Operation and Maintenance Manual with Illustrated Parts List for JetEx6D Generator Set

Series 500074A

OM-2241-A

Rev A August 17, 2016

Operation
And
Maintenance
Manual

Jet-Ex®6 Generator Set Series 500074A

OM – 2241-A

OM – 2241-A

Introduction

This manual contains operation and maintenance information for a diesel engine-generator manufactured by ITW GSE, Palmetto, Florida 34221.

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 personnel in the proper use and care of the equipment.

Use of the manual should not be put off until trouble or a 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, a chapter, section, and paragraph or figure number identify its location. 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. It contains a list of available options that may be purchased or have been purchased with that unit. Items on the list with check marks next to them have been added to the standard unit per the customer’s 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 are 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

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

Write:	ITW GSE Americas Service Department 11001 US Highway 41, North Palmetto, FL 34221 U.S.A.
Call Inside U.S.A./Canada:	(866)-845-0441 (Parts) (877) 874-5322 (Service)
Call From Foreign Countries:	(941) 721-1092 (Technical Support) (941) 721-1000 (Spare Parts)
FAX inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(941) 721-1091
E-Mail:	technicalsupport@itwgse.com parts@itwgse.us
Web Page:	www.itwgse.com

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. 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, damage to other equipment or property. The operator must strictly observe all safety rules and take precautionary actions. Safe practices have been developed from 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 the 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

This equipment 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 and 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 troubleshooting 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 EMERGENCY RESCUE SQUAD 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.

8) Equipment Precautionary Labels

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

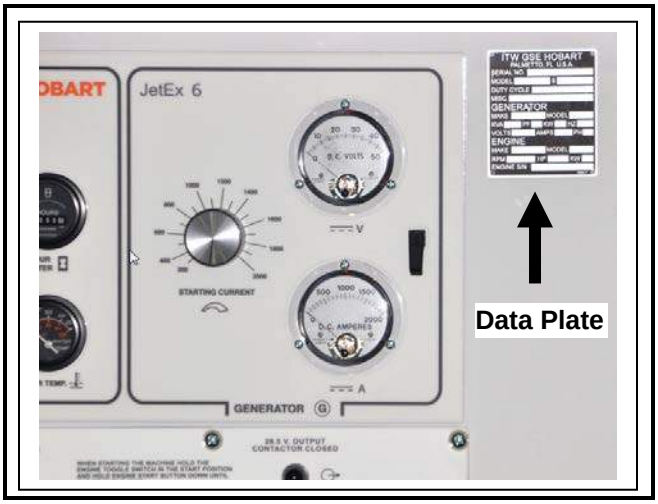
This page intentionally left blank.

Preventive Maintenance

Here are the replacement filters for Jet-Ex 6 (500074A) ground power unit (GPU). This list is provided as a quick reference chart for the maintenance technician or diesel mechanic in charge of routine preventative maintenance to the ground power unit.

Generator Set Model Number

Make sure your generator set is the model listed above. Identify the model number by looking on the data plate, which is located next to the control panel.



Filter Part Numbers

The table below lists the filter part numbers for your generator set.

Filter	**Hobart Part Number**
Oil Filter Element	286897-029
Engine Primary Fuel Filter Element	286897-036
Lubricity/Fuel Water Separator Element	286897-031
Air Filter Replacement Element	290941

The oil and fuel filters are available as a kit for maintenance every 500 hours. The kit does not include the air filter element.

Kit	**Hobart Part Number**
Preventative Maintenance Kit This kit includes: • Engine Oil Filter (286897-029) • Fuel Filter Element Elements (286897-036) • Lubricity / Fuel Water Separator Element (286897-031)	290300-013

ITW GSE - Supply Contact Information

ITW GSE has a supply staff that is able to help with the quote and sale of parts. Our helpful supply staff is also able to provide delivery information for the customer.

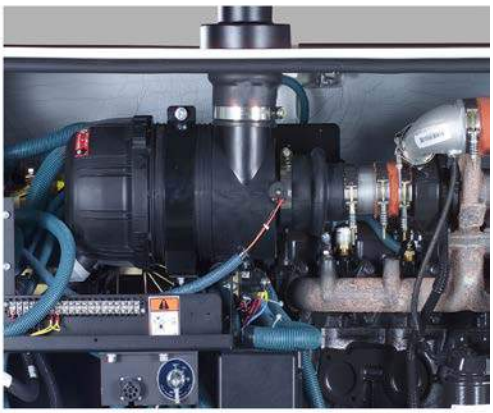
Contact the ITW GSE supply department staff for all the preventative maintenance parts:

e-mail: technicalsupport@itwgse.us

call (inside USA) (877) 874-5322
call (other countries) (941) 721-1092

For more information about maintenance procedures, refer to Chapter 2 of the manual.

Filter Pictures

<table>
<tr>
<td> 
Air Cleaner</td>
<td> 
Oil Filter</td>
</tr>
<tr>
<td> 
Fuel Filter</td>
<td> 

Lubricity Fuel/Water Separator</td>
</tr>
</table>

Table of Contents

Chapter 1 Description/Operation Chapter-Section/Page#

Chapter 2 Servicing / Troubleshooting Chapter-Section/Page#

Chapter 4 Illustrated Parts List Chapter-Section/Page#

Chapter 1 Description/Operation

Section 1 Description

1) General

The basic generator set (GPU) covered in this manual is manufactured by ITW GSE in Palmetto, Florida. The generator set is designed to produce and deliver 28.5 V DC, 600 A, power to a parked aircraft or other load. This 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 500074A identifies the “model or series” of the generator set. Figure 1 uses the part number to identify the variations possible covered in this manual.

Part Number	Fuel Tank	Exhaust	Mounting	AC Outputs	28.5V DC Output
DCE600CU2000T3-A	Composite	Horizontal	Trailer	None	Yes
DCE600CU2000ST3-A	Composite	Vertical	Fixed	None	Yes

Figure 1 500074A Series Generator Set Part Number Descriptions

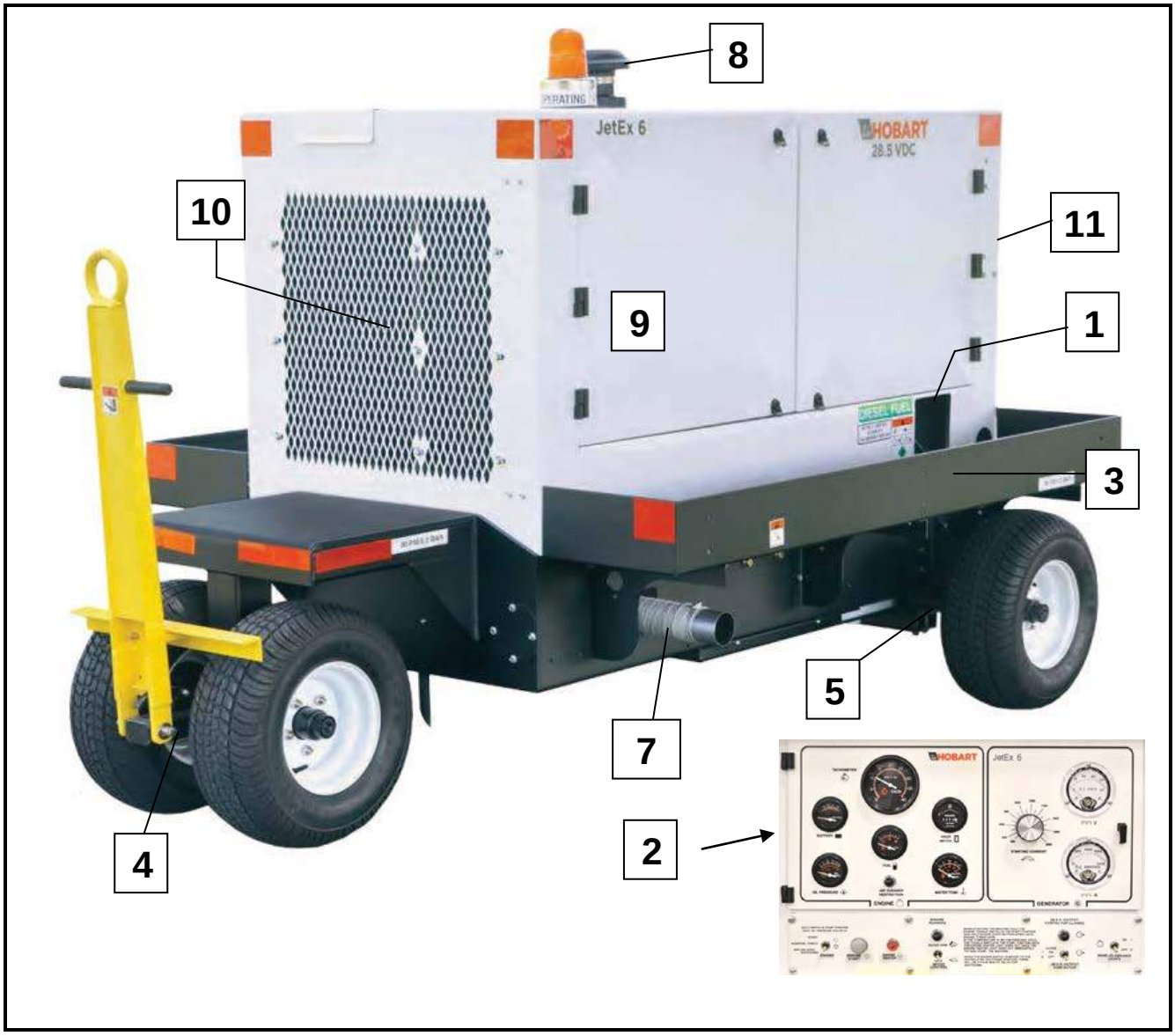
The CE certified units have an additional fuse in the control box and a CE Kit option listed in the Appendix. CE is "**C**onformité **E**uropéene" or "European Conformity."

2) Optional Equipment - Appendix A

Chapters 1 through 5, of this Operation and Maintenance Manual, identify only the basic version of the Jet-Ex6D generator set. Appendix A contains a list of optional equipment to customize the unit to your requirements.

3) Orientation

For purpose of orientation, the radiator end of the Jet-Ex 6D 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.



1. Fuel Filler Neck
2. Operator's Control Panel
3. Output Cable Trays
4. 5th Wheel Assembly
5. Rear Axle Assembly
6. Emergency Stop (not shown,)
7. Exhaust Stack Outlet
8. Engine Air Intake
9. Lift Off Access Doors
10. CAC/Radiator End
11. Generator End
12. Cable Rollers (optional)
13. Forklift Pockets (optional)

Figure 2 General Assembly of Generator Set

4) Special Features

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

a) Current Limit

The “Soft-Start” current limiting feature provides controls to limit the inrush current to the aircraft’s engine starter. When the operator presets to the desired value, 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 aircraft engine manufacturers to protect the engine’s starter. The current limiting control is continuously adjustable from 300 amperes, recommended for helicopter and small turbine starting, to 2000 amperes required for starting larger engines.

b) Engine Electronic Control Module (ECM)

The engine is equipped with an electronic control module (ECM) that monitors, records, and controls engine performance. The ECM is specially calibrated in the factory to ensure the generator set performance meets industry standards.

c) Battery System Disconnect Switch

The generator set is equipped with a battery disconnect switch inside the unit on the LEFT side. The disconnect switch can be placed in the off position during long periods of shutdown.

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) provides 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.

6) Specifications and Capabilities

a) Physical Size

Quantity	Basic Unit (Fixed Mount)	With Trailer (w/ tow bar up)
Length	74 in. (1880 mm)	101 in. (2570 mm)
Width	37 in. (940 mm) (no cable trays)	67 in. (1702 mm)
Height	60 in. (1524 mm)	67 in. (1702 mm)
Weight	3700 lb. (1678 kg.)	4000 lb. (1814 kg.)

b) 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	1800 +/-50 RPM

c) Engine

Manufacturer	Cummins Engine Company
Model No.	QSB4.5
Type	In-Line 4 cylinder, 4 cycle diesel, electronic controlled
Bore and Stroke	4.21 in. x 4.88 in. (107 mm x 124 mm)
Displacement	275 in^3 (4.5 L)
Horsepower	110 hp (82 kW)
Idle speed	1000 ± 50 rpm
Maximum over-speed capability	3700 ± 50 rpm
Normal governed speed	1800 rpm
Firing Order	1-3-4-2
Electrical system	12 VDC
Ground	Negative
Lubricating oil capacity (w/ filter)	11.6 quarts (11 liters)
Coolant capacity system	20 quarts (18.9 liters)

d) Cable

Output Cable	600 AMP Continuous, 2000 AMP starting

e) Protective Devices

Generator	28.5 volt over voltage module trips at 32 to 34 volts.
Engine	Water Temperature Switch opens engine circuit at 210º F (98.8º C). Low Oil Pressure Switch opens at 20 PSI (138 kPa).

6) Engine and Generator

The engine and generator comprise the principal components of the generator set. They are mounted on the welded steel frame and trailer. Figures 3 and 4 show the locations of all major components and sub-assemblies.

a) Basic Engine

The engine used in the Jet-Ex6D is a Cummins Model QSB4.5, four-cylinder, four-stroke diesel engine. See the previous page for specifications and capabilities.

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 Manufacture's Operation and Maintenance Manual.

(1) Alternator (G401)

The alternator is rated at 100 amperes. Its 12 VDC output charges the batteries and powers the internal electrical system.

(2) Fuel Filters

The fuel filters are remote-mounted, spin-on, disposable types. One of the fuel filters is the lubricity additive fuel filter, which also serves as the fuel/water separator. The other filter is the primary engine fuel filter.

(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.

(5) Pre-programmed Electronic Control Module (ECM)

The ECM is a pre-programmed engine control module, mounted directly to the engine block.

(6) Engine low coolant sensor

The engine is equipped with a low coolant sensor that is located in the top tank of the radiator. The sensor will send a signal to the engine's ECM to shut the engine down in case of low coolant.

c) Hobart Installed Equipment

This generator set is assembled at Hobart Ground Systems by the addition of some of the following equipment:

(1) Radiator and Charge-Air-Cooler

The radiator and charge-air-cooler are combined into one complete module assembly in a side to side fashion.

(2) 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.

(3) Shut Down/Reset devices

In addition to the other devices provided by the engine manufacturer, the factory also added engine shutdown/reset features and protections.

a **EMERGENCY STOP and SHUTDOWN/RESET SWITCH (S28)**

The emergency shutdown switch has two purposes. One is to reset the starting circuit following a failed starting sequence. The other is to provide instant manual shut off of the generator set by disconnecting power to the ECM through the control box. The switch is located below the control box.

To operate the **EMERGENCY STOP and SHUTDOWN/RESET SWITCH**:

- Push the button in until the engine stops or until button travel stops
- After the engine stops, pull the button back out to reset it.

b Coolant high temperature shutdown system

The coolant temperature shutdown system consists of a factory supplied temperature switch, which will stop the engine if the temperature reaches 210º F (99º C).

c Oil pressure shutdown system

The oil pressure shutdown system consists of a factory supplied oil pressures switch, which will stop the engine if the oil pressure is under 20 PSI (138 kPA).

(4) Fuel Tank

The composite fuel tank holds approximately 50-gallons (189 liters) with all the necessary fittings and hoses. The large fuel tank gives the user over 10 hours of use at the 600 A rated output.

(5) Air cleaner

The diesel engine air cleaner is so constructed that air enters through a rain hood to its cylindrical body and then is filtered in the process before being passed onto the engine turbo-charger assembly. An air cleaner service indicator device is mounted on the air cleaner assembly to monitor the airflow of the air cleaner. As the air cleaner becomes filled with dust, dirt, and carbon, the intake system airflow becomes increasingly restricted. This restriction causes a diaphragm inside the indicator to move toward an electrical contact. When the maximum allowable restriction level is reached, the circuit closes and the air cleaner indicator fault appears on the control panel to warn the operator that the air cleaner must be changed soon. The electrical indicator automatically resets when the restriction level drops sufficiently.

(6) Exhaust Muffler

The exhaust system is designed to safely route the engine exhaust out of the generator set and reduce the engine exhaust noise level. The exhaust exit can be configured to either exit vertically (standard) above the radiator or horizontally under the cable tray (optional).

(7) Master [Battery] Disconnect Switch (S417)

The master disconnect switch is designed to isolate the batteries from the entire electrical system to eliminate the possibility of battery voltage draw by the engine ECM or any other components between long periods of no operation. The switch can also be used to prevent starting of the equipment for maintenance conditions.

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 supplies a 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's main bearings. A generator fan is mounted on the coupling hub and draws cooling air over the generator windings.

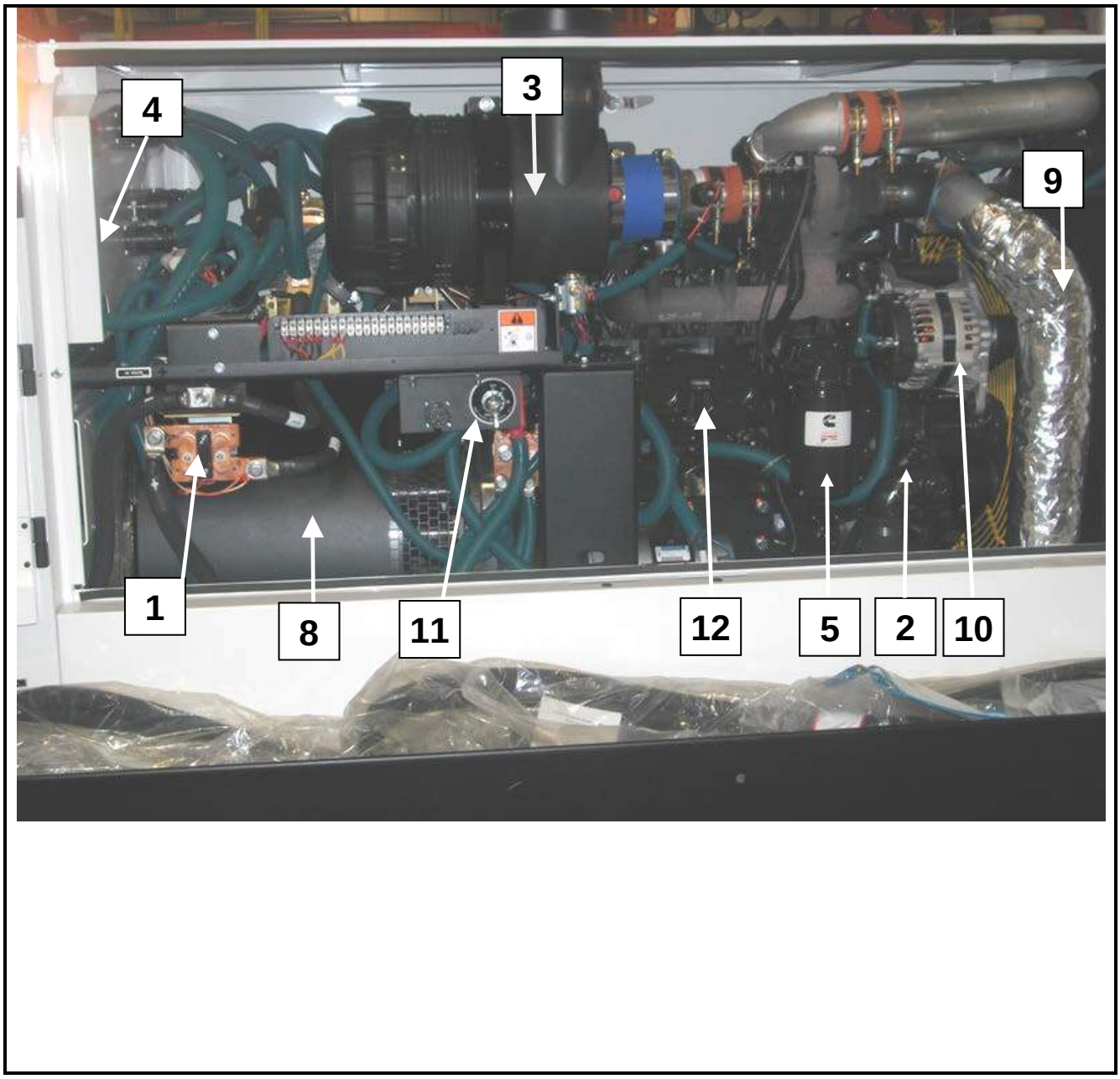
Air flows over the rectifier assembly and then enters through the anti-drive end of the generator and is discharged through openings in the flywheel housing at the drive end. The generator housing assembly, which contains the generator stator, is bolted to the engine flywheel housing.

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 V DC.

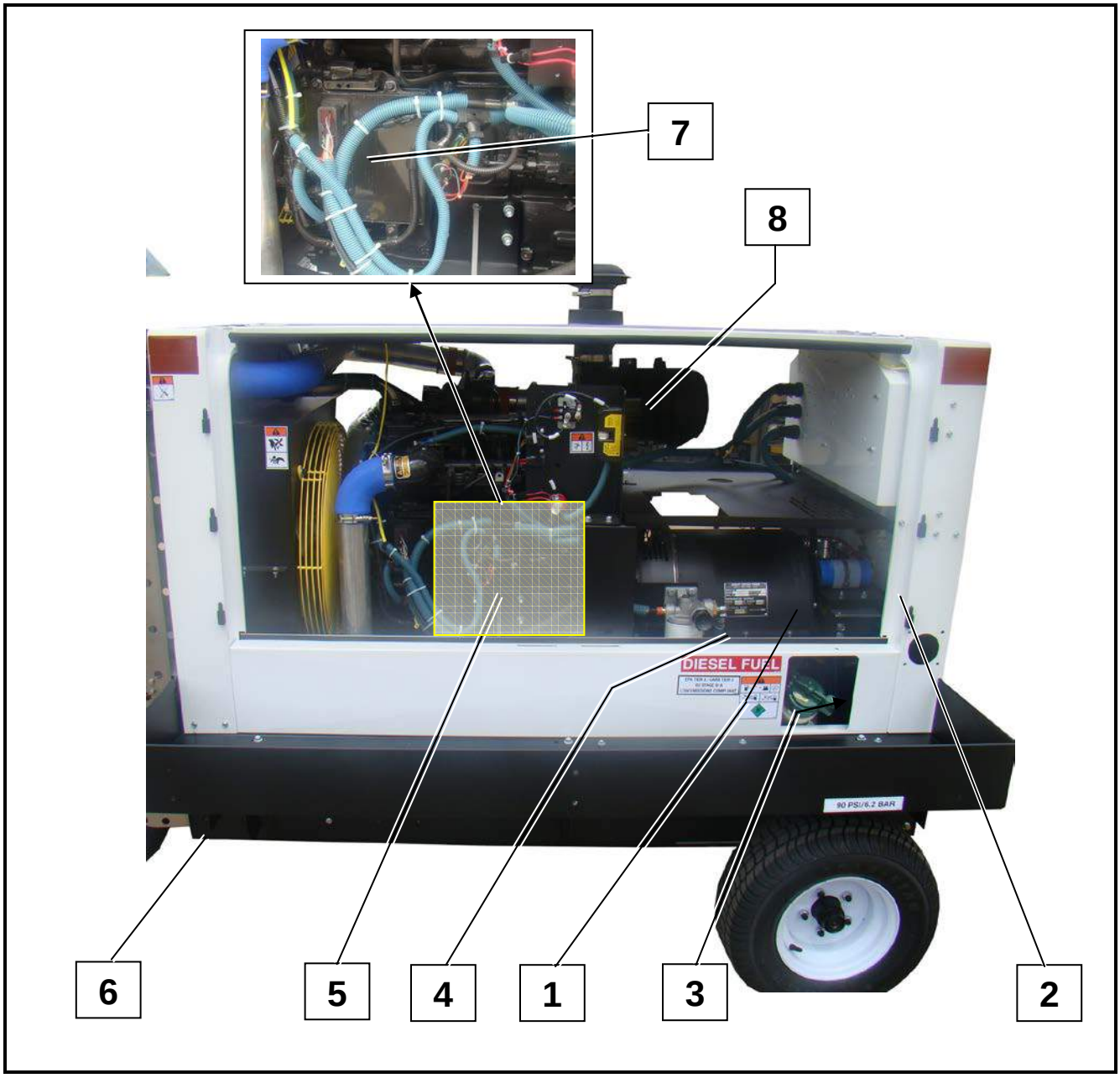
f) Ammeter Shunt (R407)

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.



