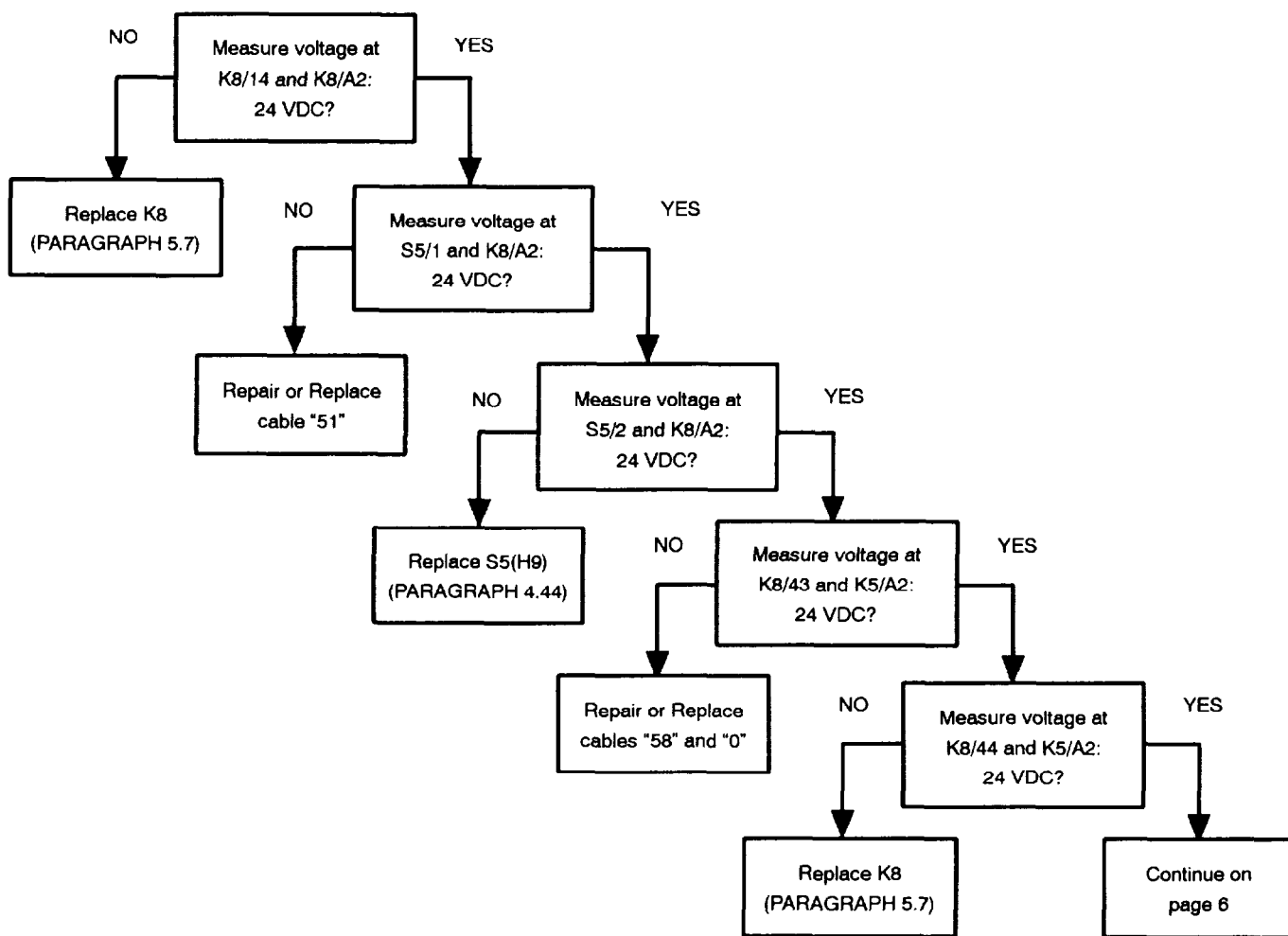


Figure 5-16 UNDER/OVER VOLTAGE lamp lights up during operation (sheet 5 of 6).

WARNING

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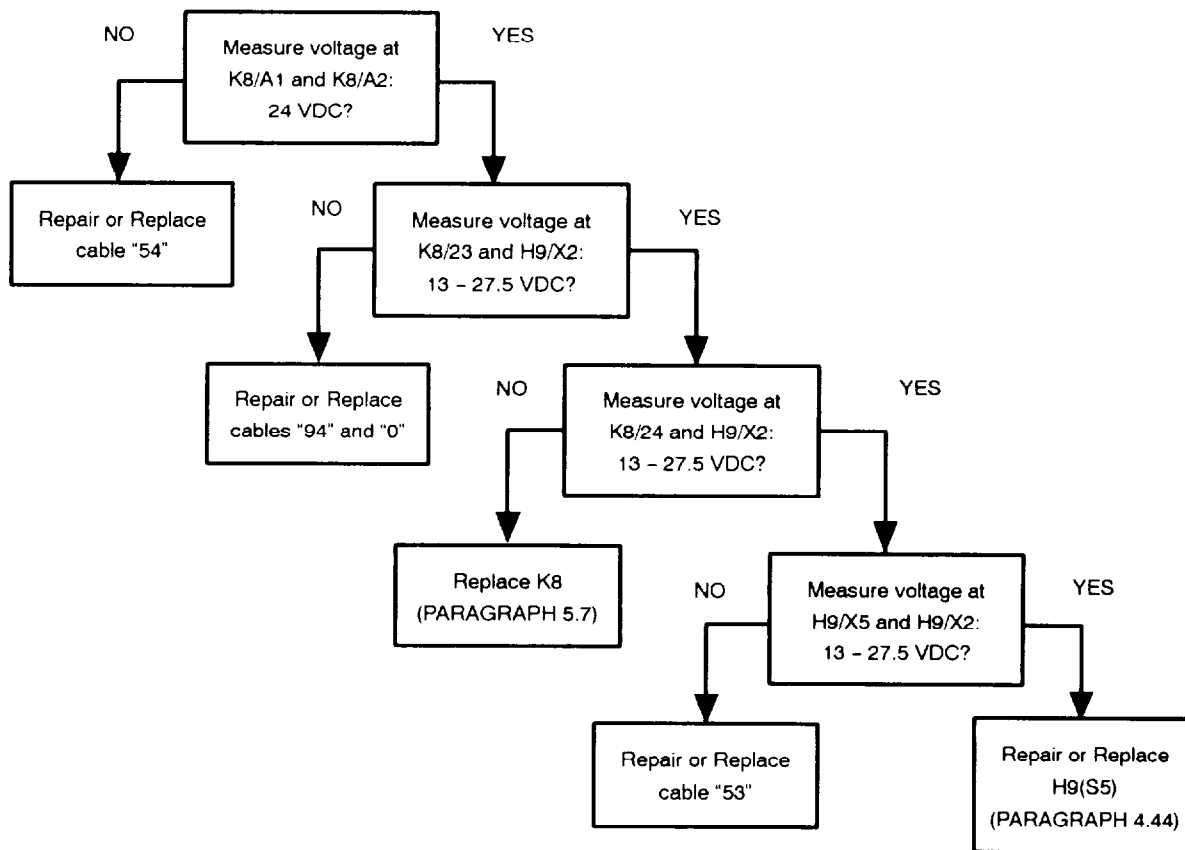


Figure 5-16 UNDER/OVER VOLTAGE lamp lights up during operation (sheet 6 of 6).

WARNING

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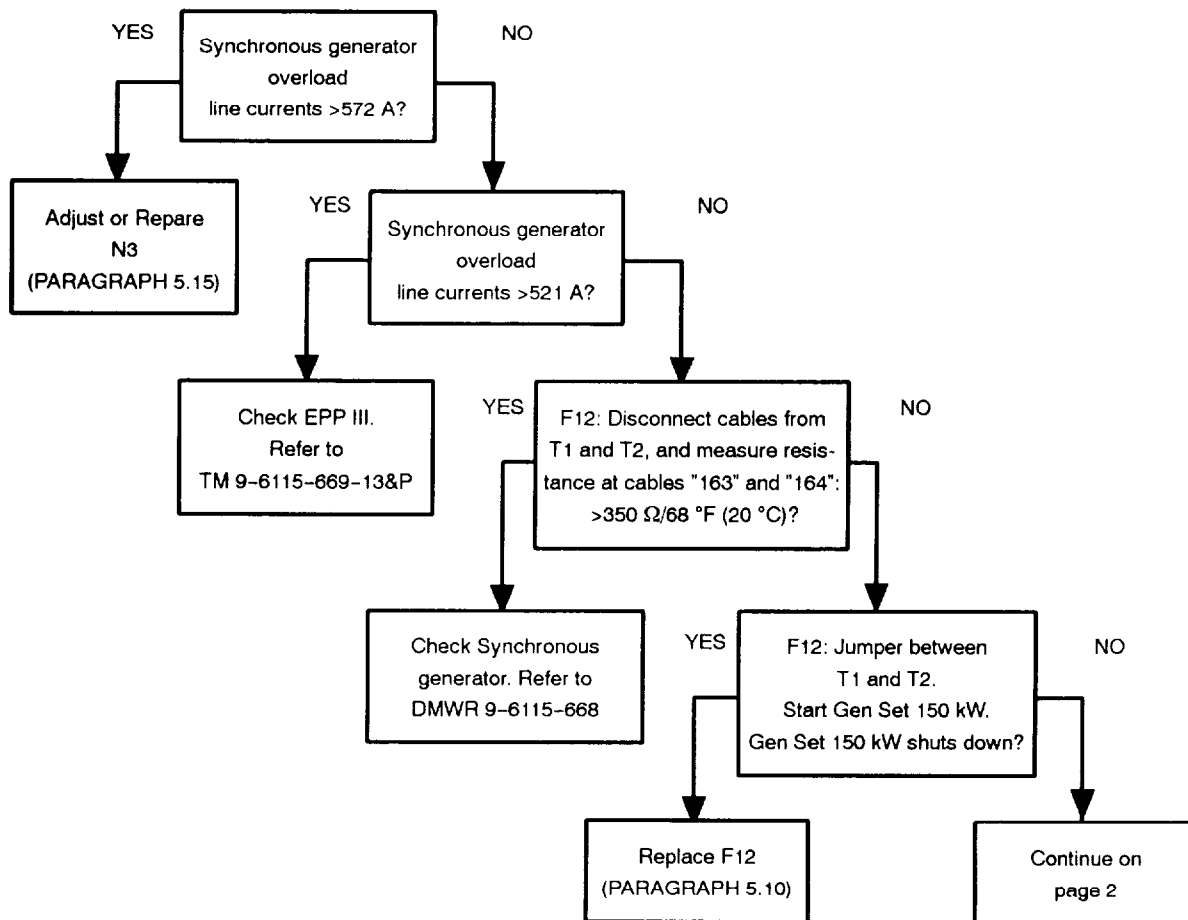


Figure 5-17 GENERATOR OVER TEMPERATURE lamp lights up during operation (sheet 1 of 4).

WARNING

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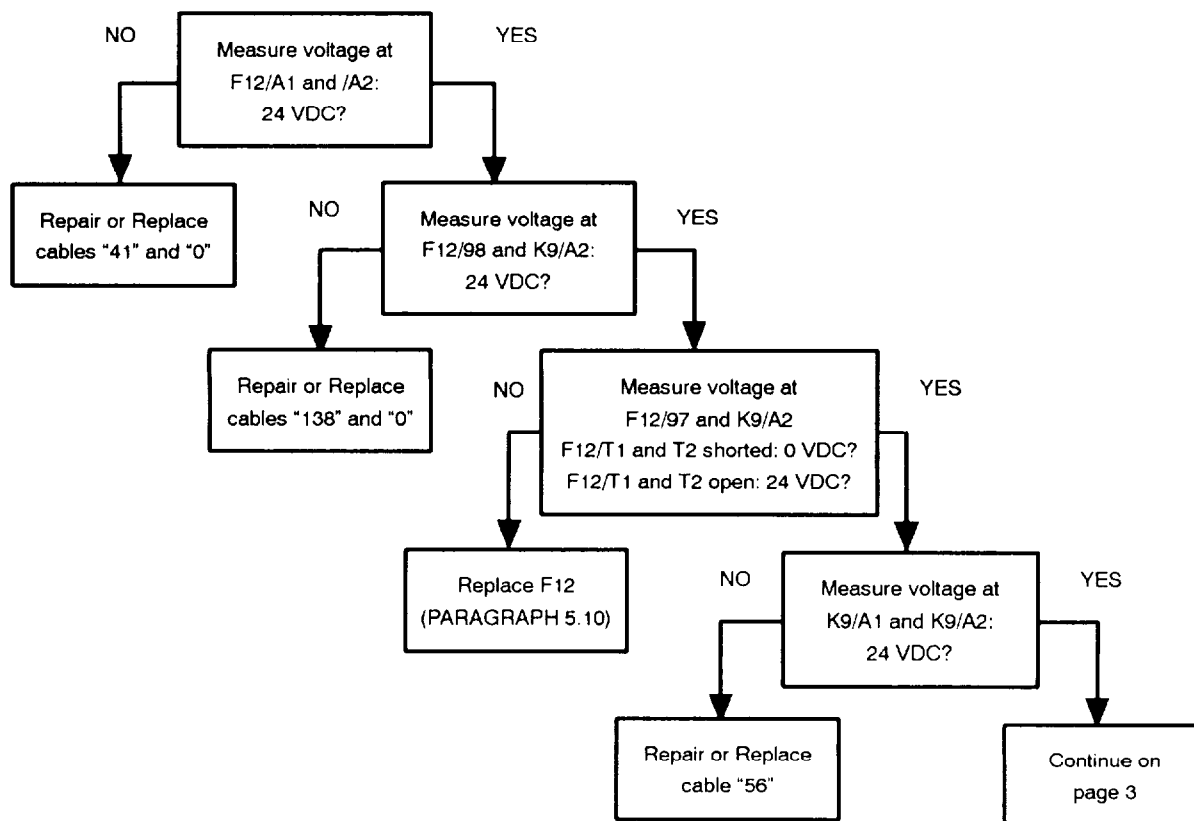


Figure 5-17 GENERATOR OVER TEMPERATURE lamp lights up during operation (sheet 2 of 4).

WARNING

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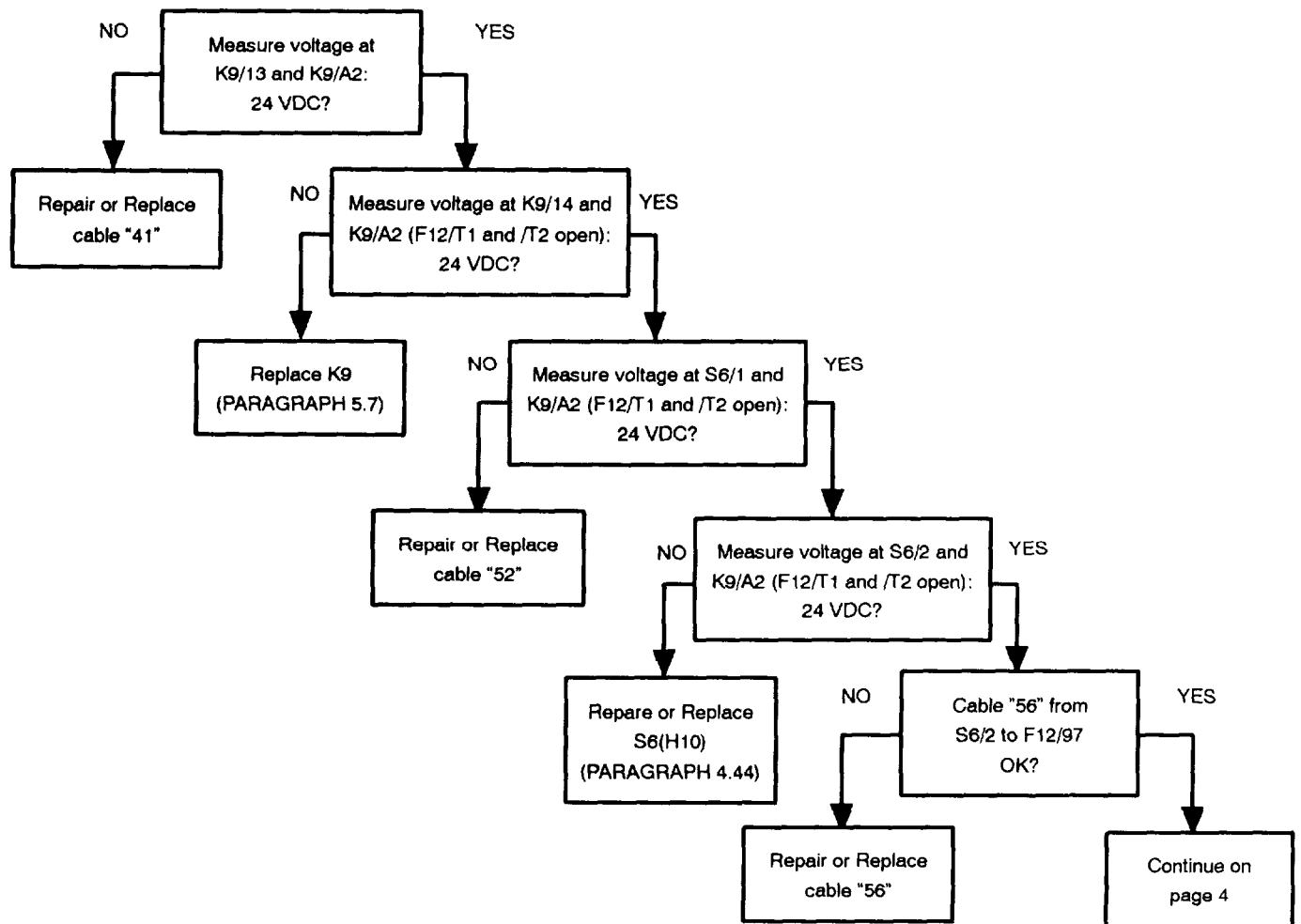


Figure 5-17 GENERATOR OVER TEMPERATURE lamp lights up during operation (sheet 3 of 4).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

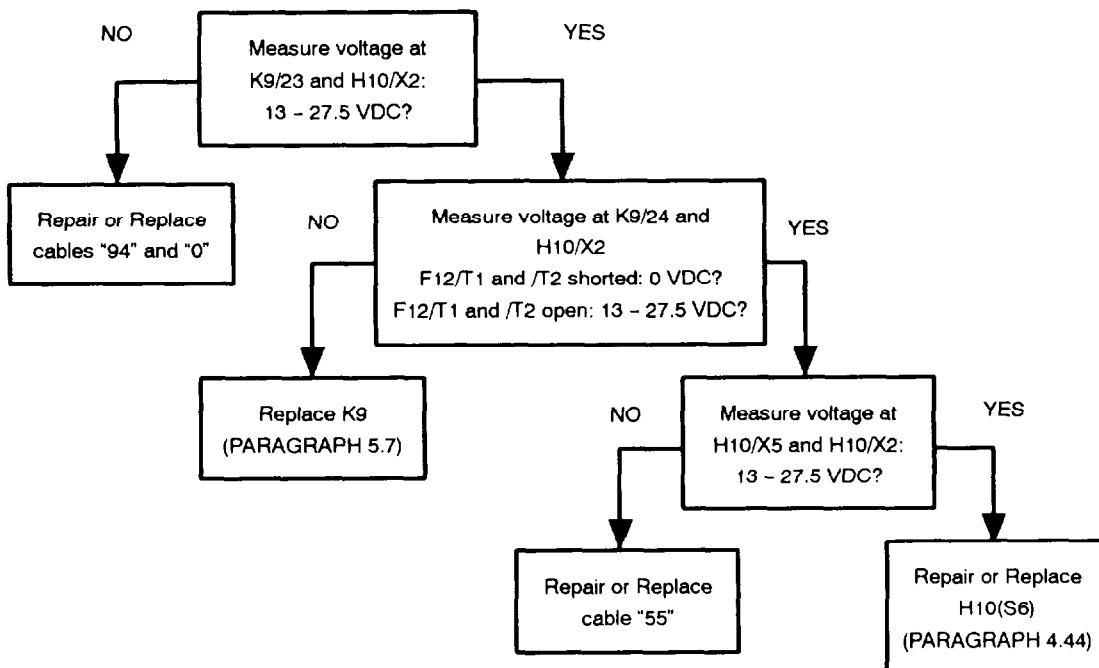


Figure 5-17 GENERATOR OVER TEMPERATURE lamp lights up during operation (sheet 4 of 4).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

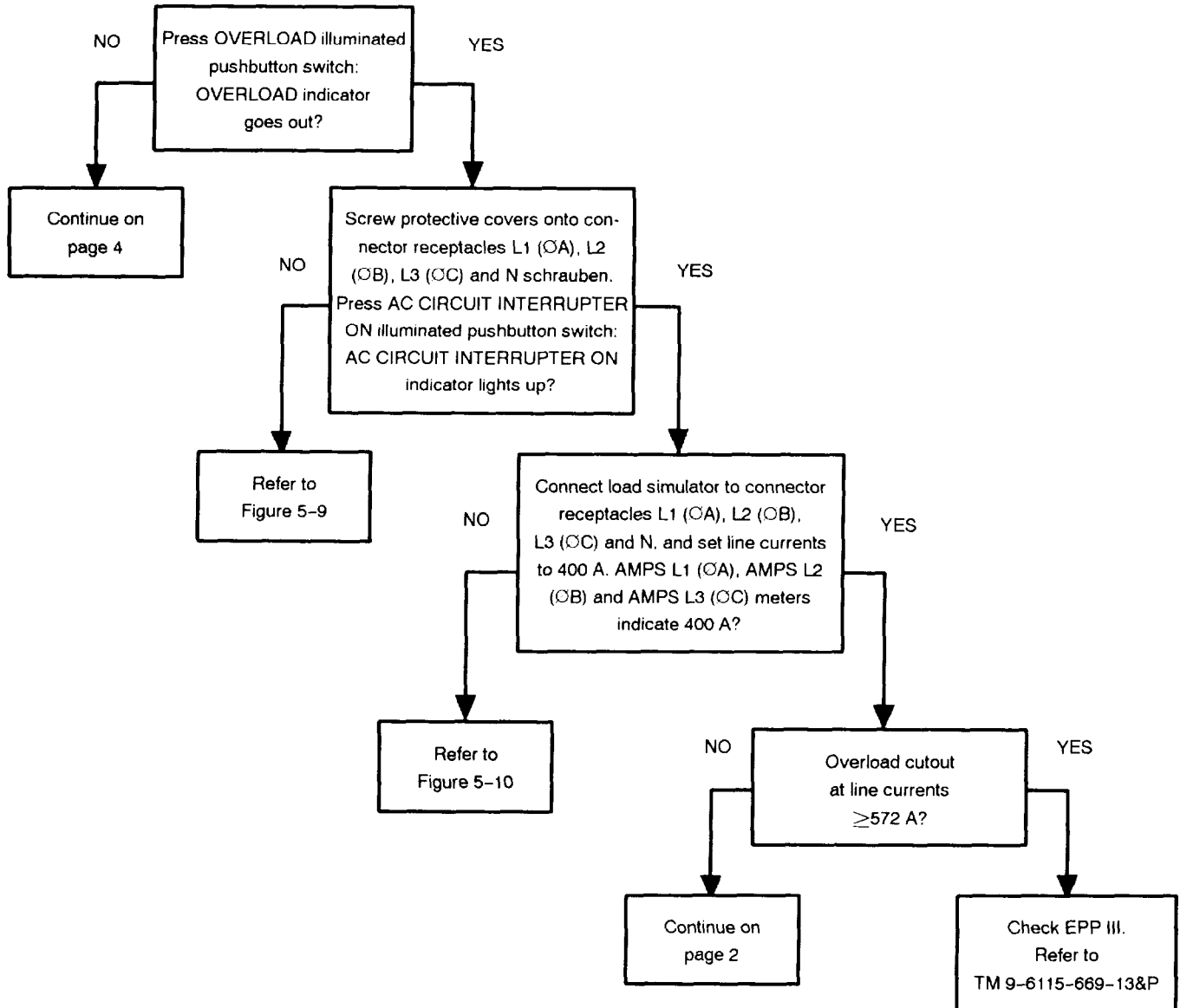


Figure 5-18 OVERLOAD lamp lights up during operation (sheet 1 of 4).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

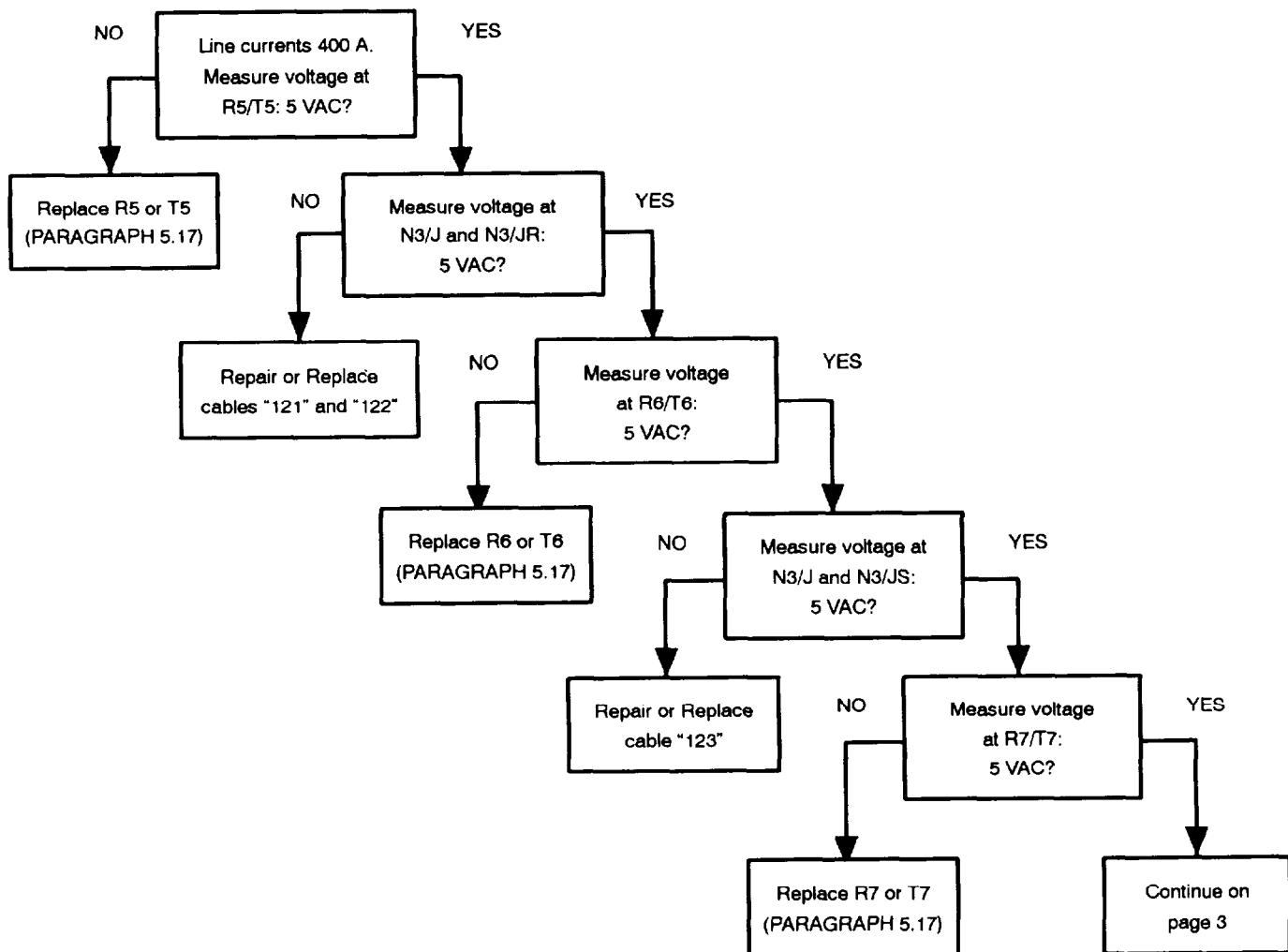


Figure 5-18 OVERLOAD lamp lights up during operation (sheet 2 of 4).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

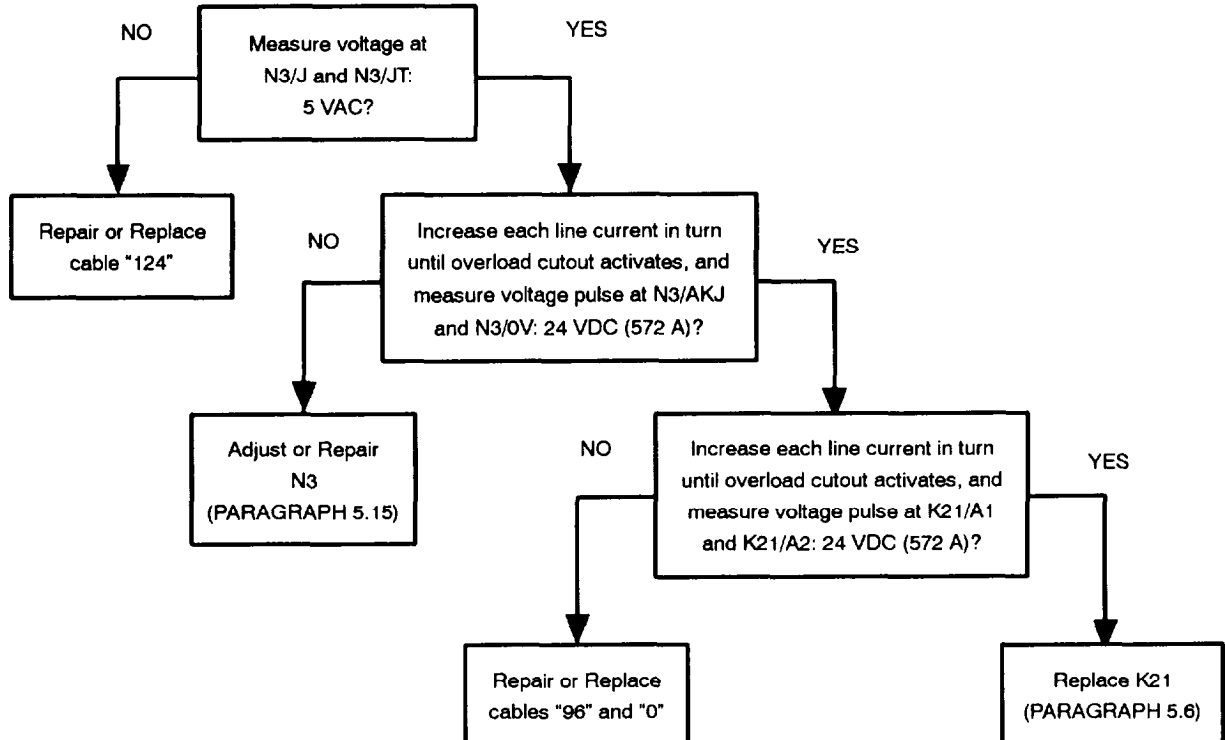


Figure 5-18 OVERLOAD lamp lights up during operation (sheet 3 of 4).

WARNING

DANGEROUS VOLTAGE EXISTS ON LIVE CIRCUITS. ALWAYS OBSERVE SAFETY PRECAUTIONS AND NEVER WORK ALONE. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

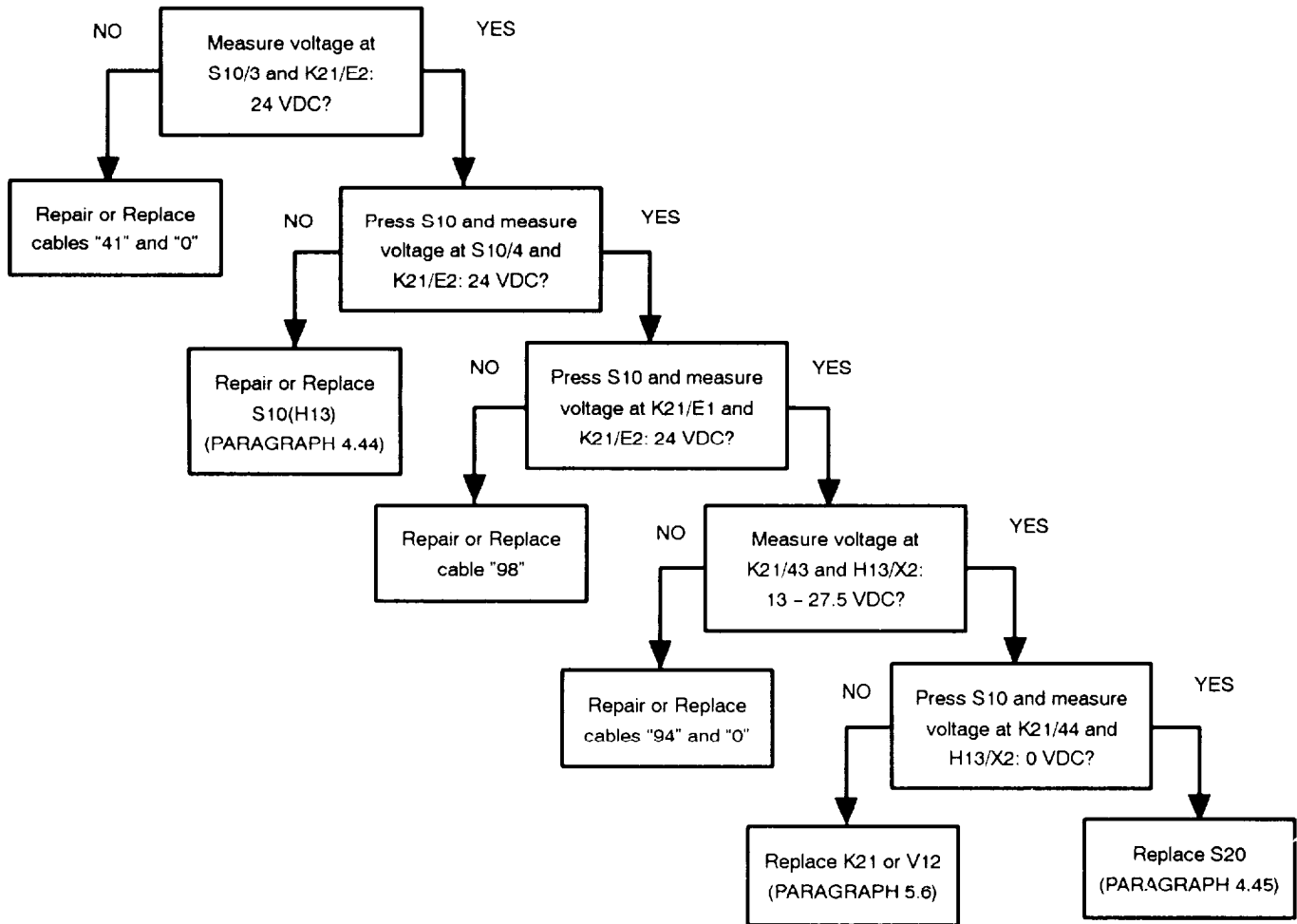


Figure 5-18 OVERLOAD lamp lights up during operation (sheet 4 of 4).

Section III. MAINTENANCE PROCEDURES

5.5 GENERAL.

This section will provide authorized direct support level maintenance instructions for the Generator Set 150 kW and its components. Each major component will be covered under its own paragraph heading. Each paragraph will be further divided into specific maintenance tasks, as directed by the Maintenance Allocation Chart (MAC). These tasks will include inspection, testing, service, adjustment, removal, disassembly, assembly, repair, replacement, and installation, as applicable. Step by step instructions and spot illustrations will guide personnel through each maintenance task.

WARNING

- **Potential 150 kw shock hazard with failure to adhere to this warning. Contact with this high power could result in death or severe injury. If the removal of one generator from the EPP III is required, replace it with an extra generator. Always make sure that two generators are mounted to the EPP III. Continued use of the EPP III with only one generator could result in a catastrophic shock hazard.**
- **Do not operate one of the EPP-III generators when the other generator is dismantled.**
- **Prior to energizing the equipment the operator must check for exposed electrical terminals.**
- **Always install protective covers on control and power cables when cables are not connected.**
- **Be sure to observe all warning signs on equipment.**

WARNING

- **Disconnect the negative battery terminal cable if task involves electrical connections.**
- **Remove the ignition key while working around the engine.**
- **For safety reasons, work on the GEN SET 150 kW must always be performed by two persons.**
- **A notice will indicate when three persons are required for a particular task.**

NOTE

- The following should generally be performed after any removal/Installation operation, if applicable:
 - Functional test
 - Lamp test
 - Sealing check
 - Bleeding
 - Oil pressure check
 - Oil level check
- Observe all regulations when disposing of oil filters, used oil, and rags.

5. Use a screwdriver to push locking element (28) on auxiliary contractor K2 (35) in direction of arrow, tilt auxiliary contractor K2 (35) upward and remove from mounting bar (38).
6. Unlock semiconductor device V13 (29) by pushing in direction of arrow, and remove from auxiliary contractor K2 (35).

INSTALLATION

NOTE

Installation procedure for auxiliary contractor with semiconductor device K2 (35)/V13 (29), K4 (39)/V14 (40), K11 (49)/V7 (44), K12 (50)/V8 (45), K14 (59)/V9 (46), K21 (57)/V12 (58), K23 (52)/V10 (59), K24 (53)/V11 (60) is the same as for auxiliary contractor K2 (27) with semiconductor device V13 (29) described below.

1. Hook top (37) of auxiliary contractor K2 (35) into mounting bar (38) and clip in at the bottom.
2. Install semiconductor device V13 (29) on auxiliary contractor K2 (35) and clip into place.

CAUTION

Make sure polarity is correct when semiconductor device is connected.

3. Noting correct labeling and position, install cables (32) and cable (33) of semiconductor device V13 (29) to terminals (30) of auxiliary contractor K2 (35), and tighten screws (31).
4. Noting correct labeling and position, install cables (26) and cable (34) of semiconductor device V13 (29) to terminals (27) of auxiliary contractor K2 (35), and tighten screws (28).
5. Stow prop (5) and close front panel (4).
6. Close flap (2).

INSTALLATION

NOTE

Installation procedure for auxiliary contractor K5 (41), K6 (42), K7 (43), K8 (47), K9 (48), K15 (54), K16 (55), K18 (56), K27 (61) is the same as for auxiliary contractor K28 (20), described below.

1. Hook top (25) of auxiliary contractor K28 (20) into mounting bar (38) and clip into place at the bottom.
2. Noting correct labeling and position. Install cables (23) in lower terminals (22) of auxiliary contractor K28 (20), and tighten screws (21).
3. Noting correct labeling and position, install cables (17) to upper terminals (18) of auxiliary contractor K28 (20), and tighten screws (19).
4. Stow prop (5) and close front panel (4).
5. Close flap (2).

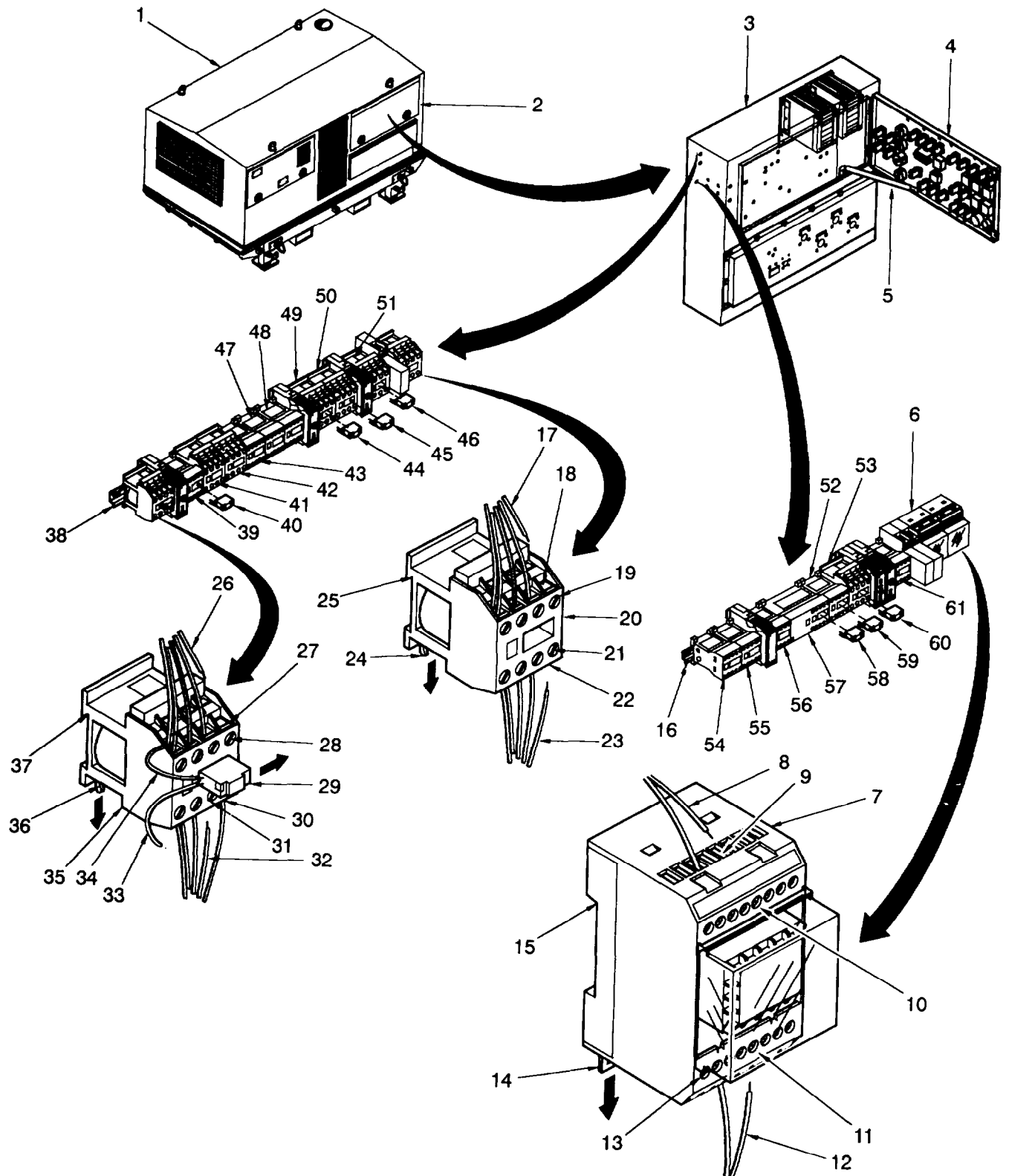


Figure 5-19 Control Cabinet Assembly, Auxiliary Contactor with Semiconductor, Auxiliary Contactor, Transformer, Maintenance.

5. Record labeling and position of cables (22) to lower terminals (23) of time relay K26 (19), loosen screws and disconnect cables (22).
6. Record labeling and position of cables (20) to lower terminals (21) of time relay K26 (19), loosen screws and disconnect cables (20).
7. Use a screwdriver to push locking element (18) on time relay K26 (19) in direction of arrow, tilt time relay K26 (19) upward, and remove from mounting bar (30).

TESTING

CAUTION

Before TESTING, check settings of time relays under ADJUSTMENT, and correct if necessary.

1. Time relay K3 (40):
 - a. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - b. Check that green LED lights up while 24 V input voltage is applied.
 - c. Check that amber LED is activated after time₁ = 24 seconds has elapsed, and lights up while input voltage is applied.
 - d. Connect multimeter between terminals 15 and 18 and check that 24 V voltage drops to zero after time₁ = 24 seconds has elapsed.
 - e. Perform Generator Set 150 kW shut down, paragraph 2.5.2.
2. Time relay K10 (42):
 - a. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - b. Check that green LED lights up while 24 V input voltage is applied.
 - c. Check that amber LED is activated after time₁ = 30 seconds has elapsed, and lights up while input voltage is applied.
 - d. Pull cable with plug 1J2/1 off oil pressure switch 1S2. Connect plug 1J2/1 to ground and check that diesel engine shuts down,
 - e. Once diesel engine has shut down, reconnect cable with plug 1J2/1 to oil pressure switch 1S2.
 - f. Start diesel engine as instructed in paragraph 2.5.1.
 - g. Perform Generator Set 150 kW shut down, paragraph 2.5.2.
3. Time relay K13 (43):
 - a. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - b. Check that green LED lights up while 24 V input voltage is applied.
 - c. Use a screwdriver to push AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch S8/H14 and check that AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch S8/H14 lights up and relay K1 is energized.
 - d. Perform Generator Set 150 kW shut down, paragraph 2.5.2.

