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Operation and Maintenance Manual with Illustrated Parts List for JetEx5D Generator Set



Series 500285C

Hobart Ground Power
Troy, Ohio 45373
U.S.A.



Warranty

Data Sheet 165
Index: 990223
Replaces: 980601

HOBART GROUND POWER
TROY, OHIO 45373

1. Hobart Brothers Company (hereinafter called HOBART) warrants that each new and unused Hobart Ground Power Equipment, (hereinafter called the PRODUCT) is of good workmanship and is free from mechanical defects, provided that (1) the PRODUCT is installed and operated in accordance with the printed instructions of HOBART, (2) the PRODUCT is used under the normal operating conditions for which it is designed, (3) the PRODUCT is not subjected to misuse, negligence or accident, and (4) the PRODUCT receives proper care, lubrication, protection, and maintenance under the supervision of trained personnel.
2. This warranty expires 15 months after shipment by HOBART to the first user, or 12 months after installation, whichever first occurs.
3. This warranty does not apply to: primary and secondary switch contacts, cable connectors, carbon brushes, fuses, bulbs, and filters unless found to be defective prior to use.
4. Hobart DOES NOT WARRANT THE FOLLOWING COMPONENTS: Engines, engine components; such as: starters, alternators, regulators, governors, etc., and cable retrieving devices. Many of the foregoing components are warranted directly by the manufacturer to the first user and serviced by a worldwide network of distributors and others authorized to handle claims for component manufacturers. A first user's claim should be presented directly to such an authorized component service outlet. In the event any component manufacturer has warranted its component to HOBART and will not deal directly with a first user then HOBART will cooperate with the first user in the presentation of a claim to such manufacturer. Under NO circumstances does HOBART assume any liability for any warranty claim against or warranty work done by or in behalf of any manufacturer of the foregoing components.
5. This warranty is extended by HOBART only to the purchaser of new PRODUCTS from HOBART or one of its authorized distributors. The PRODUCTS purchased under this warranty are intended for use exclusively by the buyer and his employees and by no other persons and, therefore, there shall be no third party beneficiary to this warranty.
6. A claim of defects in any PRODUCT covered by this warranty is subject to HOBART factory inspection and judgment. HOBART'S liability is limited to repair of any defects found by HOBART to exist, or at HOBART'S option the replacement of the defective product, F.O.B. factory, after the defective product has been returned by the purchaser at its expense to HOBART'S shipping place. Replacement and exchange parts will be warranted for the remainder of the original Warranty, or for a period of ninety (90) days, whichever is greater.
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8. Continued use of the PRODUCT(S) after discovery of a defect VOIDS ALL WARRANTIES.
9. Except as authorized in writing, this warranty does not cover any equipment that has been altered by any party other than HOBART.
10. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HERE OF. HOBART MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
11. HOBART neither assumes nor authorizes any person to assume for HOBART any liability in connection with the PRODUCTS sold, and there are no oral agreements or warranties collateral to or affecting this written Warranty. This warranty and all undertakings of HOBART thereunder shall be governed by the laws of the State of Ohio, United States of America.

WARNING

AT ALL TIMES, SAFETY MUST BE CONSIDERED AN IMPORTANT FACTOR IN THE INSTALLATION, SERVICING AND OPERATION OF THE PRODUCT, AND SKILLED, TECHNICALLY QUALIFIED PERSONNEL SHOULD ALWAYS BE EMPLOYED FOR SUCH TASKS.

Safety Warnings and Cautions

WARNING

ELECTRIC SHOCK can **KILL**. Do not touch live electrical parts.

ELECTRIC ARC FLASH can injure eyes, burn skin, cause equipment damage, and ignite combustible material. **DO NOT** use power cables to break load and prevent tools from causing short circuits.

IMPROPER PHASE CONNECTION, PARALLELING, OR USE can damage this and attached equipment.

IMPORTANT

Protect all operating personnel. Read, understand, and follow all instructions in the Operating/Instruction Manual before installing, operating, or servicing the equipment. Keep the manual available for future use by all operators.

WARNING

CALIFORNIA PROPOSITION 65 - DIESEL ENGINES. Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

1) General

Equipment that supplies electrical power can cause serious injury or death, or damage to other equipment or property. The operator must strictly observe all safety rules and take precautionary actions. Safe practices have been developed from past experience in the use of power source equipment. While certain practices below apply only to electrically-powered equipment, other practices apply to engine-driven equipment, and some practices to both.

2) Shock Prevention

Bare conductors, terminals in the output circuit, or ungrounded, electrically live equipment can fatally shock a person. Have a certified electrician verify that the equipment is adequately grounded and learn what terminals and parts are electrically **HOT**. Avoid hot spots on machine. Use proper safety clothing, procedures, and test equipment.

The electrical resistance of the body is decreased when wet, permitting dangerous currents to flow through it. When inspecting or servicing equipment, do not work in damp areas. Stand on a dry rubber mat or dry wood, and use insulating gloves when dampness or sweat cannot be avoided. Keep clothing dry, and never work alone.

a) Installation and Grounding of Electrically Powered Equipment

Equipment driven by electric motors (*rather than by diesel or gasoline engines*) must be installed and maintained in accordance with the National Electrical Code, ANSI/NFPA 70, or other applicable codes. A power disconnect switch or circuit breaker must be located at the equipment. Check the nameplate for voltage, frequency, and phase requirements. If only 3-phase power is available, connect any single-phase rated equipment to only two wires of the 3-phase line. **DO NOT CONNECT** the equipment grounding conductor (lead) to the third live wire of the 3-phase line, as this makes the equipment frame electrically **HOT**, which can cause a fatal shock.

Always connect the grounding lead, if supplied in a power line cable, to the grounded switch box or building ground. If not provided, use a separate grounding lead. Ensure that the current (amperage) capacity of the grounding lead will be adequate for the worst fault current situation. Refer to the National Electrical Code ANSI/NFPA 70 for details. Do not remove plug ground prongs. Use correctly mating receptacles.

b) Output Cables and Terminals

Inspect cables frequently for damage to the insulation and the connectors. Replace or repair cracked or worn cables immediately. Do not overload cables. Do not touch output terminal while equipment is energized.

3) Service and Maintenance

This equipment must be maintained in good electrical condition to avoid hazards stemming from disrepair. Report any equipment defect or safety hazard to the supervisor and discontinue use of the equipment until its safety has been assured. Repairs should be made by qualified personnel only. Before inspecting or servicing this equipment, take the following precautions:

- a)** Shut off all power at the disconnecting switch, or line breaker, or by disconnecting battery, before inspecting or servicing the equipment.
- b)** Lock switch OPEN (or remove line fuses) so that power cannot be turned on accidentally.
- c)** Disconnect power to equipment if it is out of service.
- d)** If troubleshooting must be done with the unit energized, have another person present who is trained in turning off the equipment and providing or calling for first aid.

4) Fire And Explosion Prevention

Fire and explosion are caused by electrical short circuits, combustible material near engine exhaust pipes, misuse of batteries and fuel, or unsafe operating or fueling conditions.

a) Electrical Short Circuits and Overloads

Overloaded or shorted equipment can become hot enough to cause fires by self-destruction or by causing nearby combustibles to ignite. For electrically powered equipment, provide primary input protection to remove short circuited or heavily overloaded equipment from the line.

b) Batteries

Batteries may explode and/or give off flammable hydrogen gas. Acid and arcing from a ruptured battery can cause fires and additional failures. When servicing, do not smoke, cause sparking, or use open flame near the battery.

c) Engine Fuel

Use only approved fuel container or fueling system. Fires and explosions can occur if the fuel tank is not grounded prior to or during fuel transfer. Shut unit **DOWN** before opening fuel tank cap. **DO NOT** completely fill tank, because heat from the equipment may cause fuel expansion overflow. Remove

all spilled fuel **IMMEDIATELY**, including any that penetrates the unit. After clean-up, open equipment doors and blow fumes away with compressed air.

5) Toxic Fume Prevention

Carbon monoxide - Engine exhaust fumes can kill and cause health problems. Pipe or vent the exhaust fumes to a suitable exhaust duct or outdoors. Never locate engine exhausts near intake ducts of air conditioners.

6) Bodily Injury Prevention

Serious injury can result from contact with fans or hot spots inside some equipment. Shut **DOWN** such equipment for inspection and routine maintenance. When equipment is in operation, use extreme care in doing necessary trouble-shooting and adjustment. Do not remove guards while equipment is operating.

7) Medical and First Aid Treatment

First aid facilities and a qualified first aid person should be available for each shift for immediate treatment of all injury victims. Electric shock victims should be checked by a physician and taken to a hospital immediately if any abnormal signs are observed.

EMERGENCY FIRST AID

Call physician immediately. Seek additional assistance. Use First Aid techniques recommended by American Red Cross until medical help arrives.

IF BREATHING IS DIFFICULT, give oxygen, if available, and have victim lie down. **FOR ELECTRICAL SHOCK**, turn off power. Remove victim; if not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin external heart massage. **CALL EMERGENCY RESCUE SQUAD IMMEDIATELY.**

8) Equipment Precautionary Labels

Inspect all precautionary labels on the equipment monthly. Order and replace all labels that cannot be easily read.

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Introduction

This manual contains operation and maintenance information for a JetEx5D, 28.5 VDC Generator Set manufactured by ITW GSE Group, Hobart Ground Power, Troy, Ohio 45373.

This manual is not intended to be a textbook on electricity or electronics. Its primary purpose is to provide information and instructions to experienced operators, electricians, and mechanics that have never operated this equipment. It is the intent of this manual to guide and assist operators and maintenance people in the proper use and care of the equipment.

Use of the manual should not be put off until a trouble or need for help develops. Read the instructions before starting the unit. Learn to use the manual and to locate information contained in it. Its style and arrangement are very similar to commercial aircraft manuals.

The manual is divided into five chapters plus an appendix. Each chapter is divided into as many sections as required. Each new section starts with page 1. Each page is identified by chapter, section and page number, which are located in the lower, outside corner. When information located in another portion of the manual is referred to, its location is identified by a chapter, section, and paragraph or figure number.

For example: "(see Section 2-3, Paragraph 1.a.)" refers to information located in Chapter 2, Section 3, Paragraph 1.a. If a chapter and section are not indicated in a reference, the referenced material is located in the same section as the reference, for example: "(see Paragraph 1.a.)."

The Appendix is the last section. Its contains a list of available options that may be purchased with that unit. Items on the list with check marks next to them, have been added to the standard unit per the customers order. Literature for each option follows. The Appendix will help control the information in the manual: making it unique to the unit purchased.

In addition to operation and maintenance instructions, the manual contains an illustrated parts list in Chapter 4, and a collection of manufacturer's literature and supplemental information in Chapter 5.

Contents of the manual is arranged as follows:

Chapter 1. Description/Operation

Chapter 2. Servicing/Troubleshooting

Chapter 3. Overhaul/Major Repair

Chapter 4. Illustrated Parts List

Chapter 5. Manufacturer's Literature

Appendix A Options



OM-2094C / Operation and Maintenance Manual
JetEx5D/ Series 500285C/ 28.5 VDC Generator Set

If you have any questions concerning your Hobart Ground Power equipment, immediately contact our Service Department by mail, telephone, FAX, or E-Mail.

Write:	ITW GSE Group Hobart Ground Power Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@itwgsegroupp.com
Web Page :	www.itwgsegroupp.com

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Chapter 5 Manufacture's Literature

Appendix A Options/Features

Wet Stacking

Unusual Service Conditions

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Chapter 1 Description/Operation

Section 1 Description

1) General

The basic generator set covered in this manual, manufactured by ITW GSE Group, Hobart Ground Power, is rated at 28.5 V DC. It is designed to produce and deliver 28.5 V DC, 600 A, power to a parked aircraft or other load. The unit is also designed for starting any fixed-wing aircraft or helicopter that is equipped with an external 28.5 V DC power receptacle.

The number 500285C identifies the “model or series” of the GPU. The part number is followed by a different dash number that separates the basic units available. Figure 1 uses the part number to identify the variations possible covered in this manual.

Part & Dash Number	Model Description
500285C-001	Trailer Mounted with Cable Trays
500285C-002	Fixed/Truck Mounted with Cable Hangers
500285C-003	Trailer Mounted with Cable Trays (Special)

Series Generator Set Part Number Descriptions
Figure 1

2) Optional Equipment - Appendix A

Chapters 1 through 5 of this Operation and Maintenance Manual identifies only the “strip down” version of the Jet-Ex5D generator set. A list of optional equipment, which make this manual unique to the generator set that you have purchased, appears in Appendix A. A few items included in Appendix A is a 120 VAC generator, trailer, 14-volt DC power, etc.

3) Orientation

For purpose of orientation, the radiator end of the Jet-Ex 5D is the front. Right and left are determined by standing at the rear of the unit, facing it. The control panel is located at the rear.

4) Special Features

The generator set has special features that are described more fully under the assemblies in which they appear.

a) Standard

The “Soft-Start” current limiting feature, recommended by most aircraft engine manufacturers, provides the operator with controls to limit the inrush current to the aircraft engine's starter. When the operator presets this control, the generator will provide constant voltage to the preset current value. The more current is increased beyond the preset current value, the voltage will decrease to a minimum of 14 volts DC, after which the voltage will remain constant as more current may be delivered beyond the preset current value. Limiting inrush current is recommended by most engine manufacturers to protect the aircraft engine's starter shear section. The current limiting control is continuously adjustable from 300 amperes, which is recommended for helicopter and small turbine

starting, to 2000 amperes, required for starting larger aircraft engines when the control is turned fully clockwise.

5) Canopy

The standard canopy is a sheet metal enclosure that protects the engine, generator, and electrical controls. It has four hinged doors to provide access for service and maintenance. A bolted on panel at the rear (below the control box) to provide access to the rectifier assembly. A Plexiglas window is mounted in front of the control panel to allow observation of the instruments while protecting them from the weather. The canopy is also designed to reduce the operational noise level in the immediate area of the machine.

Physical	Basic Unit (Fixed Mount)	With Trailer (w/ towbar up)
Length	68 in. (173 cm)	94.5 in. (240 cm)
Width	37 in. (94 cm)	67 in. (170 cm)
Height	46 in. (117 cm)	62 in. (158 cm)
Weight (dry fuel tank)	2400 lbs (1089 kg)	2670 lbs (1211 kg)
Ground Clearance	N/A	14 in. (36 cm)
GENERATOR		
Output power rating	22.8 kW	
Output voltage	28.5 volts DC	
Rated load capacity	800 amperes continuous at 28.5 volts DC	
Starting Current Capacity	2000 amperes maximum	
Current Limiting Capability	300 to 2000 amperes, continuously adjustable	
Operating Speed	2200 to 2500 +/-50 RPM	
ENGINE		
Manufacturer	Cummins Engine Company	
Model No.	4B4.5T	
Fuel Pump Model No.	Delphi DP210 Mechanical	
Type	4-cylinder, 4-stroke, direct injection	
Bore and Stroke	4.02 in. x 5.42 in.	
Displacement	275 in. ³ (4.5 liters)	
Horsepower	99 Hp (74 kW)	
Idle speed	1000 +/- 50 RPM	
High speed limiting	3750 +/- 50 RPM	
Electrical system	12 VDC	
Ground	Negative	
Lubricating oil capacity (w/ filter)	11.5 quarts (11 liters)	
Coolant capacity system	12 quarts (11.4 liters)	
Fuel Tank Capacity	20.5 U.S. gallons (78 liters)	
PROTECTIVE DEVICES		
Generator	28.5 volt over voltage module trips at 32 to 34 volts.	
Engine	Water Temperature Switch opens engine circuit at 210° F (98.8° C). Low Oil Pressure Switch opens at 20 PSI (138 kPa).	

Specifications and Capabilities
Figure 2

6) Engine and Generator

The engine and generator are mounted on a trailer assembly. A fuel tank support located at the rear of the unit supports the fuel tank and provides a mounting location for the load contactor and output terminals. The radiator is mounted to the front canopy and frame.

a) Basic Engine.

The engine used in the Jet-Ex 5D generator set is a Cummins Model 4B4.5T four-cylinder, four-stroke, direct injection diesel engine. It has a 275 cubic inch (4.5 liter) cylinder displacement and the engine firing order is 1-3-4-2.

A spring-loaded relief valve in the oil pump limits maximum pressure in the system. A full-flow oil filter cleans the oil before it enters the oil distributing system. A low oil pressure switch is mounted on the engine block as a protective device. The fuel valve solenoid circuit is wired through the contacts of this switch, which closes at 20 PSI (138 kPa). This prevents the engine from continuing operation if oil pressure will not build up, and also shuts down the engine if oil pressure drops radically during operation.

b) Engine Manufacturer's Equipment

As received from the engine manufacturer, the engine includes the following equipment, which is more fully described in the Engine Manufacturer's Operation and Maintenance Manual.

(1) Alternator (G401)

The battery charging alternator is rated at 65 amperes. The alternator responsibility is to produce/regulate 12V DC for the generator sets internal electrical system.

(2) Fuel Filter

The fuel filter is a remote mounted spin-on disposable lubricity additive type, connected between the fuel lift pump and injector pump.

(3) Oil Filter

The engine oil filter is a spin-on, full-flow type. It is mounted on the right side of the engine.

(4) Starter (B401) and Starter Solenoid (L401)

The starter solenoid is mounted on the starter motor, on the right side of the engine.

c) Engine-cooling fan

The engine fan is designed to blow air outward through the radiator, rather than pulling the air inward as a conventional fan does.

d) Fuel System

The fuel system consists of a 20.5-gallon (77.6 liters) plastic fuel tank with all the necessary fittings and hoses.

e) Exhaust Muffler

This muffler helps deaden audible noise from the engine's exhaust.

f) Engine faults

The following is a table listing faults, which may occasionally occur. Column two of the table explains what happens in the engine's circuitry when the fault occurs, and column three tells how to return the generator set to service once the problem is solved. Refer to Chapter 2 for more details on all other faults.

ENGINE FAULTS		
Engine Fault Condition	What Occurs	How To Reset
Over temperature	Automatically removes power from the fuel valve solenoid and shuts down the engine.	Let the engine cool down enough to check for low coolant level and/or a faulty over temperature switch. Restart engine.
Low oil pressure	Automatically removes power from the fuel valve solenoid and shuts down the engine.	Let the engine cool down enough to check for low oil level and/or a faulty oil pressure switch. Restart engine.
Clogged air cleaner or other restriction in the combustion air inlet.	Turns on the air cleaner restriction indicating light.	Replace clogged air filter if needed and clean out the air intake chamber. Restart engine.

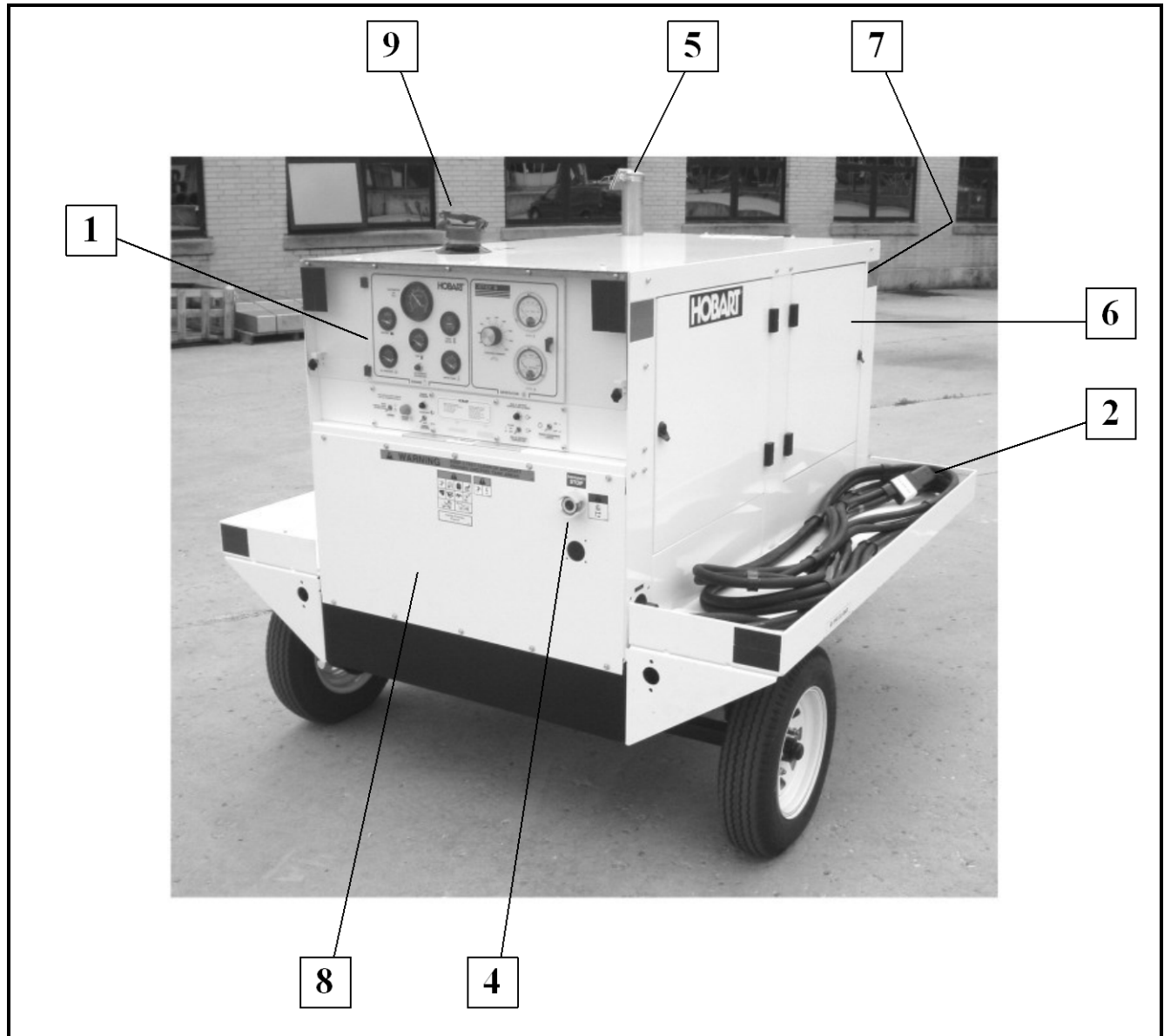
g) Emergency Shut Down Device

In addition to the other devices provided by the engine manufacturer, an emergency engine shutdown feature is added by Hobart Ground Power. Since diesel engines typically require several minutes of running at idle speed before shutdown, this push button switch is intended for use in emergencies only.

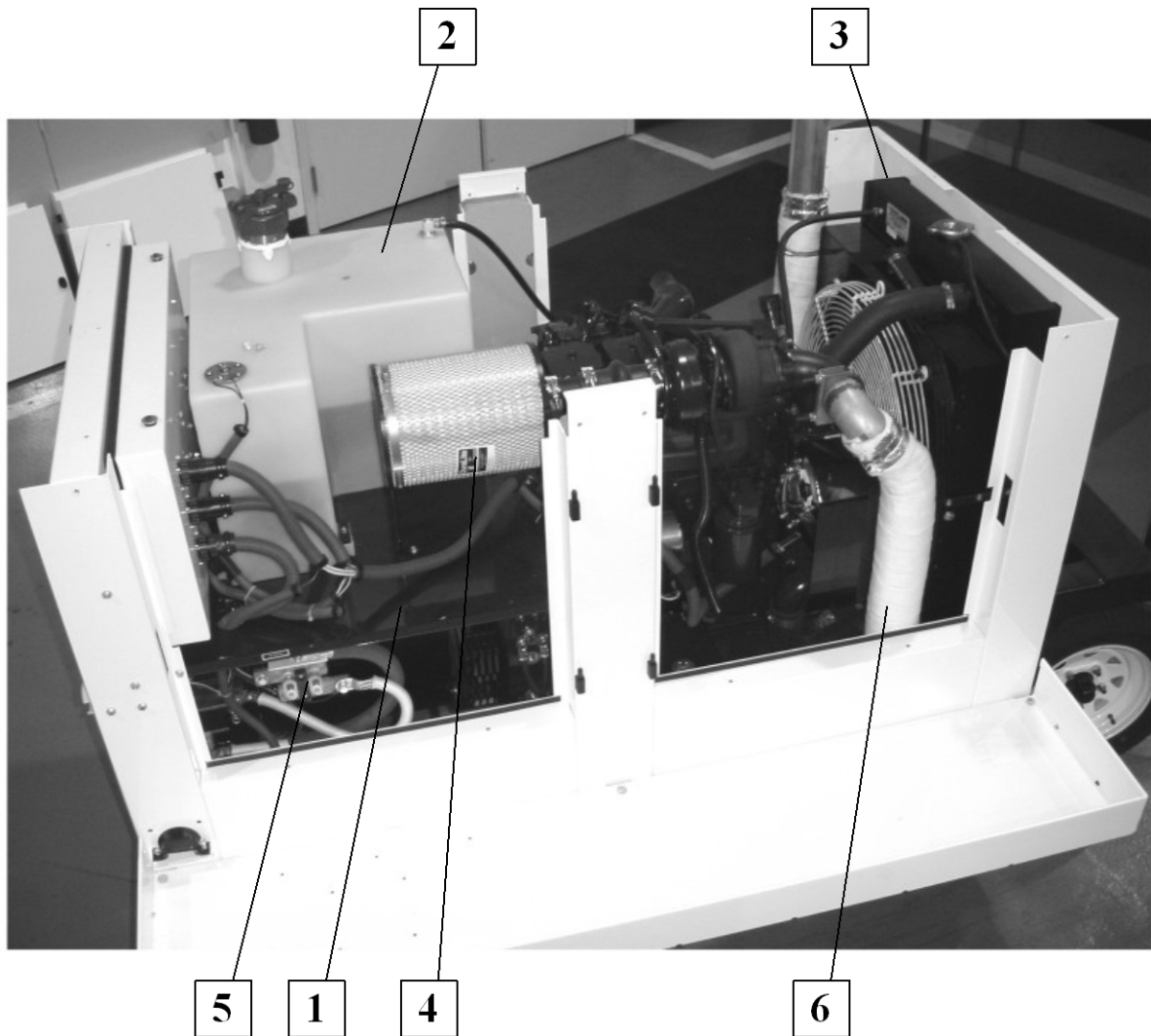
This emergency push button switch (S413) has one purpose: To provide immediate shut off of the generator set by disconnecting power to the fuel solenoid through the control box. Once pushed, it must be pulled back out to restart the generator set. It is located on the rear panel, below the control box.

To operate the EMERGENCY SHUTDOWN push button switch:

- Push button in until engine stops or until button travel stops.
- Pull the button back out to reset.

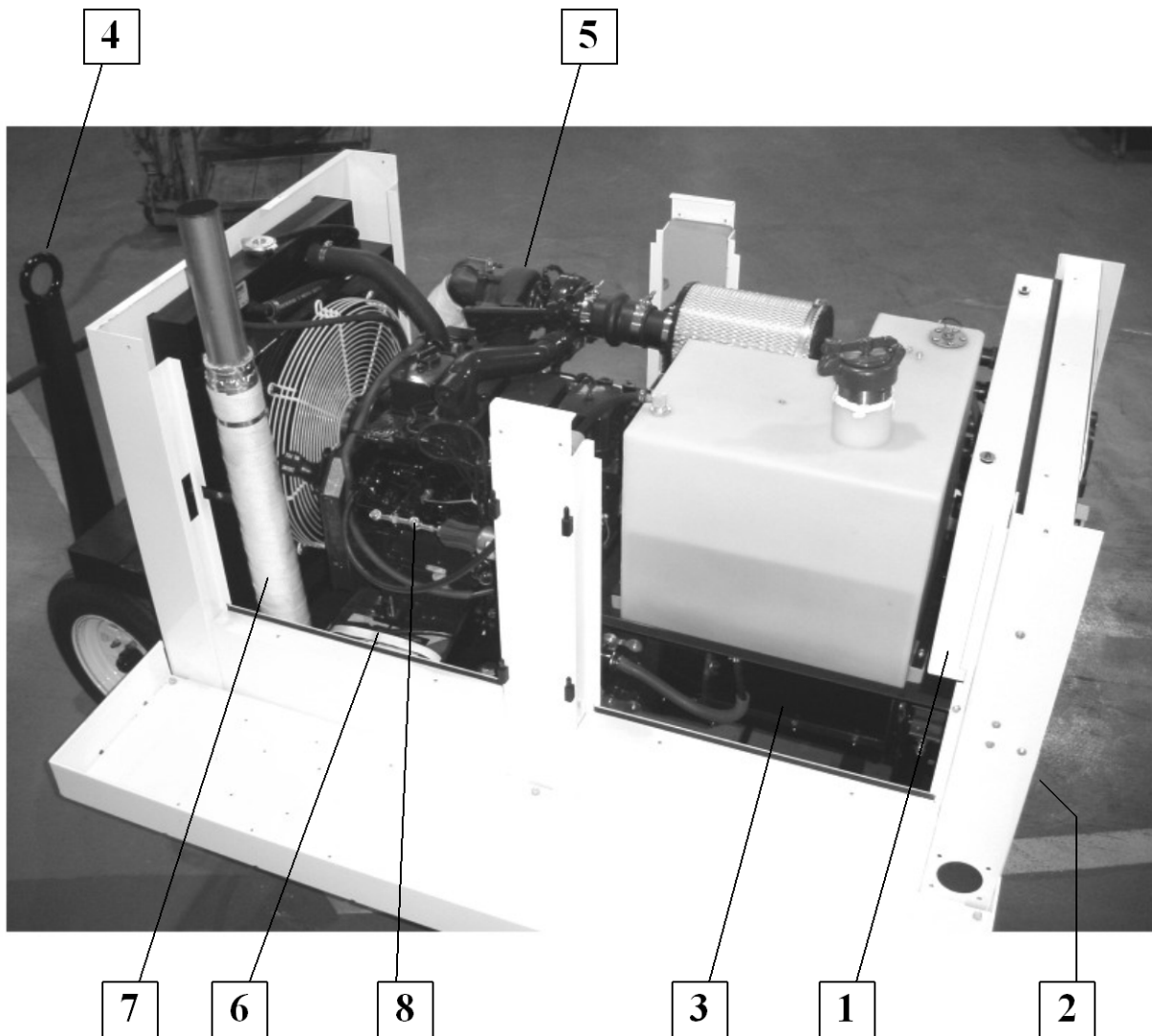


General Assembly of Generator Set
Figure 3



- | | |
|----------------------------------|--------------------------------|
| 1. Fuel Tank Support | 4. Air Cleaner / Intake System |
| 2. Fuel Tank w/ Protectoseal Cap | 5. 28.5 VDC Contactor (K402) |
| 3. Radiator / Cooling System | 6. Exhaust System |

Interior Components (Right Side)
Figure 4



Item # 4 is located below the control panel behind the end panel assembly.

1. Control Panel
2. Rectifier Assembly (Not Shown)
3. Generator (G402)
4. 5th Wheel Trailer Assembly

5. Cummins 4B4.5T Engine
6. Battery (BT401)
7. Exhaust System
8. Fuel Pump Actuator

Interior Components (Left Side)
Figure 5

d) Generator (G402)

The generator is a multi-phase, synchronous salient pole, revolving field, AC generator whose output is rectified. The output is rectified by a rectifier assembly made up of twelve rectifiers connected into a full wave configuration. The generator is self-excited, receiving excitation from a three phase full wave rectified stator winding. One positive and one negative brush in contact with slip rings supply controlled excitation current from the stator winding through the voltage regulator to the rotating field winding. The voltage regulator controls the excitation current and maintains a constant output voltage. Access to the brushes is through holes in the anti-drive end bracket. The rotor is supported at the anti-drive end (slip ring end) by a single-row ball bearing. The drive end is connected to the engine flywheel by a flexible disc and hub coupling assembly and is supported by the engine main bearings. A radial-blade fan of formed and welded sheet metal construction is mounted on the coupling hub and draws cooling air over the generator windings.

Air flows over the rectifier assembly and then enters through the anti-drive end of the generator and is discharged through openings in the flywheel housing at the drive end. The generator housing assembly, which contains the generator stator, is bolted to the engine flywheel housing.

e) Rectifier Assembly

The Rectifier Assembly consists of two aluminum heat sinks with six diodes on each heat sink. The rectifier assembly converts the AC output of the generator to 28.5 Volts DC.

f) Ammeter Shunt (M407)

The ammeter shunt is connected in the generator's negative output circuit. It supplies a small voltage proportional to output current for operation of the ammeter, and to the current limit circuit of the voltage regulator. This shunt is mounted on the negative heat sink of the rectifier assembly.

g) Contactor (K402)

The load contactor, which is mounted on the right side of the unit below the fuel tank, provides a safe and convenient means of connecting and disconnecting the generator from the load. Initial power for closing the load contactor is supplied by the generator through the spring-loaded momentary contacts of the contactor control toggle switch. Holding power, to keep the contactor closed, passes through the normally open auxiliary contacts in the load contactor. The output power connection is made by attaching the positive lead to the top terminal of the load contactor, and the negative lead to the negative output terminal located above the load contactor.

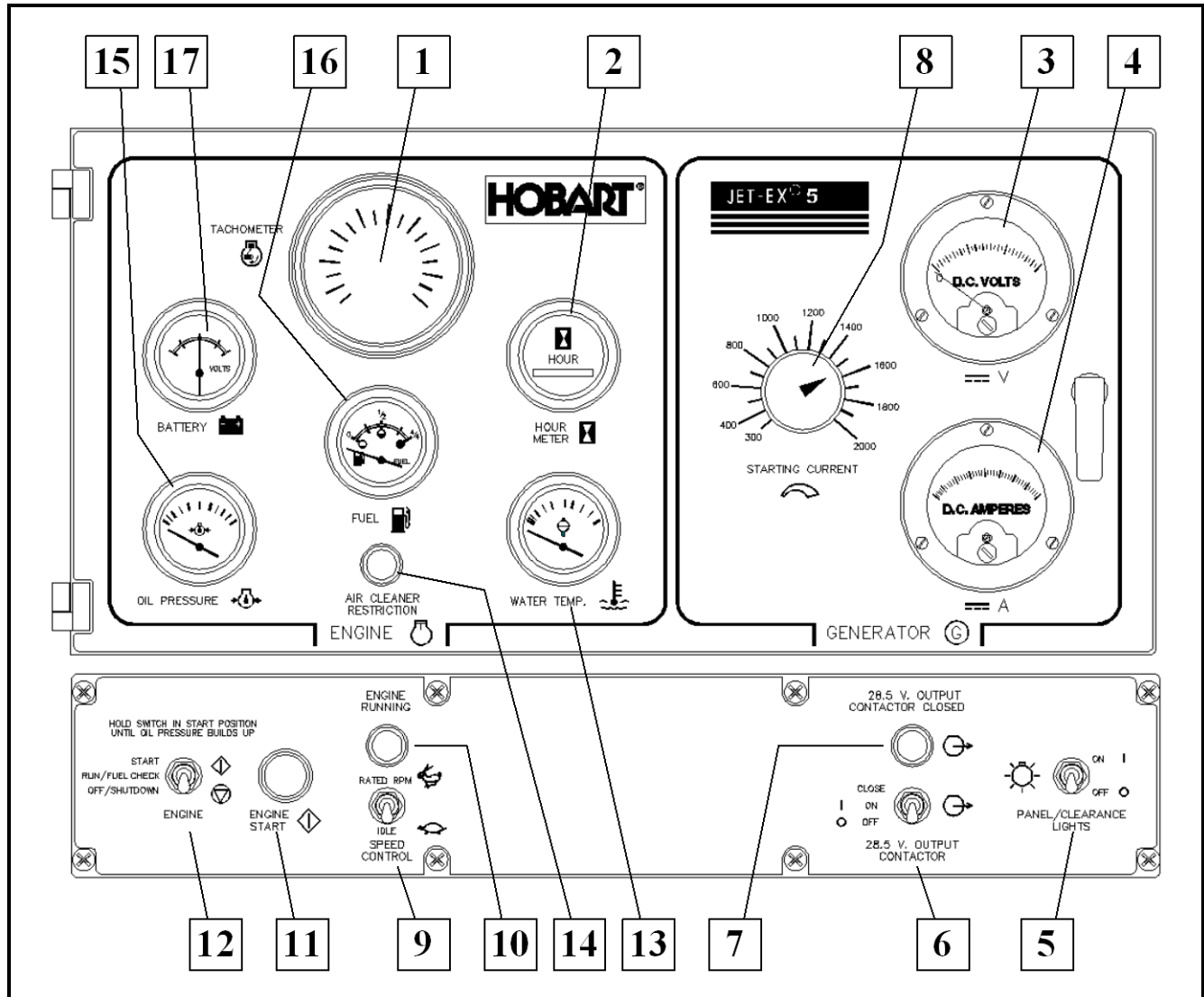
7) Control Box Panel Assembly

The Control Box Assembly houses and provides mounting facilities for controls, monitoring instruments, voltage regulator, relays, etc. The box is mounted at the rear of the canopy.

a) Control Box Front Panel

(1) Tachometer (M403)

This instrument receives its operating signal from the alternator to display the engine speed in RPM.



- | | |
|--|---|
| 1. Tachometer (M403) | 10. Engine On Lamp (DS407) |
| 2. Hour Meter (M402) | 11. Engine Start Push Button Switch (S401) |
| 3. Voltmeter [Generator] (M406) | 12. Engine Circuit Toggle Switch (S404) |
| 4. Ammeter [Generator] (M407) | 13. Water Temperature Gauge (M404) |
| 5. Panel Lights Toggle Switch (S405) | 14. Air Filter Restriction Indicator Lamp (DS412) |
| 6. Contactor Control Toggle Switch (S408) | 15. Oil Pressure Gauge (M405) |
| 7. Contactor Closed Lamp (DS408) | 16. Fuel Gauge (M408) |
| 8. Current Limiting Control Potentiometer (R402) | 17. Voltmeter [Battery] (M401) |
| 9. Speed Control Toggle Switch (S406) | |

Control Box Panel Assembly
Figure 6

(2) Hour Meter (M402)

The hour meter records the total hours of engine operation for scheduling maintenance.

(3) Voltmeter, Generator (M406)

The voltmeter indicates generator output voltage.