1. 28.5 VDC Contactor (optional)
2. Cummins QSB4.5 Engine
3. Air Filter Assembly
4. Operator's Control Panel (back side)
5. Engine Fuel Filter
6. Engine Oil Filter (not shown)
7. 12 VDC Batteries (not shown)
8. Generator
9. Turbo Exhaust Pipe / Exhaust Outlet
10. Engine Alternator
11. Battery Disconnect Switch
12. Engine ECM Connector

Figure 3: Main Components of Generator Set (Right Side)



1. Generator (G402)
2. Rectifier Assembly
3. Fuel Tank Fuel Tank w/ Protectoseal Cap
4. Lubricity Fuel Filter with Hand Pump
5. Cummins QSB4.5 Engine
6. Exhaust System
7. Engine ECM (ECM1)
8. Engine Electrical Panel

Figure 4 Interior Components (Left Side)

g) Contactor (K402)

The load contactor, which is mounted on the right side of the generator set, 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, PCB's, etc. The box is mounted in the rear of the generator set.

a) Tachometer (M403)

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

b) Hour Meter (M402)

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

c) Generator Voltmeter (M406)

The voltmeter indicates generator output voltage.

d) Generator Ammeter (M407)

The ammeter displays generator current output.

e) Panel/Clearance Lights Toggle Switch (S405)

The panel/clearance lights toggle switch turns the panel lights and clearance lamps (if supplied) on and off.

f) Contactor Control Toggle Switch (S408)

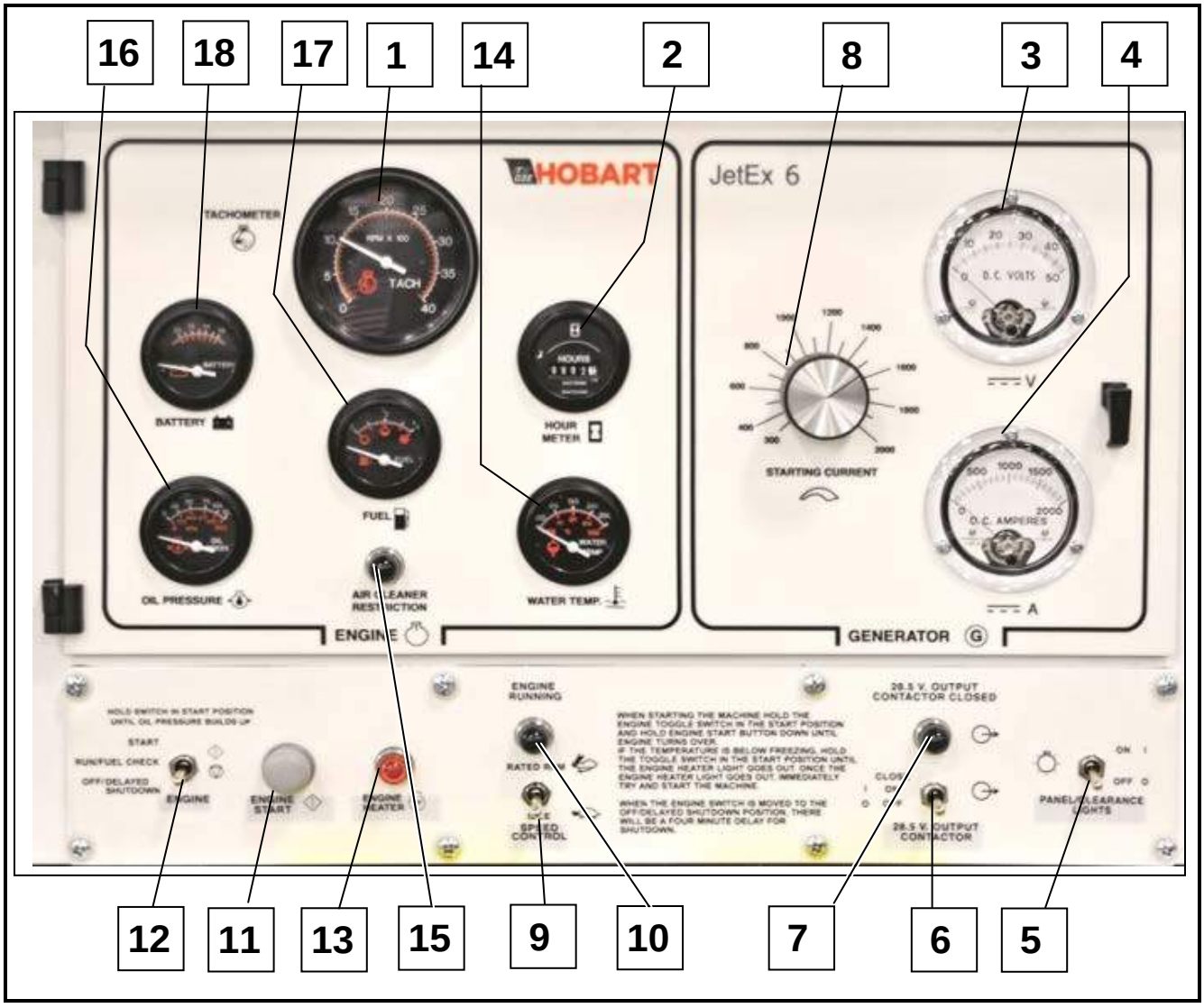
The contactor control toggle switch is a three-position toggle switch used to close and open the output load contactor. The top "**CLOSE**" position is spring-loaded and is held momentarily until the contactor closed lamp glows, then released to the center "**ON**" position. In this position the switch 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.

g) Contactor Closed Lamp (DS408)

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

h) 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.



1. Tachometer (M403)
2. Hour Meter (M402)
3. Voltmeter [Generator] (M406)
4. Ammeter [Generator] (M407)
5. Panel Lights Toggle Switch (S405)
6. Contactor Control Toggle Switch (S408)
7. Contactor Closed Lamp (DS408)
8. Current Limiting Control Potentiometer (R402)
9. Speed Control Toggle Switch (S406)
10. Engine On Lamp (DS407)
11. Engine Start Pushbutton Switch (S401)
12. Engine Toggle Switch (S404)
13. Engine Heater Lamp (DS426)
14. Water Temperature Gauge (M404)
15. Air Filter Restriction Indicator Lamp (DS412)
16. Oil Pressure Gauge (M405)
17. Fuel Gauge (M408)
18. Voltmeter [Battery] (M401)

Figure 5 Control Box Panel Assembly

i) Speed Control Toggle Switch (S406)

The speed control toggle switch is a two-position switch. In the "**IDLE**" position, the engine speed is controlled to approximately 1000 RPM. In the "**RATED RPM**" position, the engine speed is controlled to approximately 1800 RPM.

j) Engine On Lamp (DS407)

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

k) 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 toggle switch (S404) is held in its top spring-loaded "**START**" position.

l) Engine Toggle Switch (S404)

The engine toggle switch must be held in the top "**START**" position and the engine start push button must be pressed to start the generator set. When released from its top "**START**" position, after the engine starts and the oil pressure comes up, this toggle switch will return to center "**RUN/FUEL CHECK**" position. The "**ENGINE RUNNING**" lamp will glow as long as the switch is in "**RUN/FUEL CHECK**" position. In the bottom "**OFF/SHUTDOWN**" position, this switch will trigger the delayed shutdown mode and the engine will stop in about 4 minutes and the "**ENGINE RUNNING**" lamp will go out.

In cold operating conditions, the engine heater may need to warm the engine up before starting. When the engine toggle switch is placed in the "**RUN/FUEL CHECK**" position, the engine's ECM powers up and checks the engine's manifold temperature. If the engine heater is required, the ECM turns on the grid heater in the intake manifold for about 30 seconds.

m) Engine Heater Lamp (DS426)

The engine heater lamp is on when the engine heater is running.

n) Water Temperature Gauge (M404)

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

o) Air Filter Restriction Lamp (DS412)

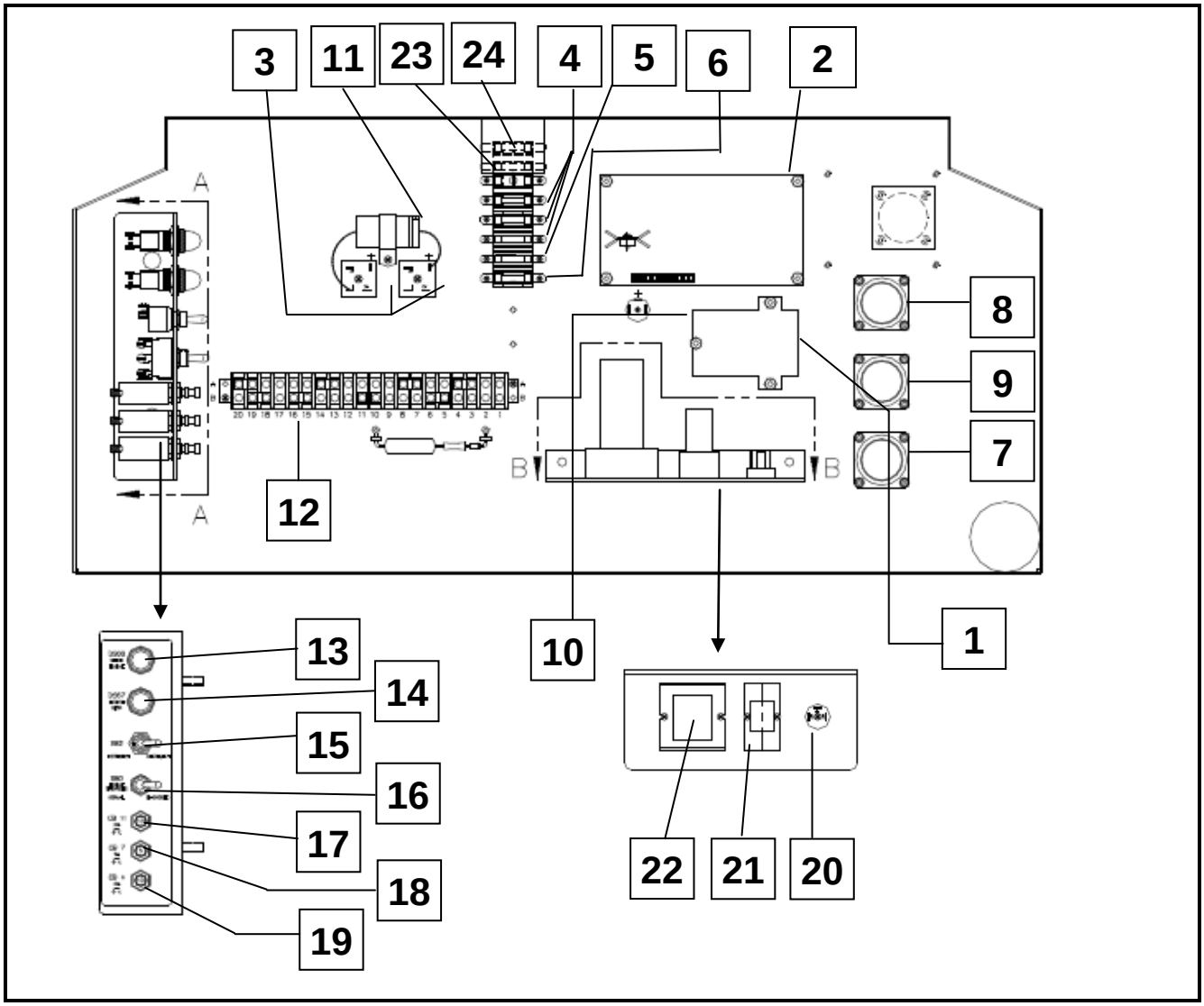
The air filter restriction red lamp glows when the air filter needs changed.

p) 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 next the engine ECM.

q) Fuel Gauge (M408)

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



1. Over Voltage Relay (K403)
2. Voltage Regulator (VR402)
3. Excitation Rectifiers (CR417 and CR418)
4. Control Windings Fuses (10 A) (F406 - F408)
5. Voltage Build-up Fuse (10 A) (F405)
6. Voltage Regulator Fuse (10 A) (F403)
7. Rectifier Harness Connector (J43)
8. Engine Harness Connectors (J46–Power)
9. Engine Harness Connectors (J47 – Engine)
10. Blocking Rectifier (CR401)
11. 100 MFD, 350 VDC Capacitor (C403)
12. Terminal Block (TB1)
13. Check Engine Indicator (DS68)
14. Check Stop Indicator (DS67)
15. Engine Fault Code Switch (S82)
16. Engine Diagnostic Switch (S80)
17. Light Circuit Breaker, 10 A (CB11)
18. Control Circuit Breaker, 5 A (CB7)
19. Engine Circuit Breaker, 10 A (CB4)
20. Shutdown Rectifier (CR426)
21. Shutdown Relay(K407)
22. Shutdown Timer Relay (K406)
23. Interlock CE Fuse (0.5 A) (F411)
24. Switch Interlock Fuse (5 A) (F413)

Figure 6 Control Box Interior Assembly

r) Battery Voltmeter (M401)

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

8) Control Box Interior Assembly

a) 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 ±.2 seconds.

b) Voltage Regulator (VR402)

The voltage regulator is a solid-state device, which regulates the 28.5 V DC generator output voltage.

c) 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's revolving field.

d) Control Windings Fuses – cartridge type – 10 amp each (F406 – F408)

e) Voltage Build-up Fuse – cartridge type – 10 amp (F405)

f) Voltage Regulator Fuse – cartridge type – 10 amp (F403)

g) Panel Lights Circuit Breaker – 10 amp (CB4)

h) Engine Circuit Breaker – 10 amp (CB11)

i) Control Circuit Breaker – 5 amp (CB7)

j) Check / Stop Engine Indicator Light (DS68 and DS67)

The indicator lights display the condition of the engine (i.e. fault code present).

k) Engine Fault Code Switch (S82)

The switch is used to scroll through the fault codes of the engine, as read from the check/stop engine indicator light.

l) Engine Diagnostic Switch (S80)

The switch is used to disable the engine starter, thus still allowing the user to turn on the control circuitry for diagnostics and troubleshooting.

m) Rectifier Harness Connector (J43)

The connector provides connections between the control box and the rectifier assembly.

n) Engine Harness Connectors (J46 & J47)

The connectors provide connections between the control box and engine components.

o) Blocking Rectifier (CR401)

This rectifier provides generator automatic voltage build-up.

p) Capacitor (C403)

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

q) Shutdown Timer Relay (K406)

r) Interlock CE Fuse (F411)

s) Switch Interlock Fuse (5 A) (F413)

When the engine switch is placed in the "**OFF/SHUTDOWN**" position, this timer relay is activated and will shut the engine down after a proper turbo cooling period of approximately 4 minutes.

9) Rectifier Assembly

a) Filter Capacitor (C401) and Preload Resistors (R403 – R405)

The DC output voltage is smoothed (filtered) by an R-C filter made up of the capacitor and preload resistors. The resistors also provide a safety discharge circuit for quickly discharging the filter capacitor whenever the power supply is turned off.

b) Shunt (R407)

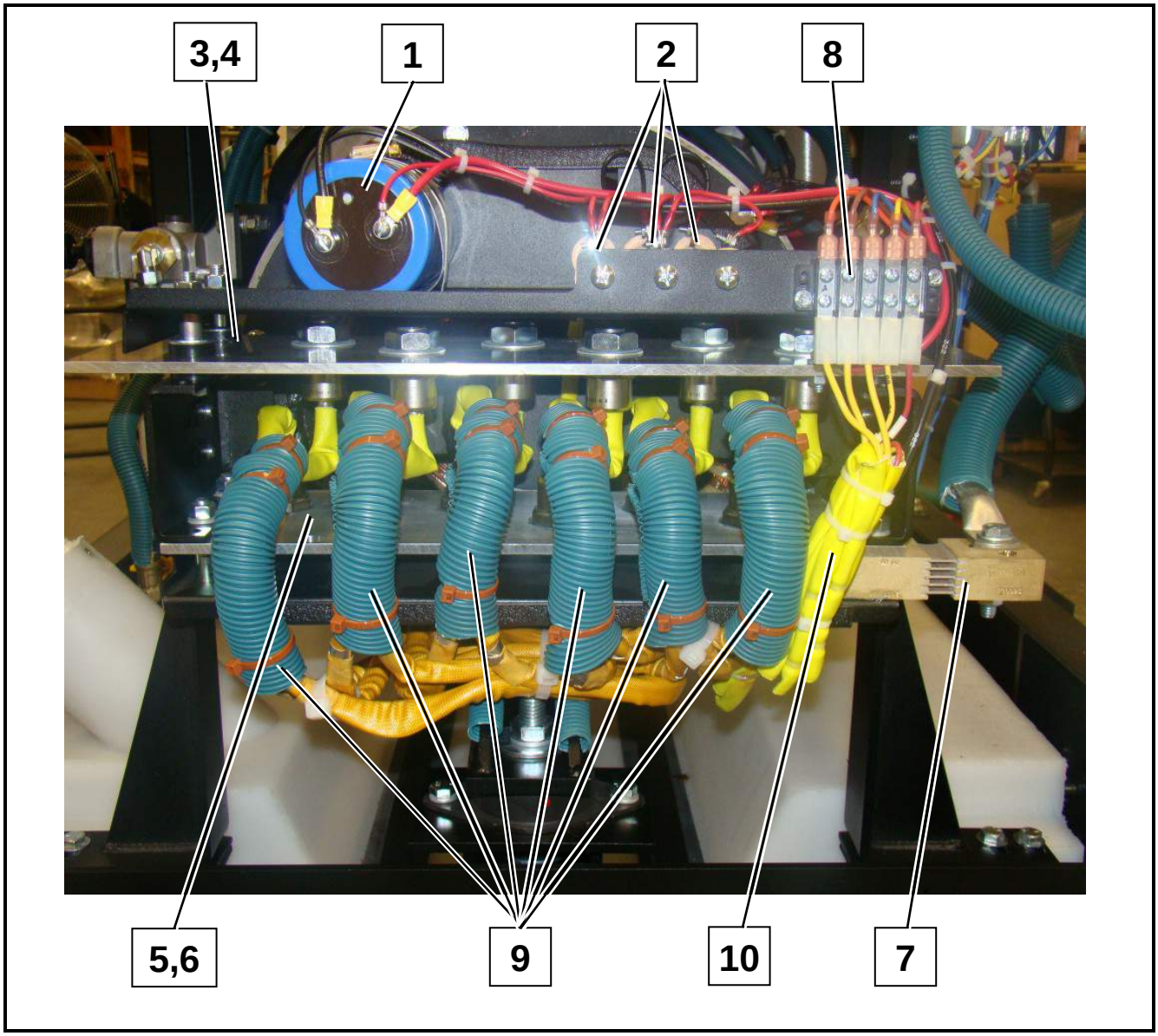
The shunt provides current feedback to the regulator for purpose of line drop comp and current limiting and also provides a signal to the output ammeter

c) Positive/Negative Heat Sinks and Diodes (CR405 – R410 and CR411 – R416)

Forms a 6-phase full wave rectifier

d) Terminal Block (TB3)

The terminal block provides a connection point for the field leads and exciter leads.



1. Filter Capacitor (C401)
2. Preload Resistors (R403 – R405)
3. Positive Heat Sink Panel
4. Positive Diodes (CR411 – R416)
5. Negative Heat Sink Panel
6. Negative Diodes (CR405 – R410)
7. Shunt (R407)
8. Terminal Block (TB3)
9. Generator Leads
10. Exciter and Field leads

Figure 7 Rectifier Assembly

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 to be sure all retaining hardware is tight and secure (i.e. engine mounting bolts)

(6) Check the following:

a Fuel

Place the engine toggle in the "**RUN/FUEL CHECK**" position to energize the fuel gauge when engine is stopped. Fuel is supplied from a customer-furnished source. Fuel tank capacity is approximately 50 gallons (189 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 mixture, as received from the factory, is a solution of 50% permanent antifreeze (Ethylene glycol) and 50% clean water.

ENGINE OIL AND COOLANT CAPACITIES	
Lubricating oil capacity (w/ filter)	11.6 quarts (11 liters)
Coolant capacity system	20 quarts (18.9 liters)

Figure 1

c Engine lubricating oil level

The oil check gage 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.

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.

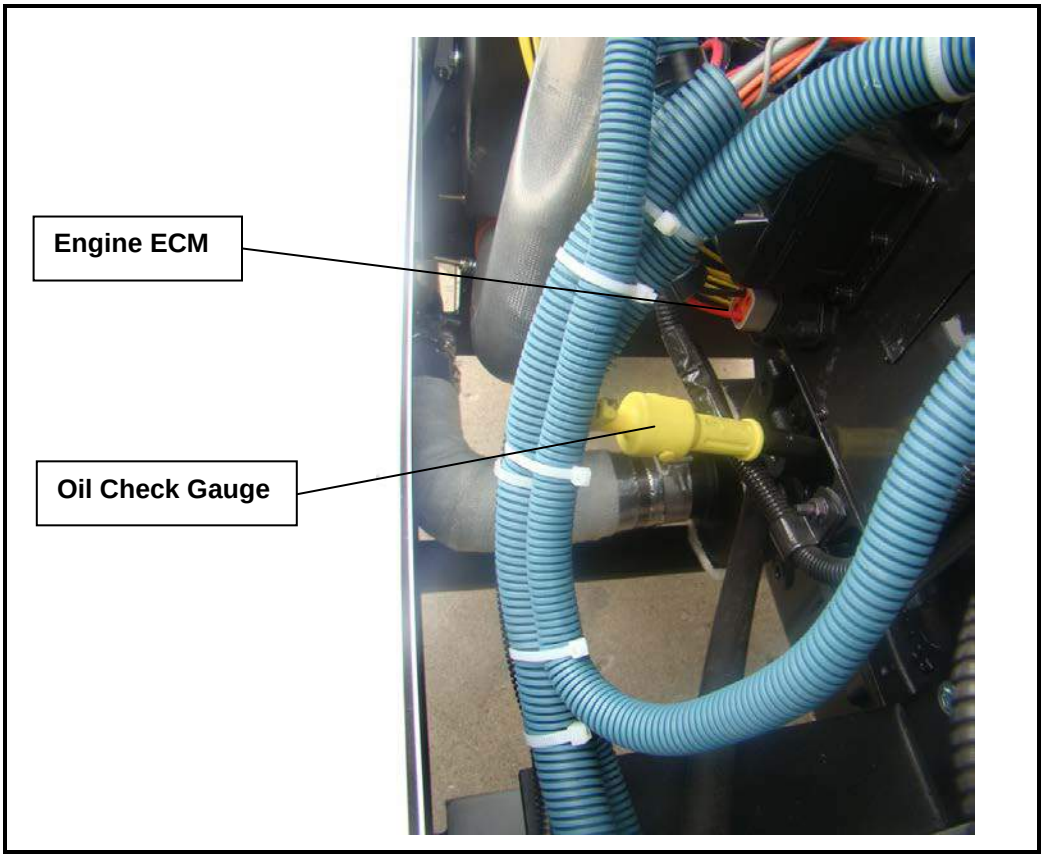


Figure 2 Oil Level Check Locations

Check Batteries

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

c) Output Cable Requirements and Installation

Jet-Ex 6D units are normally supplied with a 30 foot generator-to-aircraft output cable. This output cable consists of two single conductor 4/0 cables (positive and negative).

(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 type with lug-type terminals on one end and an MS-90347 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.

(2) Cable Connection (See Figure 3)

Open and remove the right rear door and the panel below the door (if necessary). Carefully set panels aside.

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

Connect the positive cable lead to the positive output terminal on the contactor. Connect the negative cable lead to the negative output terminal located above the load contactor on the support bracket. Always place the lead (terminal lug) behind a flat washer.

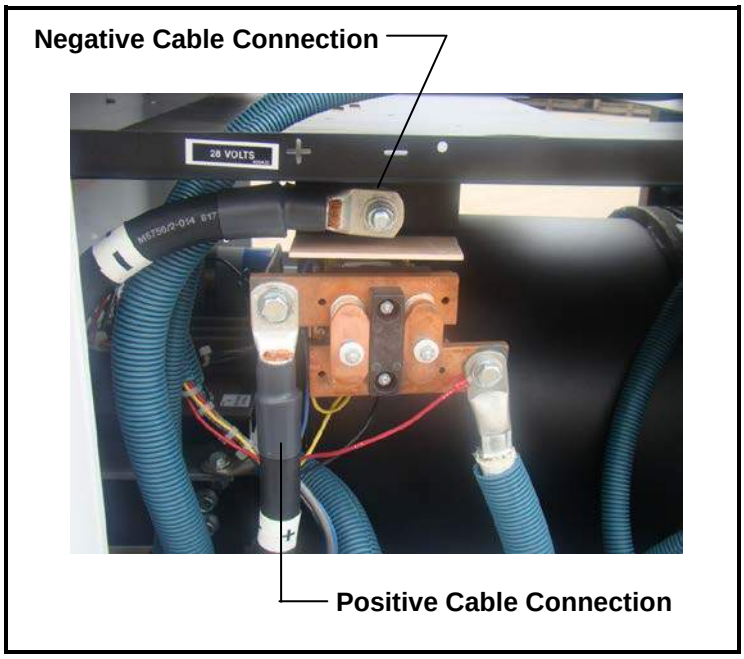


Figure 3 Output Cable Connections

Tighten the cable clamp and re-install the lower panel and the access door, if removed.

Store cables in cable tray or on hangers on side of canopy if cable trays 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 preparations, 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 176ºF (80ºC) or the thermostat opens.

(3) While the engine is running, ensure that normal operating controls are in good working condition before shutdown and storage.

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.

This page intentionally left blank.

Chapter 1
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 the sequence of procedures to be followed in supplying power to aircraft.

NOTE: Read all of the operating instructions below before attempting to operate the equipment. A simple step-by-step operating procedure can also be found on the control panel.

WARNING

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

2) Operating Procedure

a) Pre-start Inspection

(1) Check the supply of fuel, crankcase oil and radiator coolant.

(2) Be sure the fuel shutoff valve (located at the fuel tank outlet) is open. Checking the fuel gauge 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 as they could cause serious damage to the engine, generator, or personal injury to anyone standing nearby.