4. Time relay K17 (45):
 - a. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - b. Check that green LED lights up, while 24 V input voltage is applied.
 - c. Apply +24 V (with respect to A2) on relay terminal AI and check that AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch S8/H14 lights up and relay K1 is energized.
 - d. Perform Generator Set 150 kW shut down, paragraph 2.5.2.
5. Check function of time relay K25 (44):
 - a. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - b. Check that green LED lights up while 24 V input voltage is applied.
 - c. Check contacts D-H of plug J9 and check that amber LED lights up for time2 = 0.5 after time1 = 0.5 seconds has elapsed, and AC CIRCUIT INTERRUPTER ON illuminated pushbutton switch S8/H14 is off.
 - d. Perform Generator Set 150 kW shut down, paragraph 2.5.2.
6. Time relay K26 (19):
 - a. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - b. Check that green LED lights up while 24 V input voltage is applied.
 - c. Check that amber LED is activated after 6 seconds, and stays illuminated while input voltage is applied.
 - d. Connect multimeter between terminals 15 and 18, and check that 24 V voltage drops to zero after time1 = 6 seconds has elapsed.
7. Perform Generator Set 150 kW shut down, paragraph 2.5.2.

ADJUSTMENT

CAUTION

Check jumpers on terminals, and remove, insert, or reconfigure as necessary.

1. Set Time relay K26 (19) to a 6-seconds switching time:
 - a. On front of time relay K26 (19), use TIME DIP switches (1) to set a 10-seconds time window as indicated in figure 5-20.
 - b. On front of Time relay K26 (19) use knob (3) to set a multiplication factor of .6.
2. Set time relay K3 (40) to switching time of 24 seconds:
 - a. On front of time relay K3 (40) use TIME DIP switches (1) to set a 30-seconds time window as indicated in figure 5-20.
 - b. On front of time relay K3 (5-200) use knob (3) to set a multiplication factor of .8.
3. Set time relay K10 (42) to switching time of 30 seconds:

- a. On front of time relay K10 (5-202) use TIME DIP switches (1) to set a 30-seconds time window as indicated in Figure 5-20.
 - b. On front of time relay K10 (42) use knob (3) to set a multiplication factor of 1.
4. Set time relay K13 (43) to switching time of 12 seconds:
- a. On front of time relay K13 (43) use TIME DIP switches (1) to set a 30-seconds time window as indicated in figure 5-20.
 - b. On front of time relay K13 (43) use knob (3) to set a multiplication factor of .4.

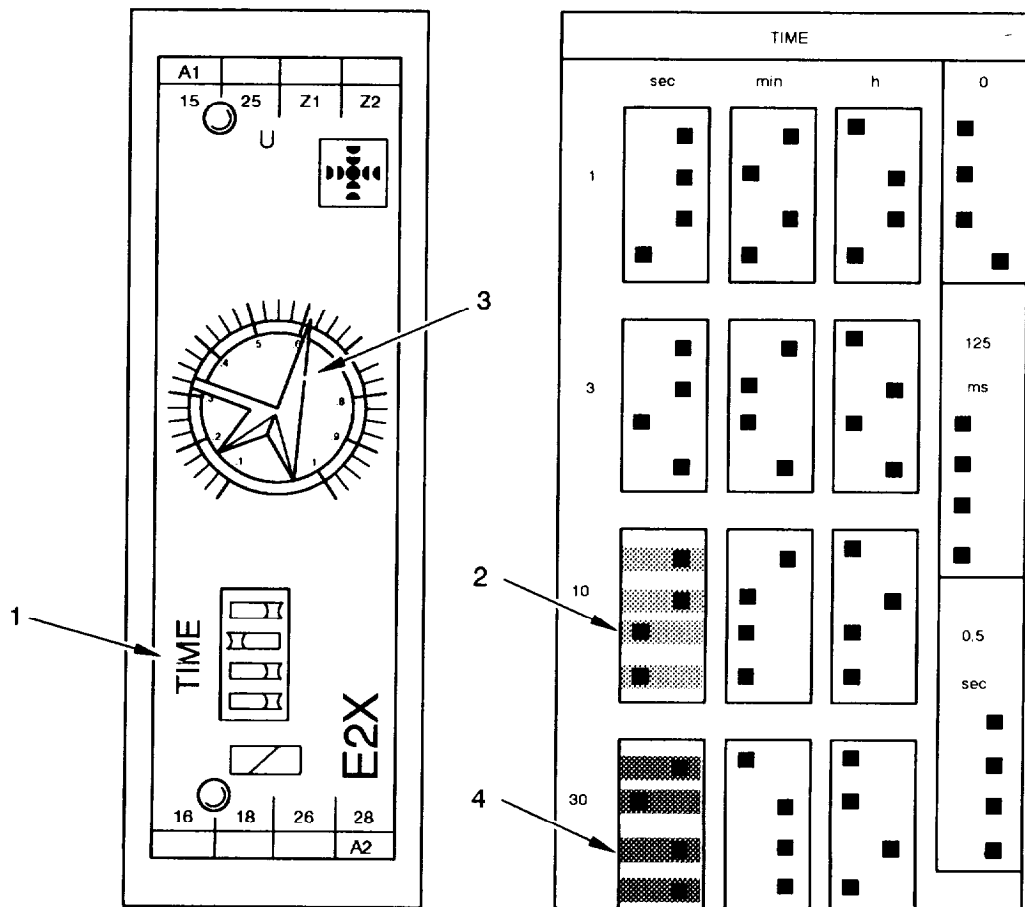


Figure 5-20 Time Relays K3, K10, K13 and K26

5. Set time relay (Wipe Relay) K17 (23) to switching time of 0.5 seconds:
 - a. Insert jumper Y1-Y2 into lower row of terminal as shown in figure 5-21.

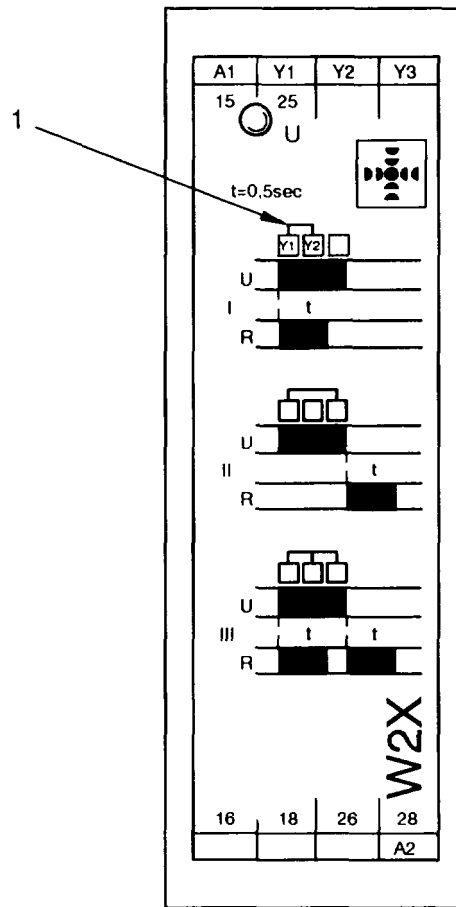


Figure 5-21 Time Relay k17

6. Set time relay K25 (44) to switching time $t_1 = 0.5$ seconds and pulse time $t_2 = 0.5$ seconds:
 - a. Insert jumper Y1 -Y2-Y3 (1) into upper row of terminal as shown in figure 5-22.
 - b. Set switching time t_1 :

On front of time relay K25 (44), use TIME DIP switches (2) to set a 1 -seconds time window as indicated in figure 5-22.

On front of time relay K25 (44), use rotary knob (4) to set a multiplication factor of .5.
 - c. Set pulse time t_2 :

On front of time relay K25 (44), use TIME DIP switches (5) to set a 1 -seconds time window as indicated in figure 5-22.

On front of time relay K25 (44), use knob (6) to set a multiplication factor of .5.

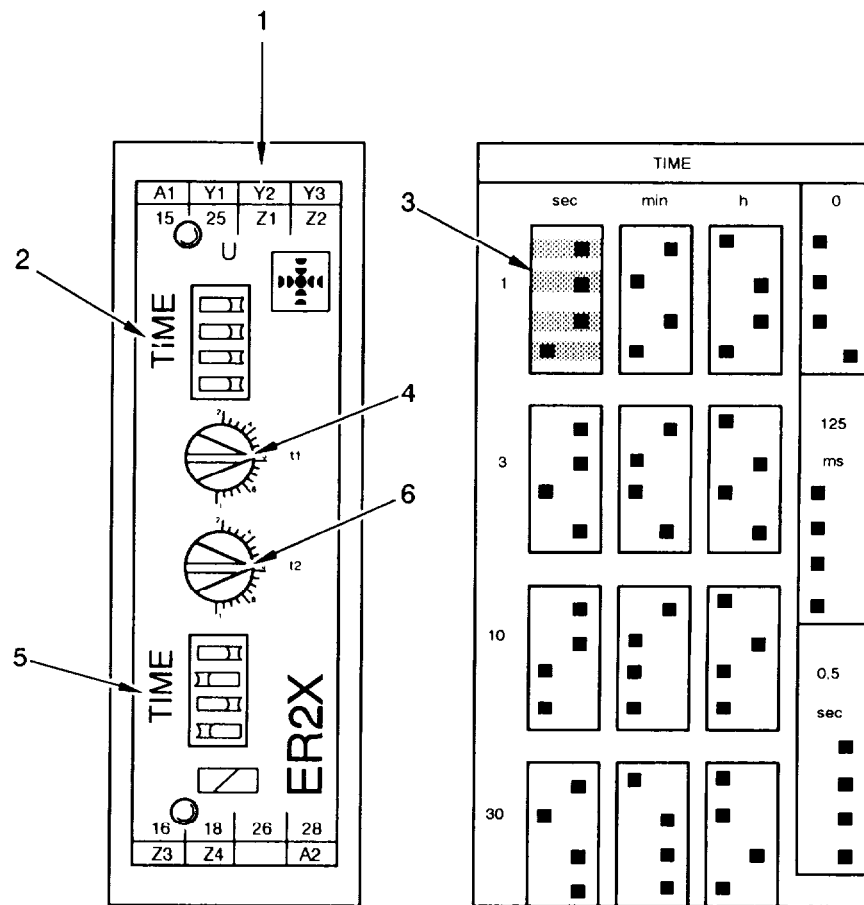


Figure 5-22 Time Relay K25

INSTALLATION

1. Hook top (17) of time relay K26 (19) into mounting bar (30) and push in at the bottom.
2. Noting correct labeling and position, install cables (20) on lower terminals (21) of time relay K26 (19), and tighten screws.
3. Noting correct labeling and position, install cables (22) on lower terminals (23) of time relay K26 (19), and tighten screws.
4. Noting correct labeling and position, install cables (29) on upper terminals (28) of time relay K26 (19), and tighten screws (27).
5. Noting correct labeling and position, install cables (26) on upper terminals (25) of time relay K26 (19), and tighten screws (24).
6. Stow prop (5) and close front panel (4).
7. Close flap (2).

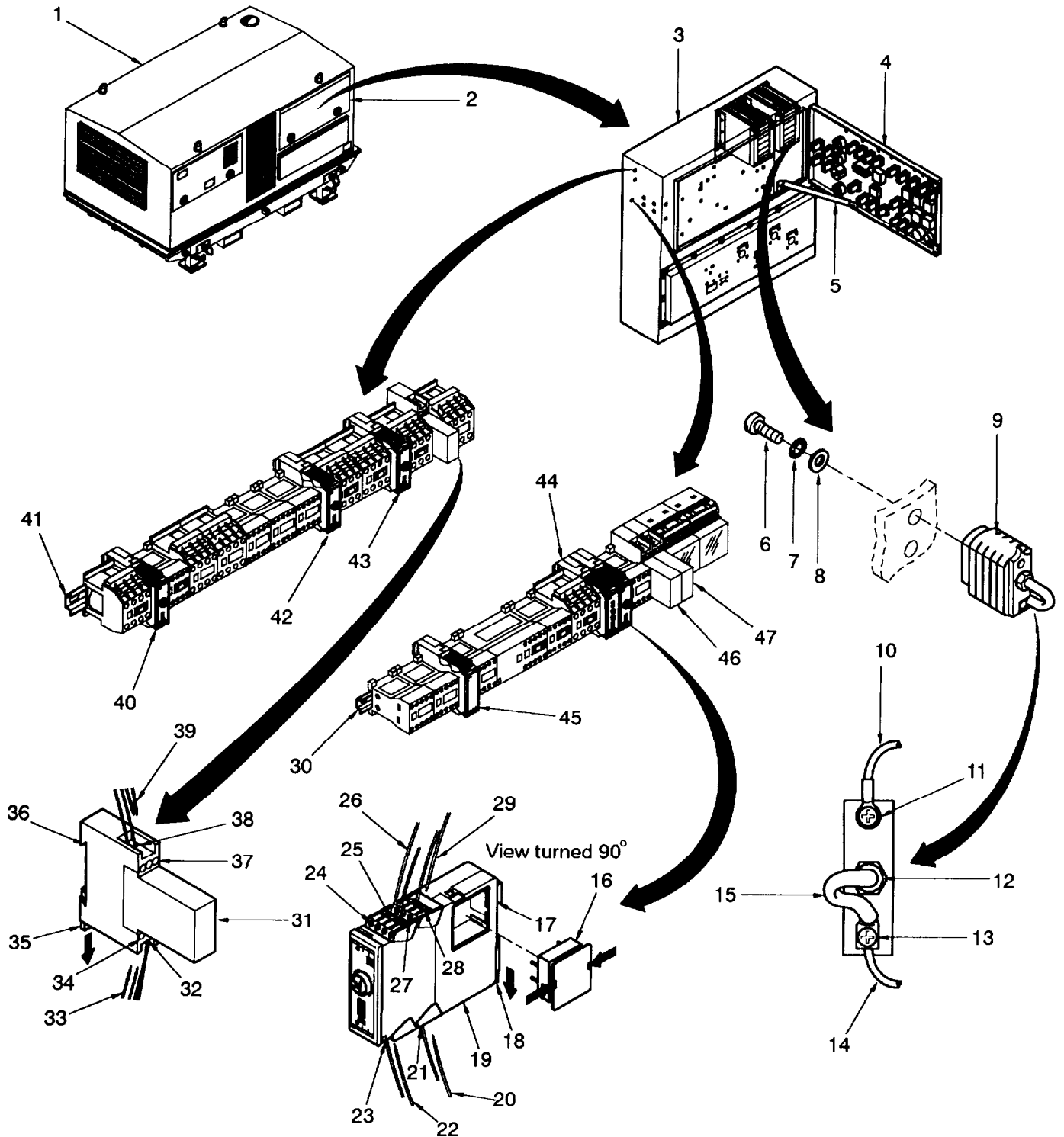


Figure 5-23 Diodes, Time Relay, Power Supply Maintenance.

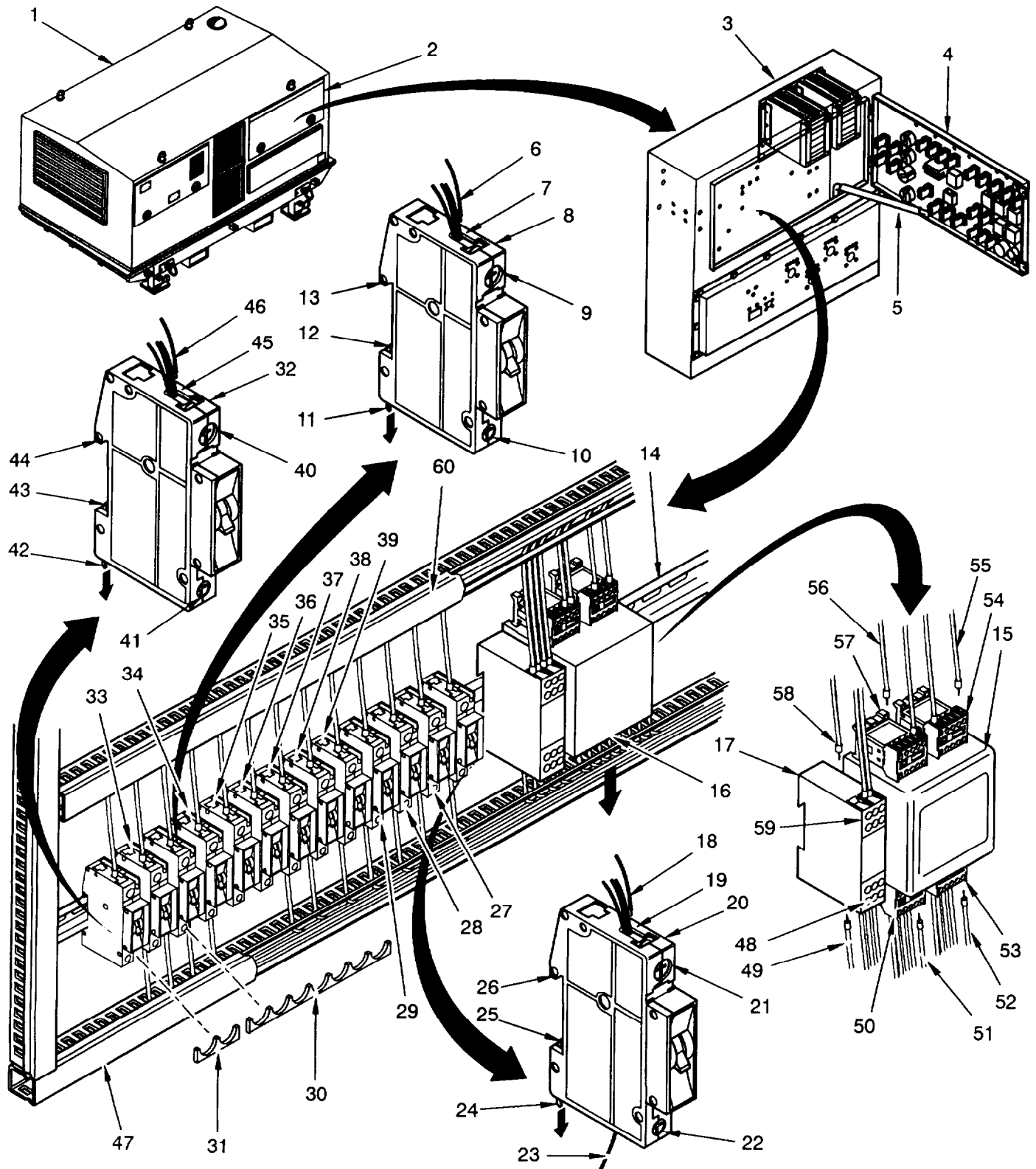


Figure 5-24 Control Cabinet Assembly, Circuit Breaker F1 to F11, Thermistor relay F12, True Power Measure Transformer P4A Maintenance.

5.11 DIGITAL ISOCHRONOUS LOAD SHARING MODULE N4 MAINTENANCE.

This task covers: a. Removal b. Adjustment c. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
 (item 2, appendix B)
 Automotive Fuel and Electrical System Repair, Tool Kit
 (item 3, appendix B)
 Load Bank (item 19, appendix B)

Equipment Conditions

Reference
 Generator Set 150 kW shut
 down,
 paragraph 2.5.2

Materials/Parts

Cable ties
 (item 10, appendix E)

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Open flap (2, figure 5-27) on unit hood assembly (1).
2. Open front panel (4) on control cabinet assembly (3) and secure with prop (5).
3. Using a suitable wrench to hold standoffs (35), remove two nuts (32), two serrated lock washers (33), and two washers (34), from standoffs (35).
4. Remove nut (22), serrated lock washer (23), washer (24), voltage compensation line (21), and washer (25).
5. Cut cable ties at cable tie holder (26) and remove cables.
6. Remove knurled nuts (29, 30) on N4 (36) and housing cover (31).
7. Record labeling and position of cables and disconnect cables from terminals of N4 (36).
8. Using a suitable wrench to hold standoff (37), remove screws (40), serrated lock washers (39), and washers (38), from standoff (37).
9. While holding standoff with a suitable wrench, remove screw (28) serrated lock washer (27), and cable tie holder (26).
10. Remove digital isochronous load sharing module N4 (36) from standoffs (35,37).

ADJUSTMENT**NOTE**

The EPP III must be operating in order to adjust digital isochronous load sharing module N4; see TM 9-6115-669-13&P

1. Connect load bank to generator set and perform procedures in paragraph 5.53.
2. Open digital isochronous load sharing module N4 (36) as instructed under REMOVAL, step 7.
3. Preset potentiometers as follows (figure 5-25):

RPLVL	to position	5	
FP OFF	to position	5	
FP ON	to position	5	
LOAD PULSE	to position	12	
LS GAIN	to position	5	
DROOP	to position	7	(fully counterclockwise)
PM GAIN	to position	do not adjust	(factory preset)

4. Connect multimeter to TP 1 (+) and TP 2 (-); (Measurement range 10 V-, R; $\geq 10 \text{ M}\Omega$).
5. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
Set output parameters: P = 150 kW, IL = 520 A, $\cos \phi = 0.8$.
6. Adjust settings:
 - a. Use CT CAL potentiometer to set voltage on multimeter 7.5 V-.
 - b. Use LS GAIN potentiometer to set voltage on multimeter to 5.5 V.
 - c. Switch on Generator Set 150 kW No. 2 and set up parallel operation with Generator Set 150 kW No.1.
 - d. When Generator Set 150kW is running with rising and falling rpm, turn LOAD PULSE potentiometer counterclockwise until a stable condition is achieved and the rotation speed no longer changes even if the control linkage between speed control device and fuel injection pump is tapped.
 - e. When rotation speed is constant, allow Generator Sets 150 kW No. 1 and No. 2 to run in test mode.
7. Shut down Generator Set 150 kW No. 1 and No. 2 as instructed in paragraph 2.5.2.
8. Disconnect mutimeter from TP 1 (+) and TP 2 (-).
9. Close digital isochronous load sharing module N4 (36) as instructed under INSTALLATION, step 4.
10. Disconnect load bank from Generator Set 150 kW.

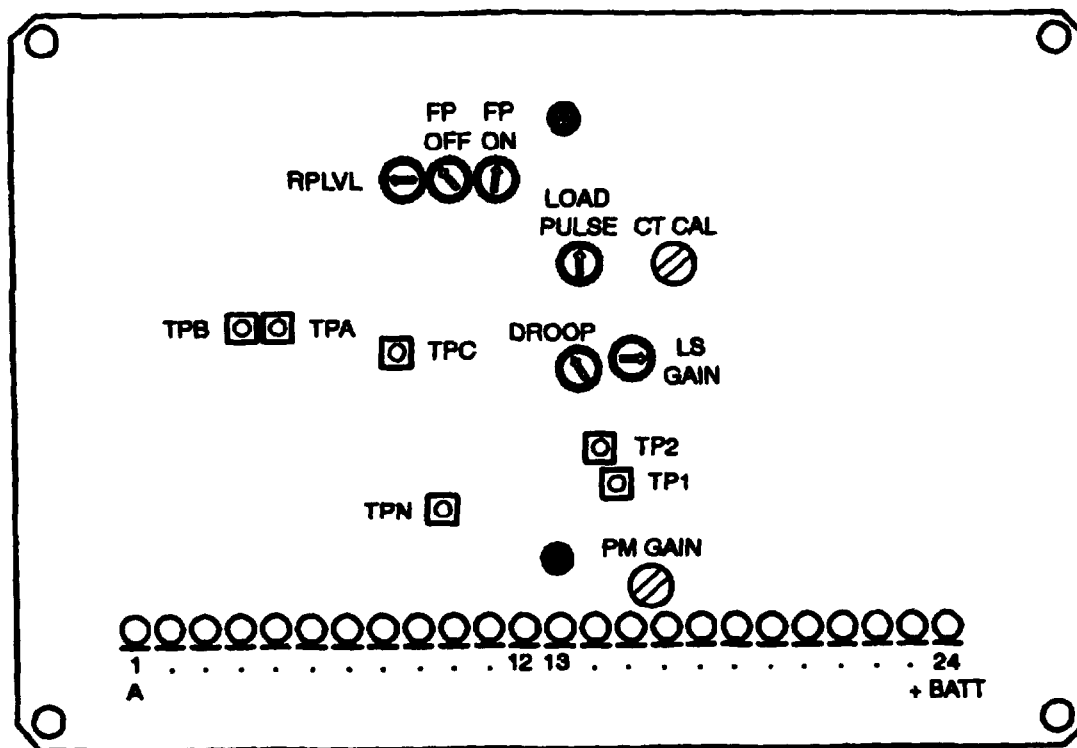


Figure 5-25 Digital Isochronous Load Sharing Module N4, Location of Potentiometers and Test Points.

INSTALLATION

NOTE

Perform the ADJUSTMENT procedure when installing a new digital isochronous load sharing module N4 (34).

1. Place digital isochronous load sharing module N4 (36) on standoffs (35,37).
2. install two nuts (32), two serrated lock washers (33) and two washers (34) on standoffs (35) while holding standoff (35) with a suitable wrench.
3. install cables to terminals of digital isochronous load sharing module N4 (36). Note correct labeling and position.
4. Install housing cover (31) on module (36) and tighten nuts (29, 30).
5. Install washer (25), line (21), washer (24), serrated lock washer (23), and nut (22) on threaded pin.
6. Install cable tie holder (26) with screw (28) and serrated lock washer (27), while holding standoff with a suitable wrench; arrange cables and secure with cable ties.
7. Install two serrated lock washers (39), two washers (38), and two screws (40) on two standoffs (37) while holding standoffs (37) with a suitable wrench.
8. Stow prop (5) and close front panel (4).
9. Close flap (2).

- b. Pull relay K19 (7) out of relay socket (16).
5. Remove relay socket (16) with contact bushings:
 - a. Remove nut (9), serrated lock washer (10), and washer (11) from standoff (8).
 - b. Remove relay board (15) with relay K20 (6) from standoff (8).
 - c. Remove nut (12), serrated lock washer (13) and washer (14) from threaded element (17).
 - d. Remove threaded element (17) and relay socket (16) from relay board (15).

CAUTION

Use only removal tool to push out contact bushings.

6. Remove contact bushings:
7. Insert removal tool from the front into contact bushing and push contact bushing with cable out of relay socket (16).

INSTALLATION

CAUTION

Use only installation tool to Insert contact bushings.

1. Slide installation tool over contact bushing and push contact bushing with cable into relay socket (16).
2. Insert relay socket (16) into relay board (15).
3. Install two washers (11), two serrated lock washers (10), and two nuts (9) on two standoffs (8).
4. Insert relay K19 (7) into relay socket (16).
5. Install two screws (20) two serrated lock washers (19), and two washers (18).
6. Install digital isochronous load sharing module N4 (36) as instructed in paragraph 5.11.
7. Stow prop (5) and close front panel (4).
8. Close flap (2).

5.13 SPEED GOVERNOR ASSEMBLY N1 MAINTENANCE.

This task covers: a. Removal b. Adjustment c. installation

INITIAL SETUP**Tools**

General Mechanics Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)
Load bank (item 19, appendix B)
XY-printer
(item 16, appendix B)

Materials/Parts

Cable ties
(item 10, appendix E)

Equipment Conditions

Reference
Generator Set 150 kW shut
down
paragraph 2.5.2

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Open flap (2, figure 5-27) on unit hood assembly (1).
2. Open front panel (4) on control cabinet assembly (3) and secure with prop (5).

NOTE

Speed governor assembly N1 (43) is located behind digital isochronous load sharing module N4 (33).

3. Remove two nuts (32), two serrated lock washers (32) and two washers (34) from two standoffs (35), while holding standoffs (35).
4. Swing digital isochronous load sharing module N4 (36) to one side.
5. Record labeling and position of cables (42) and remove cables (42) from terminals (44) of speed governor assembly N1 (43).
6. Remove resistor R10 (41) from speed governor assembly N1 (43) and set aside for re-use.
7. Remove cables (54) for resistors R100 to R102 from connection strip (53).

8. Remove two screws (45), two serrated lock washers (46), and two washers (47) from two standoffs (48).
9. Remove speed governor assembly N1 (43) with mounting plate (51) and resistors R100 to R102 (55 to 57) from standoffs (48).

ADJUSTMENT

1. Connect load bank to generator set and perform procedures in paragraph 5.53.
2. Remove cover panel over socket terminals L1 to L3 and N in control cabinet as instructed in paragraph 5.24.
3. Connect X/Y-printer to threaded pin of terminals L1, L2, L3 and N.
4. Preset potentiometers as follows (figure 5-26):

LIM	to position	11	
INT	to position	11	
DER	to position	11	
ACT	to position	12	
DROOP	to position	7	(full counterclockwise)
GAIN	to position	9	

5. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
Set output parameters: P = 150 kW, IL = 520 A, $\cos \phi = 0.8$.
6. Adjust settings:
 - a. Rotate FREQUENCY ADJUST potentiometer R4 all the way clockwise and lock control knob with lever.
 - b. Use SPD IN potentiometer to set frequency on FREQUENCY meter P5 to 416 Hz.
 - c. Use FREQUENCY ADJUST potentiometer R4 to set frequency on FREQUENCY meter P5 to 400Hz, and lock control knob with lever.
 - d. Rotate ACT potentiometer clockwise, until unit begins to vibrate (if necessary, tap control linkage between speed control device and fuel injection pump).
 - e. Rotate ACT potentiometer counterclockwise until a stable condition is achieved, and unit does not begin to vibrate even if the control linkage is tapped (potentiometer pointer between 2 and 3).
 - f. Rotate GAIN potentiometer clockwise, until unit begins to vibrate (if necessary, tap control linkage between speed control device and fuel injection pump).
 - g. Rotate GAIN potentiometer counterclockwise, until a stable condition is achieved, and unit does not begin to vibrate even if the control linkage is tapped (potentiometer pointer between 10 and 11).
 - h. Switch load on and off, and use INT and DER potentiometers to optimize control characteristics based on curves recorded with X/Y-printer.
7. Shut down Generator Set 150 kW No. 1 AND No.2 as instructed in paragraph 2.5.2.
8. Disconnect X/Y-printer from threaded pins of terminals L1, L2, L3 and N.
9. Install cover panel above socket terminals L1 to L3 and N in control cabinet as instructed in paragraph 5.24.
10. Disconnect load bank from Generator Set 150 kW.

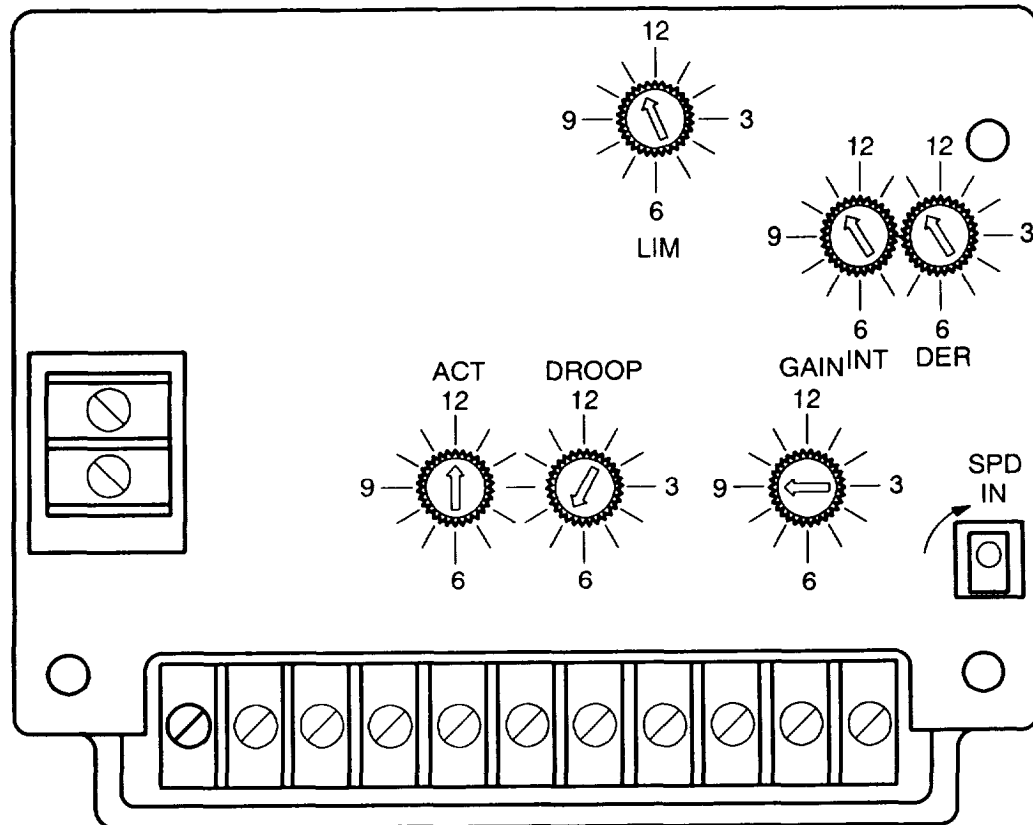


Figure 5-26 Speed Governor Assembly N1, Location of Potentiometers.

INSTALLATION

NOTE

Perform the **ADJUSTMENT** procedure when installing a new speed governor assembly N1 (34).

1. Install speed governor assembly N1 (43) with mounting plate (51) and resistors R100 to R101 (50 to 57) on standoff (48) on back panel of control cabinet (3).
2. Install two screws (45) with two serrated lock washers (46) and two washers (47).
3. Connect cables (54) for resistors R100 to R102 (55 to 57) to connection strip (53).
4. Connect resistor R10 (41) to speed governor assembly N1 (43).
5. Noting correct labeling and position, reconnect cables to terminals (44) of speed governor assembly N1 (43).
6. Swing digital isochronous load sharing module N4 (36) over speed governor assembly N1 (43).
7. Install two serrated lock washers (33) and two washers (34) and screw on two nuts (32) while holding standoffs (35).
8. Stow prop (5) and close front panel (4).
9. Close flap (2).

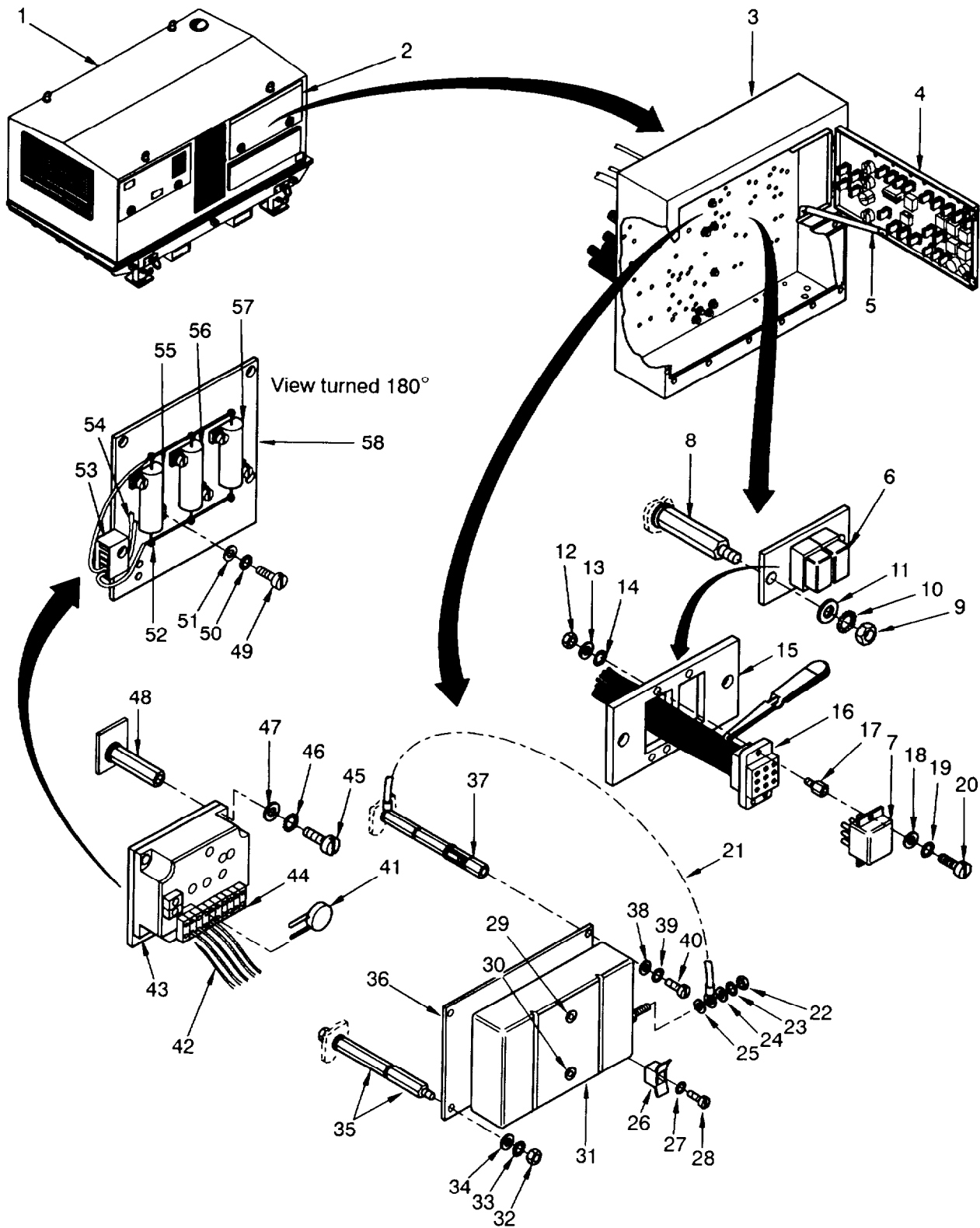


Figure 5-27 Control Cabinet Assembly, Relays K19, K20, Digital Isochronous Load Sharing Module N4, Speed Governor Assembly N1, Resistor Maintenance.

5.14 VOLTAGE REGULATOR N2 MAINTENANCE.

This task covers: a. Removal b. Repair c. Adjustment d. Installation

INITIAL SETUP**Tools**

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)
Load bank (item 19, appendix B)
XY-printer (item 16, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down
paragraph 2.5.2

Materials/Parts

Cable ties
(item 10, appendix E)

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Open flap (2, figure 5-29) on unit hood assembly (1).
2. Open front panel (4) on control cabinet assembly (3) and secure with prop (5).

CAUTION

Do not use excessive force to remove circuit boards. Note the position of circuit boards during removal for correct positioning during installation.

3. Removing circuit boards (16 to 19) from voltage regulator N2 (6):
 - a. Removing four screws (11), four serrated lock washers (12), four washers (13), two angle pieces (14), and front panel (15) from voltage regulator housing (10).
 - b. Remove circuit boards (16 to 19) from voltage regulator housing (10):

Voltage Sensing Transformer	TT1309-./03	(16)
Averaging Circuit	TT1311-./01	(17)
Linear Regulator	TT1310-./01	(18)
Equal Power Distribution	TT1315-./01	(19)

4. Remove complete voltage regulator N2 (6):
 - a. Record labeling and position of cables and remove cables from terminals (9) on voltage regulator N2 (6).
 - b. Remove two nuts (8) and remove voltage regulator N2 (6) from bolts (7). Discard nuts (8).

REPAIR

CAUTION

Perform ADJUSTMENT procedure after replacing parts.

1. If a circuit board is defective:
 - a. Remove defective circuit board (16 to 19) from voltage regulator housing (10) and insert new circuit board.
2. If transistors are defective (3 x 2N3773, mounted on housing):
 - a. Remove all circuit boards (16 to 19) from voltage regulator housing (10).
 - b. Replace voltage regulator housing (10) and reinsert circuit boards (16 to 19).

ADJUSTMENT

1. Adjust equal power distribution TT1310-./01:
 - a. Use potentiometers (figure 5-28) to adjust power distribution:

Ref.	full clockwise (maximum 18 turns), then 9 turns back
Gain	full clockwise (maximum 18 turns), then 9 turns back.
Offs.	do not adjust (factory preset).
2. Adjust linear regulator TT1310-./01 :
 - a. Connect load bank to generator set and perform procedures in paragraph 5.53.
 - b. Remove cover panel socket terminals L1 to L3 and N in control cabinet as instructed in paragraphs 5.24.
 - c. Connect X/Y-printer to threaded pins of terminals L1, L2, L3 and N.
 - d. Preset potentiometers (figure 5-28).

Gain	full counterclockwise (maximum 18 turns), then 9 turns back.
------	--
 - e. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - f. Optimize control characteristics:

Gain	while switching load OFF and ON, observe excursion printed on X/Y-printer and adjust for minimum amplitude..
------	--
 - g. Shut down Generator Set 150 kW as instructed in paragraph 2.5.2

- h. Disconnect X/Y-printer from threaded pins of terminals L1, L2, L3 and N.
- i. Install cover over socket terminals L1 to L3 and N in control cabinet as instructed in paragraph 5.24.
- j. Disconnect load bank from Generator Set 150 kW.

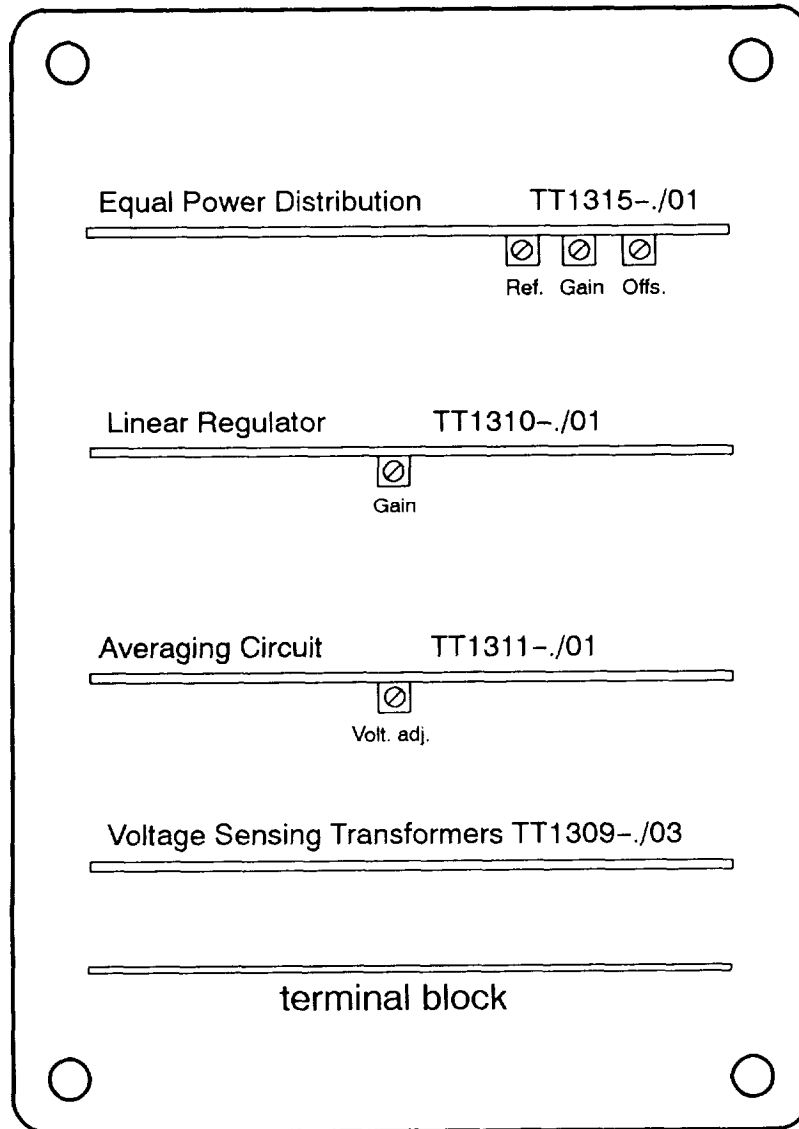


Figure 5-28 Voltage Regulator N2, Location of Circuit Boards and Potentiometers.

- 3. Adjust averaging circuit TT1311-./01:
 - a. Connect multimeter to terminals of VOLTAGE meter P6 (measurement range 300 V ~, $R_i \geq 10 \text{ M}\Omega$).
 - b. Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

- c. Set averaging:
Rotate VOLTAGE ADJUST potentiometer R3 all the way clockwise (10) and lock control knob with lever. Use Volt. adj. potentiometer to set voltage on multimeter to 230 V.
Use VOLTAGE ADJUST potentiometer R3 to set voltage on multimeter to 208 V, and lock control knob with lever.
- d. Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.
- e. Remove connectors of multimeter from terminals of VOLTAGE meter P6.

INSTALLATION

CAUTION

Note position of boards when removed to ensure correct positioning during Installation.

1. Install boards into voltage regulator N2 (6):
 - a. insert boards into voltage regulator housing (10):

Voltage Sensing Transformer	TT1309-./03	(16)
Averaging Circuit	TT1311-./01	(17)
Linear Regulator	TT1310-./01	(18)
Equal Power Distribution	TT1315-./01	(19)
 - b. Install front panel (15) and two angle pieces (14) on voltage regulator housing (10).
 - c. Install two screws (11), two serrated lock washers (12) and two washers (13) on voltage regulator housing (10).
2. Install complete voltage regulator N2 (6):

NOTE

Use new self-locking nuts (6) when installing voltage regulator N2.

- a. Place voltage regulator N2 (6) on bolts (7) and install new nuts (8). Tighten nuts (8).
 - b. Noting correct labeling and position, install cables to terminals (9) of voltage regulator N2 (6).
3. Stow prop (5) and close front panel (4).
 4. Close flap (2).