(4) Ammeter (M407)

The ammeter displays generator current output.

(5) Panel/Clearance Lights Toggle Switch (S405)

The panel/clearance lights toggle switch turns the panel and clearance lamps on and off.

(6) Contactor Control Toggle Switch (S408)

The contactor control toggle switch is a three-position toggle switch used to close and open the output load contactor. The top CLOSE position is spring-loaded and is held momentarily until the contactor closed lamp glows, then it is released to the center ON position. In this position the switch provides holding current to the load contactor to keep it closed. Protective devices in the load contactor circuit provide protection against over voltage by opening the load contactor if that condition occurs. In the bottom OFF position, the contactor is opened.

(7) Contactor Closed Lamp (DS408)

The contactor closed lamp glows green when the output load contactor is closed.

(8) Current Limiting Control Potentiometer (R402)

The current limiting control potentiometer is used to select the starting current recommended for various aircraft. The current limiting setting is continuously adjustable from 300 to 2000 amperes.

(9) Speed Control Toggle Switch (S406)

The speed control toggle switch is a two position switch wired to a throttle solenoid on the engine. In the IDLE position, used for starting, the engine speed is controlled to approximately 1000 RPM. In the Rated RPM position, engine speed is controlled to between 2200 and 2500 RPM.

(10) Engine On Lamp (DS407)

The engine on lamp glows green when the engine is running.

(11) Engine Start Push Button Switch (S401)

The engine start push button switch is a momentary contact switch that closes the starter solenoid circuit and cranks the engine. This switch is operable only when the engine circuit toggle switch is held in its top spring-loaded START position.

(12)Engine Circuit Toggle Switch (S404)

The engine circuit toggle switch must be held in the top START position and the engine start push button must be depressed to start the generator set. When released from its top START position after the engine starts, this toggle switch will return to center RUN position. The ENGINE ON lamp will glow as long as the switch is in RUN position. In the bottom STOP position, this switch will stop the engine and the lamp will go out.

(13)Water Temperature Gauge (M404)

The water temperature gauge indicates the engine coolant temperature and is actuated by a temperature sender mounted on the engine's water jacket.

(14)Air Filter Restriction Lamp (DS412)

The air filter restriction lamp glows red when the air filter needs changed.

(15)Oil Pressure Gauge (M405)

The OIL PRESSURE gauge displays the pressure in the engine's lubrication system. It is operated by a sender mounted on the engine block.

(16)Fuel Gauge (M408)

The fuel gauge indicates the amount of fuel remaining in the fuel tank.

(17)Voltmeter (Battery) (M401)

The battery voltmeter indicates the voltage of the engine's 12 volt DC electrical system.

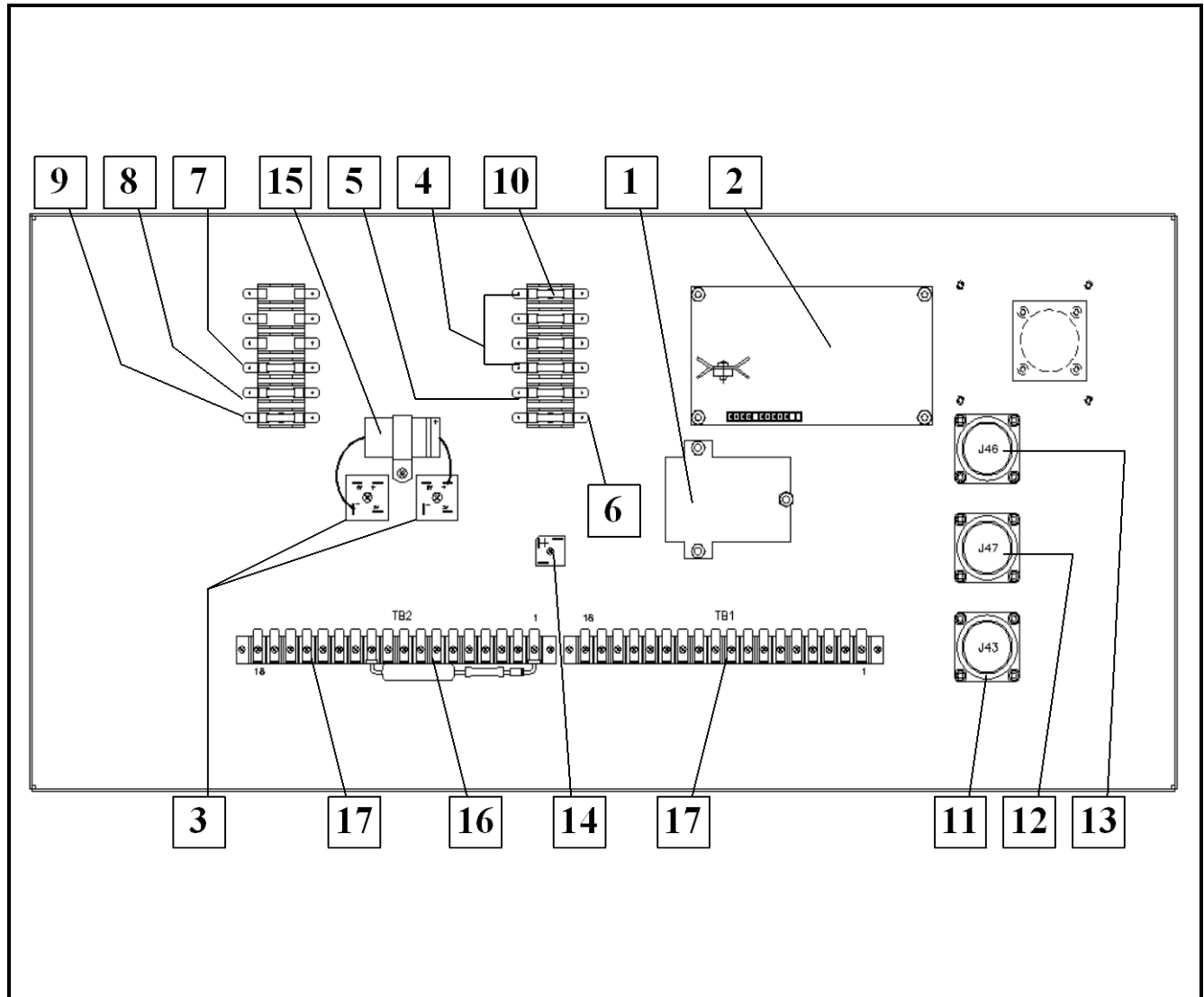
8) Control Box Interior Assembly

(1) Over Voltage Relay (K403)

The over voltage relay is a solid-state protective device on a printed circuit board. A normally closed relay in the circuit is wired into the load contactor coil circuit. An over voltage condition causes the relay contacts to open, which in turn prevents the contactor from closing, or opens the load contactor and discontinues the power delivery. The over voltage module is adjusted to trip at 32 to 34 volts DC in .5 seconds $\pm$.2 seconds.

(2) Voltage Regulator (VR402)

The voltage regulator is a solid-state device, which regulates the 28.5 Volts DC generator output after the voltage is built up.



- | | |
|---|---|
| 1. Over Voltage Relay (K403) | 10. Throttle Solenoid Fuse (20 Amp. Slo-Blo) (F409) |
| 2. Voltage Regulator (VR402) | 11. Rectifier Harness Connector (J43) |
| 3. Excitation Rectifiers (CR417 & CR418) | 12. Engine Harness Connectors (J46 – Power) |
| 4. Control Windings Fuses (10 Amp.) (F406 - F408) | 13. Engine Harness Connectors (J47 – Engine) |
| 5. Voltage Build-up Fuse (10 A) (F405) | 14. Blocking Rectifier (CR401) |
| 6. Voltage Regulator Fuse (10 A) (F403) | 15. 100 MFD, 350 VDC Capacitor (C403) |
| 7. Panel Lights Fuse (10 A) (F401) | 16. Tachometer Circuit Assembly (CR403 & R406) |
| 8. Engine Circuit Fuse (10 A) (F402) | 17. Terminal Block (TB1 & TB2) |
| 9. 28 VDC Protection Fuse (5 A) (F410) | |

Control Box Interior Assembly
Figure 7

(3) Excitation Rectifiers (CR417 and CR418)

Two diode bridge rectifiers, convert an AC voltage from the generator armature to the DC voltage needed for the generator revolving field.

(4) 3 Control Windings Fuses—cartridge-type—10 amp each (F406 - F408)

(5) Voltage Build-up Fuse—cartridge-type—10 amp (F405)

(6) Voltage Regulator Fuse—cartridge-type—10 amp (F403)

(7) Throttle Solenoid Fuse—cartridge-type—20 amp Slo-Blo (F409)

(8) Panel Lights Fuse—cartridge-type—10 amp (F401)

This protects the panel lights circuit.

(9) Engine Circuit Fuse—cartridge-type—10 amp (F402)

The engine circuit fuse protects the engine circuitry.

(10) 28 VDC Circuit Protection—cartridge-type—10 amp (F410)

(11) Control Panel Light (DS70 & DS421-DS425)

Control panel lights provide illumination for instruments and controls.

(12) Rectifier Harness Connector (J43)

Provides connections between the control box and the Rectifier assembly.

(13) Engine Harness Connectors (J46 & J47)

Provides connections between the control box and engine compartment components.

(14) Blocking Rectifier (CR401)

Provides automatic voltage build-up.

(15) Capacitor (C403)

A 100mfd, 350V DC Capacitor, that filters the DC excitation volts produced by rectifiers CR417 and CR418.

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Section 2 Preparation for Use, Storage, or Shipping

1) Preparation for Use

a) General

The generator set is shipped with an empty fuel tank. After the fuel tank is filled and the generator set is inspected, the generator set is ready for use.

b) Inspection/Check

Inspect the unit thoroughly prior to operation.

- (1) Remove blocking, banding, ties, and other securing material.
- (2) Inspect exterior for shipping damage such as broken lights, damaged sheet metal, etc.
- (3) Open all canopy doors and inspect interior for foreign material such as rags, tools, shipping papers, etc.
- (4) Check fuel, coolant, oil hoses and connections for visible leaks. Visually inspect the compartment floor and ground surface under the unit for signs of leakage. If leaks are found, correct by tightening hose clamps, tube fitting, etc., as required.
- (5) Check security of generator set retaining components.
- (6) Check the following:

a Fuel

Press lamps button to energize fuel gage when engine is stopped. Fuel is supplied from a customer-furnished source. Fuel tank capacity is 20.5 gallons (77.6 liters).

NOTE: For recommended fuel specifications refer to the Engine Manufacturer's Operation and Maintenance Manual provided with this manual.

b Engine coolant

Remove radiator cap to check coolant level. Coolant level should be at the bottom of the filler neck. See Figure 1 for capacity.

CAUTION	BE SURE the cooling system antifreeze solution is adequate to protect below the lowest temperature expected.
----------------	---

NOTE: Typical antifreeze protection is a solution of 50% permanent antifreeze (Ethylene glycol) and 50% clean water.

ENGINE OIL AND COOLANT CAPACITIES	
Lubricating oil capacity (w/ filter)	11.5 quarts (11 liters)
Coolant capacity system	12 quarts (11.4 liters)

Figure 1

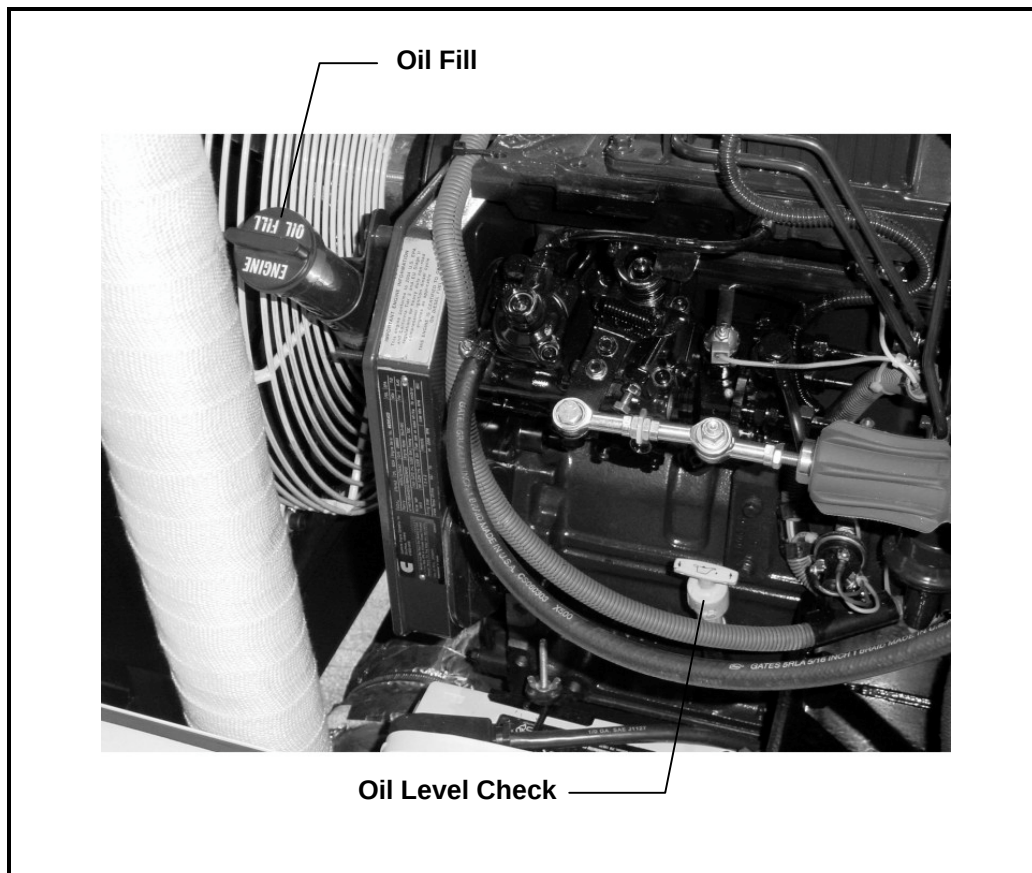
c Engine lubricating oil level

The oil gage rod (See Figure 2) has "H" high level mark and "L" low level mark to indicate the operating lubrication oil supply. Oil level should be kept as near the high mark as possible, without going over it. See Figure 1 for capacity.

CAUTION

NEVER operate the engine with oil level below the "L" level mark or above the "H" level mark.

NOTE: See Engine Manufacture's Operation and Maintenance Manual for oil recommendations.



Oil Fill and Oil Level Check Locations
Figure 2

d Check Batteries

Inspect the batteries for proper connection of the terminals and also check the electrolyte level (if possible). Service or replace if necessary.

c) Output Cable Requirements and Installation

Jet-Ex 5D units are normally supplied with a 30 foot generator-to-aircraft output cable. This output cable consists of two single conductor 4/0 cables.

(1) Cable Requirements

Cable length is determined by the customer's requirements. It is recommended that the cable be no longer than 30 feet (9 m). It should be two conductor with lug-type terminals on one end and an AN-2551 plug connector on the other.

The recommended cable size for 28.5 volt DC is determined by the maximum starting load amperage expectations. A maximum starting load of 1500 amps requires two single conductor 4/0 cables. A maximum starting load of 600 amps requires two single conductor 2/0 cables.

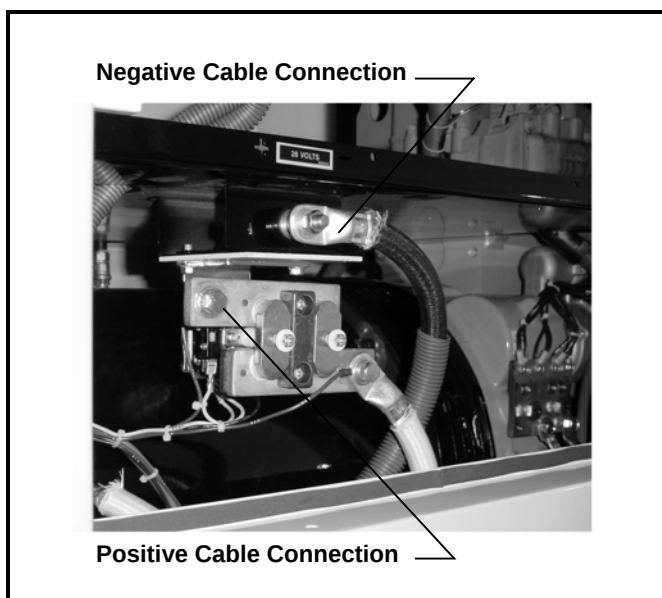
NOTE: Some operators may wish to add a second cable assembly with MS-25019 plug connector for starting aircraft such as Jetstar and Sabre liner.

(2) Cable Connection (See Figure 3)

Open and remove the right rear door and the panel below the door. Set aside.

Loosen the output cable clamp and thread the lugged end of the output cable through the opening in the right side of the unit.

Connect the positive cable lead to the output terminal on the contactor. Connect the negative cable lead to the negative output terminal located above the load contactor. Always place the lead under the flat washer shown.



**Output Cable Connections
Figure 3**

Tighten the cable clamp and install the lower panel, and the door.

Store cables in cable tray or on hangers on side of canopy if fenders are not used.

2) Preparation for Storage

When a generator set is to be stored or removed from operation, special precautions should be taken to protect the internal and external parts from rust, corrosion, and gumming in the engine fuel system.

a) General

Pull all circuit breakers and/or disconnect battery negative terminal.

- (1) The unit should be prepared for storage as soon as possible after being removed from service.
- (2) The unit should be stored in a building which is dry and which may be heated during winter months.
- (3) Moisture absorbing chemicals (Hobart Brothers Part No. 76A1354-001) are available for use where excessive dampness is a problem; however, the unit must be completely packaged and sealed if moisture absorbing chemicals are to be effective.

b) Temporary Storage

When storing the unit for 30 days or less, prepare as follows:

- (1) Lubricate the unit completely in accordance with instructions in Section 2-2. This will include changing engine oil, and all filter elements.
- (2) Start the engine and operate for about two minutes so that all internal engine components will be coated with new oil.

NOTE: Do not drain the fuel system or crankcase after this run.

- (3) Make certain the cooling system antifreeze solution is adequate to protect below the lowest temperatures expected during the storage period. Be sure the solution is thoroughly mixed.
- (4) Clean the exterior of the engine. Dry with clean rags and compressed air.
- (5) Seal all engine openings. Use a waterproof, vapor proof material that is strong enough to resist puncture damage from air pressures.

c) Long Time Storage (Over 30 Days)

To protect the generator and other electrical components, the complete unit should be packaged using moisture proof packaging material and sealing material. Place containers of moisture absorbing chemicals, Hobart Brothers Part No. 76A-1354-001, in the unit before packaging. The unit may be stored for long periods with no special preparation if it is possible to operate the engine once each week. When starting once a week proceed as follows:

- (1) Make certain the cooling system is adequately protected.

WARNING

ENSURE adequate ventilation before starting the engine.

- (2) Start the engine and operate under full load until coolant temperature has reached at least 176°F (80°C).
- (3) While the engine is running, ensure that normal operating controls are in good working condition before shutdown and storage. If weekly operation is not possible, contact the Engine Manufacturer's distributor or agent for instructions.

3) Preparation for Shipment

- a) Disconnect battery negative terminal before shipping.
- b) During long shipments, vibration, jolting, etc may loosen the generator set retaining hardware.

CAUTION

When shipping the unit, provide sufficient retaining materials to ensure the generator set cannot roll out or off the vehicle in which it is being transported.

NOTE: It is suggested that strong banding be used to secure the generator set, or a strong steel bar be either welded or bolted across the front of the generator set frame.

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Section 3 Operation

1) General

This section contains information and instructions for the safe and efficient operation of the equipment. Operating instructions are presented in step-by-step sequence of procedures to be followed in supplying power to aircraft.

NOTE: Read all of the operating instructions before attempting to operate the equipment.

WARNING	Ear protection equipment may be necessary when working close to this equipment.
----------------	---

2) Operating Procedure (Reference Figure 1)

a) Pre-start Inspection

- (1) Always be sure there is sufficient oil and coolant in the engine.
- (2) Be sure the fuel shutoff valve (located at the fuel tank outlet) is open. Checking the fuel gage make certain there is sufficient fuel to complete the job to be done.
- (3) If the unit is trailer mounted and is not connected to a tow vehicle, be sure the parking brake is applied and that the drawbar is raised and locked in the vertical position.
- (4) Open the engine compartment doors and inspect interior for rags, tools, and foreign material.

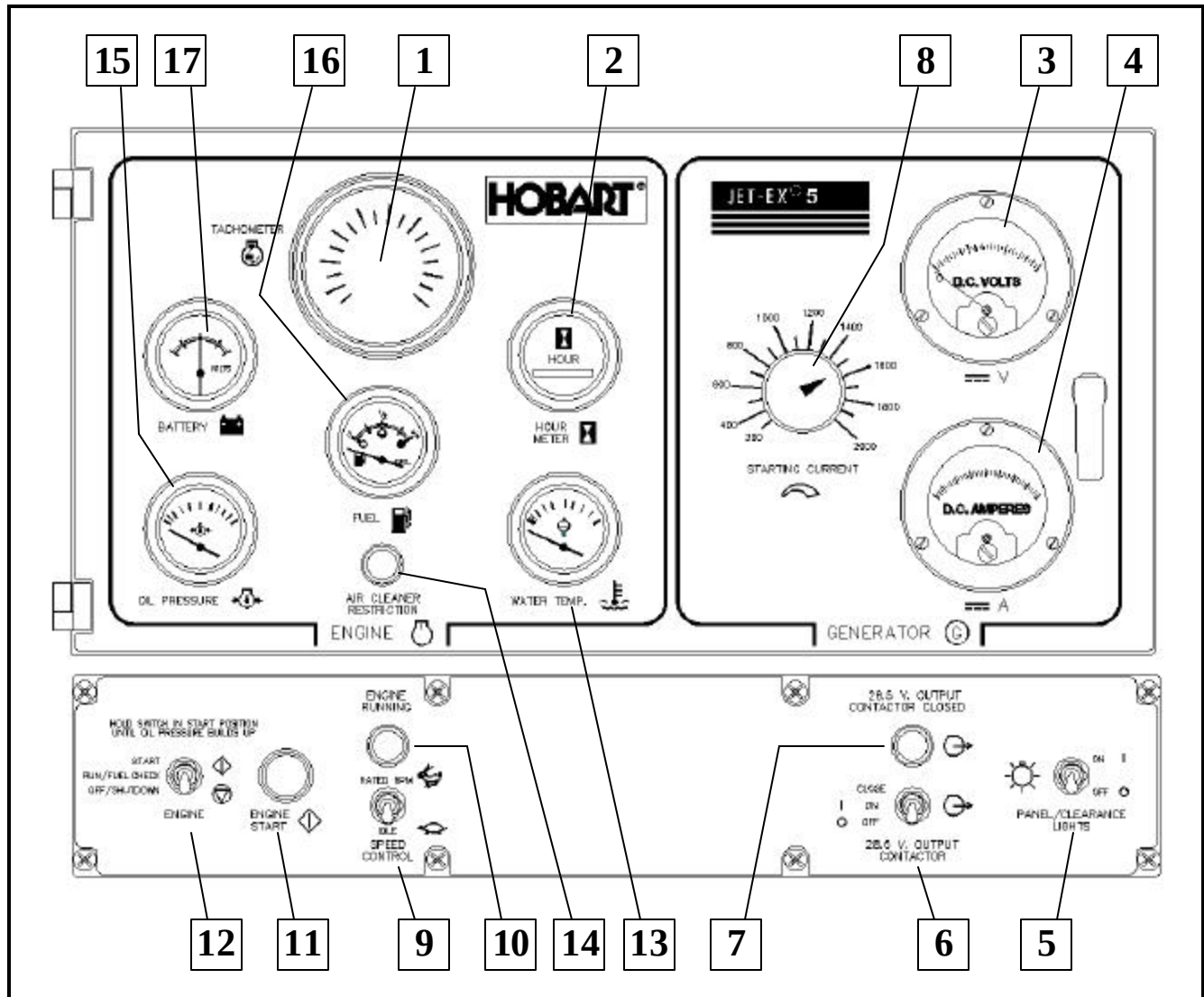
b) Pre-start Instructions

In all probability, the unit will be moved from one location to another many times during its lifetime of service. Therefore, the following steps should be taken to optimize maximum efficient operation.

CAUTION	Refer to the operating instructions in the Engine Manufacture's Operation and Maintenance Manual, when starting engine for the first time.
----------------	--

NOTE: The Engine Manufacture's Operation and Maintenance Manual is provided with this Hobart manual.

- (1) Check the supply of fuel, crankcase oil and radiator coolant. See the Engine Manufacture's Operation and Maintenance Manual for specifications.
- (2) Inspect the unit thoroughly to be sure it is in proper working order. Check all fuel lines and wire connections to be certain they are secure. Tighten any loose screws, nuts or bolts.
- (3) Wipe off the entire unit and blowout air passages, control box, and other hard to reach places with compressed air not over 25 psi (172 kPa).



- | | |
|--|---|
| 1. Tachometer (M403) | 10. Engine On Lamp (DS407) |
| 2. Hour Meter (M402) | 11. Engine Start Push Button Switch (S401) |
| 3. Voltmeter [Generator] (M406) | 12. Engine Circuit Toggle Switch (S404) |
| 4. Ammeter [Generator] (M407) | 13. Water Temperature Gauge (M404) |
| 5. Panel Lights Toggle Switch (S405) | 14. Air Filter Restriction Indicator Lamp (DS412) |
| 6. Contactor Control Toggle Switch (S408) | 15. Oil Pressure Gauge (M405) |
| 7. Contactor Closed Lamp (DS408) | 16. Fuel Gauge (M408) |
| 8. Current Limiting Control Potentiometer (R402) | 17. Voltmeter [Battery] (M401) |
| 9. Speed Control Toggle Switch (S406) | |

Control Box Panel Assembly
Figure 1

- (4) Make sure that no loose bars, tools, parts, etc. are in or on any part of the engine, as they could cause serious damage to the engine, generator, or personal injury to anyone standing nearby.
- (5) If the unit is operated indoors, make sure that an exhaust line is properly connected to the engine exhaust system, and discharged outside. Avoid short bends or reduction in line sizes in exhaust pipes. Locate the unit so as to necessitate the shortest possible exhaust line to insure the least amount of back pressure on the engine. Back-pressure can cause engine damage and loss of power.
- (6) Check the electrical system to make sure the connections are secure and properly connected.
- (7) If applicable, check the battery electrolyte level. The factory installed battery is maintenance free.

c) Starting the Engine

Make sure that all pre-starting instructions have been carried out and be sure the unit was prepared for use per Section 2 of this chapter.

- (1) Check engine oil, fuel and coolant levels.
- (2) Check air cleaner service indicator lamp (14). If lamp is glowing, replace air filter element and/or remove other objects that obstruct air flow.
- (3) Place speed control toggle switch (9) in the idle (down) position.
- (4) Hold engine circuit toggle switch (12) in START position.
- (5) Press and hold engine start push-button switch (11). Release as soon as engine starts and oil pressure comes up, as seen on oil pressure gauge (15).

CAUTION

If the engine stalls or falters in starting, wait three or four seconds before re-engaging starter. This will prevent possible damage to starter or the engine. DO NOT operate the starter for periods longer than 15 seconds at a time. An interval of at least two minutes should be allowed between cranking periods to protect the starter from overheating.

- (6) Release engine circuit toggle switch (12) to run position when oil pressure builds up.
- (7) Observe engine RPM on the tachometer (1), idle speed should be 1000 RPM +/- 50 RPM.
- (8) Allow engine to warm up before applying a load.

CAUTION

To eliminate the possibility of wet stacking and excessive oil consumption (See Appendix A), **DO NOT** allow the engine to idle for long periods of time.

WARNING

The engine's entire exhaust system will get very hot and cause severe burns if touched.

d) Generator Operation

- (1) Place speed control switch (9) in rated RPM (up) position and the generator will automatically build up to produce rated voltage.
- (2) Adjust current limiting control potentiometer (8) if necessary. Refer to aircraft documentation for proper setting.

e) Power Delivery

- (1) Connect output cable to aircraft.
- (2) Hold contactor control toggle switch (6) in close position. Release to ON position as soon as green contactor closed lamp (7) comes on.

WARNING

NEVER disconnect the output cable while power is being delivered. Output contactors must be open prior to removal of the cable from the aircraft.

f) Shutdown/Stop Operation

- (1) Normal Conditions
 - a When power delivery is completed (aircraft discontinues drawing current), place contactor control toggle switch (6) in off position. The contactor closed lamp (7) should go off to indicate load contactor has opened and power is no longer available at the aircraft.
 - b Place speed control toggle switch (9) in idle (down) position. Allow engine to run for 2 to 3 minutes.
 - c Disconnect output cable from aircraft receptacle and store cable in cable trays or on cable hangers, whichever is available.
 - d Place engine circuit toggle switch (12) in stop position.

CAUTION

The battery will drain if the engine circuit toggle switch (12) is not placed in stop position after shutdown.

(2) Emergency Conditions

To prevent personal damage or damage to generator set, use of the emergency shut down (E-stop) push button switch will provide immediate shut down of the engine. Once pushed in, the E-stop button must be pulled back out to restart the generator set.

- a Depress E-stop button; engine will shut down
- b Pull E-stop button back out to restart.

g) Adverse Weather Precautions

(1) Cold weather operation

Operation of this engine-driven unit at sub-zero temperatures requires special precautions and extra servicing from both operation and maintenance personnel, if poor performance or total functional failure is to be avoided. Consult the Engine Manufacturer's Operation and Maintenance Manual and recommendations below.

a Fuel system

Keep system clean and free from water, which may collect in a low spot in the fuel line and freeze. Fuel tanks should be kept FULL to prevent water condensation from the air above the fuel.

b Fuel Storage

Keep fuel storage tanks or drums as full as possible to avoid condensation of moisture from the air above the fuel. After filling or moving fuel containers, allow fuel to settle before using. Never draw fuel from the extreme bottom of the container. Strain all fuel to remove any foreign matter. When operating outdoors, take steps to prevent the entry of snow, water, and ice into the fuel containers.

c Cooling system

Prior to cold weather, drain and flush the cooling system to remove accumulations of rust and sediment. Mix and add antifreeze solution, check the cooling system connections for leaks. Add a can of rust inhibitor to the radiator when system is winterized. This will keep system cleaner and furnish lubrication for the water pump.

d Lubrication

Drain the crankcase (preferably when warm after running) and fill with a lighter grade of oil. See engine oil recommendations chart in the Engine Manufacturer's Operation and Maintenance Manual for recommended viscosity for various atmospheric temperatures. In cold weather, drain oil more frequently. Water condenses and collects quickly, mixes with the oil and increases deposits to form a sludge. Check oil frequently for this condition. Water in crankcase may freeze and cause serious damage to the oil pump, or shut off the oil supply.

e Electrical system

Cold weather requires an efficient electrical system to start the cold engine. Check the entire system for loose connections or indication of bad wiring or shorted conditions.

f Battery

Battery efficiency decreases sharply with lower temperatures. Make sure the battery is full charged before attempting to start engine in sub-zero conditions.

(2) Operation in Hot and Humid Conditions

Maintain a more frequent check of the coolant level in the radiator.

(3) Operation in Extremely Dusty Conditions

If unit is to be operated under dusty outdoor conditions, place it in a sheltered area. Take advantage of any natural barriers which may offer protection from blowing dust. If the installation is more than temporary, erect a protection shield.

a Fuel system

Change the fuel filter at prescribed intervals and keep fuel containers covered and protected against dust entry.

b Air Cleaner

This filter needs more frequent attention under dusty conditions. Check air filter restriction lamp located on control panel daily.

c Crankcase Oil

The crankcase oil level will require close attention. Dusty conditions tend to load crankcase oil with dirt. Watch for dirty and gritty oil conditions, and change oil more frequently as required.

(4) Operation in Salt Water Areas

a Canopy

Wash canopy regularly to remove salt film. Repaint any damaged places and oil the hinges regularly.

b Covering

To protect the engine and generator as much as possible from salt water atmosphere, keep the side doors on the canopy closed, when not in use. It is advisable to keep the unit covered with a tarpaulin, if available, when not in use. Salt water should be wiped from the engine, and all terminals and connections in the electrical system wiped dry. Keep all linkage oiled.

c Brushes

The brushes of the generator should be inspected regularly to make certain that they are free in the holders. Lift the brushes in the brush holders about every two days to insure their freedom to slide within the holder. Wipe dry all the parts that can be reached, and use compressed air, if available, to dry the parts of the generator that cannot otherwise be reached.

d Field coils

The fields should be dried as thoroughly as possible.

e Battery terminals

Thoroughly clean the battery terminals and connections. Coat terminals and connections with petroleum jelly to retard corrosion.

(5) Miscellaneous

Once a month, oil the hinged plexiglass cover.

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Chapter 2 Service and Troubleshooting

Section 1 Maintenance Inspection/Check

1) General

To make certain the generator set is always ready for operation, it must be inspected and maintained regularly and systematically so that defects may be discovered and corrected before they result in serious damage to components, or failure of the equipment.

WARNING

STOP operations at once if a serious or possibly dangerous fault is discovered.

2) Maintenance Schedule

a) General

A periodic maintenance schedule should be established and maintained. A suggested schedule is provided in Figure 1 on the following pages. It may be modified, as required to meet varying operating and environmental conditions. It is suggested that generator set and vehicle inspections be coordinated as much as possible.

b) Maintenance Schedule Check Sheet

It is strongly recommended that the customer use a maintenance schedule check sheet such as the one in the engine manufacturer's operation manual. The check sheet will provide a record and serve as a guide for establishment of a schedule to meet the customer's maintenance requirements for his specific operation.

c) Time Intervals

The schedule is based on both hours of operation and calendar intervals. These two intervals are not necessarily the same. For example, in normal operation the oil change period, based on hours of operation, will be reached long before the three months calendar period. The calendar period is included to make certain services are performed regularly when the equipment is stored, or being operated infrequently. Lubricating oil standing in engines that are stored, or used very little, may tend to oxidize and may require changing although it is not dirty. Perform all services on whichever comes-first basis.

d) Identification of Interval Periods

Each interval period is identified by a letter A, B, C, etc. For example, services under B schedule should be performed at the end of each 250 hours of operation, or every three months, BR service is performed during the break in period (first 50-150 hours) and AR service is performed as required.

Hourly Interval	AR	50-150	10	250	500	1000	1500	2000
Calendar Interval		Once	Daily	3 Mo.	6 Mo.	1 Yr.	1.5 Yr.	2 Yr.
Symbol	AR	BR	A	B	C	D	E	F
Engine								
Change Air Cleaner Cartridge	X							
Check Coolant Hose and Clamps	X							
Check Crankcase Oil Level			X					
Drain Fuel Pre-Filter Elements (option)			X					
Check Coolant Level			X					
Check for Leaks and Correct		X	X					
Check Air Cleaner Indicator			X					
Check Exhaust System	X		X					
Change Lubricity Fuel Filter Element		X		X				
Change Fuel Pre-Filter Element		X		X				
Check Fuel Pump				X				
Check Radiator Core and Hoses				X				
Check Oil Pressure and Record				X				
Change Crankcase Oil		X		X				
Change Oil Filter Element		X		X				
Check Engine and Generator Mounts		X			X			
Check Coolant, Additive-Concentration		X			X			
Check Fan Hub and Drive Pulley						X		
Check Hose Clamps on Air Intake Side	X					X		
Check Belts Conditions and Tensioner						X		
Check and/or Adjust Valve Clearance						X		
Check Water Pump		X				X		
Steam Clean Engine		X					X	
Clean Fuel System							X	
Check Alternator							X	
Check Cranking Motor							X	
Check Vibration Damper								X
Check Cooling System								X

Maintenance Schedule
Figure 1 (Sheet 1 of 2)

Hourly Interval	AR	50-150	10	250	500	1000	1500	2000
Calendar Interval		Once	Daily	3 Mo.	6 Mo.	1 Yr.	1.5 Yr.	2 Yr.
Symbol	AR	BR	A	B	C	D	E	F
Engine (continued)								
Flush and Change Coolant								X
Check Fan Mounting				Spring & Fall				
Clean Cooling System				Spring & Fall				
Check Hoses				Spring & Fall				
Clean Electrical Connections				Spring & Fall				
Check Thermostats and Seals				Fall				
Electrical (12 VDC System)								
Check All Lights			X					
Check Alternator Charging Rate			X					
Check Battery and Fluid Level				X				
Clean Battery Terminals	X			X				
Check Wiring and Connections					X			
Check All Engine Meters			X					
Electrical (28 VDC System)								
Check Output Cable and Connectors			X					
Check Volt and Amp Meters			X					
Check Protective Relays					X			
Inspect Wiring and Connectors					X			
Clean and Inspect Generally					X			

Maintenance Schedule
Figure 1 (Sheet 2 of 2)

3) Inspection/Check

a) General

Inspections, checks, and maintenance are described in general and more specific and detailed information can be found in Section 2-2 and 2-3, when applicable.

b) "AR" Checks and Operations (As Required)

(1) Engine

a Change Air Cleaner

A definite time schedule for changing the air cleaner cannot be established. This filter should not be washed more than six times or retained for more than one year of service, whichever comes first.

- b Check and tighten, as required, all coolant hose clamps, air intake hose clamps and exhaust clamps. Check all coolant hoses, air intake hoses and exhaust pipes for leaks.

(2) Electrical System (12 VDC)

- a Check Battery Terminals

Anytime the compartment doors are opened for any reason, visually check battery cable connectors and battery posts. If corrosion is observed, disconnect cables and clean battery posts and connectors with a wire brush or special battery post-cleaning tool. Coat posts and connectors with a light film of petroleum lubricant before reconnecting cables.

c) "BR" Checks and Operations (Break-In Period, Once After 50-150 hrs.)

The following procedures are precautionary measures taken on most new engines. If a problem occurs with any of the following issues be sure to recheck it after the next 50-150 hours.