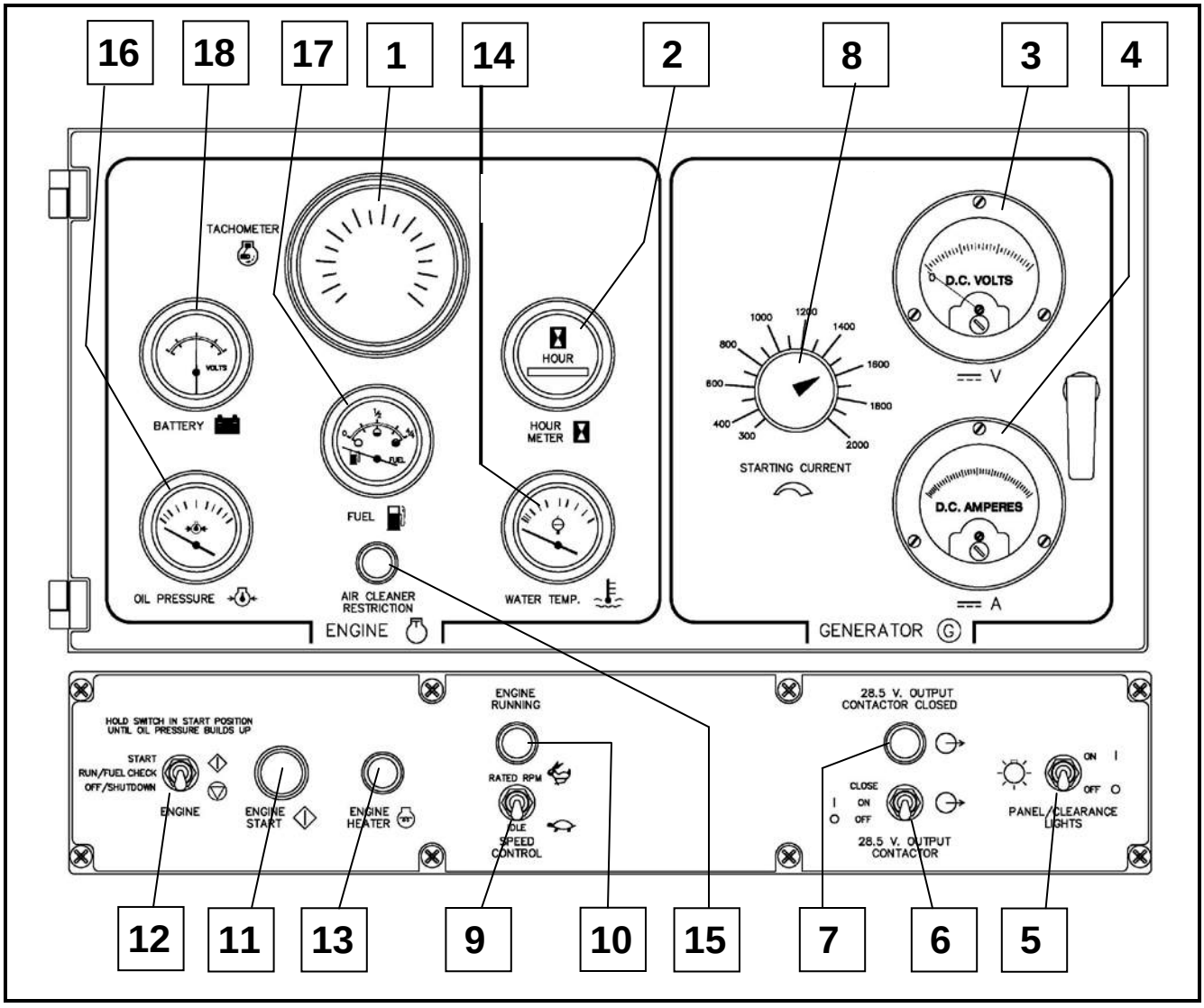
(5) Inspect the unit thoroughly to be sure it is in proper working order. Check all fuel lines and wire connections to be certain they are secure. Tighten any loose screws, nuts or bolts.

(6) Be sure all air passages are not blocked (i.e. nothing in front of the radiator).

(7) 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.

(8) Check the electrical system to make sure the connections are secure and properly connected.

(9) If applicable, check the battery electrolyte level. The factory installed battery is maintenance free.



1. Tachometer (M403)
2. Hour Meter (M402)
3. Voltmeter [Generator] (M406)
4. Ammeter [Generator] (M407)
5. Panel Lights Toggle Switch (S405)
6. Contactor Control Toggle Switch (S408)
7. Contactor Closed Lamp (DS408)
8. Current Limiting Control Potentiometer (R402)
9. Speed Control Toggle Switch (S406)
10. Engine On Lamp (DS407)
11. Engine Start Push Button Switch (S401)
12. Engine Circuit Toggle Switch (S404)
13. Engine Heater (DS426)
14. Water Temperature Gauge (M404)
15. Air Filter Restriction Indicator Lamp (DS412)
16. Oil Pressure Gauge (M405)
17. Fuel Gauge (M408)
18. Voltmeter [Battery] (M401)

Figure 1 **Control Box Panel Assembly**

b) 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) Place "**SPEED CONTROL**" toggle switch in the "**IDLE**" position.

(2) Switch the '**ENGINE**" toggle switch into the "**RUN/FUEL CHECK**" position. If the "**ENGINE HEATER**" light comes on, then wait until the light goes out before starting the engine.

(3) After the engine heater check, hold '**ENGINE**" toggle switch in "**START**" position.

(4) Press and hold "**ENGINE START**" push-button switch. Release as soon as engine starts and oil pressure comes up (1-2 seconds), as seen on oil pressure gauge.

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.

(5) Release '**ENGINE**" toggle switch to "**RUN/FUEL CHECK**" position when oil pressure builds up.

(6) Observe engine RPM on the tachometer, idle speed should be 1000 RPM +/- 50 RPM.

(7) Check air cleaner service indicator lamp. If lamp is glowing, replace air filter element and/or remove other objects that obstruct air flow.

(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.

c) Generator Operation

(1) Place "**SPEED CONTROL**" toggle switch into "**RATED RPM**" position (1800 RPM) and the generator will automatically build up to produce rated voltage.

(2) Adjust current limiting control potentiometer, if necessary. Refer to aircraft documentation for proper setting.

d) Power Delivery

(3) Connect output cable to aircraft.

(4) Hold "**28.5 VDC OUTPUT CONTACTOR**" toggle switch in "**CLOSED**" position. Release to "**ON**" position as soon as green "**28.5 VDC OUTPUT CONTACTOR CLOSED**" lamp comes on.

WARNING

NEVER disconnect the output cable while power is being delivered. The output contactor must be opened prior to removal of the cable from the aircraft.

e) Shutdown/Stop Operation

(1) Normal Shutdown Condition

a When power delivery is completed, place "**28.5 VDC OUTPUT CONTACTOR**" toggle switch in the "**OFF**" position. The "**28.5 VDC OUTPUT CONTACTOR CLOSED**" lamp should go off to indicate load contactor has opened and power is no longer available at the aircraft.

b Place "**SPEED CONTROL**" toggle switch in "**IDLE**" position.

c Disconnect output cable from aircraft receptacle and store cable in cable trays or on cable hangers, whichever is available.

d Place '**ENGINE**" toggle switch in "**STOP**" position. This will engage the delayed shutdown timer. The engine will shut down in approximately 4 minutes.

CAUTION

The battery will drain if the '**ENGINE**" toggle switch is not placed in "**STOP**" position after shutdown.

(2) Emergency Shutdown Condition

To prevent personal injury or damage to the generator set an emergency stop push-button switch is provided for immediate shutdown of the engine. Once pushed in, the emergency stop button must be pulled back out to restart the engine.

f) Adverse Weather Precautions

(3) Cold weather operation

Operation of this generator set 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 Manufacture's Operation and Maintenance Manual and recommendations below.

a Fuel system

Keep system clean and free from water that 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 Cooling system

Prior to cold weather, drain and flush the cooling system to remove accumulations of rust and sediment. Add antifreeze solution and 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.

c Lubrication

Drain the crankcase (preferably when warm after running) and fill with a lighter grade of oil. See engine oil recommendation chart in the Engine Manufacture'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 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.

d 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.

e Battery

Battery efficiency decreases sharply with lower temperatures. Make sure the battery is fully 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 and Cleaning

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 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 the terminals and connections with petroleum jelly (or equivalent) to prevent corrosion.

Chapter 2 Service and Troubleshooting

Section 1 Maintenance Inspection/Check

1) General

To make certain the ground power unit 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 immediately 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 ground power units 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 engine manufacture'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 month 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 a 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**	**10**	**250**	**500**	**1000**	**1500**	**2000**
Calendar Interval		**Daily**	**3 Mo.**	**6 Mo.**	**1 Yr.**	**1.5 Yr.**	**2 Yr.**
Symbol	**AR**	**A**	**B**	**C**	**D**	**E**	**F**
Change Air Cleaner Cartridge	X						
Check Coolant Hose and Clamps	X						
Check Air Cleaner		X	X				
Check Crankcase Oil Level		X					
Check Crankcase Breather Tube		X					
Drain Fuel/Water Separator Element		X					
Check Coolant Level		X	X				
Check for Leaks and Correct		X					
Check Exhaust System		X					
Air Intake Piping and Hoses			X				
Check Charge-Air-Cooler and Hoses			X				
Check Radiator Core and Hoses			X				
Check Belts Conditions			X				
Check and Record Oil Pressure			X				
Check Engine Coolant				X	X		
Change Lubricity Fuel Filter Element				X			
Change Primary Fuel Filter Element				X			
Change Oil and Filter Element				X			
Check Oil Pressure and Record				X			
Engine Cylinder Carbon Build-Up				X			
Check Cooling Fan Belt Tensioner					X		
Check Fan Hub and Drive Pulley					X		
Drain and Flush Cooling System					X		
Check Vibration Damper					X		
Check Engine and Generator Mounts					X		
Steam Clean Engine						X	
Check and/or Adjust Valve Clearance							X
Check Alternator							X
Check Starter Motor							X
Clean Cooling System Cores			Spring & Fall				

Figure 1 Maintenance Schedule
(Sheet 1 of 2)

Hourly Interval	**AR**	**10**	**250**	**500**	**1000**	**1500**	**2000**
Calendar Interval		**Daily**	**3 Mo.**	**6 Mo.**	**1 Yr.**	**1.5 Yr.**	**2 Yr.**
Symbol	**AR**	**A**	**B**	**C**	**D**	**E**	**F**
Engine (continued)							
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			X				
Clean Battery Terminals	X		X				
Check Wiring and Connections				X			
Check All Engine Meters		X					
Electrical (28.5 VDC System)							
Check Interlock Operation (if supplied)			X				
Check Output Cable and Connectors		X					
Check Volt and Amp Meters		X					
Check and/or Adjust Output Voltage	X			X			
Inspect Wiring and Connectors				X			
Clean and Inspect all Components				X			

Figure 1 Maintenance Schedule
(Sheet 2 of 2)

3) Inspection/Check

a) General

Inspections, checks, and maintenance are described in general with more specific and detailed information that can be found in Chapter 2, Section 2 and 3.

Always refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information on inspection, repair and replacement procedures for the engine.

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

(1) Engine

a Change Air Cleaner Cartridge

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

b Check Coolant Hose and Clamps

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

(2) Electrical System (12 VDC)

a Check Battery Terminals

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 the posts and connectors with a light film of petroleum lubricant before reconnecting cables.

(3) Electrical (28.5 VDC System)

a Check and/or Adjust Output Voltage

Check the output voltage and be sure it is set for 28.5 VDC ± 1 V. Adjustments can be made using the multi-turn potentiometer (R46) on the voltage regulator PCB (VR402). Clockwise rotation increases the voltage level and counterclockwise rotation decreases the voltage level.

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

(1) Engine

a Check Air Cleaner

Check for excessive dirt build-up and/or air blockages. Change or clean the filter as necessary to allow the proper amount of air flow to the engine.

At each daily start-up, observe the air cleaner indicator light. If this light comes on, it indicates that the air cleaner should be cleaned, changed or it is obstructed.

b 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.

Check oil level daily with oil gauge dipstick.

Oil level should not be checked until 3 to 5 minutes after engine shutdown. Keep oil level as near the upper bar as possible.

c Check Crankcase Breather Tube

Inspect the breather tube for sludge, debris or ice in the tube. Inspect the tube more frequently in icy conditions. Be sure the tube is routed in such a way to prevent a water/fluid trap. Blockage of the breather tube could reduce the power of the engine or cause internal damage.

d Drain Fuel/Water Separator Element

The life of the fuel pump and injectors can be extended if the operator drains water from the fuel/water separator on a daily basis.

1. Provide a container for catching drained fuel and water.
2. Open the drain valve on the fuel/water separator.
3. Drain the filter until clear fuel is visible.
4. Tighten the drain valve.
5. Safely dispose of drained fuel.
6. Purge air from fuel system if necessary.

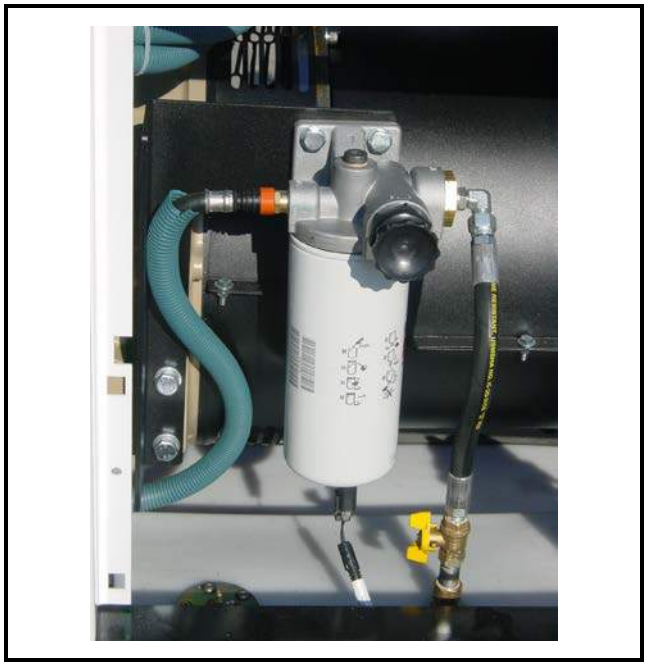


Figure 2 Fuel/Water Separator Drain

e Check Coolant Level

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

WARNING

Cooling system is pressurized. To avoid personal injury, DO NOT remove radiator cap when engine is hot. Wait until the engine is cooled down before removing the radiator cap.

f Check for Leaks and Correct

At each daily start-up, check for coolant, fuel, and oil leaks. Observe pumps, hoses, fittings, gasket connections, etc., for signs of leakage. Correct as required.

g Check Exhaust System

Visually inspect muffler and exhaust pipes for rust, leaks and signs of approaching failure.

WARNING

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

(2) Electrical System (12 VDC)

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. Reference tables listed in this section for all lamps and circuit breakers information.

b Check Alternator Charging Rate

Observe the 12 VDC voltmeter each time the engine is started to be sure the battery is charging.

c Check All Engine Meters

Check the operation of all the engine meters.

(3) Electrical (28.5 VDC System)

a Check Output Cables and Connector

Check the output cable plug connection for damaged insulation and contacts each time the connector is detached from the aircraft. If the cable head sockets are exposed, even just a little, the cable head or cable should be changed immediately.

b Check Volt and Amp Meters

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

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

(1) Engine

a Check Air Intake Piping and Hoses

Visually inspect piping and hoses for wear points and damage. Inspect clamps for proper tightening to prevent air from leaking. Check for corrosion under the clamps and hoses to prevent corrosive products and dirt from entering the air intake system.

b Check Charge-Air-Cooler and Hoses

Inspect the charge-air-cooler for dirt and debris blocking the fins. Clean as necessary. Check for cracks, holes, or other damage.

Inspect the pipes and hoses for leaks, holes, cracks, or loose connections. Tighten the hose clamps if necessary.

c Check Radiator Core and Hoses

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

Inspect the pipes and hoses for leaks, holes, cracks, collapsing or loose connections. Tighten the hose clamps if necessary.

d Check Belts Conditions

Inspect the belt for cracks and proper tension. Refer to the engine operation and maintenance manual for details on belt repair and tightening.

e Check Air Cleaner

Check for excessive dirt build-up and/or air blockages. Change or clean the filter as necessary to allow the proper amount of air flow to the engine.

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 or it is obstructed.

f Check Coolant Level

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

WARNING

Cooling system is pressurized. To avoid personal injury, DO NOT remove radiator cap when engine is hot. Wait until the engine is cooled down before removing the radiator cap.

g Check and record oil pressure

After each oil change, check and record oil pressure at idle speed after the engine has reached operating temperature. Record the oil pressure under identical conditions after each oil change. A comparison of pressure at idle speed with previous readings will give an indication of progressive wear of oil pump, bearings and shafts. Investigate any abnormal change in pressure readings.

(2) Electrical (12 VDC system)

NOTE: The battery furnished with this generator set is MAINTENANCE FREE.

Check Battery Terminals

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 the posts and connectors with a light film of petroleum lubricant before reconnecting cables.

(3) Electrical (28.5 VDC System)

Check Optional Interlock Operation (if supplied)

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

(1) Engine

a Check Engine Coolant

Check the coolant level and fill as necessary.

Check the anti-freeze concentration. Use a 50/50 mixture of water and ethylene glycol as the preferred mixture.

b Change Lubricity Fuel Filter and Primary Fuel Filter Element

Change all fuel filter elements. The lubricity fuel filter can only be changed with a lubricity fuel filter replacement.

c Change Oil Filter Element.

The oil filter must be changed with the every oil change.

d Check and record oil pressure

After each oil change, check and record oil pressure at idle speed after the engine has reached operating temperature. Record the oil pressure under identical conditions after each oil change. A comparison of pressure at idle speed with previous readings will give an indication of progressive wear of oil pump, bearings and shafts. Investigate any abnormal change in pressure readings.

e Engine Cylinder Carbon Build-Up

To prevent the build-up of oil and sludge in the cylinders, and prevent "wet stacking" of the engine, a full operating load should be placed on the unit for 30 minutes during each preventative maintenance cycle.

(2) Electrical (12 VDC system)

a Check Wiring and Connections

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

(3) Electrical (28.5 VDC System)

a Check and/or Adjust Output Voltage

Check the output voltage and be sure it is set for 28.5 VDC ± 1 V. Adjustments can be made using the multi-turn potentiometer (R46) on the voltage regulator PCB (VR402). Clockwise rotation increases the voltage level and counterclockwise rotation decreases the voltage level.

b Inspect Wiring and Connections

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

c Clean and Inspect all Components

A periodic cleaning of all control PCB's, terminal blocks, terminal studs, relays, fuse holders, etc. will help eliminate hot spots and possible premature failure.

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

(1) Engine

a Check Cooling Fan Belt Tensioner

Check the tensioner arm, pulley and stops for cracks. Tensioner must be replaced if cracks or found.

Check for belt location on pulley. The belt should be centered or in the middle of the pulley. Incorrect belt location can cause premature belt wear, belt roll-off, or tensioner bushing wear.

b Check Fan Hub and Drive Pulley

Inspect for loose bolts or worn features. Tighten bolts and replace parts if necessary. Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

c Drain and Flush Cooling System

Periodic flushing of the coolant system is essential for efficient engine heat transfer and preventing engine cooling jacket damage. Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

d Check Vibration Damper.

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

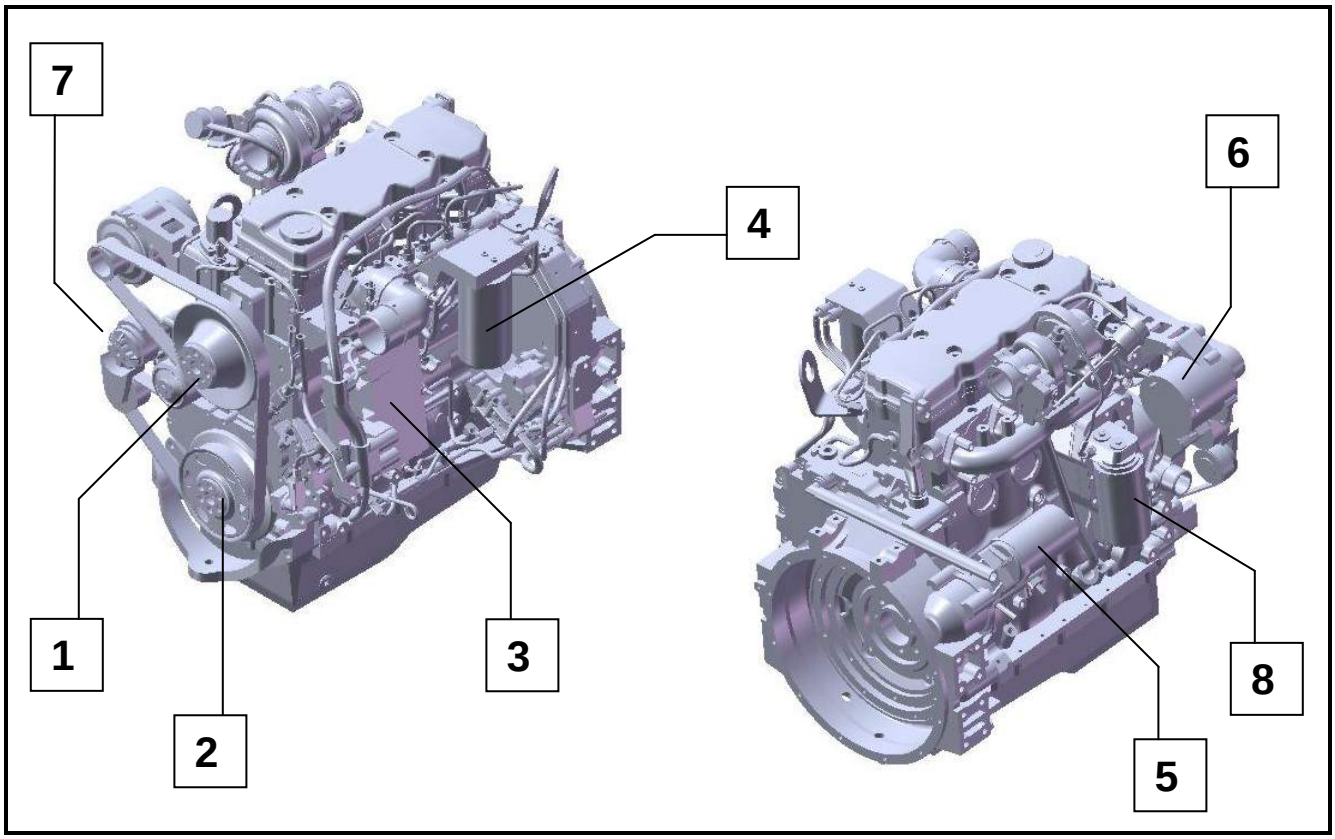
Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

e Check Engine and Generator Mounts

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

(i) Engine mount bolts must have an applied torque of 135 N-m (100 ft-lb).

(ii) Generator mount bolt must have an applied torque of 80 N-m (60 ft-lb).



1. Fan Pulley
2. Vibration Damper
3. ECM (Electronic Control Module)
4. Primary Fuel Filter (Remote Mounted)
5. 12 VDC Starter
6. 12 VDC Alternator
7. Belt Tensioner
8. Oil Filter

Figure 3 Engine Accessories

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. Also, a clean engine will run cooler and develop fewer hot-spots. Steam cleaning is one of the most satisfactory methods of cleaning an engine; however, there are some **CAUTIONS** to be observed:

WARNING

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

CAUTION

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

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

(1) Engine

a Check and/or Adjust Valve Clearance

Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

b Check Alternator

Check the drive belt and alternator pulley to be sure the alternator is rotating properly.

Check all wiring connections for cleanliness, tightness and defects.

Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

c Check Starter Motor

Check all wiring connections for cleanliness, tightness and defects.

Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

j) Seasonal Maintenance Checks Spring/Fall (Engine)

(1) Clean Cooling System Cores

Cleaning the radiator core and the charge-air-cooler core will keep the cooling system running efficiently and keep the engine operating temperatures within limits to meet the emissions standards (EPA/CARB/EURO).

(2) Check All Electrical Connections

Check all wiring connection. Check for damages wires and connections. Clean and remove all dirt and debris.

(3) Check Thermostats and Seals

Check thermostat operation and all engine seals. Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.

4) Lamps, Circuit breakers, and Fuses

a) Check all lamps daily

The lamp table lists all lamps with their location and identifying trade number.

b) Check circuit breakers and fuses as required.

The circuit breaker tale lists all circuit breakers with their location, size, and type.

c) Check all fuses

The fuse table lists all fuses with their location, size, and type.

Item Protected	Location	Quantity	Size
Voltage Regulator	Inside Control Box (F403)	1	10 A
Voltage Build-up	Inside Control Box (F405)	1	10 A
Control Windings	Inside Control Box (F406-F408)	3	10 A
Interlock CE	Inside Control Box (F411)	1	0.5 A
Switch Interlock	Inside Control Box (F413)	1	5 A
Engine Pre-Heater	Electronic Panel	1	125 A

Figure 4 Fuse Identification Chart

Light Identification	Illustration or Location	Lamp (Bulb) as per Lamp Industry Trade Number
Engine On Lamp	Switch Panel (DS407)	1815
Engine Pre-Heater Lamp	Switch Panel (DS426)	757
Contactor Closed Lamp	Switch Panel (DS408)	757
Air Filter Restriction Lamp	Switch Panel (DS412)	1815
Engine Check Lamp	Inside Control Box (DS68)	1815
Engine Stop Lamp	Inside Control Box (DS67)	1815

Figure 5 Lamp Identification Chart

Item Protected	Location	Quantity	Size
Engine Circuit	Inside Control Box (CB4)	1	10 A
Controls Circuit	Inside Control Box (CB7)	1	5 A
Light Circuit	Inside Control Box (CB11)	1	10 A

Figure 6 Circuit Breaker Identification Chart

Section 2 Maintenance Procedures

1) General

This section provides maintenance procedure details for the maintenance schedule items that were described in the previous section.