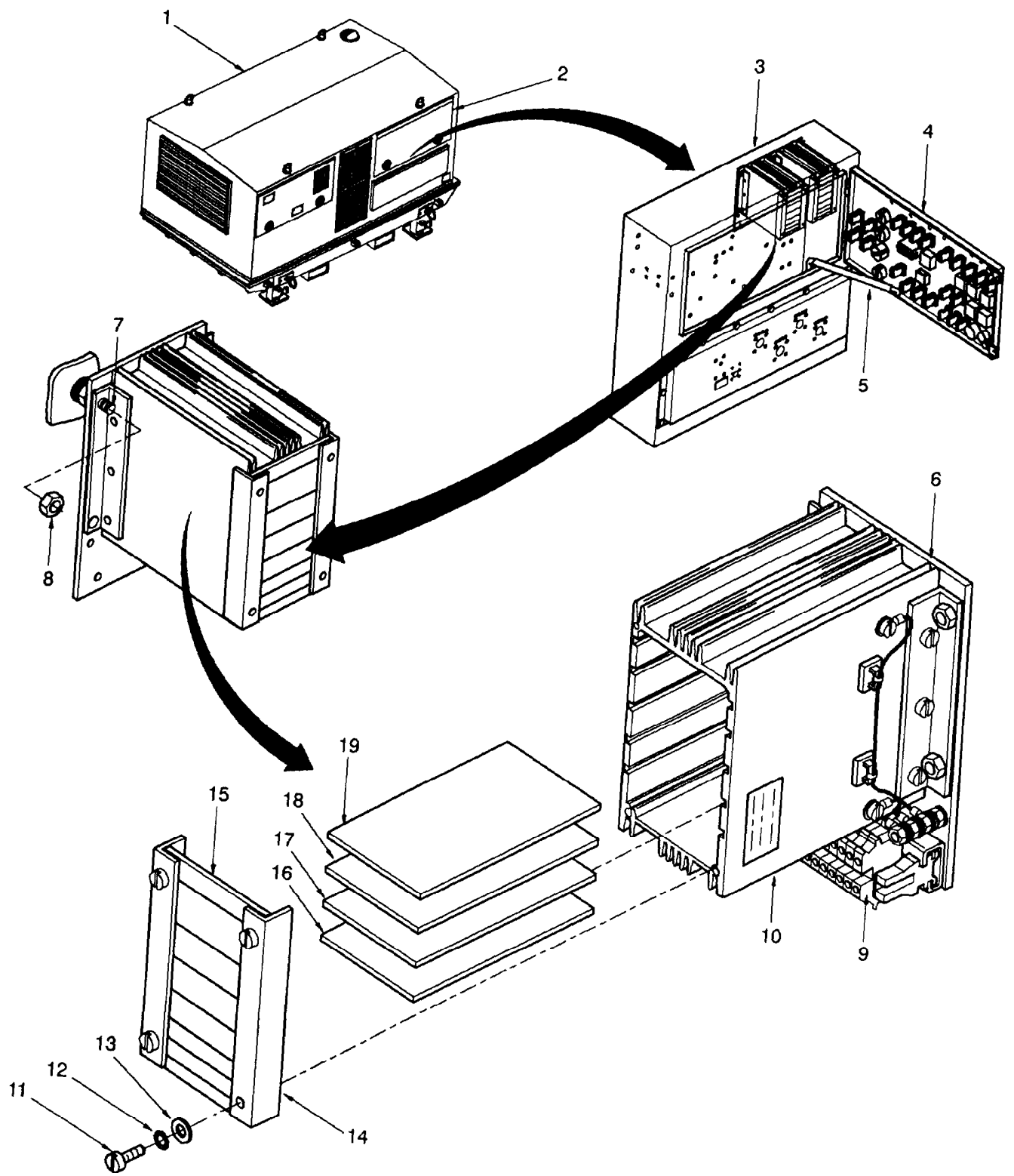


Figure 5-29 Control Cabinet Assembly Voltage Regulator N2 Maintenance.

- b. Pull circuit board (16 to 19) out of voltage regulator housing (10):

Synchronizing Relay	TT1308-.01	(16)
Voltage Sensing Transformers	TT1309-./02	(17)
Voltage/Frequency Error Detection	TT1314-./01	(18)
Overcurrent/Rev. Power Detection	TT1313-./01	(19)

4. Remove complete safety device N3 (6):
- Record labeling and position of cables and disconnect cables from terminals (9) of safety device N3 (6).
 - Remove nuts (8) and safety device N3 (6) from bolts (7). Discard nuts (8).

REPAIR

CAUTION

Perform ADJUSTMENT procedure after replacing parts.

- Remove defective circuit board (16 to 19) out of safety device housing (10) and insert new board.

ADJUSTMENT

- Adjust Overcurrent/Rev. Power Detection TT1313-./01 :
 - Connect load bank to generator set and perform procedures in paragraph 5.53.
 - Remove cover over socket terminals L1 to L3 and N in control cabinet as instructed in paragraph 5.24.
 - Connect X/Y-printer to threaded pins of terminals L1, L2, L3 and N.
 - On relay K12 (50, figure 5-19), attach a jumper between terminals 21 and 22.
 - Preset potentiometers (figure 5-30).

Imax	Rotate all the way clockwise (maximum 18 turns)
Delay I	Rotate all the way counterclockwise (maximum 18 turns)
PRmax	Rotate all the clockwise (maximum 18 turns)
Delay P	Rotate all the way counterclockwise (maximum 18 turns)
Offs.	Do not adjust (factory preset)
 - Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
Set output parameters: $P = 150 \text{ kW}$, $I_L = 520 \text{ A}$, $\cos \phi = 0.8$.
 - Adjust overload:

Increase inductive load at load bank to et current to 1.1 times rated value: $I_L = 572 \text{ A}$.

Slowly rotate imax potentiometer counterclockwise until OVERLOAD indicator H13 lights up on front panel of control cabinet.

Turn delay I potentiometer four turns clockwise.

Reduce load at load bank and push OVERLOAD illuminated pushbutton switch S10 on front

panel of control cabinet:

OVERLOAD indicator must go out.

- h. Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.
- i. On Relay K12, remove jumper between terminals 21 and 22.
- j. Start up Generator Set 150 kW as instructed in paragraph 2.5.1 and check settings.

CAUTION

Increase loads only for short periods.

- k. Check trip times:

Increase load at load bank to set current to 1.2 times rated value $I_L = 628$ A.

Trip time of load circuit must be <2.5 seconds.

Increase load at load bank to set current to 1.8 times rated value $I_L = 936$ A.

Trip time of load circuit must be <1.5 seconds.

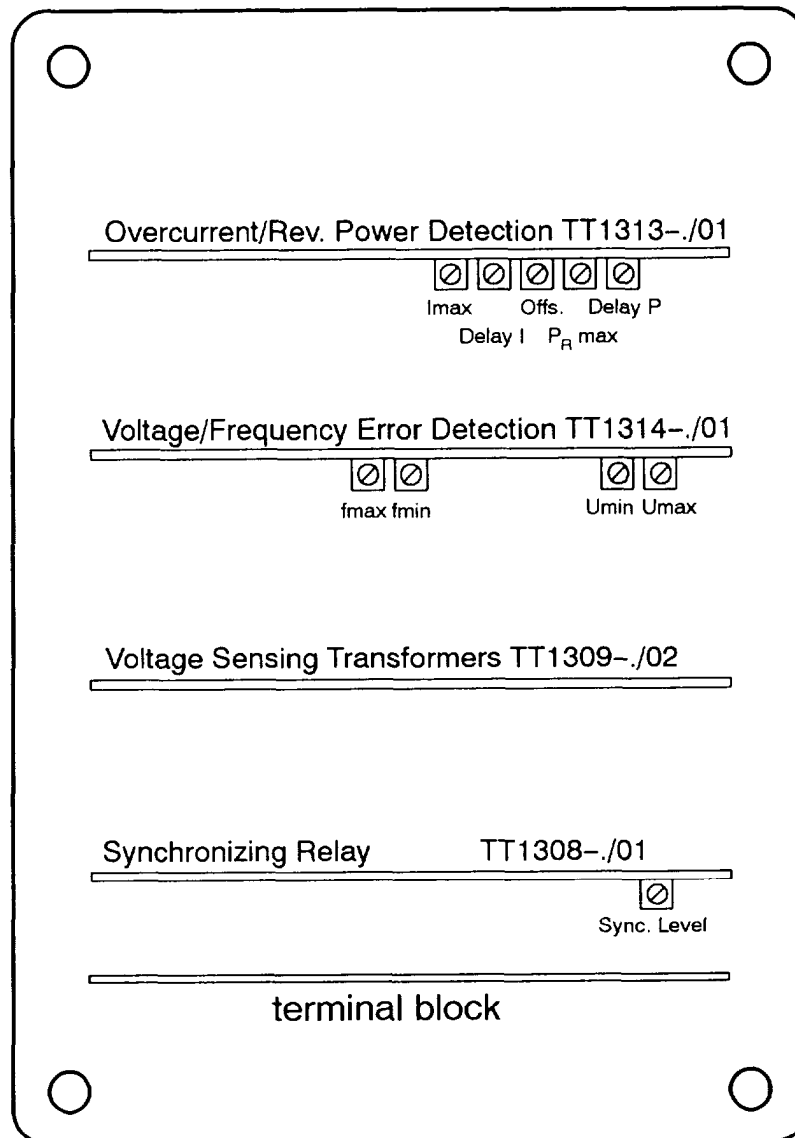


Figure 5-30 Voltage Regulator N2, Location of Circuit Boards and Potentiometers.

- l. Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.
- m. Disconnect load bank from Generator Set 150 kW.
- n. Disconnect X/Y-printer from threaded pins of terminals L1, L2, L3, and N.
- o. Install cover over socket terminals L1 to L3 and N in control cabinet as instructed in paragraph 5.24.
- p. Adjust reverse power for Generator Set 150 kW No. 1:

NOTE

To adjust reverse power for Generator Set 150 kW No. 1 and Generator Set 150 kW No. 2, the EPP III must be running, since Generator Set 150 kW No. 1 and Generator Set 150 kW No. 2 must be operating in parallel mode. See TM 9-6115-669-13&P.

- q. Start up Generator Set 150 kW No. 1 and Generator Set 150 kW No. 2 as instructed in paragraph 2.5.1 and operate in parallel mode with no load.
- On Generator Set 150 kW No. 2, turn FREQUENCY ADJUST potentiometer (R4) clockwise, until KILOWATTS meter (P4) displays 30 kW. Lock control knob with lever.
- On Generator Set 150 kW No. 1, turn P_R max potentiometer counterclockwise until REVERSE POWER ON indicator (H11) lights up. Contactor K1 de-energizes and AC CIRCUIT INTERRUPTER ON indicator goes out (H14). Press REVERSE POWER illuminated pushbutton switch (S22):
- REVERSE POWER indicator (H11) goes out.
- On Generator Set 150 kW No. 2, use FREQUENCY ADJUST potentiometer (R4) to set a frequency of 399.8 Hz or 400.2 Hz on FREQUENCY meter (P5). Lock control knob with lever. On Generator Set 150 kW No. 1, push PARALLEL OPERATION ON illuminated pushbutton switch (S9). PARALLEL OPERATION ON indicator (H12) lights up during automatic synchronization of Generator Set 150 kW No. 1 and Generator Set 150 kW No. 2.
- On Generator Set 150 kW No. 2, turn FREQUENCY ADJUST potentiometer (R4) clockwise until KILOWATTS meter (P4) displays 30 kW (adjustment point check).
- Lock control knob with lever.
- On Generator Set 150 kW No. 1, REVERSE POWER indicator (H11). Contactor K1 de-energizes and ACCIRCUIT INTERRUPTER ON indicator (H14) goes out. Press REVERSE POWER illuminated pushbutton switch (S22): REVERSE POWER indicator (H11) goes out.
- On Generator Set 150 kW No. 2, use FREQUENCY ADJUST potentiometer (R4) to set a frequency of 399.8 Hz or 400.2 Hz on FREQUENCY meter (P5).
- Lock control knob with lever.
- On Generator Set 150 kW No. 1, press PARALLEL OPERATION ON illuminated pushbutton switch (S9). PARALLEL OPERATION ON indicator (H12) lights up during automatic synchronization of Generator Set 150 kW No. 1 and Generator Set 150 kW No. 2.

- r. Adjust reverse power for Generator Set 150 kW No. 2:
 On Generator Set 150 kW No. 1, turn FREQUENCY ADJUST potentiometer (R4) clockwise until KILOWATTS meter (P4) displays 30 kW. Lock control knob with lever.
 On Generator Set 150 kW No. 2, turn P_R max potentiometer counterclockwise, until indicator REVERSE POWER ON (H11) lights up. Contactor K1 de-energizes and AC CIRCUIT INTERRUPTER indicator ON (H14) goes out.
 Press REVERSE POWER (S22) illuminated pushbutton switch:
 REVERSE POWER indicator goes out.
 On Generator Set 150 kW No. 1, use FREQUENCY ADJUST potentiometer (R4) to set a frequency of 399.8 Hz or 400.2 Hz on FREQUENCY meter (P5).
 Lock control knob with lever.
 On Generator Set 150 kW No. 2, press PARALLEL OPERATION ON illuminated pushbutton switch (S9). PARALLEL OPERATION ON indicator (H12) lights up during automatic synchronization of Generator Set 150 kW No. 1 and Generator Set 150 kW No. 2.
2. Adjust Voltage/Frequency Error Detection TT1314-./01 :
- On relay K5 (41, figure 5-19), disconnect cable from terminal 1.
 - Connect multimeter to terminals of VOLTAGE meter (P6) (measurement range $300\text{ V} \sim R_i \geq 10\text{ M}\Omega$).
 - Preset potentiometers (figure 5-30).

Umax	Turn all the way clockwise (maximum 18 turns)
Umin	Turn all the way counterclockwise (maximum 18 turns)
fmax	Turn all the way clockwise (maximum 18 turns)
fmin	Turn all the way counterclockwise (maximum 18 turns)
 - Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 - Adjust overvoltage:

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 Turn VOLTAGE ADJUST potentiometer (R3) all the way clockwise (10). Lock control knob with lever. Use Volt.adj. potentiometer (figure 5-28) to set voltage on multimeter to 240 V.
 Turn VOLTAGE ADJUST potentiometer (R3) counterclockwise to set voltage on multimeter to 239.2 V. Lock control knob with lever.
 Turn Umax potentiometer counterclockwise until UNDER/OVER VOLTAGE indicator (H9) lights up.
 Turn VOLTAGE ADJUST potentiometer (R3) five turns counterclockwise. Lock control knob with lever.
 Press UNDER/OVER VOLTAGE illuminated pushbutton switch (S5). UNDER/OVER VOLTAGE indicator (H9) goes out.
 Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.
 On relay K5, connect cable to terminal 1.
 Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 Turn VOLTAGE ADJUST potentiometer (R3) clockwise and check that UNDER/OVER VOLTAGE indicator (H9) lights up and Generator Set 150 kW shuts down.

f. Adjust undervoltage:

On relay K5 (41, figure 5-19), disconnect cable from terminal 1,
 Start up Generator Set 150 kW as instructed in paragraph 2.5.1.
 Turn VOLTAGE ADJUST potentiometer (R3) all the way counterclockwise (0). Lock control knob with lever.

Use Volt. adj. potentiometer (figure 5-28) to set voltage on multimeter to 175 V.
 Turn VOLTAGE ADJUST potentiometer (R3) five turns clockwise. Lock control knob with lever.
 Turn Umin potentiometer clockwise until UNDER/OVER VOLTAGE indicator (H9) lights up.
 Turn VOLTAGE ADJUST potentiometer (R3) five turns clockwise. Lock control knob with lever.
 Press UNDER/OVER VOLTAGE illuminated pushbutton switch (S5); UNDER/OVER VOLTAGE indicator (H9) goes out.

Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.

On relay K5, connect cable to terminal 1.

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn VOLTAGE ADJUST potentiometer (R3) counterclockwise and check that UNDER/OVER VOLTAGE indicator (H9) lights up and Generator Set 150 kW shuts down.

g. Adjust setpoint:

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn VOLTAGE ADJUST potentiometer (R3) all the way clockwise (10). Lock control knob with lever.

Use Volt. adj. potentiometer (figure 5-28) to set voltage on multimeter to 230 V.

Turn VOLTAGE ADJUST potentiometer (R3) counterclockwise and set voltage to 208 V.

Lock control knob with lever.

Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.

Disconnect connectors of multimeter from terminals of VOLTAGE meter (P6).

h. Adjust over-frequency:

On relay K5 (34, figure 5-19), disconnect cable from terminal 1.

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn FREQUENCY ADJUST potentiometer (R4) all the way clockwise (10). Lock control knob with lever. Use SPD IN potentiometer of speed governor assembly N1 (figure 5-28) to set a frequency of 435 Hz on

FREQUENCY meter (P5).

Use FREQUENCY ADJUST potentiometer (R4) to set a frequency of 430 Hz on FREQUENCY meter (P5).

Lock control knob with lever.

Turn fmax potentiometer (figure 5-30) counterclockwise until UNDER/OVER FREQUENCY (H8) indicator lights up.

Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.

On relay K5, disconnect cable from terminal 1.

Turn FREQUENCY ADJUST potentiometer (R4) five turns counterclockwise. Lock control knob with lever.

i. Press UNDER/OVER FREQUENCY illuminated pushbutton switch (S4); UNDER/OVER FREQUENCY indicator (H8) goes out.

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn FREQUENCY ADJUST potentiometer (R3) counterclockwise and press UNDER/OVER VOLTAGE

illuminated pushbutton switch (S4): UNDER/OVER VOLTAGE indicator (H8) goes out.

j. Adjust underfrequency:

On relay K5 (41, figure 5-19), disconnect cable from terminal 1.

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn FREQUENCY ADJUST potentiometer (R4) all the way counterclockwise (0). Lock control knob with lever.

Use SPD IN potentiometer of speed governor assembly N1 (figure 5-28) to set a frequency of 365 Hz on

FREQUENCY meter (P5).

Use FREQUENCY ADJUST potentiometer (R4) to set a frequency of 370 Hz on FREQUENCY meter (P5).

Lock control knob with lever.

Turn fmin potentiometer clockwise until UNDER/OVER FREQUENCY indicator (H8) lights up.

Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.

On relay K5, connect cable to terminal 1.

Turn FREQUENCY ADJUST potentiometer (R4) five turns clockwise. Lock control knob with lever.

Press UNDER/OVER FREQUENCY illuminated pushbutton switch (S4): UNDER/OVER FREQUENCY indicator (S4) goes out.

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn FREQUENCY ADJUST potentiometer (R4) counterclockwise and check that UNDER/OVER FREQUENCY (H8) indicator lights up and Generator Set 150 kW shuts down.

Turn FREQUENCY ADJUST potentiometer (R4) clockwise and press UNDER/OVER FREQUENCY illuminated pushbutton switch (H8): UNDER/OVER FREQUENCY indicator (H8) goes out.

k. Adjust setpoint:

Start up Generator Set 150 kW as instructed in paragraph 2.5.1.

Turn FREQUENCY ADJUST potentiometer (R4) all the way clockwise (10). Lock control knob with lever.

Use SPD IN potentiometer of speed governor assembly N1 (figure 5-28) to set a frequency of 416 Hz on FREQUENCY meter (P5).

Use FREQUENCY ADJUST potentiometer (R3) to set a frequency of 400 Hz on FREQUENCY meter (P5).

Lock control knob with lever.

Shut down Generator Set 150 kW as instructed in paragraph 2.5.2.

INSTALLATION

CAUTION

Do not use excessive force when installing circuit boards. Note correct position of circuit boards during removal to ensure correct positioning during installation.

1. Install circuit boards in voltage regulator N2 (6):

a. Insert circuit boards into voltage regulator housing (10):

Synchronizing Relay	TT1308-./01	(16)
Voltage Sensing Transformers	TT1309-./02	(17)
Voltage/Frequency Error Detection	TT1314-./01	(18)
Overcurrent/Rev. Power Detection	TT1313-./01	(19)

b. Install front panel (15) and two angle pieces (14) on voltage regulator housing (10).

c. Install four screws (11), four serrated lock washers (12), and four washers (13) on voltage regulator housing (10).

2. Install complete safety device N3 (6):

NOTE

Use new self-locking nuts when installing safety device N3.

a. Install safety device N3 (6) on bolts (7) using new nuts (8).

b. Noting correct labeling and position, install cables on terminals (9).

3. Stow prop (5) and close front panel (4).

4. Close flap (2).

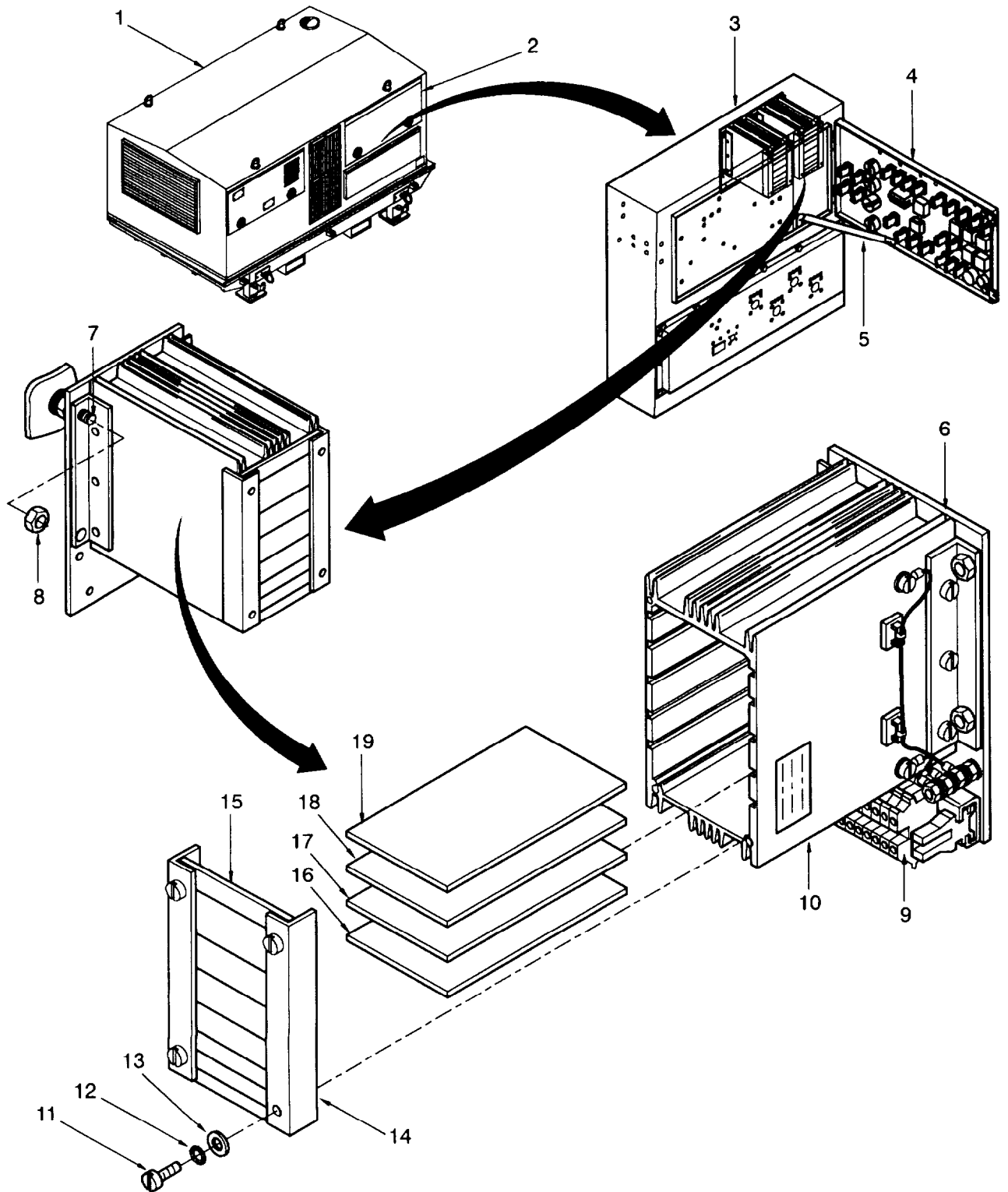


Figure 5-31 Control Cabinet Assembly, Safety Device N3 Maintenance.

INSTALLATION

1. Install filter box FK (16) on back panel of power distribution unit (3) and secure using four screws (19) four serrated lock washers (20) and washers (21).
2. Noting correct labeling and position, install cables (17) to input connection strip (15) of filter box FK (16).
3. Noting correct labeling and position, install cables (18) to output connection strip (14) of filter box FK (16).
4. Install cover (13) on filter box FK (16) and secure with eight screws (10), eight serrated lock washers (11) and eight washers (12).
5. Close control cabinet connector panel (9) and remove wooden props.
6. Secure with eighteen screws (6), eighteen serrated lock washers (7) and eighteen washers (8).
7. Stow prop (5) and close front panel (4).
8. Close flap (2).

- a. Remove screw (42), serrated lock washer (43), washer (44) and cables (45) from bus bar (46).
 - b. Record labeling and position of cables (29) to current transformer T12 (36) and remove cable ties.
 - c. Loosen two screws (25), two serrated lock washers (26), two cable clamps (27), and remove cables (29) from current transformer T12 (36).
 - d. Remove screw (22), serrated lock washer (23) and washer (24).
 - e. Remove screw (33), serrated lock washer (34) and washer (35).
 - f. Pull current transformer T12 (36) with resistor R13 (38) downward from bus bar (46).
6. Remove resistor R13 (38):

NOTE

Removal procedure for resistor R5 (51), R6 (53), R7 (56) and R12 (48), R14 (50), R15 (56) is the same as for resistor R13 (38), described below.

- a. Remove current transformer T12 (36) with resistor R13 (38) as instructed in step 5.
- b. Remove two nuts (40), two serrated lock washers (39), and plate with resistor R13 (38).
- c. Remove two nuts (37), two screws (32), and two serrated lock washers (31) from current transformer T12 (36).

INSTALLATION

1. Install resistor R13 (38):
 - a. When replacing current transformer T12 (36), install two screws (32), two serrated lock washers (31) on current transformer T12 (36) and screw on nut (37).

NOTE

Installation procedure for resistor R5 (51), R6 (53), R7 (56) and R12 (46), R14 (50), R15 (56) is the same as for resistor R13 (38), described below.

- b. Install resistor R13 (38) with plate on current transformer T12 (36).
 - c. Install two serrated lock washers (39) and screw on two nuts (40).
 - d. Install cables (28, 30) to current transformer T12 (36), using two screws (25), two serrated lock washers (26), and two cable clamps (27).
2. Install current transformer T12 (36):

NOTE

- Installation procedure for current transformer T5 (52), T6 (54), T7 (55), T8 (61), T9 (62), T10 (63), T11 (47) and T13 (50) is the same as for current transformer T12 (36), described below.
 - When installing current transformer T1 (57), T2 (64), T3 (65), T4 (66), also install Insulator strip (60) and secure with three plastic screws (59).
- a. Install current transformer T12 (36) with resistor R13 (38) on bus bar (46) from below.
 - b. Install screw (33), serrated lock washer (34) and washer (35).
 - c. Install screw (22), serrated lock washer (23) and washer (24).
 - d. Noting correct labeling and position install cables (29) to current transformer T12 (36), tighten two screws (25), and secure with cable ties.
 - e. Install cables (45) on bus bar (46) and secure with screw (42), serrated lock washer (43), and washer (44).
3. Close control cabinet connector panel (9) and remove props.
 4. Install eighteen screws (6), eighteen serrated lock washers (7), and eighteen washers (8) securing control cabinet connector panel (9) on control cabinet assembly (3).
 5. Stow prop (5) and close front panel (4).
 6. Close flap (2).
 7. Connect load bank to generator set and perform procedures in paragraph 5.53.

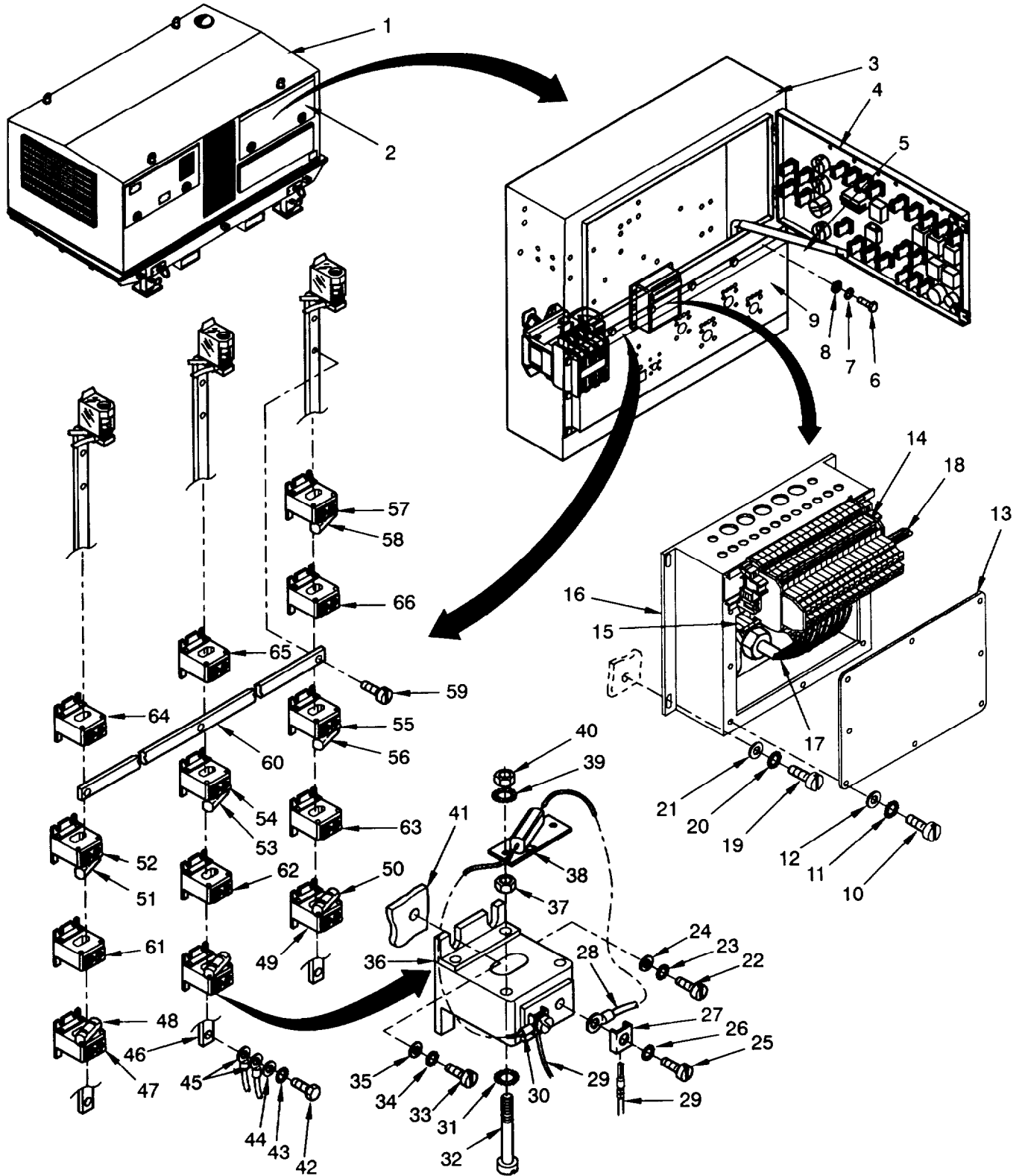


Figure 5-32 Control Cabinet Assembly, Filter Box FK, Current Transformers, Resistors Maintenance.

4. Diode V103 (38), V104 (39):

NOTE

Removal procedure for diode V104 is the same as for diode V103, described below.

- a. Open cable conduit (40).
- b. Record labeling and position of diode V103 (38) on terminal strip X101 (37) and disconnect diode V103 (38).
- c. Expose cable end terminal of diode V103 (38) and remove insulation at connection point with cable.
- d. Unsolder diode V103 (38) from cable using solder gun.

INSTALLATION

1. Diode V101 (9), V102 (10), V105 (11), V106 (12):

NOTE

Installation procedure for diode V102, V105, V106 is the same as for diode V101, described below.

- a. Slide heat shrink tubing over cable end and solder diode V101 (9) to cable using solder gun.
- b. Slide heat shrink tubing over solder joint and shrink on using heating gun.
- c. Noting correct labeling and position, install cables and diode V101 (9) to top terminal (13) of auxiliary contactors K109 (14),
- d. Place cable with diode V101 (9) in correct position and close cable conduit (40).

2. Diodes V103 (38), V104 (39):

NOTE

Installation procedure for diode V104 is the same as for diode V103, described below.

- a. Slide heat shrink tubing over cable end and solder diode V103 (38) to cable using solder gun.
 - b. Slide heat shrink tubing over solder joint and shrink on using heating gun.
 - c. Noting correct labeling and position, install cables and diode V103 (38) to terminal of terminal strip X101 (37).
 - d. Place cable with diode V103 (38) in correct position and close cable conduit (40).
3. Stow prop (5) and close front panel (4).
 4. Close flap (2).

TESTING

1. Time relay K106 (27):
 - a. Start up engine preheating assembly as instructed in paragraph 2.5.1.
 - b. Check that switching cycle proceeds as follows:
 - Amber PULS LED goes on when supply voltage is applied.
 - Red PAUSE LED goes on at 60 seconds.
 - Red PAUSE LED lights up at 150 seconds.
 - Amber PULS LED lights up at 180 seconds.
 - Amber PULS LED or red PAUSE LED lights up at 840 seconds.
 - c. Shut down Generator Set 150 kW, paragraph 2.5.2.
2. Time relay K107 (6):
 - a. Start up engine preheating assembly as instructed in paragraph 2.5.1.
 - b. Check that switching cycle proceeds as follows:
 - Green LED activates when supply voltage is applied.
 - Green LED lights up at 60 seconds.
 - Green LED lights up at 150 seconds.
 - Green LED lights up at 180 seconds.
 - Green LED lights up at 840 seconds.
 - c. Shut down Generator Set 150 kW, paragraph 2.5.2.
3. Time relay K108 (7):
 - a. Start up engine preheating assembly as instructed in paragraph 2.5.1.
 - b. Check that switching cycle proceeds as follows:
 - Green LED lights up at 60 seconds.
 - Green LED lights up at 150 seconds.
 - Green LED lights up at 180 seconds.
 - Green LED and amber LED go on at 180 seconds.
 - c. Shut down Generator Set 150 kW, paragraph 2.5.2.
4. Time relay K110 (20):
 - a. Start up engine preheating assembly as instructed in paragraph 2.5.1.
 - b. Check that switching cycle proceeds as follows:
 - Green LED activates when supply voltage is applied.
 - Green LED lights up after 60 seconds.
 - Green LED lights up after 150 seconds.
 - Green LED and amber LED light up at 180 seconds.
 - Green LED and amber LED light up at 840 seconds.
 - c. Shut down Generator Set 150 kW, paragraph 2.5.2.

ADJUSTMENT

1. Set time relay K106 (27) to switching time time 1 = 108 seconds and time 2 = 60 seconds:

a. Set switching time time1:

On front of time relay K 106 (27), use TIME DIP switches (1) to set a time window of 3 minutes as shown in figure 5-33.

On front of time relay K 106 (27), use rotary knob (3) to set a multiplication factor of .6.

b. Set switching time time 2:

On front of time relay K 106 (27), use TIME DIP switches (4) to set a time window of 1 minutes as shown in figure 5-33.

On front of time relay K 106 (27), use rotary knob (6) to set a multiplication factor of 1.

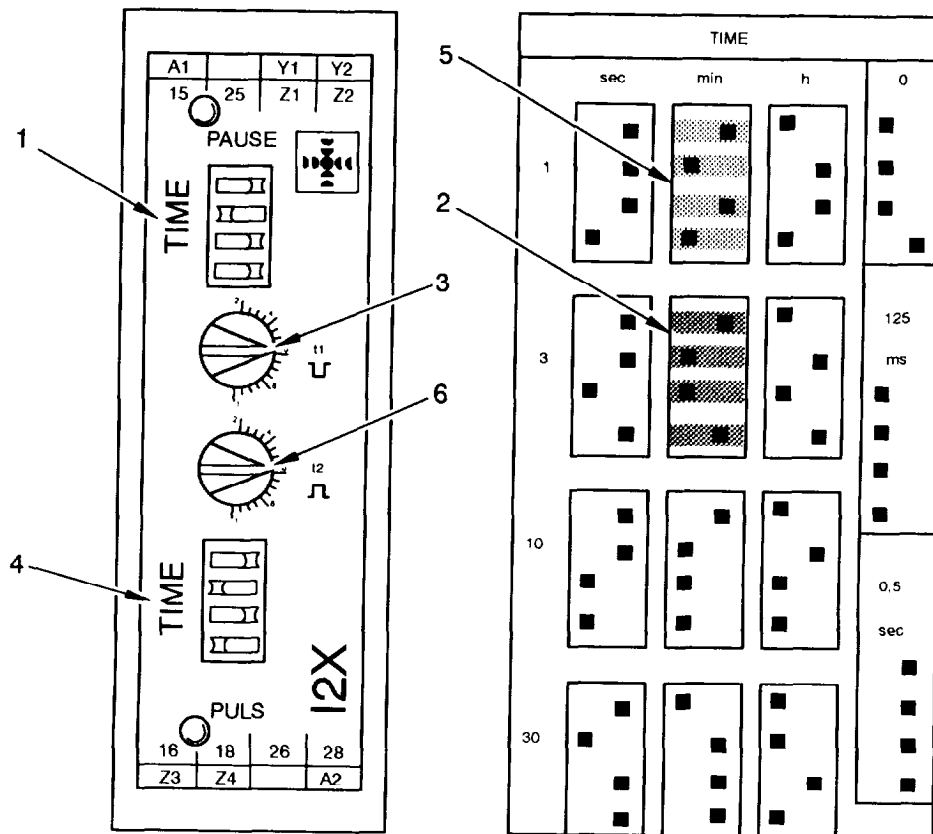


Figure 5-33 Time Relay K106

2. Set time relay K107 (6) to switching time time1 = 108 seconds and time 2 = 60 seconds:
 - a. Set switching time time1:

On front of time relay K 107 (6), use TIME DIP switches (1) to set a time window of 3 minutes as shown in figure 5-34.

On front of time relay K 107 (6), use rotary knob (3) to set a multiplication factor of .6.
 - b. Set switching time time2:

On front of time relay K 107 (6), use TIME DIP switches (1) to set a time window of 1 minutes as shown in figure 5-34.

On front of time relay K 107 (6), use rotary knob (3) to set a multiplication factor of 1.

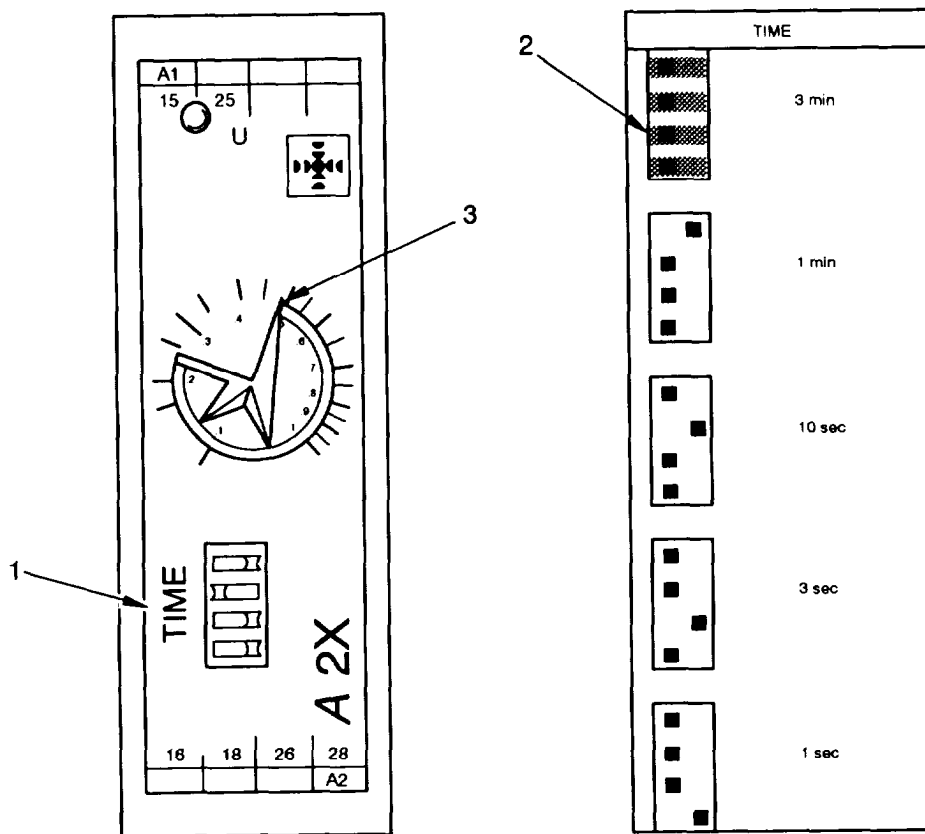


Figure 5-34 Time Relay K107

3. Set time relay K108 (7) to switching time on 700 seconds:
 - a. On front of time relay K 108 (7), set FUNCTION DIP switches (1) as shown in figure 5-35.
 - b. On front of time relay K 108 (7), use TIME DIP switches (3) to set a time window of 30 minutes as shown in Figure 5-35.
 - c. On front of time relay K 108 (7), use rotary knob (5) to set a multiplication factor of .4.

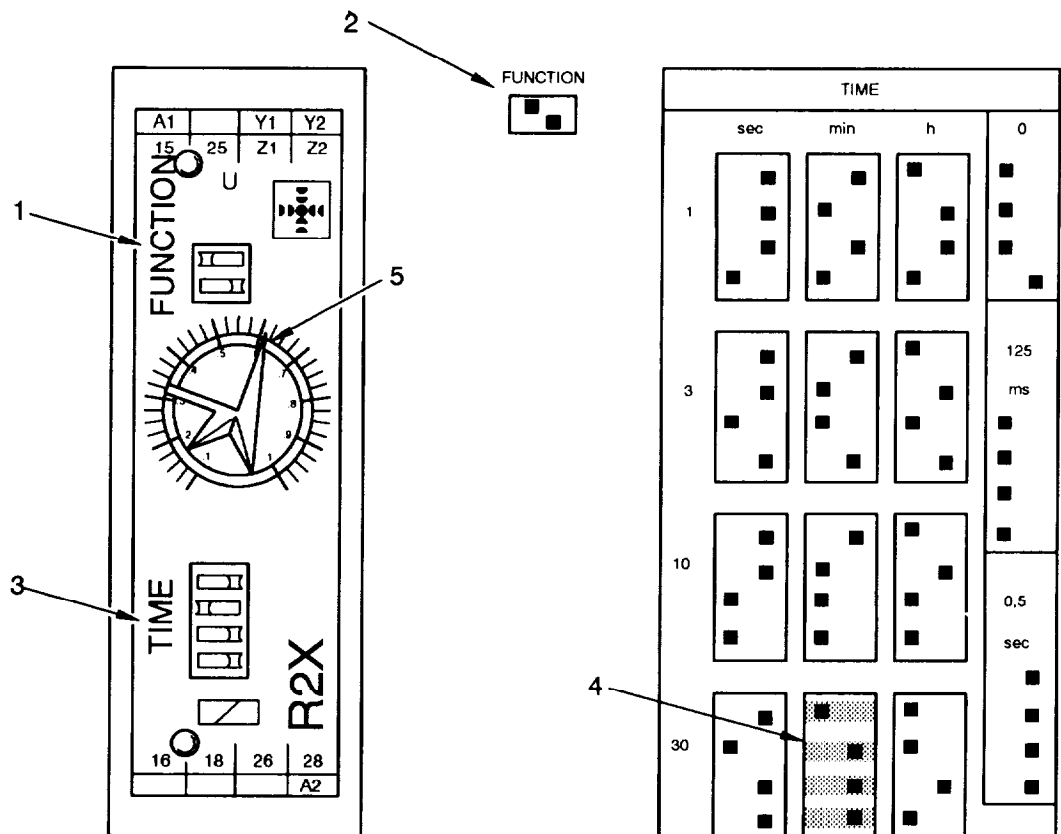


Figure 5-35 Time Relay K108

4. Set time relay K110 (20) to switching time of 180 seconds:
 - a. On front of time relay K 110 (20), use TIME DIP switches (1) to set a time window of 3 minutes as shown in figure 5-36.
 - b. On front of time relay K 110 (20), use rotary knob (3) to set a multiplication factor of 1.