(1) Engine

- a Check for leaks and correct. This involves an overall inspection of the engine and may require some maintenance if leaks are found. Refer to the engine manufacturer's operations manual for assistance.
- b Change all fuel filter elements. Metal shavings from the new fuel tank can clog the filter.
- c Change crankcase oil. New engines often release metal shavings more frequently. Therefore the crankcase oil must be changed as a precautionary measure.
- d Change oil filter element. The oil filter should be changed with the oil.
- e Check engine and generator mounts to ensure they are properly installed and they have not worked loose (Torque is set at 90 ft-lb. and 60 ft-lb. respectively).
- f Check coolant additive concentration. Refer to the engine manufacturer's operations manual for assistance.
- g Steam clean the engine to free it of oil and dirt to prevent uneven engine cooling "hot spots". The oil and dirt can also fall into the engine and fuel system when covers are removed during repair work.
- h Inspect the water pump weep hole for indication of a steady leak. If a steady flow of coolant or oil is observed, replace the water pump with a new or rebuilt unit. Refer to the engine manufacturer's operations manual for assistance.

d) "A" Checks and Operations (10 Hours or Daily)

- (1) Check crankcase oil level

CAUTION

DO NOT overfill. **DO NOT** operate the engine with oil level below the lower bar or above the upper bar on the dipstick.

- a Check oil level daily with oil gage dipstick.
- b Oil level should not be checked until 3 to 5 minutes after engine shutdown. Keep oil level as near the upper bar as possible.

CAUTION

BE SURE to prime and bleed the fuel system after draining the filters, replacing filter element, or if the fuel tank has run empty. Failure to do so can cause engine starting problems.

- (2) Check for water in the fuel/water filter (optional accessory).

- a Provide a container for catching drained fuel.
- b Open the drain valve on the fuel/water filter by turning it counterclockwise.
- c Drain the filter until clear fuel is visible.
- d Tighten the drain valve.
- e Safely dispose of drained fuel.
- f Purge air from fuel system if necessary.

- (3) Check coolant level

Check coolant level daily or at each fuel fill interval. Investigate for cause of any coolant loss.

WARNING

Cooling system is pressurized. To avoid personal injury, **DO NOT** remove radiator cap when engine is hot.

- (4) Check for leaks and correct

At each daily start-up, check for coolant, fuel, and oil leaks. Coolant leaks may be more noticeable when components are cold. Observe pumps, hoses, fittings, gasket connections, etc., for signs of leakage. Correct as required.

- (5) Check air cleaner indicator

At each daily start-up, observe the air cleaner indicator light. If this light comes **ON**, it indicates that the air cleaner should be changed.

(6) Check exhaust system

Visually inspect muffler and exhaust pipes for rust and signs of approaching failure. Listen for any gasket or joint leaks.

WARNING

A leaking and defective exhaust system could be a fire hazard.

(7) Electrical (Engine)

a Check all lights

Check all indicating lights to be sure they will operate when they should. If any light fails to operate, check both the lamp and its protective circuit breaker. Figure 4 lists all lamps with their location and part number. Figure 3 lists all fuse and locations.

b Check alternator charging rate

Observe the 12 VDC ammeter each time the engine is started. A zero amperage reading or extremely high reading for any length of time indicates trouble in the alternator, regulator, battery, or interconnecting wiring.

(8) Electrical (Generator)

a Output cable plug connector

Check the output cable plug connection for damaged insulation and contacts each time the connector is detached from the aircraft.

b Monitoring instruments

Check operation of voltmeter and ammeter meter each time the unit is started.

e) "B" Check and Operations (250 Hours or 3 Months)

(1) Engine

a Change crankcase oil and filters

b Check and record oil pressure

After each oil change, check and record oil pressure at idle speed after oil has warmed to approximately 140° F. Record oil pressure under identical conditions at each oil change interval. A comparison of pressure at idle speed with previous readings will give an indication of progressive wear of oil pump, bearings, shafts, etc. Investigate any abnormal change in pressure readings.

c Change fuel filters.

- d Clean radiator hoses and core.

Inspect the radiator core for dirt and debris blocking the fins. Clean as necessary. Check for cracks, holes, or other damage.

(2) Electrical (12 VDC system)

NOTE: The battery furnished with this generator set is maintenance free.

- a Battery electrolyte level (if applicable)

Battery electrolyte level must be maintained above top of plates. Add distilled water as required.

CAUTION

DO NOT overfill.

- b Check battery

If battery requires water frequently, or is low in charge, the reason for the condition must be found and corrected.

- c Battery terminals

Check battery terminals and clean, if necessary.

f) "C" Checks and Operations (500 Hours or 6 Months)

(1) Engine

- a Change crankcase oil.
- b Change oil filter element each time crankcase oil is changed.
- c Clean the radiator core.

(2) Check and adjust drive belts

- a Check tension and make adjustments as necessary.

(3) Check engine mounts

CAUTION

An unstable or loosely mounted engine can create hazardous environment and may also damage equipment.

- a Engine mount bolts must be torqued to 90 ft-lb.
- b Generator mount bolts must be torqued to 60 ft-lb.

(4) Check coolant additive concentration

The cooling system protective liquid (nitrite-, amine- and phosphate free) provides effective protection against corrosion, cavitation, and freezing. See the engine manufacturer's operation manual for ordering and mixture details.

(5) Electrical (12 VDC system)

a Wiring

Inspect all cables and leads for worn or damaged insulation.

b Connections

Inspect connectors for damaged or corroded condition.

(6) Electrical (Generator)

a Protective relays

Check operation of all protective relays to make certain they will function if a fault should occur in the output circuit. Procedures for testing these relays are contained in the Adjustment/Test section of this manual.

b Wiring and connections

Check all cables, leads, and wiring for broken, worn and damaged insulation. Check all connections for tightness.

c Clean and inspect generally

g) "D" Checks and Operations (1000 Hours or 1 Year)

(1) Engine

a Check fan hub and drive pulley.

Inspect for loose bolts or worn features. Tighten bolts and replace parts if necessary

b Check fuel pre-filter cartridge.

Pre-filter may accumulate foreign substances that may cause damage to fuel system if not removed. Inspected prefilter thoroughly.

c Check hose/clamps on air intake side.

Be sure that all clamps are properly secured to prevent leaks.

h) “E” Checks and Operations (1500 Hours or 1.5 Year)

(1) Engine

a Steam clean engine

There are several reasons why the engine exterior should be kept clean. Dirt on the outside will enter fuel and oil filter cases and rocker housings when covers are removed, unless dirt is removed first. A clean engine will run cooler and develop fewer hot-spots. Steam cleaning is one of the most satisfactory methods of cleaning and engine; however, there are some **CAUTIONS** to be observed:

WARNING

Exercise care to avoid injury and damage to eyes and skin.

CAUTION

1. If a cleaning compound is used, select one that is free from acid and will not remove paint.
2. Protect (or remove) all electrical accessories, such as voltage regulator, alternator, and electrical wiring.
3. Seal all openings. **DO NOT** use a flammable solvent.
4. **DO NOT** use mineral spirits or solvents on a hot engine.
5. Remove or protect bottom panel of unit (belly pan) to protect insulation.

b Clean fuel system

See the engine manufacturer's operations manual for instructions.

c Check vibration damper (Figure 2).

Check vibration damper for looseness, wobble, chunking, and streaking. Verifying the hub bolts are tightened to the engine manufacturer's specifications.

d Check water pump (Figure 2).

Check water pump for signs of leaking and lubricant loss. Replace with new pre-lubricated pump if lubricant is being lost.

e Check fan hub (Figure 2).

Check fan hub for signs of lubricant loss. Replace with new pre-packed hub if lubricant is leaking.

f Check alternator and cranking motor.

The alternator and cranking motor on this particular engine requires no periodic lubrication.

g Change Coolant

Completely flush and clean the cooling system.

i) "F" Checks and Operations (2000 Hours or 2 Years)

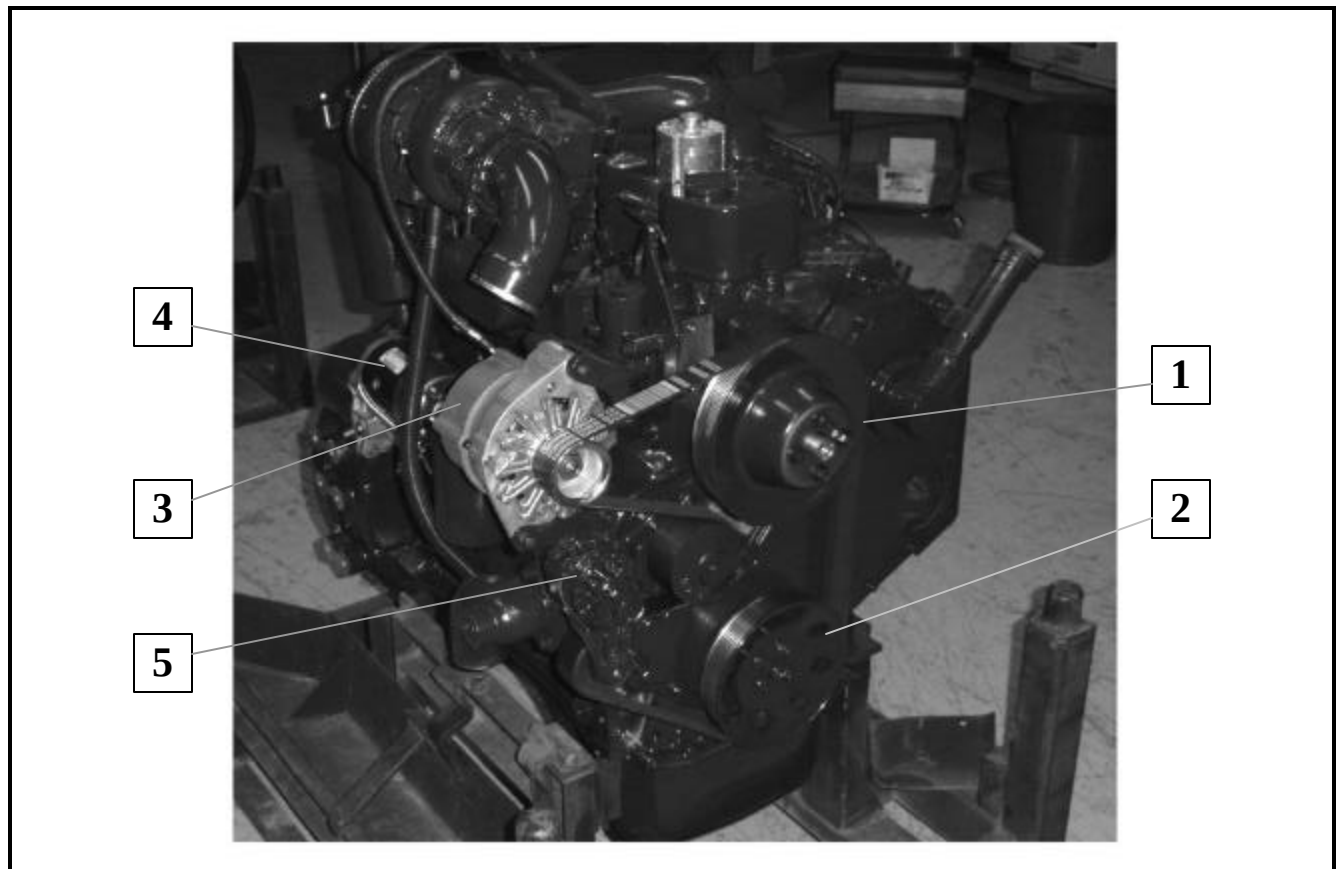
(1) Engine

These checks should determine whether the engine requires a complete overhaul or whether it may be operated for another service period. High oil consumption, low oil pressure at idle speed, oil dilution and other signs of wear must be considered.

Disassemble the engine sufficiently to perform the following inspections and services. Complete overhaul facilities should be available. If the user performs this operation in his own shop, a shop manual should be procured from the engine manufacturer.

a Check fuel pump calibration

This operation may be performed on an as required basis. Pump calibration also requires special tools and testing equipment. Consult the engine manufacturer for information.



1. Fan Pulley
2. Vibration Damper
3. Alternator

4. Starter Motor
5. Belt Tensioner

Engine Accessories
Figure 2

b Clean/Calibrate/Replace Injectors

Injectors must be cleaned and calibrated regularly to insure proper fuel delivery to the combustion chambers. Special tools are required. It is suggested that an engine manufacturer representative be consulted for this operation.

c Change coolant

d Inspect cylinder heads for the possibility of overhaul

e Inspect pistons and piston rings

j) Seasonal Maintenance Checks Spring/Fall (Engine)

(1) Inspect engine cooling fan each spring and fall.

a Check fan to be sure it is securely mounted.

b Check for fan wobble and/or broken/cracked blades.

c Check fan hub and crankshaft pulley for secure mounting.

(2) Check cooling system each spring and fall. Clean if necessary.

(3) Check all hoses.

In addition to daily checks of hoses for leaks, inspect hoses thoroughly each time the cooling system is cleaned and serviced. Inspect for signs of deterioration and collapse.

a Inspect for cracks and cuts

b Inspect for cutting and deformation caused by hose clamps.

c Replace hoses as required.

(4) Check and adjust drive belt each time the cooling system is cleaned, or on an as required basis.

(5) Check thermostat and seals each fall when cooling system is serviced.

k) Lamps Circuit breakers, and Fuses

(1) Check all lamps daily

(2) Check circuit breakers and/or fuses as required.

(3) A lamp chart (Figure 3) lists all lamps with their location and identifying trade number in table below.

(4) The fuse chart (Figure 4) lists all fuses with their location, size, and type.

Light Identification	Illustration or Location	Lamp (Bulb) as per Lamp Industry Trade Number
Engine On Lamp	1-1, Figure 7, Item 11	1815
Contactor Closed Lamp	1-1, Figure 7, Item 8	757
Air Filter Restriction Indicator	1-1, Figure 7, Item 16	1815

**Lamp Identification Chart
 Figure 3**

Item Protected	Illustration	Quantity	Size
Voltage Regulator	1-1, Figure 7, Item # 6	1	10 A
Voltage Build-up	1-1, Figure 7, Item # 5	1	10 A
Control Windings	1-1, Figure 7, Item # 4	3	10 A
Throttle Solenoid	1-1, Figure 7, Item # 10	1	20 A (Slo-Blo)
Control Panel Lights	1-1, Figure 7, Item # 7	1	10 A
Engine Circuit	1-1, Figure 7, Item # 8	1	20 A
28 VDC Protection	1-1, Figure 7, Item # 9	1	5 A

**Fuse Identification Chart
 Figure 4**

Section 2 Maintenance Procedures

1) General

A suggested maintenance schedule was provided in Section 1 of this Servicing Chapter. Each step of the schedule was also covered in general in Section 1. This Section covers maintenance in more detail, where necessary.

WARNING

STOP operations at once if a serious or possibly dangerous fault is discovered.

2) Lubrication

a) General

Proper lubrication is one of the most important steps in good maintenance procedure. Proper lubrication means the use of correct lubricants and adherence to a proper time schedule. Lubrication points, frequency of lubrication, and recommended lubricants are indicated in Figures 1 and 2.

b) DC Generator

The 28.5 volt DC generator requires NO lubrication. The armature is sealed at the factory for lifetime, maintenance free operation. The front end of the armature is supported by the engine main bearings.

c) Generator Controls

Generator controls and instruments require no periodic lubrication. A few drops of oil may be required on door hinges occasionally to insure free and quiet operation.

d) Engine

Although the engine and its accessories require no more attention than any other similar installation, they still inherently require a major portion of the generator set lubrication and maintenance. Recommendations regarding engine lubrication have been taken from the engine manufacturer's "Operation and Maintenance Manual" and incorporated here to make them more readily available to operators and maintenance personnel.

(1) Lubrication schedule

Time schedules indicated on the Lubrication Chart, Figure 1, are approximate. They are based on average operating conditions. It may be necessary to lubricate more frequently under severe operating conditions such as: low engine temperatures, high oil temperatures, or intermittent operation. However, time intervals should not exceed those indicated in the chart without careful evaluation.

The use of quality lubricating oil, combined with a appropriate lubricating oil drain and filter change intervals, are important factors in extending engine life.

(2) Oil specification

Engine lubricating oil, recommended by the engine manufacturer, is identified by an API (American Petroleum Institute) classification designation. The manufacturer does not recommend any specific brand of lubricating oil.

Oil recommended for the diesel engines in this application is API Class CE/SG

Lubricating oil is discussed in detail in the Engine Manufacturer's Operation Manual.

(3) Oil viscosity

A temperature and oil viscosity index chart is shown below. For operation at temperatures consistently below -13°F (-25°C), refer to the Cummins Operation Manual.

(4) Changing engine oil

Oil should be changed once after the first 50 - 150 hrs. of use, then every 250 hrs of engine operation thereafter. The generator set is equipped with an hour meter to record actual engine operating time. The ideal time to change engine oil is soon after a power delivery run, when the engine is at operating temperature.

Change the oil filter element each time the oil is changed.

NOTE: If lubricating oil is drained immediately after the unit has been run for some time, most of the sediment will be in suspension and will drain readily.

CAUTION

High ash oils may produce harmful deposits on valves that can cause valve burning.

CAUTION

Do not use solvents as flushing oils in running engines.

Change oil as follows:

- a Provide an open container for catching the old oil below the oil drain plug. Container capacity must be greater than 30 quarts (28.4 liters).
- b Remove drain plug located in oil pan. Allow sufficient time for oil to drain from valve train, timing gear case, etc., before reinstalling plug.
- c While oil is draining, change the oil filter element. See instructions below.
 - (i) Provide a container for catching spilled oil from the filter.
 - (ii) Remove the oil filter by twisting counter-clockwise and inspect it.

NOTE: The gasket can stick to the filter head. Make sure it is removed before installing a new filter.

Item	Maintenance Required
Lube Oil Capacity Oil Filter Replacement	Check oil level daily or after every 10 hours of use. Change oil and the oil filter after the first 50 to 150 hours of use, then at 250 hour or 6 month intervals thereafter. Use oil specification API, Class CE/SG. 11.5 quarts (11 liters) Oil Filter Replacement Equipment Manufacturer No. 286897-028 Oil Filter Replacement Fleetguard No. LF3805
Lube Oil Viscosity Required as per Ambient Temperatures	<u>VISCOSITY AMBIENT</u> <u>TEMPERATURE CONDITIONS</u> SAE 15W40 (Preferred) 0°F (-18°C) and above for most climates SAE 10W30 -10°F to +50°F (-23°C to +10°C) Winter conditions SAE 5W30 -20°F to +50°F (-29°C to +10°C) Artic Conditions SAE 0W30 -20°F and below to +50°F (-29°C and Below to +10°C)
Synthetic Oils	See the Engine Manufacture's Operator's Manual for usable synthetic oils and instructions.
Fuel Strainer and Lubricity Additive Filter. Fuel Pump	Change both filter elements every 250 hours or 3 months of use, whichever comes first. See the Engine Manufacture's Operator's Manual for maintenance instructions.
Coolant	Check coolant level daily. Service and maintain coolant system according to Section 2-2, paragraph 6. Engine coolant capacity : 12 quarts (11.4 liters)
Coolant hoses and connections	Check coolant hoses and connections daily for leaks.
Air Cleaner	Change air cleaner filter as required when air cleaner indicator (on engine control panel) shows that it should be changed.
Fan Belt	Check fan belt condition and tension every 500 hours or 6 months of use.
DC Generator	AC generator bearings are sealed and require no periodic lubrication.
Alternator	Alternator bearings are sealed and require no periodic lubrication.
Starter	Starter motor bearings are sealed and require no periodic lubrication.
Water Pump	The water pump is packed at assembly and requires no periodic lubrication.
Fan Hub	The fan hub is lubricated at assembly and requires no periodic lubrication.

Lubrication and Maintenance Chart
Figure 1

Symbol	Name	Specification	Notes
1	Grease, General Purpose	MIL-G-3545	Excludes those of sodium or soda soap thickness.

Lubricants Chart

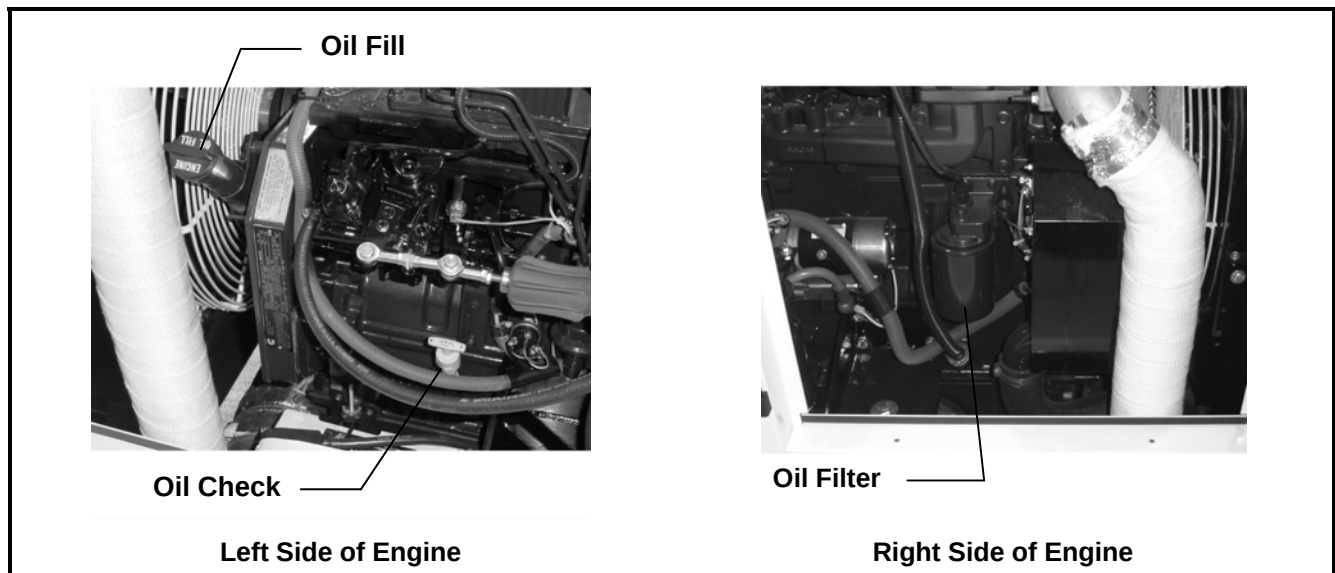
- (iii) Fill the new filter with clean lubricating oil before installation.
- (i) Apply a light coating of lubricating oil to the gasket sealing surface and install the filter. **DO NOT** over tighten the filter.

CAUTION

If bearing metal particles are found on the element or in the shell, the source should be determined before a failure.

CAUTION

Determine source of moisture, internal leaks, defective seals, gaskets, etc.



Lubrication System
Figure 2

- e Clean the drain plug and install when engine oil has completely drained. Torque the drain plug to 50 foot-pound (68 Nm).
- f Use the oil refill tube to refill the crankcase with new, clean oil that meets engine manufacturer's recommendations.

NOTE: Using a funnel to fill the oil crankcase will help prevent spills.

CAUTION

1. Always use clean containers, funnels, etc.
2. Don't forget to install the drain plug and install the new oil before starting the engine.

- g Start engine and check oil pressure at once. Allow engine to idle for 5 minutes, check for leaks, than stop the engine.
- h After the engine has been stopped for about 5 minutes, recheck the oil level. Add oil, if required, to bring the level up to the high bar on the oil dipstick.

e) Engine Accessories Lubrication

(1) Alternator

Most alternators contain sealed bearings and require no periodic lubrication, however, check to make certain there are no lubrication points on your particular alternator.

(2) Starter

Most starting motors are lubricated at assembly and should be re-lubricated only when the starter is removed and disassembled, however, inspect the starter to make certain it has no lubrication points.

(3) Water Pump

The water pump is packed at assembly and requires no periodic lubrication. Replace pump if signs of lubricant leakage are found.

(4) Fan Hub

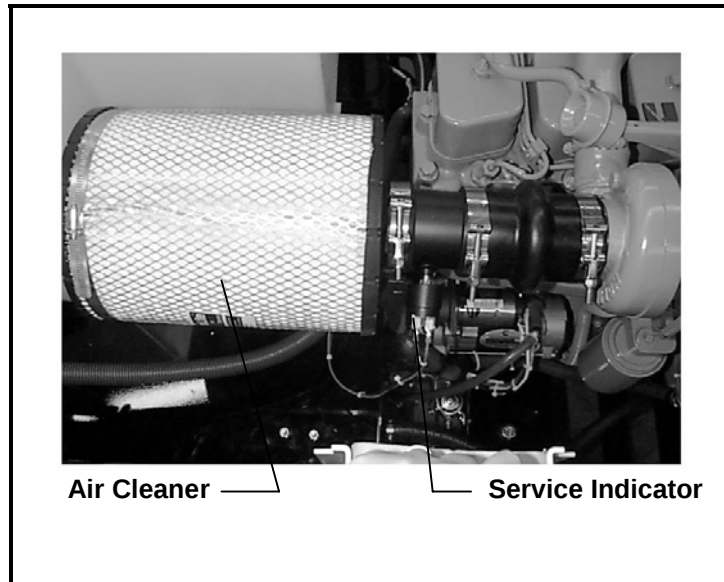
The fan hub is also lubricated at assembly and requires no periodic lubrication. Replace hub if lubricant is leaking.

3) Servicing the Air Cleaner

This air cleaner is a disposable type which, when dirty it may be discarded. A definite time schedule for cleaning or changing the air cleaner cannot be determined because of varying operating conditions; therefore an air restriction indicator lamp is mounted on the control panel. Change the filter when the red indicator lamp glows.

a) Inspecting the Air Cleaner

- (1) Make periodic checks of air cleaner inlet screen for obstructions. If any obstructions are present, remove them.
- (2) Check outlet connection for proper seal.



**Air Cleaner Assembly
Figure 3**

b) Changing the Air Filter

- (1) Open right rear canopy door to gain access to the air cleaner.
- (2) Using a 5/16 socket, loosen the clamps that surround the air cleaner and secure it to the air filter bracket.
- (3) Loosen and remove the clamp and air cleaner from the intake hose.

d) Disposal

Normal trash pick-up is acceptable. **NEVER** burn the air filter for disposal.

4) Engine Fuel

a) How to select Fuel—Quality

The quality of fuel oil used in the diesel engine is a major factor in engine performance and life. Fuel oil must be clean, completely distilled, stable and non-corrosive.

Use commercially available diesel fuel with less than 0.5% sulfur content. If the sulfur content is higher than 0.5%, oil change intervals should be reduced (See Engine Manufacturer's Operation Manual).

CAUTION

Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the injection pump and the injection nozzles.

CAUTION

The use of low lubricity fuels can shorten life and/or damage the engine's fuel pump.
The engine manufacturer recommends only diesel fuel.

In general, fuels meeting the properties of ASTM designation D 975 (grades 1-D and 2-D) have provided satisfactory performance. For more information regarding the selection of fuel to use, refer to publication "Engine Requirements—Lubricating Oil, Fuel, and Filters" available from authorized Engine Manufacture service outlets.

b) Cold Weather Operation

In cold weather, diesel fuel will form wax crystals that can restrict flow and clog filters. Fuel oil suppliers approach this problem several ways. Some provide a specially refined product, while others may use flow-improving additives or winter blends. Winter blended fuel will likely contain kerosene or 1-D fuel, which provide good cloud point temperatures, but result in a lighter fuel with a lower heat content. These fuels may be used, but they may result in reduced engine power and/or fuel mileage.

In most cases, adequate resistance to cold can be obtained by adding an additive. For further assistance contact the nearest Engine Manufacture service representative.

5) Engine Fuel System

The fuel system consists of five primary components: Fuel tank, Fuel Pre-Filter, Fuel Lift Pump, Fuel Filter, and the Fuel Return Line. The following are maintenance procedures for each of these items.

a) Fuel Tank

Be sure that no foreign objects are permitted in the fuel tank. The fuel tank may need to be removed and flushed out if objects are found in the Fuel Pre-Filter

b) Fuel Pre-Filter (Strainer)

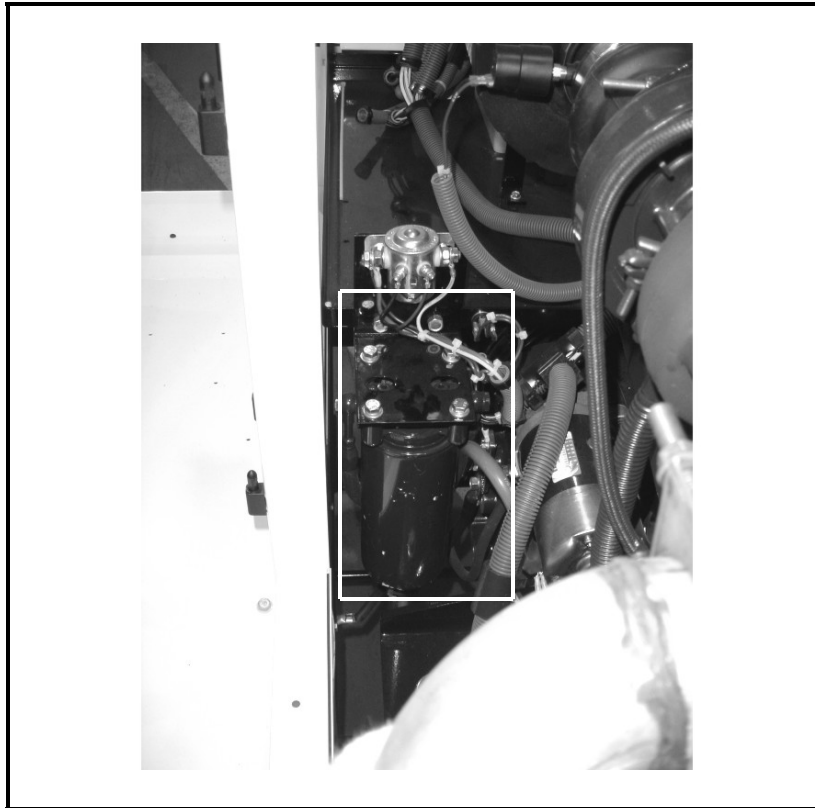
Hobart Ground Power has mounted a fuel filter (strainer) near the engine flywheel housing to remove foreign material from the fuel before it enters the fuel lift pump.

c) Fuel Pump

The fuel pump supplies pressure to the fuel system so the diesel fuel can circulate freely. A consistent check of the fuel pressure is necessary. Loss in fuel pressure in the fuel line may indicate a faulty fuel pump.

d) Engine Lubricity Additive Fuel Filter

The forth item in the fuel line system is the factory installed lubricity additive fuel filter. The filter's function is to remove foreign material from the fuel and add a lubricity additive into the fuel before it enters the engine's fuel pump. The filament element is a throwaway type in which the case and element are made as one disposable part.



**Engine Lubricity Fuel Filter
Figure 4**

(1) Changing fuel filter

- a Replacement fuel filter part number.
 - Equipment Manufacturer Part No. 286897-026
 - Engine Manufacture Part No. 3966406
- b The fuel filter must be changed after 250 hours of operation in order for the fuel filter to continue adding the proper amounts of the lubricity additive into the fuel system.
- c Shut off fuel valve.
- d Place a pan underneath the fuel filter to catch spilled fuel
- e Undo fuel filter with commercial tool and spin off.
- f Catch any fuel.
- g Clean any dirt from the filter carrier rim
- h Apply a light film of oil or diesel on the rubber seal on the new filter.

CAUTION

When installing new element, do not over tighten it; mechanical tools may distort or crack filter head.

- i Fill new filter with diesel fuel
- j Screw in the new fuel filter "snug". Check that the cartridge is seated correctly against the gasket and tighten with a final half turn.
- k Open fuel valve.

e) Fuel Return

The fuel return is a hose that takes unused fuel from the engine, and delivers it to the fuel tank. No maintenance is required, other than periodic inspections for cracks.

f) Priming Fuel System (when applicable)

If this generator set has been run out of fuel, the fuel system must be manually primed with diesel fuel up to the fuel injectors before the generator set can be started again. Once the fuel has reached the fuel injectors, crank the engine until it starts.

CAUTION

Make sure that all rags, or absorbent sheets, are clear of moving engine parts and cannot be drawn in to the radiator fan.

CAUTION

Do not crank the engine for more than 15 seconds continuously. Allow the starter to cool for 15 seconds between attempts.

6) Engine Cooling System

a) General

Cooling system service requires more than maintaining the proper coolant level in the radiator and protecting the system against freezing. Water should be clean and free of any corrosive chemicals such as chloride, sulfate, and acids. It should be kept slightly alkaline with a pH value in the range of 8.0 to 9.5. Any water that is suitable for drinking can be used in the engine when properly treated as described in Engine Manufacture Operation Manual. The Engine Manufacture Distributor should be consulted regarding the selection of satisfactory brand, permanent-type antifreeze for use in the cooling system.

b) Radiator Cap

(1) General

A pressure relief valve is built into the radiator cap. It is designed to open at a pressure of approximately 10 psi (68.9 Kpa).

WARNING

When removing cap from a very hot radiator, do not turn cap past safety stop until the pressure or steam has escaped.

(2) Removal

To remove, turn the cap to the left (counterclockwise) to the safety stop. When all pressure is released, press down on the cap and continue to turn until the cap is free to be removed.

CAUTION

Allow engine to cool before adding coolant.

CAUTION

Do not attempt to repair the valve in a radiator cap in case of failure. Replace with a new cap.

(3) Installation

When installing the cap, be sure it is turned clockwise as far as it will go so that the pressure retaining valve will be functional.

c) Coolant

The preparation and maintenance of the coolant solution is important to engine life and is completely covered in the Engine Manufacture's Operation and Maintenance Manual. For information regarding coolant specifications, testing equipment, antifreeze, etc., refer to Engine Manufacture's Operation and Maintenance Manual that accompanies the Hobart manual or consult the local Engine Manufacture Distributor.

CAUTION

Never use soluble oil in the cooling system.

(1) General

A permanent type antifreeze is recommended for use in the cooling system.

CAUTION

1. **DO NOT** use methanol or alcohol as antifreeze.
2. **DO NOT** mix brands or type of antifreeze. A solution containing two or more types of antifreeze is impossible to test accurately.

(2) Selecting antifreeze

- a Select a permanent type antifreeze known to be satisfactory for use with chromate corrosion resistor.
- b When it is not known if the antifreeze is satisfactory for use with chromate resistor, check with local Engine Manufacture Distributor for a list of compatible antifreezes.

(3) Checking antifreeze solution

Check the solution with a reliable tester when in doubt about antifreeze protection.

d) Draining the Cooling System

To completely empty the cooling system requires draining the engine block and the radiator assembly.

To drain the cooling system, proceed as follows:

- (1) Remove radiator cap.
- (2) Place a drain pan with at least a 40 quart (28.4 liters) capacity under radiator to catch coolant.
- (3) Place the radiator drain hose that comes off the radiator drain valve, into the drain pan.
- (4) Open the radiator drain valve.
- (5) Allow the system to drain completely.

NOTE: Be sure the drain valves do not clog during draining.

- (6) When the system is completely drained, close the drain valve and replace engine drain plug.

e) Flushing the Cooling System

Flushing the cooling system should be a yearly maintenance procedure. By flushing the system, clean water is forced through the engine block to remove expired coolant and other contaminants.

f) Cleaning the Radiator Core

Blow out accumulated dirt from the radiator core air passages, using water. Bent or clogged radiator fins often cause engine overheating. When straightening bent fins, be careful not to damage the tubes or to break the bond between fins and tubes.

NOTE: Direct the water in a reverse direction to normal air flow. Normal flow on this installation is from the engine compartment outward.

g) Filling the Cooling System

The preparation and monitoring of coolant in liquid-cooled engines is especially important because corrosion, cavitation, and freezing can lead to engine damage. For coolant system protection details see the Engine Manufacturer's Operations Manual.

- (1) Install coolant
 - a Remove radiator cap. Be sure that both radiator drain valves are closed.
 - b Pour coolant into radiator very slowly until it reaches the bottom of fill neck.
 - c Start the engine and bring up to rated speed and allow the thermostat to open. Add coolant as trapped air escapes from the system and the coolant level falls.
 - d Continue to check coolant level until all trapped air escapes. Add coolant if needed to fill to the bottom of fill neck. Install radiator cap.

(2) Inspection/Check

- a Check system for evidence of leaks.
- b Inspect all hoses. Install new hoses as necessary. Tighten hose clamps as required.
- c Check the condition of fan and water pump belts. Replace belts if necessary.

NOTE: It is good practice to attach a card, indicating the cooling system contents and date serviced, to the radiator filler neck.

h) Thermostat

The thermostat should be checked each fall, or as required. Refer to Engine Manufacture's Operation for recommended instructions.

7) Generator Maintenance

The only maintenance service required for the generator will be brush replacement, slip ring cleaning, etc.

a) Brush Service

If inspection reveals that brushes are gummy or sticking in the brush holders, they should be removed and cleaned. Clean both the brushes and brush holders. Use a good, safe, commercial cleaner. Dry all parts thoroughly. Be sure brushes can move freely in brush holders.

CAUTION

Do not use a flammable solvent. Be sure the unit is completely dry before operating.

b) Generator Revolving Field Brush Replacement (See Figure 5)

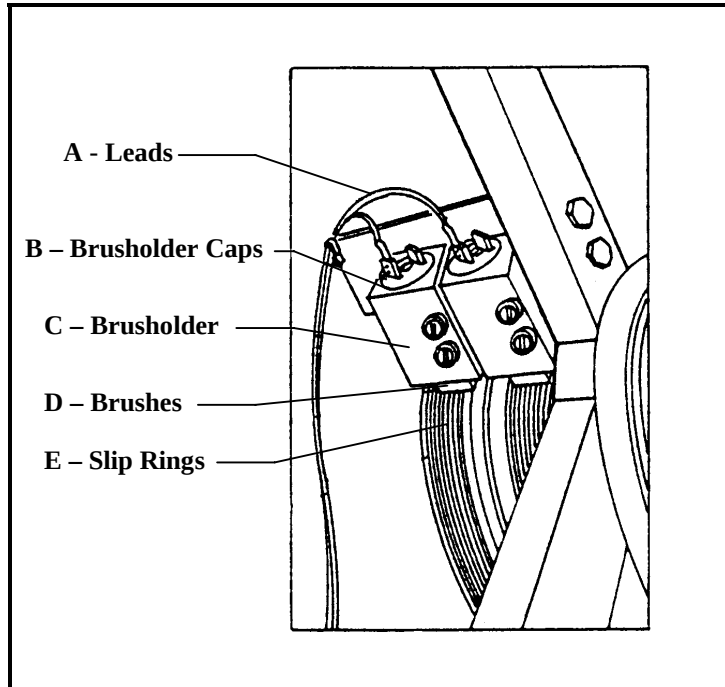
- (1) Disconnect leads (A) from connectors on brush holder caps (B).
- (2) Remove brush holder caps (B) from brushholder.