WARNING

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

2) Preventive Maintenance

The table below lists the filter part numbers for your generator set.

Filter	ITW GSE Part Number
Oil Filter Element	286897-029
Engine Primary Fuel Filter Element	286897-036
Lubricity/Fuel Water Separator Element	286897-031
Air Filter Replacement Element	290941

For more information, refer to the Preventive Maintenance page in the front of this manual.

3) Lubrication

a) General

Proper lubrication is one of the most important steps in a 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 following figures and tables.

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.

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

Lubrication schedules 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.

(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.

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

Oil recommended for the diesel engines in this application is API Class CCMC.

(3) Oil viscosity

A sample temperature and oil viscosity index chart is shown in Figure 2. Refer to the engine manufacturer's operation manual for the most recent updates. For operation at temperatures consistently below 5º F (-15º C) refer to the engine manufacturer's operation manual.

(4) Changing engine oil

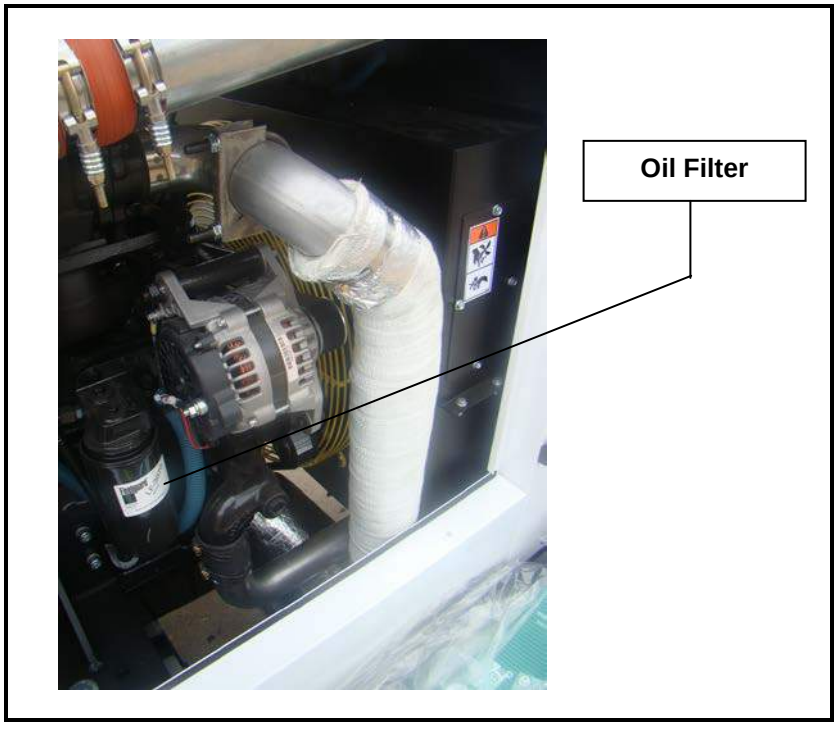


Figure 1 Oil Filter Location

Change the oil once after the first 50 to 150 hours of use and then every 500 hours 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.

Change oil as follows:

1. Provide an open container for catching the old oil below the oil drain plug. Container capacity must be greater than 20 quarts (19 liters).

2. Remove drain plug in the oil pan.

3. While oil is draining, change the oil filter element. See instructions below.

   a. Provide a container for catching spilled oil from the filter.

   b. 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.

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

   c. Fill the new filter with clean lubricating oil before installation.

   d. Apply a light coating of lubricating oil to the gasket's sealing surface and install the filter. DO NOT over tighten the filter.

4. Clean the drain plug and install when engine oil has completely drained.

5. Refill the crankcase with new clean oil that meets engine manufacturer's recommendations.

CAUTION	• Always use clean containers, funnels, etc. • Remember to close the drain plug valve and install the new oil before starting the engine.

6. Start engine and check oil pressure at once. Allow engine to idle for 5 minutes, check for leaks, than stop the engine.

7. 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.

Item	Maintenance Required
Lube Oil	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 500 hours or 6 month intervals thereafter. Use oil SAE 15W40 heavy duty oil which meets API CH-4/SJ or CI-4/SK.
Capacity	11.6 quarts (11 liters)
Oil Filter Replacement	ITW GSE Part No. - 286897-029 Cummins Part No. - LF3970
Lube Oil Viscosity Required as per Ambient Temperatures	**VISCOSITY AMBIENT** — **TEMPERATURE CONDITIONS** SAE 15W40 (Preferred) — 5ºF (-15ºC) and above for most climates CI-4 and SAE 10W30 — -10ºF to +70ºF (-23ºC to +21ºC) Winter conditions SAE 5W30 — -15ºF to +70ºF (-26ºC to +21ºC) Arctic Conditions SAE 0W30 — -30ºF and below to 32ºF (-34ºC and below to 0ºC)
Synthetic Oils	See the engine manufacturer's operations manual for usable synthetic oils and instructions.
Fuel Water Separator and Lubricity Additive Filter	Drain filters daily. Change the filter elements every 500 hours or after 3 months of use, whichever comes first.
Coolant	Check coolant level daily. Engine coolant capacity (system): 20 quarts (18.9 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.
AC 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.

Figure 2 Lubrication and Maintenance Chart

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 Pulley

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 filter element is a disposable type that may be discarded when dirty. A definite time schedule for cleaning or changing the air cleaner cannot be determined because of varying operating conditions. This air cleaner filter element can be removed and replaced by rotating the rear housing cap counter-clockwise and removing it to gain access to the elements. The filter elements can be inspected either at prescribed service intervals or at any time deemed necessary.

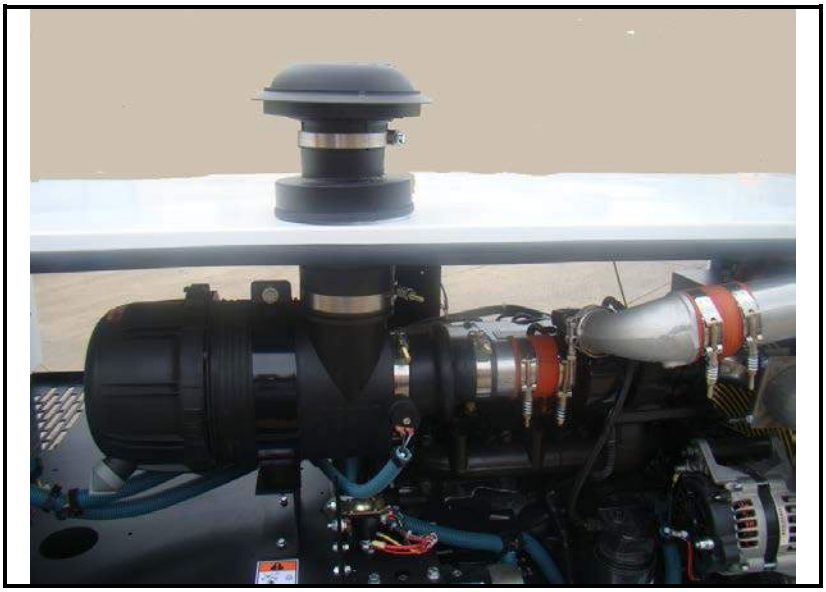


Figure 3 Air Cleaner Assembly

a) Inspecting the Air Cleaner

Make periodic checks of air cleaner filter element for obstructions. If any obstructions are present, remove them.

Check all connections for proper sealing.

b) Changing the Air Filter

1. Rotate the rear housing cap counter-clockwise and remove the cap.
2. Remove the filter element and replace.
3. Replace the rear cap housing back on the air filter housing.

c) Disposal

Dispose of the filter properly per local guidelines.

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.

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 (i.e. Jet-A or JP8) can shorten life and/or damage the engine's fuel pump. The engine manufacturer recommends only diesel fuel.

For recommended fuel specifications that meet the EPA/CARB/EURO emissions, refer to the engine manufacturers operation and maintenance manual provided with this manual. In general, fuels meeting the properties of ASTM number 2D will result in optimum engine performance.

b) Cold Weather Operation

In cold weather, diesel fuel will form wax crystals, which 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 can contain a blend of number 2D and 1D fuel providing good cloud point temperatures. These blended fuels may be used, but they may result in reduced engine power and/or fuel consumption.

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

5) Engine Fuel System

The fuel system consists of a fuel tank, fuel supply line, fuel/water separator (lubricity additive fuel filter), fuel lift pump, engine primary 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 into the fuel tank. The fuel tank must be removed and flushed out if objects are found in the fuel filters.

b) Fuel Supply Line

The fuel supply line takes fuel from the tank and delivers it to the fuel/water separator. No maintenance, repair, or replacement is required unless fuel leaks or cracks or noticed.

c) Fuel/Water Separator (Lubricity Additive Fuel Filter)

The fuel/water separator is mounted on the engine flywheel housing near the fuel fill location. Its function is to remove foreign material, extract water from the fuel before it enters the fuel lift pump and automatically add lubricity additives to the fuel. Daily draining of the filter/water separator is required.

- Draining the fuel/water separator:

  1. Open drain valve
  2. Drain accumulated water and contaminants.
  3. Close drain valve.

- Priming fuel/water separator:

  1. Loosen the vent plug.
  2. Pump until fuel purges at the vent plug.
  3. Close the vent plug and start the engine. Check for leaks,
  4. Correct or repair leaks as necessary with the engine off.

- Changing the fuel water/separator element:

  The filter element replacement part number:

  - ITW GSE Part No. 286897-031
  - Cummins Part No. FS20022

  1. Drain off some fuel by loosening the vent plug and opening the drain valve.
  2. Shut off fuel valve.
  3. Remove the element and clean the O-ring gland in the filter head.
  4. Apply a coating of clean fuel or motor oil to the new O-ring and element seal.
  5. Screw in the new fuel filter “snug”. Check that the cartridge is seated correctly against the gasket and tighten with a final half turn. DO NOT OVER TIGHTEN!
  6. Open fuel valve
  7. With the vent plug still loosened pump knob until fuel purges at the vent plug. Close the vent plug and start the engine. Check for leaks and correct as necessary with the engine off.

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 maybe necessary at times, because a loss in fuel pressure in the fuel line may indicate a faulty fuel pump.

Fuel/Water Separator

Engine Primary Fuel Filter

Engine Fuel Filter Locations
Figure 4

d) Engine Primary Fuel Filter

The primary engine filter removes the smaller particles not removed in the pre-filter stage before the fuel enters the engine's fuel pump.

- Replacement fuel filter part number:
  - ITW GSE Part No. 286897-036
  - Cummins Part No. FF5612
- Change the fuel filter after every 500 hours.
- Changing the primary fuel filter:
  1. Shut off fuel valve.
  2. Place a pan underneath the fuel filter to catch spilled fuel.
  3. Remove the fuel filter.
  4. Catch any fuel.
  5. Clean any dirt from the filter head.
  6. 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.

7. Fill new filter with diesel fuel

8. Screw in the new fuel filter “snug”. Check that the cartridge is seated correctly against the gasket and tighten with a final half turn. DO NOT OVER TIGHTEN!

9. Open fuel valve.

10. With the vent plug still loosened pump knob until fuel purges at the vent plug. Close the vent plug and start the engine. Check for leaks and correct as necessary with the engine off.

e) Fuel Lift Pump

Observe for leaks. Refer to a local engine manufacturer’s agent for maintenance or repair.

f) Fuel Return Line

The fuel return line takes unused fuel from the engine and returns the fuel to the fuel tank. No maintenance, repair, or replacement is required unless fuel leaks or cracks or noticed.

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 by clean and free of any corrosive chemicals such as chloride, sulfate, and acids. Any water, which is suitable for drinking, can be used in the engine when properly treated as described in engine manufacturer’s operation manual. The engine manufacturer’s representative 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 15 psi (103 kPa).

WARNING	When removing cap from a very hot radiator, do not turn cap past safety stop until the coolant has cooled to an acceptable temperature.

(2) Removal

To remove, turn the cap to the left (counter-clockwise) 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 manufacturer's operation manual. For information regarding coolant specifications, testing equipment, antifreeze, etc., refer to engine manufacturer's operation manual or consult the local engine manufacturer's representative.

(1) Filling Radiator

A fully formulated type antifreeze meeting the requirements specified in the engine manual should only be used in the cooling system.

CAUTION	**DO NOT** mix brands or type of antifreeze. A solution containing two or more types of antifreeze is impossible to test accurately.

(2) 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 after coolant is at a proper temperature level.
2. Place a drain pan with at least a 40 quarts (28.4 liters) capacity under radiator to catch coolant.
3. Place the radiator drain hose over the drain pans.
4. Open the radiator drain valves.
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 valves.

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 air or 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 air or 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, cavitations, and freezing can lead to engine damage. For coolant system protection details see the engine manufacturer's operations manual.

- Install coolant:

  1. Remove radiator cap. Be sure the radiator drain valve is closed.

  2. Pour coolant into radiator very slowly until it reaches the bottom of fill neck. Allow time for trapped air to escape from the system then continue filling until the coolant level remains at the bottom of the fill neck.

  3. 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.

  4. 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.

- Inspection/Check

  1. Check system for evidence of leaks.

  2. Inspect all hoses. Install new hoses as necessary. Tighten hose clamps as required.

  3. Check the condition of fan and water pump belts. Replace belts if necessary.

h) Thermostat

Check the thermostat each fall or as required. Refer to engine manufacturer's operations manual for recommended instructions.

7) Generator Maintenance

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

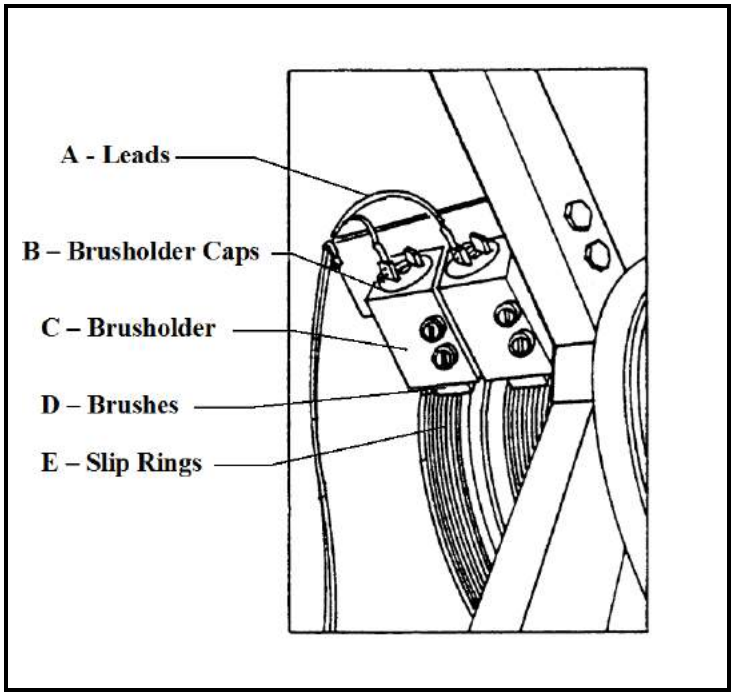


Figure 5 Generator Revolving Field Brushes

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 brush holder.

`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 pack 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 or brush holders are removed for servicing. 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 sand 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 sand paper 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 no more than 25 psi (172 kPa) air pressure.

7) 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

Check belt tension every 1000 hours or once year, 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 one belt thickness per foot of deflection.

Refer to the engine manufacturer's operation manual for checking belt tension and changing worn belts.

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

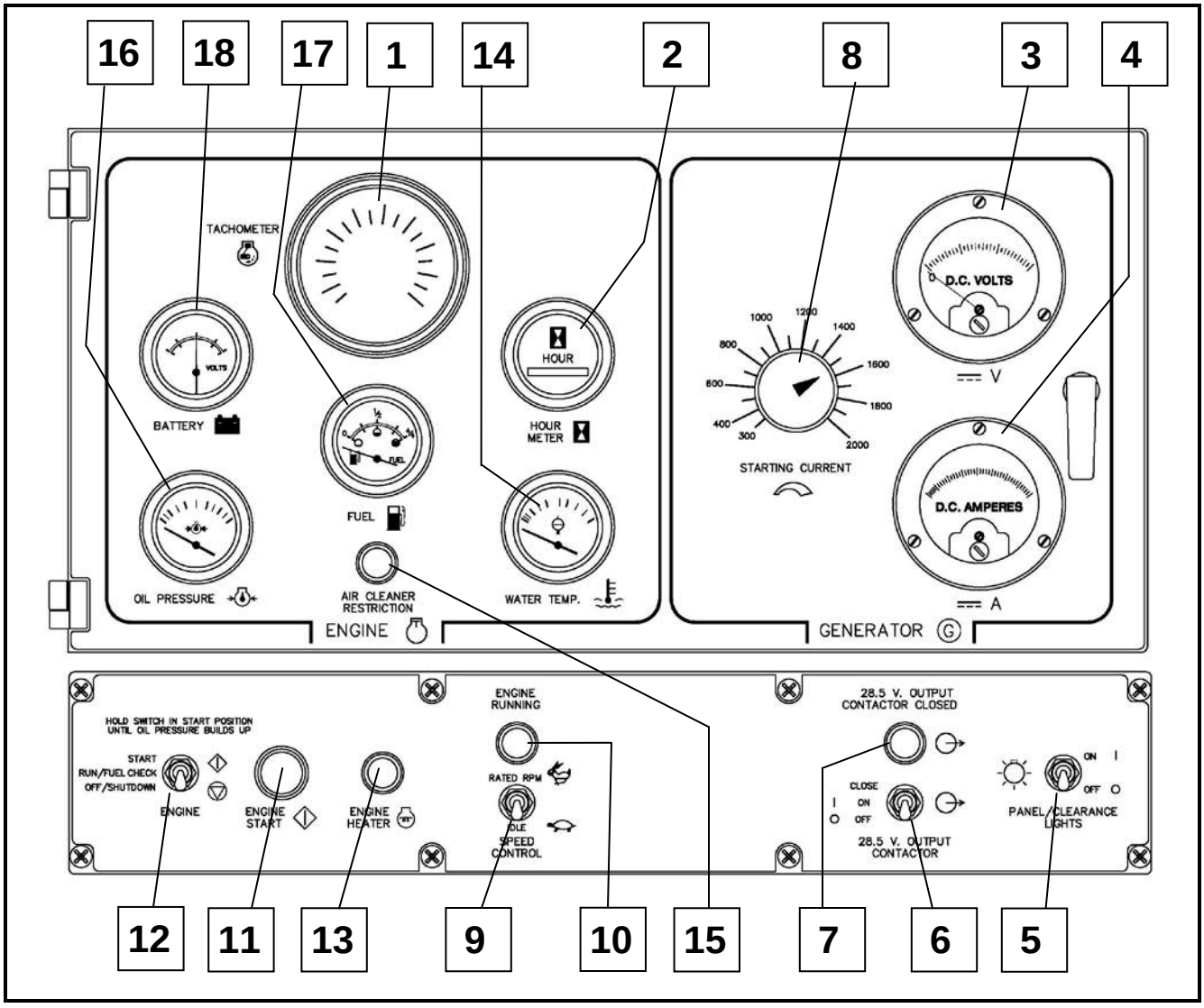
1. Check engine oil level. Oil should be at high bar on the dipstick.
2. Check radiator coolant level.
3. Check tension of drive belt.
4. Inspect for oil, fuel and coolant leaks.
5. Check control panel lights and fuse by toggling panel light switch. If panel lights operate, the fuse, switch, and lamps are good.
6. Make a general inspection of all wiring and terminals. Inspect the equipment to be certain no damage will result from starting the engine.
7. Connect the output cable 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 rating current expectations:

   - Use No. 2/0 cable for < 600 amperes of current.
   - Use No. 4/0 cable for > 600 amperes of current.

   Be sure the generator output “N” cable is grounded.

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.
4. Check oil pressure gauge. It should read 35 to 60 psi (241 to 414 kPa).
5. Check water temperature gauge. It should read 180 to 200º F (82 to 93º C) when engine thermostat is fully open.
6. Observe engine RPM on the tachometer, idle speed should be 1000 RPM ± 50 RPM.
7. Place the “**SPEED CONTROL”** toggle switch into the “**RATED RPM**” position. The engine’s operating speed should be 1800 ± 50 RPM.



1. Tachometer (M403)
2. Hour Meter (M402)
3. Voltmeter [Generator] (M406)
4. Ammeter [Generator] (M407)
5. Panel Lights Toggle Switch (S405)
6. Contactor Control Toggle Switch (S408)
7. Contactor Closed Lamp (DS408)
8. Current Limiting Control Potentiometer (R402)
9. Speed Control Toggle Switch (S406)
10. Engine On Lamp (DS407)
11. Engine Start Push Button Switch (S401)
12. Engine Circuit Toggle Switch (S404)
13. Engine Heater (DS426)
14. Water Temperature Gauge (M404)
15. Air Filter Restriction Indicator Lamp (DS412)
16. Oil Pressure Gauge (M405)
17. Fuel Gauge (M408)
18. Voltmeter [Battery] (M401)

Figure 1 Control Box Panel Assembly

8. Check for 28.5 output voltage on generator voltmeter to assure automatic voltage buildup.

9. Set "**STARTING CURRENT**" limiting control potentiometer to the maximum full clockwise position.

10. Adjust the load bank for a load of 600 amperes.

11. Place the "**28.5 VDC OUTPUT CONTACTOR**" toggle switch in the "**CLOSED**" position. The "**28.5 VDC OUTPUT CONTACTOR CLOSED**" lamp will glow as the contactor closes. Release the contactor control toggle switch to the center "**ON**" position. The tachometer will indicate an engine speed of 1800 ± 50 RPM.

12. Remove the load from the load bank and check the over-voltage protection by adjusting voltage regulator potentiometer (R66) to increase the voltage. The over-voltage relay will trip and open the load contactor between 32 to 34 V DC.

13. Re-adjust the voltage to 28.5 VDC and re-apply the 600 amperes to the load bank and close the contactor.

14. Remove the load from the load bank and check voltage regulation at no load. Voltage will be 28.5 VDC. Re-apply loads to the load bank and check voltage regulation with load bank settings of 137, 275, 413, 550, and 600 amperes and check voltage at each setting. Voltage will be 28.5 ± 1 VDC at each different load.

15. With the "**STARTING 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 ± 40 amperes.

    NOTE: Voltage will not drop below 14 VDC.

16. Set "**STARTING CURRENT**" limiting control potentiometer to 2000 and apply a 1200 amperes load. Then set the "**STARTING CURRENT**" limiting control potentiometer to1000 amperes. Current displayed on ammeter will then be 1000 ± 100 amperes.

17. Remove load. Set engine to idle and stop the engine which will engage the delayed shutdown.

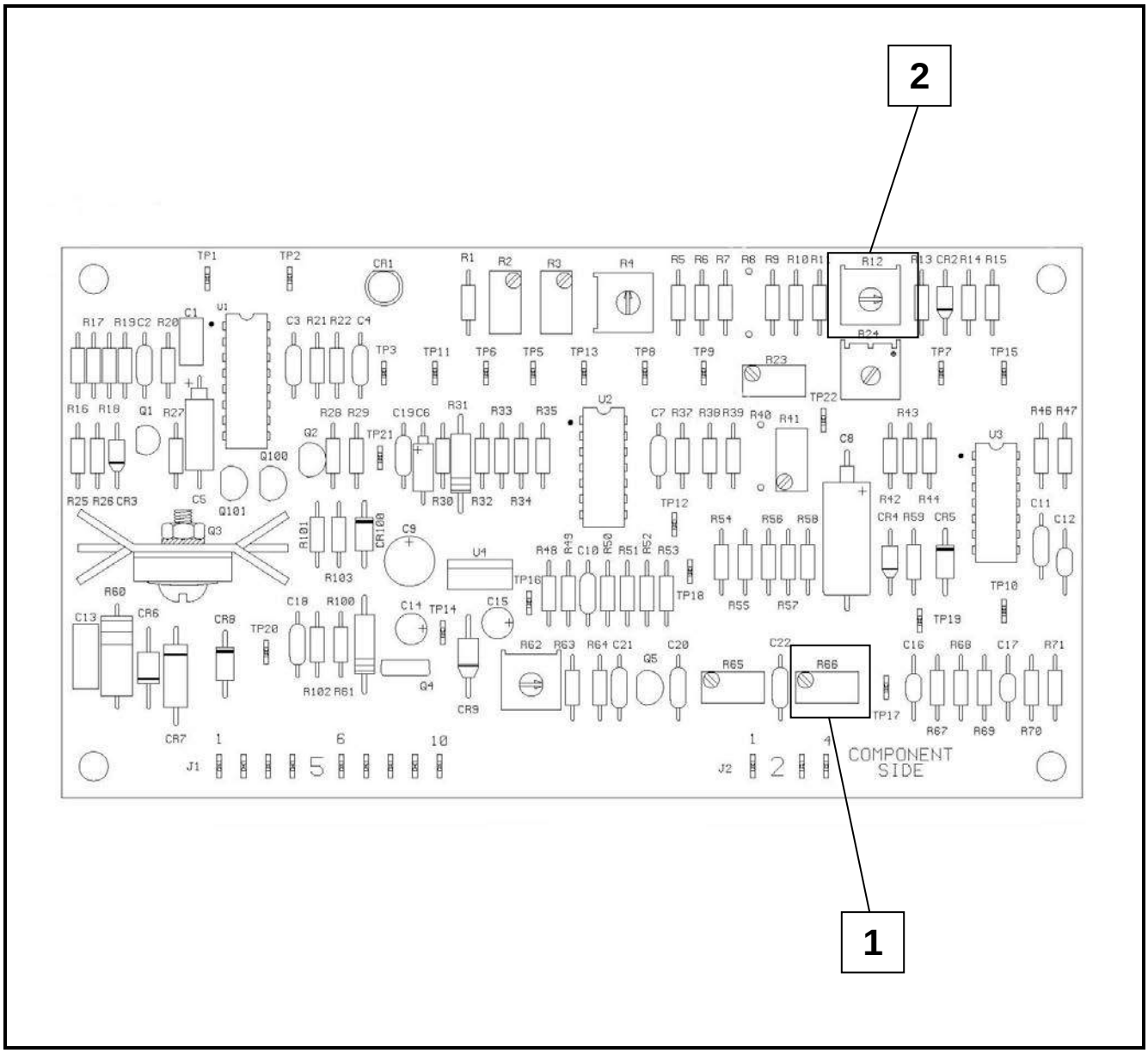
a) Voltage regulator adjustment

(1) 28.5 Volt Adjustment

The operating voltage is determined by the position of the regulator potentiometer (R66) setting. Clockwise (CW) rotation increases the voltage level at which the unit operates. Conversely, counter-clockwise (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 (R12) 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. Line Drop Compensation Adjustment (R12)

Figure 2 Voltage Regulator PC Board

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 the 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, Symptom, and Condition are described and numbered. Probable Cause is indented to the right and listed in numbered steps. Test Check and/or Remedy provide instructions for correcting the malfunction.