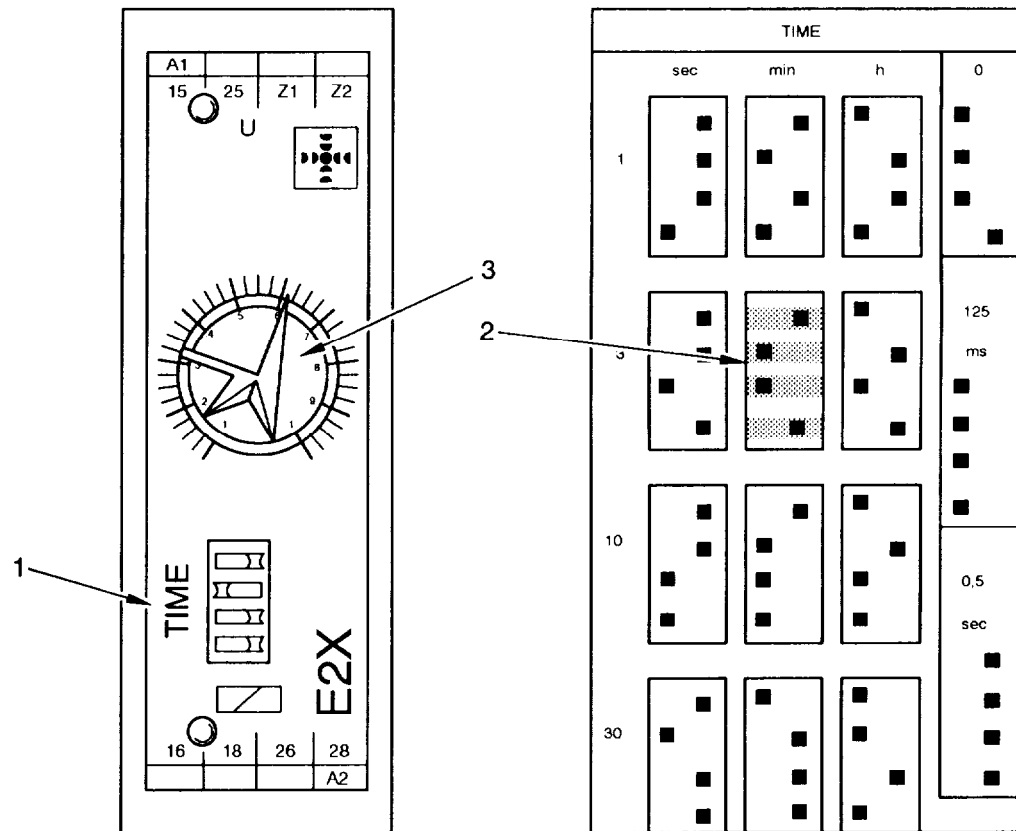


Figure 5-36 Time Relay K110

INSTALLATION

NOTE

Installation procedure for all relays is the same as for time relay K106, described below.

1. Insert time relay K106 (27) into top of mounting bar (41) and push in at the bottom.
2. Noting correct labeling and position, install cables (31, 34) to lower terminals (32, 35) and tighten screws (33, 36).
3. Noting correct labeling and position. Install cables (23, 25) to upper terminals (22, 26) and tighten screws (21, 24).
4. Stow prop (5) and close front panel (4).
5. Close flap (2).

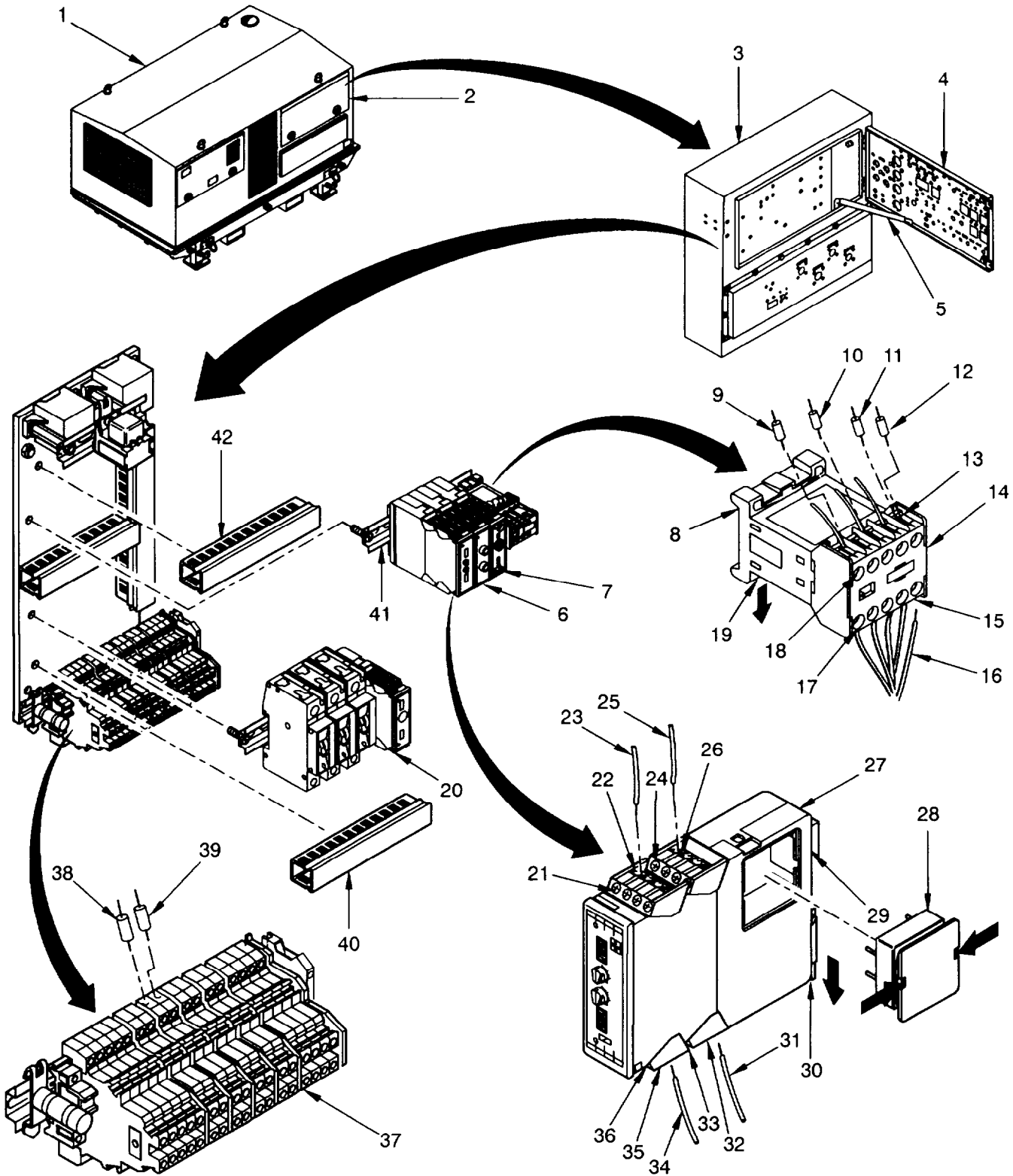


Figure 5-37 Control Cabinet Assembly, Engine Preheating Control Board, Auxiliary Contactor K109, Diodes, Time Relay Maintenance.

INSTALLATION

NOTE

- **Installation procedure for miniature relay K103 (6), K104 (7), K111 (9) is the same as for miniature relay K105 (8), described below.**
- **Before inserting flat connector (16) with cable (17) into relay socket (12), bend backsnap-in hooks (18).**

1. Install cable (17) with flat connector (16) in relay socket (12):
 - a. Noting correct labeling and position of cables to relay socket (12), insert cables (17) with flat connectors (16) from below into relay sockets (12) until they stop.
 - b. Pull on cable (17) to check that snap-in hook (18) has snapped into relay socket (12).
2. Install relay socket (12) of miniature relay K105 (8):
 - a. Insert relay socket (12) into mounting grooves of adjacent relay sockets and push downward.
 - b. Push the four relay sockets (12) toward mounting bar (11).
 - c. Install screws (15), serrated lock washers (14), and washers (13) into clips (10) on mounting bar (11).
3. Install miniature relay K105 (8):
 - a. Insert miniature relay K105 (8) into relay sockets (12) and push in all the way.
4. Stow prop (5) and close front panel (4).
5. Close flap (2).

INSTALLATION

NOTE

Installation procedure for power relay K102 is the same as for power relay K101, described below.

1. Noting correct labeling and position, install cables (34) to terminals (33) on miniature relay K101 (31).
2. Place power relay (31) onto threaded pin (35) on mounting plate (19).
3. Install washer (30), serrated lock washer (29), and nut (28) on threaded pin (35).
4. Install washer (27), serrated lock washer (26) on threaded pin (35) and screw on spacer (25).
5. Install washer (24), mounting bar (23), washer (22), serrated lock washer (21), and nut (20). Tighten nut 20.
6. Tighten nuts (28) and spacer (25) on threaded pin with torque wrench to the torque value referenced in appendix G.
7. Position the four relay sockets (12) in place.
8. Install screws (15), serrated lock washers (14), and washers (13) into clip (10).
9. Insert miniature relays K103 (6), K104 (7), K105 (8) and K111 (9) into the four relay sockets (12).
10. Stow prop (5) and close front panel (4).
11. Close flap (2).

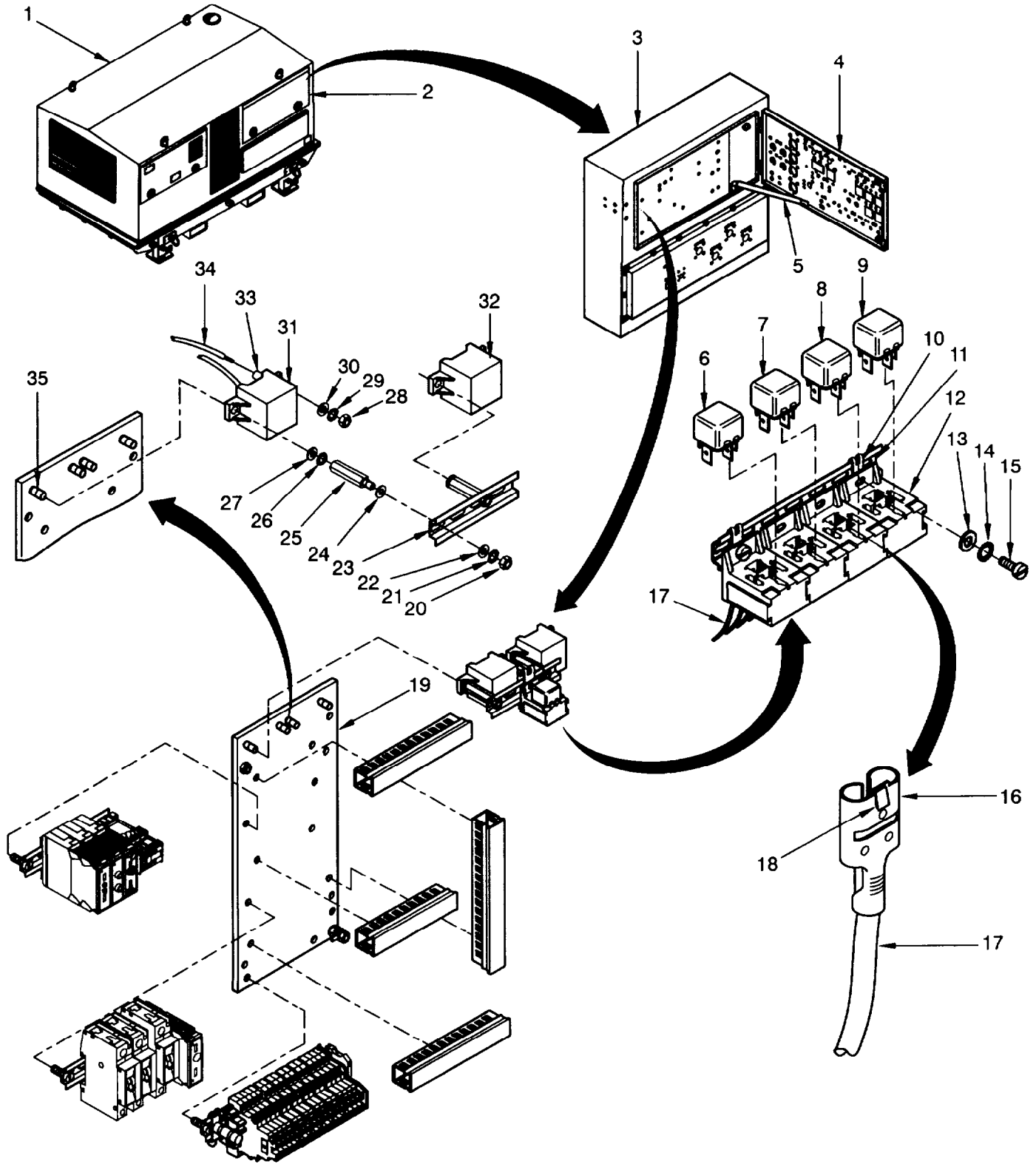


Figure 5-38 Miniature Relay, Power Relay Maintenance.

- d. Remove screw (33), serrated lock washer (36) and spacers (37).
 - e. Remove two nuts (23), two serrated lock washers (24) and two washers (25).
 - f. Remove two screws (26), angle piece (32) and interlock switch S12 (17).
 - g. Use socket wrench (shop manufactured) to remove threaded ring (35) from threaded part on connector receptacle L1 (16), holding nut (44 or 45) with a suitable wrench.
 - h. Remove connector receptacle L1 (16).
6. Remove connector receptacles L2 (14) and N (10):
- a. Perform steps 5a. through h.

INSTALLATION

1. Install connector receptacles L1 (16) and L3 (12):

NOTE

Installation procedure for connector receptacle L3 (12) is the same as for connector L1 (16), described below.

- a. Insert connector receptacle L1 (16) into control cabinet connection panel (9) from the front.

NOTE

Apply four drops of Loctite 243 to threaded ring before threading onto the back.

- b. Install threaded ring (35) on threaded part (34) of connector receptacle L1 and tighten with socket wrench, holding nut (44 or 45).
 - c. Place washer (43), cable (42), washer (41), serrated lock washer (39) on threaded terminal (38).
 - d. Install nut (39) on threaded terminal (38), holding nut (44 or 45) with a suitable wrench.
 - e. Install screw (33) on control cabinet connection panel (9) and serrated lock washer (36).
 - f. Install spacers (37) onto screw (33).
 - g. Insert two screws (26) on control cabinet connection panel (9) and install angle piece (32) with interlock switch S12 (17).
 - h. Install two washers (25), two serrated lock washers (24), and two nuts (23) on two screws (26) and tighten two nuts (23).
 - i. Place cover (46) on spacers (37) and screw on two nuts (47).
2. Install connector receptacles L2 (14) and N (10):
- a. Perform steps 1 a. through i.
3. Close control cabinet connection panel (9) and remove props.
4. Install eighteen screws (6), eighteen serrated lock washers (7) and eighteen washers (98) on control cabinet assembly(3).
5. Stow prop (5) and close front panel (4).
6. To install unit hood assembly (1) refer to paragraph 4.14.

INSTALLATION**NOTE**

Installation procedure for Interlock switch S13 (15), S14 (13) and S15 (11) is the same as for Interlock switch S12 (17), described below.

1. Install angle piece (32) on control cabinet connection panel (9) using screws (26).
2. Install two washers (25), two serrated lock washers (24), and two nuts (23) on two screws (26).
3. Install cable (20), screws (18), and washers (19) on interlock switch S12 (17).
4. Install angle piece:
 - a. Install angle piece (32) on interlock switch (17).
 - b. Install two screws (21) and two serrated lock washers (22) on angle piece (32).
 - c. Insert screws (26) into control cabinet connection panel (9) and install angle piece (32).
 - d. Install designation plate (30) on outside of control cabinet connection panel (9) using two screws (31).
 - e. Install two washers (29), two serrated lock washers (28), and two nuts (27) on two screws (31) and tighten two nuts (27).
5. Install cover (46) on spacers (37) and secure using two nuts (47).
6. Stow prop (5) and close front panel (4).
7. To install unit hood assembly (1) refer to paragraph 4.14.
8. Connect load bank to generator set and perform procedures in paragraph 5.53. ■

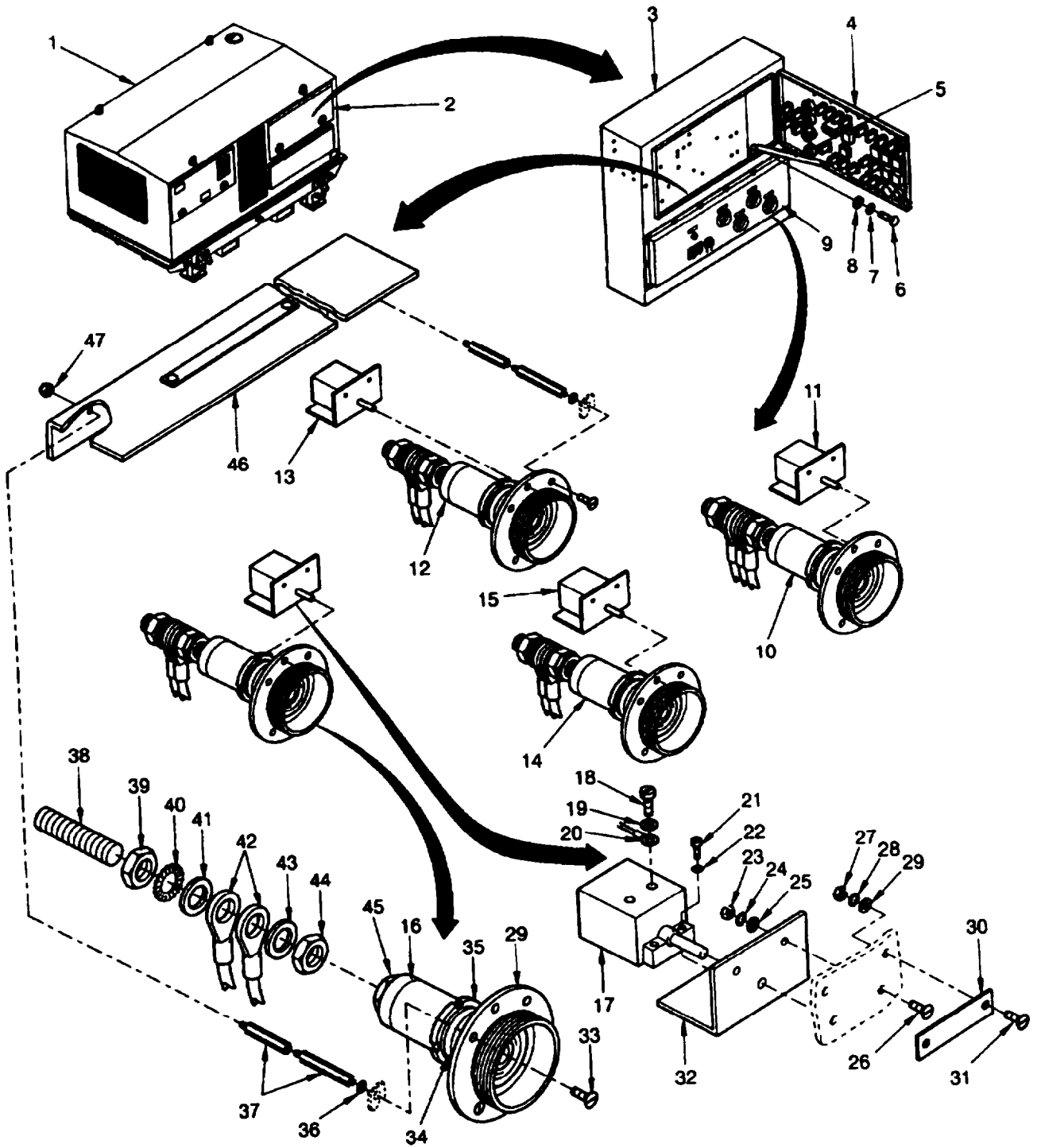


Figure 5-39 Control Cabinet Assembly, Connection Panel, Connector Receptacle L1 to L3 and N, Interlock Switch Maintenance.

INSTALLATION

CAUTION

After working on J3 slave receptacle 24 V connector, reconnect the positive terminal first and then the negative terminal of battery set (refer to paragraph 4.90).

1. Install washer (26), negative cable (21), washer (25), serrated lock washer (24), and nut (23), on threaded pin (22) and tighten nut (23).
2. Pull positive cable (8) through bottom plate of base frame (4) and connect positive cable (8) to starter (refer to paragraph 4.90).
3. Insert J3 slave receptacle 24 V connector (12), with cap (15) and mount (16), into base frame (4) from the rear.
4. Insert four screws (14) with four washers (13) in connector (12).
5. Install four washers (11), four serrated lock washers (10), and four nuts (9) on four screws (14).
6. Slide heat-shrink tubing (20) over negative cable (21) and positive cable (8).
7. Install negative cable (21) on J3 slave receptacle 24 V connector (12), with screw (17), serrated lock washer (18) and washer (19). Tighten screw (17).
8. Install positive cable (8) on J3 slave receptacle 24 V connector (12), with screw (5), serrated lock washer (6), and washer (7). Tighten screw (5).
9. Slide heat shrink tubing (20) over terminals of positive cable (8) and negative cable (21) and over J3 slave receptacle 24 V connector (12).
10. Shrink heat shrink tubing (20) using heating gun.
11. Close flap (2).

15. Loosen clamp (63) and remove rubber hose (65) off elbow (62).
16. Loosen clamp (60) and remove elbow (62) out of rubber hose (61).
17. Loosen clamp (59) and remove rubber hose (61) off pipe (58).
18. Loosen clamp (57) and remove pipe (58) out of rubber hose (56).
19. Loosen clamp (55) and remove rubber hose (56) off turbocharger inlet.

INSTALLATION

NOTE

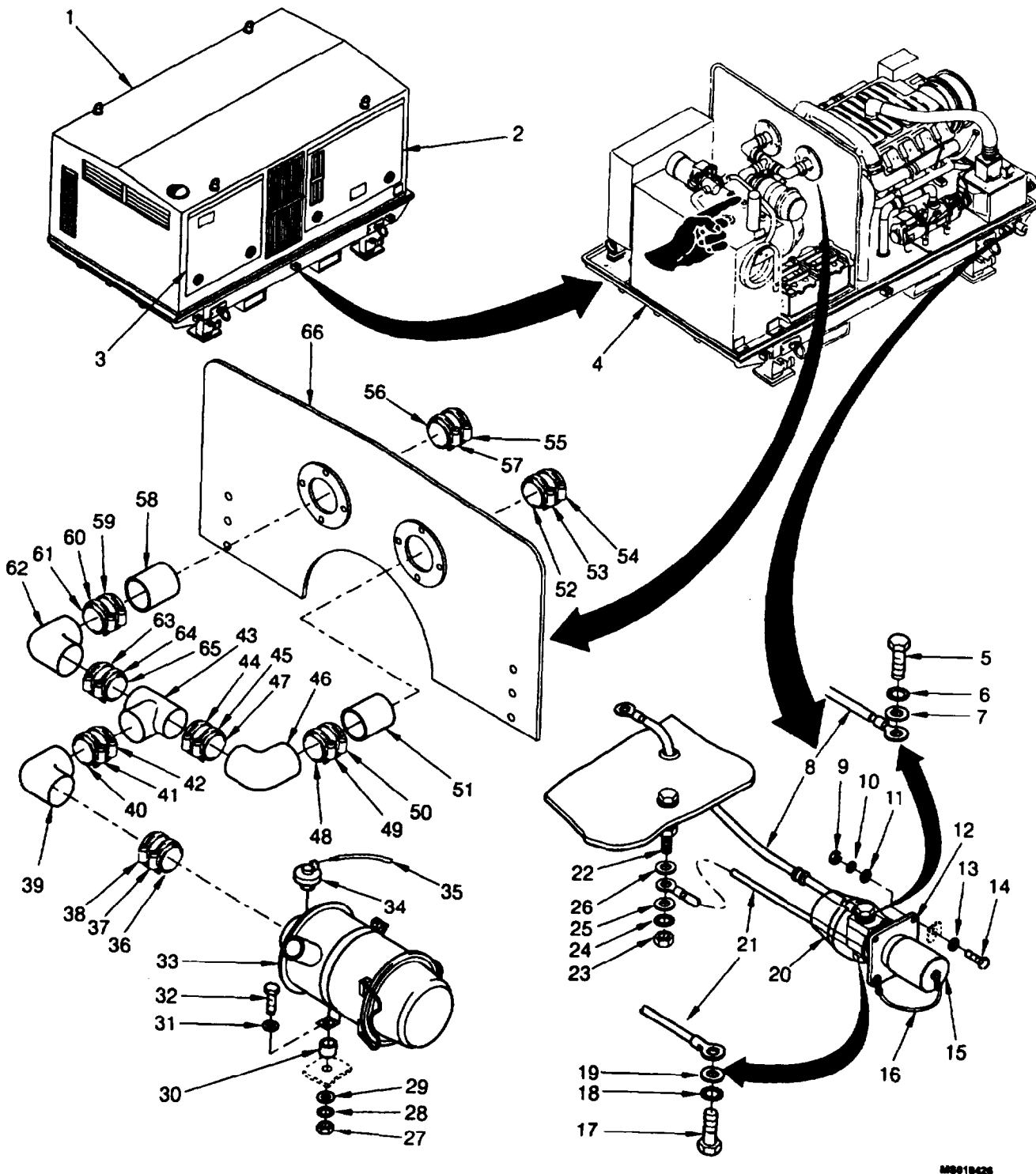
Before sliding rubber hoses onto pipes, elbows and T-junction, coat insides with lubricant.

1. Install rubber hose (56) and clamps (55, 57) on turbocharger inlet and tighten clamp (55).
2. Install pipe (58) into rubber hose (56) and tighten clamp (57).
3. Install rubber hose (61) and clamps (59, 61) on pipe (58) and tighten clamp (59).
4. Install elbow (58) into rubber hose (61) and tighten clamp (60).
5. Install rubber hose (65) and clamps (63, 64) on elbow (62) and tighten clamp (63). Do not tighten clamp (64).
6. Install T-junction (43) into rubber hose (40); do not tighten clamp (41).
7. Install rubber hose (52) and clamps (53, 54) on turbocharger inlet and tighten clamp (54).
8. Install pipe (51) into rubber hose (52) and tighten clamp (53).
9. Install rubber hose (48) on pipe (51) and tighten clamp (50).
10. Install elbow (46) into rubber hose (48) and tighten clamp (49).
11. Install rubber hose (47) on elbow (46) and tighten clamp (45).
12. Install rubber hose (47) and clamps (45, 44) on T-junction (43); do not tighten clamp (44).
13. Install rubber hose (40) and clamps (41, 42) on T-junction (43) and tighten clamp (42).
14. Install elbow (39) into rubber hose (40) and tighten clamp (41).
15. Install rubber hose (36) and clamps (37, 38) on elbow (39) and tighten clamp (38).
16. Install connector piece of air filter housing (33) on rubber hose (36) and place on (33); tighten clamp (37).
17. Install two screws (32), two washers (31), and two spacers (30), two washers (29), two serrated lock washers (28) and two nuts (27).

CAUTION

Align air filter housing and piping so that elbow (39) does not contact generator lifting eye.

18. Tighten clamps (64, 44).
19. Install plug connector 2J6 with cable (35) on service switch (34).
20. Install unit hood assembly (1) as instructed in paragraph 4.14.



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Figure 5-40 Air filter Assembly, J30 slave receptacle 24 V Connector Maintenance.

INSTALLATION**NOTE**

If hollow screws (9,15,23, and 27) and screw (10) were installed to prevent contamination, remove prior to beginning installation procedure. If plastic bags were installed on oil lines, remove prior to beginning installation procedure.

1. Install screw (10) with new seal (11) in subcurrent filter (5).
2. Install hollow screw (9) with new seals (8,6) and oil line (7) on subcurrent filter (5).
3. Install hollow screw (27), new seals (25,26) and oil line (7) in adapter (24)
4. Install hollow screw (15) with new seals (12, 14) and oil line (13) on subcurrent filter (5).
5. Install hollow screw (23) with new seals (22, 21) and oil line (13) in adapter (20).
6. Install screws (3), washers (4), and subcurrent filter (5) on bracket (16).
7. Install nuts (19) serrated lock washers (18), and washers (17) on screws (3) and tighten.
8. Install new cable ties, bundle cable ties (28, 29).
9. Close flap (2).

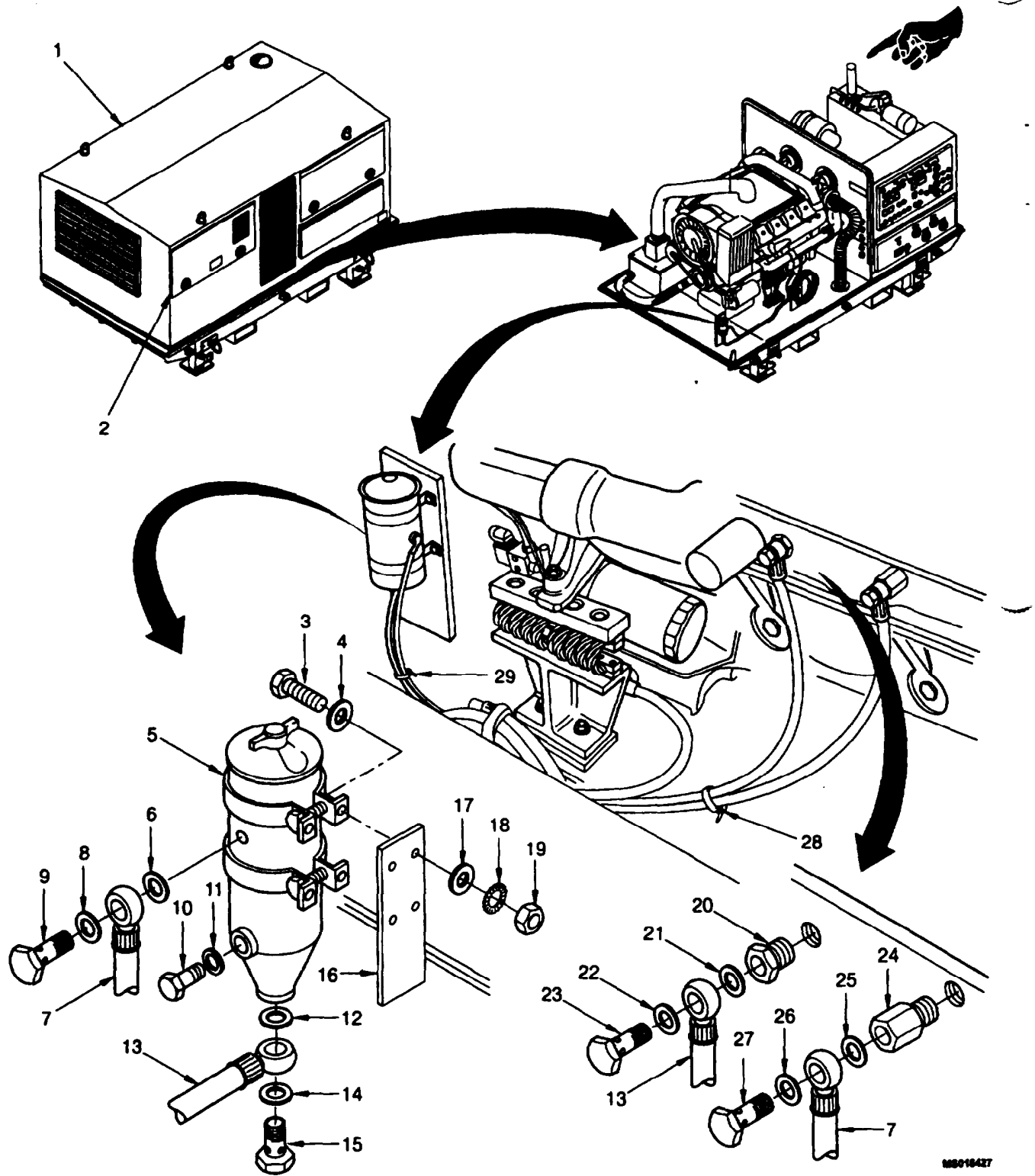
5. Remove hollow screw (15) and remove oil line (13) with sealing rings (12,14). Discard sealing rings (12, 14) and bag oil line (13).
6. Remove hollow screw (27), sealing rings (26, 25) and oil line (7) from adapter (24) on engine block. Discard sealing rings (26, 25).
7. Remove hollow screw (23), sealing rings (22, 21) and oil line (13) from adapter (24) on engine block. Discard sealing rings (22, 21).

INSTALLATION

NOTE

Use new sealing rings

1. Install hollow screws (23) oil line (13), new sealing rings (21, 22) on adapter (20) on engine block.
2. Install hollow screw (27), oil line (7), new sealing rings (26, 25) on adapter (24) on engine block.
3. Install hollow screw (15) new sealing rings (12, 14) and oil line (13) on subcurrent oil filter (5).
4. Install hollow screw (9) new sealing rings (6, 6) and oil line (7) on subcurrent oil filter (5).
5. Reinstall cable ties, bundle ties.
6. Install screw (10) and new sealing ring (11) on subcurrent oil filter (5) and tighten screw (10).
7. Close flap (2).



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Figure 5-41 Subcurrent Filter Assembly, Oil Lines Maintenance.

5.30 FLAME GLOWPLUG SYSTEM MAINTENANCE.

This task covers: a. Removal b. Test c. Installation

INITIAL SETUPTools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut down,
paragraph 2.5.2

Materials/Parts

Plastic bags
(item 21, appendix E)
Rubber bands
(item 22, appendix E)
Hylomar
(item 15, appendix E)

WARNING

Make sure that there are no open flames in the vicinity, and that fuel cannot splash onto hot components. Failure to observe this warning could result in severe personal injury.

REMOVAL

1. Open flap (2, figure 5-42) on unit hood assembly (1).

NOTE

Procedure for flame glowplug on cable 1X6 on opposite side of engine is the same as this procedure.

2. Remove nut (15) and washer (14) from threaded portion of flame glowplug (11).
3. Remove cable 1X5 (13).

WARNING

- **Fire hazard: do not allow fuel to touch hot engine.**
 - **Collect fuel in a container.**
4. Remove collar nut (12) from fuel line (6) and bag with plastic bag; secure with rubber band.
 5. Loosen locknut (10) and remove flame glowplug (11) from turbocharger air duct (9).

TEST

1. Check general function:
 - a. Remove screw (7) and sealing ring (8) from turbocharger air duct (9).

WARNING

Remove plug connector 1J13 (16) from pickup together with cable so that diesel engine cannot start.

NOTE

GLOWPLUG ON lights up after approximately 90 seconds.

- b. On front panel of control cabinet unit, set MASTER SWITCH S1 to ON.

WARNING

Due to explosion hazard, stay at least 80 inches (2 m) away from turbocharger air duct.

- c. On front panel of control cabinet unit, turn GLOWPLUG/START rotary switch to START and hold.

WARNING-

Place suitable container under fuel line (6) to minimize fire hazard.

NOTE

If flame is visible in turbocharger air duct and GLOWPLUG ON indicator does not light up, perform troubleshooting as indicated in figure 3.3.

- d. Check that smoke is emerging from threaded fitting, and flame is visible in turbocharger air duct (9).
2. Check fuel delivery:
 - a. Remove collar nut (12) on fuel line (6) from flame glowplug (11) and pull fuel line (6) off.
 - b. On front panel of control cabinet unit, set MASTER SWITCH S1 to ON.
 - c. On front panel of control cabinet unit, turn GLOWPLUG/START rotary switch to START and hold.

NOTE

- **Fuel must emerge from the fuel line while the engine turns over.**
- **If no fuel emerges, check fuel line (6) and operation of solenoid valve (5) and repair if necessary. Remove panels (17) to check solenoid valve (5).**

3. Check electrical function:
 - a. Remove collar nut (12) on fuel line (6) from flame glowplug (11) pull fuel line (6) off flame glowplug (11), and Plug-
 - b. On front panel of control cabinet unit, set MASTER SWITCH S1 to ON.
 - c. On front panel of control cabinet unit, turn GLOWPLUG/START rotary switch to START and hold.

NOTE

If voltage is <17 VDC or >22 VDC, perform troubleshooting as indicated in figure 3-3.

- d. Use multimeter to measure DC voltage at cable 1X5 (13): should be approximately 1 SVDC.
4. Check flame glowplug:
 - a. Remove flame glowplug **as** instructed in steps 2. through 5.
 - b. On front panel of control cabinet unit, set MASTER SWITCH S1 to ON.
 - c. On front panel of control cabinet unit, turn GLOWPLUG/START rotary switch to START and hold.
 - d. Install fuel line (6) and cable 1X5 (13) on flame glowplug (11).

NOTE

- **Fuel must emerge from flame glowplug as engine turns over.**
- **If no fuel emerges, replace flame glowplug (11).**

- e. On front panel of control cabinet unit, set MASTER SWITCH S1 to ON.
- f. Turn GLOWPLUG/START rotary switch to START and hold.

INSTALLATION

NOTE

Use Hylomar when Inserting flame glowplug.

1. Install flame glowplug (11) on turbocharger air duct (9) and tighten locknut (10).
2. Install cable 1X5 (13) on threaded portion of flame glowplug (11) with washer (14) and nut (5).
3. Install collar nut (12) on fuel line (6) to flame glowplug (11).
4. Screw plug connector 1J13 (16) with cable onto pickup.
5. Close flap (2).

5.31 ENGINE PREHEATING ASSEMBLY MAINTENANCE.

This task covers: a. Removal b. Test c. Installation

INITIAL SETUP**Tools**

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut down,
paragraph 2.5.2

Materials/Parts

Cable ties
(item 10, appendix E)

WARNING

Make sure that there are no open flames in the vicinity, and that fuel cannot splash onto hot components. Failure to observe this warning could result in severe personal injury.

REMOVAL

1. Remove unit hood assembly (1, figure 5-43) as instructed in paragraph 4.14.
2. Remove cable J102 (23) from plug connector X102 on connector box (24) of heating unit (12).
3. Remove nut (22), washers (21, 19), serrated lock washer (20), and grounding cable (18) from threaded pin (17) on heating unit (12).
4. Pull plug connector X103 (27) out of rear of heat exchanger box (3).
5. Loosen clamp (28) and pull air hose (29) off fitting of heat exchanger box (3).
6. Loosen screw on clamp (31) and remove clamp (31) with seal (30).
7. Loosen locknut (24) and unscrew screw (35) five turns out of nut (33) on exhaust manifold (32).
8. Remove exhaust manifold (32) from heating unit (12).
9. Loosen screw on clamp (25) and remove air inlet pipe (26) from heating unit (12).
10. Remove screws (6) of clamp strap closures (7) and unhook clamp strap closures (7).
11. Remove screws (8), serrated lock washers (9), and washers (10).

CAUTION

Place a container under fuel line connectors and collect any fuel that emerges.

NOTE

For better access to clamps on fuel lines, rotate heating unit to the left. If fuel lines are not to be reinstalled immediately, bag with plastic bag and secure with rubber band.

12. Loosen clamp (16), pull fuel supply line (15) off fitting on heating unit (12) and tie up.
13. Loosen clamp (13), pull fuel return line (14) off fitting on heating unit (12) and tie up.
14. Lift heating unit (12) out of brackets (11) and remove clamp straps (7).

TEST

1. Start up engine preheating assembly as instructed in paragraph 2.5.1.
2. Open flap (2, figure 5-43) and check that hot air is being blown onto V belts.
3. Open flap (2, figure 5-27) and front panel (4) of control cabinet assembly (3) and check that mounting plate (36) behind speed governor assembly N1 (31) is being heated.

INSTALLATION

1. Insert clamp straps (7, figure 5-43) into brackets (11).
2. Place heating unit (12) in clamp straps (7) and turn onto left side.
3. Slide fuel return line (14) on fitting of heating unit (12) and tighten clamp (13).
4. Slide fuel supply line (15) on fitting of heating unit (12) and tighten clamp (16).
5. Install screws (8), serrated lock washers (9), and washers (10).
6. Hook in clamp strap closures (7) and tighten screws (6) of clamp strap closures (7).
7. Place air inlet pipe (26) with clamp (25) on heating unit (12) and tighten screw on clamp (25).
8. Insert exhaust manifold (32) into exhaust intermediate pipe (36) and place on heating unit (12) with clamp (31) and seal (30).
9. Tighten screw on clamp (31).
10. Tighten screws (35) onto exhaust intermediate pipe (36).
11. Slide air hose (29) onto fitting of heat exchanger box (3) and tighten clamp (28).

NOTE

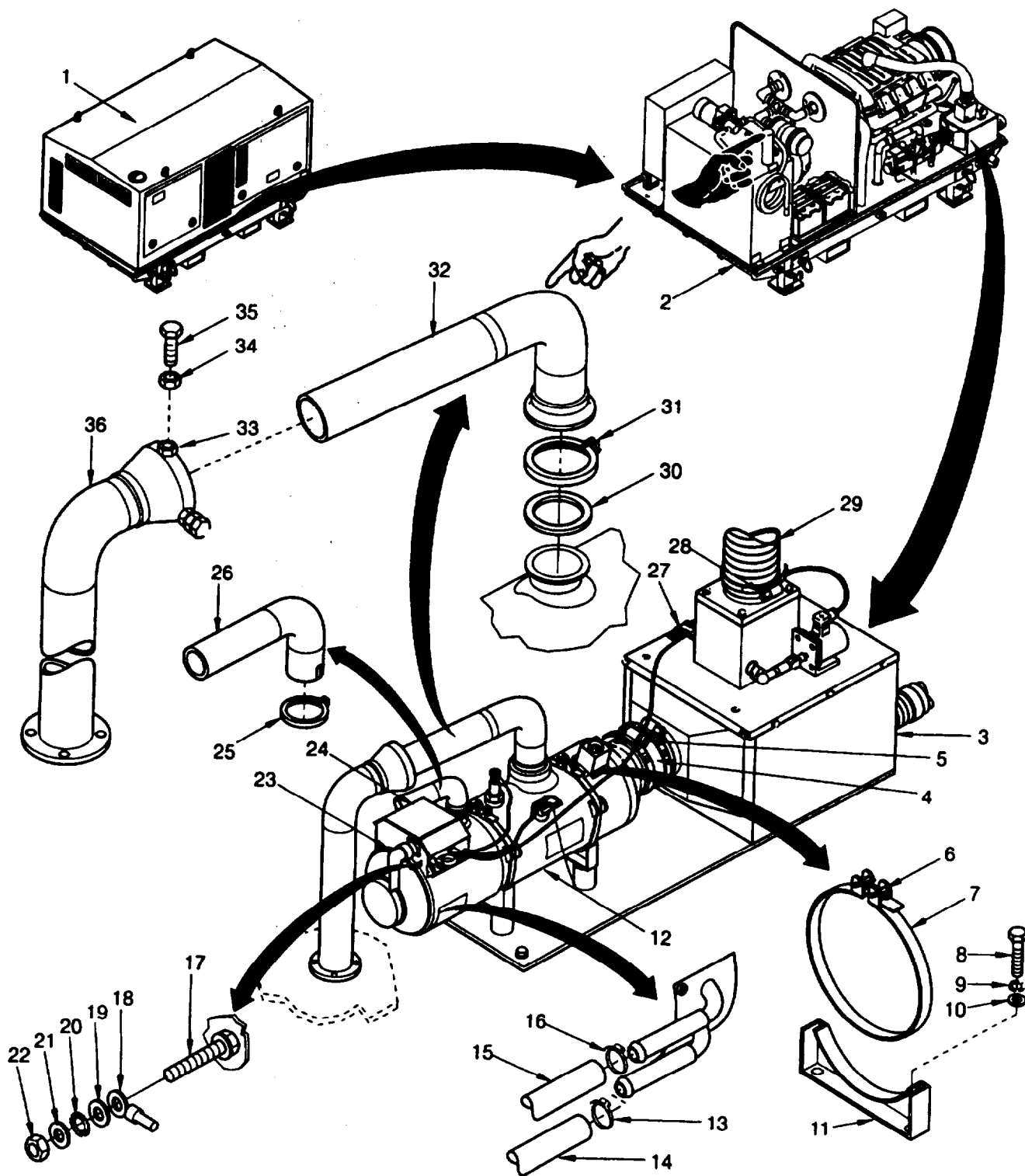
Do not run cable under clamp straps.

12. Insert plug connector X103 (27) into rear of heat exchanger box (3).
13. Place grounding strap (18), washer (19), serrated lock washer (20), and washer (21) on threaded pin (17) and screw on nut (22).
14. Place cable J102 (23) on plug connector X102 on connector box (24) of heating unit (12).

NOTE

Exhaust manifold and exhaust intermediate pipe must be aligned.

15. Align heating unit (12) and tighten locknuts (34) on exhaust intermediate pipe (36).
16. Install unit hood assembly (1) as instructed in paragraph 4.14.



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Figure 5-43 Preheating Assembly Maintenance.

5.32 BURNER MONITORING TEMPERATURE SWITCH MAINTENANCE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down
paragraph 2.5.2

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Open flap (2, figure 5-44) on unit hood assembly (1).