WARNING

When removing the lead wires, do so one at a time and replace each brush accordingly, to insure that the lead wires are put back onto the proper brushes.

- (3) Lift brush (D) from brush holder (C) for inspection. If brushes are worn unevenly or are shorter than 7/16 inch (11 mm), replace them.
- (4) Inspect slip rings whenever brushes are removed for servicing brushes or brush holders. Note surface conditions of rings. Surface should appear smooth and clean. Scoring or roughness of slip rings may be caused by grit or abrasive substance in brushes, or by oil on the rings. Moderately rough slip rings can be smoothed by holding grade 00 flint paper against their surface while the rings are revolving slowly. If the rings are badly scored, the unit must be sent to an overhaul facility for repair. After cleaning slip rings, blow dirt and grit out of the unit with compressed air. Do not use over 25 psi (172 kPa) air pressure to blow dirt out.

- (5) Slip new brushes into brush-holder guides, and place caps on top, and screw them into the guides to a "bottomed" position. The spring attached to the brush will determine the pressure at which the brush contacts the slip rings.
- (6) To fit new brushes to the slip rings, lay a strip of No. 00 sand- paper, smooth side down, on slip ring surface, and draw the sandpaper in the direction of rotation of the slip ring, lifting the brush on the return stroke. Continue until the brushes have same curvature as the slip rings. Blow all carbon dust out of the machine using not over 25 psi (172 kPa) air pressure.



Generator Revolving Field Brushes
Figure 5

8) Drive Belt

a) General

The engine cooling fan, alternator, and water pumps are driven by one serpentine belt, which must be replaced if worn or damaged.

b) Preparation for Belt Check and Adjustment

All driven assemblies must be securely mounted in operating position before checking belt tension.

c) Checking Belt Tension

CAUTION

Checking the tension and changing the serpentine belt should only be performed with the engine off.

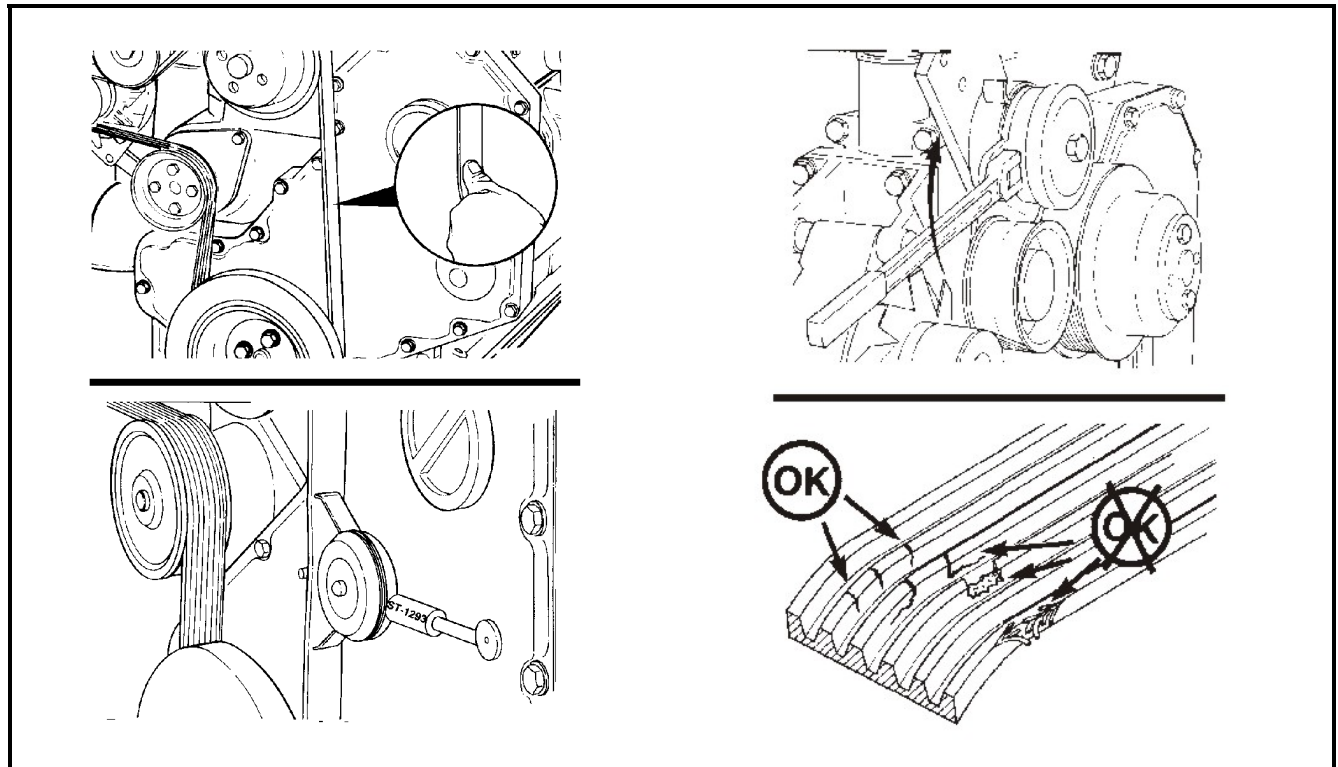
Check belt tension every 500 hours, or once a twice a, whichever comes first. A belt that is too tight is destructive to bearings of the driven part. A loose belt will slip and cause inefficient operation of the part being driven as well as wear to the belt.

CAUTION

Inspect and replace the belt if it has unacceptable cracks, is frayed, or has pieces of material missing.

Belt tension may be checked by hand. To do so, manually depress the belt with an index finger to determine the amount of belt deflection obtained. When a force is applied at a point halfway between pulleys on the longest span of a belt, there should be no more than 1/2 inch of deflection attained.

Refer to the Engine Manufacturer's Operation and Maintenance Manual for checking belt tension and changing worn belts.



Drive Belts
Figure 6

Section 3 Adjustment/Test

1) General

These adjustments and test procedures are applicable to testing and adjusting the generator set after major repair, major parts replacements, or overhaul.

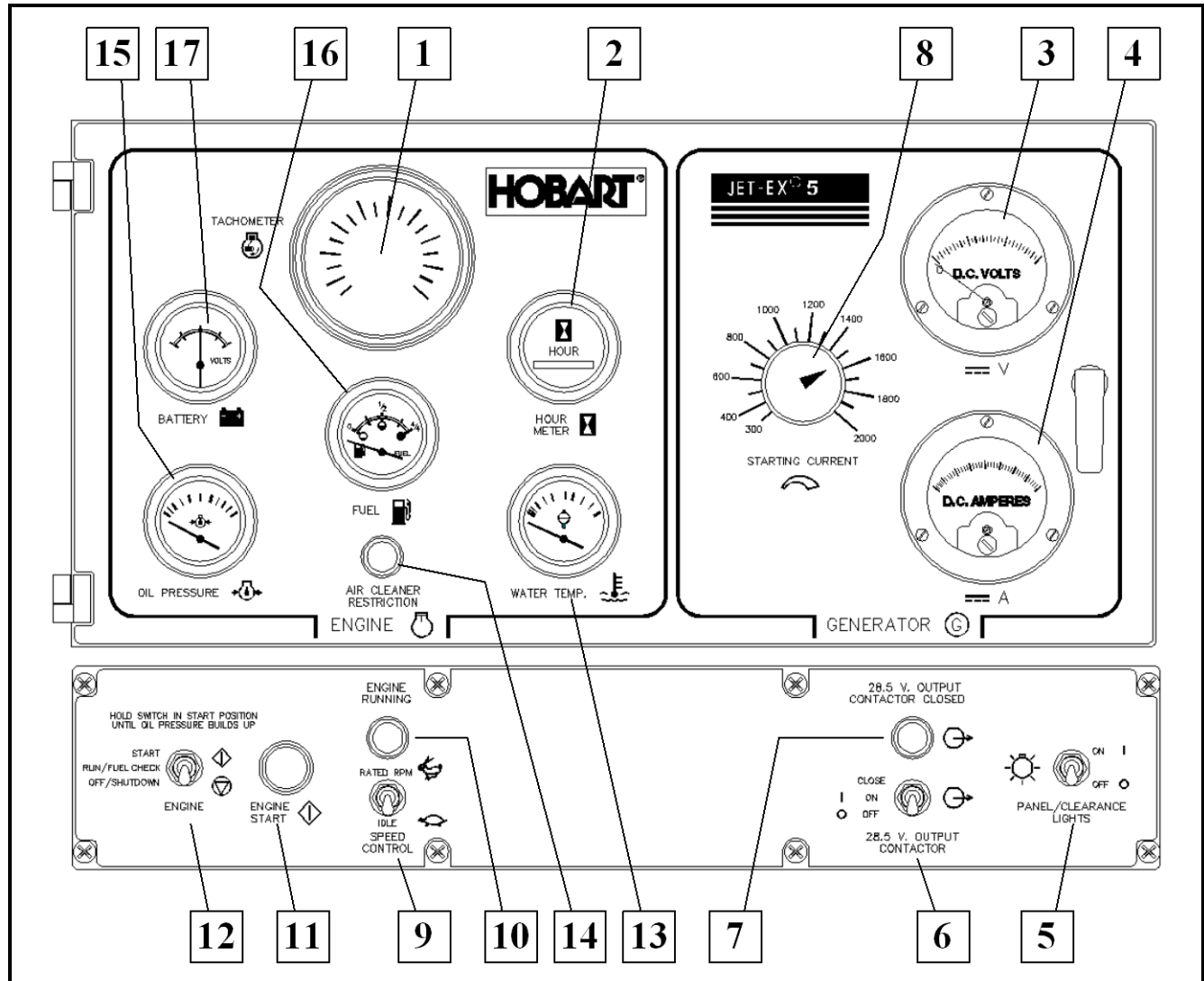
2) Testing the Generator Set

a) Pre-operational Test Procedures

- (1) Connect cables from the generator output terminals to a load bank. Use cables of the same size and length as those to be used in service. Be sure the generator output N cable is grounded.
- (2) Check engine oil level. Oil should be at high bar on the dipstick.
- (3) Check radiator coolant level.
- (4) Check tension of drive belt.
- (5) Inspect for oil, fuel and coolant leaks.
- (6) Check control panel lights and fuse by pressing panel light push button switch. If panel lights operate, the fuse, switch, and lamps are good.
- (7) Make a general inspection of all wiring, and terminals. Inspect the equipment to be certain no damage will result from starting the engine.
- (8) Connect cables from generator output terminals to a load bank. The output cable consists of two single conductor cables not more than 30 feet (9 m) long. The diameter size of each of these two cables is determined by the maximum starting current expectations:
 - Use No. 2/0 cable for 600 amp. maximum starting current
 - Use No. 4/0 cable for 1500 amp. maximum starting current.

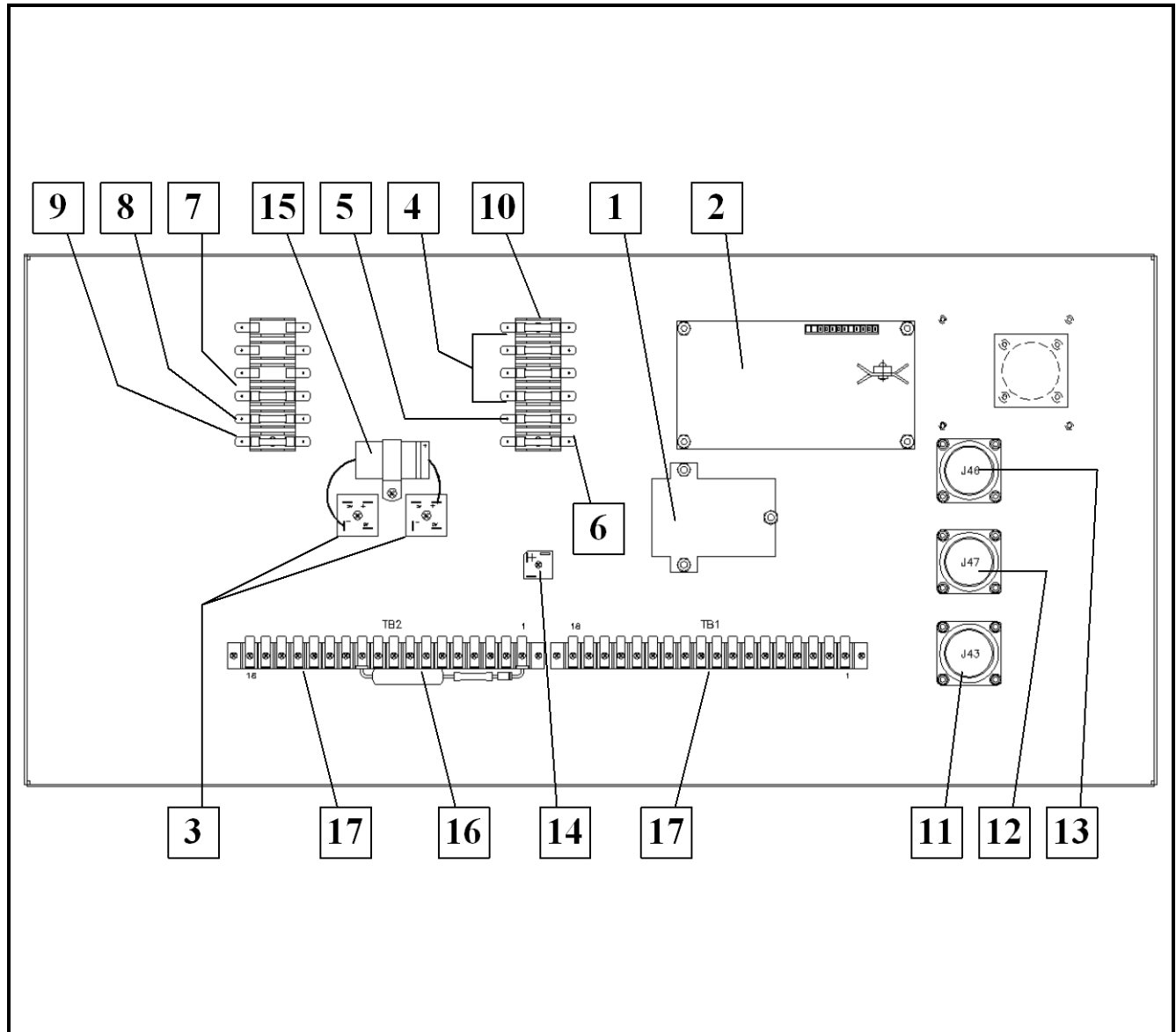
b) Operational Test Procedures

- (1) Start the engine and let it warm up at idle speed.
- (2) Inspect for oil, fuel, and coolant leaks.
- (3) Check the engine voltmeter for proper voltage. Check oil pressure gauge. It should read 35 to 60 psi (241 to 414 kPa). Check water temperature gauge. It should read 180 to 200° F (82 to 93° C.) when engine is hot.
- (4) Observe engine RPM on the tachometer, idle speed should be 1000 RPM $\pm$ 50 RPM.
- (5) Place the speed control switch in the rated RPM position. Check engine RPM's at operating speed: 2200 to 2500 RPM $\pm$ 50
- (6) Check for 28.5 output voltage on generator voltmeter to assure automatic voltage buildup.



- | | |
|--|---|
| 1. Tachometer (M403) | 10. Engine On Lamp (DS407) |
| 2. Hour Meter (M402) | 11. Engine Start Push Button Switch (S401) |
| 3. Voltmeter [Generator] (M406) | 12. Engine Circuit Toggle Switch (S404) |
| 4. Ammeter [Generator] (M407) | 13. Water Temperature Gauge (M404) |
| 5. Panel Lights Toggle Switch (S405) | 14. Air Filter Restriction Indicator Lamp (DS412) |
| 6. Contactor Control Toggle Switch (S408) | 15. Oil Pressure Gauge (M405) |
| 7. Contactor Closed Lamp (DS408) | 16. Fuel Gauge (M408) |
| 8. Current Limiting Control Potentiometer (R402) | 17. Voltmeter [Battery] (M401) |
| 9. Speed Control Toggle Switch (S406) | |

Control Box Panel Assembly
Figure 1



- | | |
|---|---|
| 1. Over Voltage Relay (K403) | 10. Throttle Solenoid Fuse (20 Amp. Slo-Blo) (F409) |
| 2. Voltage Regulator (VR402) | 11. Rectifier Harness Connector (J43) |
| 3. Excitation Rectifiers (CR417 & CR418) | 12. Engine Harness Connectors (J46 – Power) |
| 4. Control Windings Fuses (10 Amp.) (F406 - F408) | 13. Engine Harness Connectors (J47 – Engine) |
| 5. Voltage Build-up Fuse (10 A) (F405) | 14. Blocking Rectifier (CR401) |
| 6. Voltage Regulator Fuse (10 A) (F403) | 15. 100 MFD, 350 VDC Capacitor (C403) |
| 7. Panel Lights Fuse (10 A) (F401) | 16. Tachometer Circuit Assembly (CR403 & R406) |
| 8. Engine Circuit Fuse(10 A) (F402) | 17. Terminal Block (TB1 & TB2) |
| 9. 28 VDC Protection Fuse (5 A) (F410) | |

Control Box Interior Assembly
Figure 2

- (7) Set current limiting control potentiometer to maximum, full clockwise, position.
 - (8) Adjust the load bank for a load of 550 amperes.
 - (9) Place the contactor control toggle switch in the close position. The contactor closed lamp will glow as the contactor closes. Release the contactor control toggle switch to the center on position. The tachometer will indicate between 2200 and 2500 $\pm$ 50 RPM.
 - (10) Disconnect the load bank and check the over-voltage protection by adjusting voltage regulator potentiometer R46 to increase the voltage. The over-voltage relay will trip and open the load contactor between 32 to 34 volts.
 - (11) Readjust the voltage to 28.5 volts, connect the load bank, set it at 550 amperes, and close the contactor.
 - (12) Remove load bank and check voltage regulation at no load. Voltage will be 28.5 volts. Reconnect load bank and check voltage regulation with load bank set at 137, 275, 413, 550, and 660 amperes and check voltage at each setting. Voltage will be 28.5 $\pm$ 1 volts at each different load.
 - (13) With current limiting control potentiometer set to 2000, apply 600 to 700 amperes load to the generator and then set the current limiting control potentiometer to 400. Current displayed on ammeter will be 400 $\pm$ 40 amperes.
- NOTE:** Voltage will not drop below 14 volts.
- (14) Set CURRENT LIMITING CONTROL potentiometer (9) to 2000 and apply 1200 amperes load. Then set the CURRENT LIMITING CONTROL potentiometer to 1000. Current displayed on AMMETER (4) will then be 1000 $\pm$ 100 amperes and voltage will not drop below 14 volts.
 - (15) Remove load. Set engine to idle. Run for 3 minutes at idle.
 - (16) Stop and restart the engine, check the instruments as directed in step (3), and check the entire generator set for unusual vibration and noises.

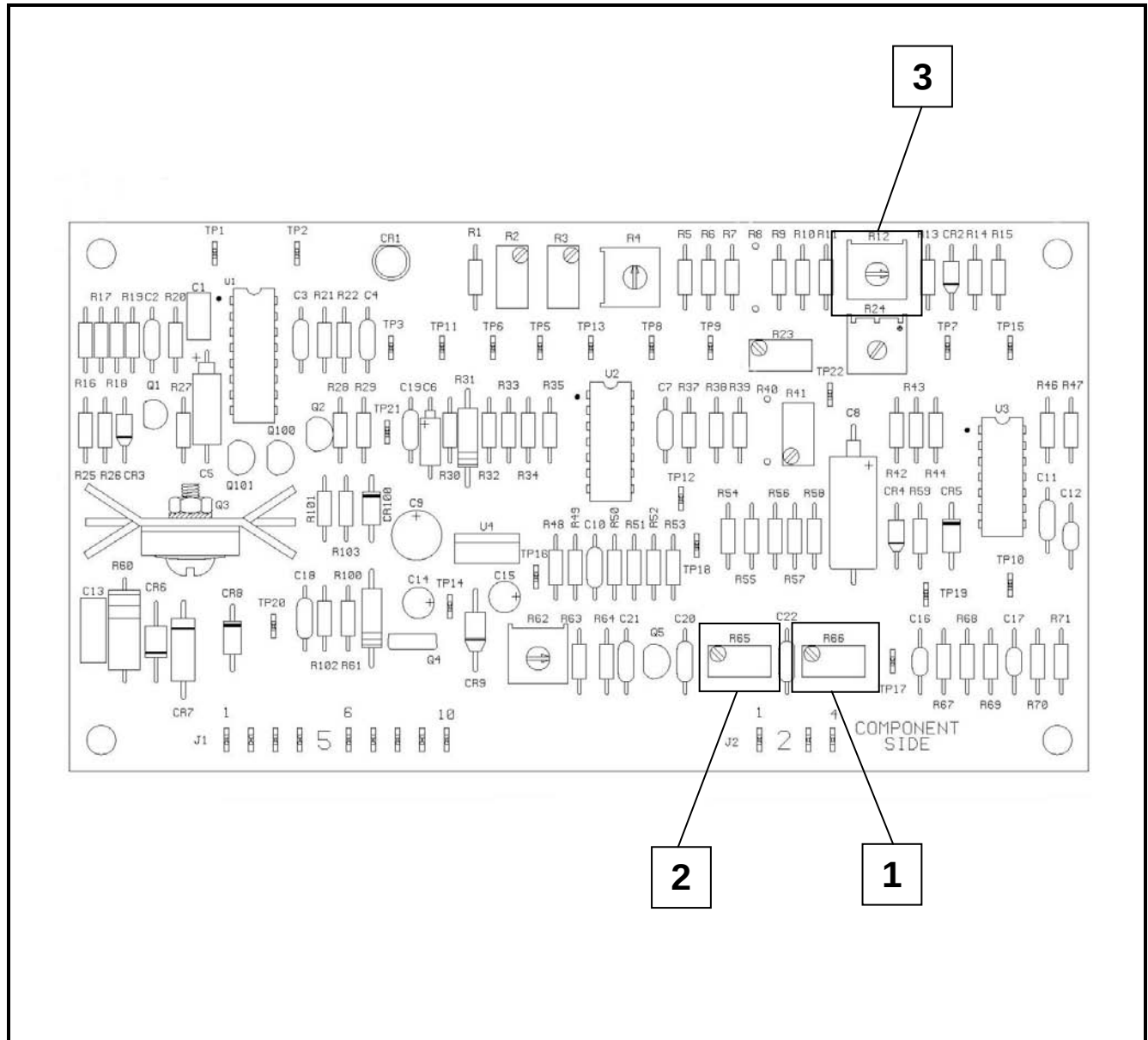
c) Voltage regulator adjustment

(1) 28.5 Volt Adjustment

The regulating voltage, in the 28.5 volt range, is determined by the position of the wiper arm of the multi-turn potentiometer R46. Clockwise (CW) rotation increases the voltage level at which the unit operates. Conversely, counterclockwise (CCW) rotation decreases the voltage level.

(2) Line Drop Compensation

Line drop compensation allows the voltage at the load end of the output cable to remain constant despite the voltage drop associated with the output cable. Clockwise (CW) rotation of the single-turn potentiometer R24 increases the compensation. This potentiometer should be set for flat regulation of voltage at the load end of the output cable when delivering rated load current.



1. 28.5 VDC Output Voltage Adjustment (R66)
2. 14 VDC Output Voltage Adjustment (R65)
3. Line Drop Compensation Adjustment (R12)

Voltage Regulator PC Board
Figure 3

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Section 4 Troubleshooting Procedures

1) General

The Troubleshooting Chart, located in the section, covers the common malfunctions that you may find during operation or maintenance of this equipment. It cannot list all malfunctions that may occur. If a malfunction is not listed in the chart, start looking for the cause at the source of power in the affected circuit. Refer to the schematic and connection diagrams in Chapter 5 and test the circuit, step by step, until the source of the malfunction is isolated.

The Troubleshooting Chart is arranged under 3 headings: Trouble Symptom and Condition, Probable Cause, and Test Check and/or Remedy. Trouble(s), Symptom(s), and Condition(s) are described and numbered. Probable Cause(s) are indented to the right and listed in numbered steps below Probable Cause. Test Check and/or Remedy provides instructions for correcting the malfunction, and is listed below each Test or Inspection procedure. Tests and inspections called for in the Troubleshooting Chart are to be performed as described in section 2-3 of this manual.

2) Equipment for Troubleshooting

WARNING	Exercise extreme care to avoid contact with high voltage leads and components. High voltage can kill!
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CAUTION	Maintenance personnel must be very careful when performing terminal-to-terminal checks to be certain the proper terminals are being used, especially when using jumper leads. Damage to electrical components may result from the application of improper voltage and current.
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A good quality multi-scale voltmeter is the only instrument required for troubleshooting. At least two jumper leads with alligator, or similar clips, will be required. The engine electrical system may be used as a 12 VDC power source.

3) Check Connections and Leads

ALWAYS make a check of connections and leads to a component suspected of being faulty. With the exception of a few instances, we will assume that connections and wiring have always been checked first and that power has not been lost as a result of defective wiring or connections.

4) Engine Troubleshooting

The ability of the engine to start and run properly depends upon a number of things.

- a) An adequate supply of 12 VDC power reaching a good starter and starter button
- b) An adequate supply of air, compressed to a sufficiently high pressure.
- c) The injection of the correct amount of clean fuel at the proper time

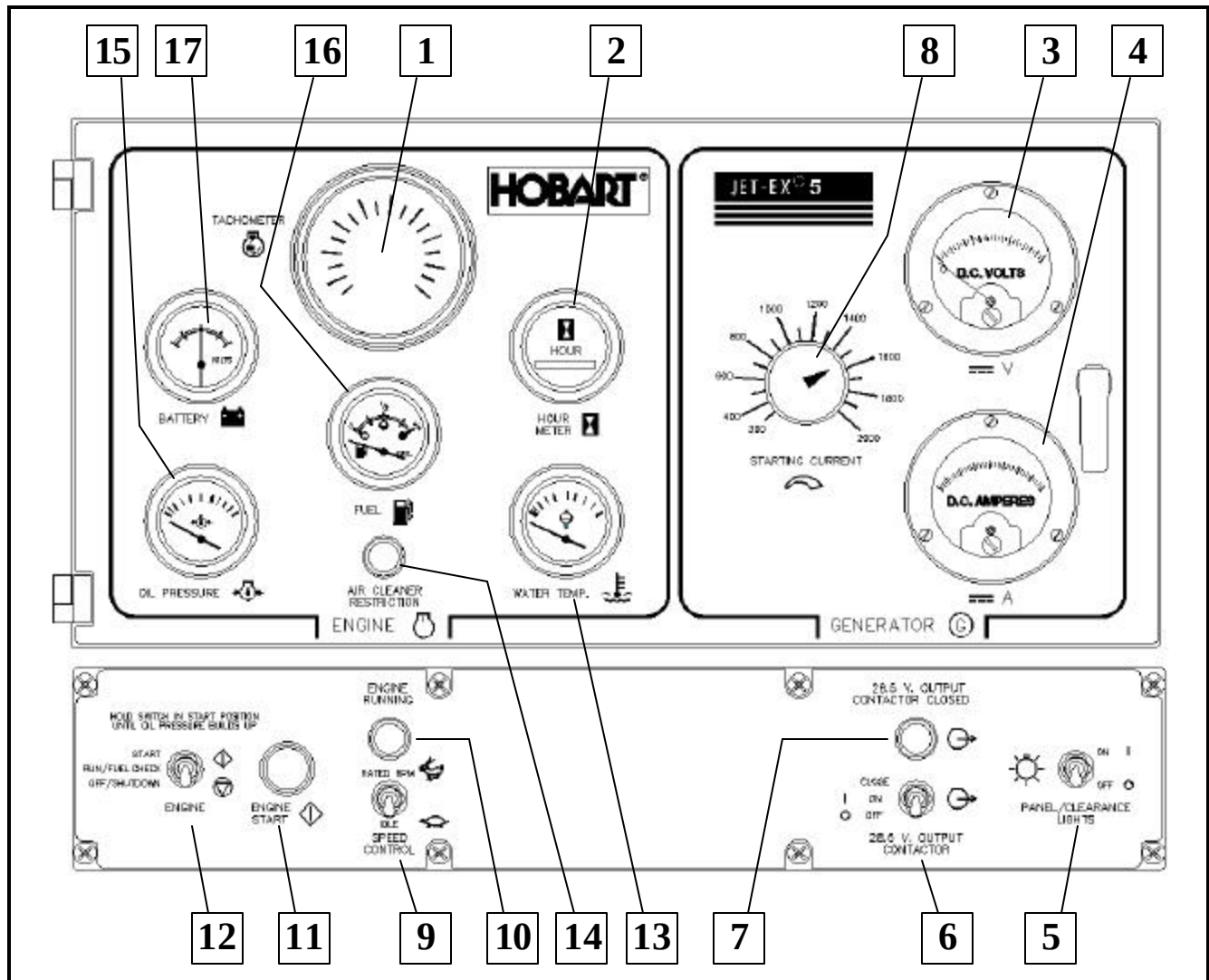
NOTE: When trouble shooting the engine, keep these requirements in mind.

5) Illustrations

Illustrations, Figures 1, 2, 3 and 4 are referred to throughout the Troubleshooting Chart

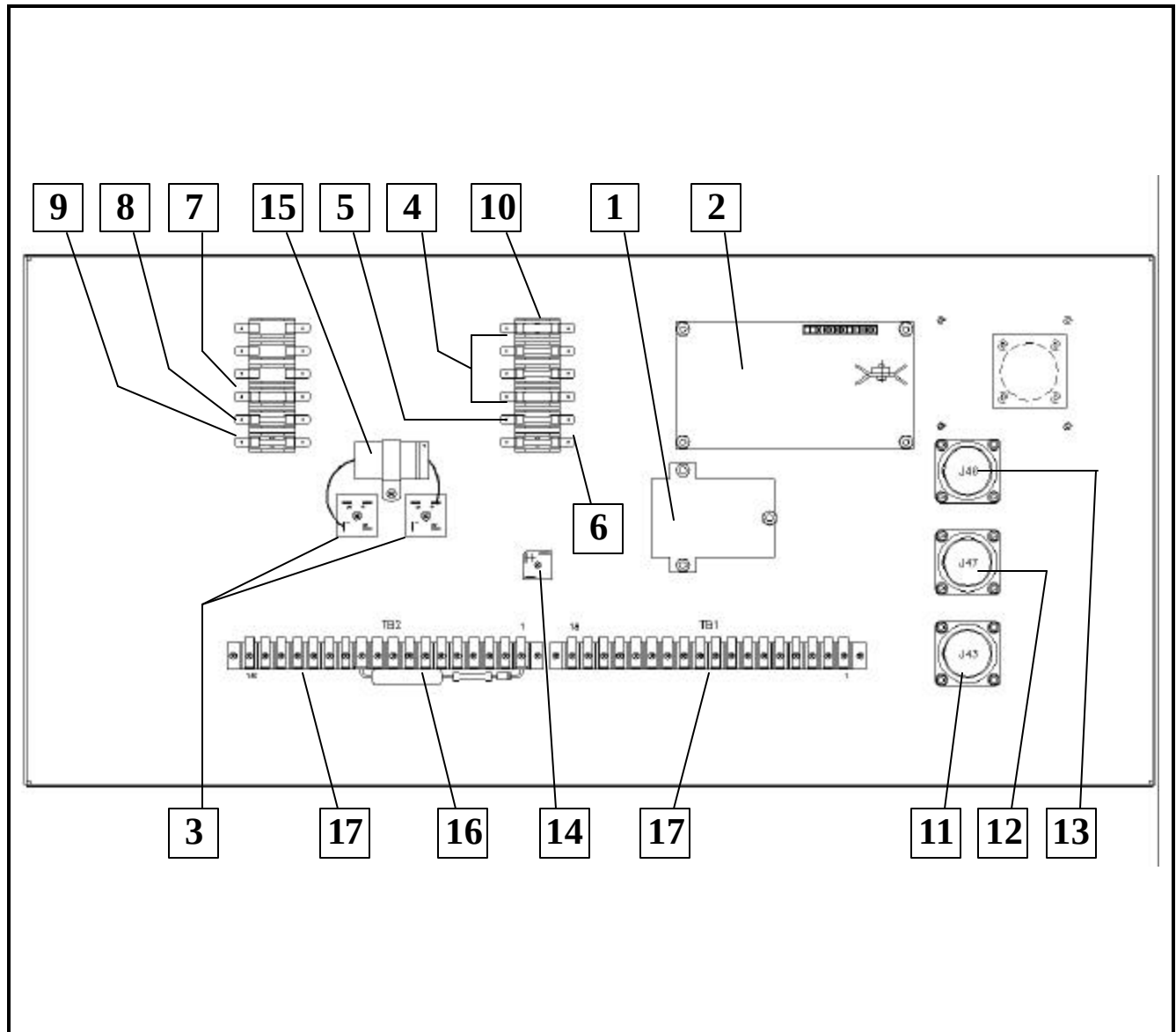
6) Connection and Schematic Diagrams

All connection and schematic diagrams for generator, engine, lights, and all controls are located in Chapter 5.