2) Equipment for Troubleshooting

WARNING	Exercise extreme care to avoid contact with high voltage leads and components. High voltage can kill!

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.

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

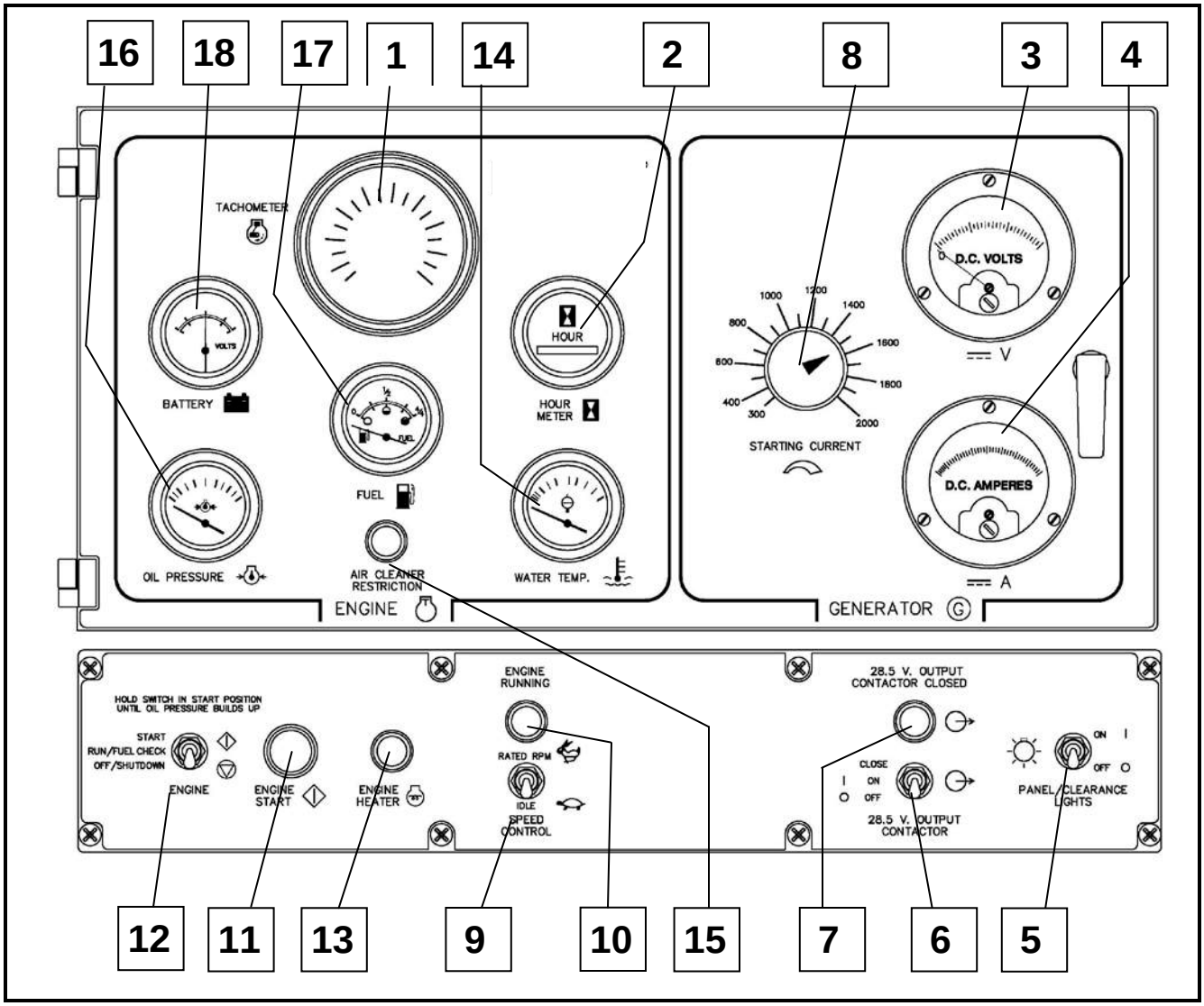
ALWAYS make a check of connections and leads of a component suspected of being faulty. With the exception of a few instances, we will assume that all connections and wiring have been checked first and that power has not been lost as a result of defective wiring or connections.

4) Illustrations

Items in figures 1 and 2 are referred to throughout the Troubleshooting Chart

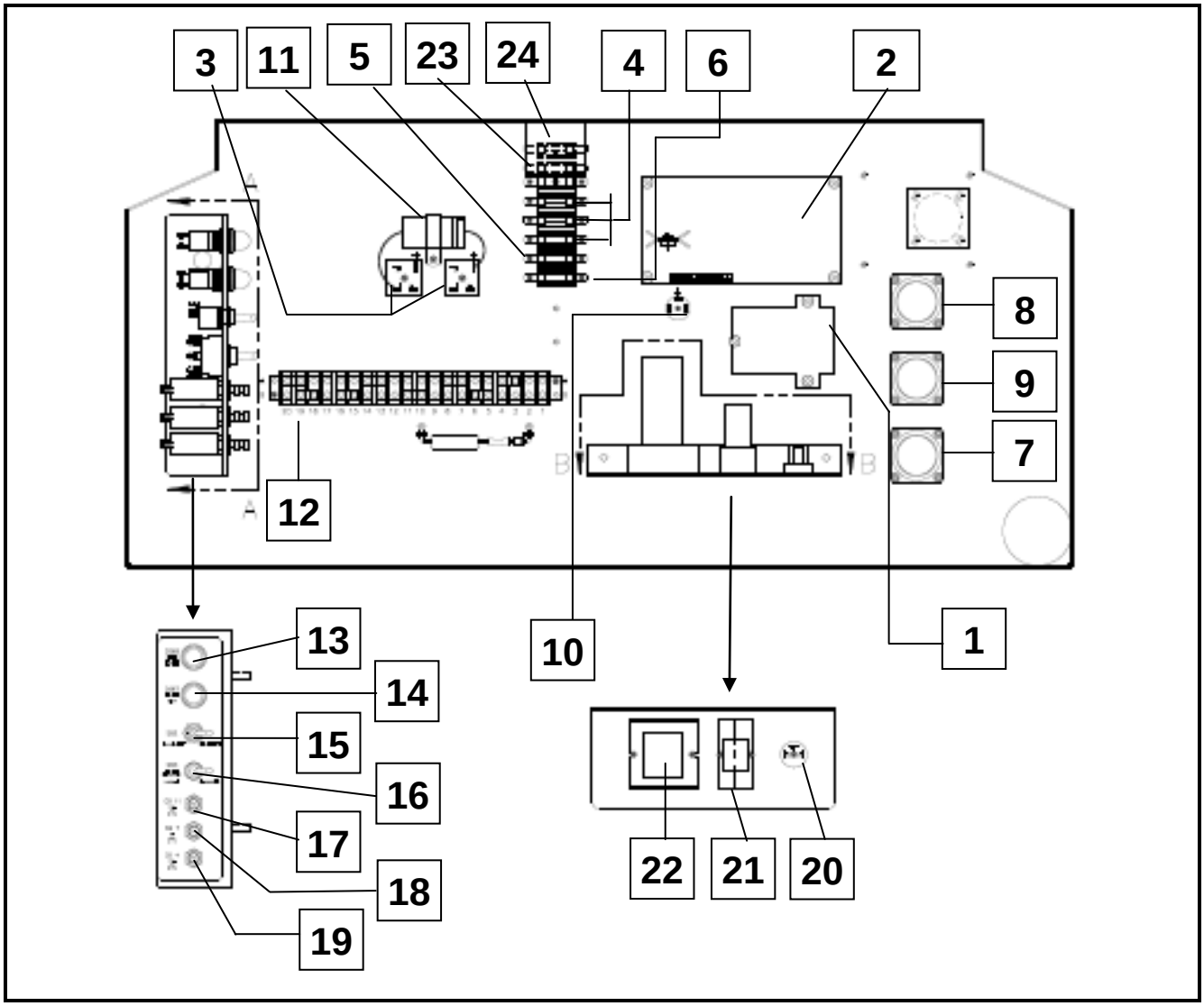
5) Connection and Schematic Diagrams

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



1. Tachometer (M403)
2. Hour Meter (M402)
3. Voltmeter [Generator] (M406)
4. Ammeter [Generator] (M407)
5. Panel Lights Toggle Switch (S405)
6. Contactor Control Toggle Switch (S408)
7. Contactor Closed Lamp (DS408)
8. Current Limiting Control Potentiometer (R402)
9. Speed Control Toggle Switch (S406)
10. Engine On Lamp (DS407)
11. Engine Start Push Button Switch (S401)
12. Engine Circuit Toggle Switch (S404)
13. Engine Heater (DS426)
14. Water Temperature Gauge (M404)
15. Air Filter Restriction Indicator Lamp (DS412)
16. Oil Pressure Gauge (M405)
17. Fuel Gauge (M408)
18. Voltmeter [Battery] (M401)

Figure 1 Control Box Panel Assembly



1. Over Voltage Relay (K403)
2. Voltage Regulator (VR402)
3. Excitation Rectifiers (CR417 and CR418)
4. Control Windings Fuses (10 A) (F406 - F408)
5. Voltage Build-up Fuse (10 A) (F405)
6. Voltage Regulator Fuse (10 A) (F403)
7. Rectifier Harness Connector (J43)
8. Engine Harness Connectors (J46–Power)
9. Engine Harness Connectors (J47 – Engine)
10. Blocking Rectifier (CR401)
11. 100 MFD, 350 VDC Capacitor (C403)
12. Terminal Block (TB1)
13. Check Engine Indicator (DS68)
14. Check Stop Indicator (DS67)
15. Engine Fault Code Switch (S82)
16. Engine Diagnostic Switch (S80)
17. Light Circuit Breaker, 10 A (CB11)
18. Control Circuit Breaker, 5 A (CB7)
19. Engine Circuit Breaker, 10 A (CB4)
20. Shutdown Rectifier (CR426)
21. Shutdown Relay(K407)
22. Shutdown Timer Relay (K406)
23. Interlock CE Fuse (0.5 A) (F411)
24. Switch Interlock Fuse (5 A) (F413)

Figure 2 Control Box Interior Assembly

Engine Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
1. Engine will not start and the starter will NOT crank engine.	**a.** Emergency Stop switch has been pressed or is defective	Check to be sure the Emergency Stop is pulled out or replace if defective.
	b. Battery disconnect switch is in the "OFF" position	Open the canopy doors on and be sure the battery disconnect switch is in the "ON" position.
	c. Battery discharged or loose battery or ground cable connection	Check voltage across batteries terminals. Voltage should be approximately 12.8 volts DC. Check all battery terminals connections.
	d. Circuit breaker (CB4) is open or a defective engine start switch (S404).	Check to be sure circuit breaker is closed. Place engine start switch in "**Run/Fuel Check**" position. Does fuel gauge operate, if no replace switch.
	e. The oil pressure switch (S403) is defective.	Replace with a known good oil pressure switch and place the engine start switch in "**Run/Fuel Check**" position and press the engine start pushbutton. If engine starts, replace oil pressure switch.
	f. Blocking rectifier (CR402) defective.	Place the engine start switch in "Run/Fuel Check" position. Check for battery voltage between the two small terminals on auxiliary starter solenoid (L402). If no voltage, replace rectifier.
	g. Defective starter push-button (S401) or auxiliary starter solenoid (L402).	Place engine start switch in "Run/Fuel Check" position and the auxiliary starter solenoid should energize. If not, replace solenoid. If the solenoid energizes and pressing the "Engine/Start" push button does not start the engine, replace push button.
	h. Defective starter solenoid L401	Contact engine manufacturer or refer the engine manuals for troubleshooting procedures.

Engine Controls (Continued)

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
(continued) Engine will not start and the starter will NOT crank engine.	**i.** Defective starter B401	Contact engine manufacturer or refer the engine manuals for troubleshooting procedures.
	j. If none of the above, possible internal engine seizure.	**CAUTION:** Make certain that engine start switch is in "Off/Shutdown" 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.
2. Engine will not start. Starter does crank engine.	**a.** Fuel valve at tank closed, or no fuel in tank and engine has lost its prime.	Check fuel valve and fuel tank level and correct as required.
	b. Defective engine fuel lift pump of plugged up fuel filter or fuel lines.	Check fuel filters, fuel lines, and fuel fittings for plugged areas. If needed, contact the engine manufacture to inspect or replace the engine fuel lift pump.
	c. Blown ECM engine power fuses F101 and F102.	Check fuses and replace if necessary.
	d. Defective engine start switch S404	When the engine start switch is placed in "**Start**" position the engine running light DS407 should be on and battery voltmeter M401 reporting voltage. If neither, replace engine start switch.

Engine Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
	e. Defective engine control module (ECM)	When engine start switch is placed in the "**Start**" position check the engine check lamp DS68 and engine stop lamp DS67 inside the control box. The lamps should briefly come on and then turn off. If they do not come on contact engine manufacture about a possible defective engine ECM.
3. Engine starts then stops when the engine start toggle switch S404 is released to "**Run/Fuel Check**" position.	**a.** Fuel valve at tank closed, or no fuel in tank and engine has lost its prime.	Check fuel valve and fuel tank level and correct as required.
	b. Plugged up fuel filter or fuel lines.	Check fuel filters, fuel lines, and fuel fittings for plugged areas.
	c. Performed improper engine start sequence.	Reset the engine circuit by cycling the E-stop button. Hold the engine start switch in the "**Start**" position while pressing the engine start push button. Once the engine starts, do not release the engine start switch until the oil pressure comes up on oil pressure gauge M405.
	d. Defective oil pressure switch S403 or low oil level.	Connect a jumper wire across the "**C**" and "**NO**" terminals of oil pressure switch. Start the engine and check the oil pressure. If the oil pressure is below 20 PSI shut down the engine and check the oil level and check for oil leaks. If oil pressure comes up to normal and the engine continues to run, the oil pressure switch is defective and needs replaced.

Engine Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
(continued) Engine starts then stops when ENGINE CIRCUIT toggle switch S404 is released to "**Run/Fuel Check**" position.	**e.** Engine in over-temperature condition or a defective water temperature switch S402.	Place a clip-lead jumper wire across the "**C**" and "**NC**" terminals of the water temperature switch. Start engine and check water temperature. If above 210° F (99° C) shut down the engine and let the engine cool down. If water temperature is normal and the engine continues to run, the water temperature switch is defective and needs replaced.
	f. Defective low coolant level switch S416	Check engine coolant level. If engine coolant level is good, then the low coolant switch may be defective and needs replaced. Contact engine manufacture.
	g. Clogged or blocked air cleaner	Check the air cleaner.
4. Engine does not go to the normal rated RPM.	**a.** 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 when switching into the "**Rated RPM**" position. Zero resistance should be measured between terminals. Replace if measurement is other than zero.
	b. The engine's ECM may be defective or corrupt engine calibration..	Contact engine manufacturer or refer the engine manuals for troubleshooting procedures.

Engine Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
5. Engine lacks power	**a.** Engine control module is de-rating the output.	Check ECM for fault codes and contact engine manufacturer.
	b. Insufficient air to engine.	Check air filter for blockage and replace or clean as required.
	c. Improper fuel being used.	Check to be sure ASTM number 2D diesel fuel is being used.
	d. Plugged up fuel filter or fuel lines.	Check fuel filters, fuel lines, and fuel fittings for plugged areas.
	e. Restricted exhaust system.	Check exhaust pipe for restrictions. Check muffler for plugged up condition. Replace and/or clean as required.
6. Engine Overheats	**a.** Debris and dirt in radiator and CAC cores.	Clean radiator core carefully and remove any restrictions, dirt and debris.
	b. Dirt or sludge in coolant.	Drain coolant, flush radiator, put in clean coolant. Refer to the Engine Manufacture's Operation and Maintenance Manual.
	c. Fan belt slips or is broken.	Tighten belt or replace as required

Generator and Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
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.	Check and replace the fuse as required.
	b. Voltage regulator fuse F403 is blown	Check and replace the fuse as required.
	c. Defective excitation rectifier CR417 and/or CR418.	Check excitation rectifiers with an ohmmeter to see if they are good. If either of the rectifiers is defective, replace them.
	d. Defective fly-back diode CR419.	Check fly-back diode on brush holder mounting bracket with an ohmmeter to see if it is good. If diode is defective, replace it.
	e. Defective rectifier CR401	Use ohmmeter to check rectifier CR401. Replace the rectifier if defective.
	f. Defective voltage regulator board 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, replace the PCB..
	g. Generator revolving field L406 defective.	Measure resistance between these two wires coming from CR419. The reading should be 10 to 11 ohms. If reading indicates an open, short or lower than normal resistance, proceed to next step.
	h. Shorted power diodes CR405-CR416.	Disconnect and check diodes with an ohmmeter to see if they are good. If any diodes are defective replace.

Generator and Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
	i. Defective generator armature G402.	If check of the generator revolving field (in the previous step) reveals no trouble, the generator stator is defective. Contact Hobart factory for details.
2. Generator builds up to only low voltage when the speed control toggle switch S406 is place in rated "**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 of the rectifiers is defective, replace them.
	b. Blown fuse or fuses F406-F408	Check and replace the fuse(s) as required.
	c. Defective generator armature G402.	If check of the generator revolving field (in the previous step) reveals no trouble, the generator stator is defective. Contact Hobart factory for details.
3. Generator builds up to a high voltage when the speed control toggle switch S406 is place in rated "**Rated RPM**" position.	**a.** Defective rectifier CR401	Use ohmmeter to check rectifier CR401. Replace the rectifier if defective.
	b. Defective excitation rectifier CR417 and/or CR418.	Check excitation rectifiers with an ohmmeter to see if they are good. If either of the rectifiers is defective, replace them.
	c. Defective voltage regulator board 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, replace the PCB..
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.** Circuit breaker CB7 open	Check to see if circuit breaker CB7 is closed.
	b. Defective contactor control toggle switch S408.	Replace switch.
	c. Defective speed control toggle switch S406.	Use ohmmeter to check speed control toggle switch. Replace switch if defective.

Generator and Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
(Continued) 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.	**d.** The over-voltage PCB relay defective K403.	Connect a jumper lead between terminals T and P on the over-voltage relay. If contactor closes, replace over-voltage PCB relay.
	e. Defective load contactor K402.	With engine at rated speed and the S408 held in the "**Closed**" position, check for 28 VDC between K402 auxiliary coil terminals. If voltage is present, contactor is defective and needs replaced.
	f. Interlock voltage is not being sensed.	Place digital multi-meter on fuse F413 checking voltage to ground is 24 to 30 VDC. If voltage to ground is below min. replace fuse and check again. If issue still exist verify aircraft is looping power back to interlock.
5. Load contactor opens as soon as contactor control toggle switch S408 is released from its "**Closed**" position to the "**On**" position.	**a.** Defective contactor control toggle switch S408.	Replace switch.
	b. Defective load contactor K402.	With engine at rated speed and the S408 held in the "**Closed**" position, check for 28 VDC between K402 auxiliary coil terminals. If voltage is present, contactor is defective and needs replaced.
6. Load contactor K402 opens during power delivery.	**a.** Contactor opening could have been normal because of an over-voltage condition.	Resume operation and closely observe voltmeter for evidence of over-voltage. If contactor opens when no over-voltage condition exists, proceed to next step.
	b. The over-voltage PCB relay defective K403.	Check over-voltage 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. The over-voltage PCB relay K403 out of adjustment.	If relay trips at less than 32 VDC, adjust potentiometer (R12) on the over-voltage board. If this does not correct problem, replace the PCB.
	d. Output load contactor K402 defective.	If no fault was found in above steps, replace load contactor

Generator and Controls

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
7. Output current cannot be limited by current limiting 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 to 10k ohms. Replace if necessary.
	b. Defective voltage regulator board 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, replace the PCB..

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).

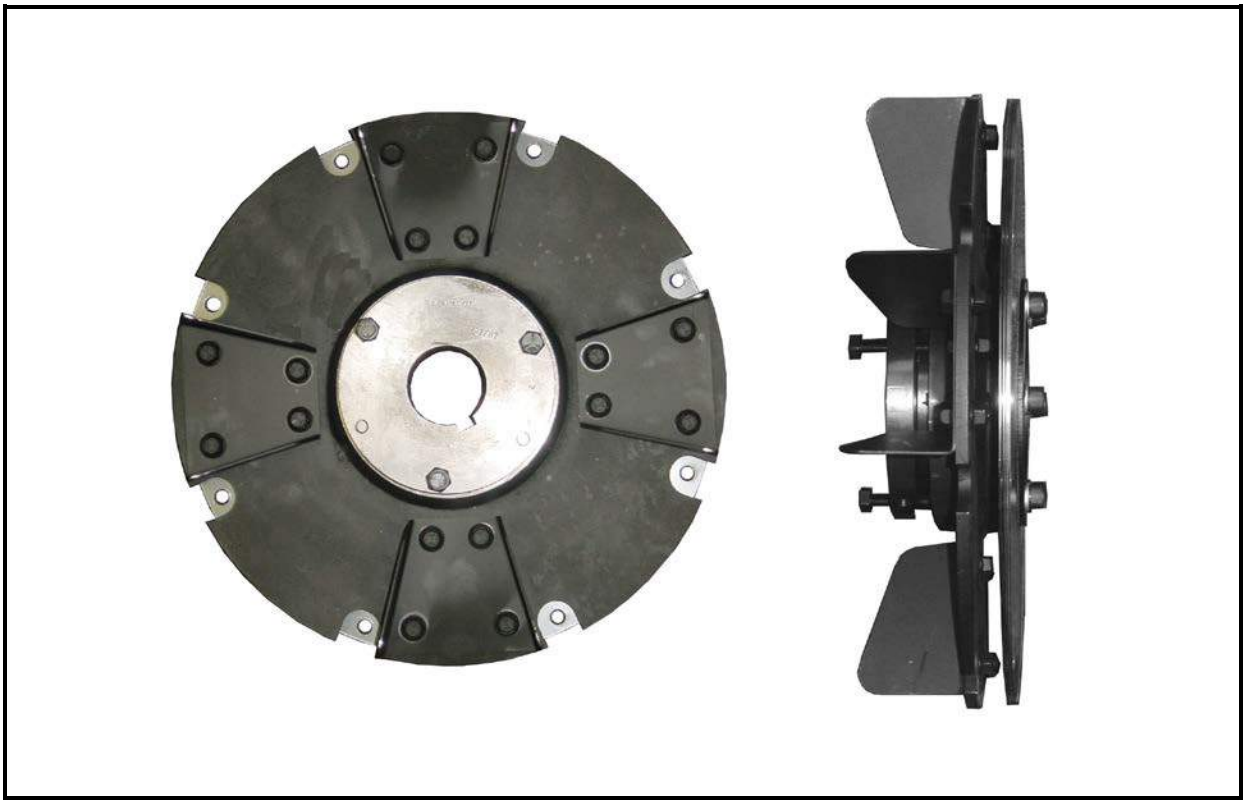


Figure 1 Flexible Coupling

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. Follow the procedure below to check the coupling screws:

1. Remove the sheet metal covers from around the generator housing and the flywheel housing.
2. Refer to Figure 2. Hold a short iron bar through the flywheel housing against the blades of the fan and coupling assembly to prevent rotation of the generator. Do this carefully to avoid damaging the fan blades.
3. 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.
4. 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).
5. Repeat the steps 2, 3, and 4 above for the remaining seven screws.
6. Reinstall covers around housings.