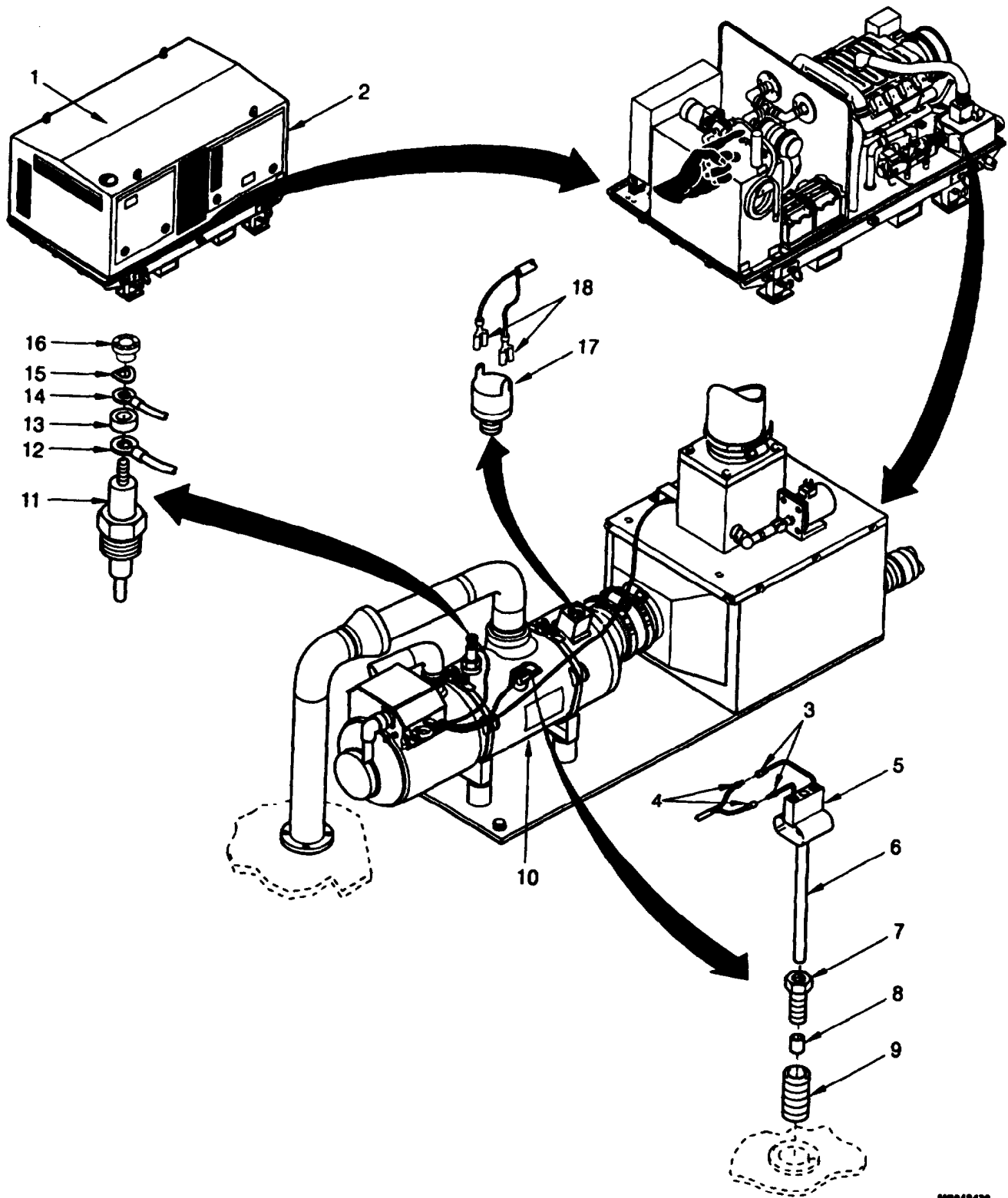
CAUTION

Do not pull round plugs off cables.

2. Unplug both round plug parts (3, 4) of X109 on burner monitoring temperature switch S109 (5).
3. Remove probe with microswitch (5, 6) from heating unit (10).
4. Hold probe with microswitch (56) at unthreaded portion (8) and screw in threaded hex portion (7).
5. Disassemble probe with microswitch (5, 6) from fasteners (7, 8, 9).

INSTALLATION

1. Reassemble probe with microswitch (5, 6) and fasteners (7, 8, 9).
2. Hold probe with microswitch (5, 6) at unthreaded portion (8) and screw in threaded hex portion (7).
3. Install probe with microswitch (5, 6) into heating unit (10).
4. Plug parts (3, 4) together.
5. Close nap (2).



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Figure 5-44 Temperature Switch, Glowplug Maintenance.

12. Loosen PG union and remove from preheating assembly cable (10).
13. Remove plug connector (13) of preheating assembly cable (10) from connector receptacle X103 (12) on heating unit (11).
14. Remove cable (10).

INSTALLATION

1. Install plug connector (13) of preheating assembly cable (10) onto connector receptacle X103 (12) on heating unit (11).
2. Slide PG union onto preheating assembly cable (10) and tighten.
3. Install preheating assembly cable (10) with PG union through back panel of control cabinet and screw on locknut (9).
4. Noting correct labeling and position, connect cables (10) to terminal strip X101 (14) of preheating control board (15).
5. Close cable conduits and place covers on busbars.

CAUTION

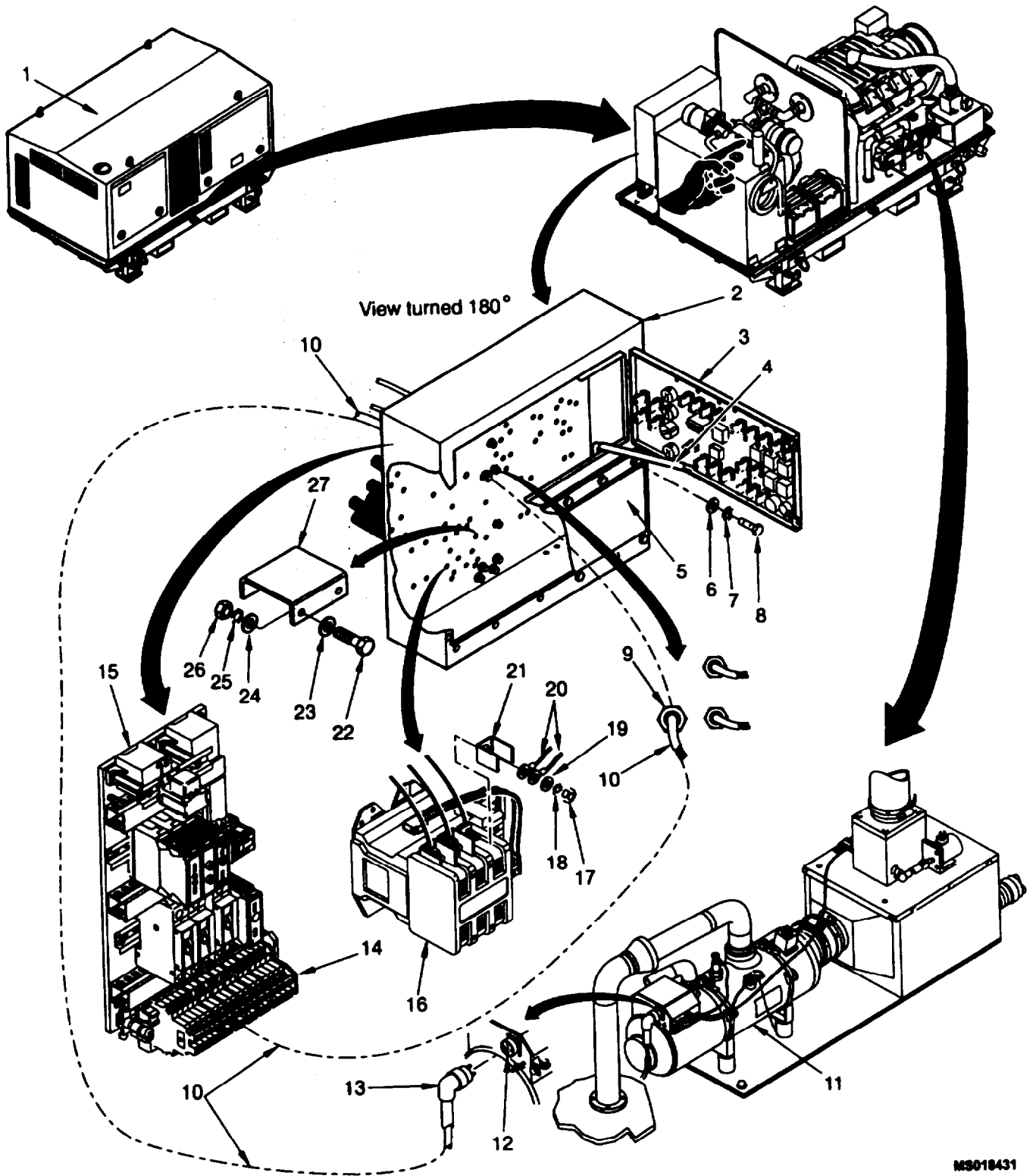
Tighten nuts on threaded pin with torque wrench to torque values in table (item G.2, appendix C), while holding screws.

6. Noting correct labeling and position, install heat sinks (21), cables (20), three washers (19), three lock serrated washers (18) and three nuts (17). Tighten nuts (17).

NOTE

Fasten left side of cover first.

7. Install two screws (22), two washers (23), cover (27), two washers (24), two serrated lock washers (29), and two nuts (26). Tighten nuts (26).
8. Close control cabinet connection panel (5) and remove props.
9. Install eighteen screws (8), eighteen serrated lock washers (7), and eighteen washers (6).
10. Stow prop (4) and close front panel (3).
11. Install unit hood assembly (1) as instructed in paragraph 4.14.



MS018431

Figure 5-45 Preheating Cable Assembly Maintenance.

INSTALLATION

1. Install oil hose (14) on fitting (13) with clamps (12) and tighten clamps (12).
2. Insert oil pump (15) and air-oil-heat exchanger (20) together into heat exchanger box (23).
3. Install three screws (2), three washers (3), three washers (7), three serrated lock washers (8), and three nuts (9) on brackets (4). Tighten nuts (9).
4. Install oil hose (16) on fitting (19) with clamps (17, 18) and tighten clamps.
5. Install oil hose (5) with clamps (6) on oil pump (15) and tighten clamps.
6. Install air hose (21) with clamp (22) on heat exchanger box (23) and tighten clamp.
7. Refill oil as instructed in paragraph 2.3.2.3.
8. Insert plug connector J103 (10) with cable on electric oil pump (15).
9. Place cover (35) on heat exchanger box (23).
10. Install six screws (32), six serrated lock washers (33) and six washers (34).
11. Install air hose (37) with clamp (36) on cover (35) and tighten clamp.
12. Install unit hood assembly (1) as instructed in paragraph 4.14.

10. Remove three nuts (9), three serrated lock washers (8), three washers (7, 3) and three screws (2) from bracket (4).
11. Lift electrical oil pump (15) and air-oil heat exchanger (20) together, out of heat exchanger box (23).
12. Loosen clamps (11) and remove oil hose (14) from oil pump (15).

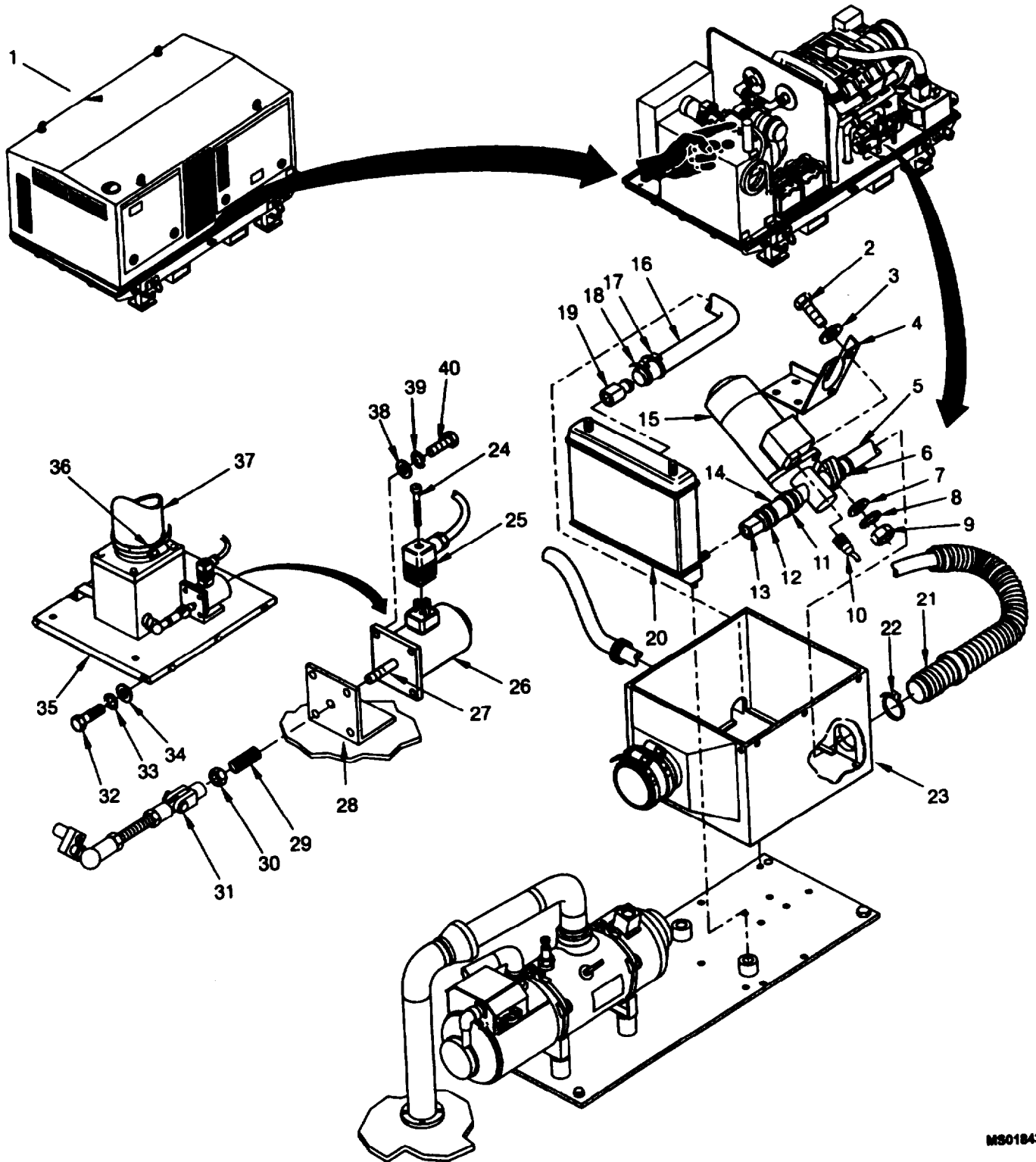
NOTE

Retain threaded fitting for reuse.

13. Remove fittings (13, 19) from air-oil heat exchanger (20).

INSTALLATION

1. Install fittings (13, 19) by using sealing tape on air-oil heat exchanger (20).
2. Install air hose (14) and clamps (11) on electrical oil pump (15), tighten clamps (11).
3. Install electrical oil pump (15) and air-oil heat exchanger (20), into heat exchanger box (23).
4. Install three screws (2), three washers (7, 3), three serrated lock washers (18), and three nuts (9) on brackets (4).
5. Install oil hose (16) and dampers (17, 18) on fitting (19), tighten clamps (17, 18).
6. Install oil hose (5) with clamps (6) on electrical oil pump (15), tighten clamps (6).
7. Install air hose (21) with clamp (22) on fitting on heat exchanger box (23), tighten clamp (22).
8. Refill oil as instructed in paragraph 2.3.2.3.
9. Install plug connector J 103 (10) on electrical oil pump (15).
10. Install cover (35) on heat exchanger box (23).
11. Install six screws (32), six serrated lock washers (33), and six washers (34).
12. Install air hose (37) with clamp (36).
13. Install unit hood assembly as instructed in paragraph 4.14.



MS01843

Figure 5-46 Air Flap Puller magnet, Electric Oil Pump, Air- Oil heat Exchanger Maintenance.

INSTALLATION

1. Slide oil hose (8) into air hose (23).
2. Install oil hose (8) with clamps (16) on fitting on oil pump (15) and tighten clamps (16).
3. Install oil hose (8) with clamps (7) on nipple (6) on oil pan and tighten clamps (7).
4. Install screw (17), washer (18) through clamp (19) and bottom plate of base frame, washer (20), serrated lock washer (21), and nut (22). Tighten nut (22).
5. Install air hose (21) with clamp (24) on fitting of heat exchanger box (25) and tighten clamp (24).
6. Install cover (32) with six screws (31) six serrated lock washers (30) and six washers (29). Tighten screws (31).
7. Slide oil hose (4) into heat exchanger box (20).
8. Install oil hose (4) with clamps (3) on T-junction on oil filler neck (2) and tighten clamps (3).
9. Install oil hose (4) with clamps (27) on fitting (28) of air-oil heat exchanger (26) and tighten clamps (27).
10. Refill oil as instructed in paragraph 2.3.2.3.
11. Install unit hood assembly (1) as instructed in paragraph 4.14.

5.40 OIL TEMPERATURE SWITCH MAINTENANCE.

This task covers: a. Removal

b. Installation

INITIAL SETUP
Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down,
paragraph 2.5.2

Materials/Parts

Cable ties
(item 10, appendix E)
Thermoconductive paste
(item 13, appendix E)

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cable. Failure to observe this warning could result in severe personal injury or death.

CAUTION

Tag all cables prior to removal to ensure correct connection of the cables during installation.

REMOVAL

1. Remove unit hood assembly (1, figure 5-47).
2. Unplug cable X 104 at receptacle (13).
3. Remove flat terminal (14) from receptacle (13) of the switch to be changed, (10) for S 103 and (9) for S 104.

NOTE

Care must be exercised to insure the proper wire is selected.

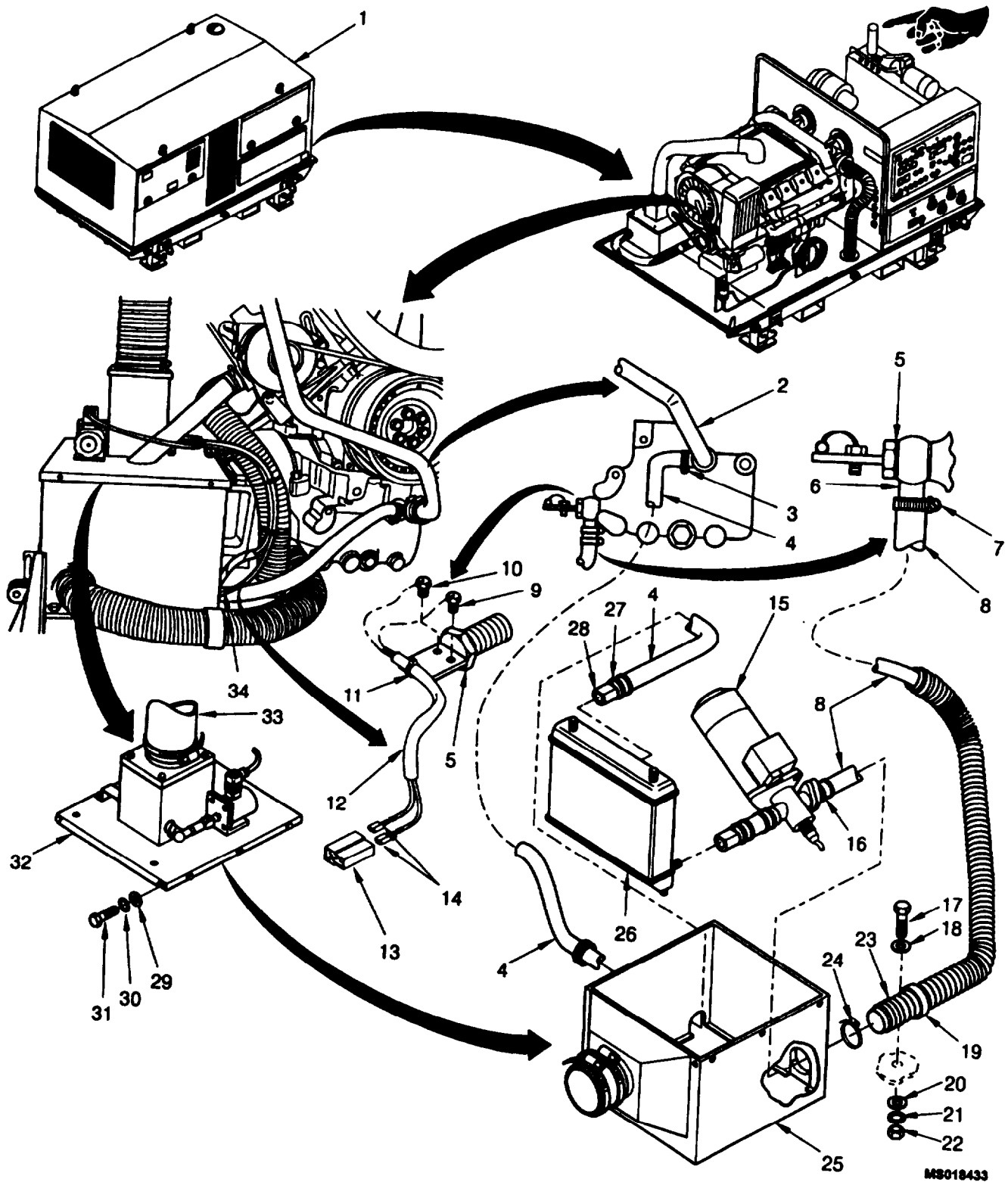
4. Cut cable tie (11) and remove.
5. Cut the flat terminal (14) from the cable removed from plug (13) and remove from insulation (12).
6. Remove temperature switch S 103 (10) or S 104(9) from hose connector fitting (5).

INSTALLATION

NOTE

Coat mating surface of temperature switch with thermoconductive paste before installing.

1. Install temperature switch S 103 (10) or S 104 (9), in hose connector fitting (5).
2. Install cable through insulation (12).
3. Install new cable tie (11).
4. Install new wire flat terminal (14).
5. Install flat terminal (14) in plug (13)
6. Reconnect both halves of receptacle (13).



MS018433

Figure 5-47 Oil Hose, Oil Temperature Switch Maintenance.

5.41 ACTUATOR ASSEMBLY MAINTENANCE.

This task covers: a. Removal b. Adjustment c. Installation

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(item 2, appendix B)
Automotive Fuel and Electrical System Repair, Tool Kit
(item 3, appendix B)
Load bank (item 19, appendix B)

Equipment Conditions

Reference
Generator Set 150 kW shut
down
paragraph 2.5.2

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

REMOVAL

1. Remove unit hood assembly (1, figure 5-48) as instructed in paragraph 4.14.
2. Remove retaining clip (6) from ball socket (7).
3. Remove ball socket (7) from ball head (10).
4. Loosen locking screw (9) and remove lever 96).
5. Remove two screws (17), and two serrated lock washers (18) and two washers (19) from plug connector 1J12 (20).
6. Remove plug connector 1J12 (20) off actuator assembly (4).
7. Remove four screws (21). and four serrated lock washers (22). and four washers (23) from actuator assembly (4).
8. Remove actuator assembly (4) from diesel engine (3).

ADJUSTMENT

CAUTION

Adjust regulator linkage only for the following reasons:

- **Engine or regulator replacement or overload setting is incorrect.**
- **The regulator linkage between the injection pump and actuator assembly is preset at the factory. It should not be readjusted unless absolutely necessary.**

1. Start up diesel engine as instructed in paragraph 2.5.1.
2. Pull link rod (12) toward actuator assembly (4) to overload position (II) until it stops, and measure spacing (g1) between ball socket (7) and engine cover panel (13).

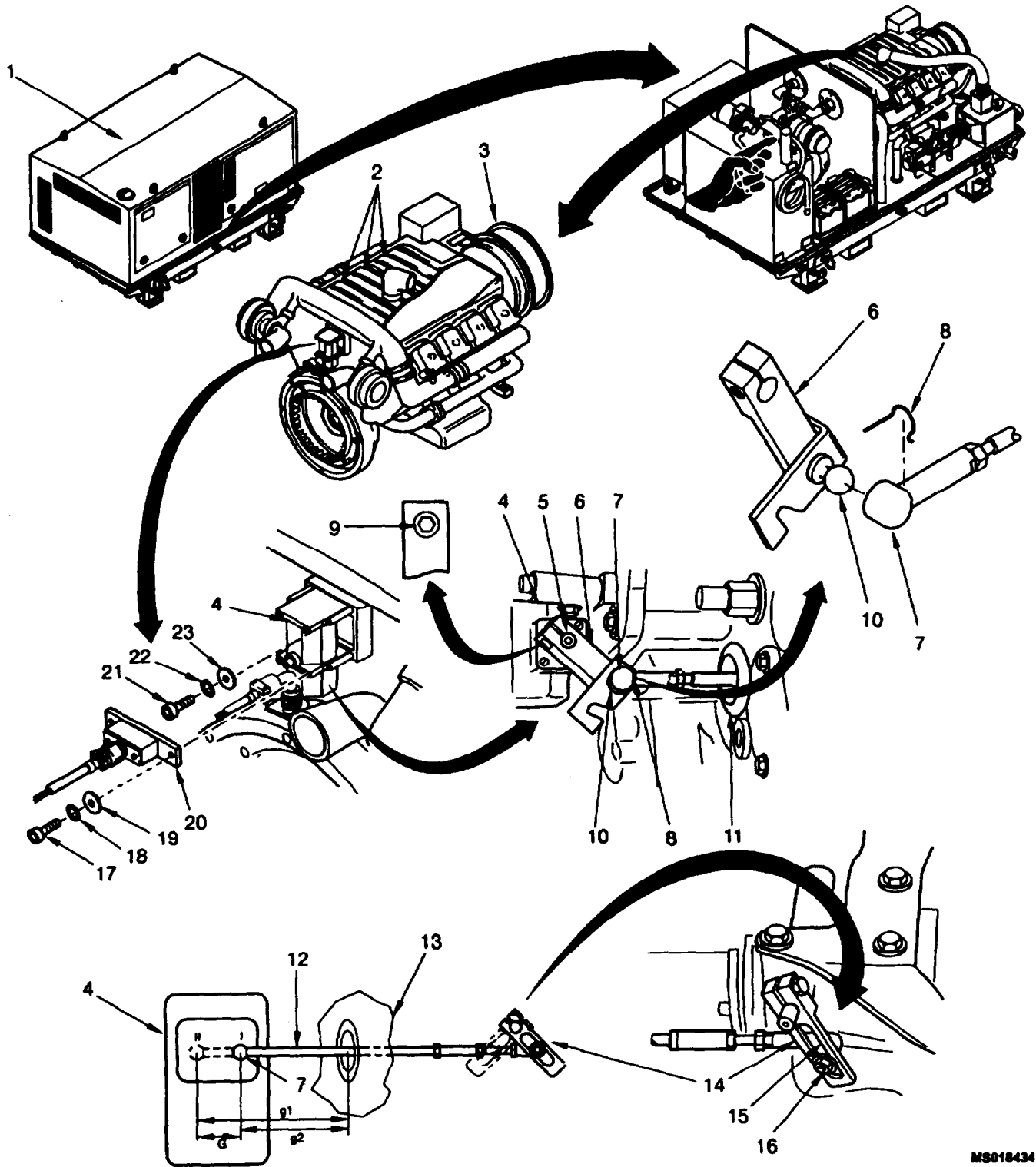
3. Restart engine.
4. Push link rod (12) toward engine cover panel (13) into stop position (I), when diesel engine (3) shuts down, and hold in that position.
5. Measure spacing (g2) between center of ball socket (7) and engine cover panel (13).
6. Calculate travel (G) between overload position (II) and stop position (I) ($G=g1 - g2$) and record.
7. Push ball socket (7) onto ball head (10) and hold lever (6) in front of actuator assembly shaft (5).
8. Move lever (6) to stop position (I) (45° angle/spacing g2), slide onto actuator shaft (5), and tighten locking screw (9).
9. Move lever (6) from stop position (I) to overload position (II), checking that control occurs over the calculated travel (G) and that the stop in stop position (I) corresponds to the end position of lever (6).
10. Check that link rod (12) moves freely between stop position (I) and overload position (II) on passthrough (11) in engine cover panel (13).
11. If control is not possible over the entire travel (G), remove engine cover panels (2), loosen nut (16) on ball head, and shift ball head linkage in oblong hole (15) of lever (14).
12. Check speed governor system:
 - a. Pull regulator linkage approximately 0.2 inches (5 mm) toward actuator (4):
Diesel engine must shut down properly.
 - b. Connect load bank.
 - c. Start diesel engine as instructed in paragraph 2.51:
Speed must stabilize immediately after load is applied (150 kVV).
13. Repeat adjustment if necessary until speed stabilizes in the correct range.
14. Insert retaining clip (8).
15. If engine cover panels (2) were removed, attach engine cover panels (2).

INSTALLATION

NOTE

Perform the ADJUSTMENT procedure when installing a different actuator.

1. Install actuator assembly (4) on diesel engine (3) and secure with four screws (21), four washers (22), and four serrated lock washers (23).
2. Install plug connector 1J12 (20) into actuator (4).
3. Install two washers (19), two serrated lock washers (18) and two screws (17). Tighten screws (17).
4. Install lever (6) on actuator assembly shaft (5).
5. Tighten locking screw (9) on lever (6).
6. Install unit hood assembly (1) as instructed in paragraph 4.14.
7. Connect load bank to generator set and perform procedures in paragraph 5.53. ■



MS016434

Figure 5-48 Actuator Maintenance.

INSTALLATION

1. Install actuator cable (9) through opening in partition (20) of base frame (22) and place plug connector (37) on actuator assembly (38).
2. Install two screws (34) two serrated lock washers (35) and two washers (36) on plug connector (37).
3. Install five screws (27), five washers (26) on partition (20) and install plate (21) using five serrated lock washers (24), five washers (25), five screws (27) and five nuts (23). Tighten nuts (23).
4. Slide PG union onto actuator cable (9) and tighten.
5. Slide actuator cables (9) with PG union through back panel of control cabinet (3) and install locknut (8).
6. Noting correct labeling and position, lay actuator cable (9) in cable conduits (12 to 14) and connect to terminal strip (11).
7. Close cable conduits (12 to 14) and swing digital isochronous load sharing module N4 (15) back into place.

NOTE

Hold standoffs (19) while installing nuts (16).

8. Install two washers (18) and two serrated lock washers (17) and two nuts (16).
9. Stow prop (5) and close front panel (4).
10. Install unit hood assembly (1) as instructed in paragraph 4.14.
11. Connect load bank to generator set and perform procedures in paragraph 5.53.

CAUTION

Pick-up position must not change.

3. Hold pick-up (31) and tighten locknut (30).
4. Connect multimeter to speed governor assembly N1 (10) between terminals 10 and 11.
5. Measure pick-up voltages:

NOTE

Counterclockwise will decrease voltage - clockwise will increase voltage.

WARNING

Extreme caution should be exercised during this procedure to avoid touching other areas due to risk of electrical shock.

- a. Start diesel engine as instructed in paragraph 2.5.1 and measure voltage during starting procedure:
Should be: 21.5 VAC.
- b. Allow diesel engine to run at rated speed and measure voltage:
Should be: 20 to 30 VAC.
- c. If either reading is incorrect, loosen locknut (30) and change pick-up position until readings are correct, and retighten locknut (30).

INSTALLATION

1. Install pick-up (31) following the adjustment procedures steps 1. through 3.
2. Connect plug connector 1J13 (33) of pick-up cable (7) to pick-up (31).
3. Install unit hood assembly (1) as instructed in paragraph 4.14.
- 4. Connect load bank to generator set and perform procedures in paragraph 5.53.

9. Remove five nuts (23), five screws (27), five serrated lock washers (24), five washers (25), five screws (27), and five washers (26) from partition (20) and remove plate (21).
10. Remove knurled nut (32) and remove plug connector (33) of pick-up cable (7).
11. Pull pick-up cable (7) through opening in partition (20).

INSTALLATION

1. Install pick-up (7) through opening in partition (20) and place plug connector (33) on pick-up (31).
2. Install five screws (27), five washers (28) into partition (20) and set plate (21) on screws (27).
3. Install five serrated lock washers (24), five washers (25), five screws (27) and five nuts (23). Tighten nuts (23).
4. Slide PG union onto pick-up cable (7) and tighten.
5. Slide pick-up cable (7) with PG union through back panel 01 control cabinet (3) and install locknut (6).
6. Noting correct labeling and position, lay pick-up cable (7) in cable conduits (12 to 14) and connect to terminal strip (11).
7. Install cables (7) on terminal strip (11).
8. Close cable conduits (12 to 14) and swing digital isochronous load sharing module N4 (15) back into place.

NOTE

Hold standoffs (19) while installing nuts (16).

9. Install two washers (18), two serrated lock washers (17), and two nuts (16). Tighten nuts (16).
10. Stow prop (5) and close front panel (4).
11. Install unit hood assembly (1) as instructed in paragraph 4.14.
- 12. Connect load bank to generator set and perform procedures in paragraph 5.53.

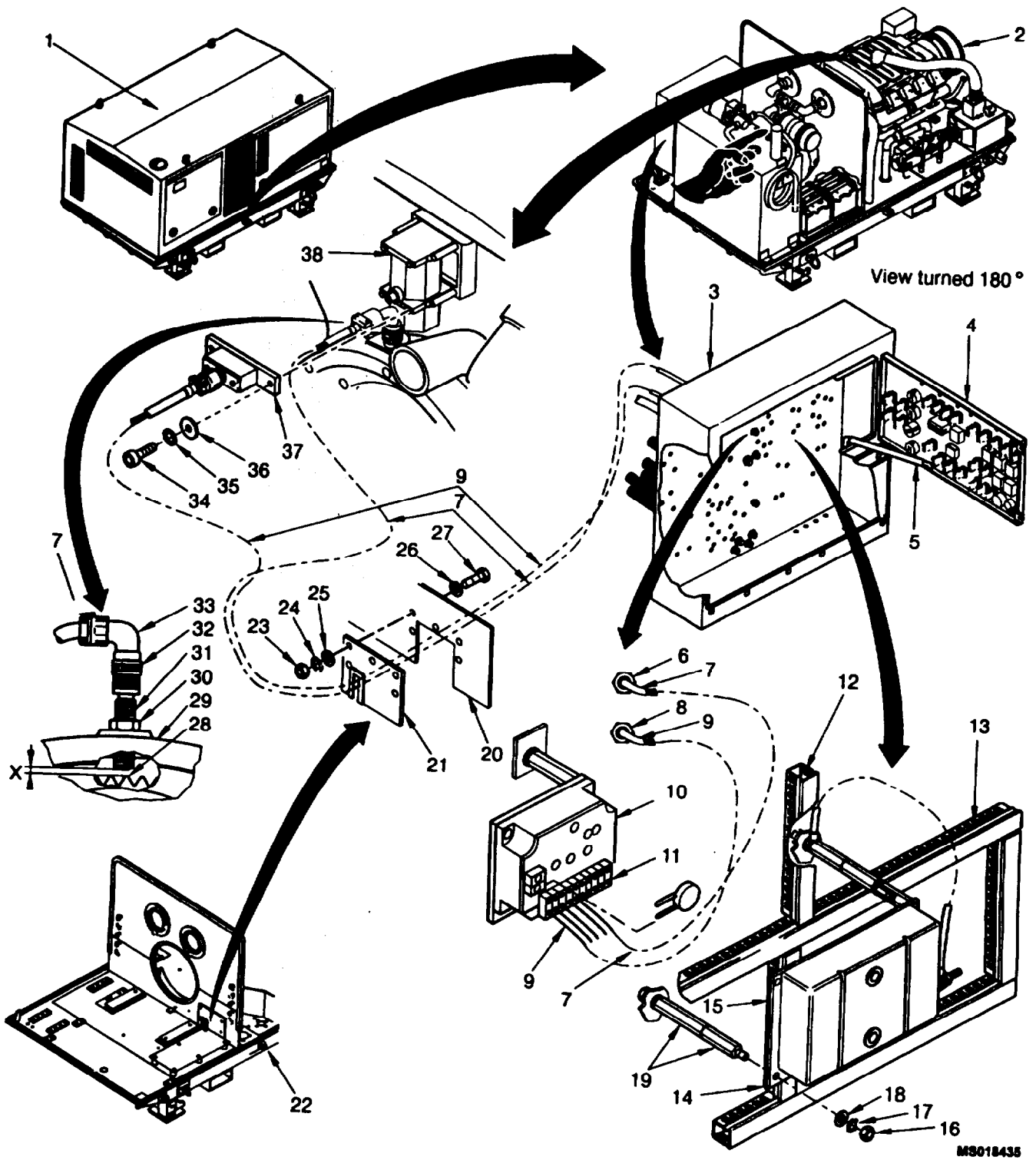


Figure 5-49 Actuator Cable, Pick-up Cable Maintenance.

INSTALLATION

1. Install temperature sensor (12) and round plug connector 1J31 (13) on cylinder head.
2. Install temperature sensor (10) and round plug connector 1J30 (11) on cylinder head.
3. Install temperature sensor (9) and flat connector 1J5 (8) on cylinder head.
4. Install cover panel (5) next to partition (6) and cover panel with air hose (7) using eight screws (2), eight washers (4), and eight serrated lock washers (3).
5. Install unit hood assembly (1) as instructed in paragraphs 4.14.

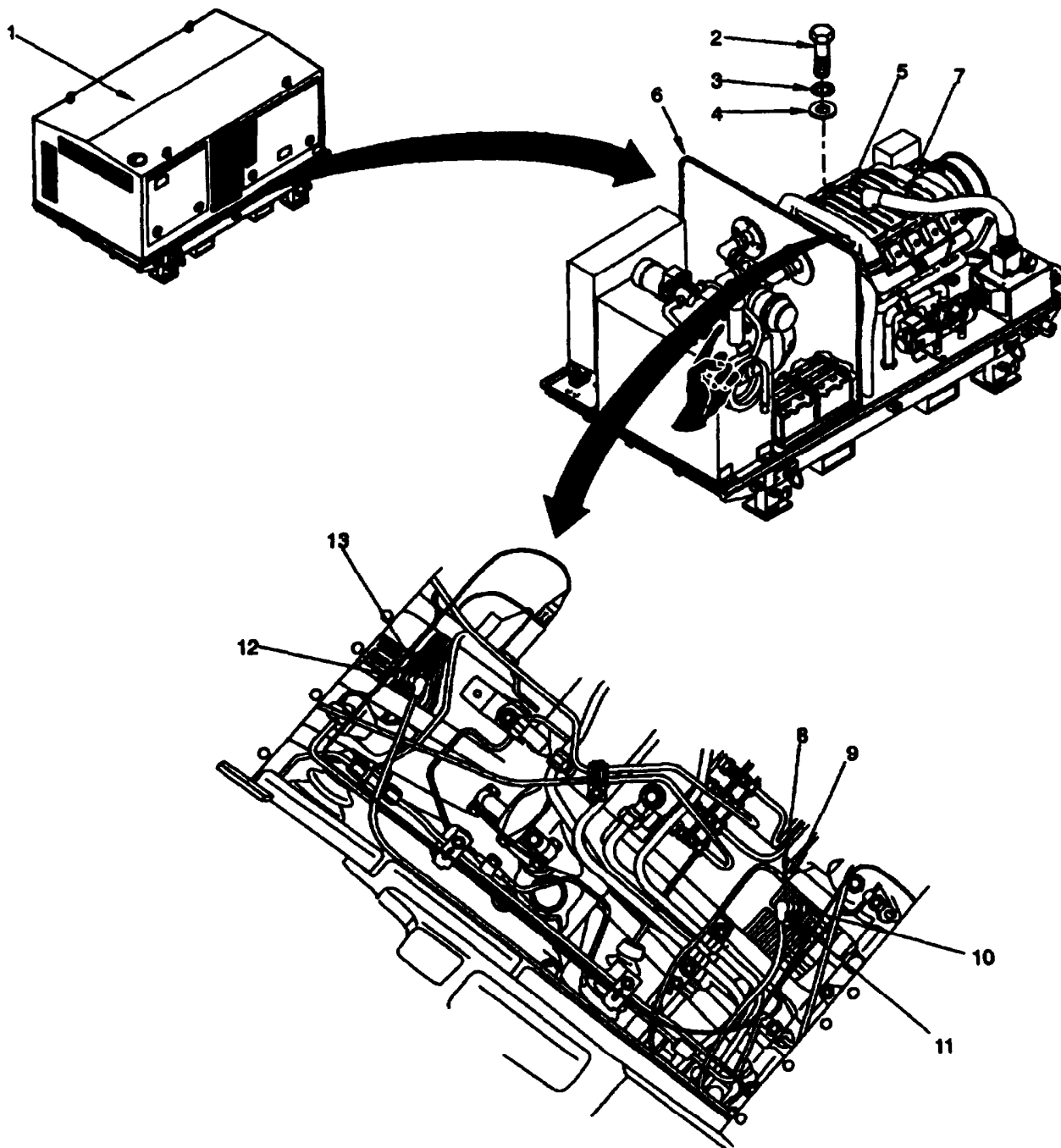
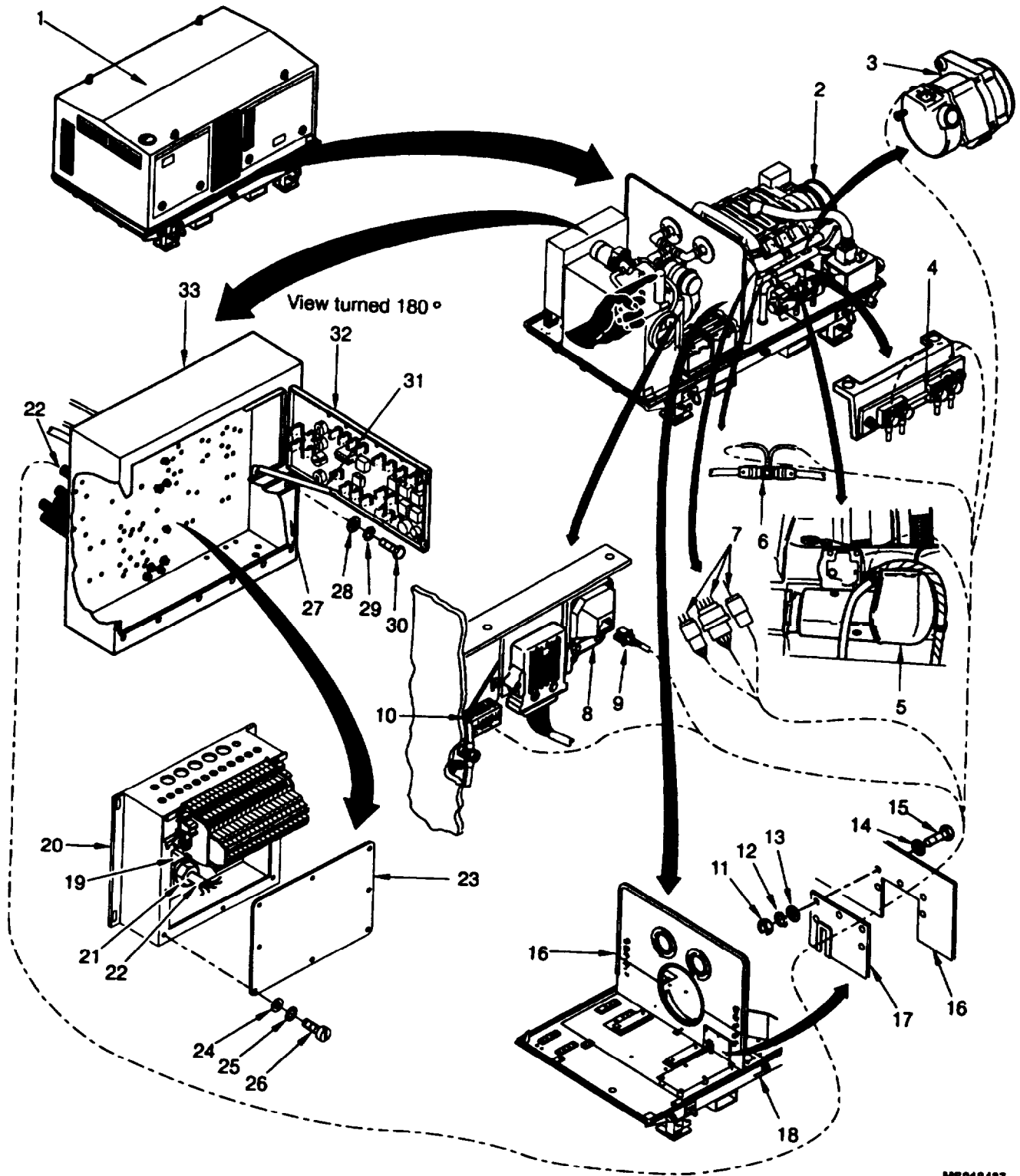


Figure 5-50 EHG and Cylinder Head Temperature Sensor Maintenance.

9. Pull plug connector 2J5 (9) off battery charging alternator regulator N6 (8).
10. Tag cables to terminal strip 2X50 (10) and disconnect.
11. Disconnect plug connector, X2 to X4 (7) above grounding stud (6).
12. Remove cable from grounding stud (6).
13. Remove cables from starter (5) as instructed in paragraph NO TAG.
14. Remove cables from resistor (Shunt) R11 (4) as instructed in paragraph NO TAG.
15. Disconnect cables from battery 'charging alternator (3) as instructed in paragraph NO TAG and remove plug connector 2J3.
16. Remove five nuts (11), five serrated lock washers (12) and five washers (13) and plate (17) and five washers (14) and five screws (15) from partition (16).
17. Remove generator wiring harness (22) through partition (16) on base frame (16).