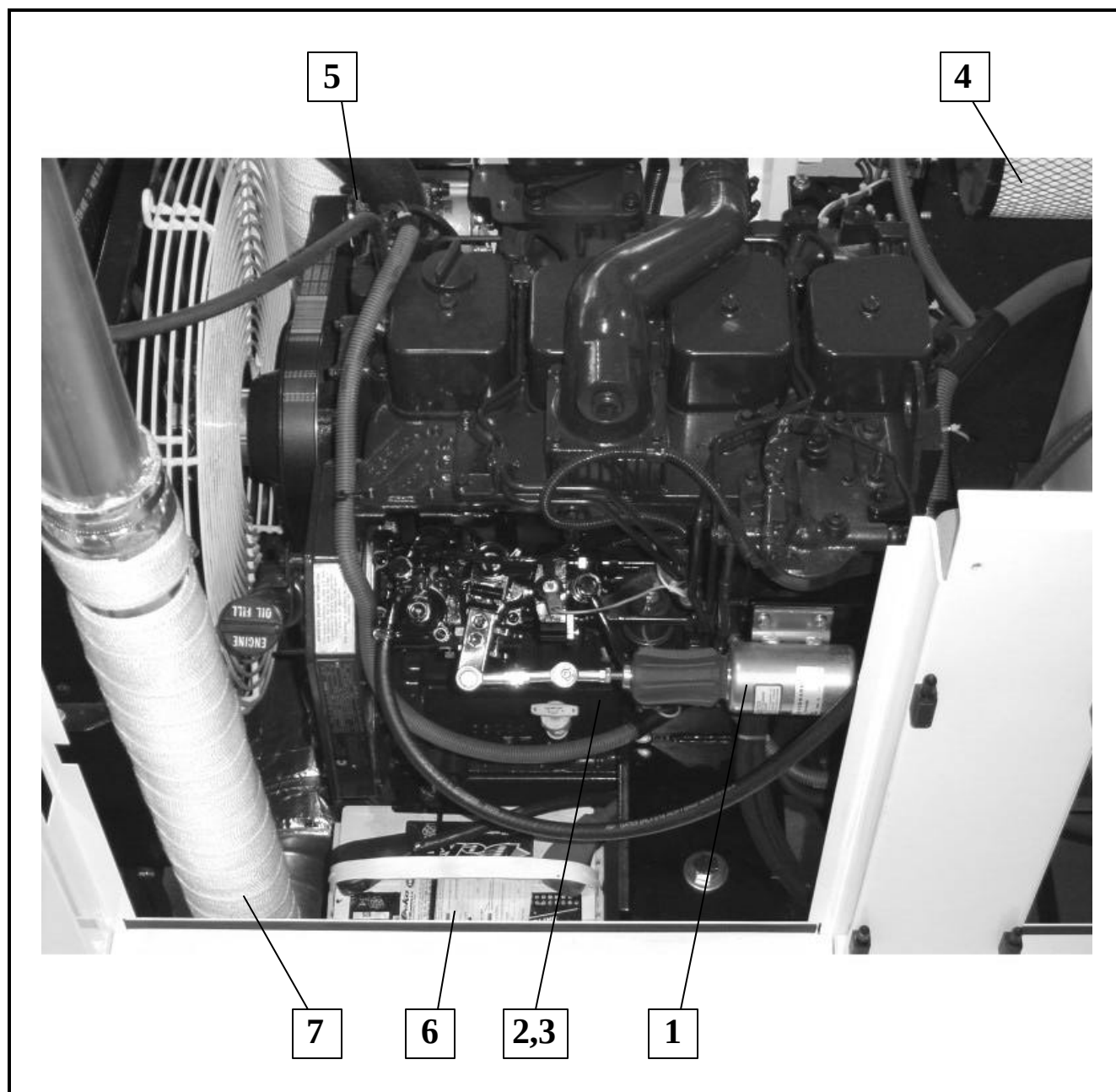
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|--|---|
| 1. Tachometer (M403) | 10. Engine On Lamp (DS407) |
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| 4. Ammeter [Generator] (M407) | 13. Water Temperature Gauge (M404) |
| 5. Panel Lights Toggle Switch (S405) | 14. Air Filter Restriction Indicator Lamp (DS412) |
| 6. Contactor Control Toggle Switch (S408) | 15. Oil Pressure Gauge (M405) |
| 7. Contactor Closed Lamp (DS408) | 16. Fuel Gauge (M408) |
| 8. Current Limiting Control Potentiometer (R402) | 17. Voltmeter [Battery] (M401) |
| 9. Speed Control Toggle Switch (S406) | |

Control Box Panel Assembly
Figure 1



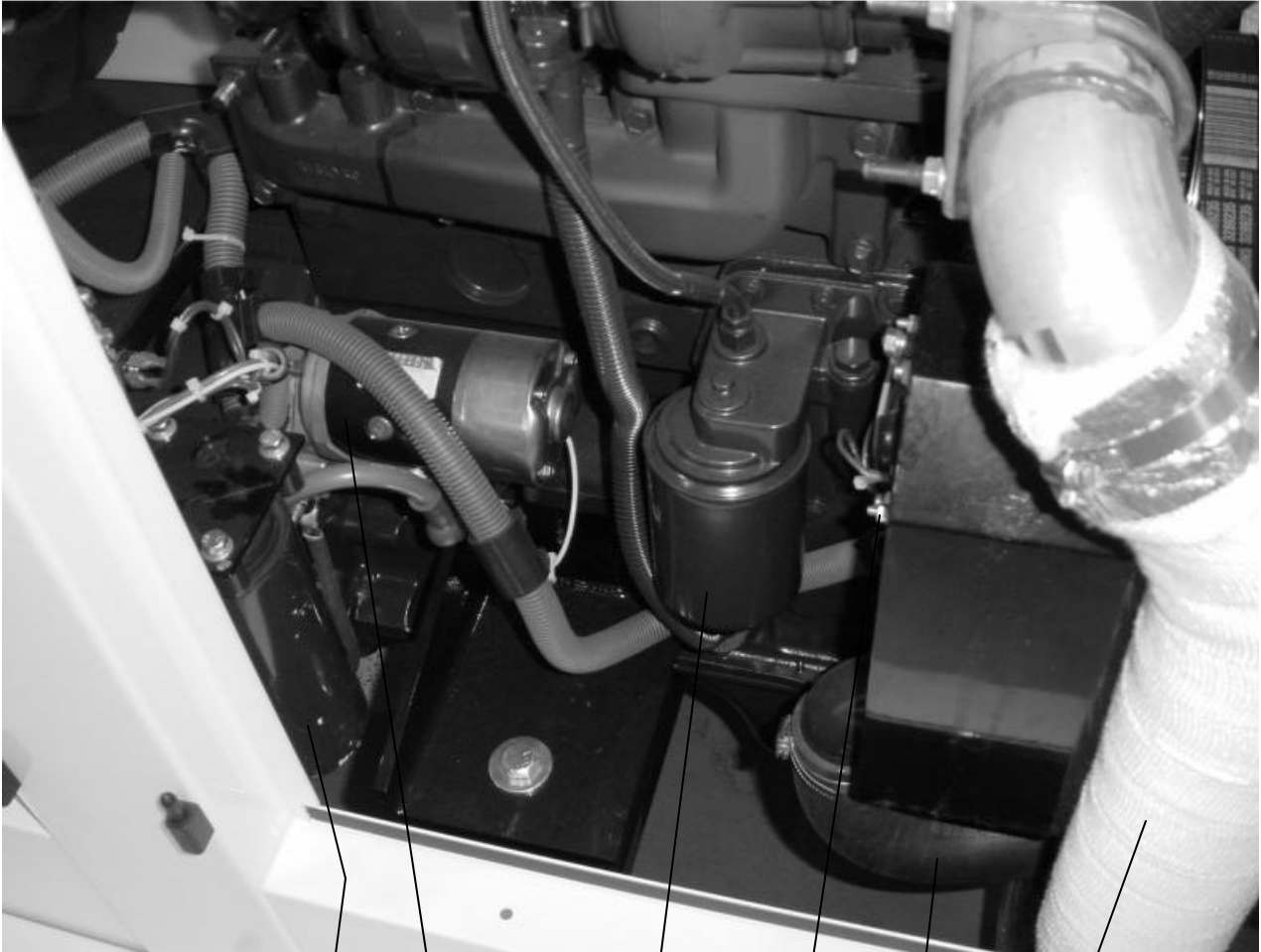
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|---|---|
| 1. Over Voltage Relay (K403) | 10. Throttle Solenoid Fuse (20 Amp. Slo-Blo) (F409) |
| 2. Voltage Regulator (VR402) | 11. Rectifier Harness Connector (J43) |
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| 4. Control Windings Fuses (10 Amp.) (F406 - F408) | 13. Engine Harness Connectors (J47 – Engine) |
| 5. Voltage Build-up Fuse (10 A) (F405) | 14. Blocking Rectifier (CR401) |
| 6. Voltage Regulator Fuse (10 A) (F403) | 15. 100 MFD, 350 VDC Capacitor (C403) |
| 7. Panel Lights Fuse (10 A) (F401) | 16. Tachometer Circuit Assembly (CR403 & R406) |
| 8. Engine Circuit Fuse (10 A) (F402) | 17. Terminal Block (TB1 & TB2) |
| 9. 28 VDC Protection Fuse (5 A) (F410) | |

Control Box Interior Assembly
Figure 2



- | | |
|---|------------------------------------|
| 1. Throttle Control Assembly | 5. Water Temperature Switch (S402) |
| 2. Oil Pressure Sender (A402) | 6. Battery (BT401) |
| 3. Oil Pressure Switch, 20 PSI [138 kPA] (S403) | 7. Exhaust Muffler |
| 4. Air Cleaner | |

Internal Components (Left Side)
Figure 3



- | | |
|----------------------|--------------------------|
| 1. Exhaust System | 4. Radiator Bottom Hose |
| 2. Alternator (G401) | 5. Starter (B401) |
| 3. Oil Filter | 6. Lubricity Fuel Filter |

Internal Components (Right Side)
Figure 4

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Engine Controls		
1. Engine will not start. Starter will NOT crank engine.	a. Battery discharged, or loose battery or ground connection.	Check voltage across batteries. Voltage should be approximately 12.8 volts DC. Check all battery terminals. Be sure 12.8 volts DC is reaching solenoid input terminal.
	b. Defective engine start button, S401 defective.	Momentarily connect a jumper between the hot side of the starter solenoid L401 and the start switch terminal on the starter relay wire. If the starter operates, replace faulty switch. If starter doesn't crank, proceed to the next step.
	c. Defective starter solenoid L401	Momentarily connect a large capacity jumper cable between the hot side of the starter relay and the starter input terminal. If the starter attempts to crank the engine, the starter solenoid is defective. Replace it. If engine still won't crank, proceed to the next step.
	d. Defective starter B401	If the engine will not crank after the previous steps, the starter is defective. Replace starter. If starter did attempt to operate, but couldn't turn engine, proceed to the next step.
	e. Internal engine seizure.	CAUTION: Make certain that engine start switch is in "stop" position so that engine does not start. Use a socket wrench on the front crankshaft pulley to try to turn engine by hand. If engine will not turn, internal damage is indicated.
	f. Engine seized up.	NOTE If engine is overcharged with ether for cold weather starting, it could seize up. If so, wait approx. 1/2 hour until it will be possible to turn engine.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Engine Controls		
2. Engine will not start. Starter does crank engine.	a. Engine circuit fuse F402 blown	Replace engine circuit fuse. Use type AGC-20 fuse.
	b. Fuel valve at tank closed, or no fuel in tank, engine has lost its prime	Check and correct as required.
	c. Defective engine circuit toggle switch S404	Check for 12-V DC from terminal 4 of S404 in "START" position. If 12-V DC is not measured, replace defective switch.
	d. Defective fuel valve solenoid (L404).	Attempt to start engine while applying 12-V DC to the fuel valve solenoid. If the engine starts, the solenoid is defective, and should be replaced. If engine still doesn't start, proceed to next step.
	e. Defective fuel pump.	Check fuel pump according to instructions in the Engine Manufacture's Operation and Maintenance Manual.
3. Engine starts then stops.	a. Fuel not turned on.	Turn on fuel shutoff valve.
	b. Defective oil pressure switch S403	Connect a jumper wire across the "C" and "NO" terminals of oil pressure switch. Start engine and check oil pressure. If it is below 10 PSI (69 kPa) shut down the engine and check lubrication system for leaks. Also check the oil pump for leaks. If oil pressure comes up to normal and the engine continues to run, the oil pressure switch is defective. Replace oil pressure switch.
4. Engine starts then stops when ENGINE CIRCUIT toggle switch S404 is released to "ON" position.	a. Open over temperature switch S402 or defective. Engine circuit toggle switch.	Place a clip-lead jumper wire on the water temperature switch terminals and check for normal operating temperature. If engine then starts properly, replace water temperature switch. If not, replace engine switch.
	b. Choked fuel filter, restriction in air cleaner, or air in fuel system.	Check for these faults according to instructions in the Engine Manufacture's Operation and Maintenance Manual.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Engine Controls		
5. Engine does not attain normal rated RPM.	a. Loose throttle linkage.	If solenoid core is pulled into the full throttle solenoid L403 when speed control toggle switch S406 is in rated RPM position, check for loose control rod between solenoid and throttle. Tighten if required. If solenoid core does not pull in, proceed to the next step.
	b. Defective full throttle solenoid L403.	Check for I2-V-DC across two terminals of solenoid when S406 is in rated RPM position. If I2-V DC is measured, but solenoid core does not pull in, replace the solenoid.
	c. Blown full throttle solenoid fuse (F409).	Replace fuse.
	d. Speed control toggle switch S406 defective.	If engine will not go from idle to rated speed when speed control toggle switch is in rated RPM position, turn off engine and take resistance measurements at speed control toggle switch terminals with switch in the rated RPM position. Zero resistance should be measured between terminals. Replace speed control switch if measurement is improper.
7. Engine lacks power.	a. Insufficient air to engine.	Check air filter restriction indicator lamp for illumination. Replace or clean as required.
	b. Restricted exhaust system.	Check exhaust pipe for restrictions. Check muffler for clogged condition. Replace as required.
	c. Low compression.	Check compression in all cylinders according to the Engine Manufacture's Operation and Maintenance Manual.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Engine Controls		
8. Engine Overheats.	a. Dirt or sludge in Coolant	Drain coolant, flush radiator, put in clean coolant. Refer to the Engine Manufacture's Operation and Maintenance Manual.
	b. Debris and dirt in radiator core.	Clean radiator core carefully. Refer to the Engine Manufacture's Operation and Maintenance Manual.
	c. Fan belt slips or is broken.	Tighten belt or replace as required

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Generator and Controls		
1. Generator will not build up voltage when speed control toggle switch S406 is placed in rated RPM position.	a. Voltage build-up fuse F405 is blown.	Replace voltage build-up fuse. Proceed to Step b to determine cause of blown fuse.
	b. Defective excitation rectifier CR417 and/or CR418.	Check excitation rectifiers with an ohmmeter to see if they are good. If either rectifier is defective, replace it. If both rectifiers are good, proceed to Step c.
	c. Defective capacitor C403.	Check capacitor with an ohmmeter to see if it is good. If defective, replace it; otherwise proceed to Step d.
	d. Defective flyback diode CR419.	Check diode, on brushholder mounting bracket, with an ohmmeter to see if it is good. If defective, replace it; otherwise proceed to Step e.
	e. Generator revolving field L406 defective.	Measure resistance between these two wires coming from CR419. It should be 10 to 11 ohms. If reading indicates an open, short or lower than normal resistance, proceed to Step f.
	f. Defective generator armature G402.	If check of the generator revolving field (Step e. above) revealed no trouble, the generator stator is defective. Send unit to overhaul.
	g. Voltage regulator fuse F403 is blown.	Replace voltage regulator fuse. Proceed to Step h to determine reason for blown fuse.
	h. Defective rectifier CR401.	Use ohmmeter to check rectifier CR401. Replace rectifier if defective.
	i. Generator voltage regulator VR402 defective.	Replace voltage regulator.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Generator and Controls		
2. Generator builds up to only low voltage when speed control toggle switch S406 is place in rated RPM position	a. Defective excitation rectifier CR417 and/or CR418.	Check excitation rectifiers with an ohmmeter to see if they are good. If either rectifier is defective, replace it. If both rectifiers are good, proceed to Step b.
	b. Generator voltage regulator VR402 defective.	Replace voltage regulator.
3. Generator builds too high a voltage.	a. Defective speed control toggle switch S406.	Use ohmmeter to check speed control toggle switch. Replace switch if defective.
	b. Defective blocking rectifier CR401.	Use ohmmeter to check blocking rectifier. Replace rectifier if defective.
	c. Generator voltage regulator VR402 defective.	Replace voltage regulator with a voltage regulator known to be good, and resume operation of generator set. If new voltage regulator produces normal operating voltage, send old voltage regulator to factory for service.
4. Load contactor will not close when contactor control toggle switch S408 is placed in closed position. Engine running normally, voltage normal, no load applied to output cable.	a. Defective contactor control toggle switch.	Momentarily connect a jumper lead between terminals on the contactor control toggle switch. If the load contactor closes momentarily, replace switch.
	b. Defective load contactor K402.	If load contactor will not close when contactor close switch is jumpered, it is likely that the contactor is defective. Replace contactor.
	c. Overvoltage relay K403 defective.	Connect a jumper lead between terminals T and P on the overvoltage relay. If contactor will now close, replace overvoltage relay.
5. Load contactor opens as soon as contactor control toggle switch S408 is released from its top (spring-loaded) position, to run position.	a. Defective contactor control toggle switch.	Connect a jumper lead between terminals on the contactor control toggle switch. If the load contactor now remains closed, replace contactor close switch.
	b. Load contactor K402 defective.	If no fault was found in steps 4-a and b, the load contactor is probably defective. Replace load contactor.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Generator and Controls		
6. Load contactor K402 opens during power delivery.	a. Contactor opening could have been normal because of an overvoltage condition.	Resume operation and closely observe voltmeter for evidence of overvoltage. If contactor opens when no overvoltage condition exists, proceed to Step b.
	b. Overvoltage relay K403 defective.	Check overvoltage relay by operating the machine under load and gradually raising voltage at the voltage regulator while observing voltmeter. Start with a low voltage (25VDC) and gradually increase voltage until relay functions to open load contactor. (32 to 34V)
	c. Overvoltage board out of adjustment.	If relay trips at less than 32-VDC, adjust potentiometer (P1) on the overvoltage board. If this does not correct problem, return old board to factory for service.
	d. Load contactor K402 defective.	If no fault was found in above steps, replace load contactor
7. Output current cannot be limited by current limiting control potentiometer R402.	a. Defective current limiting control potentiometer.	Shut down engine and check potentiometer with an ohmmeter. Disconnect the plug (P404) from the regulator board and take resistance measurements from pin 2 to pin 9 and then from pin 2 to pin 10 on the plug. For each measurement, slowly turn current limiting control potentiometer through its entire range, while observing the ohmmeter readings. Resistance should be from 0-10 k ohms. Replace if necessary.
	b. Defective voltage regulator VR402.	Replace voltage regulator with one known to be good, and then operate the generator set under sufficient load to observe current limiting. If current limiting control potentiometer now controls current properly, send old voltage regulator to factory for service.

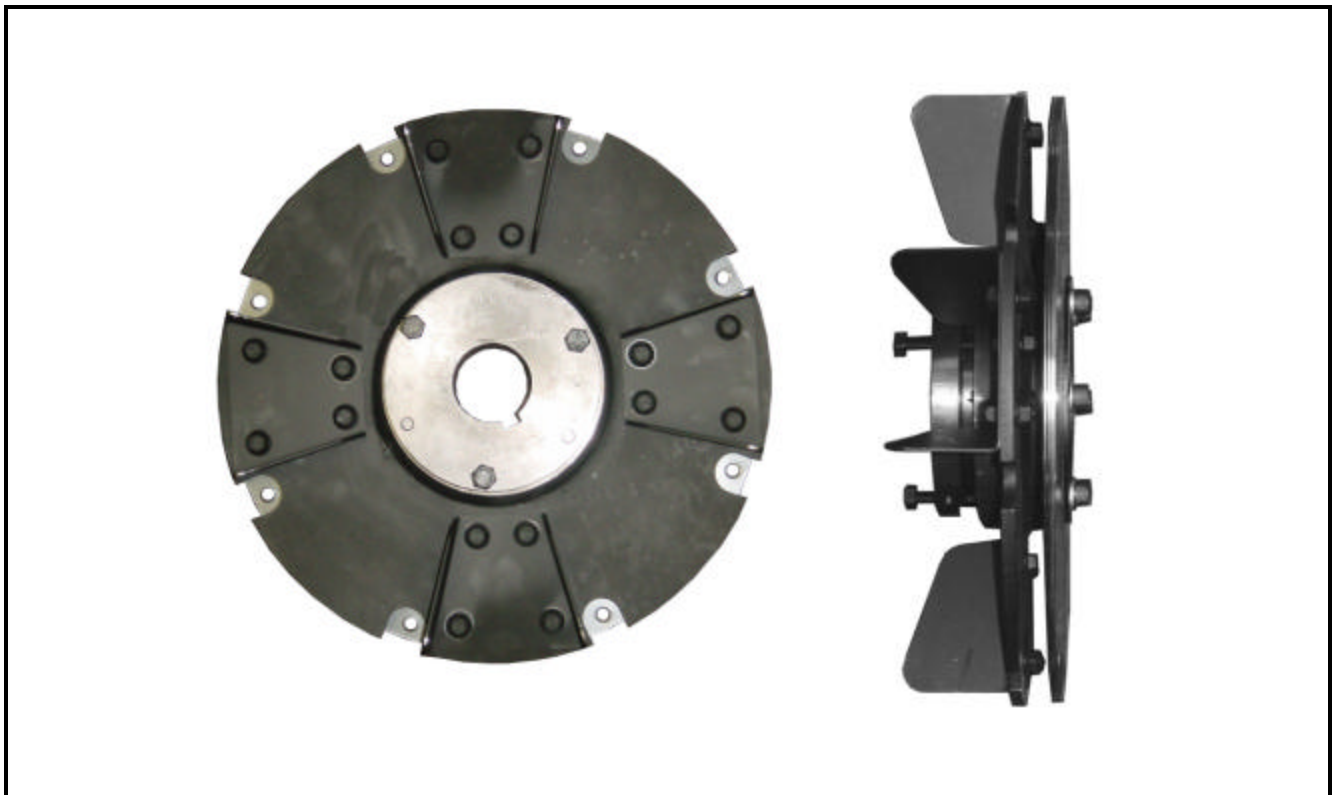
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Chapter 3 Overhaul/Major Repair

Section 1 Flexible Coupling

1) General

This section provides basic instructions for removal, service and installation of a flexible coupling kit, with a fan attached. This flexible coupling kit is designed for use with single-bearing generator sets. Figure 1 shows a rear view and side view of the flexible coupling assembly. The primary function of this assembly is to couple a Hobart generator set to a diesel engine. The flexible coupling assembly compensates for slight misalignment between the engine and the generator, due to manufacturing tolerances. A split taper bushing secures the coupling to the generator's armature shaft (See Figures 3 & 4).



General Assembly
Figure 1

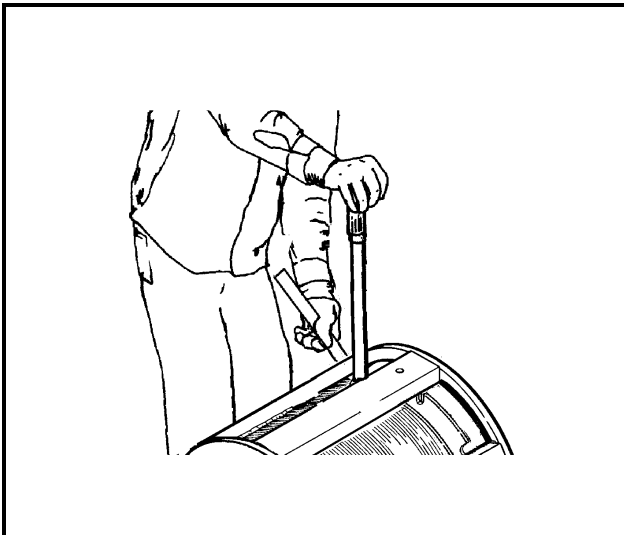
2) Coupling Screws (Routine Coupling Maintenance)

CAUTION

Failure to verify proper coupling screw installation may result in coupling failure and damage to the equipment.

If the generator set is functioning properly, servicing the coupling assembly will be essentially limited to checking the screws that attach the flexible coupling to the engine flywheel of the generator set. These eight [8] screws should be checked periodically to make certain that: (1) screws of proper type, length, and hardness are installed, (2) that the threads of the screws are not stripped, and (3) that they are torqued properly. Proceed as follows to check coupling screws.

- a) Remove the sheet metal covers from around the generator housing and the flywheel housing.
- b) Refer to Figure 2. Hold a short iron bar through the flywheel housing against the fan blades of the fan and coupling assembly to block the armature against clockwise rotation. Do this carefully to avoid damaging the fan blades.
- c) Use a long-handled, reversible ratchet drive fitted with a 5/16-inch Allen wrench to remove one coupling screw. Examine the screw. Screws specified for this coupling are Hobart Part No. 402789-004, which are socket-head, 3/8 - 16 X 3/4 inch long. **NOTE:** Use of the proper coupling screws for replacement is very important. Replacement screws must be those specified above, torqued to 40 - 45 foot-pounds (54 - 61 Nm). There is no acceptable substitute for these screws.
- d) Check the threads of the screw for stripping and replace it if the threads are stripped. If the screw is not stripped, reinstall it and torque it to 40 - 45 foot-pounds (54 - 61 Nm).
- e) Repeat the steps b, c, and d above for the remaining seven screws.
- f) Reinstall covers around housings.



**Access To Coupling Bolts
(for removal or installation)
Figure 2**

3) Disassembly

Removal of the flexible coupling is required for servicing the generator armature, generator bearings, or the coupling itself. To remove the coupling, for any reason, it is necessary to separate the engine and generator. Many mechanics prefer to remove the engine and generator as an assembly, and then separate them. Others may prefer to remove the engine or the generator separately to reach the coupling. However, separating the engine and generator while they are installed in the ground power unit is very difficult because of the limited working space. During removal **DO NOT** cut any cables or wires. Disconnect cables or wires if/as necessary and tag them for reassembly.

a) Separate Engine and Generator

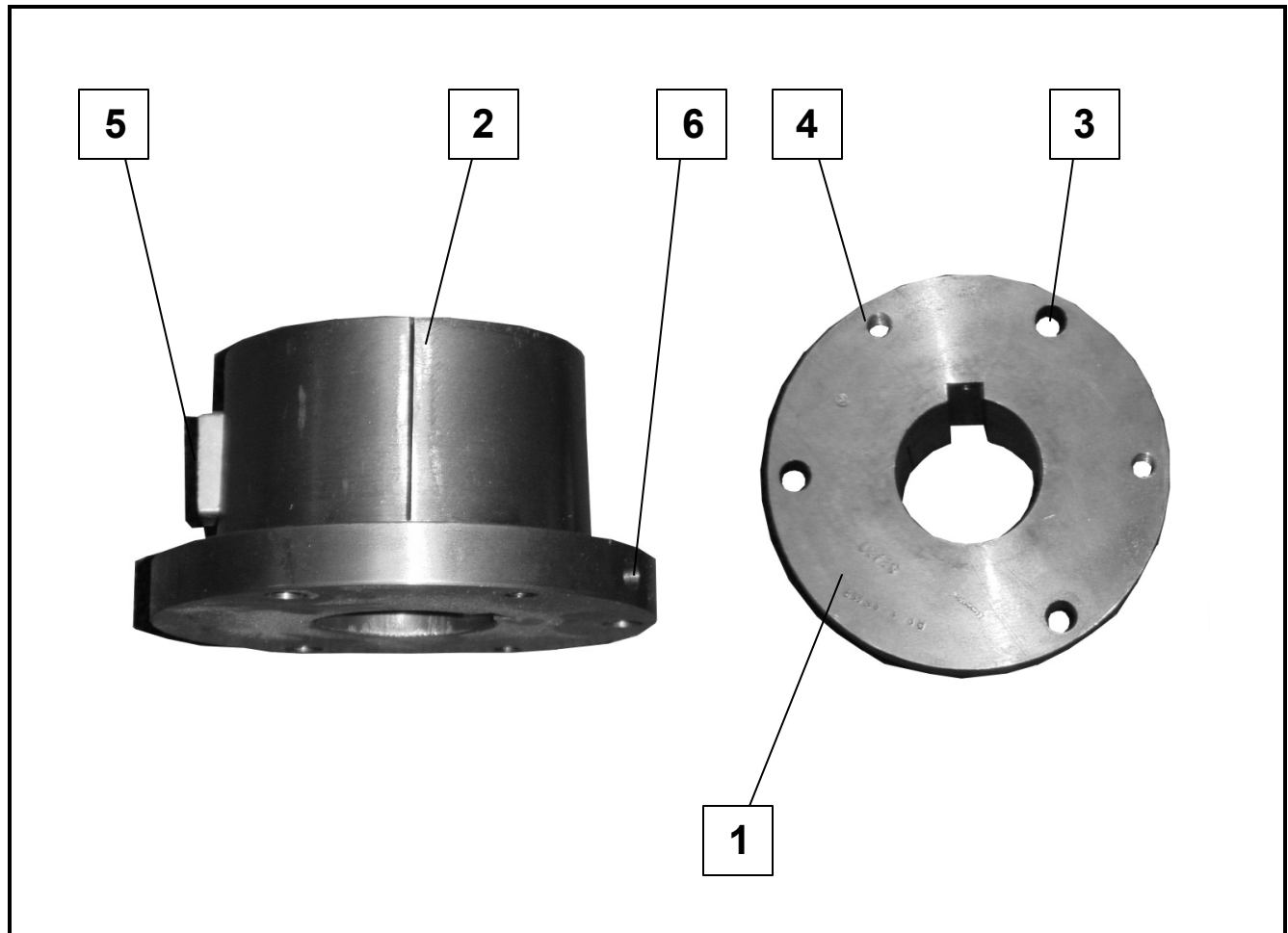
- (1) Remove fuel tank and canopy components.
- (2) Remove the sheet metal cover from around the generator housing and the flywheel housing.
- (3) Attach a hoist to the generator housing.
- (4) Use a long-handled, reversible ratchet drive fitted with a 5/16-inch Allen wrench to remove the screws that attach the flexible coupling disk to the engine flywheel (Reference Figure 2).
- (5) Support the rear of the engine with a jack stand.
- (6) Remove the bolt in the shock mount attaching the generator housing to the frame.
- (7) Remove the bolts attaching the generator housing to the engine flywheel housing.
- (8) Separate the generator from the engine with the hoist and move it to a clear working area.

b) Remove Coupling Assembly (Figure 3)

- (1) Remove all three of the screws that secure the bushing to the hub of the fan and coupling assembly.
- (2) To separate the bushing from the hub, lubricate two screws and insert them into the additional threaded holes in the bushing. Tighten these screws into the bushing until that the bushing pops loose from the hub.
- (3) Using a 3/16-inch Allen wrench, loosen the set screw in the bushing to release pressure on the key.
- (4) When the bushing is loose in the hub, use a mallet to GENTLY tap the bushing out of the hub.
- (5) Slide the coupling assembly off the shaft and remove the key.
- (6) Inspect the coupling assembly components carefully as follows:
 - a Check for deformed fan blades and damage to the disk.
 - b Check hub and split bushing for cracks, evidence of galling, and rust pits. Light rust is permissible on the split bushing and the tapered bore of the hub.
 - c Check the flexible coupling disks for warping, cracks, or worn mounting holes.
 - d Check the screws which attach the flexible disks to the hub (if required). The socket head screws are Hobart Part No. 287935-001 [3/8 - 16 X 2-1/4 inch long]. If they are loose, cracked, stretched, or have stripped threads, replace them.

NOTE: Use of the proper coupling screws and washers for replacement is very important. Replacement screws and washers must be those specified above. There is no acceptable substitute for these screws or washers.

- e Check the shaft for any damage or deformation where the coupling was mounted on it.



1. Bushing
2. Split
3. Mounting Holes (3)
4. Tapped holes (2)
5. Key
6. Set Screw

Split Taper Bushing
Figure 3

4) Coupling Installation and Re-assembly of Engine and Generator

CAUTION

Improper installation of the coupling assembly can result in serious damage to the equipment. Follow these installation instructions exactly.

a) Cleaning

It is very important that the shaft, the bore and the outside of the split bushing, and the tapered inside of the hub be thoroughly cleaned free of dirt and grit.

CAUTION

Do not lubricate any of the surfaces listed above. Lubrication of these surfaces can cause the coupling to fail and damage the generator set. Slight traces of rust are permissible only on the bushing, but nothing else.

b) Assembly (Reference Figure 4)

Proceed as follows to reassemble engine and generator.

- (1) If required, attach the four flexible disks to the coupling hub with the six [6] socket head 3/8 - 16 X 2-1/4 inch screws (Hobart Part No. 287935-001). The screws must be torqued to 40 - 45 foot-pounds (54 - 61 Nm) and have had Loctite 262, or equivalent, applied to the threads.
- (2) Attach the coupling assembly to the flywheel, using the socket-head 3/8 - 16 X 3/4 inch screws and vibration proof washers (install small teeth side facing the flex disk and bolt head). Apply Loctite 262, or equivalent, to the threads and do not tighten until all screws are installed.
- (3) Torque all of the coupling screws to 40 - 50 foot-pounds (54 - 68 Nm). Be sure the flexible disks are all seated evenly into the seat of the flywheel.
- (4) Install the key in the keyway of the armature shaft.
- (5) Place the coupling bushing on the shaft of the armature, aligning the keyway of the bushing with the keyway of the shaft.
- (6) Using a hoist, align the bushing to the fan coupling keyway and also the generator housing flange to the engine flywheel housing, and insert the attaching screws for the housing. Start the screws into the tapped holes just enough to ensure thread engagement. Do not tighten until all screws are installed.
- (7) Tighten the generator housing attaching screws 30 foot-pounds (41 N-m).
- (8) Remove the bearing cap from the back of the generator assembly.
- (9) Inspect the rear bearing. If it has moved out of the rear bearing support hub, it will need to be reset. Correct placement of the rear bearing, should be within 1/8" from the rear surface of the bearing hub.
- (10) Slide the coupling bushing forward until it is snug in the fan coupling hub.

CAUTION

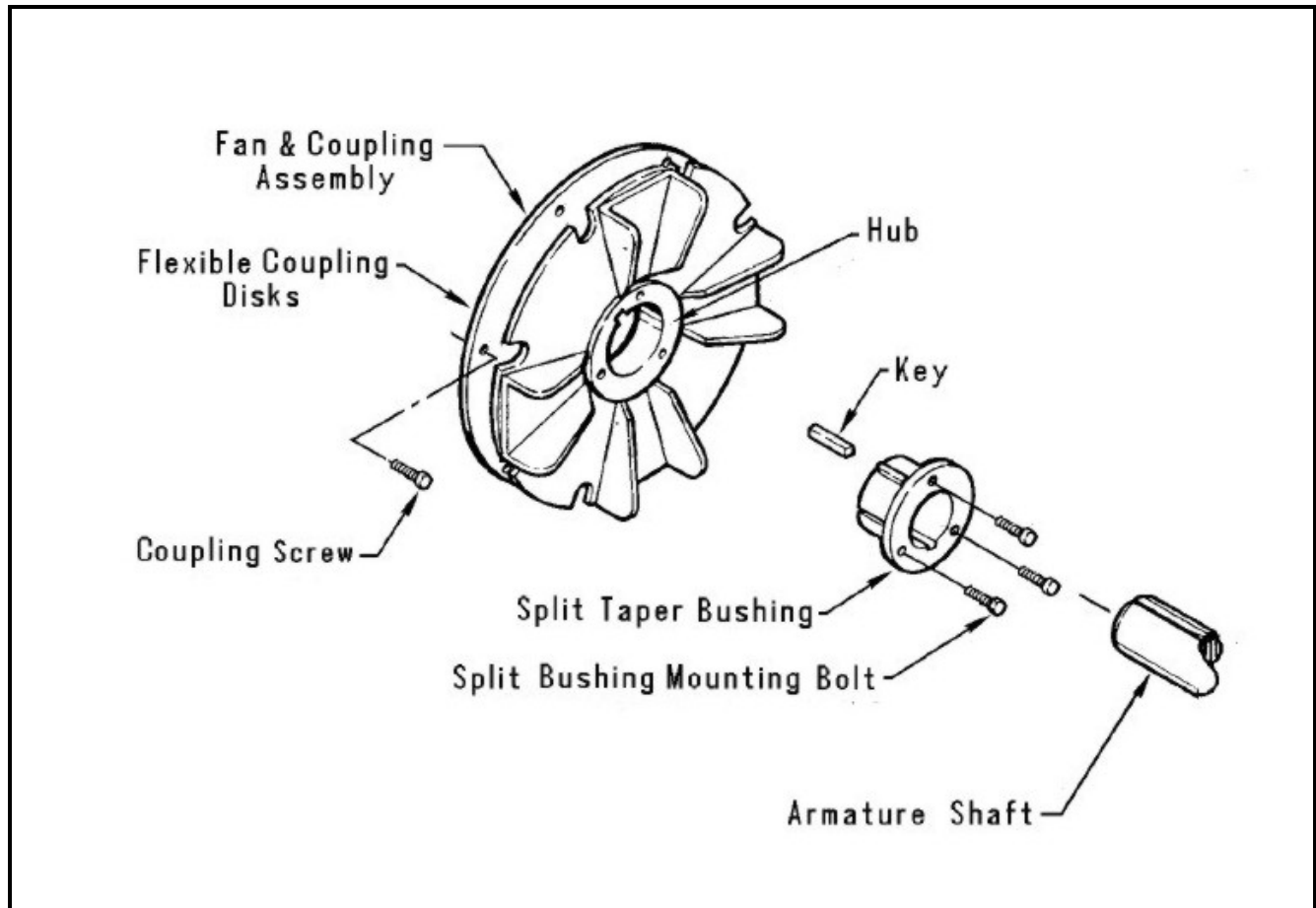
Make certain that only the screws are lubricated, and that no lubricant is permitted to get inside the bushing where the armature shaft will enter the bushing.

- (11) Lubricate the three bushing screws SPARINGLY and start them into the three (unthreaded) holes finger-tight (See Figure 4).

- (12) Refer to Figure 2. Insert and hold a short iron bar through the flywheel housing against the fan blades of the fan and coupling assembly to block the armature against clockwise rotation. Do this carefully to avoid damaging the fan blades.
- (13) Tighten the bushing screws alternately and evenly as follows:
- a Set a torque wrench to 30 foot-pounds (41 N-m) and tighten all three screws to that value. Note that when these screws are tightened, the armature will be pulled back into the bearing hub and a gap of .313 inches (8 mm) should still exist between the hub and bushing flange.
 - b Repeat step (a) above until screws can no longer be tightened. This step may need to be repeated as many as 5 times to assure proper torque on bolts.
- (14) Make certain that the armature is pulled slightly into the bearing hub (so that it does not interfere with the bearing cap).
- (15) Using a 3/16-inch Allen wrench, tighten the set screw in the bushing to apply pressure on the key.

The next steps are performed to assure that the rear bearing outer race does not spin in the bearing support hub.

- (16) Remove brush holder from the bearing support.
- (17) Remove the 6 bolts attaching the bearing support to the housing.
- (18) Slide bearing support hub off the bearing.
- Note:** If the bearing support hub will not slide off the bearing or bearing begins to slide on the shaft, **STOP** the bearing outer race is secure. Re-attach the bearing support hub to the generator housing and proceed to step 21.
- (19) If successful in removing the bearing support, apply a thin bead of Loctite RC-680 Retaining Compound to the inside of the bearing support hub.
- (20) Re-install bearing support hub on bearing and reattach the bearing support hub to the generator housing.
- (21) Re-install brush holder.
- (22) Re-install the bearing cap that was removed in step 5,b), (8) above,
- (23) Re-install the generator housing cover and the flywheel housing cover.
- (24) Re-install the fuel tank and canopy components.



**Assembly Procedure Illustration
Figure 4**

5) Run-in and Periodic Check

- Mount the engine-generator assembly in a suitable test area and operate it for a 2-hour run-in.
- Shut down the engine after 2 hours and re-torque all coupling screws to 40 to 45 foot-pounds (54 to 61 Nm) to compensate for normal torque relaxation.
- Return the unit to normal service.
- After 200 hours of operation, check all coupling screws and taper-lock bolts with a torque wrench set at 40 to 45 foot-pounds (54 to 61 Nm).
- Return the unit to normal service.
- After each additional 2,000 hours of operation (or every year) recheck all coupling screws to maintain the same torque value.

6) Coupling Service

When ordering coupling kits or other parts from your Hobart Brothers Company Distributor, be sure to include all pertinent information from the unit's identification plate: Specification No., Model No., and unit rating.

If you have any questions concerning your **Hobart Ground Power** equipment, immediately contact our Service Department **by mail, telephone, e-mail, or FAX.**

Write:	ITW GSE Group Hobart Ground Power Division Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@itwgsegroupp.com
Web Page :	www.hobartgroundpower.com

Chapter 4 Illustrated Parts List

Section 1 Introduction

1) General

The Illustrated Parts List identifies, describes, and illustrates main assemblies, subassemblies, and detail parts of a Diesel Engine-Generator Set manufactured by Hobart Ground Power, Troy, Ohio.

2) Purpose

The purpose of this list is to provide parts identification and descriptive information to maintenance and provisioning personnel for use in provisioning, requisitioning, purchasing, storing, and issuing of spare parts.

3) Arrangement

Chapter 4 is arranged as follows:

Section 1 - Introduction
Section 2 - Manufacturer's Codes
Section 3 - Parts List
Section 4 - Numerical index

4) Explanation of Parts List

a) Contents

The parts list contains a breakdown of the equipment into assemblies, subassemblies, and detail parts. All parts of the equipment are listed except:

- (1) Standard hardware items (attaching parts) such as nuts, screws, washers, etc., which are available commercially.
- (2) Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available.
- (3) Permanently attached parts, which lose their identity by being welded, soldered, riveted, etc., to other parts, weldments, or assemblies.

b) Parts List Form

This form is divided into six columns. Beginning at the left side of the form and proceeding to the right, columns are identified as follows:

- (1) FIGURE-ITEM NO. Column

This column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on an illustration is connected to the part to which it pertains by a leader line. Thus the figure and item numbering system ties the parts lists to the illustrations and

vice-versa. The figure and index numbers are also used in the numerical index to assist the user in finding the illustration of a part when the part number is known.