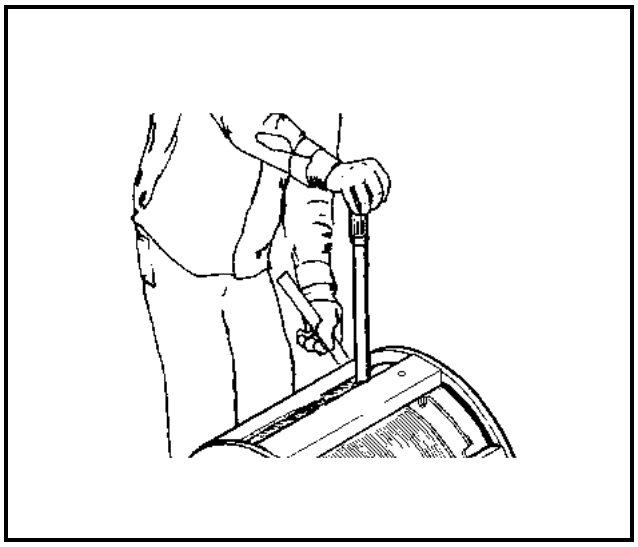


Figure 2 Access to Coupling Bolts (for removal or installation)

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. During removal, **DO NOT** cut any cables or wires. Disconnect cables or wires as necessary and tag them for reassembly.

a) Separate Engine and Generator

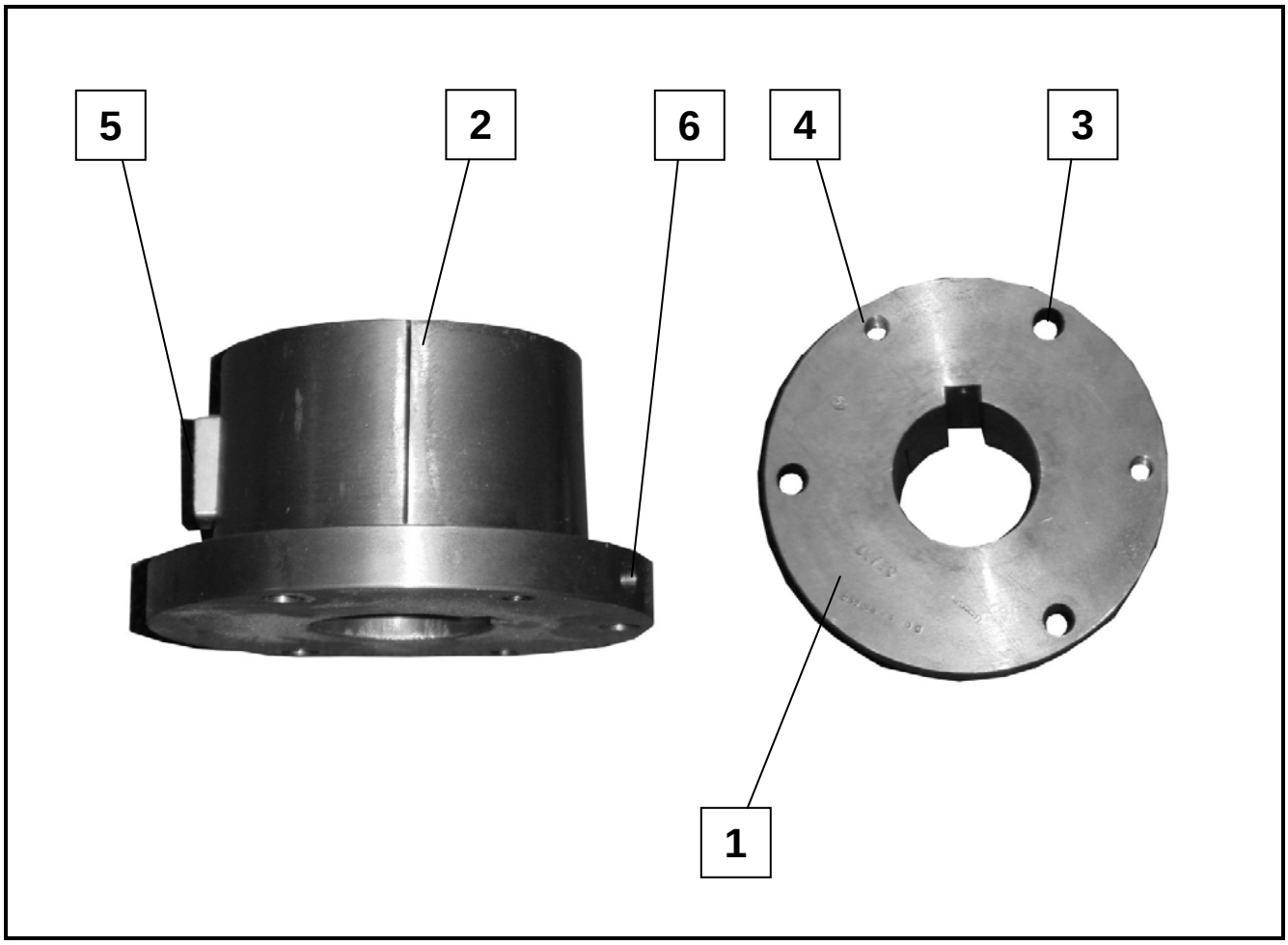
1. Remove canopy components and any other components to allow for complete access to the coupling assembly area.
2. Remove the sheet metal cover from around the generator housing and the flywheel housing.
3. Attach a hoist to the generator housing.
4. Use a long-handled, reversible ratchet drive fitted with a 5/16-inch Allen wrench to remove the screws that attach the flexible coupling disk to the engine flywheel. Reference Figure 2 for locking the coupling into place.
5. Support the rear of the engine with another separate hoist or other suitable supporting mechanism.
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 or damaged 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 that 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. Taper Bushing
2. Taper Bushing Split
3. (3) Mounting Holes for fastening bushing into place
4. (2) Tapped holes for breaking bushing loose
5. Key
6. Set Screw Location

Figure 3 Split Taper Bushing

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, the outside of the split bushing, and the taper inside of the hub be thoroughly cleaned free of dirt and grit.

CAUTION	Do not lubricate any of the surfaces. 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 N-m) 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 N-m). 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 in 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 split taper 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. Once again, make certain that the armature is pulled slightly into the rear bearing hub (so that it does not interfere with the bearing cap).
15. Using a 3/16-inch Allen wrench, tighten the setscrew in the bushing to apply pressure on the key.
16. Re-install the generator housing cover and the flywheel housing cover.
17. Re-install all other components.

c) Checking the Rear Bearing Hub Assembly

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

1. Carefully remove brush holder from the bearing support.
2. Remove the bearing cap.
3. Remove the 6 bolts attaching the bearing support to the housing.
4. Carefully attempt to slide bearing support hub off the bearing.
5. 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 7.
6. 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.
7. Re-install bearing support hub on bearing and reattach the bearing support hub to the generator housing.
8. Re-install brush holder.
9. Re-install the bearing cap.
10. Re-install the generator housing cover and the flywheel housing cover (if removed).
11. Re-install all other components.

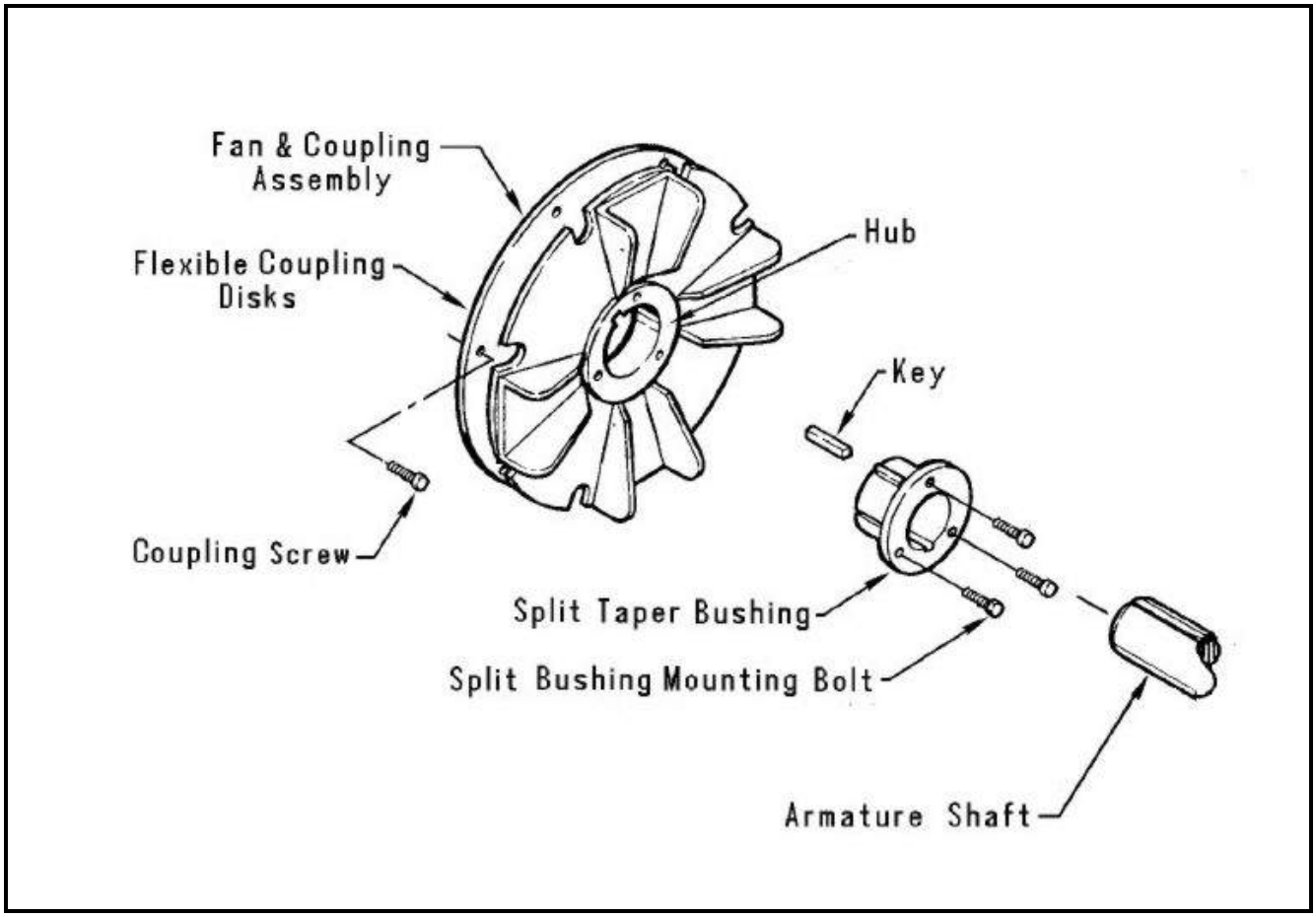


Figure 4 Assembly Procedure Illustration

5) Run-in after Assembly and Periodic Check

1. Mount the engine-generator assembly in a suitable test area and operate it for a 2-hour run-in.
2. 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.
3. Return the unit to normal service.
4. 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).
5. Return the unit to normal service.
6. 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 Ground Systems or Company Distributor, be sure to include all pertinent information from the unit's identification plate like the Specification No., Model No., and unit rating.

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

Write:	ITW GSE Americas Service Department 11001 US Highway 41, North Palmetto, FL 34221 U.S.A.
Call Inside U.S.A./Canada:	(866)-845-0441 (Parts) (877) 874-5322 (Service)
Call From Foreign Countries:	(941) 721-1092 (Technical Support) (941) 721-1000 (Spare Parts)
FAX inside U.S.A.	(877) 874-5321
FAX From Foreign Countries:	(941) 721-1091
E-Mail:	technicalsupport@itwgse.us parts@itwgse.us
Web Page:	www.itwgse.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 ITW GSE, Palmetto, Florida.

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/ Numerical Index
Section 2 - Manufacturer's Codes
Section 3 - Parts List

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:

- Standard hardware items (attaching parts) such as nuts, screws, washers, etc., which are available commercially
- Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available
- 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

Not Applicable

(5) QTY. 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.

Numerical Index

6)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.

FIGURE – ITEM NO.	HOBART PART NO.	FIGURE – ITEM NO.	HOBART PART NO.
7-	040201	6-	284372-002
7-	040213	1-	285125
10-	042471	15-18	285647
4-	050984	7-25	286388-001
7-10	16DA2162	7-	286477-002
15-6	16DA3493	4-13	286485-001
15-16	180065	7-24	286485-001
8-6	180289A	7-	286607-001
8-3	180593-003	8-11	286611
15-19	180600	7-6	286699-001
17-6	180776	16-1	286810-001
8-5	181022C-005	15-24	286813
17-13	281688	16-	286849
9-1	281881-001	5-13	286850
15-20	282239	15-13	286884
2-13	282562	15-3	286887
13-10	282562	13-1	286897-031
1-25	282658	13-7	286897-036
11-	282918	14-	286903
11-	282919	14-	287144-002
15-26	283063	14-	287145-001
14-11	283154-001	15-1	287184-003
4-10	283597	17-8	287401
4-9	283824	1-14	287459
12-	283873	1-26	287460
8-17	283978-001	13-11	287461
8-16	283978-002	1-15	287462
17-2	284371-002	1-16	287463
5-10	284372-002	6-13	287464

FIGURE – ITEM NO.	HOBART PART NO.	FIGURE – ITEM NO.	HOBART PART NO.
1-18	287465	5-	24656
1-	287466	6-8	24656
1-13	287467	1-	288120
4-	287526-002	12-	288123-001
4-	287542-001	11-5	288197-001
4-	287542-002	17-1	288210
5-7	287564	1-	288300
6-	287564	8-	288303
17-3	287564	15-	288306
1-19	287571	14-12	288331
8-8	287621	8-14	288339
1-17	287696	15-7	288380-001
1-	287698-001	7-	288836-001
14-2	287735	7-	288836-002
4-	287785	1-22	288862
9-4	287795	1-12	288866
9-	287796	1-10	288917-002
7-9	287908	1-32	288918-002
12-11	287909	5-14	288973-001
14-8	287909	17-4	288984-001
2-5	292016	5-6	288985
5-15	292016	6-4	288985
3-5	287986	17-	288985
2-3	287998	1-28	288987-006
3-	287998	7-13	288999-001
5-	288003	13-8	289037
6-	288003	7-	289078
17-9	288003	7-2	289092
15-28	288015	7-	289104-001
1-	288020	12-7	289200-001
7-23	288020	12-9	289200-002
1-	288023	1-	289278
10-	288052-002	12-14	289827

FIGURE – ITEM NO.	HOBART PART NO.	FIGURE – ITEM NO.	HOBART PART NO.
12-13	289828	7-18	290957
12-	290145	8-1	290958
1-23	290216	8-15	290959
13-	290388	7-19	290981
11-	290597-001	2-4	292012
12-	290597-001	1-1	292042
11-	290597-006	2-1	292042
11-	290597-007	5-	292011
17-10	290646	6-7	291054
13-2	290685	3-4	291056
13-6	290686	4-14	291057
5-	290831	3-3	291066
14-	290831	5-5	291066
5-	290847	9-6	291067
14-	290847	3-1	291069
8-21	290871	12-3	291070
9-2	290902	12-4	291071
6-9	290918	12-6	291072
14-3	290918	12-8	291073
8-7	290925-A	12-17	291074
7-3	290931	12-16	291075
7-	290932	13-5	291076
11-3	290936	10-2	291077
12-15	290936	11-10	291078
11-1	290938	4-1	291080
11-9	290939	4-3	291081
11-2	290940	4-5	291084
8-18	290947	4-17	291085
8-22	290948	4-16	291087
8-	290949	2-6	291088
11-8	290951	2-7	291089
11-7	290952	2-8	291092
11-6	290953	9-8	291092

FIGURE – ITEM NO.	HOBART PART NO.	FIGURE – ITEM NO.	HOBART PART NO.
2-9	291093	14-4	291334
9-7	291093	4-	291335
12-	291097	15-29	291358
3-2	291152	10-4	291379
5-4	291152	10-5	291380
9-5	291160	10-7	291382
10-1	291168	10-6	291383
10-3	291169	4-	291386
12-1	291223	1-	291393
12-2	291224	6-10	291393
12-5	291225	10-8	291394
4-4	291237-001	5-11	292502
4-2	291237-002	6-6	292502
4-8	291237-003	1-27	291402
4-7	291237-004	2-11	291407
4-19	291237-005	13-	291407
4-18	291237-006	2-12	291408
14-9	291248	13-	291408
1-2	291252	2-	291409
1-30	291253-001	13-	291409
1-31	291253-002	2-10	291420
5-9	292917	13-9	291420
6-	292917	7-1	291431
5-8	291262	8-10	291431
6-	291262	6-2	291432-003
17-15	291262	6-	291432-004
4-6	291297	15-27	291433
4-15	291302	11-4	291453
7-21	291307	9-3	291481
1-	291329	5-	291482
1-	291330	14-	291482
5-	291334	8-24	291864
14-	291334	8-23	291865-001

FIGURE – ITEM NO.	HOBART PART NO.	FIGURE – ITEM NO.	HOBART PART NO.
7-15	30GH1119	15-2	405278-006
17-12	354592	14-	405548
16-5	400435	7-	406815
15-8	400589-001	1-24	407366
7-	400613-003	8-4	407948
7-	400613-004	8-19	407948
7-	400613-004	8-	408352
8-	400613-004	7-5	408596-001
7-12	400641-012	1-20	408665-001
7-11	400642-003	1-21	408665-002
8-9	401937-004	17-18	408999-001
1-	402025-003	2-	486719-005
16-6	402025-003	13-	486719-005
15-5	402037-004	17-7	488555-001
17-20	402530	17-16	488562
17-19	402531	17-17	488628
7-	402663	17-	488784
17-21	402788	17-5	489135
1-9	402987	17-22	489426
1-8	403091-008	14-	489658-007
7-14	403189	16-	489658-010
12-10	403782-002	7-4	494134-001
14-7	403782-002	9-	494295
14-6	403809-002	15-11	494681-001
8-2	404065-002	13-12	76B1148
10-	404154-013	1-	77A1157
7-	404172-001	7-8	78A1117-002
8-	404172-001	7-7	78A1120-001
7-	404172-002	14-5	78B1118-002
8-	404172-002	8-	79B1138
7-	404172-003	8-20	79B1140
7-	404173	1-	7J422-000
8-	404173	1-11	81B1084

FIGURE – ITEM NO.	HOBART PART NO.	FIGURE – ITEM NO.	HOBART PART NO.
8-	84A1075	15-14	W10933-003
17-	85C1004-002	15-15	W11097-007
15-22	A25	15-17	W11097-007
16-	A25	15-21	W11097-022
15-23	AW626	15-9	W11114-012
16-	AW626	8-	W11166-003
7-22	HF2518-002	8-	W11166-011
8-13	HF2518-002	15-25	W11242-018
7-16	HF2518-005	7-	W11254-003
8-12	HF2518-005	15-10	W11280-015
7-20	HF2518-007	14-	W7814-000
7-17	HF2518-008	12-	W7814-004
8-	W10051-014	14-	W7814-004
17-14	W10072-063	16-2	W9218-251
14-	W10750-001	16-3	W9218-251
10-	W10869-006	5-	W9360-289
15-4	W10869-006	14-	W9360-289
14-	W10910-000	14-1	W9407-446
15-12	W10931-003		

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. If a manufacturer does not have a code, the manufacturer's full name is listed in the nomenclature column.

Code	Vendor's Name and Address
D0024	SEMIKRON ELEKTRONIK GMBH Sigmundstrasse 200 P.O. Box 82 02 51 Nuernberg, Germany 90431
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
0CYC7	Western Rubber & Supply 7888 Marathon Dr Ste Livermore, CA 94550 - 9314
0E8J0	Emka Inc. 1961 Fulling Mill Rd. Middletown, PA 17057-3125
0HZP9	Diesel Radiator Co. 1985 Janice Ave. Melrose Park, IL 60160-1008
0MR72	Henkel Corp 26941 Cablot Rd, Suite 124 Laguna Hills, CA 92653-7007
0TSE6	Infineon Technologies Industrial Power Inc. 1050 US HWY 22 Lebanon, NJ 08833-4208
00779	Tyco Electronics (Amp) 2800 Fulling Mill Rd Bldg-38 Middletown, PA 17057 - 3142

Code	Vendor's Name and Address
01XD4	Contact Industries Inc 25 Lex-Industrial Dr Mansfield OH 44903 - 8699
01428	Tuthill Corporation DBA Tuthill Controls Group 2110 Summit St. New Haven, IN 46774-9524
02660	Amphenol Corp. Spectra-Strip/ltd 40-60 Delaware Ave SIDNEY, NY 13838 - 1395
02768	Illinois Tool Works Inc. Fastex Division 195 S. Algonguin Rd. Des Plaines, IL 60016-6197
02929	Newark Electronics Div 4801 N Ravenswood Ave Chicago, IL 60640 - 4457
05HB5	Magnecomp Inc. 161 Eagles Nest Dr Pickens, SC 29671-7808
05YB3	Acon Inc. 22 Bristol Dr. South Easton, MA 02375-1108
1AA44	Collmer Semiconductor Inc. 2542 Highlander Way Carrollton, TX 75006
1DG36	Phillips And Temro Industries Inc E. M. Products Inc. 5380 Cottonwood Ln Prior Lake, MN 55372

Code	Vendor's Name and Address
1DL99	Fleetguard Inc. Div. of Cummins Engine Company 311 N. Park Street Lake Mills, IA 50450 - 1299
1E045	Austin Hardware and Supply Co. 950 Northwest Technology Dr Lees Summit, MO 64086 - 5692
1SPJ9	ITW GSE 11001 U.S. Hwy. 41, N Palmetto, FL 34221
1W134	Eaton Corp. 4201 N. 27TH St Milwaukee, WI 53216-1897
12662	Peterson Mfg Co. 4200 E 135th St Grandview MO 64030-2896
13445	Cole-Herse 20 Old Colony Ave. Boston, MA 02127-2405
14552	Microsemi Corporation 2381 Morse Ave Irvine, CA 92614-6233
14799	Square D Company, Inc Dba Schneider Electric USA, Inc. 9522 Winona Ave Schiller Park, IL 60176-1084
16476	Maxima Technologies & Systems Llc 1811 Rohrerstown Rd Lancaster, PA 17601-2321
18265	Donaldson Company Inc. DBA Torit Products 1400 W. 94th St. Minneapolis, MN 55431-2370
2B428	MJO Industries Inc. DBA Hughes-Peters 8000 Technology Blvd. Huber Heights, OH 45424 - 1573
2B664	All-Phase Electric Supply Co 1620 W Main St P.O. Box 149 Springfield OH 45501-0149

Code	Vendor's Name and Address
2N562	Power Transmission Sales Inc. 531 Washington P.O. Box 229 Chagrin Falls, OH 44022-0229
23803	N T N Bearing Corp of America 191 Sheree Blvd Ste 101 Exton PA 19341-1265
24161	Gates Corporation 900 S Broadway Denver CO 80217-5887
24446	General Electric Co. 3135 Easton Tpke. Fairfield, CT 06431
25710	Deka Plastics Inc. 914 Westfield Ave. Elizabeth, NJ 07208-1222
27410	Harris Corp. 1025 W NASA Blvd. Melbourne, FL 32901
28520	Heyco Inc. 1800 Industrial Way N. Toms River, NJ 08755-4809
3A054	McMaster Carr Supply Co. 9630 Norwalk Blvd. Santa Fe Springs, CA 90670-2932
3Y208	Taylor And Summerville Battery Co 3485 Successful Way Dayton Oh 45414-4319
30104	Automotive Controls Corp. 1300 W. Oak St. P.O. Box 788 Independence, KS 67301-0788
30430	Marathon Electric Mfg. Corp. 398 Beach Rd. Burlingame, CA 94010-2004
311K7	Kissling Electrotec Incorporated 320 Business Pkwy, Ste A Greer, SC 29651
38151	Marathon Electric Mfg. Co. 100 E. Randolph St. Wausau, WI 54401-2568

Code	Vendor's Name and Address
39TH9	Motion Industries Inc. 8580 Industry Park Dr. Piqua, OH 45356-8535
40121	Peterson Mfg. Co. Inc. 700 W. 143rd St. Plainfield, IL 60544-9733
44655	Heico Ohmite LLC 1600 GOLF RD 850 ROLLING MEADOWS, IL 60008-4204
46922	Crawford Electric Co 445 E 32 Mile Rd Romeo MI 48065-5270
49234	Protectoseal Company 225 W Foster Ave Bensenville, IL 60106-1631
5N8K3	Alpha Devices 11963 Abbey Rd. Cleveland, OH 44133
5P059	Tech Products Corp. 2215 Lyons Rd Miamisburg, OH 45342-4465
50508	Magnetic Components Inc. 9520 Ainslie St. Schiller Park, IL 60176-1191
52793	Saginaw Products Corp. DBA CIGNYS 68 Williamson St. Saginaw, MI 48601-3246
54646	Clampco Products Inc. 1743 Wall Road Wadsworth, OH 44281-9558
55752	Parker Hannifin Corp. DBA Racor Div. 3400 Finch Rd. Modesto, CA 95354-4125
56289	Sprague Electric Company 678 Main St Sanford, MA, 04073-7003
57330	Remke Industries Inc. 310 Chadick Drive Wheeling, IL 60090-6039

Code	Vendor's Name and Address
57347	Wall Industries Inc. 5 Watson Brook Rd. Exeter, NH 03833-4589
57733	Stewart-Warner Corporation 333 Ludlow St Stamford, CT 06902-6987
59656	Dean Technology Inc. DBA CKE 1000 Lucerne Road Lucernemines, PA 15754-0211
6S553	Wes-Garde Components Group Inc 300 Enterprise Dr Westerville, OH 43081-8840
6Y440	Micron Technologies Inc. 8000 S. Federal Way Boise, ID 83716-7128
60038	Timken Corporation 1835 Dueber Ave Sw Canton, OH 44706-2728
61706	EAO Switch Corporation 98 Washington St. Milford, CT 06460-3133
62292	EBM Industries Inc. 110 Hyde Rd. P.O. Box 4009 Farmington, CT 06034-4009
62445	Deutz Corporation 3883 Steve Reynolds Blvd Norcross Ga 30093
66180	Automatic Timing and Controls 3312 Bloomingdale Melrose Park, IL 60160-1030
66844	Powerex Inc. 173 PAVILION LN Youngwood, PA 15697-1800
7M613	Wright F.B. Co. of Cincinnati 4689 Ashley Dr. Hamilton, OH 45011-9706
71382	Seal Master Bearings Sub Of Emerson Electric Co. 1901 Bilter Rd. Aurora, IL 60502-9704

Code	Vendor's Name and Address
71400	Cooper Bussmann Inc. 114 Old State Road Ellisville, MO 63021-5942
72619	Dialight Corporation 1501 State Rte 34 S Farmingdale, NJ 07727-3932
74400	Hobbs Corporation 1034 East Ash Street PO Box 19424 Springfield, IL 62794-9424
74542	Hoyt Electrical Instruments 23 Meter ST. Concord, NH 03303-1894
74545	Hubbell Inc Wiring Device Div 185 Plains Road Milford, CT 06460
74829	Ilsco Corp. 4730 Madison Rd. Cincinnati, OH 45227-1426
75418	Kysor Industrial Corporation 1 Madison Ave Cadillac, Michigan 49601-9784
75915	Littelfuse, Inc. 8755 W Higgins Road Ste 500 Chicago, IL 60631 - 2701
77342	TYCO Electronics Corporation 8010 Piedmont Triad Pkwy Greensboro, NC 27409
78388	Woodward Controls Inc. 6250 W Howard St Niles, Il 60714-3433
8A334	Cummins Bridgeway LLC 2297 SW Blvd Ste K Grove City, OH 43123-1822
8T246	Whitesell RO & Associates, Inc. 7009 CORPORATE WAY Dayton, OH 45459-4238
81483	International Rectifier Corp 233 Kansas St. El Segundo, CA 90245
81703	Mulberry Metal Products Inc. 2199 Stanley Terrace Union , NJ 07083-4399
82866	Research Products Corp. P.O. Box 1467 1015 E. Washington Ave. Madison, WI 53701
86797	Rogan Corp 3455 Woodhead Dr. Northbrook, IL 60062-1812
9Y826	Marsh Electronics Inc. 1563 S. 101st St. Milwaukee, WI 53214-4032
91637	Vishay Dale Electronics Inc. 1122 23RD St. Columbus, NE 68601-3647
91929	Honeywell International Inc. DBA Honeywell 11 W. Spring St. Freeport, IL 61032-4316
94222	Southco Inc. 210 N. Brinton Lake Rd. Concordville, PA 19331
97520	Basler Electric Company Route 143 Highland, IL 62249-1074

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 that does not reflect an index number is an assembly that is not illustrated in its assembled state, or it is similar (right-hand, left-hand, top, etc.) to an item that is illustrated.