INSTALLATION

1. Install generator wiring harness (22) through partition (16), on base frame (18), and secure with cable ties.
2. Install five screws (15), five washers (14) into partition (16) and install plate (17), five washers (13), five serrated lock washers (12) and five nuts (11). Tighten nuts (11).
3. Connect cables to battery charging alternator (3) as instructed in paragraph NO TAG.
4. Install cables on resistor (Shunt) R11 (4) as instructed in paragraph NO TAG.
5. Install cables onto starter (5) as instructed in paragraph NO TAG.
6. Install cables onto grounding stud (6).
7. Install plug connectors X2 to X4 (7).
8. Noting correct labeling and position, connect cables to terminal strip 2X50 (10).
9. Install plug connector 2J5 (9) in battery charging alternator regulator N6 (8).
10. Insert generator wiring harness (21) through back panel 01 control cabinet assembly (33) and secure with locknut (21).
11. Connect generator wiring harness (22) to input terminal strip (19) of filter box FK (20).
12. Install cover (23) on filter box FK (20) and secure with eight screws (26), eight serrated lock washers (25), and eight washers (24).
13. Close control cabinet connection panel (27).
14. Install eighteen screws (30), eighteen serrated lock washers (29), and eighteen washers (28) on control unit assembly (33).
15. Stow prop (31) and close front panel (32).
16. Install unit hood assembly (1) as instructed in paragraph 4.14.
- 17. Connect load bank to generator set and perform procedures in paragraph 5.53.



M3018437

Figure 5-51 Generator Wiring Harness Maintenance.

CAUTION

- Clean up all oil leaks.
- Do not damage fuel lines, oil lines, or cables.
- Tag all cables prior to removal to ensure correct connection of the cables during installation.
- Bag all fuel and oil lines with plastic bags and secure with rubber bands to prevent contamination.
- Do not sit engine on oil pan. Blocking must be used to support the engine and generator on mounts.

REMOVAL

1. Remove unit hood assembly (1, figure 5-52, sheet 1 of 2) as instructed in paragraph 4.14.
2. Remove battery set (2) as instructed in paragraph 4.74.
3. Remove air filter housing and piping (3) as instructed in paragraph 5.27.
4. Remove rubber seal (5) from lower part (6) of partition.
5. Remove four nuts (7), four serrated lock washers (8), and four washers (9) from threaded pins (10).
6. Remove upper part (4) of partition.
7. Remove control cabinet unit (11) as instructed in paragraph 4.43.
8. Remove generator wiring harness (12) as instructed in paragraph 5.46.

NOTE

Leave EHG regulator N7 on diesel engine.

9. Remove EHG regulator N7 (13) as instructed in paragraph 4.76. Coil up cable and secure to diesel engine (28) together with EHG controller N7 (13).
10. Remove fuel lines (14) as instructed in paragraph 4.42 and tie up to fuel tank (31).
11. Loosen clamp (16) and remove air hose (15).
12. Loosen clamps (19, 21) and remove air hose (18). Retain clamps (19, 21).
13. Remove exhaust manifold (23) from heating unit (24) as instructed in paragraph 5.31.
14. Remove filter cup (25, 26) as instructed in paragraph 4.33.
15. Remove oil hoses (27) from heat exchanger box (22) and diesel engine (28) as instructed in paragraph 5.38.
16. Remove subcurrent filter oil lines (29) from diesel engine (28) as instructed in paragraph 5.29.
17. Remove exhaust pipes with header (30) from diesel engine (28) as instructed in paragraphs 4.82 and 4.83.
18. Remove pickup cable (32) as instructed in paragraph 5.44.
19. Remove actuator cable (33) as instructed in paragraph 5.42.
20. Screw long eyebolt (65) into engine block of diesel engine (64).
21. Remove bolt (69), washer (67), serrated lock washer (68) and closure plate (66).

22. Insert short eyebolt (63) into engine block of diesel engine (64).
23. Hook lifting device into eyebolts (63, 65) on diesel engine (64) and into lifting lug (62) on synchronous generator (61).
24. Remove two bolts (34) and two serrated lock washers (35) from shock absorbers (41) and engine mount (36).
25. Remove two bolts (60), two serrated lock washers (59) and two washers (58) from shock absorbers (50).

CAUTION

Secure diesel engine and synchronous generator to prevent tilting or slippage.

26. Lift diesel engine (64) and synchronous generator (61) off shock absorbers (41, 50) on base frame (45) and set down on suitable mounting blocks.

INSTALLATION

NOTE

For easier positioning of diesel engine and synchronous generator, apply assembly lubricant to rubberseal on synchronous generator air guide box and to diesel engine and synchronous generator shock absorbers.

1. Place diesel engine (64) and synchronous generator (61) on shock absorbers (41, 50) on base frame (45).

CAUTION

- **Use Loctite 243 when inserting bolts.**
- **Tighten bolts to torque values in table (item G.1, appendix G).**

NOTE

Thread in bolts (34, 60) only three turns when first installing.

2. Install two bolts (60), two washers (58), two serrated lock washers (59) in generator mount (57) and thread in three turns.
3. Install two bolts (34), two serrated lock washers (35) in engine mount (36) and shock absorbers (41), and thread in three turns,
4. Torque bolts (34, 60) with torque wrench.
5. Detach lifting device from eyebolts at positions (63, 65) on diesel engine (28) and from lifting lug (62) on synchronous generator (61).
6. Remove short eyebolt (63).
7. Install bolt (69) with washer (68), serrated lock washer (67) and closure plate (66).

8. Remove long eyebolt (65) from engine block of diesel engine (64).
9. Install actuator cable (33) as instructed in paragraph 5.42.
10. Install pickup cable (32) as instructed in paragraph 5.44.
11. Align exhaust pipes with header (30) and install on diesel engine (28) as instructed in paragraphs 4.82 and 4.83.
12. Install subcurrent filter oil fines (29) on diesel engine (28) as instructed in paragraph 5.29.
13. Install oil hoses (27) on heat exchanger box (22) and diesel engine (28) as instructed in paragraph 5.38.
- 14.. Install filter cup (25, 26) as instructed in paragraph 4.33.
15. Install exhaust manifold (23) on heating unit (24) as instructed in paragraph 5.31.
16. Install air hose (18) on header (20) and heat exchanger box (22) and tighten clamps (19,21).
17. Install air hose (15) on generator (17) and tighten clamp (16).
18. Install fuel lines (14) as instructed in paragraph 4.42.
19. Install EHG controller N7 (13) as instructed in paragraph 4.76.
20. Install control cabinet unit (11) as instructed in paragraph 4.43.
21. Install generator wiring harness (12) as instructed in paragraph 5.46.
22. Install upper part (4) of partition on lower part (6) of partition and push rubber seal (5) into place.
23. Install four washers (9) four serrated lock washers (8). and four nuts (7) on threaded pins (10).
24. Install air fitter housing and piping (3) as instructed in paragraph 5.27.
25. Install battery set (2) as instructed in paragraph 4.74.
26. Install unit hood assembly (1) as instructed in paragraph 4.14.
27. Connect load bank to generator set and perform procedures in paragraph 5.53. ■

3. Remove bolt (69), with serrated lock washer (68), washer (67), and closure plate (66).
4. Install long eyebolt (65) in diesel engine block (64).
5. Install short eyebolt (63) in diesel engine block (64).
6. Install lifting device in eyebolts (63, 65).
7. Remove two bolts (34) and two serrated lock washers (35).
8. Lift diesel engine (64) enough to take the weight off shock absorbers (41).
9. Remove four bolts (37), four serrated lock washers (38), and four washers (39).
10. Remove two shock absorber plates (40).
11. Remove two bolts (44), two serrated lock washers (43), and two washers (42) from two shock absorbers (41).
12. Remove two shock absorbers (41).

NOTE

It is not necessary to install suitable spacing material or remove lifting device if shock absorber is to be replaced immediately.

13. Install suitable spacing material between bracket (72) and engine mount (36).

INSTALLATION

CAUTION

- **Use Loctite 243 on bolts.**
- **Tighten bolts to torque values in table (item G.1, appendix G)**

NOTE

For easier positioning of components coat mating surfaces with lubricant.

1. If necessary install lifting device in eyebolts (63, 65).
2. Lift diesel engine (64) enough to allow spacing material to be removed if installed.
3. Install two shock absorbers (41) on two brackets (72) and secure with two bolts (44), two serrated lock washers (43), and two washers (42).
4. Install two shock absorber plates (40) on shock absorbers (41) and secure with four bolts (37), four serrated lock washers (38), and four washers (39).
5. Lower engine until weight has been transferred to shock absorbers (41).
6. Install two bolts (34) and two serrated lock washers (35) on mounts (36) and shock absorbers (41).
7. Remove lifting device (73) and eyebolts (63, 65).
8. Install closure plate (66) and secure with bolt (69), serrated lock washer (68), and washer (67).
9. Install upper part of partition (4) as instructed in paragraph 5.47, steps 22 through 24.
10. Install unit hood assembly (1) as instructed in paragraph 4.14.

NOTE

To remove right hand shock absorber, control cabinet must be removed.

To remove left hand shock absorber, battery set must be removed.

REMOVAL

1. Remove unit hood assembly (1, figure 5-52) as instructed in paragraph 4.14.
2. Remove upper part of partition (4) as instructed in paragraph 5.47, steps 3 through 6.
3. Remove air filter and piping (3) as instructed in paragraph 5.27.
4. Remove control cabinet (11) as instructed in paragraph 4.43 and battery set (2) as instructed in paragraph 4.74.
5. Install lifting device to lifting lugs (62) and (70).
6. Remove two bolts (60), two serrated lock washers (59), and two washers (58).
7. Lift synchronous generator (61).
8. Remove two bolts (56) and two serrated washers (55).
9. Remove shock absorber plate (54)
10. Remove two bolts (53), two serrated lock washers (52), and two washers (51).
11. Remove shock absorber (50).
12. Remove two bolts (46), two serrated lock washers (47), two washers (48), and mounting plate (49) from shock absorber (50).

NOTE

It is not necessary to install suitable spacing material or remove lifting device if shock absorber is to be replaced immediately.

13. Install suitable spacing material.

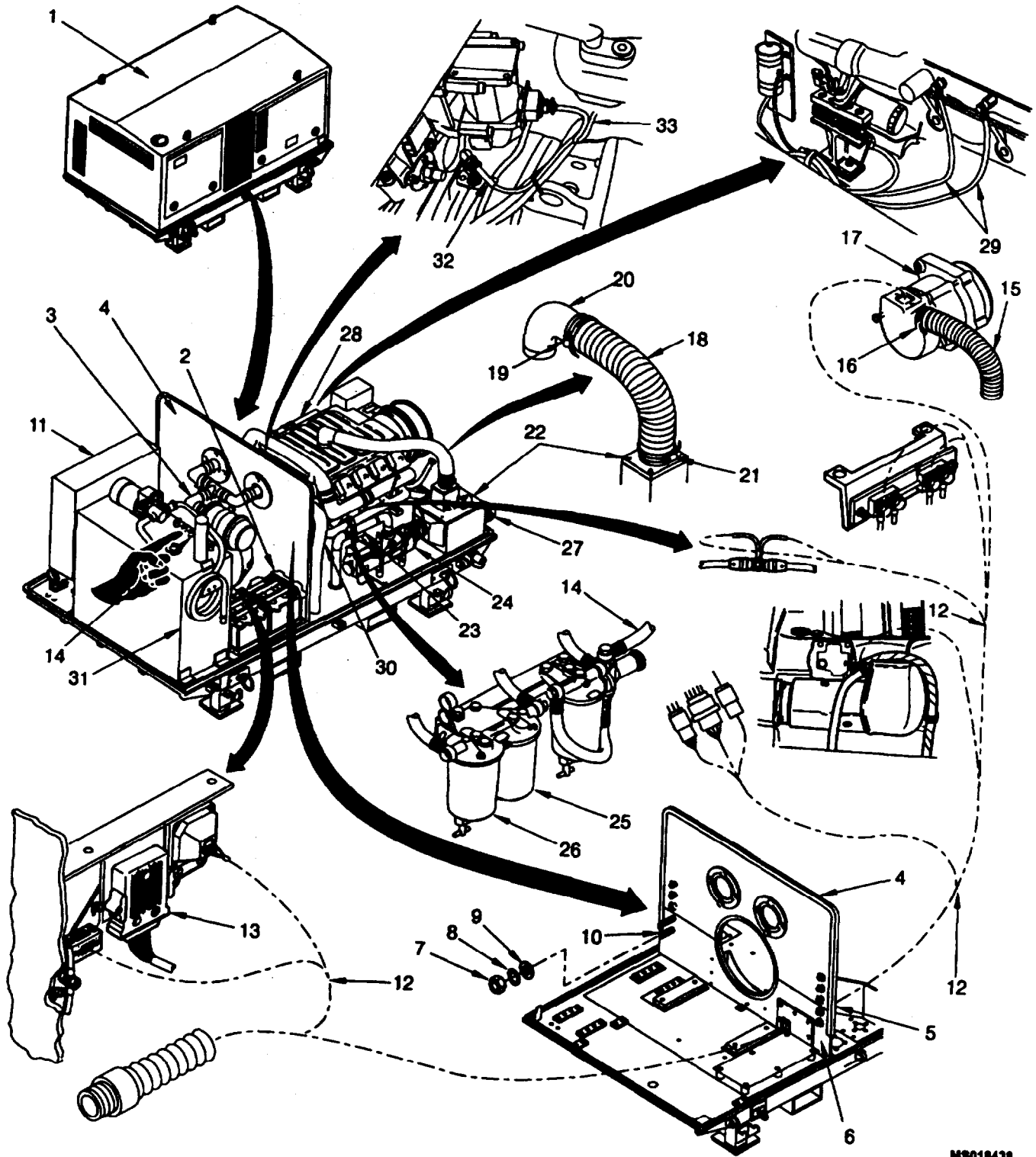
INSTALLATION**CAUTION**

- Use Loctite 243 on bolts.
- Tighten wrench to torque values in table (item G.1, appendix G)

NOTE

For easier positioning of components coat mating surfaces with lubricant.

1. If necessary, install lifting device on lifting lugs (62) and (70).
2. Lift synchronous generator (61) enough to allow spacing material to be removed if installed.
3. Install mounting plate (49) on shock absorber (50) and secure with two bolts (46), two serrated lock washers (47), and two washers (51) on shock absorber (50).
4. Install shock absorber plate (54) on shock absorber (50) and secure with bolts (56) and serrated lock washers (55).
5. Insert shock absorber (50) and secure to base (45) with two bolts (53), two serrated lock washers (52), and two washers (51).
6. Lower synchronous generator (61) until weight has been transferred to shock absorbers (50).
7. Install two bolts (60) and two serrated lock washers (59) and two washers (58).
8. Remove lifting device from lifting lugs (62) and (70).
9. Install upper part of partition (4) as instructed in paragraph 5.47, steps 22 through 24.
10. Install air filter and piping (3) as instructed in paragraph 5.27.
11. Install control cabinet (11) as instructed in paragraph 4.43 and install battery set (2) as instructed in paragraph 4.74.
12. Install unit hood assembly (1) as instructed in paragraph 4.14.



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Figure 5-52 Diesel Engine and Synchronous Generator Maintenance (Sheet 1 of 2).

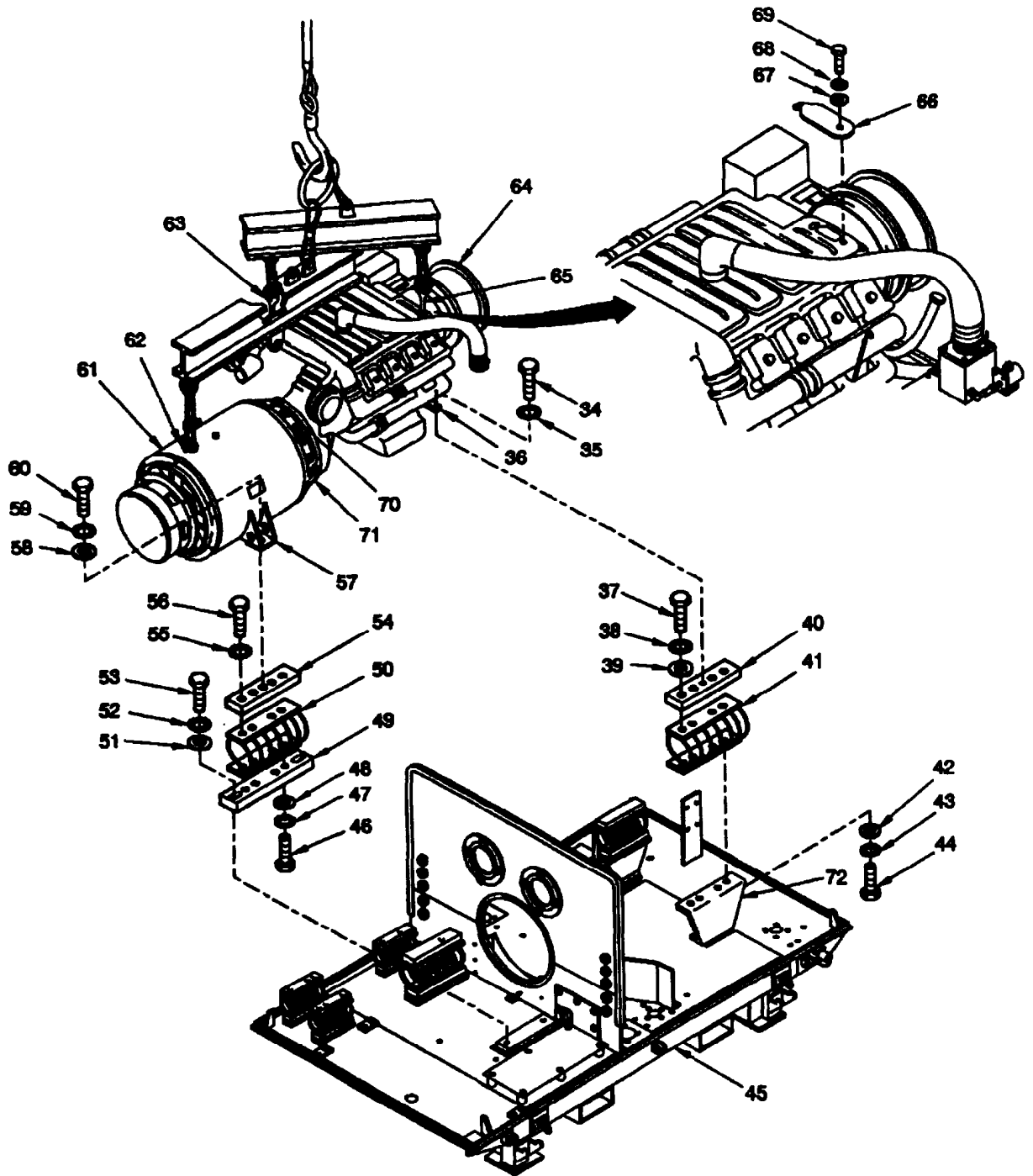


Figure 5-52 Diesel Engine and Synchronous Generator Maintenance (Sheet 2 of 2).

3. Remove generator wiring harness (24) of diesel engine as instructed in paragraph 5.46.
4. Remove EHG controller N7 (35) as instructed in paragraph 4.76 and secure to engine (3).
5. Loosen clamps (4) and (5) and remove air pipes (2) on engine side of partition.
6. Tag fuel lines (37, 38) and remove from engine block.
7. Tag fuel line (29) and remove from priming pump as instructed in paragraph 4.42.
8. Cut cable ties holding fuel lines to engine (3) or other objects.
9. Remove filter cups (30, 31) as instructed in paragraph 4.33.
10. Loosen clamp (11) and remove air hose (10) from battery charging generator (9).
11. Remove screw (15), serrated lock washer (16), and washer (17).
12. Remove spacer (20) and washer (21).

NOTE

Clamp (N) is retained on hose (8)

13. Loosen clamp (14) and remove air hose (19) and clamp (18) from elbow (13) on panel (12).
14. Remove oil hose (25) from heat exchange box (23) as indicated in paragraph 5.39.
15. Remove oil hoses (8) from engine (3) as instructed in paragraph 5.29.
16. Remove exhaust pipes with header (28) as instructed in paragraph 4.82 and 4.83.
17. Remove actuator cable (6) as instructed in paragraph 5.42.
18. Remove pick-up cable (7) as instructed in paragraph 5.44.
19. Remove bolt (43), serrated lock washer (44), washer (45) and closure plate (46).
20. Install long eyebolt (41) on diesel engine block (42).
21. Install short eyebolt (40) on diesel engine block (42).
22. Install lifting device on eyebolts (40,41) and lift until there is no slack in the cables.
23. Remove two bolts (47) two serrated lock washers (48) from engine mounts (49).
24. Support synchronous generator (60) at intermediate flange (54) with suitable support (56 to 58).
25. Remove eight bolts (51), eight serrated lock washers (52) and eight washers (53) from the diesel engine side of intermediate flange (54).
26. Separate the diesel engine (42) from the intermediate flange (54) by installing two bolts (59) in threaded hole (found above the mounting holes on the intermediate flange (54) on each side of engine).
27. Tighten bolts (59) evenly (on both sides of engine) until diesel engine (42) is disengaged from intermediate flange (54).
28. Remove two bolts (59).
29. Lift diesel engine (42) off base (34).
30. Support engine by placing suitable support under engine mounts and the clutch housing (55).

INSTALLATION**CAUTION**

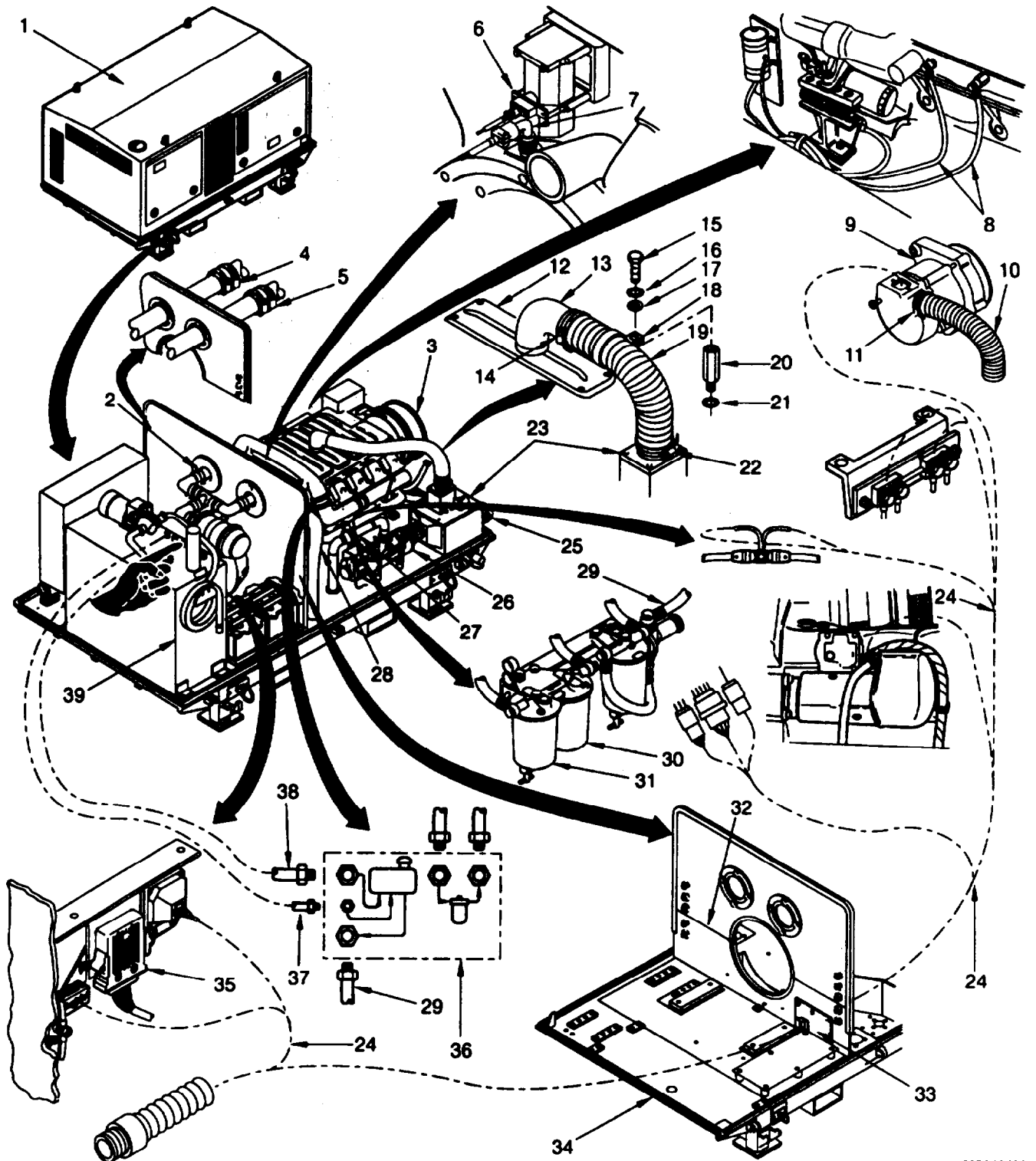
- Use Loctite 243 on bolts.
- Tighten bolts to torque values in table (item G.1, appendix G).

1. Lift diesel engine (42) off mounting blocks and place on shock absorbers (50).

CAUTION

Make sure that coupling elements do not jam when pushed together.

2. Push diesel engine (42) onto synchronous generator (60).
3. Install eight bolts (51), eight serrated lock washers (52), and eight washers (53) on intermediate flange (54) on diesel engine (42). Lighten bolts (51).
4. Install two bolts (47) and two serrated lock washers (48) into mounts (49) of diesel engine (42) and shock absorbers (50). Lighten bolts (47).
5. Remove support (56 to 53) from beneath intermediate flange (54).
6. Detach lifting device from eyebolts (40, 41) on diesel engine (42).
7. Remove short eyebolt (40) out of diesel engine block.
8. Remove long eyebolt (41) out of diesel engine block (42).
9. Install bolt (43), washer (44), serrated lockwasher (45), and closure plate (46) on diesel engine block (42). Tighten bolt (43).
10. Install pickup cable (7) as instructed in paragraph 5.44.
11. Install actuator cable (6) as instructed in paragraph 5.42.
12. Align exhaust pipes with header (28) and install on diesel engine (42) as instructed in paragraph 4.82 and 4.83.
13. Install oil hoses (8) on diesel engine (42) as instructed in paragraph 5.29.
14. Install oil hoses (25) on heat exchanger box (23) and diesel engine (42) as instructed in paragraph 5.39.
15. Install air hose (19) with clamps (14, 18) on elbow (13) of panel (12) and tighten clamp (14).
16. Install spacer (20) on diesel engine block (42).
17. Install screw (15) serrated lock washer (16), washer (17) and air hose (19) with clamps (18) on spacer (20).
18. Install air hose (10) with clamp (11) on battery charging generator (9) and tighten clamp (11).
19. Install filter cup (31, 32) as instructed in paragraph 4.33.
20. Install fuel line (29) on priming pump as instructed in paragraph 4.42.
21. Install fuel lines (37, 38) on diesel engine (3) as instructed in paragraph 4.42.
22. Bundle fuel lines using cable ties.
23. Install air pipes (2) on engine side of partition and tighten clamps (4) and (5).
24. Install EHG regulator N7 (35) as instructed in paragraph 4.76.
25. Install generator wiring harness (24) on diesel engine (3) as instructed in paragraph 5.46.
26. Connect battery set as instructed in paragraph 4.74.
27. Install unit hood assembly (1) as instructed in paragraph 4.14.
28. Connect load bank to generator set and perform procedures in paragraph 5.53.



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Figure 5-53 Diesel Engine Maintenance (Sheet 1 of 2).

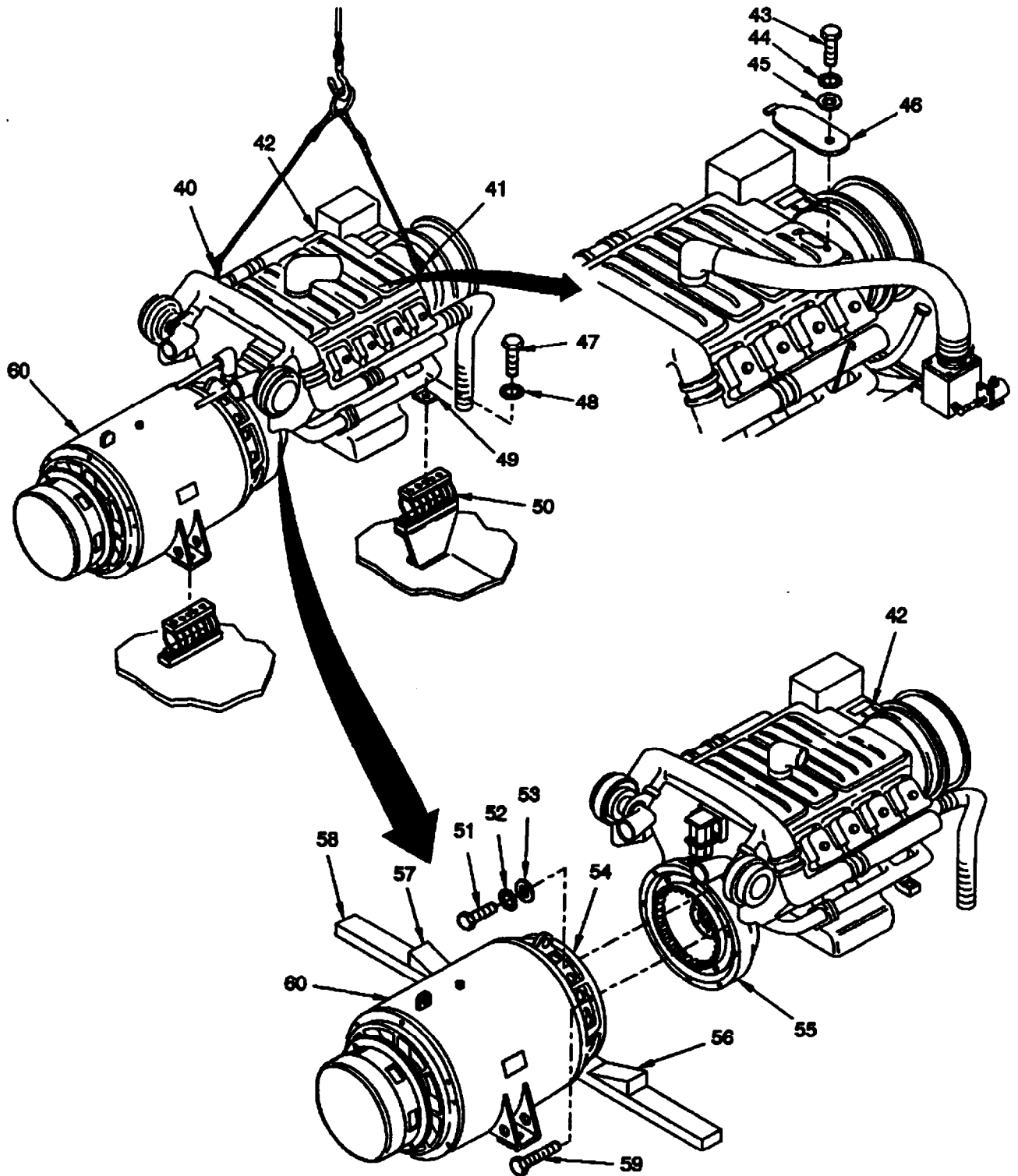


Figure 5-53 Diesel Engine Maintenance (Shett 2 of 2).

INSTALLATION**CAUTION**

- Use Loctite 243 on bolts.
- Tighten bolts to torque values in table (Item G.1, appendix G).

NOTE

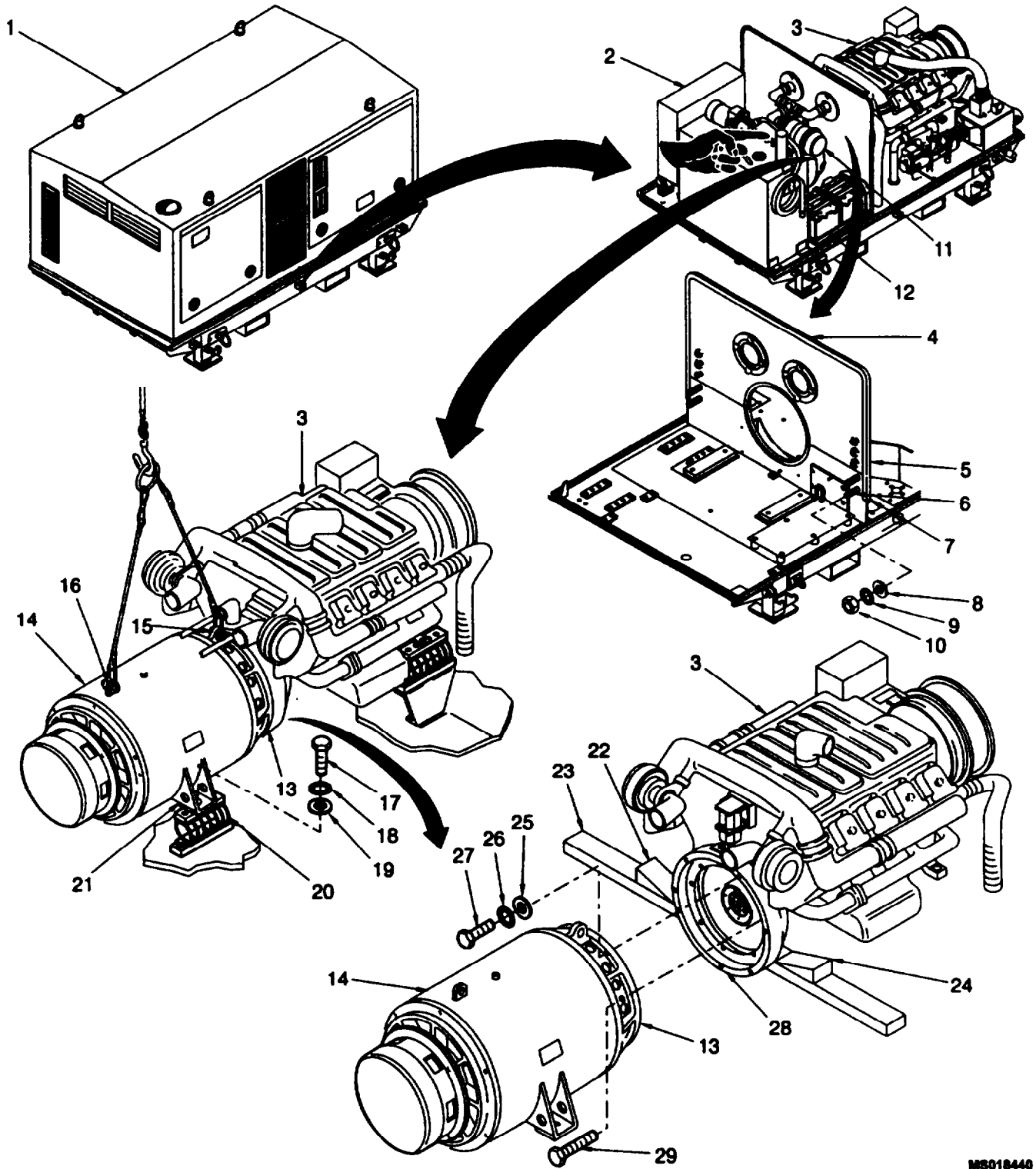
For easier positioning of synchronous generator, apply assembly lubricant to rubber seal on air guide box of synchronous generator, synchronous generator shock absorbers, and rubber coupling element.

1. Lift synchronous generator (14) off mounting blocks and place on shock absorbers (20).

CAUTION

Make sure that coupling elements do not jam when pushed together.

2. Install synchronous generator (14) on diesel engine (3).
3. Install eight bolts (27), eight serrated lock washers (26), and eight washers (25) into intermediate flange (13) and screw into flywheel housing (28).
4. Install two bolts (17), two serrated lock washers (18) and two washers (19) through synchronous generator mount (21) and on shock absorbers (20). Tighten bolts (17).
5. Remove support (22 to 24) from beneath flywheel housing (28) of diesel engine (3).
6. Remove lifting device from lifting lug (16) on synchronous generator (14) and lifting lug (15) on intermediate flange (13).
7. Install control cabinet unit (2) as instructed in paragraph 4.43.
8. Install upper part of partition (4) and secure with four washers (8) and four serrated lock washers (9) on studs (6).
9. Install rubber seal (5).
10. Install air filter housing and piping (11) as instructed in paragraph 5.27.
11. Install battery set (12) as instructed in paragraph 4.74.
12. Install unit hood assembly (1) as instructed in paragraph 4.14.
13. Connect load bank to generator set and perform procedures in paragraph 5.53. ■



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Figure 5-54 Synchronous Generator Maintenance.

NOTE

Leave woodruff key on clutch hub.

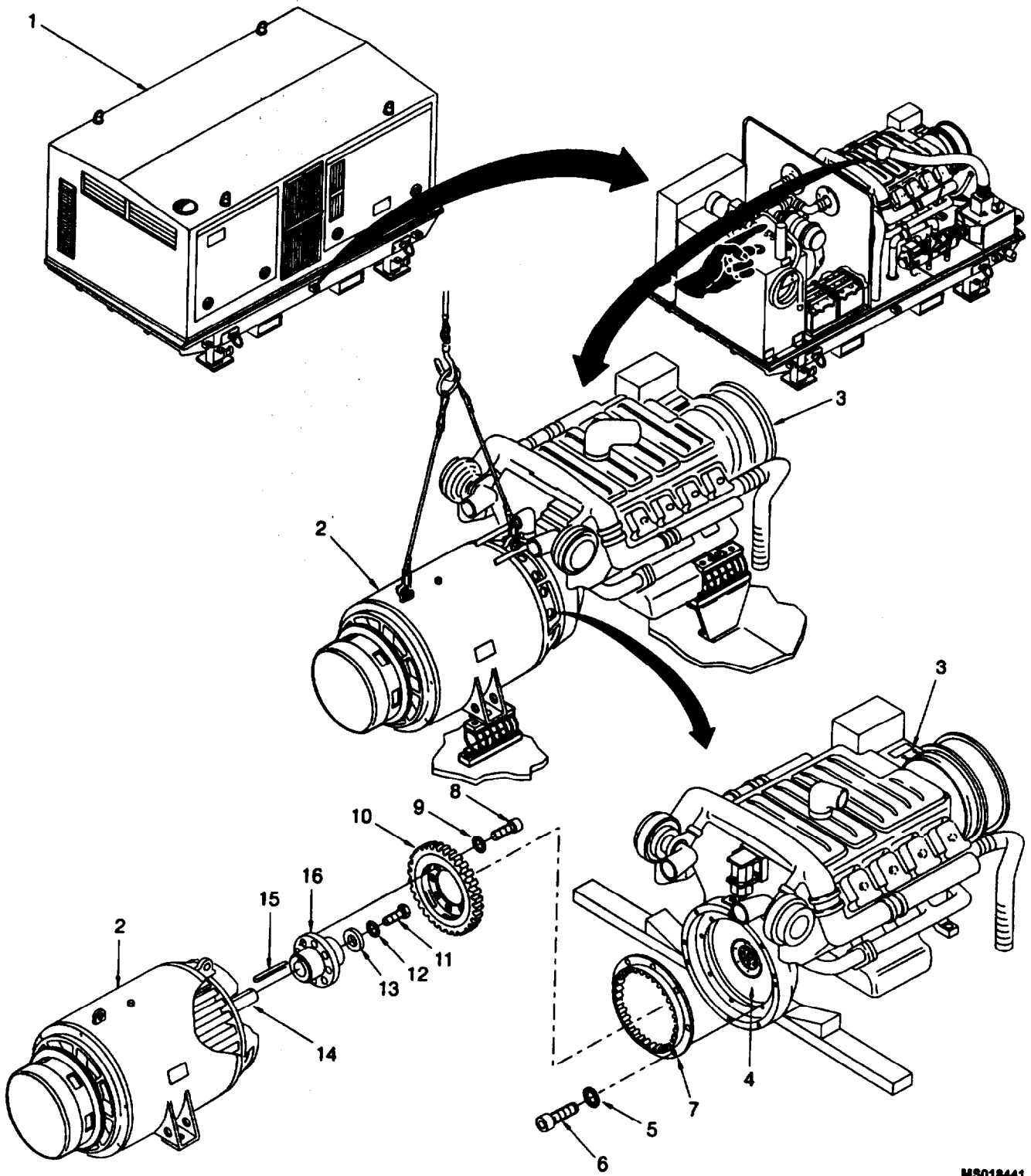
INSTALLATION

1. Place clutch hub (16) on shaft (14).

CAUTION

Tighten bolts with torque wrench to torque values in table (item G.1, appendix G).

2. Install thrust washer (13) and serrated lock washer (12) and install bolt (11) in shaft (14).
3. Install rubber element (10) into clutch hub (16).
4. Install eight bolts (8) and eight serrated lock washers (9) into rubber element (10) on clutch hub (16).
5. Place driver ring (7) on flywheel (4) and secure with eight serrated lock washers (5) and eight bolts (6). Tighten bolts (6).
6. Install synchronous generator (2) as instructed in paragraph 5.51.
7. Install unit hood assembly (1) as instructed in paragraph 4.14.
8. Connect load bank to generator set and perform procedures in paragraph 5.53.



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Figure 5-55 Clutch Assembly Maintenance.

2. Start generator set.
 - a. Adjust voltage and frequency to rated values.
 - b. Close the "AC circuit interrupter" on the generator set.
3. At EPP-III-EPU junction box, set ICC, CRG or ECS ON/OFF switch to ON.
 - a. Observe that the INPUT POWER indicator on the side of junction box is illuminated.
 - b. Observe that the appropriate shelter indicator is illuminated.
 - c. Observe that the appropriate GENERATOR ONLINE indicator is illuminated.
 - d. If indicators in a. through c. above do not illuminate, check to insure all switches are in the on position, all cables are tight, and no lamps are burned out.
4. At load bank:
 - a. Set BLOWER/CONTROL POWER switch on the load bank to ON.
 - b. Set POWER switch on digital display panel at the load bank to ON.
 - c. Select desired load using KW LOAD STEP switches.

CAUTION

- Do not apply Instantaneous (one step) loads greater than 50 kW on the EPP III 150 kW generator set.
 - Do not exceed the 30 kW rating on the PU-789/PU-804 30 kW generator set.
- d. Apply load by turning MASTER LOAD to ON.
 - e. Observe function display for appropriate indication.
 - f. Operate each of the 150 kW generator sets for approximately 30 minutes after reaching 100 percent load.
 - g. If the appropriate indications are not displayed, check to insure that all switches are in the correct position and all cables are tight. Refer to the appropriate maintenance procedures.
5. At generator set:
 - a. Observe voltage, frequency, and load meters for proper indications.
 - b. If proper indications are not present on any meter, refer to the appropriate maintenance procedures.

SHUTDOWN PROCEDURE

1. Set MASTER LOAD switch on load bank to OFF.
2. Open "AC Circuit Interrupter" on generator set.
3. After a 36-second cool down, turn BLOWER/CONTROL POWER switch on load bank to OFF.
4. Set all remaining switches on the load bank to OFF.
5. Set all switches on the EPP-III/EPU junction box to OFF.
6. Shut down generator set.
7. Disconnect load bank cables L1, L2, L3, L0 and generator power and control cables from EPP III/EPU junction box. Disconnect all ground cables.

5.54 CHECKING AND ADJUSTING VALVES.

This task covers: a. Removal b. Adjustment c. Installation

INITIAL SETUPTools

General Mechanic's Tool Kit
(item 2, appendix B)
Engine Cranking Gear (PN 100300)
Mandrel (PN 190200)

Equipment Conditions

Reference
Generator Set 150kw shut
down.
paragraph 2.5.2

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cables. Failure to observe this warning could result in severe personal injury or death.

REMOVAL

1. Remove eight screw caps (1. figure 5-56), eight packing preform (2), eight O-ring (3), eight valve cover (4), and eight gaskets (5).

NOTE

Engine must be cooled at least 3 hours.

ADJUSTMENT

1. Turn engine using Engine Cranking Gear (PN 100300) or Mandrel (PN 190200) until valves of number one cylinder overlap.

NOTE

Valve overlapping means Exhaust valve is about to close and the Intake valve is about to open. Both pushrods are now non-rotatable.

2. Check valve clearance for valves marked in black (fig 5-57), using a feeler gauge (2, fig 5-59). Gauge should just slide into gap (3, fig 5-60) between rocker arm lug (4) and valve (5):
 - Intake valve (I) 0.2 mm
 - Exhaust valve (E) 0.3mm
3. If gap is too small or too large. loosen locknut (1, fig 5-60) one or two turns and turn adjusting screw and turn adjusting screw (2) with a screwdriver (1, fig 5-59); once locknut is tightened gauge should slip out with little resistance.
4. Turn crankshaft 360 degrees so that number seven cylinder is overlapped.