(2) HOBART PART NUMBER Column

All part numbers appearing in this column are Hobart numbers. In all instances where the part is a purchased item, the vendor's identifying five-digit code and his part number will appear in the "NOMENCLATURE" column. Vendor parts, which are modified by Hobart, will be identified as such in the "NOMENCLATURE" column. In case Hobart does not have an identifying part number for a purchased part, the "HOBART PART NUMBER" column will reflect "No Number" and the vendor's number will be shown in the "NOMENCLATURE" column. Parts manufactured by Hobart will reflect no vendor or part number in the "NOMENCLATURE" column.

(3) NOMENCLATURE Column

The item-identifying name appears in this column. The indenture method is used to indicate item relationship. Thus, components of an assembly are listed directly below the assembly and indented one space. Vendor codes and part numbers for purchased parts are also listed in this column when applicable. Hobart modification to vendor items is also noted in this column.

(4) EFF (Effective) Column

This column is used to indicate the applicability of parts to different models of equipment. When more than one model of equipment is covered by a parts list, there are some parts that are used on only one model. This column is used for insertion of a code letter A, B, etc., to indicate these parts and to identify the particular model they are used on.

Parts coded "A" are usable on Part Number 500285C-001 only.
Parts coded "B" are usable on Part Number 500285C-002 only.
Parts coded "C" are usable on Part Number 500285C-003 only.

(5) UNITS PER ASSEMBLY Column

This column indicates the quantity of parts required for an assembly or subassembly in which the part appears. This column does not necessarily reflect the total used in the complete end item.

Section 2 Manufacturer's Codes

1) Explanation of Manufacturer's (Vendor) Code List

The following list is a compilation of vendor codes with names and addresses for suppliers of purchased parts listed in this publication. The codes are in accordance with the Federal Supply Codes for Manufacturer's Cataloging Handbook H4-1, (CAGE CODES) and are arranged in numerical order. Vendor codes are inserted in the nomenclature column of the parts list directly following the item name and description. In case a manufacturer does not have a code, the full name of the manufacturer will be listed in the nomenclature column.

Code	Vendor's Name and Address	Code	Vendor's Name and Address
00779	Amp Inc. 2800 Fulling Mill Rd. P.O. Box 3608 Harrisburg, PA 17105-3608	05HB5	Magnecomp Inc 161 Eagles Nest Dr Pickens Sc 29671-7808
01XD4	Contact Industries Inc 25 Lex-Industrial Dr P.O. Box 3086 Mansfield OH 44904-3086	05YB3	Acon Inc. 22 Bristol Dr. South Easton, MA 02375
01428	Tuthill Corp. Superior Linkage Div. 2110 Summit St. New Haven, IN 46774-9524	0E8J0	Emka Inc. 1961 Fulling Mill Rd. Middletown, PA 17057-3125
016T7	Amaton Inc. 446 Blake St. New Haven, CT 06515	0HZP9	Diesel Radiator Co. 1985 Janice Ave. Melrose Park, IL 60160
01989	Dana Corp Weatherhead Div U.S. 24 E. Antwerp, OH 45813	0H8R0	Magnetics 200 10TH St. P.O. Box 391 Butler, PA 16003-0391
02660	Amphenol Corp. 720 Sherman Ave Hamden, CT 06514-1146	0MR72	Power Devices Inc. 26941 Cablot Rd Suite 124 Laguna Hills, CA 92653-7006
02768	Illinois Tool Works Inc. Fastex Division 19 S. Algonguin Rd. Des Plaines, IL 60016	0ZW45	KHD Deutz Of America Corp 3883 Steve Reynolds Blvd Norcross Ga 30093
05277	Westinghouse Electric Company Semiconductor Division Hill Street Youngwood, PA 15697	1AA44	Collmer Semiconductor Inc. C/O NA-NA Co. 14368 Protopn Rd. Dallas, TX 75244-3511
054W1	Talema Electronic Inc. 3 Industrial Park Dr. P.O. Box 306 Saint James, MO 65559	1DG36	E. M. Products Inc. 220 W. 90th St. Minneapolis, MN 55420

Code	Vendor's Name and Address	Code	Vendor's Name and Address
1E045	Austin Hardware and Supply Co. 10220 E. 65TH St. P.O. Box 9550 Kansas City, MO 64133-5205	14552	Microsemi Corp 2830 S. Fairview St. Santa Ana, CA 92704-5948
1E222	Furnas Electric Co. Richmond, VA 23200	14799	Square D Co. Chicago Assembly Plant 9522 W. Winona Schiller Park, IL 60176-1025
1FQ83	Newark Electronics Div 3033 Kettering Blvd Dayton OH 45439	14604	Elmwood Sensors, Inc. Subsidiary Fasco Ind. 1655 Elmwood Avenue Cranston, RI 02907
1PAM0	DAVCO Manufacturing 1600 Woodland Dr. Saline MI 48176	14892	Bendix Corp. The Brake And Steering Div. 401 N Bendix Dr South Bend IN 46634
1SPJ9	Hobart Ground Power 1177 Trade Road East Troy, OH 45373	16238	Lord Mfg. Co. Inc. Sterling Road South Lancaster, Mass 01561
1W134	Eaton Corp. 4201 N. 27TH Ave. Milwaukee, WI 53216-1807	16476	Datcon Instrument Co. P.O. Box 128 East Petersburg, PA 17520
1Y498	F B Wright 100 E Wilson Bridge Rd Columbus Oh 43085-2334	17284	Mercury Metal Company 1201 S. Mercury Dr. Schaumburg, IL 60193
12662	Peterson Mfg Co. 4200 E 135th St Grandview MO 64030-2821	18265	Donaldson Co. Inc. 1400 W. 94th St. P.O. Box 1299 Minneapolis, MN 55440-1299
12687	Trilectron Industries 11001 U.S. Hwy. 41 North Palmetto, Florida 34221	2B664	All-Phase Electric Supply Co 1620 W Main St P.O. Box 149 Springfield OH 45501-0149
13445	Cole-Herse 20 Old Colony Ave. Boston, MA 02127	2B928	Barber Colman Co. Pasadena, TX 77501
13902	Smith Valve Corp. 1 Apple HL Suite 316 Natick, MA 01760-2072	2N562	Power Transmission Sales Inc. 351 Washington P.O. Box 229 Chagrin Falls, OH 44022-4446

Code	Vendor's Name and Address	Code	Vendor's Name and Address
23803	N T N Bearing Corp of America 650 Pennsylvania Dr Exton PA 19341	30327	Imperial Eastman Corporation 6300 W. Howard Street Chicago, IL 60648
23826	Furnas Electric Company 1004 McKee Street Batavia, IL 60510	30430	Marathon Electric Mfg. Corp. 398 Beach Rd. Burlingame, CA 94010-2004
24161	Gates Rubber Co 900 S Broadway Denver CO 80217-5887	38151	Marathon Electric Mfg. Co. 100 E. Randolph St. P.O. Box 8003 Wausau, WI 54401-2568
24446	General Electric Co. 3135 Easton Tpke. Fairfield, CT 06431	40121	Peterson Mfg. Co. Inc. 700 W. 143rd St. P.O. Box 8 Plainfield, IL 60544-9733
25710	Deka Plastics Inc. 914 Westfield Ave. Elizabeth, NJ 07208-1222	44655	Heico Ohmite LLC 3601 W. Howard St. Skokie, IL 60076-4014
26794	Connectron Inc. 12 Industrial Dr. South Amboy, NJ 08879	46922	Crawford Electric Co 445 E 32 Mile Rd Romeo MI 48065-0120
27410	Harris Corp. 1025 Nasa Blvd. Melbourne, FL 32919	49234	Protectoseal Company 1920 S. Western Chicago, Illinois 60608
28520	Heyco Molded Products Inc. 1800 Industrial Way N. P.O. Box 517 Toms River, NJ 08755	5E599	NVF Company Primary Products Div Yorklyn Rd Yorklyn, DE 19736
3A054	McMaster Carr Supply Co. 9630 Norwalk Blvd. Santa Fe Springs, CA 90670-2932	5P059	Tech Products Corp. 2348 Sandridge Dr. Dayton, OH 45439
3Y208	Taylor And Summerville Battery Co 3485 Successful Way Dayton Oh 45414-4319	5U553	Wes-Garde Components Group Inc 300 Enterprise Dr Westerville OH 43081-8840
30104	Automotive Controls Corp. 1300 W. Oak St. P.O. Box 788 Independence, KS 67301-2347	50508	Magnetic Components Inc. 9520 Ainslie St. Schiller Park, IL 60176-1116

Code	Vendor's Name and Address	Code	Vendor's Name and Address
52793	Saginaw Products Corp. 68 Williamson St. Saginaw, MI 48601-3246	60038	Timken Corp 1835 Dueber Ave Sw Canton, OH 44706-2798
55752	Parker Hannifin Corp. Racor Div. 3400 Finch Rd. Modesto, CA 95353-3208	61706	EAO Switch Corp. 198 Pepes Farm Rd. P.O. Box 552 M O Milford, CT 06460-3670
56289	Sprague Electric Company 87 Marshall St. North Adams, MA, 01247	66180	Automatic Timing and Controls 3312 Bloomingdale Melrose Park, IL 60160-1030
57347	Wall Industries Inc. 5 Watson Brook Rd. Exeter, NH 03833	66844	Powerex Inc. E. Hillis St. Youngwood, PA 15697-1176
57448	Stephens & Adamson Mfg. Company 275 Ridgeway Avenue Aurora, Illinois 60507	62292	EBM Industries Inc. 110 Hyde Rd. P.O. Box 4009 Farmington, CT 06034-4009
57733	Stewart-Warner Corporation 1826 Diversey Parkway Chicago, Illinois 60614	67529	All-Phase Electric Supply Co. 875 Riverview Dr. P.O. Box 67 Benton Harbor, MI 49022-0067
59993	International Rectifier Corp 233 Kansas St. El Segundo, CA 90245	7M613	Wright F.B. Co. of Cincinnati 4689 Ashley Dr. Hamilton, Oh 45011-9706
6H359	Hobbs Div., of Stewart Warner Corp. Highway 6 Spring Valley, IL 61362	71382	Seal Master Bearings 1901 Bilter Rd. Aurora, IL 60504-9620
6S553	Wes-Garde Components Group Inc 300 Enterprise Dr Westerville, OH 43081-8840	71400	Bussman Manufacturing Division of McGraw-Edison Company 114 Old State Road St. Louis, MO 63178
6Y440	Micron Technologies Inc. 8000 S. Federal Way Boise, ID 83707	71774	General Electric Corp. Lamp Division 4433 N. Ravenswood Ave. Chicago, IL 60640
6Y481	Hamilton Avnet Electronics Corp 777 Brooksedge Blvd Westerville, OH 43081-2821	72582	Detroit Diesel Corp 13400 W. Outer Dr. Redford, MI 48239-4001

Code	Vendor's Name and Address	Code	Vendor's Name and Address
72619	Amperex Electronic Corp. Dialight Division 203 Harrison Place Brooklyn, NY 11237	8A334	Cummins Interstate Power Inc 4000 Lyman Dr Hilliard OH 43026
74829	IlSCO Corp. 4730 Madison Rd. Cincinnati, OH 45227-1426	8T246	Whitesell RO & Associates, Inc. 4133 S. Dixie Ave. Dayton, OH 45439
77166	Pass and Seymour P.O. Box 4822 Syracuse, NY 13221	81074	Holub Industries, Inc. 413 DeKalb Avenue Sycamore, Illinois 60178
74542	Hoyt Electrical Instruments P.O. Box 8798 Penacook, NH 03303	81703	Mulberry Metal Products Inc. 2199 Stanley Terrace Union , NJ 07083
74545	Hubbell Harvey Inc. 584 Derby Milford Rd. Orange, CT 06477	82866	Research Products Corp. 1015 E. Washington Ave. Madison, WI 53701
75418	Kysor Industrial Corporation 1100 W. Wright Street Cadillac, Michigan 49601	83330	Dialight Corp. 1913 Atlantic Ave. Manasquan, NJ 08736-1005
74559	Electrical Enclosures Div Of Hoover Systems 12118 Corporate Dr Dallas TX 75228	86797	Rogan Corp 3455 Woodhead Dr. Northbrook, IL 60062-1812
77342	Potter and Brumfield Inc 200 S. Richland Creek Dr. Princeton, IN 47671-0001	90201	Emhart Ind., Inc. Mallory Capacitor Co. 4760 Kentucky Ave. Indianapolis, IN 46206
78377	Superior Carbon Products Inc Cleveland OH 44100	91637	Dale Electronics Inc. 1122 23RD St. Columbas, NE 68601-3647
78388	Synchro-Start Products Inc Sub of Knowles Electronics Inc 6250 W Howard St Niles, IL 60714	91929	Honeywell Inc. Microswitch Div. 11 W. Spring St. Freeport, IL 61032
79497	Western Rubber Co. 620 E. Douglas Goshen, IN 46526-4035	94222	Southco Inc. 210 N. Brinton Lake Rd. Concordville, PA 19331

Code	Vendor's Name and Address	Code	Vendor's Name and Address
97520	Basler Electric Company Route 143 P.O. Box 269 Highland, IL 62249		
D0024	Semikron International Sigmundstrasse 200 P.O. Box 820251 Nuerengerg, Germany 90253		
E0615	Kraus and Naimer 42 Miramar Avenue P.O. Box 15-009 Wellington, New Zealand		
S7023	Bossard LTD Fasteners Steinhauserstrasse 70 Zug Switzerland, CH-6300		

Section 3 Illustrated Parts List

1) Explanation of Parts List Arrangement

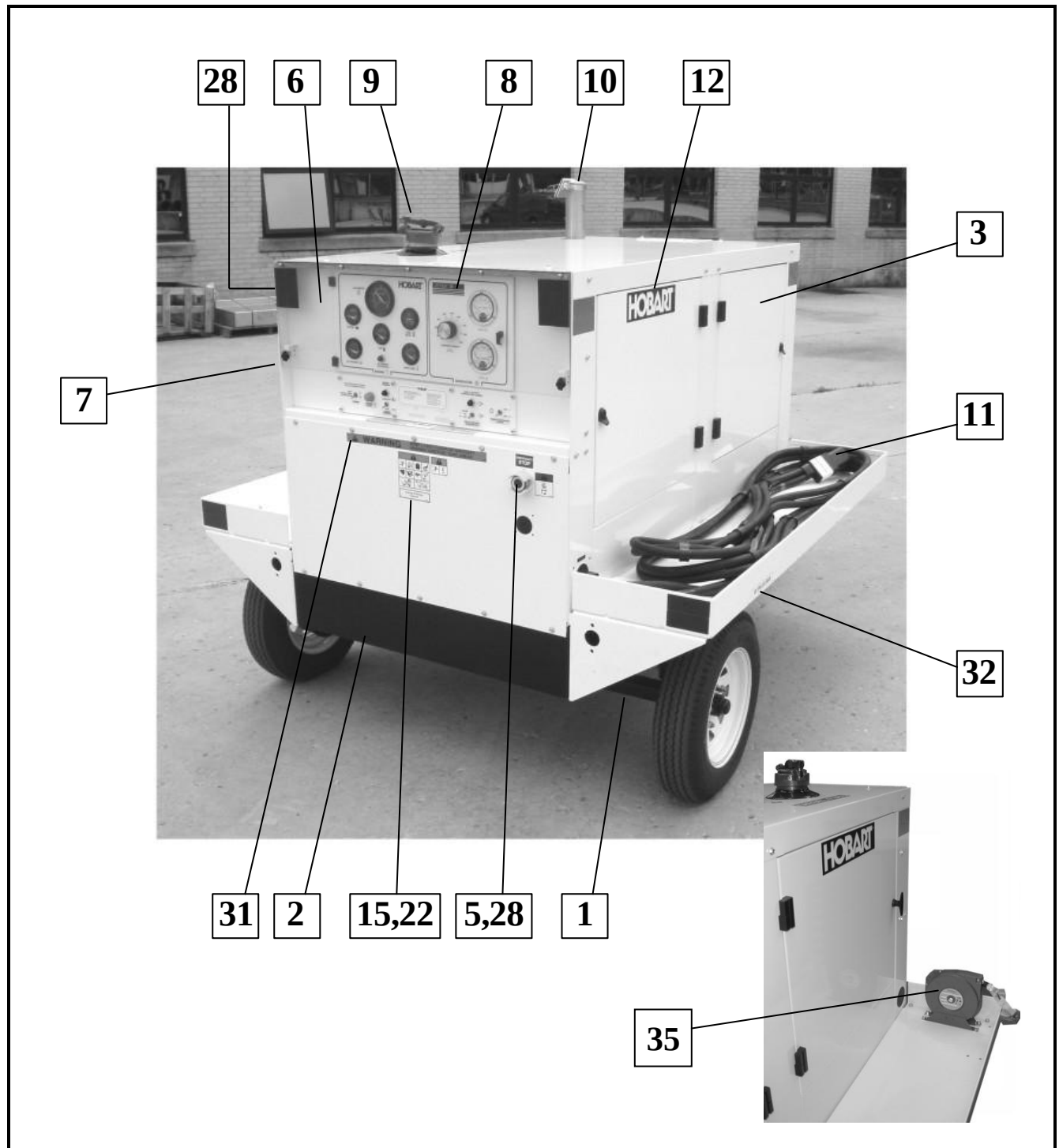
The parts list is arranged so that the illustration will appear on a left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

2) Symbols and Abbreviations

The following is a list of symbols and abbreviations used in the parts list:

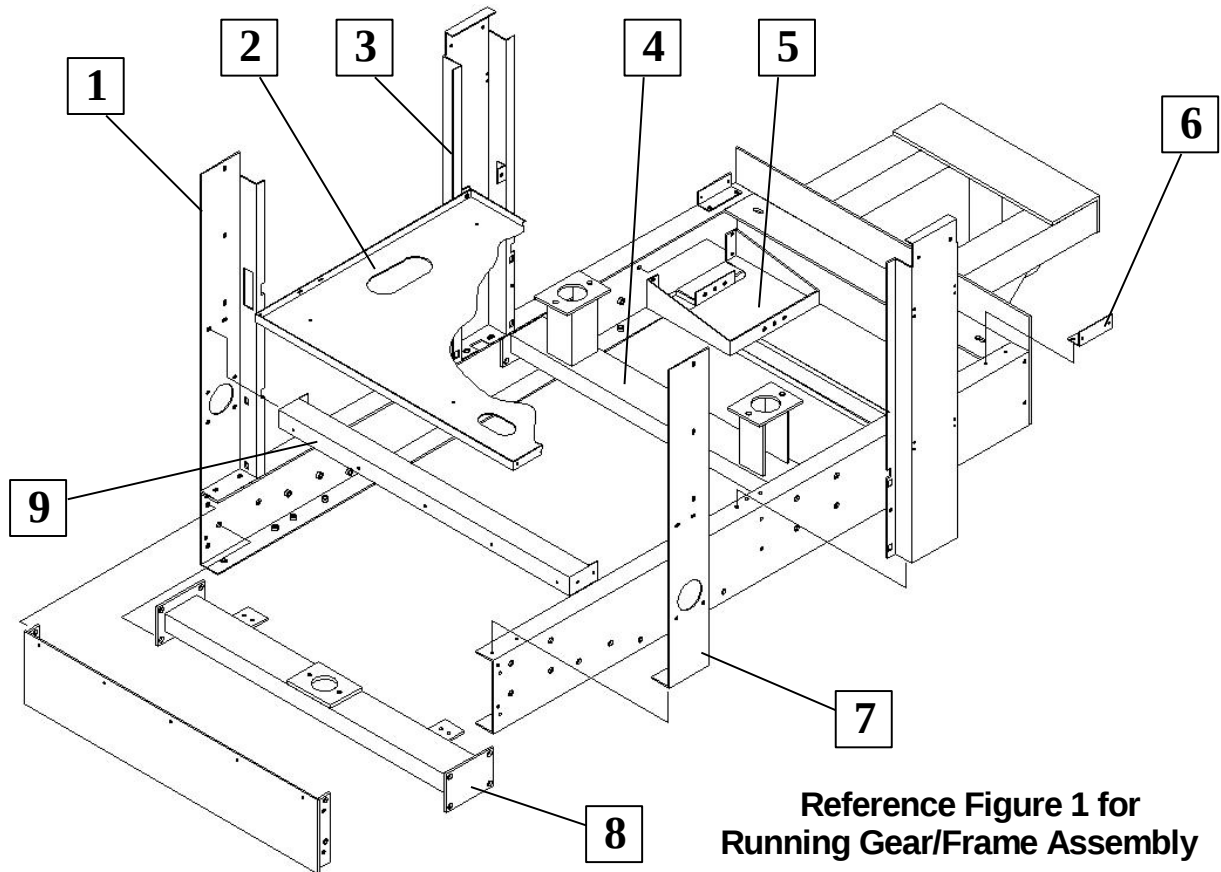
*	-	Item not illustrated
#	-	Number or Part Number
A, or AMP	-	Ampere
AC	-	Alternating current
AR	-	As required
DC	-	Direct current
Fig.	-	Figure
hd.	-	Head
hex	-	Hexagon
Hz	-	Hertz (cycles-per-second)
I.D.	-	Inside diameter
IN	-	Inch
KVA	-	Kilovolt-ampere
uF	-	Microfarad
No.	-	Number
NHA	-	Next higher assembly
PRV	-	Peak reverse voltage
PSI	-	Pounds per square inch
Ref	-	Reference (the item has been listed previously)
RH	-	Right Hand
LH	-	Left Hand
TM	-	Technical Manual
T-R	-	Transformer-rectifier
V	-	Volt or used as a prefix indicating vendor code

NOTE: An item which does not reflect an index number is an assembly which is not illustrated in it's assembled state, or it is similar (right-hand, left-hand, top, etc.) to an item which is illustrated.



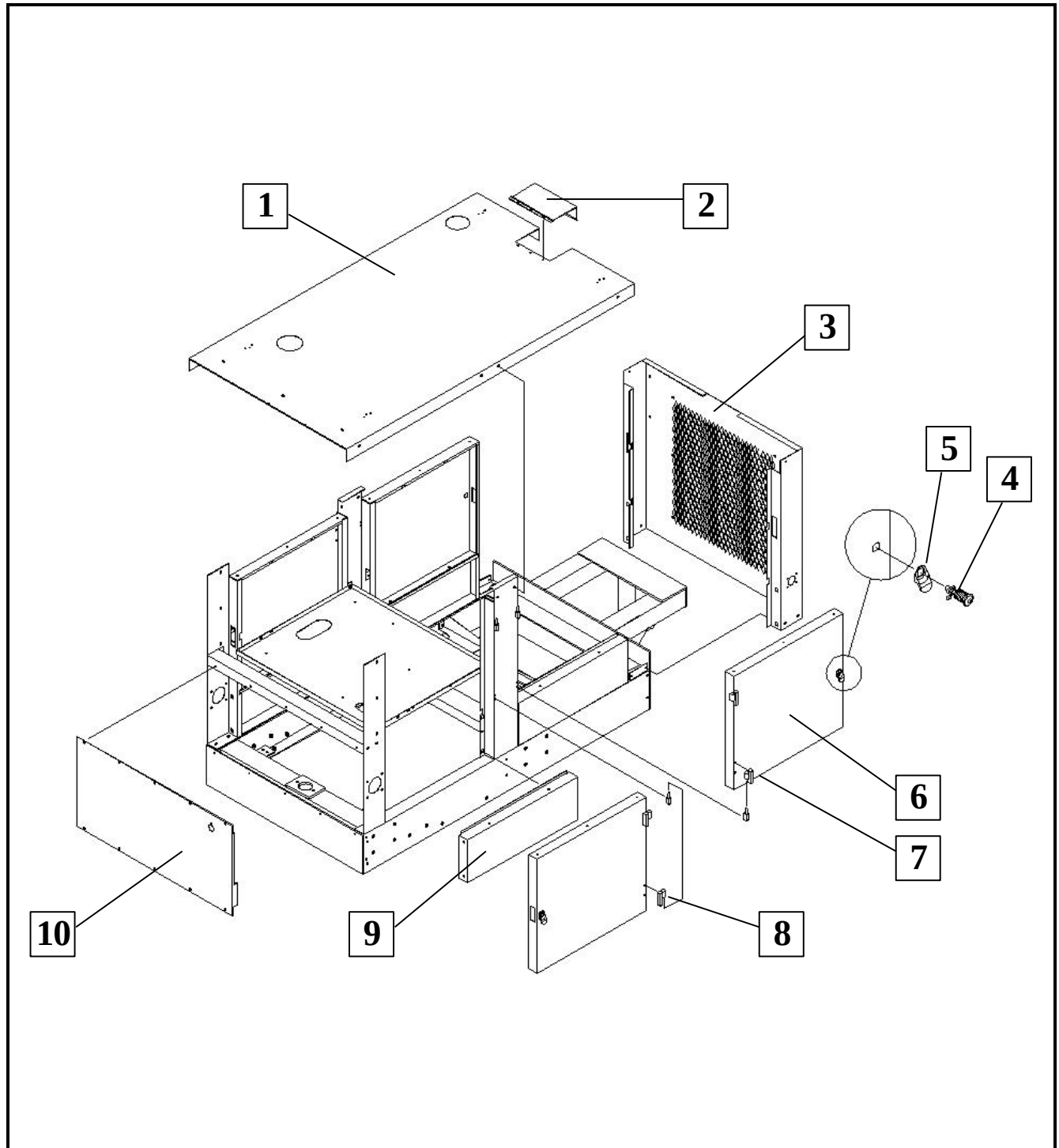
General Assembly
Figure 1

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
1 -	1	288340 Running Gear/Frame Assembly	A,C	1
*		287950 Mounting Frame	B	1
*		489689 Stationary Mounting Spacer	B	1
	2	Mounting Frame Components (See Figure 2)		Ref.
	3	Canopy Assembly (See Figure 3)		Ref.
*	4	Control Box Panel Assembly (See Figure 4)		Ref.
	5	77A1157 Switch, Maintained, Push-Pull (V14799 #KR-9R-H6)		1
		285125 ...Guard, Mushroom Button (V14799 # K564M)		1
		288300 ...Label, Emergency Stop		
6	288021	Controls Cover		1
	288022	...Controls Cover Hinge		1
7	288023	Wing Nut Latch		2
	288020	...Wing Nut Latch Bracket		2
8		Control Box Interior Assembly (See Figure 5)		Ref.
9	282562	Cap, Fuel (V49234 #1275/0003)		1
	79A1127-002	...Filler Neck Guard		1
10	288060-001	Exhaust Rain Cap		1
	11	28 VDC Output Cable (Specified By User)		1
		488640 ...Output Cable Bracket		1
		7J422-000 ...Output Cable Clamp		1
	12	402987 Hobart Nameplate		2
*	13	78A1000 Label, I.D.		1
*	14	79A1110 Label, Option		1
	15	288866 Label, Support Center		1
*	16	81B1084 Label, 28.5 Volts		1
*	17	400435 Label, 28 V		1
*	18	407366 Label Caution – Insufficient Cooling		1
*	19	76B1148 Label, Diesel Fuel		1
*	20	401842 Tag, Attention – Engine Coolant		1
*	21	040209 Tape, Sealant, Neoprene		AR
	22	287459 General Information		1
*	23	287460 Label, Danger High Voltage		3
*	24	287461 Label, Fuel Warning		1
*	25	287462 Label, Engine Coolant		1
*	25	287463 Label, Hot Muffler		2
*	26	287464 Label, Moving Parts		2
	27	287466 Label, Emergency Stop		1
	28	282554-003 Reflector Kit	A,C	2
		282554-003 Reflector Kit	B	1
*	29	403091-008 Plastic Hole Cover		1
*	30	287698-001 Output Cable Cover		1
	31	282658 Label, Clearance		1
*	32	287465 Label, Falling Objects	A,C	2
	33	287565 Label, Tire Pressure	A,C	4
*	34	287454 Label, Caution, Engine Speed		1
	35	83A1103 Reel, Grounding	C	1
*	36	288388 Label, Not A Step	A,C	2



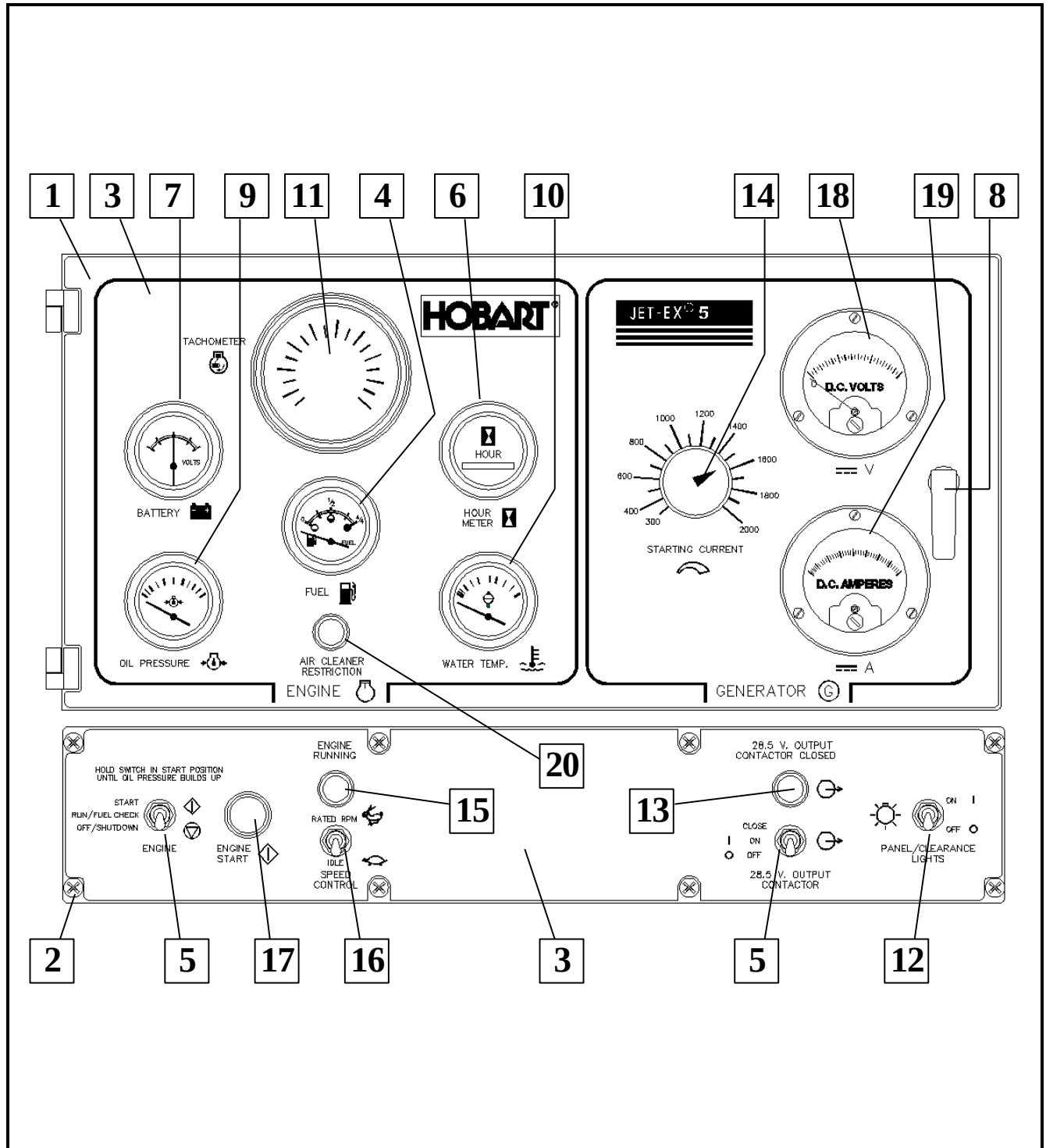
**Mounting Frame Components
Figure 2**

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
2 -	1	289090		1
	2	287980		1
	3	287972		2
	*	288064-004		2
	4	288350		1
	5	287984		1
	6	287998		2
	7	289081		1
	8	287955		1
	9	287986		1



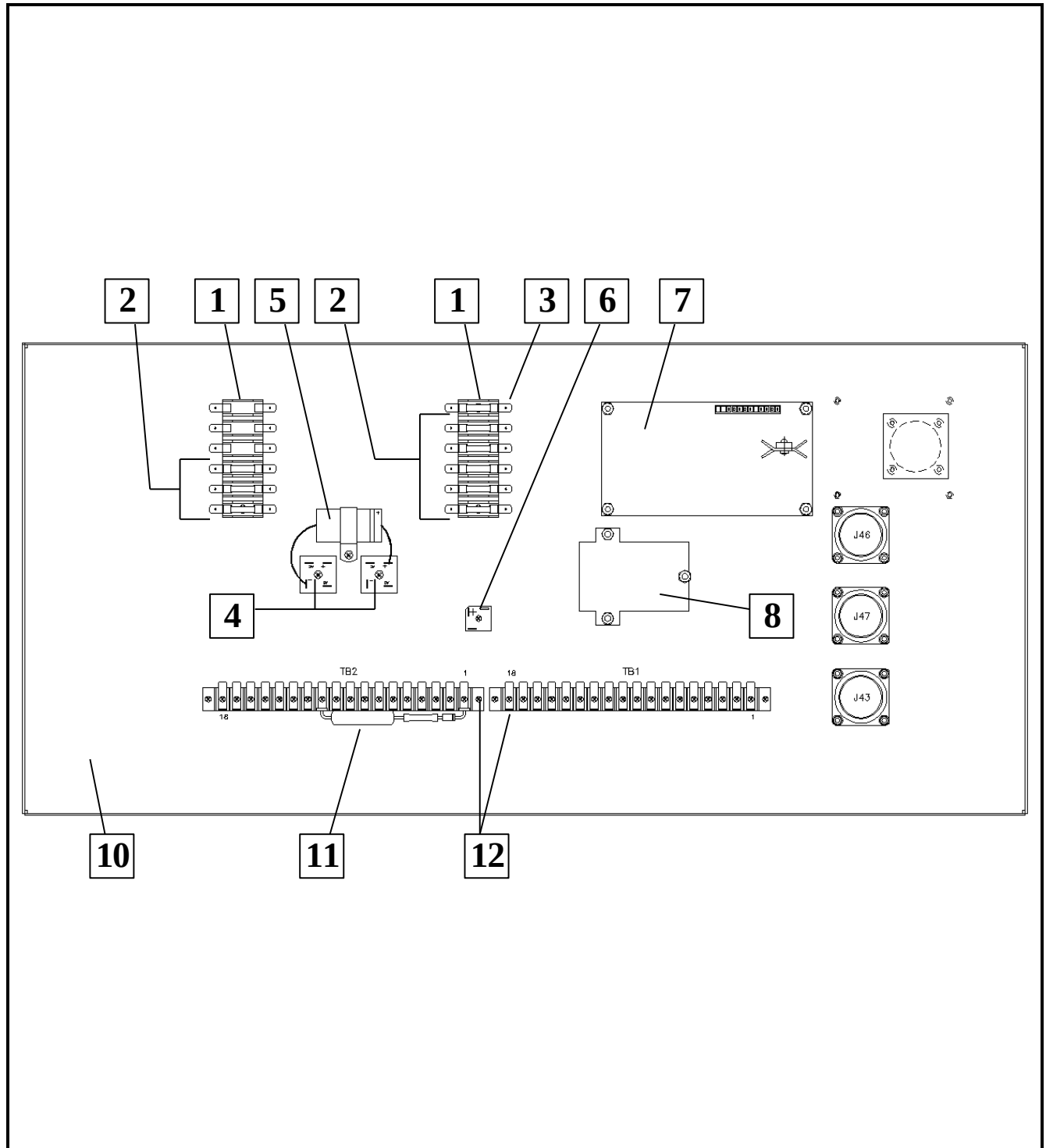
Canopy Assembly
Figure 3

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
3 -	1	287981		1
*		288064-003		1
*		288064-005		1
	2	287999		1
	3	288352		1
	4	287542-001	A,B	4
		287542-002	C	4
	5	287526-002	A,B	4
	6	287978		4
*		288064-001		4
	7	283824		4
	8	283597		4
	9	287977		4
*		288064-002		4
*		287785		16
	10	289086		1