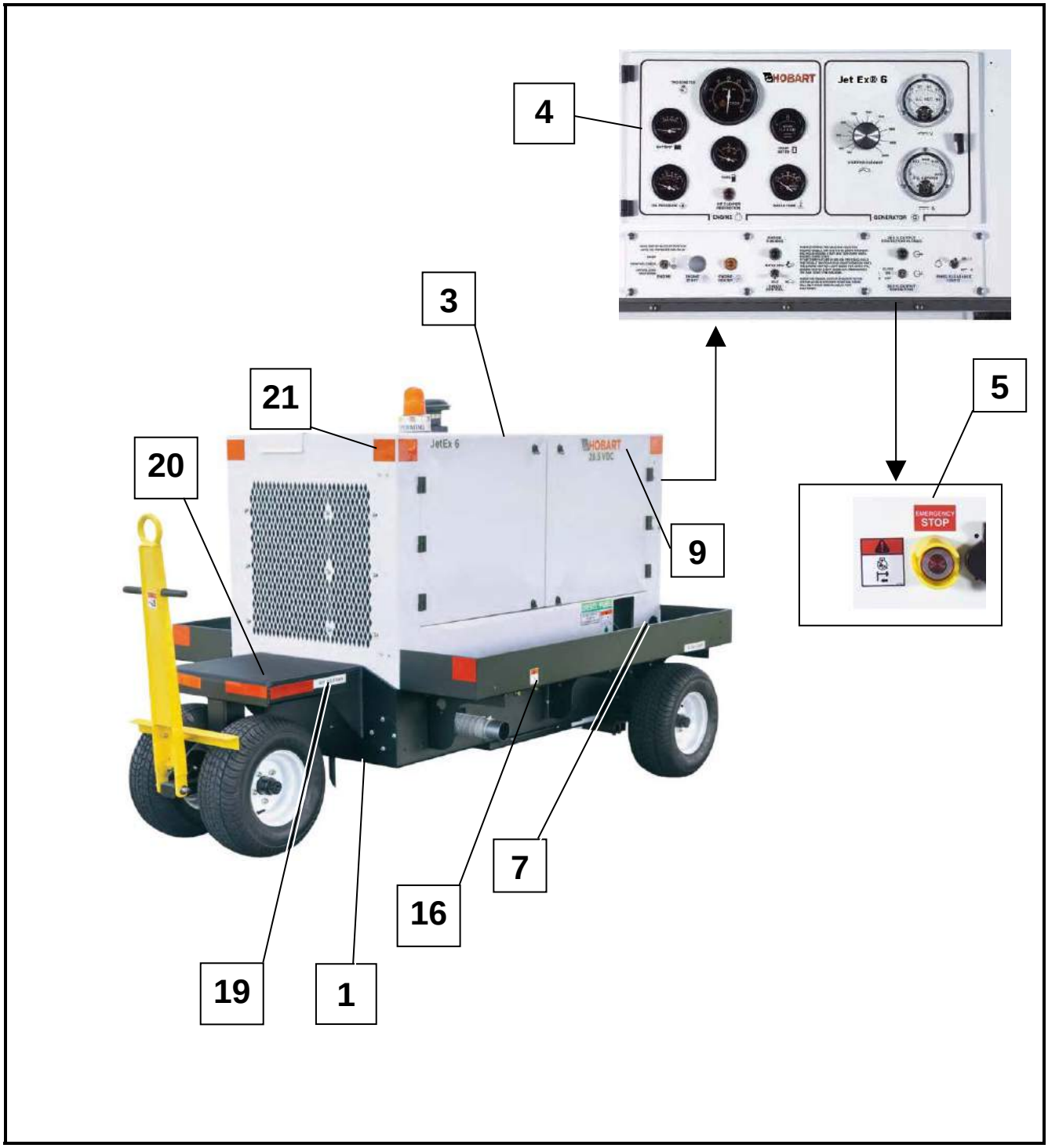


Figure 1 General Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
1 -	1	292042	Trailer and Frame Assembly (See Figure 2)	A,	1
	3		Canopy Assembly (See Figure 3 and 4)		Ref.
	4		Control Box Panel Assembly (See Figure 7 and 8)		Ref.
	5		**Emergency Stop Switch (below control panel)**		
		77A1157	…Switch, Maintained, Push-Pull *(V14799 #KR-9R-H6)*		1
		291393	…E-Stop Extension Harness		
		285125	…Guard, Mushroom Button *(V14799 # K564M)*		1
		288300	…Label, Emergency Stop		1
		287466	…Label, Emergency Stop		1
*	6		**Control Panel Cover**		
		291329	…Controls Cover		1
		291330	…Controls Cover Hinge		1
		288023	…Wing Knob Latch		2
		288020	…Cover Support Bracket		2
		289278	…Slotted Latch (optional for CE kits)		2
	7		**Output Cable and Clamp Assembly**		
		288120	…Output Cable Bracket		1
		7J422-000	…Output Cable Clamp		1
		287698-001	…Output Cable Cover (unused output cable hole)		1
		402025-003	…Cable, DC Output 30 ft.		1
*	8	403091-008	Plastic Hole Plug (if block heater not used)		1
	9	402987	Hobart Nameplate (on doors)		2
*	10	288917-002	Label, I.D. (on control panel)		1
*	11	81B1084	Nameplate, Output Cable, 28 Volts		1
*	12	288866	Support Center Label (on back panel)		1
*	13	287467	Label, Glow Plug		2
*	14	287459	General Information (on back panel)		1
*	15	287462	Engine Coolant Label (at radiator cap access)		1
	16	287463	Hot Muffler Label (at muffler outlet)		2
*	17	287696	Hearing Protection Label		1
*	18	287465	Falling Objects Label		2
	19	287571	Tire Pressure Label (mounted above tires)		4
	20	408665-001	Red Reflector (on the ends)		8
			Red Reflector		4
	21	408665-002	Amber Reflector (on the sides)		24
			Amber Reflector		12
*	22	288862	Engine Speed Caution Label		1
*	23	290216	Low Emissions Label (near fill neck)		1
*	24	407366	Label, Caution		1
*	25	282658	Label, Warning, Clearance		1
*	26	287460	Label, Warning, High Voltage		3
			Optional Components		
*	27	291402	Forklift Pockets (optional accessory, call factory)		1
*	28	288987-006	Cable Tray Rollers (optional accessory, call factory)		1
*	29	Call Factory	Spare Tire		1
*	32	288918-002	Option Label (only if options are added)		1

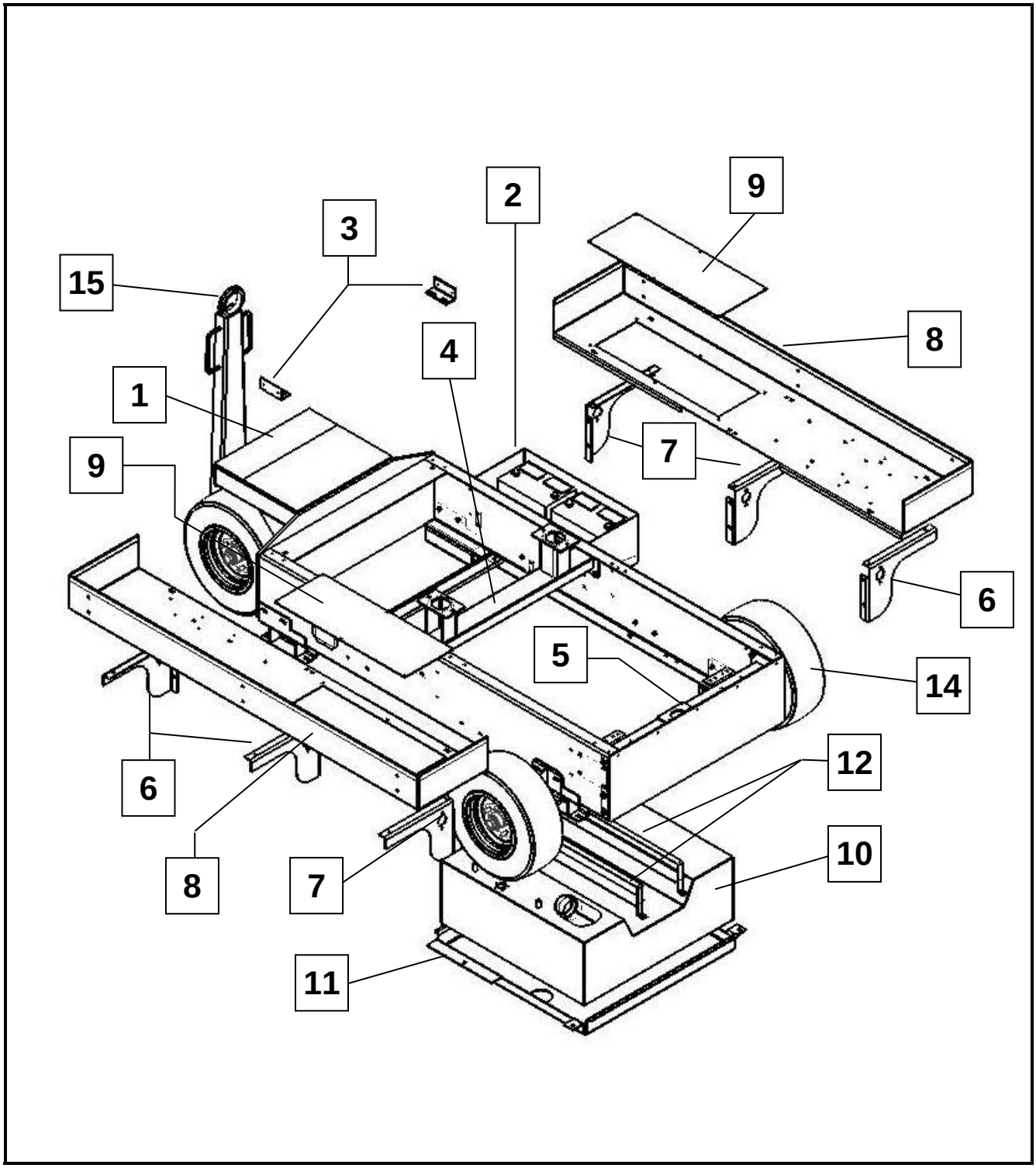


Figure 2 Trailer and Frame Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
2 -	1	292042	Trailer Assembly		1
	2		12 VDC Battery Components (See Figure 9)		1
	3	287998	Front Panel Bracket		2
	4	292012	Engine Support (included with frame)		Ref.
	5	292016	Generator Support (included with frame)		Ref.
	6	291088	Cable Tray Fender		3
	7	291089	Cable Tray Fender		3
	8	291092	Cable Tray		2
	9	291093	Battery Tray Cover		2
	10	291420	50 Gallon Fuel Tank Assembly		1
*		486719-005	…Fuel Gauge Sender		1
	11	291407	Fuel Tank Belly Pan		1
	12	291408	Fuel Tank Strap		2
		291409	…Fuel Tank Strap Gasket		2
*	13	282562	Cap, Fuel Fill, Diesel Green		1
	14	Call Factory	Spare Tire		1
	15	Call Factory	Spare Tow bar		1

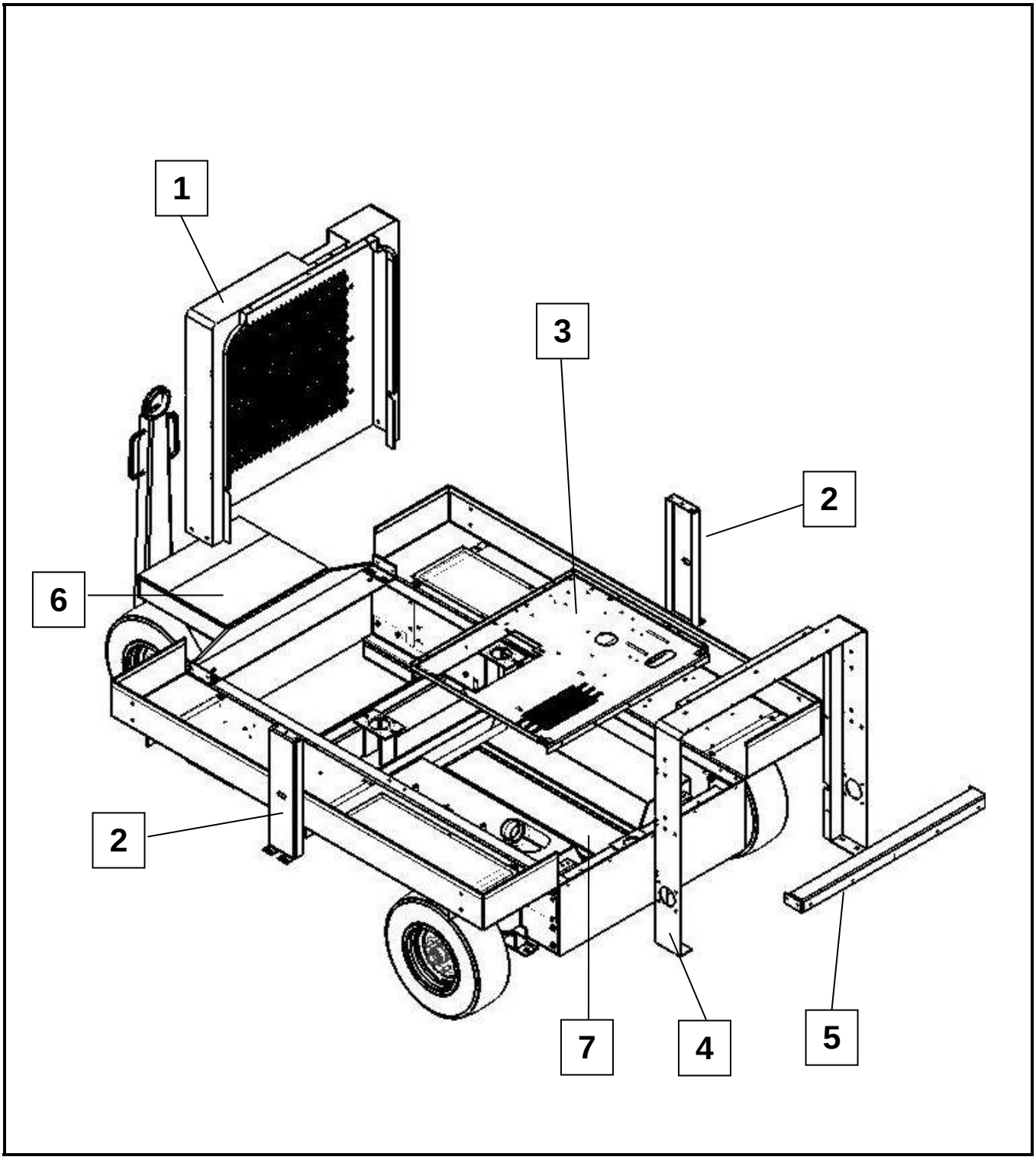


Figure 3 Canopy Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
3 -	1	291069	Front Panel		1
*		287998	…Front Panel Bracket (See Figure 2)		1
	2	291152	TR Panel Support Leg		2
	3	291066	TR Support Panel		1
	4	291056	Control Box Support		1
	5	287986	Control Panel Support		1
	6		Trailer/Frame Assembly (See Figure 2)		Ref.
	7		Fuel Tank Assembly (See Figure 2)		Ref.

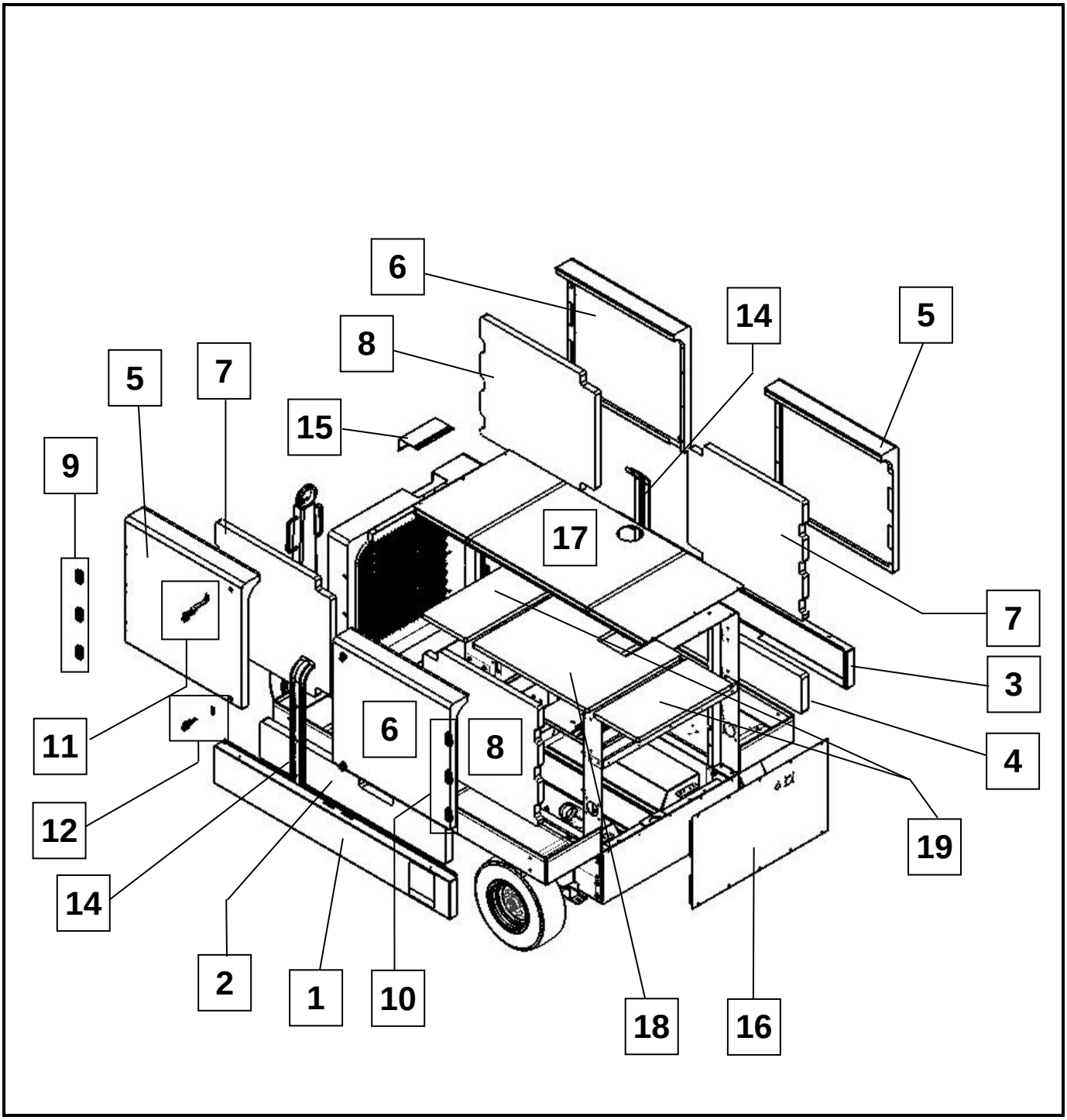


Figure 4 Canopy Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
4 -	1	291080	Fuel Side Lower Door Panel		1
*		292118-003	…Insulation, Lower Panel RH		1
		287785	Access Panel Fastener		2
	2	291237-002	Fuel Side Lower Door Panel Insulation		1
	3	291081	Lower Door Panel		1
*		292118-004	…Insulation, Lower Panel LH		1
		287785	Access Panel Fastener		2
	4	291237-001	Lower Door Panel Insulation		1
	5	291084	Access Door		2
	6	291297	Access Door		2
	7	292118-001	…Access Door Insulation		2
	8	292118-001	…Access Door Insulation		2
	9	283824	…Access Door Hinge Assembly *(To Door PN 291084)*		6
	10	283597	…Access Door Hinge Assembly *(To Door PN 291297)*		6
	11		…Access Door Top Latch Assembly		4
		291335	……Access Door Latch Pawl		4
		287542-001	……Access Door Latch, Hex		4
		287542-002	……Access Door Latch, T-Handle		4
		287526-002	……Access Door Latch Pull Tab		4
	12		…Access Door Bottom Latch Assembly		4
		291386	……Access Door Latch Pawl		4
		287542-001	……Access Door Latch, Hex		4
		287542-002	……Access Door Latch, T-Handle		4
		287526-002	……Access Door Latch Pull Tab		4
*	13	286485-001	…Access Door Gasket (cut in four 31-inch strips)		124 in.
*		050984	…Access Door Gasket (cut in two 62-inch strips)		124 in.
	14	291057	Access Door Stop		2
	15	291302	Radiator Cap Access Door		1
	16	291087	Lower Rear Panel		1
	17	291085	Top Canopy Assembly		1
	18	291237-006	…Top Canopy Insulation		1
	19	291237-005	…Top Canopy Insulation		2

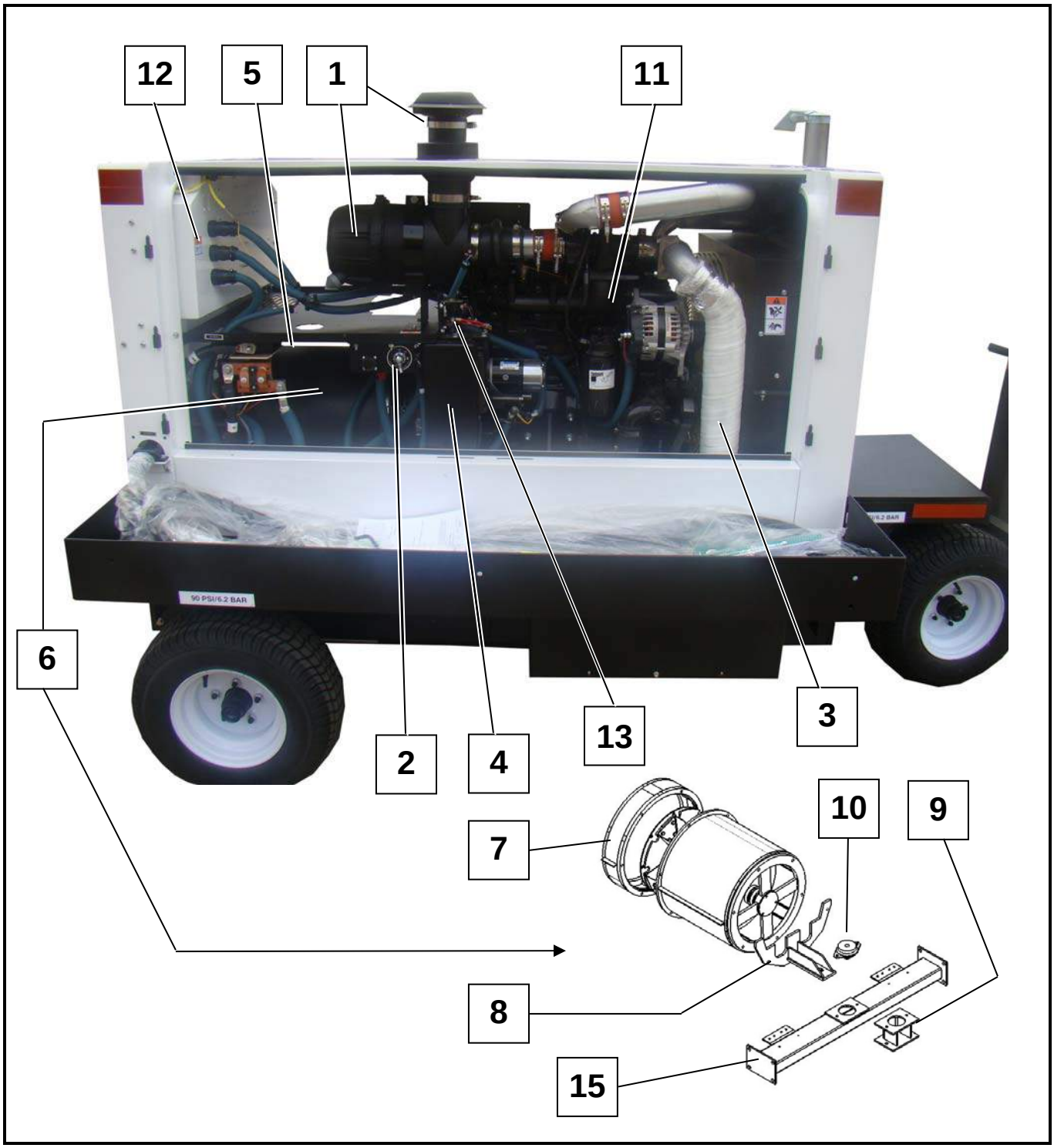


Figure 5 Internal Components (Right Side)

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
5 -	1		Engine Air Intake System (See Figure 11)		Ref.
	2		**Engine Dongle and Battery Disconnect Panel**		Ref.
		291334	… Engine Dongle/Battery Disconnect Panel		1
		290831	… Battery Disconnect Switch		1
		290847	…… Battery Disconnect Plate		1
		291482	… Disconnect Switch to Starter Cable		1
		W9360-289	… Disconnect Switch to Electronics Panel Cable		1
	3		Engine Exhaust System (See Figure 10)		Ref.
	4	291152	TR Panel Support Leg		2
	5	291066	TR Support Panel		1
	6	288985	Generator Assembly (See Figure 17)		1
	7	287564	Fan Housing		1
		288003	…Fan Housing Cover		1
	8	291262	Generator Support Bracket (mounted on generator)		1
	9	292017	Generator Rear Bracket Support		1
	10	24656	Mount, Shock		1
	11	292052	**Cummins QSB4.5 Electronic Engine *(V8A334)***		1
*		292011	…Bracket, Engine Support		2
*		24656	…Mount, Shock		2
	12		Control Box Assembly (See Figures 7 and 8)		1
	13	286850	Solenoid, Aux. Starter, 12 VDC		1
*	14	288973-001	Diode, Starter Solenoid		1
	15	292016	Generator Support (included with frame)		Ref.