NOTE

Valve overlapping means Exhaust valve is about to close and the Intake valve is about to open. Both pushrods are now non-rotatable.

5. Check valve clearance for valves marked in black (fig 5-58), using a feeler gauge (2, fig 5-59). Gauge should just slide into gap (3, fig 5-60) between rocker arm lug (4) and valve (5):
 - Intake valve (I) 0.2 mm
 - Exhaust valve (E) 0.3mm
6. If gap is too small or too large, loosen locknut (1, fig 5-60) one or two turns and turn adjusting screw and turn adjusting screw (2) with a screwdriver (1, fig 5-59); once locknut is tightened gauge should slip out with little resistance.

INSTALLATION

1. Replace O-ring (3, fig 5-56) and gasket (S5) with new ones.
2. Install valve cover (4), packing perform (2), and screw cap (1).
3. Tighten to 12 Nm.

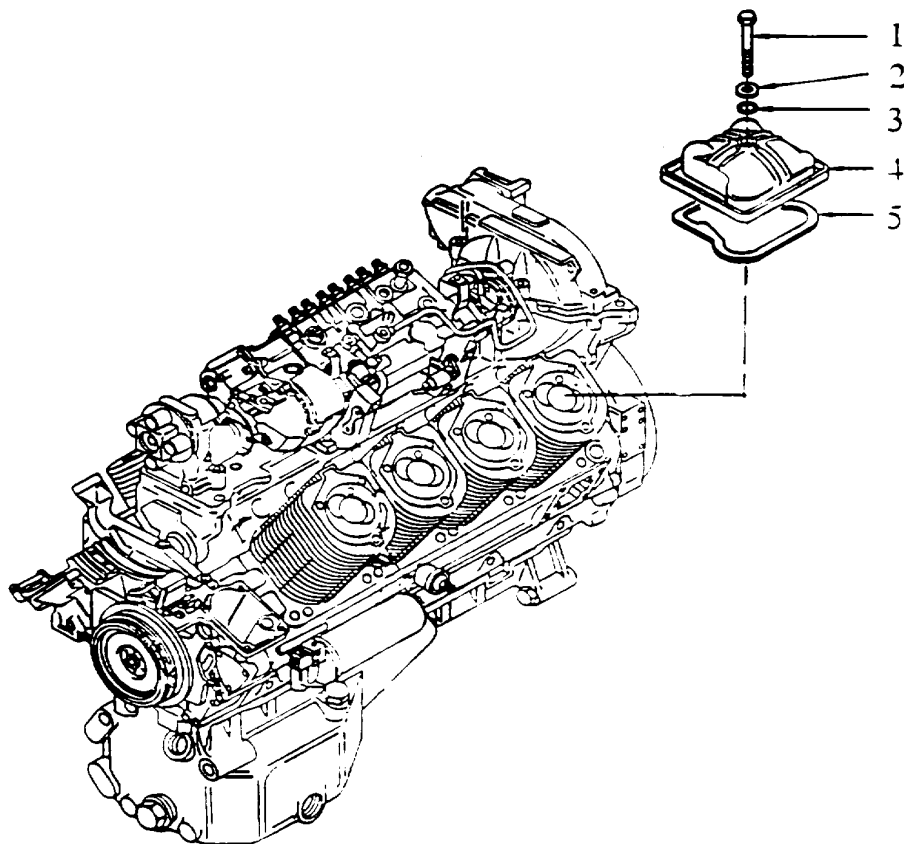


Figure 5-56

I= Intake

E = Exhaust

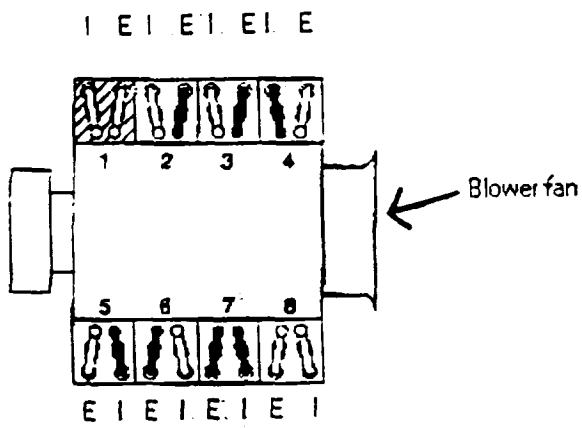


Figure 5-57

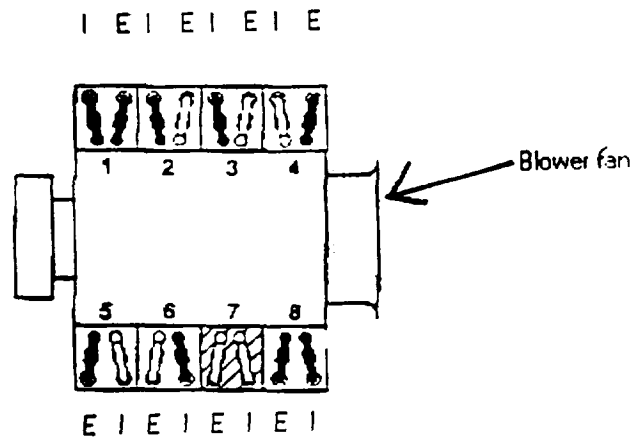


Figure 5-58

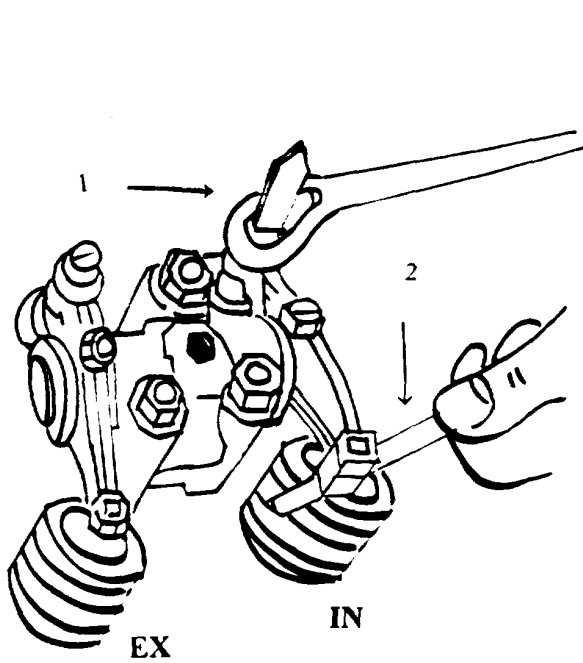


Figure 5-59

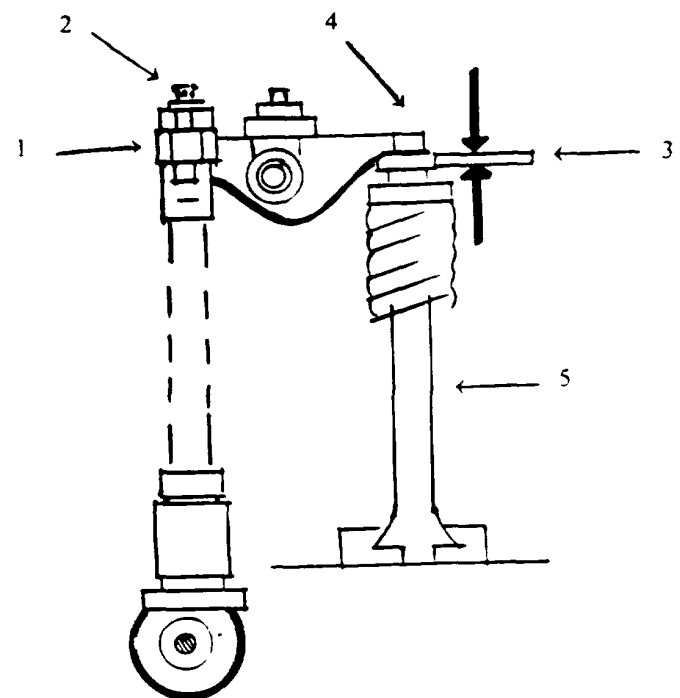


Figure 5-60

5.55 Cooling Blower Assembly Maintenance.

This task covers: a. Removal b. Service c. Installation

INITIAL SETUPTools

General Mechanic's Tool Kit
(item 2, appendix B)
Puller for Centrifugal Oil
Filter (PN 160010)
Sling/hoisting device, Universal
(item 7 appendix B)

Equipment Conditions

Reference
Generator Set, 150kw, shut down,
paragraph 2.5.2

WARNING

Disconnect the negative battery cable first and then the positive battery terminal cable. Failure to observe this warning could result in severe personal injury or death.

REMOVAL

1. Remove unit hood assembly IAW Paragraph 4.14.
2. Remove oil line (27) from cover (7).
3. Remove screw cap hexagon (4), washer spring tension (5), washer flat (6), and remove cover (7).
4. Remove screw cap hexagon (4), washer spring tension (5) and ring (9).
5. Remove cover filter (10) with puller (PN 160010).

SERVICE

1. Clean cover filter (10) and coupling clutch (15) with solvent and cloth to remove old oil and build up.
2. Replace O-ring (8) and O-ring (11).

INSTALLATION

1. Install cover filter (10), ring (9), washer spring tension (5). and screw cap hexagon (4) and tighten.
2. Install cover (7), washer flat (6), washer spring tension (5) and screw cap hexagon (4) and tighten.

3. Install oil line (27) and tighten.
4. Install unit hood assembly IAW paragraph 4.14

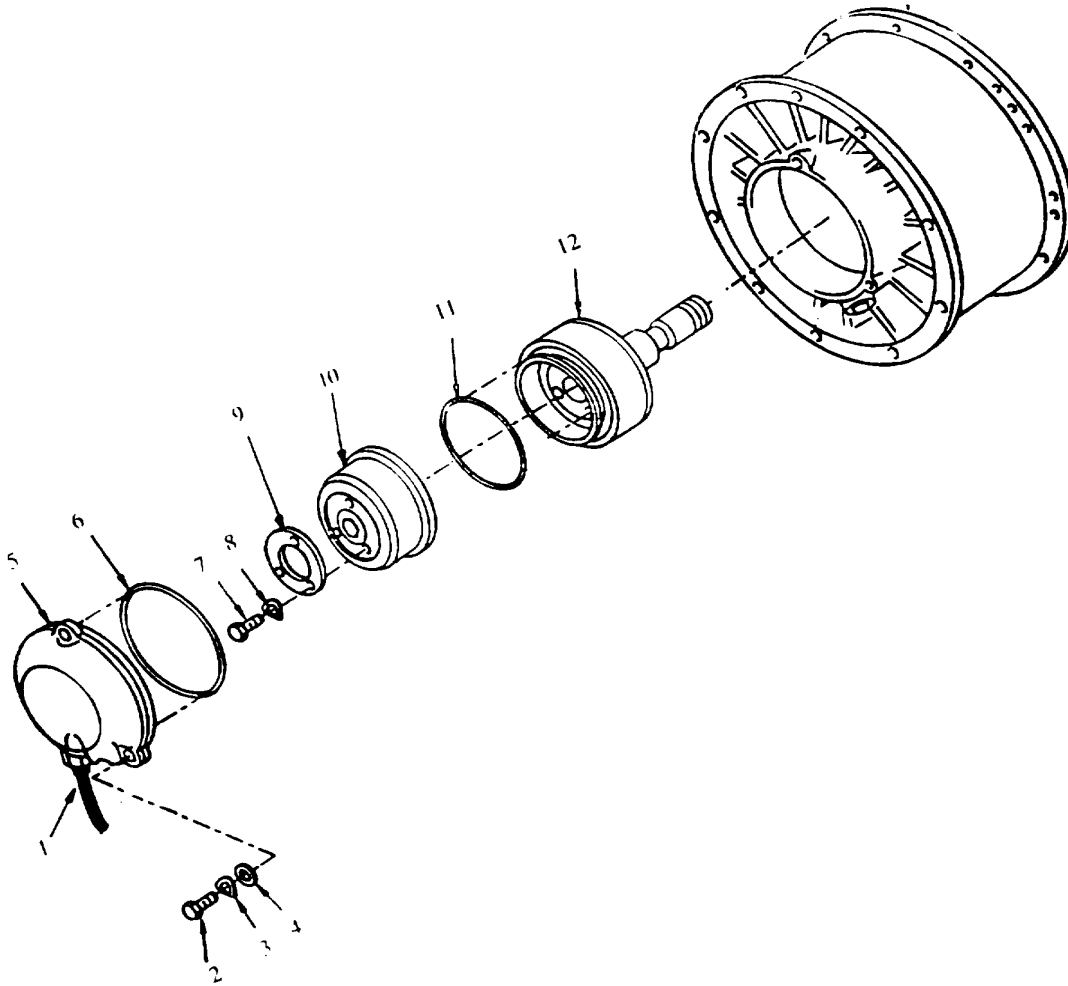


Figure 5-61. Cooling Blower Assembly

APPENDIX A

REFERENCES

A.1 SCOPE.

This appendix lists all forms, regulations, pamphlets, specifications, standards, technical manuals, and field manuals referenced in this manual.

A.2 FORMS.

Recommended Changes to Publications and Blank Forms.	DA Form 2028
Recommended Changes to DA Publications	DA Form 2028-2
Depreservation Guide for Vehicles and Equipment	DA Form 2258
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Report of Discrepancy	SF 364
Product Quality Deficiency Report	SF 368

A.3 ARMY REGULATIONS.

Dictionary of United States Army Terms	AR 310-25
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A.4 DEPARTMENT OF THE ARMY PAMPHLETS.

The Army Maintenance Management System (TAMMS)	DA PAM 738-750
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A.5 MILITARY SPECIFICATIONS.

Preservation, Methods of.	MIL-P-116
Barrier Materials, Transparent, Flexible, Heat Sealable	MIL-B-22191
Generator Sets, Mobile Electric Power; Packaging of	MIL-G-28554

A.6 MILITARY STANDARDS.

Abbreviations for Use on Drawings, and in Specifications, Standards and Technical Documents	MIL-STD-12
Marking for Shipment and Storage	MIL-STD-129
Standard Requirements for Soldered Electrical and Electronic Assemblies	MIL-STD-2000

A.7 TECHNICAL MANUALS.

Procedures of Destruction of Equipment to Prevent Enemy Use	TM 750-244-3
Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools), Electrical Generator Assembly, 150 kW 400 Hz .	TM 9-6115-668-23P
Operator, Unit, and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) Electrical Power Plant III (EPP III) 150 kW 400 Hz	TM 9-6115-669-13&P

A.8 FIELD MANUALS.

Electrical Power Generation in the Field	FM 20-31
First Aid for Soldiers	FM 21-11

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B.1 THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction (section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown in the MAC in column (4) as:

Unit - includes two sub columns, C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F sub column.

General Support - includes an H sub column.

Depot - includes an D sub column.

c. Section III lists the tools and test equipment (both special tools and common tools sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B.2 MAINTENANCE FUNCTIONS. Maintenance functions will be limited to and defined as follows:

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

b. **Test.** To verify serviceability and detect early minor, or intermittent faults by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

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

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

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

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

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, sealing, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

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

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

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

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

B.3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II. Below are listed and defined column entries for Section II, Maintenance Allocation Chart.

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

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

c. Column 3 - Maintenance Function. Column 3 lists the functions to be performed on the items listed in column 2. These functions, are defined in paragraph B.2 above.

d. Column 4 - Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate sub column(s), the lowest level of maintenance authorized to perform the function listed in Column 3. The figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The sub columns of Column 4 are as follows:

- C . . . Operator or Crew
- O . . . Unit Maintenance
- F . . . Direct Support Maintenance
- H . . General Support Maintenance
- D . . . Depot Maintenance

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

f. **Column 6 - Remarks.** This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in section IV.

B.4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENT, SECTION III. Below are listed the column entries for this chart.

a. **Column 1 - Reference: Code.** The numbers in this column coincide with the numbers used in Column 5 of the MAC. The numbers indicated the applicable tool or test equipment for the maintenance function(s).

b. **Column 2 - Maintenance Level.** The codes in this column indicate the maintenance level(s) allocated for the tool or the test equipment.

c. **Column 3 - Nomenclature.** This column lists the noun name and nomenclature of the test equipment or tool required to perform the maintenance function.

d. **Column 4 - National Stock Number.** This column lists the National/NATO Stock Number (NSN) of a specific tool or test equipment.

e. **Column 5 - Tool Number.** This column lists the manufacturer's part number or tool followed by the Contractor and Government Entity (CAGE) Code (5 digit) in parentheses,

B.5 EXPLANATION OF COLUMNS IN REMARKS. SECTION IV. This two column chart provides definition and information of the reference codes in the MAC.

a. **Column 1 - Reference Code.** This code refers to the appropriate letter code in Section II, Column 5.

b. **Column 2 - Remarks.** This column provides the required explanatory information necessary to clarify items appearing in Section II, Column 5.

**Section II, MAINTENANCE ALLOCATION CHART (MAC)
FOR
GEN SET 150 KW**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS	
			C	O	F	H	D			
00	Generator Set, 150KW	Inspect	.3					2,3 2,3 2,3,7,17,18,20 2,3,7,17,18,20 1 Thru 20 300	I	
		Service	.5	.5					A,B	
		Test		.5	.5					K
		Replace			15					
		Repair Overhaul		1.5	3.0					B,C,L D
01	Unit Hood Assembly	Inspect	.2					2,3 2,3 2,3	I	
		Service	.5	.5					A,B	
		Rem/Inst		1.5	2.5					B,C
		Repair		1.5	2.5					B,C,L
0101	Hood Assembly	Inspect	.2					2,3 2,3 2,3	I	
		Service	.5	.5					A,B	
		Rem/Inst		1.5	2.5					B,C
		Repair		1.5	2.5					B,C
02	Control Cabinet Assembly	Inspect	.2					2,3 2,3,7,8 2,3 2,3,7,8 2,3,7,8 2,3,7,8	I	
		Service		.5					A,B	
		Test		.5	.5					B,C,G
		Adjust			.5					C,E
		Rem/Inst		2.0	2.0					B,C
		Replace			2.0					
		Repair		3.0	3.5					B,C,L
0201	Control Cabinet, Control Panel	Inspect	.1					3 2,3 2,3,9	I	
		Test		.5	.8				G	
		Rem/Inst			1.5				C	
		Repair		1.5	2.0				B,C,L	
020101	Wiring, Control Cabinet	Inspect			.1			3 2,3 2,3,6	I	
		Test			1.0				G,J	
		Rem/Inst			3.0				C	
		Repair			3.5				C	
020102	Light Assembly, Panel Illumination	Test		.5			1,2,3	B,G		
		Rem/Inst		1.0			1,2,3	B		
		Repair		1.0			2,3,6	B		
020103	Push Button Switch and Indicator Assembly	Test		5			2,3	B,G		
		Rem/Inst		1.0			1,2,3,4	B		
020104	Push Button Switch	Test		.5			2,3	B,G		
		Rem/Inst		1.0			2,3	B		
		Repair		1.0			2,3	B		
020105	Light Indicator Assembly	Test		.5			1,2,3	B,G		
		Replace		1.0			2,3	B		
		Repair		1.0			2,3	B		

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
020106	Voltage Adjust Assembly	Test Rem/Inst Repair		.3 .5 .5				2, 3 2, 3 2, 3	a B B
020107	Frequency Adjust Assembly	Test Rem/Inst Repair			.5 .5 .5			2, 3 2, 3 2, 3	C C C
020108	Battle Short Switch	Test Rem/Inst Repair		.3 .5 .5				2, 3 2, 3 2, 3	B B B
020109	Panel Dimmer	Test Rem/Inst Repair		.3 .3 5				2, 3 2, 3 2, 3	B B B
0202	Control Cabinet, Connecting Panel	Inspect Test Rem/Inst Repair		.2 .5 1.5 1.5	.8 2, 0 1, 5			2, 3 2, 3 2, 3 2, 3	I B, C B, C B, C, L
020201	Connector Assembly	Test Rem/Inst Repair		.3 .5 .5	.5 .5			2, 3 2, 3 2, 3	B, G B, C B, C
020202	Connecting Assembly	Test Rem/Inst Repair		.3 .5 .5				2, 3 2, 3 2, 3	B, G B B
0203	Control Cabinet Preheating Board	Inspect Test Rem/Inst Repair	.1	5 1.5 1.5	8 1, 5 2, 0			2, 3 2, 3 2, 3 2, 3	I B, C, G B, C B, C, L
020301	Relay Assembly	Test Rem/Inst Repair			.5 .5 .5			2, 3 2, 3 2, 3	C C C
020302	Time Relay Assembly	Test Rem/Inst Adjust Repair			.5 .5 .3 .5			2, 3 2, 3 2, 3 2, 3	C C C, E C
020303	Circuit Breaker Assembly	Rem/Inst Repair		.3 .3				2, 3 2, 3	B B

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
020304	Resistor Assembly	Rem/Inst		.3				2, 3	B
		Repair		.3				2, 3	B
020305	Wiring, Preheating Board	Test			1.5			2, 3	C
		Replace			3.0			2, 3	C
		Repair			1.5			2, 3	C
0204	Control Cabinet, DYNA II Installation	Rem/Inst			.5			2, 3	C
		Repair			.5			2, 3	C
020401	DYNA II, Power Control Assembly	Rem/Inst			.5			2, 3	C
		Repair			.5			2, 3	C
020402	DYNA II Digital Module	Test			.5			2, 3	C
		Replace			.5			2, 3	C
		Repair					2.0	2, 3	D
0205	Cabinet Assembly	Test		.5	.5			2, 3	B, C
		Rem/Inst		1.5	2.0			2, 3, 12, 13, 15	B, C
		Repair		1.5	2.0			2, 3, 12, 13, 15	B, C, L
020501	Key Assembly	Rem/Inst		.3				2, 3	B
		Repair		.3				2, 3	B
020502	Cabinet Illumination	Test		.3				2, 3	B
		Rem/Inst		.3				2, 3	B
		Repair		.3				2, 3	B
020503	Diode Assembly	Rem/Inst		.3				2, 3	B
		Repair		.3				2, 3	B
020504	Time Relay Assembly	Test			.5			2, 3	C, G
		Adjust			.3			2, 3	C
		Rem/Inst			.5			2, 3	C
		Repair			.5			2, 3	C
020505	Transformer Assembly	Test		.5				2, 3	B, G
		Rem/Inst		.5				2, 3	B
		Repair		.5				2, 3	B
020506	Resistor Assembly, Mounted	Rem/Inst			.5			2, 3	C
		Repair			.5			2, 3	C
020507	Automatic Voltage Regulator Assembly	Test			.5			2, 3	C, G
		Rem/Inst			.5			2, 3	C
		Adjust			1.0			2, 3, 16	C
		Repair			1.0			2, 3	C

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
02050701	Printed Circuit Card Assembly	Replace Repair			1.0		2.0	2, 3 2, 3	C D
020508	Equipment Protection Assembly	Test Rem/Inst Adjust Repair			.5 .5 1.0 1.0			2, 3 2, 3 2, 3 2, 3	C, G C C, M C
02050801	Printed Circuit Card Assembly	Replace Repair			1.0		2.0	2, 3 2, 3	C D
020509	Relay Assembly	Rem/Inst Repair		.5 .5	.5			2, 3, 16 2, 3	B B, C
020510	Contactoer Assembly	Rem/Inst Repair			1.0 1.0			2, 3 2, 3	C C
020511	Filter Box Assembly	Test Rem/Inst Repair			1.0 1.0 1.0			2, 3 2, 3 2, 3	C C C
0206	Housing, Control Cabinet	Rem/Inst Repair		1.0 1.0	1.0			2, 3 2, 3	B B, C, L
03	Fuel Tank Assembly	Inspect Service Rem/Inst Repair	.2	.5 1.5 2.0	2.5			2, 3 2, 3 2, 3	I A, B B B, C, L
0301	Fuel Hose Assembly	Inspect Replace Repair	.2	2.0	2.0			2, 3 2, 3	I B C
0302	Hose Assembly, Fuel	Inspect Rem/Inst Repair	.2	1.5 1.5	2.0			2, 3 2, 3	I B
04	Battery Set Assembly	Inspect Service Test Rem/Inst Repair	.1	.1 .3 1.5 1.0				2, 3 2, 3 2, 3 2, 3	I A, B B B B, L
05	Air Filter Assembly	Inspect Service Rem/Inst Repair	.1	.5 1.0 2.0				2, 3 2, 3 2, 3	I A, B B B, L

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
06	Engine Preheating Assembly	Inspect Service Rem/Inst Repair	.1	.5 2.0 2.5				2,3 2,3 2,3	I A, B B B, L
0601	Gas Exhaust Assembly	Inspect Rem/Inst Repair	.2	3.0 3.0				2,3 2,3	I B B
0602	Hose Assembly, Oil	Inspect Rem/Inst Repair	.2		2.5 3.0			2,3 2,3	I C C
0603	Mounting Plate	Inspect Rem/Inst	.2	3.0				2,3	I B
07	Muffler Assembly	Inspect Rem/Inst Repair	.2	3.0 3.0				2,3 2,3	I B B, L
08	Scavenge Pump Assembly	Inspect Service Rem/Inst Repair	.2	.5 1.0 1.0				2,3 2,3 2,3	I A, B B B, L
0801	Scavenge Pump	Replace Repair		1.0	1.5			2,3 2,3	B C
09	Synchronous Alternator Assembly	Inspect Service Test Replace Rem/Inst Repair Overhaul	.1	.3	.5 10.0 10.0 10.0			2,3 2,3 2,3, 8, 17 2,3, 8, 17 2,3, 8, 17 1 thru 20	I A, B C, K C C C, L D
0901	Bearing Assembly, Rotor side	Test Rem/Inst Repair			.5 5.0 5.0			2,3 2,3 2,3	C C C
0902	Excitor Stator Assembly	Test Rem/Inst Replace Repair			.5 5.0 5.0		3.0	2,3 2,3 2,3	C C C D

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0903	Bearing Assembly, Excitor Side	Test Rem/Inst Repair			5 5.0 5.0			2, 3 2, 3 2, 3	C C C
0904	Rotor Assembly	Test Rem/Inst Replace Repair			.5 5.0 5.0		3.0	2, 3 2, 3 2, 3 2, 3	C c C D
0905	AC-Stator Assembly	Test Rem/Inst Replace Repair			.5 5.0 5.0		3.0	2, 3 2, 3 2, 3 2, 3	C C C D
10	Engine Assembly	Inspect Service Test Rem/Inst Repair Overhaul	.1	.3	.5 10.0 10.0		150	2, 3 2, 3 2, 3, 8, 16-18 2, 3, 8, 16-18 2, 3, 8, 16	I A, B CK C C, L D, H
1001	Prefilter Assembly, Fuel	Inspect Service Rem/Inst Replace	.1	.5 .5 .5				2, 3 2, 3 2, 3	I A, B B B
1002	Two Step Fuel Filter Assy	Inspect Service Rem/Inst Replace	.1	.5 .5 .5				2, 3 2, 3 2, 3	I B B B
1003	Pick Up Cable Assy	Inspect Rem/Inst Repair	.1		5 .5			2, 3 2, 3	I C C
1004	Actuator Cable Assy	Inspect Rem/Inst Repair	.1		5 .5			2, 3 2, 3	I C C
1005	Engine	Inspect Service Test Replace Rem/Inst Repair Overhaul	.2	.5	1.5 27.0 27.0 30.0		150	2, 3 2, 3 2, 3, 8, 16-20 2, 3, 8, 16-20 2, 3, 8, 16-20 2, 3, 8, 16-20	I A, B C, K C C C, L D, H

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
100501	Engine Cable Harness Assy	Test			3.0			2,3	C, G
		Rem/Inst			2.0			2,3	C
		Replace			10.0			2,3	C
		Repair			2.0			2,3	C
100502	Cable Harness Assy	Test			.5			2,3	C, G
		Rem/Inst			2.0			2,3	C
		Replace			1.0			2,3	C
		Repair			2.0			2,3	C
100503	Connecting Elbow Assy. Air	Rem/Inst			1.0			2,3	C
		Repair			2.0			2,3	C
100504	Air Shielding Assy, Turbo	Rem/Inst			1.0			2,3	C
		Repair			2.0			2,3	C
100505	Oil Tube Assy, Turbo LH	Rem/Inst			1.0			2,3	C
		Repair			2.0			2,3	C
100506	Oil Tube Assy, Turbo RH	Rem/Inst			1.0			2,3	C
		Repair			2.0			2,3	C
100507	Oil Tube Assy, Turbo Return	Rem/Inst			1.0			2,3	C
		Repair			2.0			2,3	C
100508	Turbocharger Assy	Rem/Inst			1.0			2,3	C
		Repair			2.0			2,3	C, L

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
100509	Suction Pipe Assy	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100510	Breather Pipe Assy	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100511	Breather Pipe Assy, Crankcase	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100512	Exhaust Pipe Assy, LH	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100513	Exhaust Pipe Assy, RH	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100514	Breather Assy, Crankcase	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100515	Oil Return Tube Assy. Breather	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100516	Cover Plate Assy, Oil Cooler	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100517	Cooling Blower Assy	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100518	Linkage Assy	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100519	Cooling Air Duct Assy, Rear LH	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100520	Cooling Air Duct Assy, Rear RH	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C
100521	Cooling Air Duct Assy, Front RH	Rem/nst Repair			1.0			2, 3	C
					2.0			2, 3	C
100522	Valve Drive Assy	Rem/Inst Repair			1.0			2, 3	C
					2.0			2, 3	C

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
100523	Fuel Injector Assy	Rem, Inst Replace Repair			1.0 1.0			2, 3 2, 3 2, 3	C C D
100524	Cylinder Head Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100525	Drive Coupling Assy	Rem/Inst Repair			1.0 2.0			2, 3 2, 3	C C
100526	Two Wheel Drive Gear Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100527	Timing Device Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100528	Blower Drive Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100529	Oil Pan Assy	Rem/Inst Repair			1.0 2.0			2, 3 2, 3	C C
100530	Oil Line Assy	Rem/Inst Repair			1.0 2.0			2, 3 2, 3	C C
100531	Piston Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100532	Connecting Rod Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100533	Crankshaft Assy	Replace Repair					5.0 5.0	2, 3 2, 3	D D
100534	Block, Engine	Replace Repair					5.0 5.0	2, 3 2, 3	D D
11	Wiring Harness, Electrical Generator 150KW	Inspect Test Rem/Inst Repair	.2		1.0 2.5 2.5			2, 3 2, 3 2, 3	I C, G C C
12	Base Frame Assy	Inspect Service Rem/Inst Repair	.2	5 3.0	3.0 3.5			2, 3 2, 3 2, 3	I A, B B, C C, L

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
1201	Subcurrent Filter Assy	Service Rem/Inst Repair		5 .8 .8				2, 3 2, 3 2, 3	A, B B B
1202	Slave Receptacle Assy	Rem/Inst Repair		.8 .8				2, 3 2, 3	B B
1203	Frame	Replace Repair			10		10	2, 3 2, 3	C D, F

Section III, Tool and Test Equipment Requirements

FOR

GEN SET 150 KW

Tool or Test Equipment	Maintenance Level	Nomenclature	National Stock Number	Tool Number
1	O, F	Lamp Extractor		3SB1902-2AD
2	O, F	Tool kit, Auto	5180-00-177-7033	SC-5180-90-CL-N26-1
3	O, F	Tool kit, Fuel/Elec	5180-00-754-0655	SC5180-91-CL-R13-HR-1
4	O, F	Wrench, Oil Filter		67.600.47.111
5	F	Watch Stop		
6	F	Resistor, 1000 OHMS .25 Watt		525.17.0301
7	O, F	Mandrel		190200
8	F	Wrench, Shop Manufactured		505.09.0063
9	F	Fork-Head, Screwdriver		505.38.0011
10	F	Removal Tool	5210-00-177-6966	MS27495R20
11	F	Installation Tool	5210-00-177-6967	MS27495A20
12	F	Removal Tool	5210-00-409-5206	M81969/8-08
13	F	Installation Tool	5210-00-018-0529	M81969/8-07
14	F	Crimp Tool, Hydraulic		505.38.0003
15	F	Wrench, Socket, Shop Manufactured		505.38.0010
16	F	X/Y Printer	6625-01-438-6968	RS 3200
17	F	Eyebolt		02417150
18	F	Eyebolt		02417148
19	F, D	Load Bank, 150KW		Avtron K675a
20	F, D	Engine Stand		13230E6806
21	F, D	Shop Set, Automotive	4910-00-754-0654	SC4910-95-CLA47-HR
22	F, D	Shop Set, Electrical		

Section IV, REMARKS
FOR
GEN SET 150 KW

Reference Code	Remarks
A	Preventative Maintenance Checks and Services (PMCS)
B	Unit Maintenance Instructions
C	Direct Support Maintenance Instructions
D	Depot Maintenance Work Requirement (DMWR)
E	In Accordance with Procedures in applicable TM
F	Weld and Straighten
G	Continuity Test
H	Test Pressure Output
I	Visual inspection
J	Voltage Test
K	Operation Test
L	Repair by Replacement of Sub-Assemblies/Components
M	Adjust to Specifications in Applicable TM

APPENDIX C

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

Section I. INTRODUCTION

C.1 SCOPE.

This appendix lists components of the end item and basic issue items for the generator set 150 kW to help you inventory the items for safe and efficient operation of the equipment.

C.2 GENERAL.

The Components of End Item (COEI) and Basic Issue Items (BII) Lists are divided into the following sections:

C.2.1 Section II. Components of End Item. This listing is for information purposes only, and is not authority to requisition replacements. There are no components of end item for the generator set 150 kW.

C.2.2 Section III. Basic Issue Items. These essential items are required to place the (enter name of end item) in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the generator set 150 kW during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

C.3 EXPLANATION OF COLUMNS.

C.3.1 Column (1). Illus Number. Column (1), Illus Number, gives you the number of the item illustrated.

C.3.2 Column (2). National Stock Number. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

C.3.3 Column (3). Description and Usable On Code. Column (3), Description and Usable On Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the CAGEC (Commercial and Government Entity Code) (in parenthesis) and the part number.

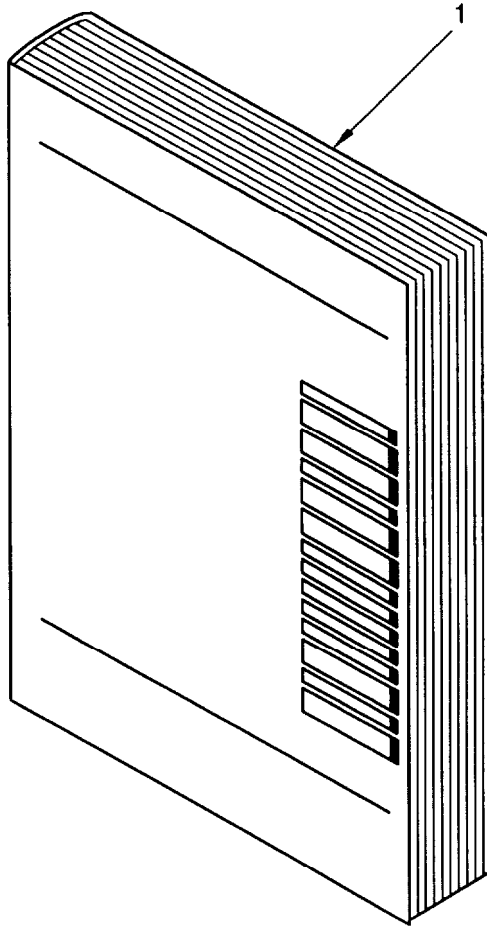
C.3.4 Column (4). U/M (unit of measure). Column (4), U/M (unit of measure), indicates how the item is issued for the National Stock Number shown in column two.

C.3.5 Column (5). Qty Rqr (quantity required). Column (5), Qty Rqr, indicates the quantity required.

Section II. COMPONENTS OF END ITEM

(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty Rqr
		This section is not applicable to the generator set 150 kW		

Section III. BASIC ISSUE ITEMS



(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4)	(5) QtY Rqr
1		Manual, Technical TM 9-6115-668-13	E A	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D.1 SCOPE.

This appendix lists additional items you are authorized for the support of the generator set 150 kW.

D.2 GENERAL.

This list identifies items that do not have to accompany the equipment and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D.3 EXPLANATION OF LISTING.

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description. If item required differs for different models of this equipment, the model is shown under the "Usuable on" heading in the description column.

APPENDIX E

EXPENDABLE AND DURABLE ITEMS LIST

Section I. INTRODUCTION

E.1 SCOPE.

This appendix lists expendable and durable items that you will need to operate and maintain the generator set 150 kW. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-790, Expendable/Durable Items (except medical, class V repair parts, and heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

E.2 EXPLANATION OF COLUMNS.

E.2.1 Column 1. Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g., "Use cleaning cloth, Item 3, Appendix E").

E.2.2 Column 2. Level. This column identifies the lowest level of maintenance that requires the item.

E.2.3 Column 3. National stock number. This is the national stock number assigned to the item which you can use to requisition it.

E.2.4 Column 4. Item name, description, Commercial and Government Entity Code (CA-GEC) and part number. This provides the other information you need to identify the item.

E.2.5 Column 5. Unit of Measure. This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Section II. EXPENDABLE AND DURABLE ITEMS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION CAGEC, PART NUMBER	(5) U/M
1	C	9150-00-152-4117	Lubricating Oil, Engine, MIL-L-2104, 15/40w	
2	C		Lubricating Oil, Engine, 5/30W	
3	C, O	7920-01-338-3329	Cloth, Cleaning, TX-250	
4	O		Bearing grease	
5	O		Talc, technical grade	
6	O, F		Lubricant	
7	O		Light-duty detergent, commercial	
8	O		Kerosene	
9	O		Lubricating grease	
10	F		Cable ties	
11	F		Adhesive	
12	F	3439-00-974-1873	Solder, Tin Alloy, SN60WRAP2, 1 Lb. Spool	
13	F		Thermoconductive Paste	
14	F		Heat-shrink tubing	
15	F		Hylomar	
16	F		Loctite 243	
17	F		Adhesive tape	
18	F		Heat-shielding tape	
19	F		Sealing tape	
20	F		Double-sided Adhesive Tape	
21	F		Plastic Bags	
22	F		Rubber Bands	

APPENDIX F

OPERATOR'S LUBRICATION INSTRUCTIONS

Section I. INTRODUCTION

F.1 GENERAL.

This appendix is not applicable to the generator set 150 kW.

APPENDIX G

TORQUE LIMITS

G.1 BOLTS.

Bolt alloy: K18-8(A4)-70, DIN 931/933, in lengths up to 8 x nominal thread diameter (d) at room temperature, strength class 70 (normal), work-hardened.

NOTE

Coefficient of friction $\mu = 0.16$

Coarse-pitch thread	Tightening torque, ft-lb (Nm)
M5	3.5 (4.7)
M6	6 (8.2)
M8	14.5 (19.6)
M10	28.8 (39)
M12	49.4 (67)
M14	78.2 (106)
M16	119.5 (162)
M18	166 (225)
M20	233 (316)
M22	174 (236)
M24	224 (304)
M27	327 (443)
M30	446 (605)

G.2 STUDS.

Stud alloy: A1Mg 3

Coarse-pitch thread	Tightening torque, ft-lb (Nm)
M3	0.6 (0.8)
M4	1.5 (2.0)
M5	2.6 (3.5)

GLOSSARY

Section I. ABBREVIATIONS

COMMON ABBREVIATIONS.

The common abbreviations used in this manual are in accordance with MIL-STD-12D.

SPECIAL OR UNIQUE ABBREVIATIONS.

The following are abbreviations and symbols that are used in this manual and not listed in MIL-STD-12D.

AAL	additional authorization list
BII	basic issue
°C	degrees Celsius
CAGE	commercial and government entity
CAGEC	commercial and government entity code
COEI	components of end item
CPC	corrosion prevention and control
CTA	common table of allowance
DOD	Department of Defense
EIR	equipment improvement recommendation
°F	degrees Fahrenheit
Hz	hertz
JTA	joint table of allowances
k g	Kilogram
kW	kilowatt
m	meter (metric measure)
MAC	maintenance allocation chart
MTOE	modification table of organization and equipment
Nm	newton meter
NSN	national stock number
PMCS	preventive maintenance checks and services
RPSTL	repair parts and special tools list
SMR	source, maintenance, and recoverability
TAMMS	The Army Maintenance Management System
TDA	table of distribution and allowances
TMDE	test, measurement, and diagnostic equipment
UOC	usable on code

Section II. DEFINITION OF UNUSUAL TERMS

UNUSUAL TERMS.

The following are terms that are used in this manual and not listed in the Army dictionary (AR 310-25).

None.