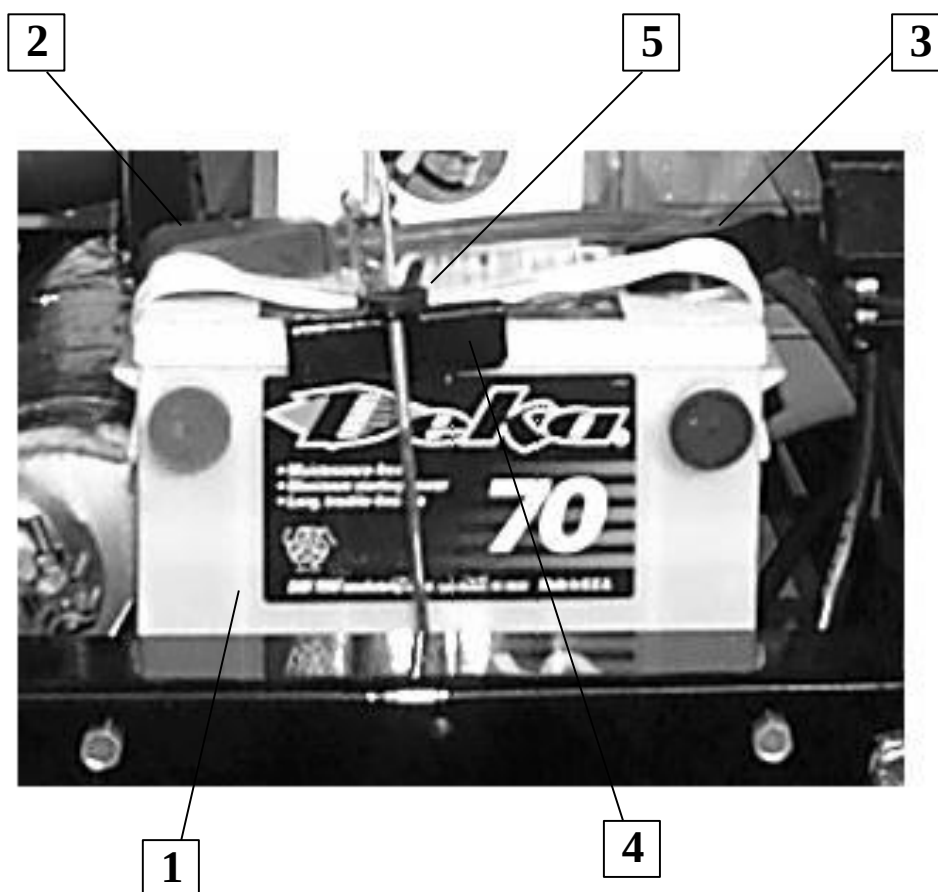
Control Box Exterior Assembly
Figure 4

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
4 - 1	289092	Control Panel		1
	288836-001	...Type A Miniature Offset Hinge		1
	288836-002	...Type B Miniature Offset Hinge		1
	040201	...Neoprene Door Gasket		5.3 ft.
2	289079	Switch Panel		1
	040213	...Neoprene Switch Panel Gasket		4.1 ft.
3	289082	Control Box Label		1
4	494134-001	Gauge, Fuel, Electric, 12V (V16476 #06339-01)		1
5	403189	Switch, Toggle (V91929 #312TS1-59)		2
6	78A1120-001	Gauge, Hour Meter (V16476 #56288)		1
7	286699-001	Voltmeter, Battery (V16476 #06351-001)		1
8	288999-001	Compression Latch		1
9	78A1117-002	Gauge, Oil Pressure (V16476 #06340)		1
10	287908	Gauge, Water Temp., (V16476 #06343)		1
11	408596-001	Tachometer (V16476 #71076-00)		1
12	402662	Switch, Toggle, DPST, (V74559 #2GK71-73)		1
13	180913-002	Light, Pilot, Green, 28 V Assembly		1
*	180914	...Base, Light (V83330 #26-5710-11-301)		1
*	404172-003	...Lens, Green (V83330 #26-1192-300)		1
*	400613-003	...Bulb (V1FQ83 Type 757)		1
14	16DA2162	Knob, Rheostat (V44655 #5150)		1
*	401428-001	...Potentiometer, 10 kΩ, 2W (V44655 #CMU-1031)		1
*	402663	...Nut, Potentiometer, Lock		1
15	180913-001	Light, Pilot, Engine, Green, 12 V. Assy.		1
*	180914	...Base, Light (V83330 #26-5710-11-301)		1
*	404172-003	...Lens, Green (V83330 #26-1192-300)		1
*	400613-003	...Bulb (V1FQ83 Type 757)		1
16	402682	Switch, Toggle, 3 PDT (V74559, HLA-211-73)		1
17	30GH1119	Switch, Pushbutton (V13445 #9095-09)		1
	406815	...Boot, Pushbutton Switch (V13445 #83280)		1
18	400642-003	Voltmeter, DC (V74542 #D-1007819T81)		1
19	400641-012	Ammeter (V74542 #D-1218619379)		1
20	180913-004	Red Pilot Light		1
*	180914	...Base, Light (V83330 #26-5710-11-301)		1
*	404172-001	...Lens, Red (V83330 #26-1192-300)		1
*	400613-003	...Bulb (V1FQ83 Type 757)		1
*	21	289077	Control Box Housing	1
*	22	288020	Cover Support Bracket	2



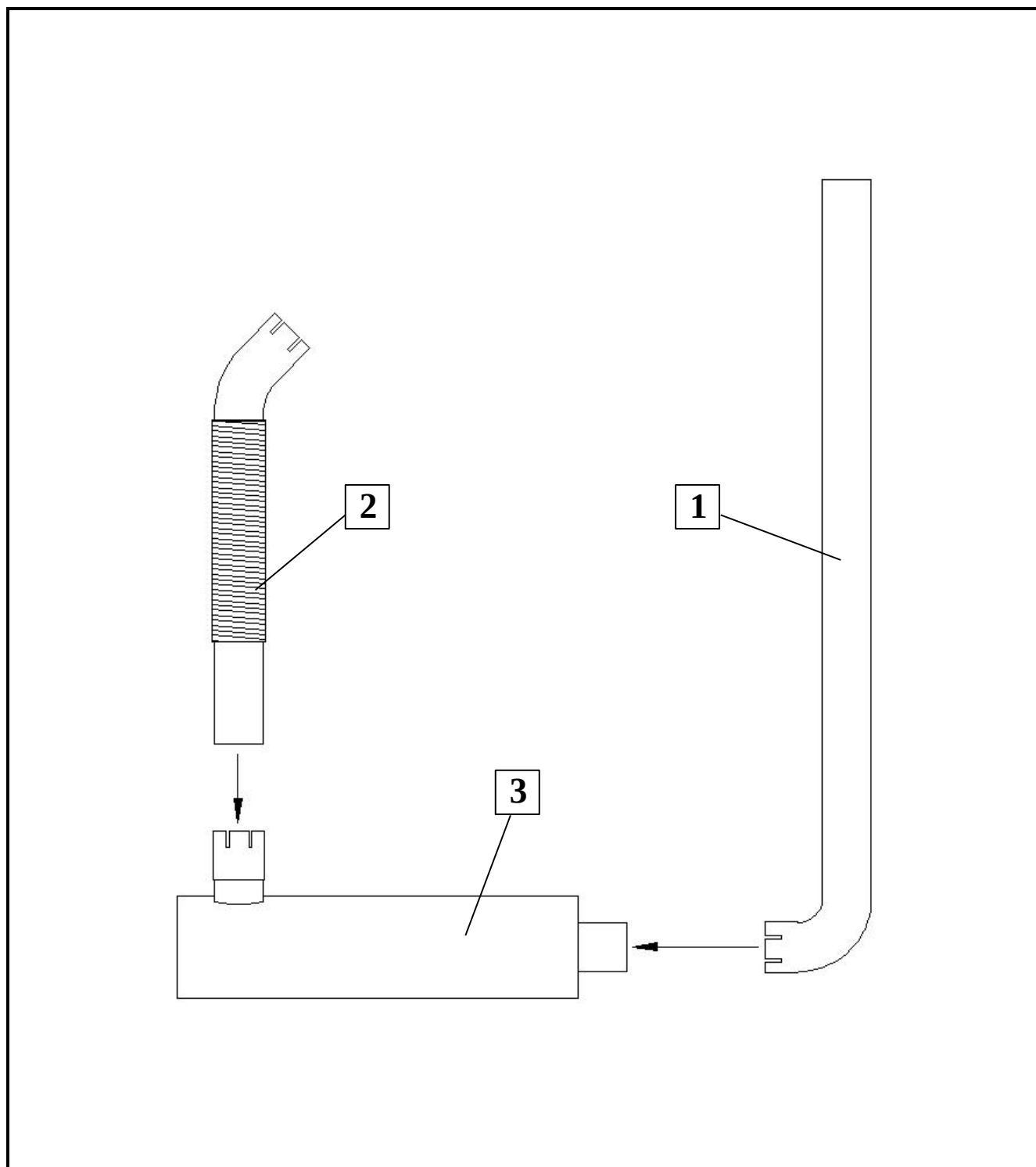
Control Box Interior Assembly
Figure 5

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
5 -	1	405129-001		1
	2	W11166-003		8
	3	288019-004		1
	4	404065-002		2
	5	180593-003		1
		W10051-014		1
	6	407948		1
	7	181022A-005		1
*		287683		1
*		84A1075		3
	8	180289		1
*		84A1075		3
*	9	289099		1
	10	289091		1
	11	287621		1
	12	401937-004		2
*	13	286485-001		7 ft.
*	14	286388-001		4
*		289104-001		4
*		286477-002		4



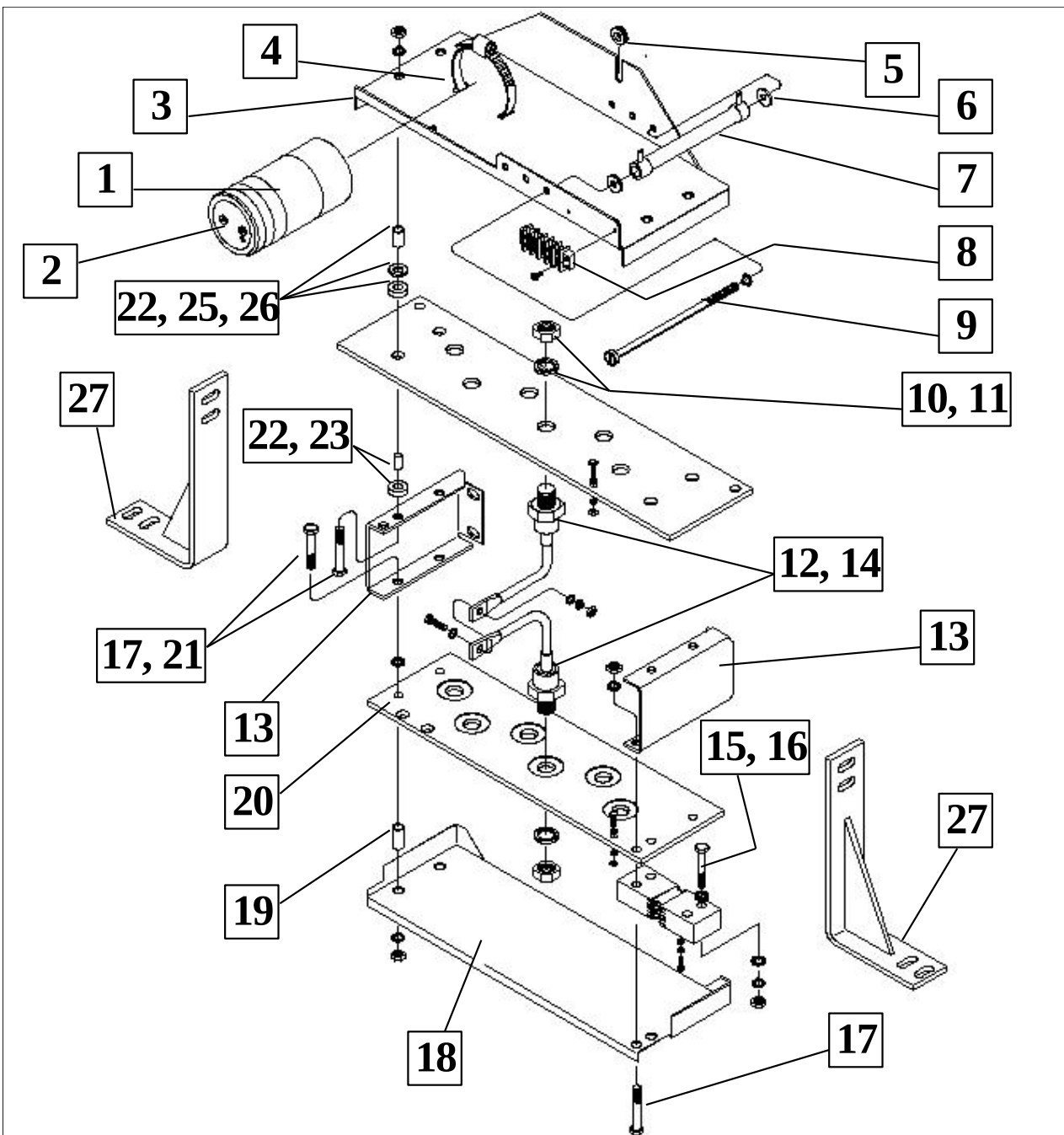
Battery Components
Figure 6

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
6 -	1	281881-001	Battery, 12 V (V04055 #724 DT)	1
	2	288046	Battery Cable, Positive, Assy.	1
	3	288047	Battery Cable, Negative, Assy.	1
	4	287796	Battery Hold Down	1
	5	494295	Battery Hold Down Bolt	1



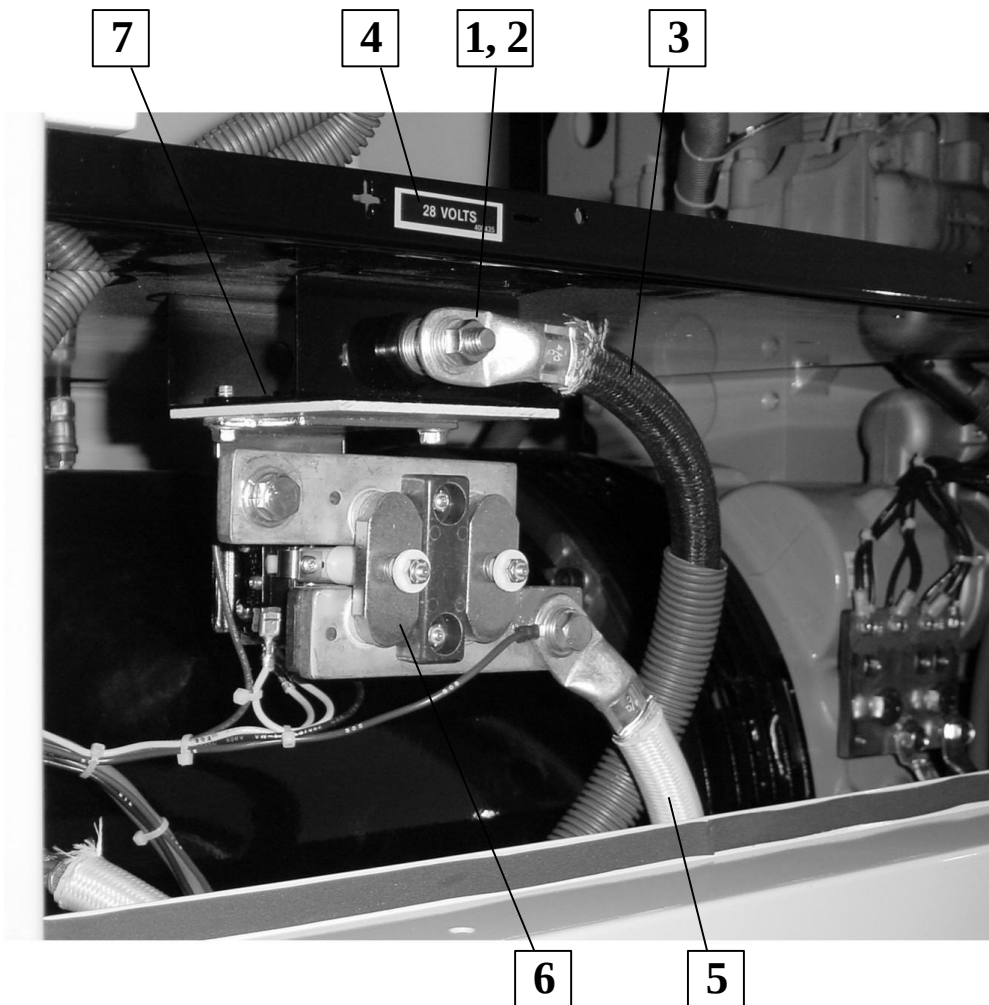
Exhaust System Assembly
Figure 7

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
7 -	1	288374 Exhaust Elbow		1
*		042471 Insulation		3 ft ²
*		288052-001 3" Full Circle Clamp		2
*		W10869-006 Hose Clamp		2
	2	289044 Flexible Exhaust Connector		1
*		042471 Insulation		3.5 ft ²
*		404154-013 3" Full Circle Clamp		1
*		W10869-006 Hose Clamp		4
	3	288376 Muffler Assembly		1
*		042471 Insulation		1.4 ft ²
*		288059-001 Hose Clamp		2



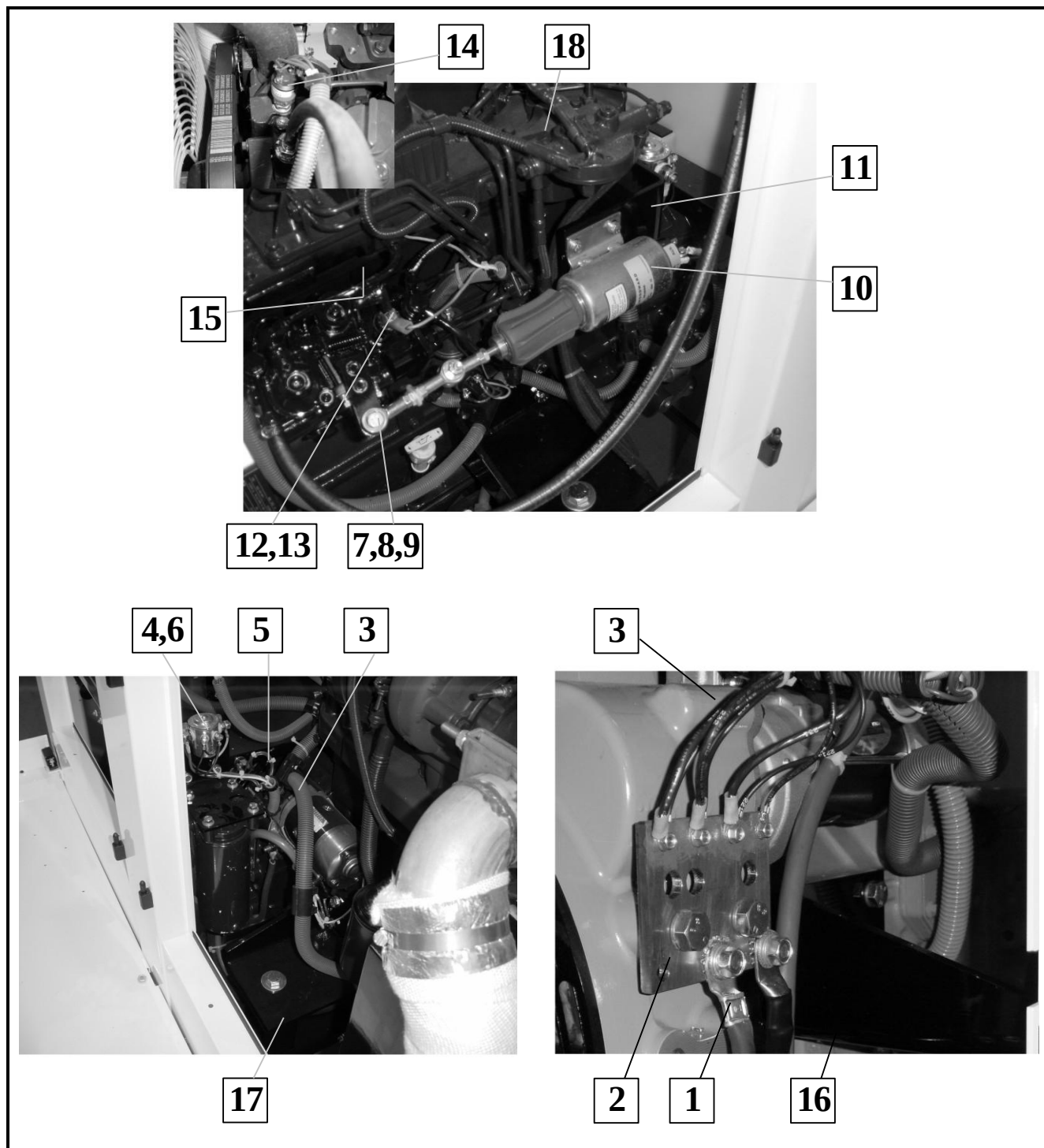
Rectifier Components
Figure 8

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
8 -	1	287184-003	Insulator, Capacitor	1
	2	405278-006	Capacitor, 90000 MFD, 75	1
	3	286887	Shroud, Air, Top, Rectifier	1
	4	W10869-006	Capacitor Clamp	1
	5	402037-004	Rubber Grommet (V02231)	1
	6	16DA3493	Insulating Washer	6
	7	288380-001	Resistor, 10 OHM, 100 WATT (V44655 #61917)	3
	8	401911-005	5 Station Terminal Block (V6S553)	1
	9	W11114-012	Screw, 1/4-20 X 7-1/4 inches Lg.	3
	10	W11280-015	Nut, Jam, Hex, 3/4-16	12
	11	494681-001	Spring Washer	12
	12	W10931-003	Rectifier, Positive, Base (V59993 #300U30A)	6
	13	286884	Heat Sink Bracket	2
	14	W10933-003	Rectifier, Negative, Base (V59993 #300UR30A)	6
	15	W11097-007	Screw, HHC, 3/8-16 x 2 inches Lg.	1
	16	180065	200 A Shunt	1
	17	W11097-007	Screw , 3/8-16 x 2 inches Lg.	5
	18	285647	Shroud, Air, Bottom, Rectifier	1
	19	180600	Shroud Spacer	3
	20	282239	Heat Sink, Rectifier, Negative	1
	21	W11097-022	Screw , 3/8-16 x 2-1/2 inches Lg.	4
	22	A25	Insulating Washer	8
	23	AW626	Bushing, Insulating (V5E599 # #E48013(M))	4
	24	286813	Positive Rectifier Heat Sink	1
	25	W11242-018	Washer, Flat, 3/8"	8
	26	283063	Rectifier Spacer	8
	27	288008	Rectifier Mounting Bracket	2
*	28	288015	Wire Harness	1
*	29	291358	Splice, Solder	3



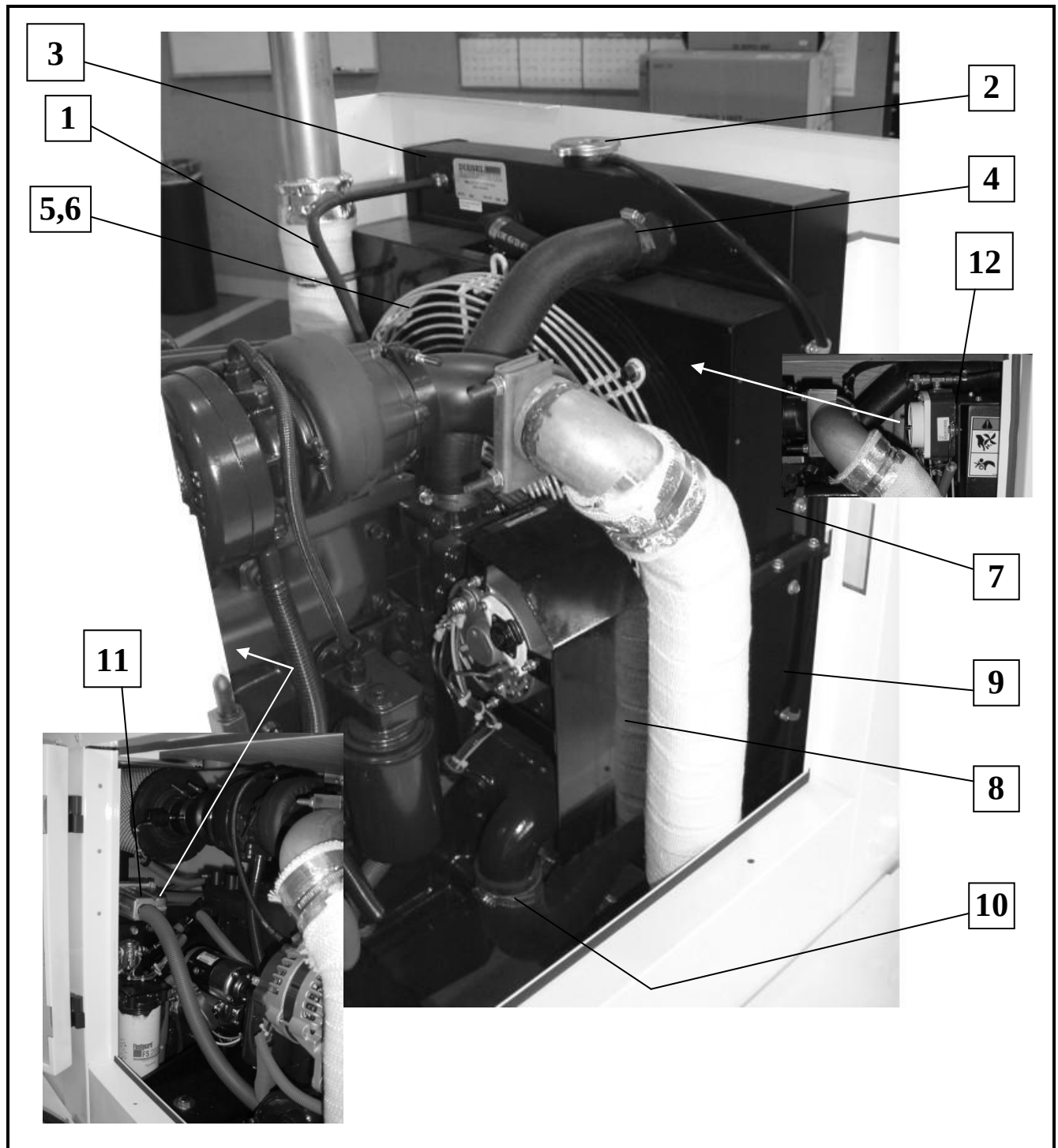
Contactor Components
Figure 9

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
9 -	1	A25		2
	2	AW626		1
	3	W9218-227		1
	4	400435		1
	5	W9218-251		1
	6	286810-001		1
	7	286849		1
*	8	489658-010		1



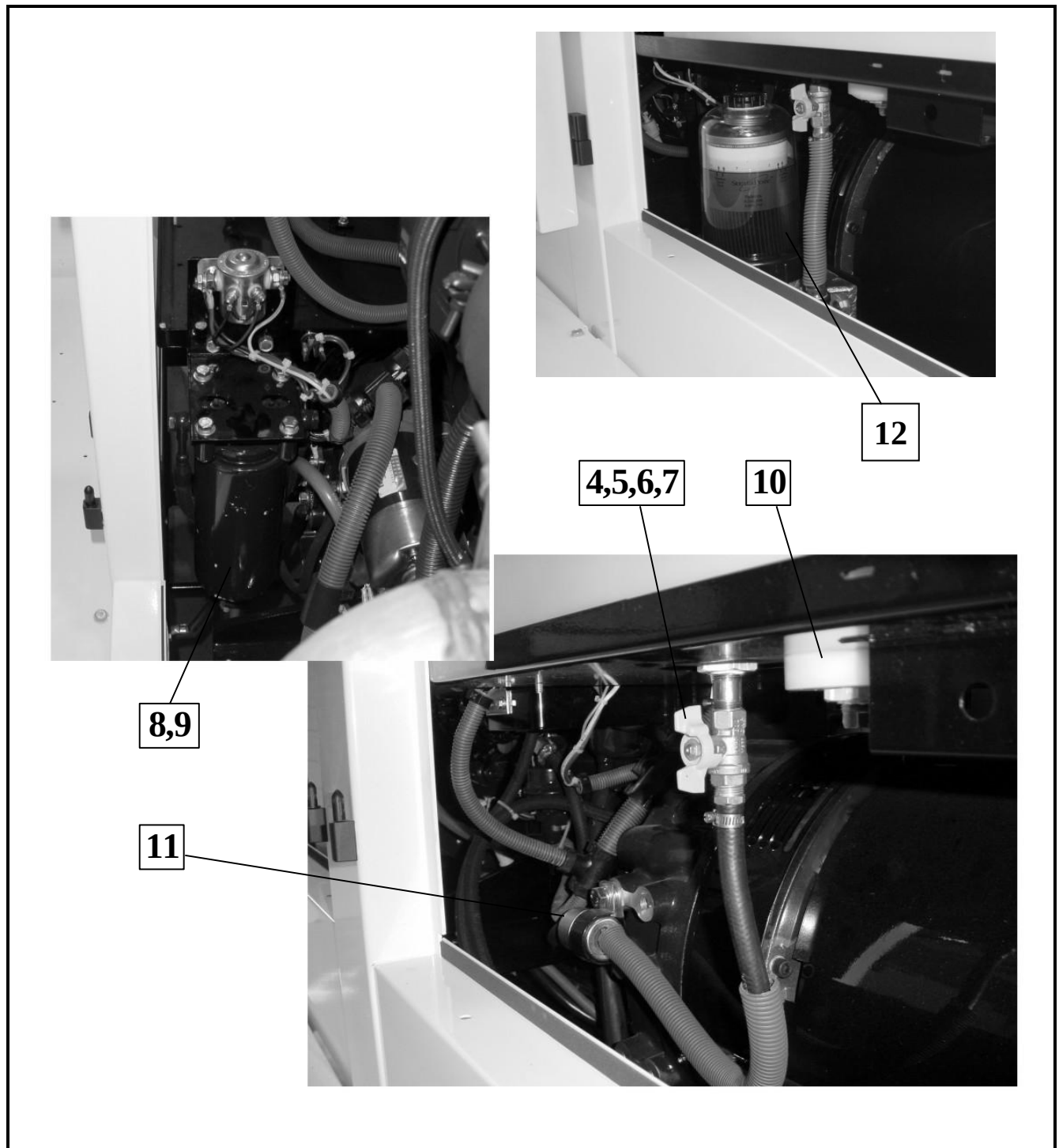
Engine Components
Figure 10

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
10 -	1	W9407-446	Ground Cable	1
	2	287735	Ground Plate	1
	3	289049	Engine Harness	1
	4	286850	Starter Cut-Out Solenoid	2
	5	407948	Rectifier, Starter Solenoid	1
	6	489658-007	Flyback Diode	2
	7	289031	Throttle Arm	1
	8	288215-001	Rod End Bearing (V71382 # AR-5)	3
	9	288221-001	Threaded Rod	1
	10	288045-001	Throttle Solenoid (V78388 # 2370-12-E-2U1B5A)	1
	11	289030	Throttle Solenoid Bracket	1
	12	78B1118-002	Oil Pressure Sender (V16476 # 109600)	1
	13	403809-002	Oil Pressure Switch	1
*		W10910-000	...Tee Fitting	1
*		287419	...Adapter, M10 TO 1/8 NPT	1
*		W10750-001	...1/8" Pipe Nipple	1
	14	403782-002	Water Temperature Switch	1
	15	287909	Water Temperature Sensor (V16476 # 02025-00)	1
*		W7814-004	...Pipe Bushing	1
	16	288347-001	Engine Support Bracket, Left	1
	17	288347-002	Engine Support Bracket, Right	1
	18	288934	Engine, Cummins, 4B4.5T	1
		056525	...Hose,Rubber,3/4 ID X 1/8 Wall	72 inches
		482496-2	...Clamp,Universal	2
	19	284372-002	Engine Shock Mount (V5P059 # 51510-2)	2
*	20	286897-028	Oil Filter (V33457 #LF3805)	1



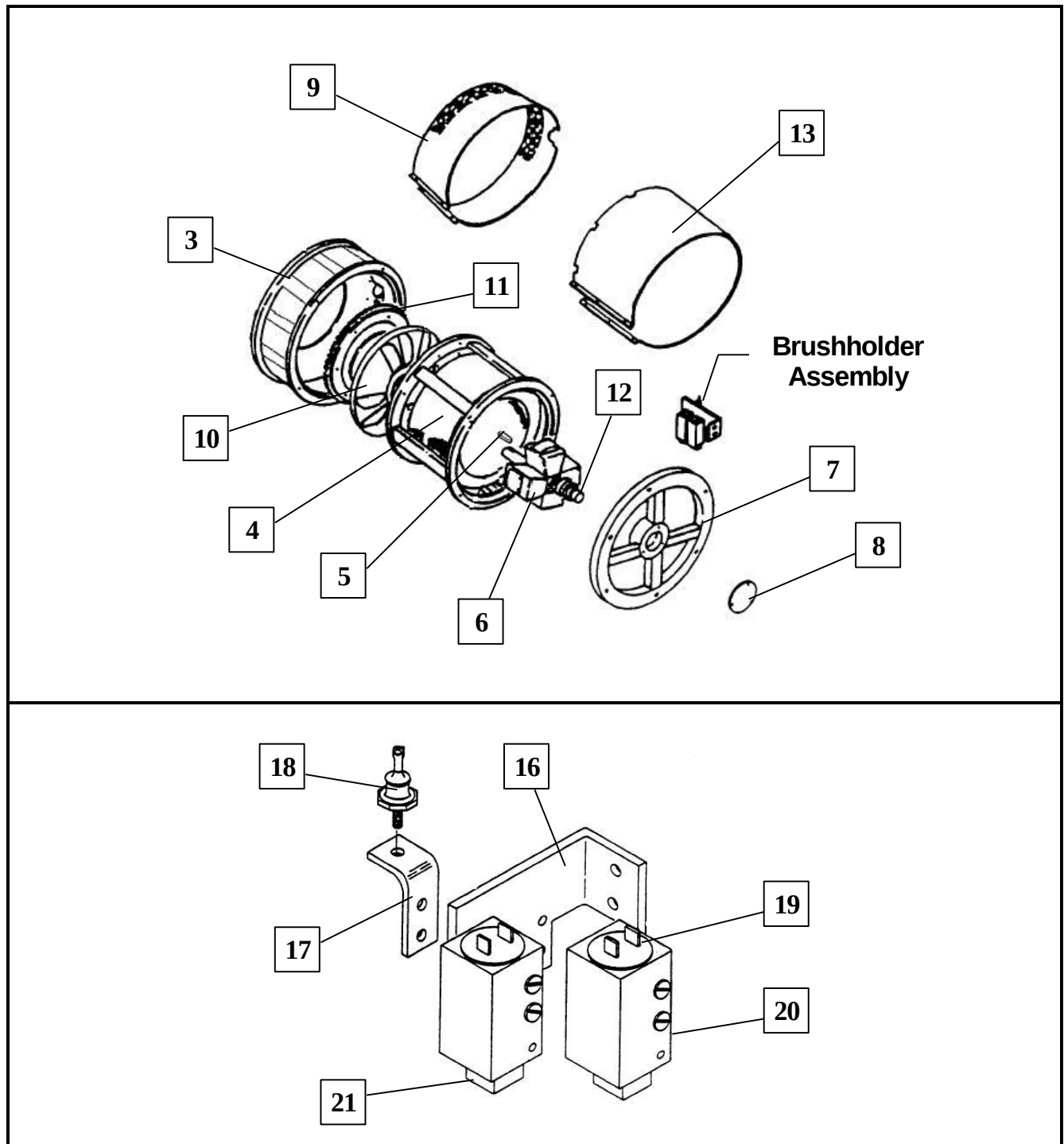
Cooling System Components
Figure 11

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
11 -	1	056534 Deaeration Hose		21.5 in.
		W7814-000 ...1/8 X 1/ 4 Pipe Bushing		1
		402927-003 ...Male Connector		2
		W10869-014 ...Hose Clamp		2
	2	287333-001 Radiator Cap, 10 PSI		1
	3	288343 Radiator		1
		283873 ...Drain Valve		1
		056535 ...3/8 inch Drain Hose		12 inches
		W10869-014 ...Hose Clamp		1
		W10051-007 ...Plastic Wire Clamp		2
	4	288063 Top Radiator Hose		1
		W10869-003 ...Hose Clamp		2
	5	288002 Fan Guard		1
	6	288001 20 inch Cooling Fan		1
	7	287982 Top Fan Shroud		1
	8	289042 Alternator Guard		1
	9	288000 Bottom Fan Shroud		1
	10	289043 Bottom Radiator Hose		1
		W10869-005 ...Hose Clamp		2
	11	288139-001 Kit, Block Heater, 120V	C	Ref.
		287570 ...Adapter, 3/4 Hose Barb X 1/2 NPT	C	2
		213502 ...Hose, 3/4 I.D., Radiator	C	11.75 in.
		213502 ...Hose, 3/4 I.D., Radiator	C	23.25 in.
		287566-001 ...Block Heater	C	1
		12CW2077-3 ...Street Elbow,90 Degrees	C	1
12		283063 ...Spacer, Rectifier	C	2
		287570 ...Adapter, 3/4 Hose Barb X 1/2 NPT	C	2
		288074-001 Kit, Low Coolant Shutdown	C	Ref.
		283873 ...Valve, Raditor, Drain	C	1
		288123-001 ...Connector, Male, 1/4 NPT, 3/8 Tube	C	3
		W10869-014 ...Clamp, Hose, Stainless Steel	C	4
		56534 ...Hose, Low Press, Lube Oil, 1/4 I.D.	C	4"
		288077-001 ...Gage, Low Coolant	C	1
		288123-002 ..Connector, Male, 1/2 NPT, 3/8 Tube	C	1
		288071-001 ...Tee, Street, 1/4 NPT	C	1
		288126-001 ...Tee, Street, Male Branch, 1/4 NPT	C	1
		289558 ...Capacitor, & Resistor, Ay.	C	1
		289566 ...Chart, Wire	C	1
		79B1140 ...Relay, 12VDC	C	1
		408585 ...Spring, Relay	C	1
		408352 ...Socket, Relay	C	1
		290111 ...Bracket, Low Coolant Meter	C	1