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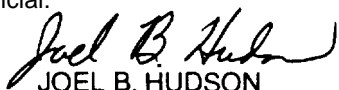
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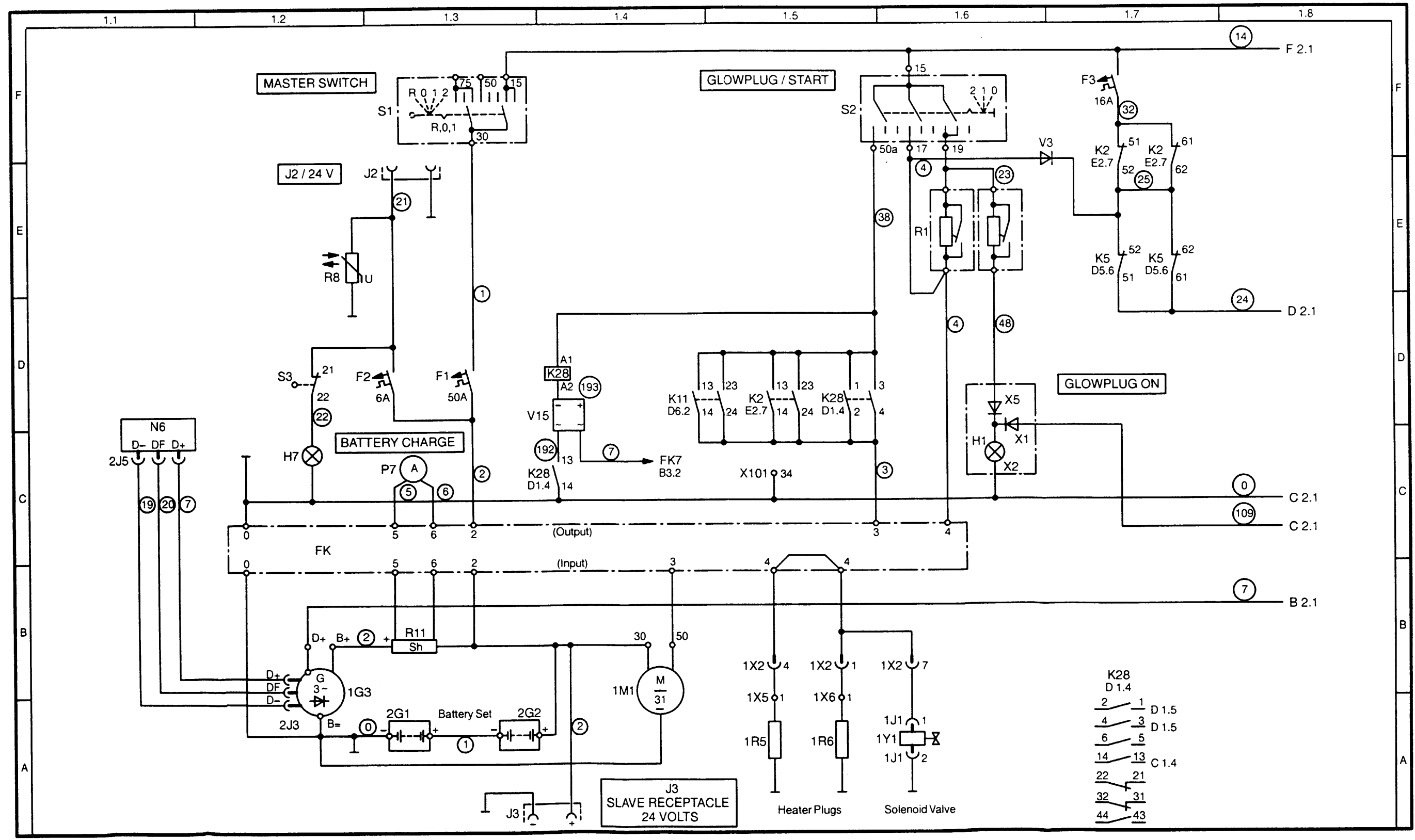
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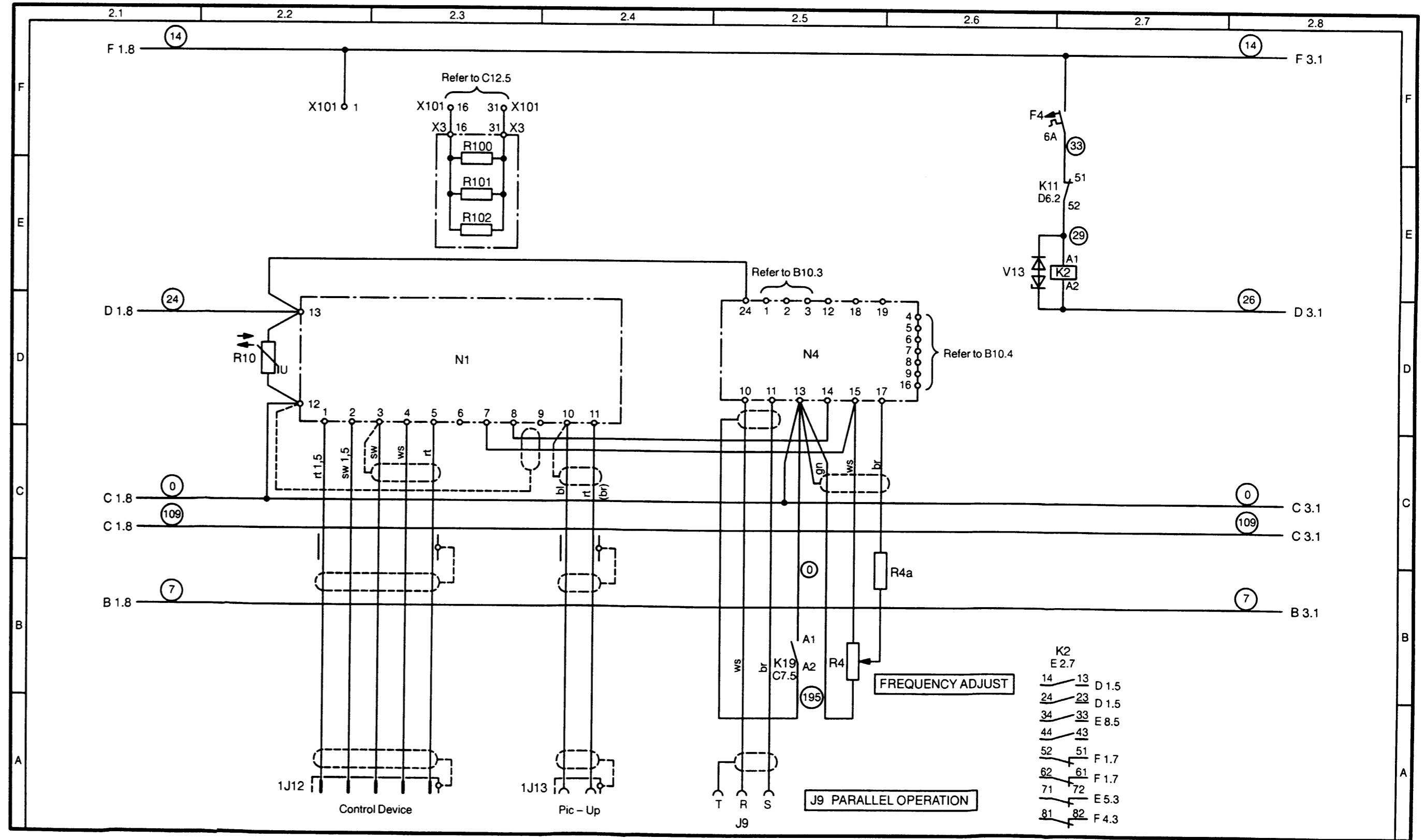
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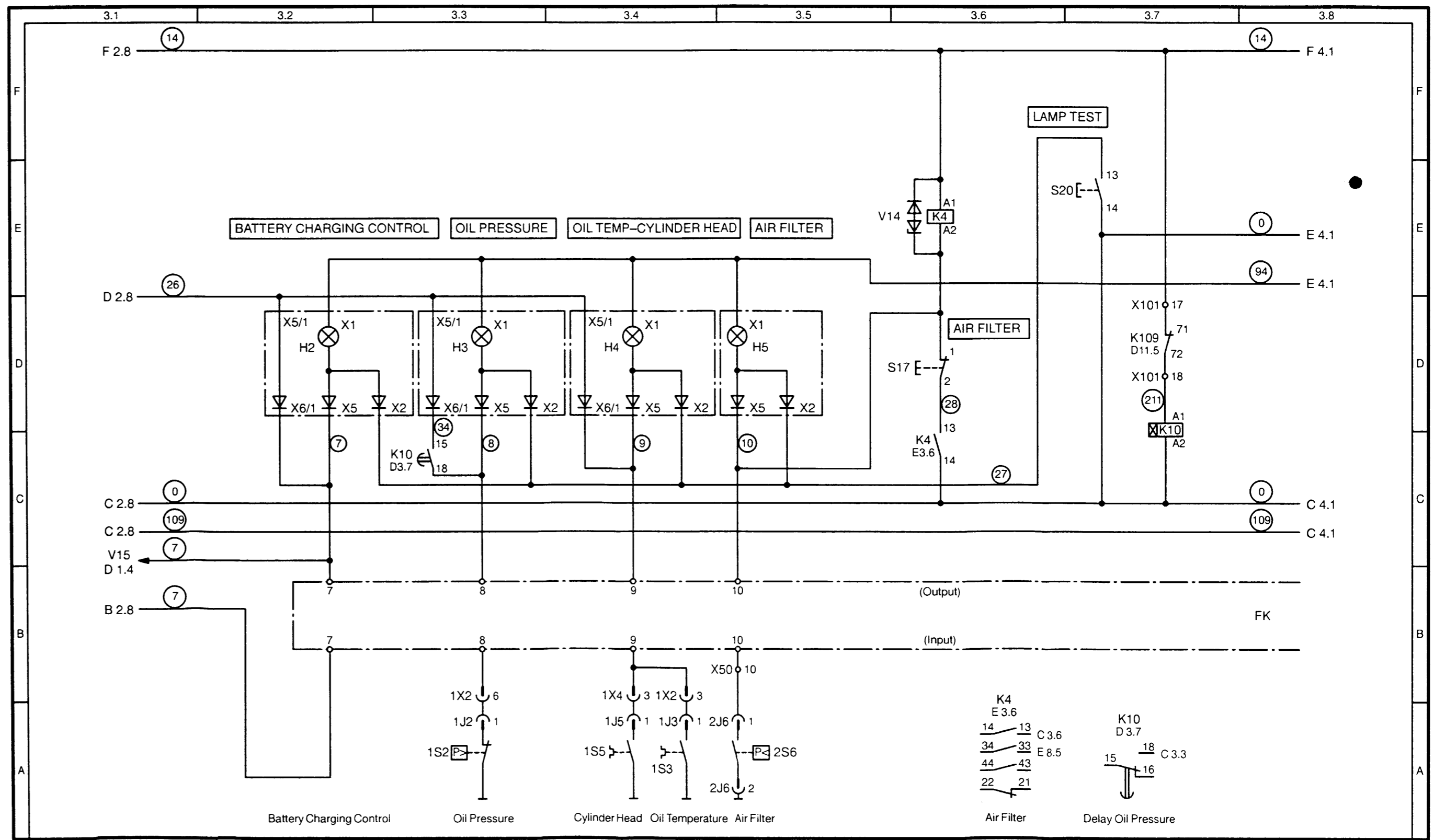
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(Sheet 1 of 11)



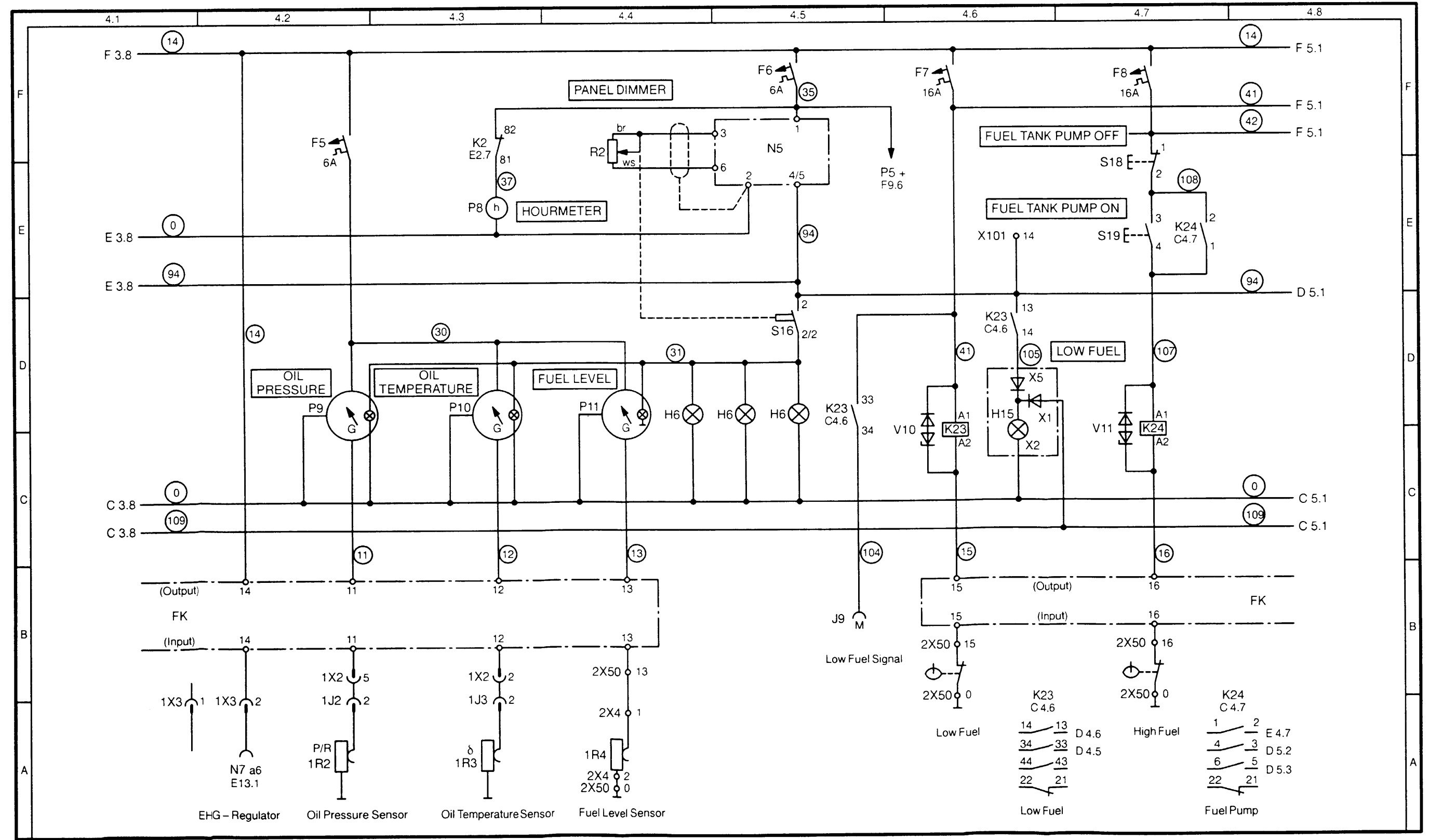
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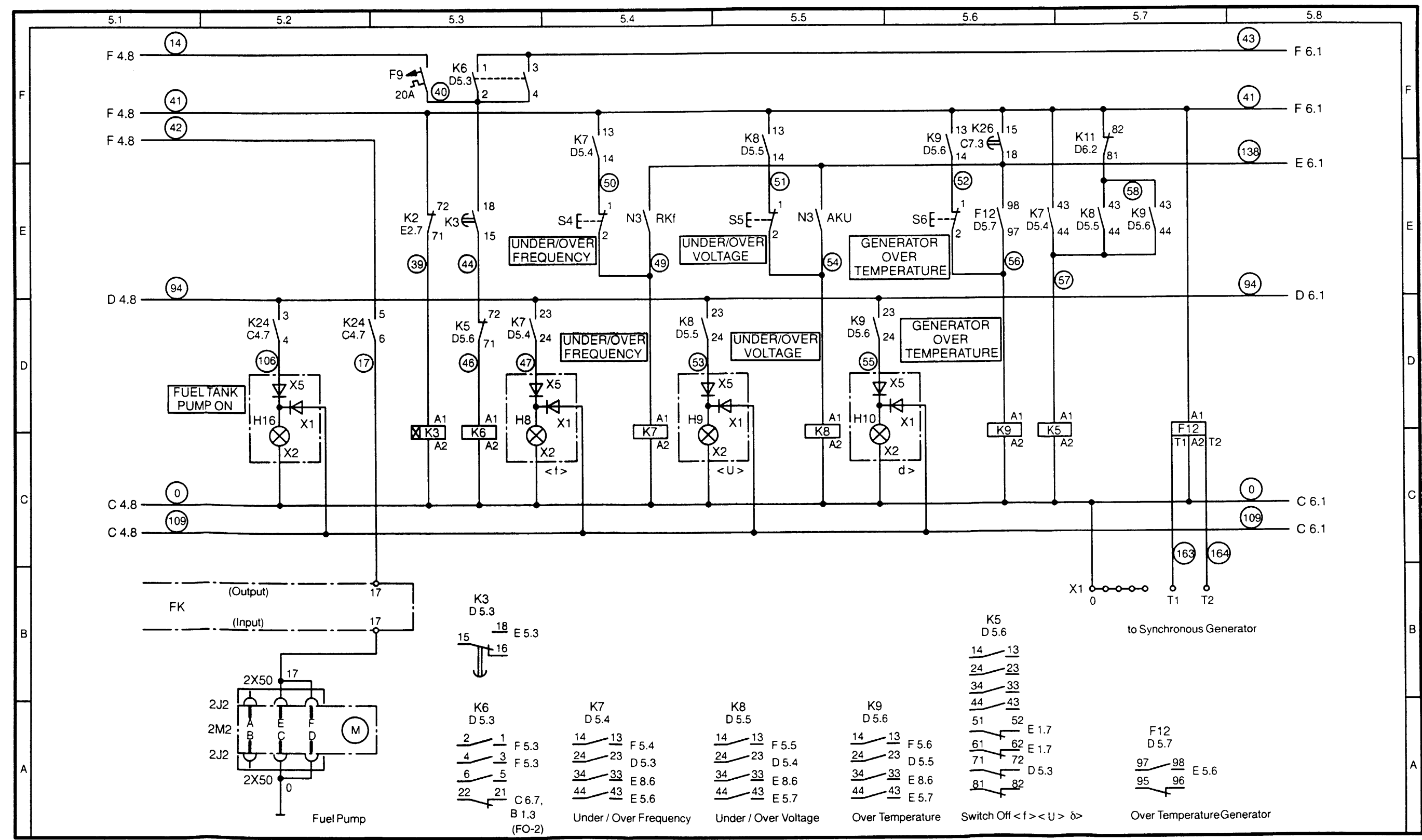
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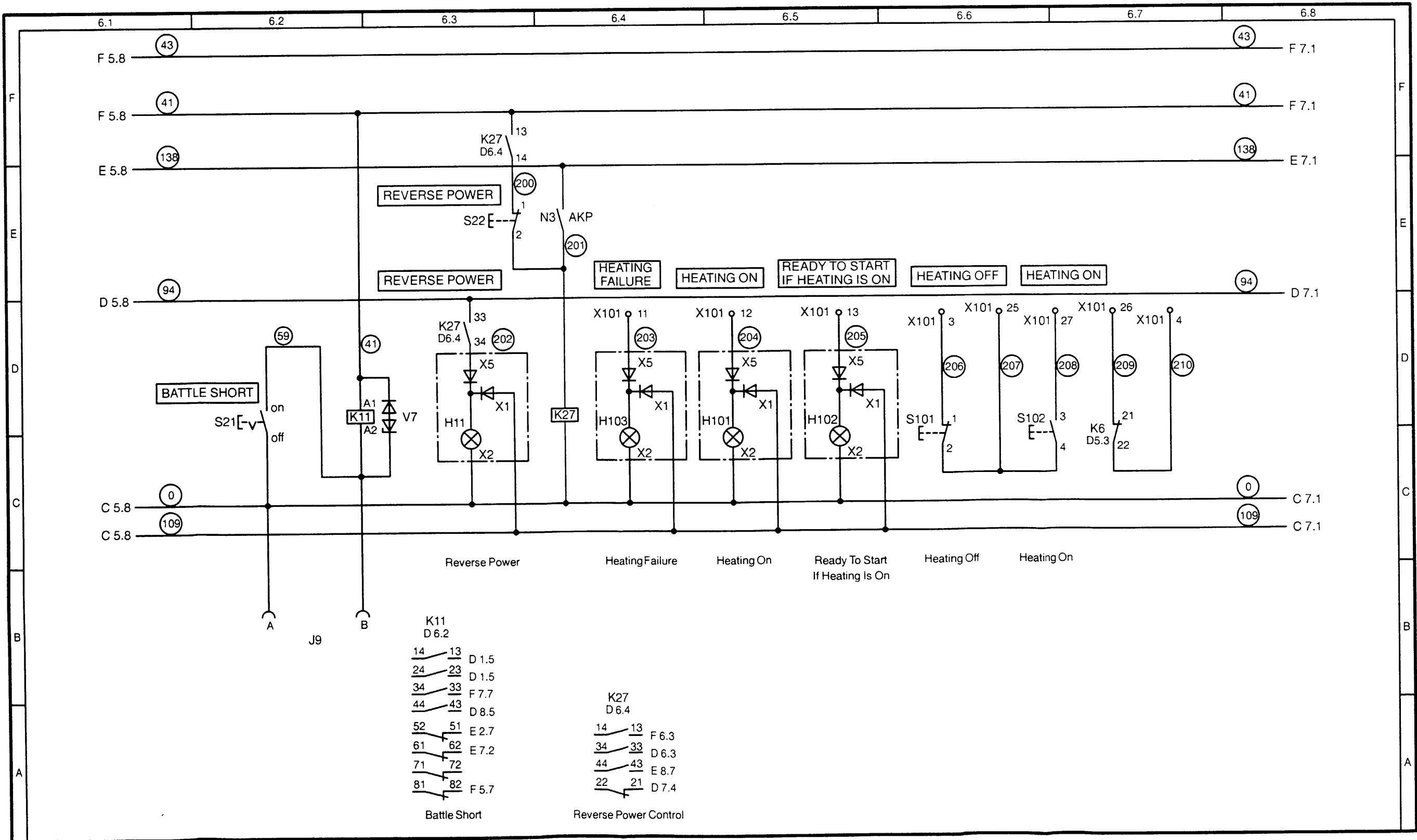
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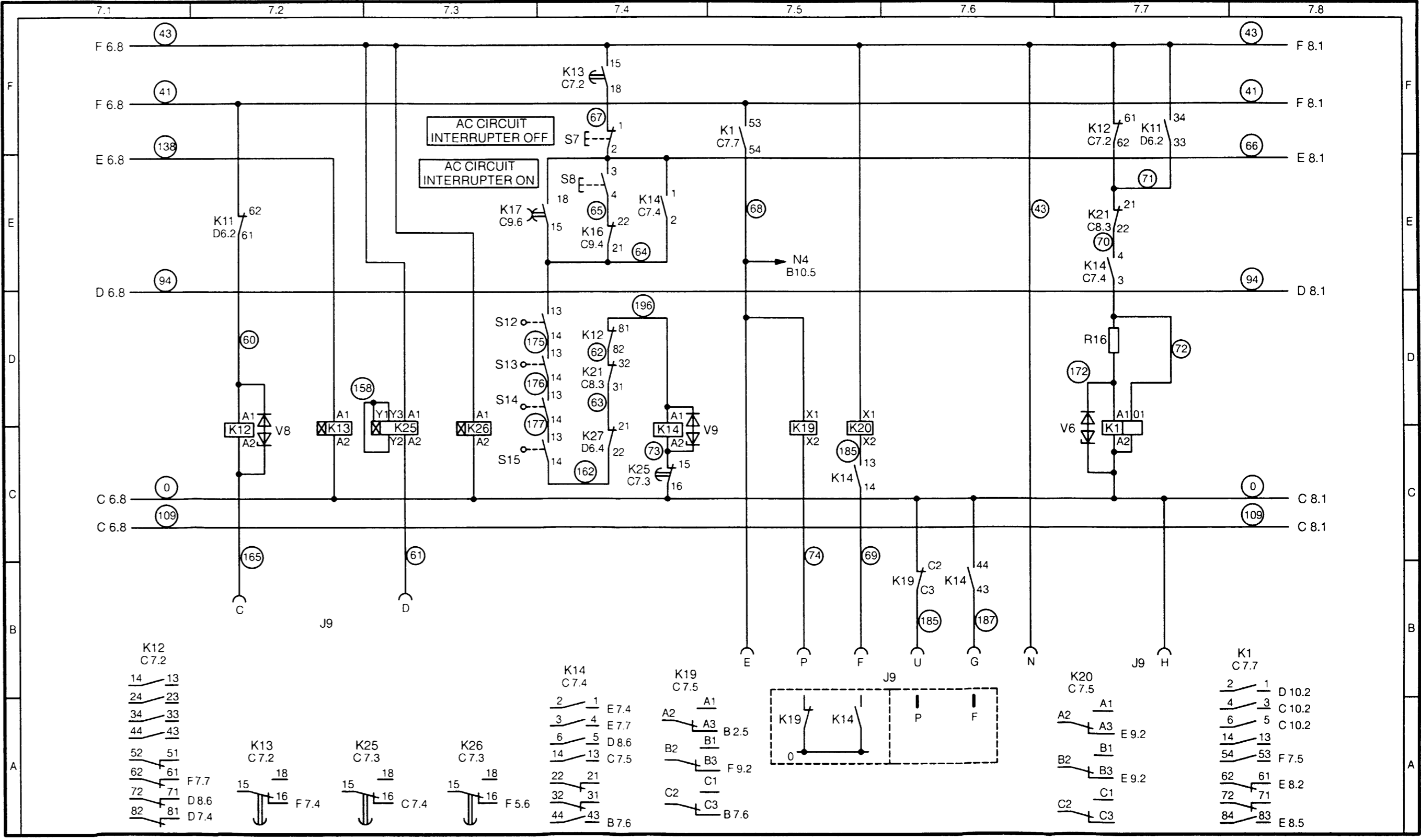
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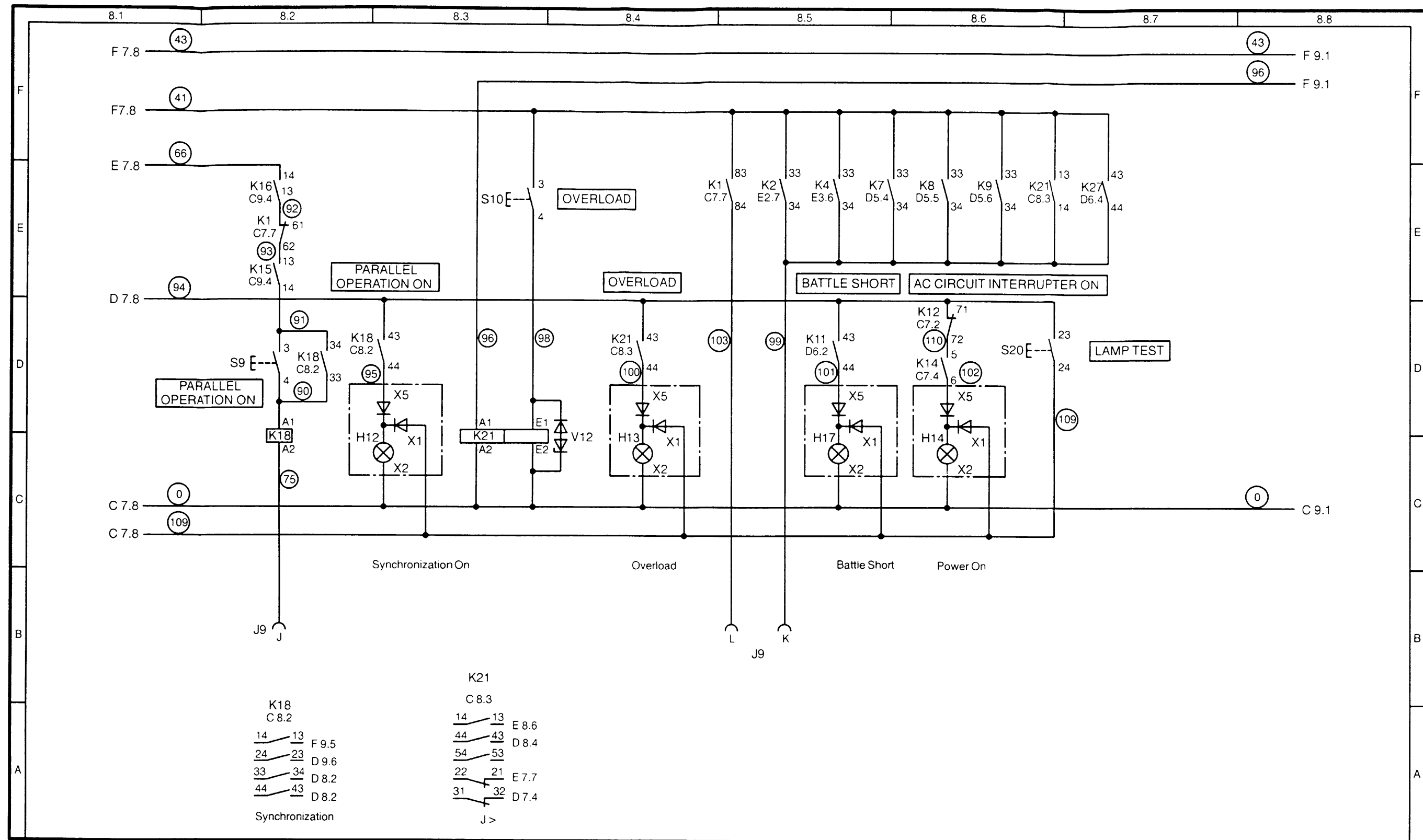
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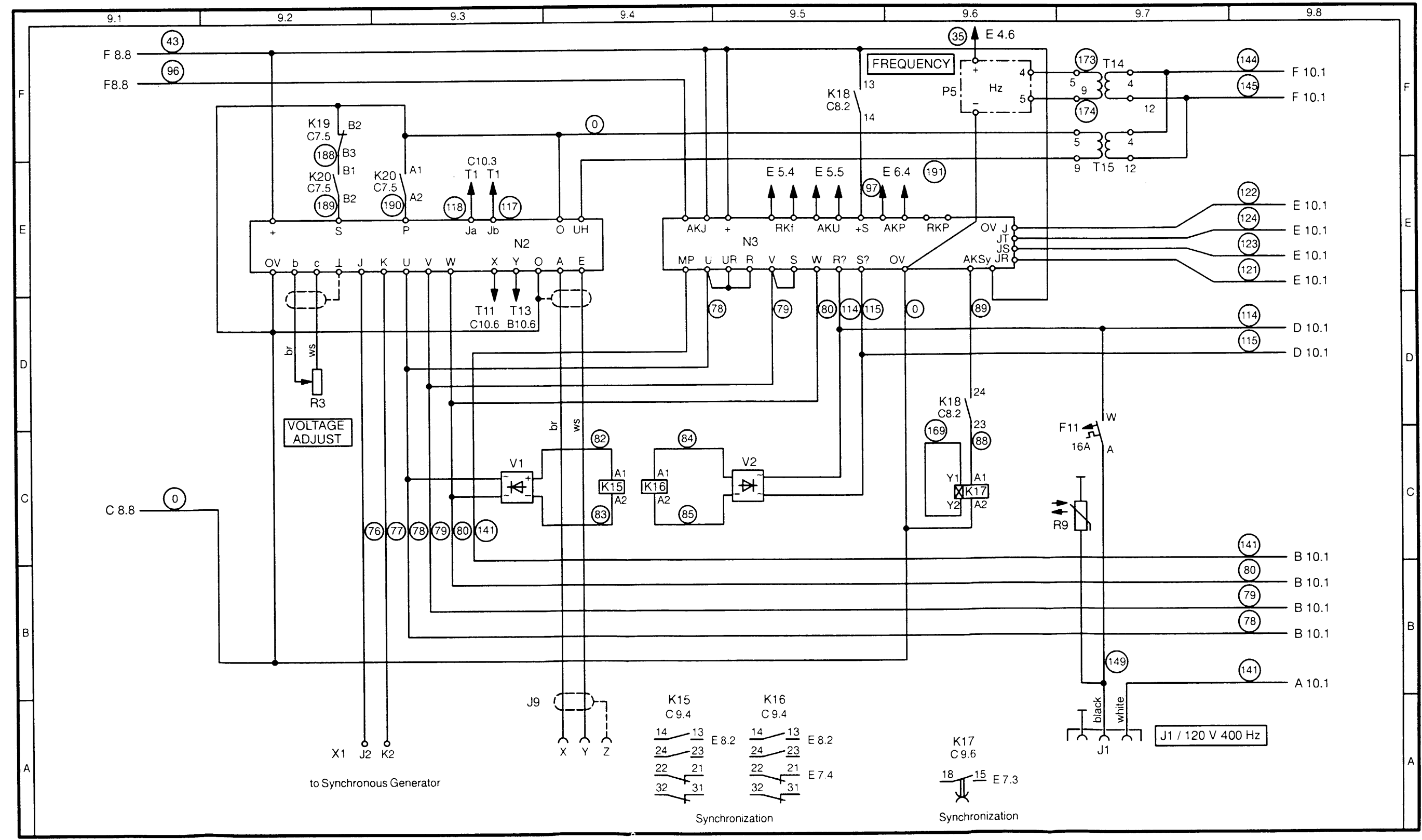
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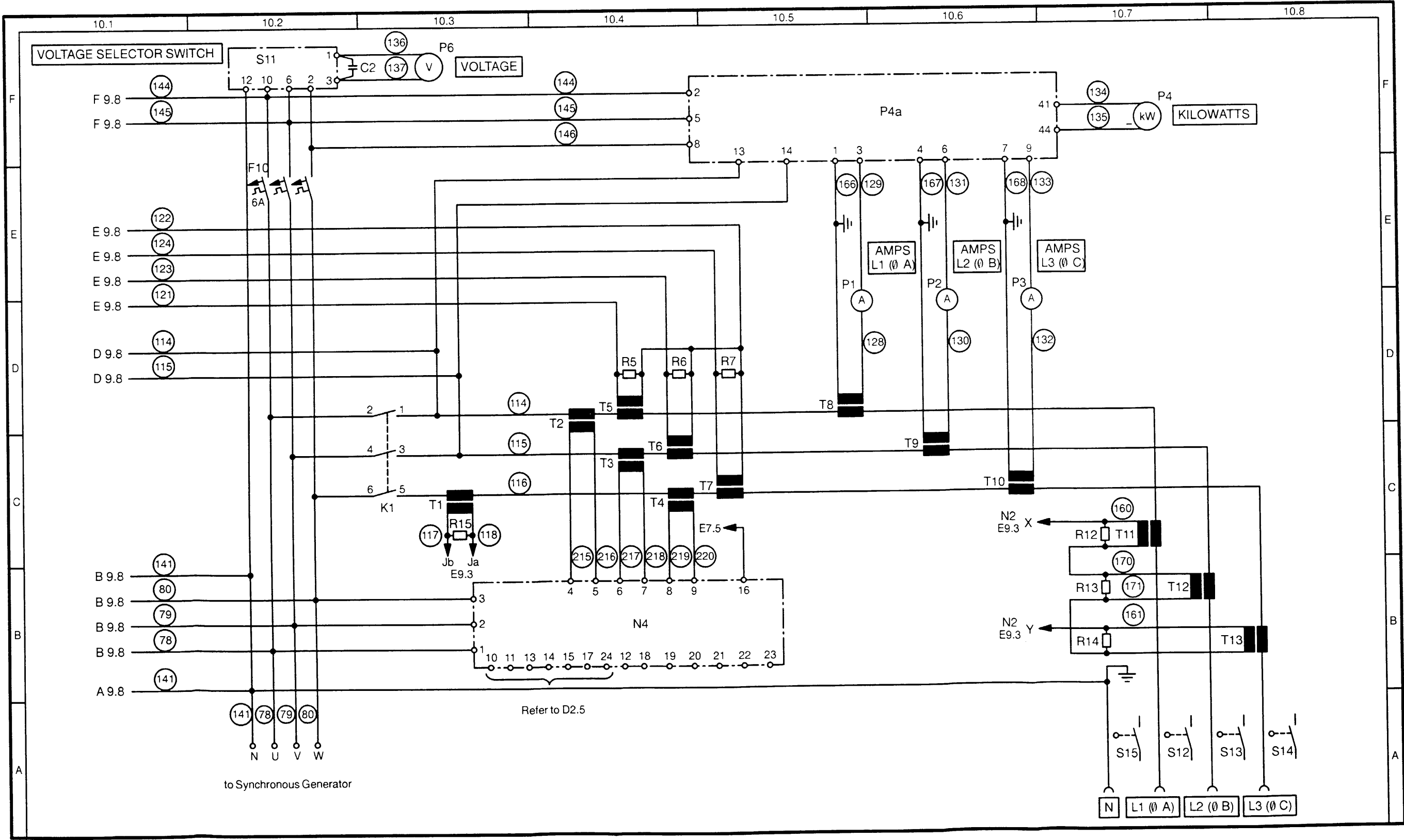




FO-1 Generator Set 150 kW Wiring Diagram

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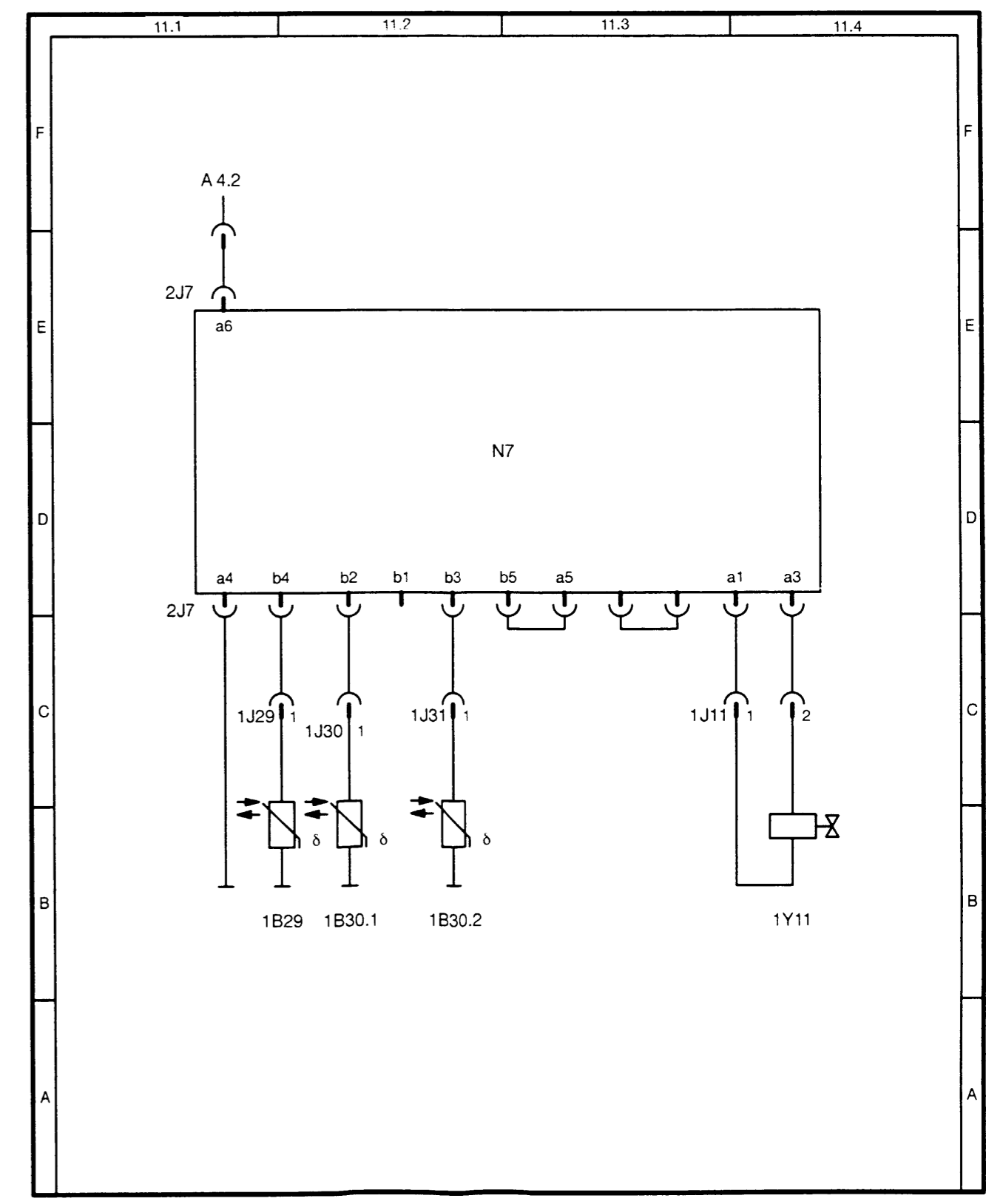
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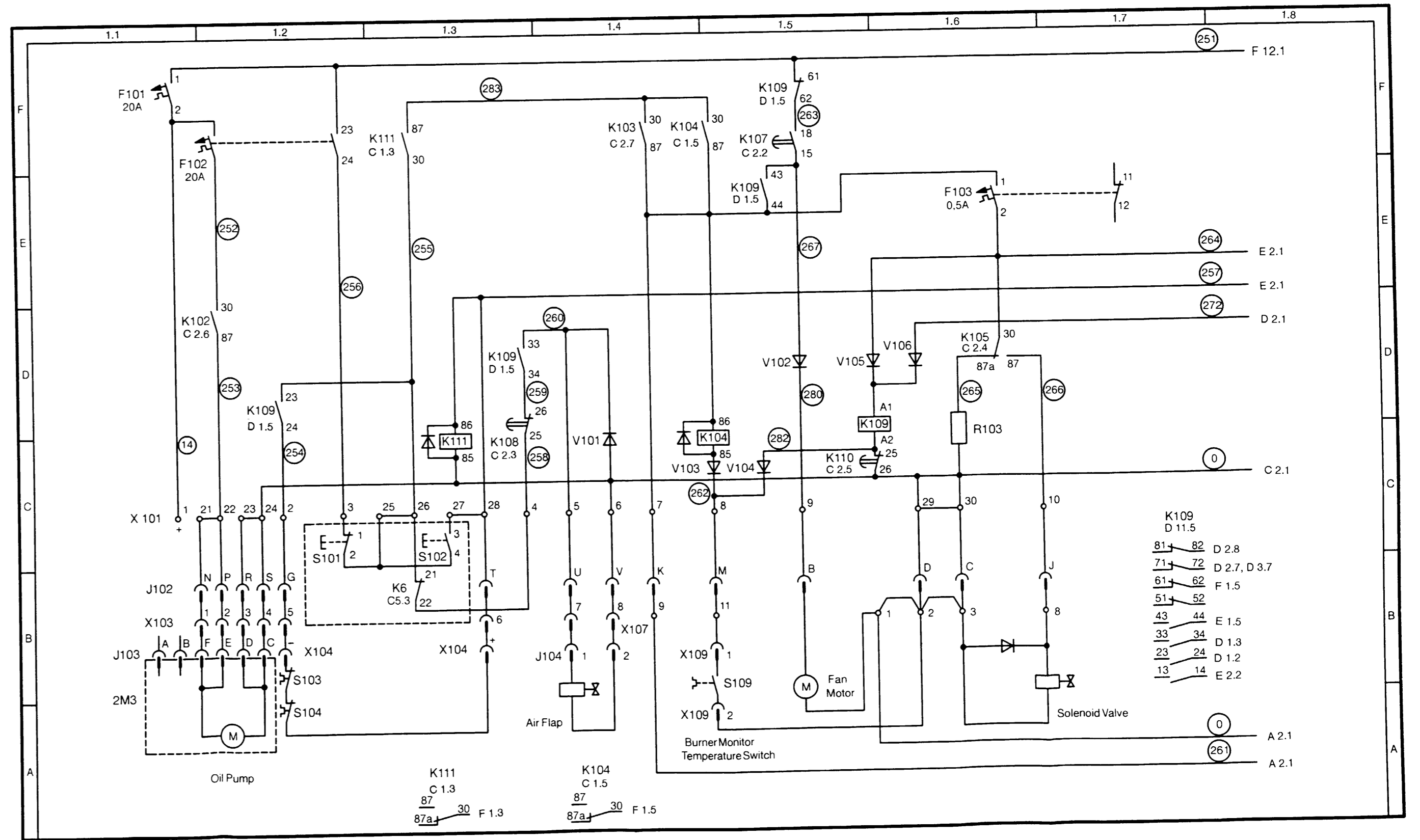
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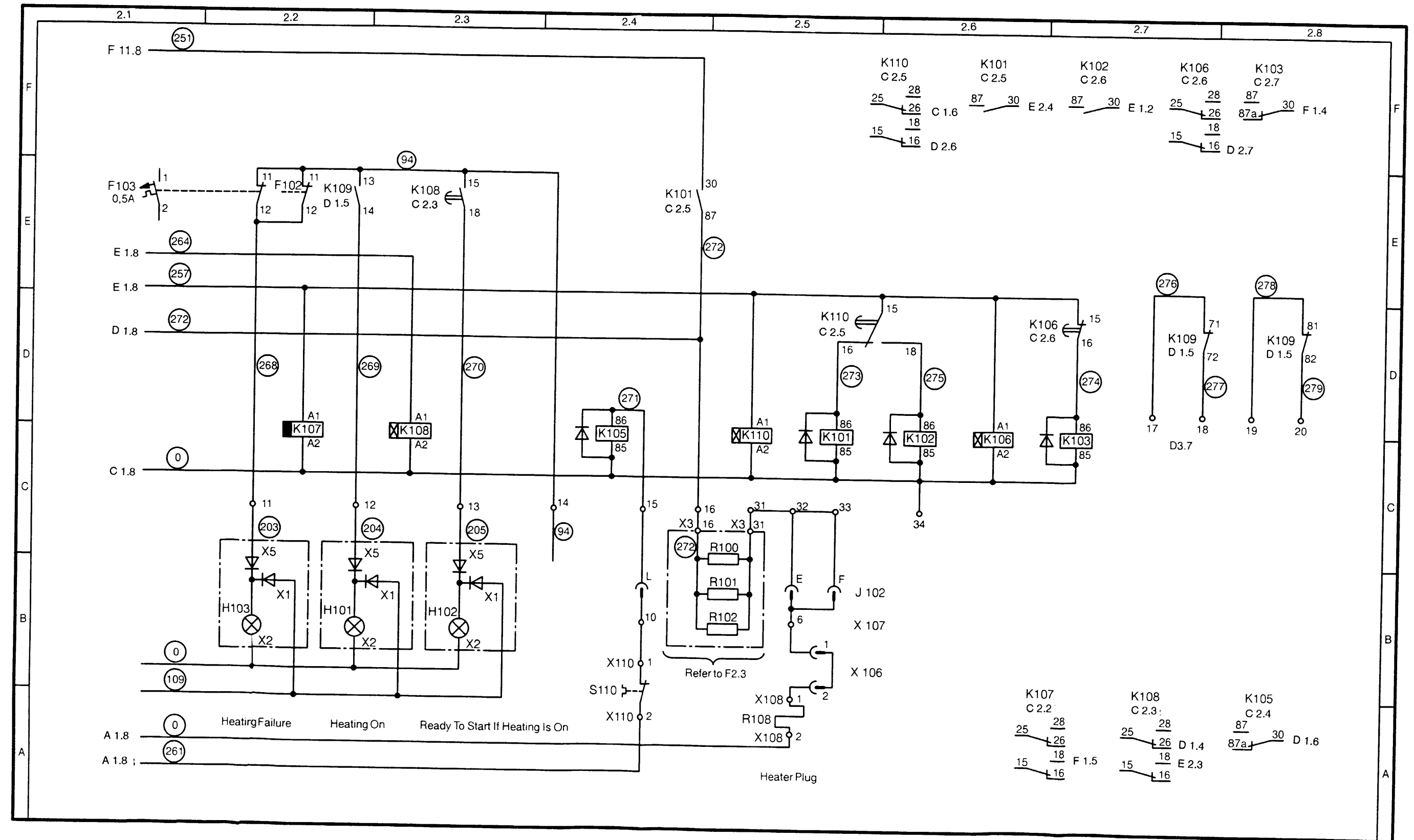
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FO-2 Engine Preheating Assembly Wiring Diagram

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FO-2 Engine Preheating Assembly Wiring Diagram

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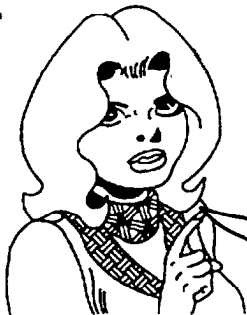
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7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName:** Joe
14. Submitter MName: T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
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22. Reference: 6
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B1		4-3		

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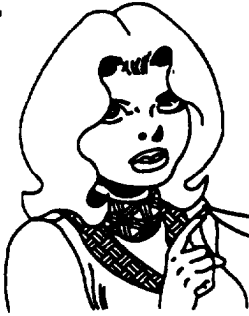
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