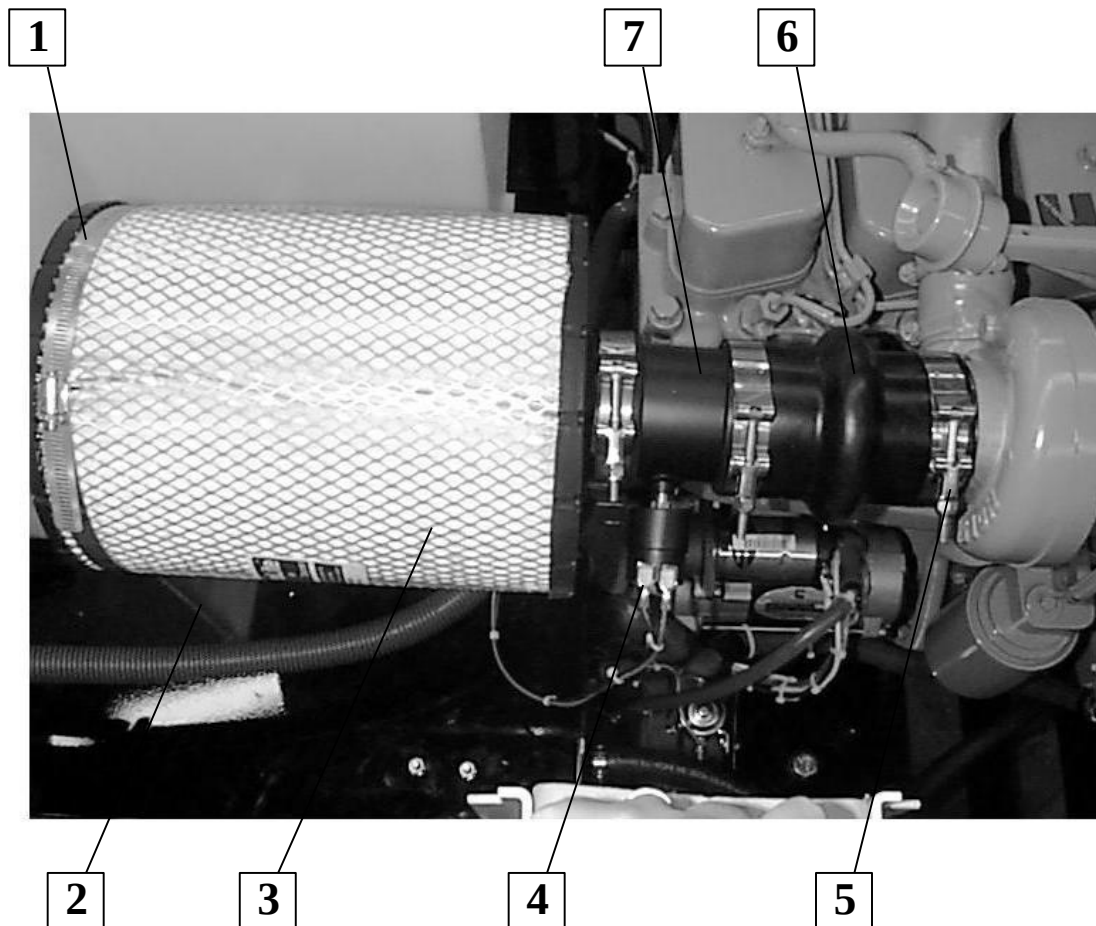
Fuel System Components
Figure 12

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
12 -		Fuel Return Line		
* 1	056544	Hose, 5/16 inch I.D. (Fuel Return Line)		37 inches
* 2	288224	Straight Fitting		1
* W10869-014		...Hose Clamp		2
* 3	288254-001	Hose Clamp		1
		Fuel Supply Line		
4	288383	Shut-Off Valve		1
5	288384	Adapter Nipple		1
6	288358	Fitting, Straight, 3/8 inch Barb To 3/8 inch NPT		1
7	056535	Hose, 3/8 inch I.D. (Tank To Filter)		16 inches
	W10869-014	...Hose Clamp		2
8	286897-026	Lubricity Additive Fuel Filter (V8A334 #3966659)		1
		...Fuel Lines (Supplied by Cummins)		AR
9	289037	Fuel Filter Bracket	A,B	1
* 290110		Fuel Filter Bracket	C	1
10	282299	Fuel Tank Assembly		1
	284203	...Fuel Tank Mounting Plate		5
11	288382	Fuel Strainer		1
12	288188	Fuel/Water Separator Filter	C	1
	056544	...Hose, 5/16" ID	C	30 inches
	W10869-014	...Clamp, Hose (.22-.63)	C	1
	286851	...Fitting, Hose, Barbed, Brass	C	1
	W7814-4	...Bushing, Pipe, Steel	C	1
	12CW2077-3	...Street Elbow,90 Degrees	C	1
* 13	290112	Line, Fuel (Filter To Tank)	C	1



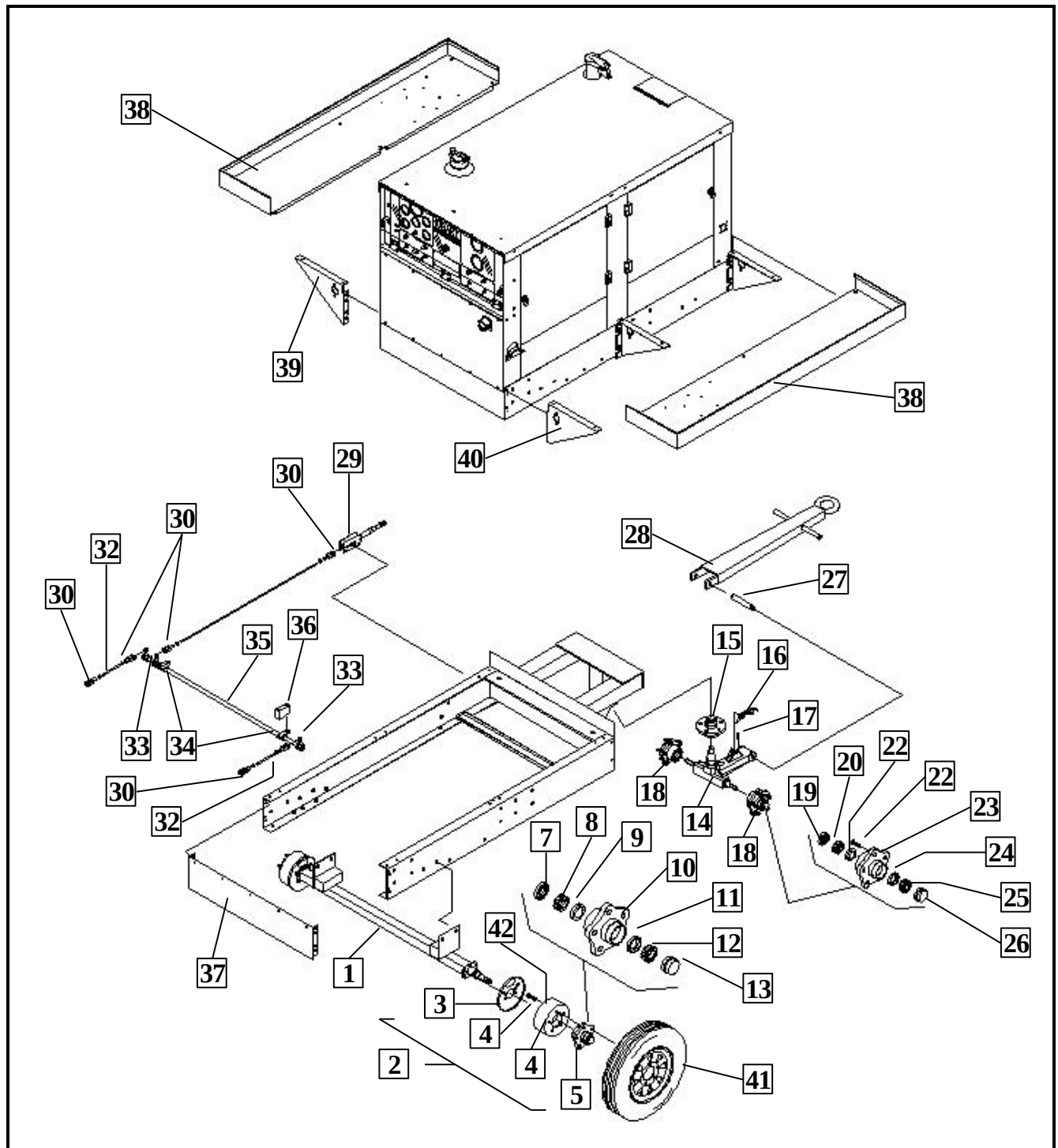
Generator Components and Brush Holder Assembly
Figure 13

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
13 -	1	288210		1
*	2	284371-002		1
	3	287564		1
	4	488557-008		1
	5	489135		1
	6	180776		1
	7	488555-001		1
	8	287401		1
	9	288003		1
	10	290646		1
*		402789-004		6
*		W11254-005		6
*		85C1004-002		1
	11			Ref.
	12	354592		2
	13	281688		1
*	14	W10072-063		1
*	15	287956		1
	16	488562		1
	17	488628		1
	18	408999-001		1
	19	402531		2
	20	402530		2
	21	402788		2



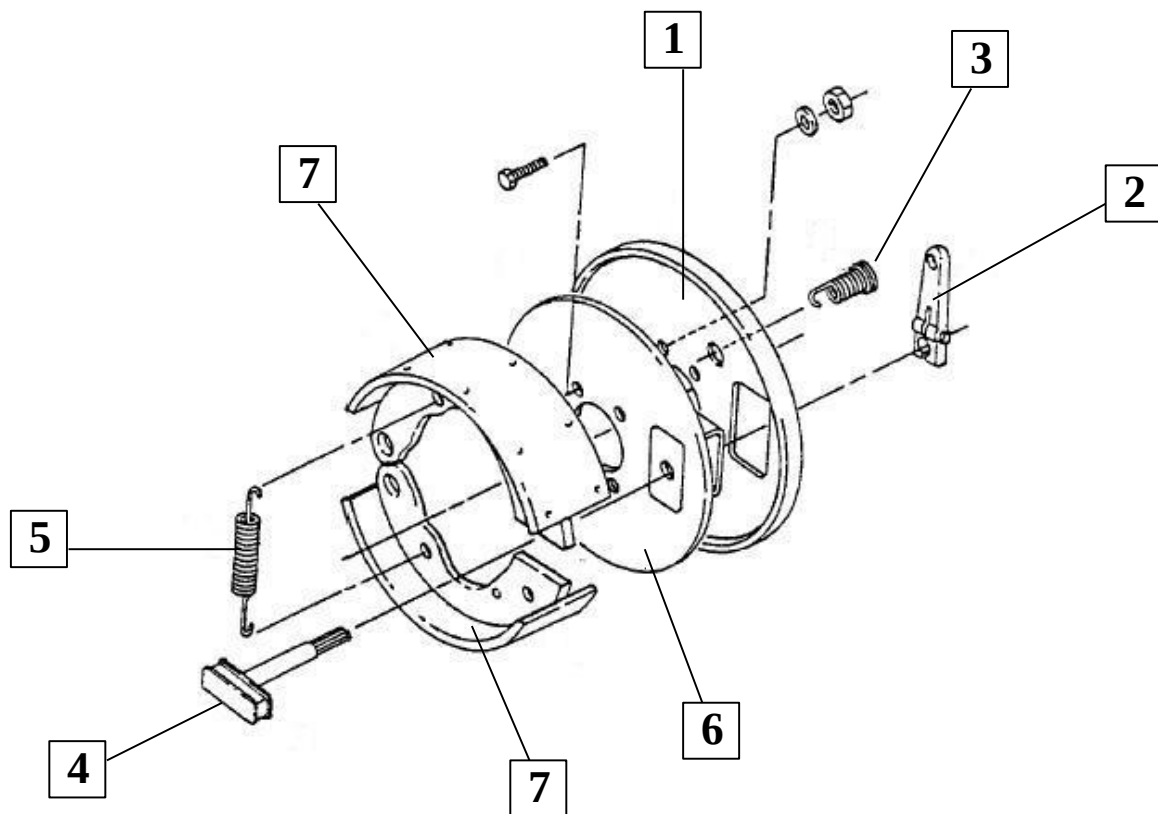
Air Cleaner Components
Figure 14

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
14 -	1	288059-001		1
	2	288049		1
	3	288048-001		1
	4	282918		1
	*	282919		1
		...Indicator Adapter		1
	5	280732-004		3
	6	288056-001		1
	7	288057-001		
		Air Cleaner Hose Clamp		
		Rubber Pipe, Turbo Inlet (V18265 # P105608)		
		Straight Pipe		



Trailer Components
 Figure 15

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
15 -	1	288389	Rear Axle Weldment (V52793 # 05-053285)	A,C 1
	2	287587	Hub and Brake Assembly (V52793 # 05-046894)	A,C 2
		285917	...Lug nut (V52793 # 05-007805)	A,C 5
	3	285911	...Dust Shield (V52793 # 317968)	A,C 1
	4	286205	...Hub Bolt (V52793 # 05-006440)	A,C 5
	5	287627	...Brake Drum (V52793 # 05-006712-21)	A,C 1
	6	287626	...Hub Assembly (V52793 # 05-0468791AL)	A,C 1
	7	287626-001	Grease Seal (V52793 # 16743 CR)	A,C 1
	8	287626-002	Inner Bearing Cone (V60038 # 67048)	A,C 1
	9	287626-003	Inner Bearing Cup (V60038 # 67010)	A,C 1
	10	287628	Hub (V52793 # 03-044880-AL)	A,C 1
	11	287626-004	Outer Bearing Cup (V60038 # 11910)	A,C 1
	12	287626-005	Outer Bearing Cone (V60038 # 11949)	A,C 1
	13	287626-006	Wheel Hub Cap (V52793 # 1517)	A,C 1
	14	288390	Front Axle Weldment (V52793 # 05-053308)	A,C 1
	15	288392	Hub Assembly (V52793 # 2-1206-01-01)	A,C 1
	16	285851	Latch Pedal (V52793 # 05-051009)	A,C 1
	17	285850	Compression Spring (V52793 # C-063F-7)	A,C 1
	18	286735	Hub Assembly (V52793 # 03-044876-1AL)	A,C 2
		285917	...Lug Nut (V52793 # 05-007805)	A,C 5
	19	286735-001	...Grease Seal (V52793 # 16743 CR))	A,C 1
	20	286735-002	...Inner Bearing Cone (V60038 # 67048)	A,C 1
	21	286735-003	...Inner Bearing Cup (V60038 # 67010)	A,C 1
	22	286205	...Hub Bolt (V52793 # 03-006440)	A,C 5
	23	286734	...Wheel Hub (V52793 # 03-044875-AL)	A,C 1
	24	286735-004	...Outer Bearing Cup (V60038 # 11910)	A,C 1
	25	286735-005	...Outer Bearing Cone (V52793 # 11949)	A,C 1
	26	286735-006	...Wheel Hub Cap (V52793 # 1517)	A,C 1
	27	285844	...Drawbar Pin Assembly (V52793 # 05-046787-A)	A,C 1
	28	288393	...Drawbar Weldment (V52793 # 05-053590)	A,C 1
	29	286978	Brake Lever Assembly (V52793 # 05-031110)	A,C 1
	30	286982	Clevis (V52793 # 2708-4A)	A,C 6
	31	288394	Brake Handle Rod (V52793 # 05-053305)	A,C 1
	32	288395	Brake Lever Rod (V52793 # 05-053304)	A,C 2
	33	288398	Shaft Lever	A,C 3
*		286985	Collar, Set Screw (V52793 # SC-075)	A,C 2
*		286984	Roll Pin (V52793 # LL 5/16 x 1-1/4RP)	A,C 3
	34	286981	Shaft Bearing (V52793 # 05-046646)	A,C 2
	35	288396	Brake Cross Bar (V52793 # 05-053306)	A,C 1
	36	288397	Spacer Block (V52793 # 05-053414)	A,C 1
	37	288391	Rear Frame Plate (V52793 # 05-053276)	A,C 1
	38	287996	Fender	A,C 2
	39	287994	Fender Mounting Bracket	A,C 3
	40	287993	Fender Mounting Bracket	A,C 3
	41	282720	Wheel and Tire Assembly	A,C 4
	42	286201	Brake Assembly (See Figure 16)	A,C 2



Brake Assembly Components
Figure 16

FIGURE ITEM NO.	FACTORY PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
16 -	1	285911 Dust Shield (V52793 #317968)	A,C	Ref.
	2	285915-006 Cam ASM. (V14892 #317687)	A,C	1
	3	285915-001 Hold Down Spring (V14892 #4152194)	A,C	2
	4	285915-005 Cam Shaft (V14892 #313061)	A,C	1
	5	285915-003 Shoe Return Spring (V14892 #4152195)	A,C	1
	6	285915-004 Support Plate (V14892 #310949)	A,C	1
	7	285915-002 Shoe ASM. (V14892 #320647)	A,C	1

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Section 4 Numerical Index

1) Explanation of Numerical Index

The purpose of this index is to assist the user in finding the illustration and description of a part when the part number is known. Part numbers are arranged in alphanumerical sequence. Thus, any part number beginning with the letter "A" would be located at or near the top of the index list. Likewise, a part number "9" would be listed near the end of the list and far below a part number "1000". The figure number and item number location of the part is directly opposite the part. If the part is used in more than one place, each location is listed commencing with the first location the part is listed.

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
4-	040201	1-31	282658
1-21	040209	15-41	282720
4-	040213	14-4	282918
7-	042471	14-	282919
7-	042471	8-26	283063
7-	042471	11-	283063
10-	056525	3-8	283597
11-1	056534	3-7	283824
11-	056535	11-	283873
12-7	056535	11-	283873
12-1	056544	12-	284203
12-	056544	13-2	284371-002
11-	12CW2077-3	10-19	284372-002
12-	12CW2077-3	1-	285125
4-14	16DA2162	8-18	285647
8-6	16DA3493	15-27	285844
8-16	180065	15-17	285850
5-8	180289	15-16	285851
5-5	180593-003	15-3	285911
8-19	180600	16-1	285911
13-6	180776	16-3	285915-001
4-15	180913-001	16-7	285915-002
4-13	180913-002	16-5	285915-003
4-20	180913-004	16-6	285915-004
4-	180914	16-4	285915-005
4-	180914	16-2	285915-006
4-	180914	15-	285917
5-7	181022A-005	15-	285917
11-	213502	15-42	286201
11-	213502	15-4	286205
14-5	280732-004	15-22	286205
13-13	281688	5-14	286388-001
6-1	281881-001	5-	286477-002
8-20	282239	5-13	286485-001
12-10	282299	4-7	286699-001
1-28	282554-003	15-23	286734
1-	282554-003	15-18	286735
1-9	282562	15-19	286735-001

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
15-20	286735-002	5-	287683
15-21	286735-003	1-30	287698-001
15-24	286735-004	10-2	287735
15-25	286735-005	3-	287785
15-26	286735-006	6-4	287796
9-6	286810-001	4-10	287908
8-24	286813	10-15	287909
9-7	286849	1-	287950
10-4	286850	2-8	287955
12-	286851	13-15	287956
8-13	286884	2-3	287972
8-3	286887	3-9	287977
12-8	286897-026	3-6	287978
10-20	286897-028	2-2	287980
15-29	286978	3-1	287981
15-34	286981	11-7	287982
15-30	286982	2-5	287984
15-	286984	2-9	287986
15-	286985	15-40	287993
8-1	287184-003	15-39	287994
11-2	287333-001	15-38	287996
13-8	287401	2-6	287998
10-	287419	3-2	287999
1-34	287454	11-9	288000
1-22	287459	11-6	288001
1-23	287460	11-5	288002
1-24	287461	13-9	288003
1-25	287462	8-27	288008
1-25	287463	8-28	288015
1-26	287464	5-3	288019-004
1-32	287465	1-	288020
1-27	287466	4-22	288020
3-5	287526-002	1-6	288021
3-4	287542-001	1-	288022
3-	287542-002	1-7	288023
13-3	287564	10-10	288045-001
1-33	287565	6-2	288046
11-	287566-001	6-3	288047
11-	287570	14-3	288048-001
11-	287570	14-2	288049
15-2	287587	7-	288052-001
5-11	287621	14-6	288056-001
15-6	287626	14-7	288057-001
15-7	287626-001	7-	288059-001
15-8	287626-002	14-1	288059-001
15-9	287626-003	1-10	288060-001
15-11	287626-004	11-4	288063
15-12	287626-005	3-	288064-001
15-13	287626-006	3-	288064-002
15-5	287627	3-	288064-003
15-10	287628	2-	288064-004

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
3-	288064-005	4-21	289077
11-	288071-001	4-2	289079
11-12	288074-001	2-7	289081
11-	288077-001	4-3	289082
11-	288123-001	3-10	289086
11-	288123-002	2-1	289090
11-	288126-001	5-10	289091
11-11	288139-001	4-1	289092
12-12	288188	5-9	289099
13-1	288210	5-	289104-001
10-8	288215-001	11-	289558
10-9	288221-001	11-	289566
12-2	288224	12-	290110
12-3	288254-001	11-	290111
1-	288300	12-13	290112
1-1	288340	13-10	290646
11-3	288343	8-29	291358
10-16	288347-001	4-17	30GH1119
10-17	288347-002	13-12	354592
2-4	288350	1-17	400435
3-3	288352	9-4	400435
12-6	288358	4-	400613-003
7-1	288374	4-	400613-003
7-3	288376	4-	400613-003
8-7	288380-001	4-19	400641-012
12-11	288382	4-18	400642-003
12-4	288383	4-	401428-001
12-5	288384	1-20	401842
1-36	288388	8-8	401911-005
15-1	288389	5-12	401937-004
15-14	288390	8-5	402037-004
15-37	288391	13-20	402530
15-15	288392	13-19	402531
15-28	288393	4-12	402662
15-31	288394	4-	402663
15-32	288395	4-16	402682
15-35	288396	13-21	402788
15-36	288397	13-	402789-004
15-33	288398	11-	402927-003
4-	288836-001	1-12	402987
4-	288836-002	1-29	403091-008
1-15	288866	4-5	403189
10-18	288934	10-14	403782-002
4-8	288999-001	10-13	403809-002
10-11	289030	5-4	404065-002
10-7	289031	7-	404154-013
12-9	289037	4-	404172-001
11-8	289042	4-	404172-003
11-10	289043	4-	404172-003
7-2	289044	5-1	405129-001
10-3	289049	8-2	405278-006

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
4-	406815	11-	W10869-014
1-18	407366	11-	W10869-014
5-6	407948	11-	W10869-014
10-5	407948	12-	W10869-014
11-	408352	12-	W10869-014
11-	408585	12-	W10869-014
4-11	408596-001	10-	W10910-000
13-18	408999-001	8-12	W10931-003
10-	482496-2	8-14	W10933-003
13-7	488555-001	8-15	W11097-007
13-4	488557-008	8-17	W11097-007
13-16	488562	8-21	W11097-022
13-17	488628	8-9	W11114-012
1-	488640	5-2	W11166-003
13-5	489135	8-25	W11242-018
10-6	489658-007	13-	W11254-005
9-8	489658-010	8-10	W11280-015
1-	489689	11-	W7814-000
4-4	494134-001	10-	W7814-004
6-5	494295	12-	W7814-4
8-11	494681-001	9-3	W9218-227
11-	56534	9-5	W9218-251
1-19	76B1148	10-1	W9407-446
1-5	77A1157		
1-13	78A1000		
4-9	78A1117-002		
4-6	78A1120-001		
10-12	78B1118-002		
1-14	79A1110		
1-	79A1127-002		
11-	79B1140		
1-	7J422-000		
1-16	81B1084		
1-35	83A1103		
5-	84A1075		
5-	84A1075		
13-	85C1004-002		
8-22	A25		
9-1	A25		
8-23	AW626		
9-2	AW626		
11-	W10051-007		
5-	W10051-014		
13-14	W10072-063		
10-	W10750-001		
11-	W10869-003		
11-	W10869-005		
7-	W10869-006		
7-	W10869-006		
8-4	W10869-006		

Chapter 5 Manufacturer's Literature

Vendor Literature

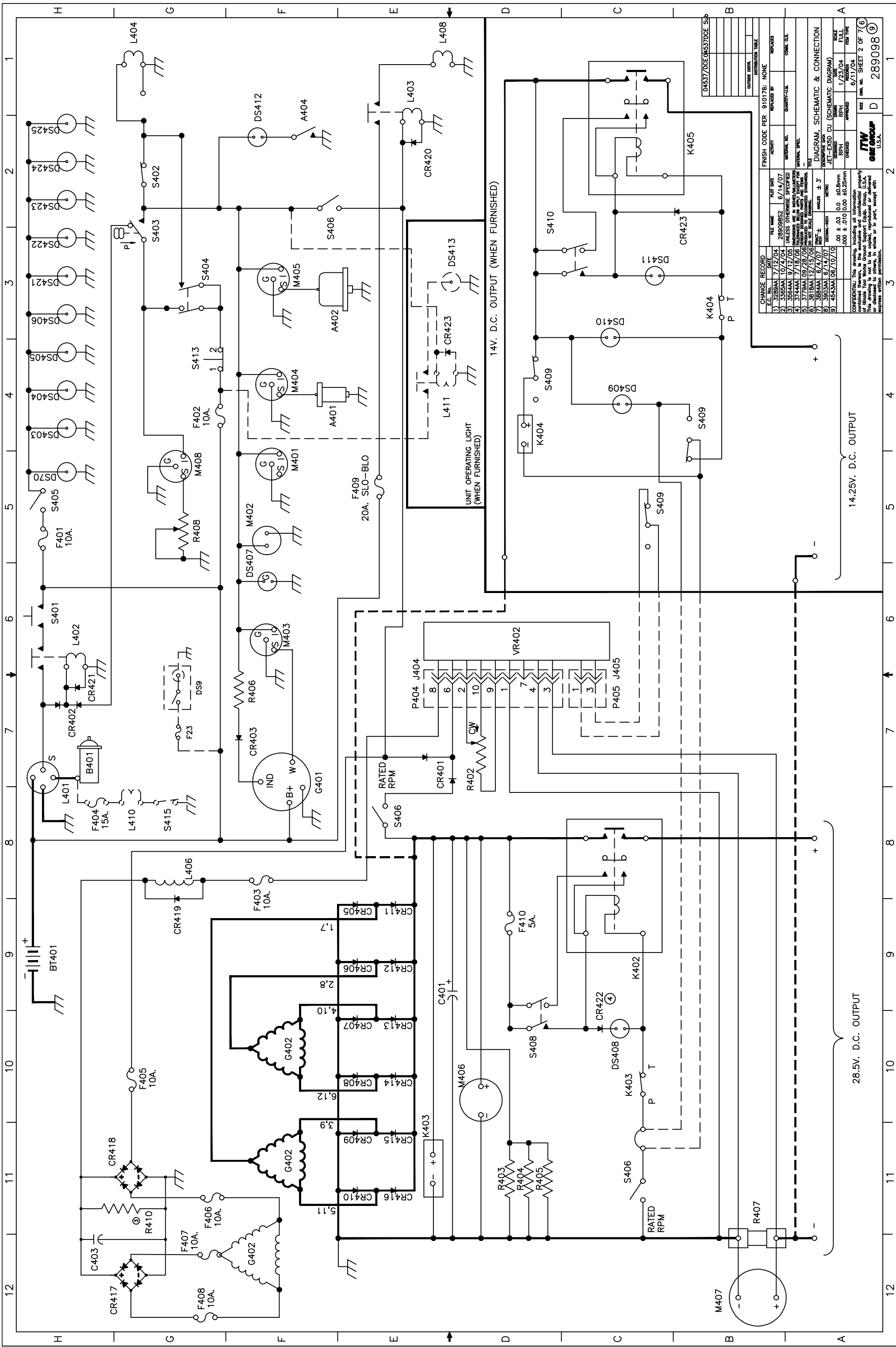
Type	Diagram Description
Engine	Operation and Maintenance Manual (Included) Parts Catalog (Optional, Purchased From Engine Manufacture)

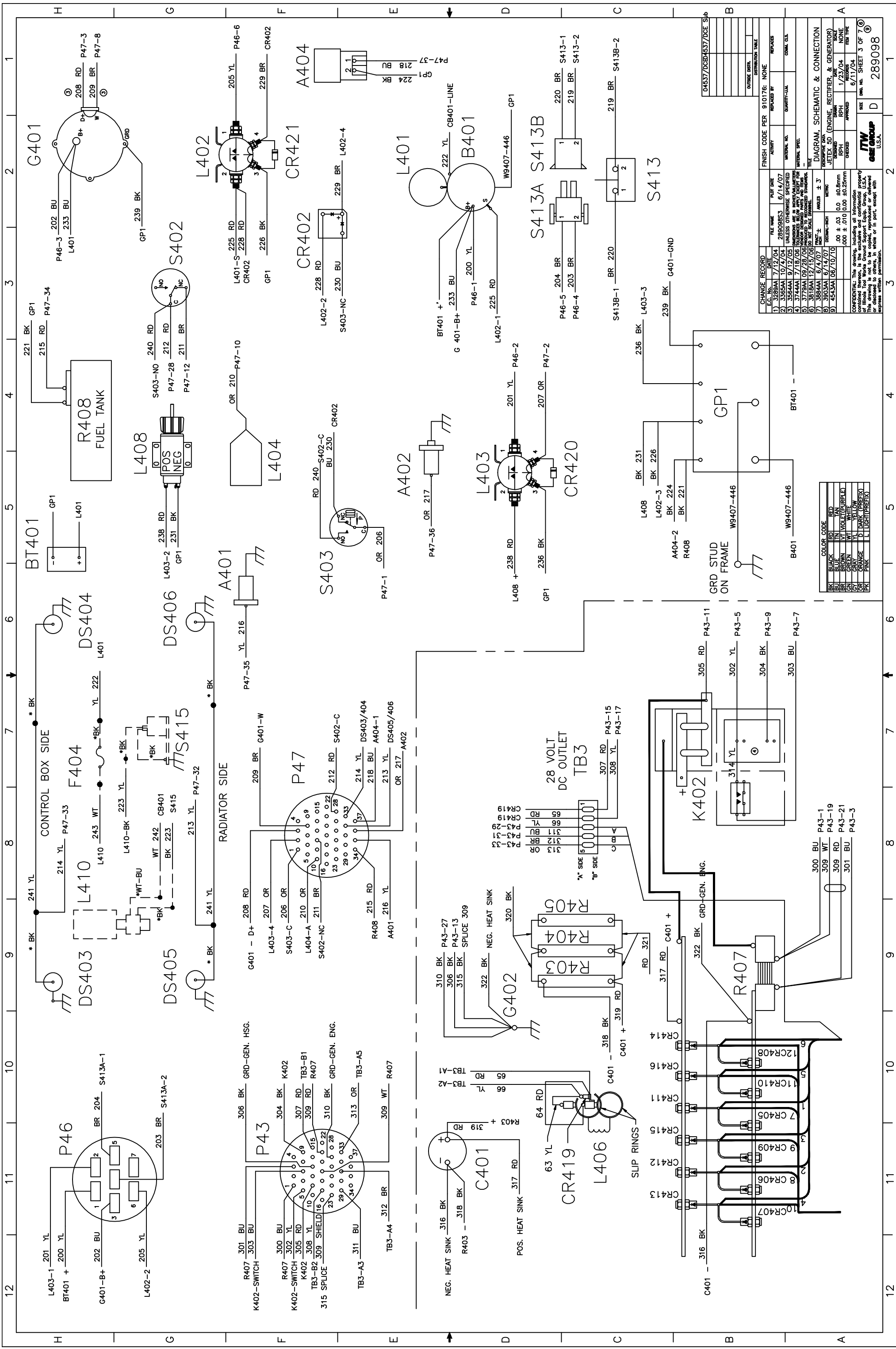
Diagram Number	Diagram Description
289098, Rev. 9	Diagram, Schematic & Connection

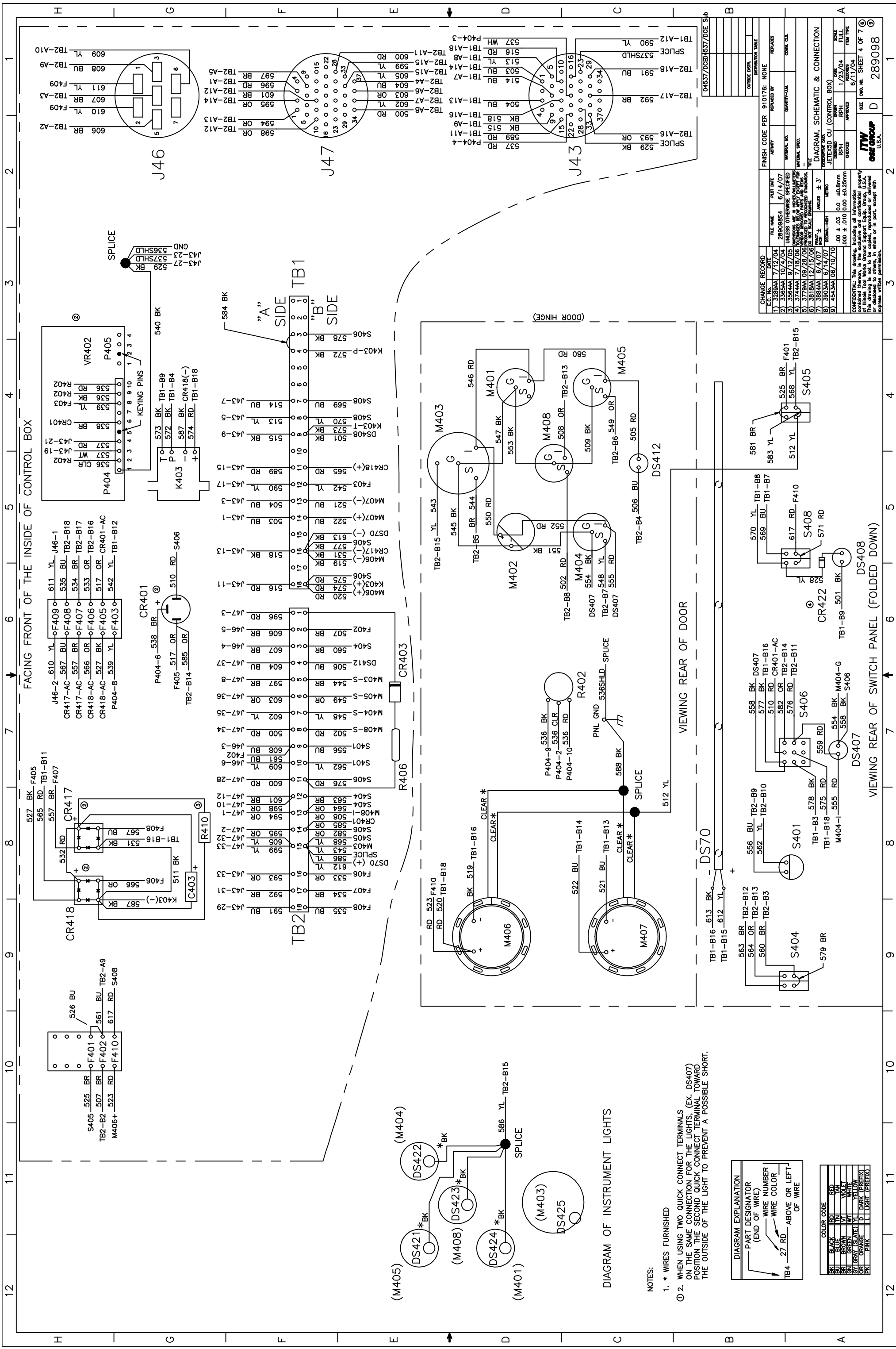
Contact Hobart Ground Power if either copy of these drawings or manuals are not with this manual (unless otherwise noted above). Refer to Appendix A for specific information on the JetEx5, 28 VDC Generator Set, optional equipment.

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Appendix A Options / Features

Option/Features Available			
Description	Part Number	Document Number	In This Section
Kit, Block Heater, 120V	288139-1	TO-271	
Kit, Block Heater, 240V	288139-2	TO-271	
Kit, Fixed Mounting	489689		
Support, Fork Lift Assembly	288257		
Kit, Tie-Down	284706		
Kit, CE Certification, Trailer	287589-3		
Kit, CE Certification, Fixed	287589-4		
T-Handle Latch (as required)	287542-2		
Kit, Clearance Lights	288234	TO-291	
Kit, Fuel/Water Separator	288372	TO-292	
Package, 120 VAC Generator (Factory Inst.)	181735	TO-288	
Package, 120 VAC Generator (Field Inst.)	181735-1	TO-288	
Reel, Grounding	83A1103		
Kit, Start, Ether	489782A	TO-211	
Kit, 14 V Output, w/ Fenders	288296-1	TO-275	
Kit, 14 V Output, w/ Cable Hangers	288296-1	TO-275	
Crate, Shipping, Export	489848		
Kit, Unit Operating Light	288482	288482	

The following is a list of options/features available for the JetEx5, 28.5 VDC Generator Set. This chart contains the description, part number, and document number (if applicable) of the option/feature. There is also a column to identify which option/feature document is contained in this Appendix.

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Wet-Stacking in Generator Set

1) Diesel Engines

All diesel engines operated for extended periods under light load may develop a condition commonly referred to as wet-stacking. This condition results from the accumulation of unburned fuel in the exhaust system. It is recognizable by fuel oil wetness around the exhaust manifold, pipes, and muffler. Liquid fuel, in the form of droplets, may be spewed from the exhaust outlet.

Wet-stacking is common, and may be expected in diesel engines operated under light load. Light loads do not allow the engine to reach the most efficient operating temperature for complete combustion of fuel. The unburned fuel collects in the exhaust system to create the wet condition known as wet-stacking.

To alleviate wet-stacking in lightly loaded engines, it is recommended that the machine be connected to a load bank after each 200 hours of use and operated under full rated load for one hour. This will burn away and evaporate the accumulation of fuel in the exhaust system. This clean-out procedure should be considered as a regular maintenance operation for machines operated under light loads. The time schedule of 200 hours may be changed as required to suit each user's particular needs and operating conditions.

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Unusual Service Conditions

This information is a general guideline and cannot cover all possible conditions of equipment use. The specific local environments may be dependent upon conditions beyond the manufacturer's control. The manufacturer should be consulted if any unusual conditions of use exist which may affect the physical condition or operation of the equipment.

Among such conditions are:

1) Exposure to:

- a) Combustible, explosive, abrasive or conducting dusts.
- b) Environments where the accumulation of lint or excessive dirt will interfere with normal ventilation.
- c) Chemical fumes, flammable, or explosive gases.
- d) Nuclear radiation.
- e) Steam, salt-laden air, or oil vapor.
- f) Damp or very dry locations, radiant heat, vermin infestation, or atmospheres conducive to fungus growth.
- g) Abnormal shock, vibration or mechanical loading from external sources during equipment operation.
- h) Abnormal axial or side thrust imposed on rotating equipment shafts.
- i) Low and/or high ambient temperatures.
- j) High electromagnetic fields

2) Operation at:

- a) Voltages above or below rated voltage.
- b) Speeds other than rated speed.
- c) Frequency other than rated frequency.
- d) Standstill with rotating equipment windings energized.
- e) Unbalanced voltages.
- f) Operation at loads greater than rated.

3) Operation where low acoustical noise levels are required.

4) Operation with:

- a) Improper fuel, lubricants or coolant.
- b) Parts or elements unauthorized by the manufacturer.
- c) Unauthorized modifications.

5) Operation in poorly ventilated areas.