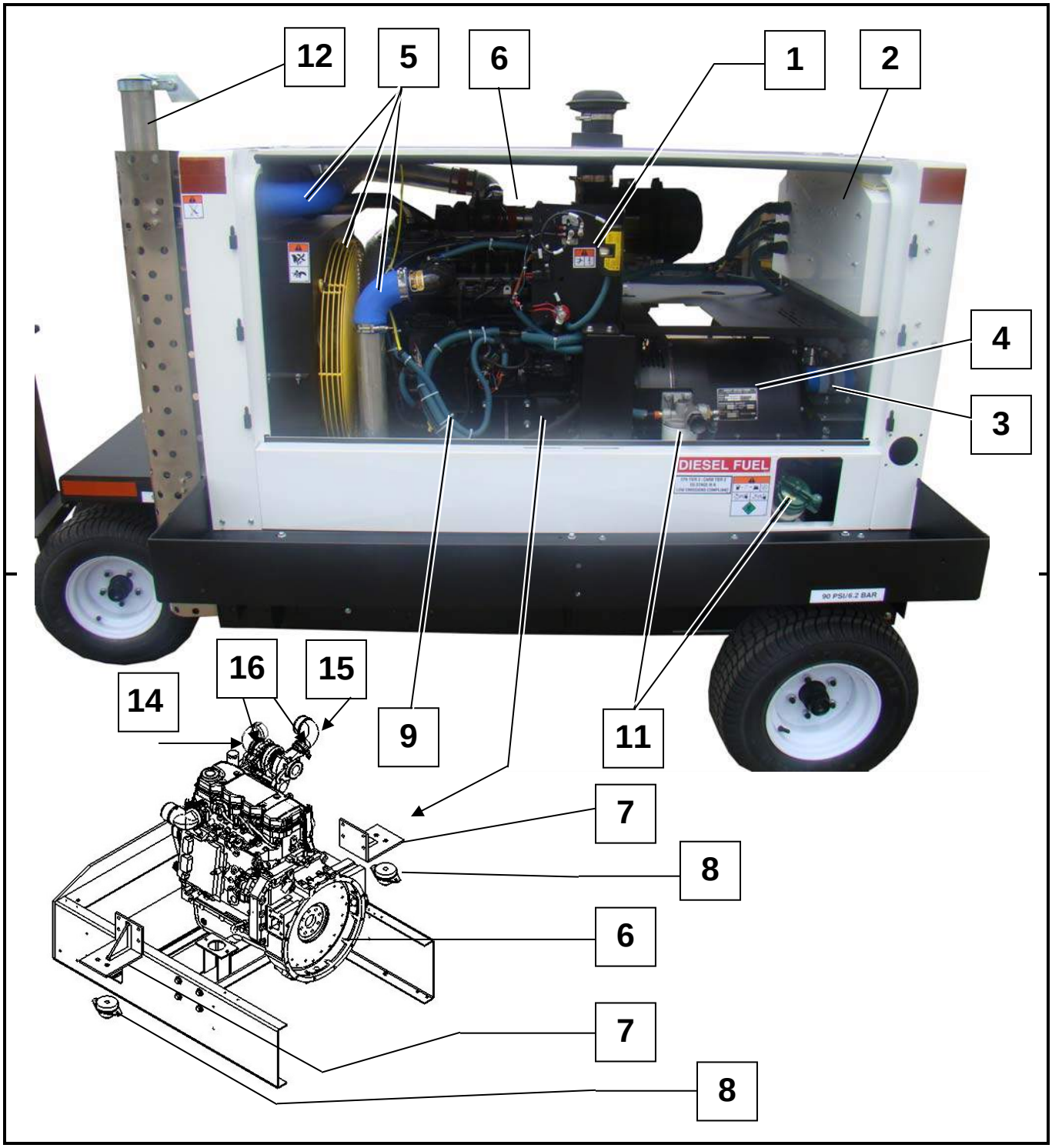


Figure 6 Internal Components (Left Side)

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
6 -	1		**Engine Electronic Panel (See Figure 14)**		1
	2	291432-003-A	Control Box Assembly (See Figures 7 and 8)		Ref.
		291432-004	Control Box Assembly, CE (See Figures 7 and 8)		Ref.
	3		Rectifier Assembly (See Figure 15)		1
	4	288985	Generator Assembly (See Figures 5 and 17)		1
*		287564	…Fan Housing		1
*		288003	…Fan Housing Cover		1
*		291262	… Generator Support Bracket (mounted on generator)		1
*		292017	…Generator Support Column		
*		24656	…Shock Mount		1
	5		Engine Cooling System Assembly (See Figure 12)		1
	6	292052	Cummins QSB4.5 Electronic Engine		1
	7	292011	… Engine Support Bracket		2
	8	24656	…Shock Mount		2
	9	290918	…Engine Wire Harness		1
*	10	291393	…E-Stop Extension Harness		1
	11		Engine Fuel System (See Figure 13)		Ref.
	12		Exhaust System Assembly (See Figure 10)		Ref.
	13	287464	Label, Fan and Moving Parts		2
	14	3999798	Cummins Parts Elbow		1
	15	3903652	Cummins Parts Elbow		1
	16	4898590	Clamp		1

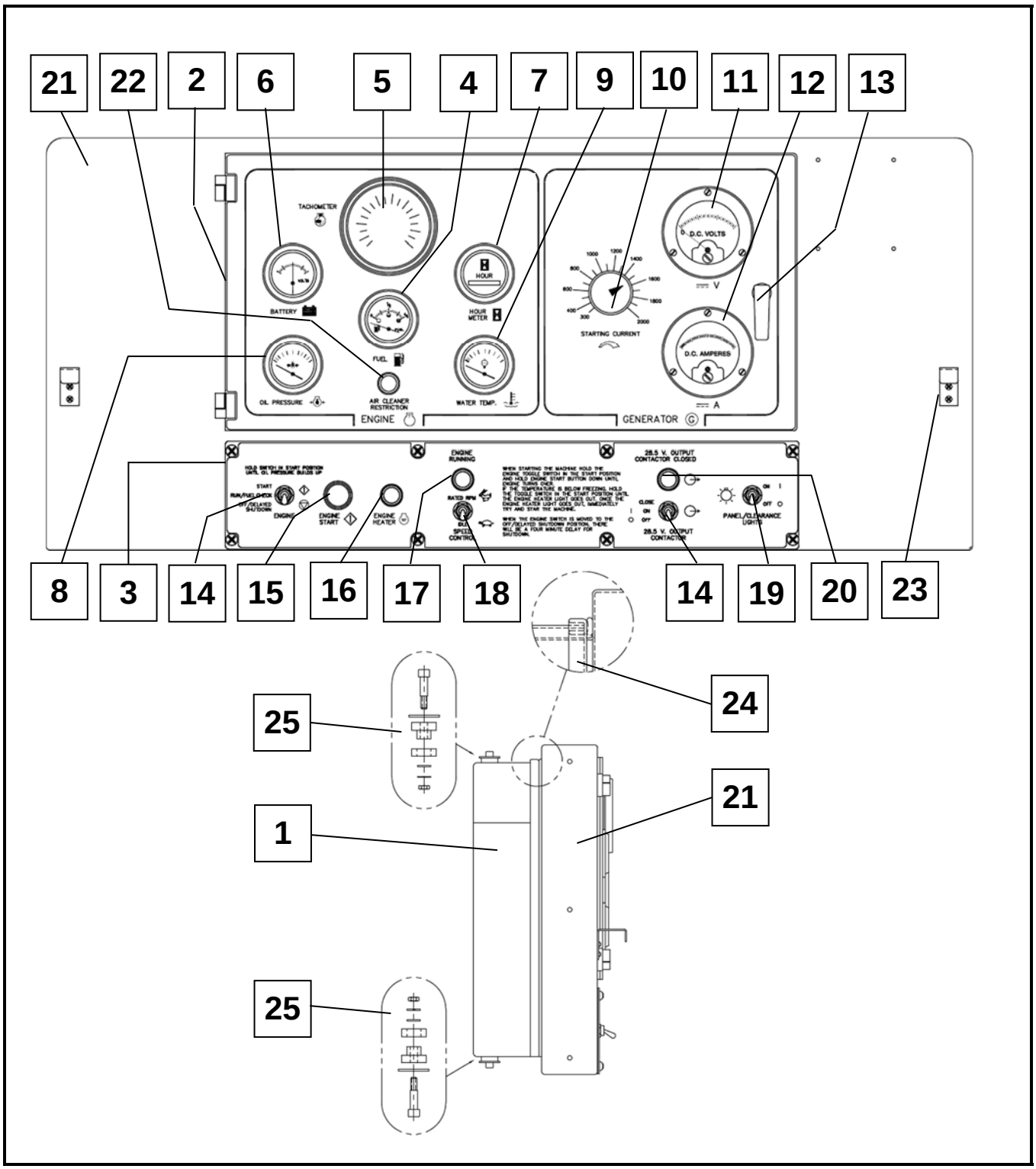


Figure 7 `Control Box Exterior Assembly

FIGURE - ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	QTY.
7 - 1	291431	Control Box Mounting Panel		1
2	289092	Control Box Door		1
	290932	…Control Box Label		1
	288836-001	…Type A Miniature Offset Hinge		1
	288836-002	…Type B Miniature Offset Hinge		1
*	289078	…Hinge Spacer (located behind hinge)		2
*	040213	…Neoprene Door Gasket		AR ft.
3	290931	Switch Panel		1
	040201	…Neoprene Switch Panel Gasket		12.5 ft.
4	494134-001	12 V Electric Fuel Gauge *(V16476 #06339-01)*		1
5	408596-001	Tachometer *(V16476 #71076-00)*		1
6	286699-001	Battery Voltmeter *(V16476 #06351-001)*		1
7	78A1120-001	Hour Meter Gauge *(V16476 #56288)*		1
8	78A1117-002	Oil Pressure Gauge *(V16476 #06340)*		1
9	287908	Water Temperature Gauge *(V16476 #06343)*		1
10	16DA2162	Rheostat Knob *(V44655 #5150)*		1
	286607-001	…Potentiometer		1
	402663	… Potentiometer Lock Nut		1
11	400642-003	DC Voltmeter *(V74542 #D-1007819T81)*		1
12	400641-012	DC Ammeter *(V74542 #D-1218619379)*		1
13	288999-001	Latch, Control Box		1
14	403189	Toggle Switch *(V1W134 #8946K613)*		2
15	30GH1119	Pushbutton Switch *(V13445 #9095-09)*		1
	406815	… Pushbutton Switch Boot *(V13445 #83280)*		1
16	HF2518-005	12 V Amber Pilot Light Assembly		1
*	404173	…Light Base *(V72619 #26-1310-11-301)*		1
*	404172-002	…Amber Lens *(V72619 #26-1133-300)*		1
*	IL11562	…Bulb *(V02929 Type 1815)*		1
17	HF2518-008	12 V Green Pilot Light Assembly		1
*	404173	…Light Base *(V72619 #26-1310-11-301)*		1
*	404172-003	…Green Lens *(V72619 #26-1192-300)*		1
*	400613-004	…Bulb *(V02929 Type 1815)*		1
18	290957	Toggle Switch *(V91929 #312TS1-59)*		2
19	290981	Toggle Switch *(V1W134 #8946K613)*		1
20	HF2518-007	28 V Green Pilot Light Assembly		1
*	404173	…Light Base *(V72619 #26-1310-11-301)*		1
*	404172-003	…Green Lens *(V72619 #26-1192-300)*		1
*	400613-003	…Bulb *(V02929 Type 757)*		1
* 21	291307	Control Box Housing		1
22	HF2518-002	12 V Red Pilot Light Assembly		1
*	404173	…Light Base *(V72619 #26-1310-11-301)*		1
*	404172-001	…Red Lens *(V72619 #26-1192-300)*		1
*	400613-004	…Bulb *(V02929 Type 1815)*		1
23	288020	Cover Support Bracket		2
24	286485-001	Sealing Gasket		124 in.
25	286388-001	Ring and Bushing Mount		4
	289104-001	…#10-24 Shoulder Screw		4
	286477-002	…Snubber Washer		4
	W11254-003	…#10 Brass Flat Washer		4

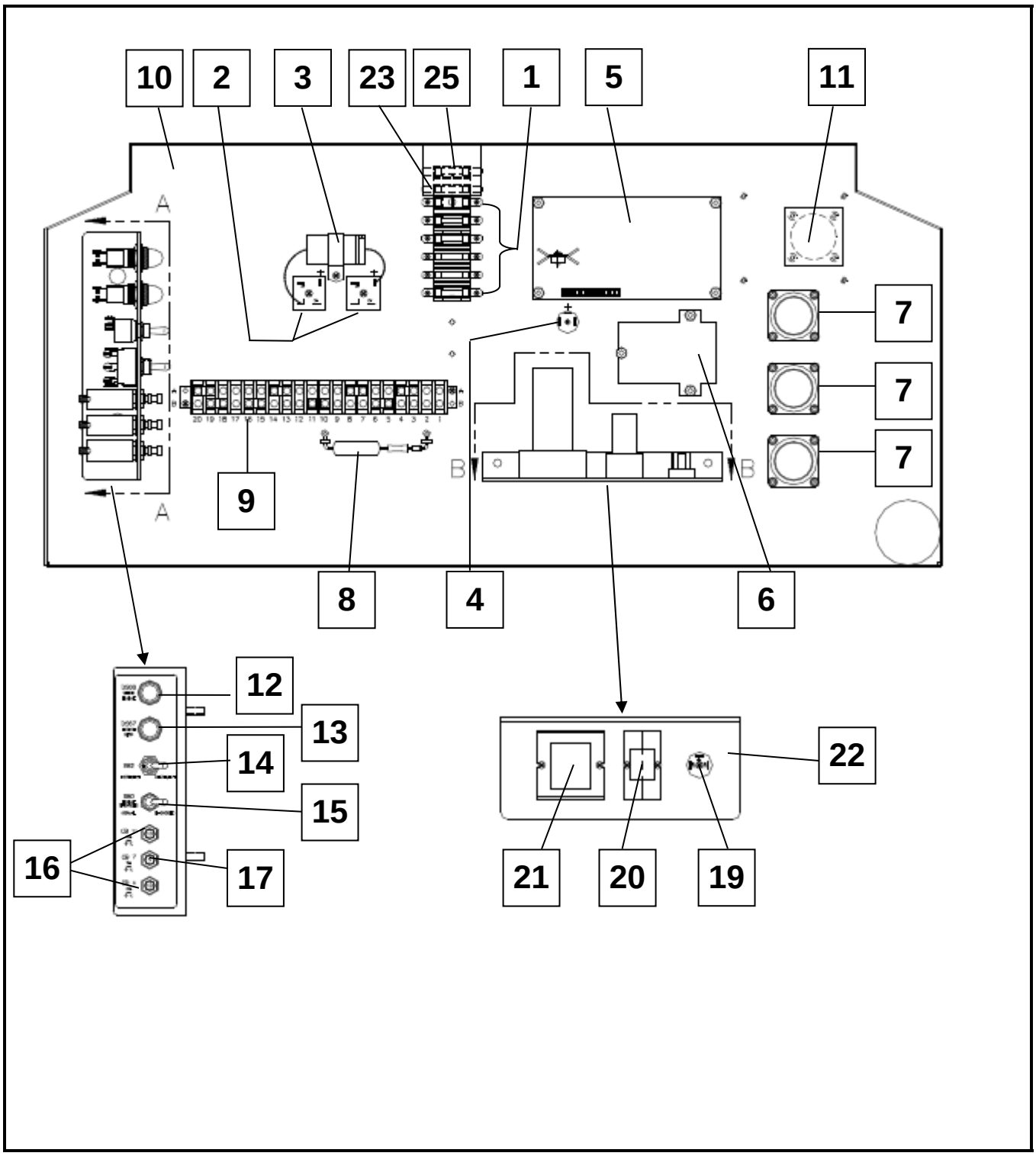


Figure 8 Control Box Interior Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
8 -	1	290958	6-Position Fuse Block *(V71400 #S8301-6)*		1
		W11166-003	…10 A Fuse *(V71400)*		5
	2	404065-002	Silicon Rectifier		2
	3	180593-003	100 MFD, 350VDC Capacitor Assembly		1
		W10051-014	…Plastic Wire Clamp		1
	4	407948	Isolated Base Rectifier *(V14552 #CT 106)*		1
	5	181022C-005	Regulator PC Board		1
*		84A1075	…Rubber Mount *(V5P059 #51083)*		4
	6	180289A	Overvoltage PC Board		1
*		84A1075	…Rubber Mount *(V5P059 #51083)*		3
*	7	290925-A	Control Box Wire Harness		1
	8	287621	…Resistor And Diode Assembly		1
	9	401937-004	Terminal Block		1
	10	291431	Control Box Mounting Panel		1
	11	286611	…Blank Label (when low fuel option is not used)		1
	12	HF2518-005	12 V Amber Pilot Light Assembly		1
*		404173	…Light Base *(V72619 #26-1310-11-301)*		1
*		404172-002	…Green Lens *(V72619 #26-1133-300)*		1
*		400613-004	…Bulb *(V02929 Type 1815)*		1
	13	HF2518-002	12 V Red Pilot Light Assembly		1
*		404173	…Light Base *(V72619 #26-1310-11-301)*		1
*		404172-001	…Red Lens *(V72619 #26-1192-300)*		1
*		400613-004	…Bulb *(V02929 Type 1815)*		1
	14	288339	Momentary Toggle Switch		1
	15	290959	Toggle Switch		1
	16	283978-002	10 A Circuit Breaker		2
	17	283978-001	5 A Circuit Breaker		1
	18	290947	Panel, Switches		1
		290949	…Bracket Label		1
	19	407948	Isolated Base Rectifier		1
	20	79B1140	12 VDC Relay		1
		408352	…Relay Socket		1
	21	290927	12 VDC Timer Relay-Settings: Mode"D",Range:"M" & Set to 4 minutes		1
		79B1138	…Relay Socket		1
	22	290948	Relay Support Bracket		1
	23	291865-001	Kit, Fuse, CE		1
		288303	…Fuse holder		Ref.
		W-11166-11	…Fuse, AGC 0.5 A 250 V		Ref.
	24	291864	Labels, Component, CE		1
	25	W11166-002	…Fuse, Fast Blow, AGC, 5 AMP		1

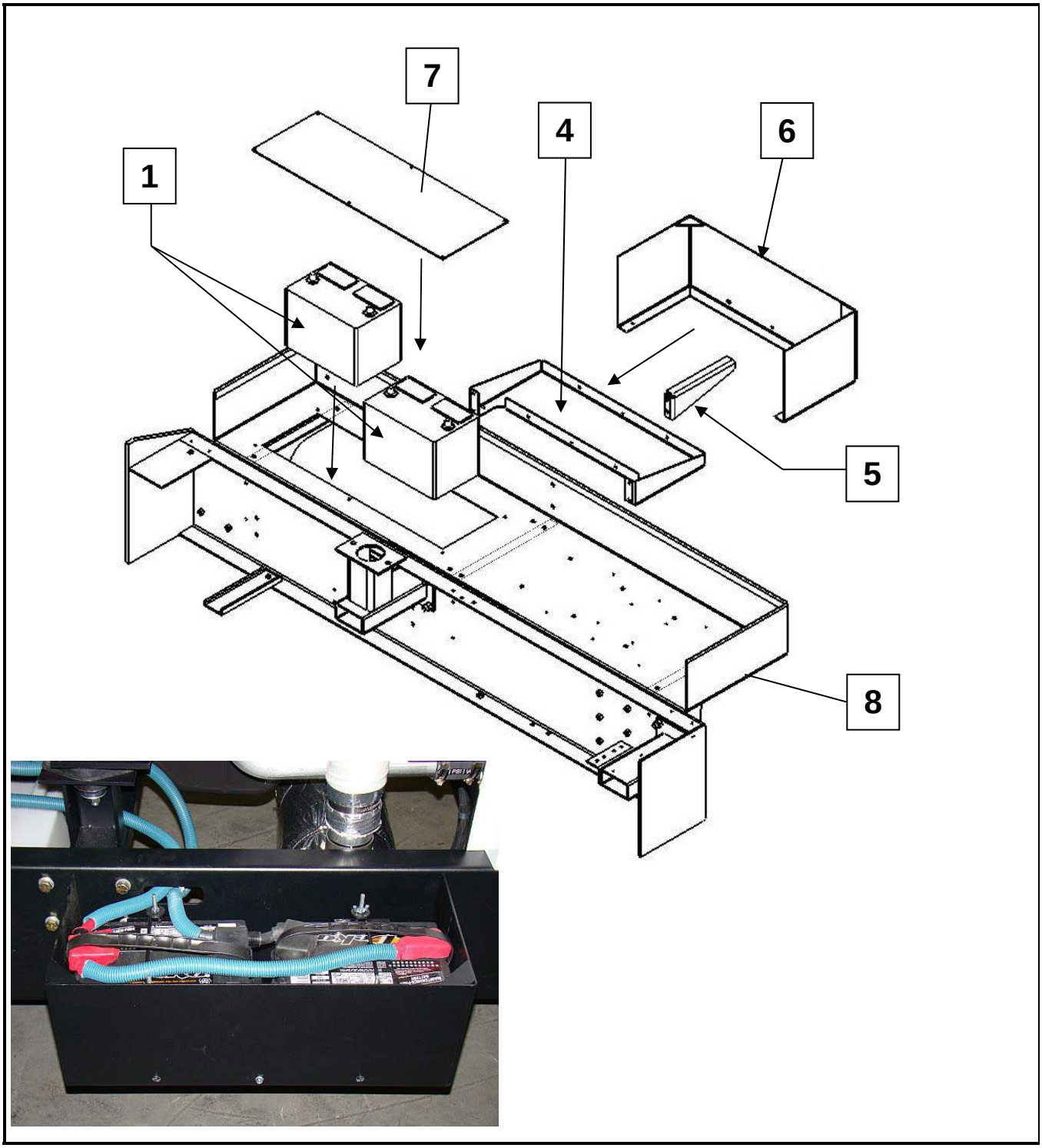


Figure 9 12VDC Battery Components

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
9 -	1	281881-001	12 VDC Battery *(V25710 #1231-PMF)*		2
		287796	…Battery Hold Down *(V3Y208)*		2
		494295	…Battery Hold Down Bolt *(V3Y208)*		4
*	2	290902	Negative Battery Cable *(V3Y208)*		1
*	3	291481	Positive Battery Cable *(V3Y208)*		1
	4	287795	Battery Tray		1
	5	291160	Battery Tray Support Bracket		1
	6	291067	Battery Tray Housing		1
	7	291093	Battery Cover		1
	8	291092	Cable Tray		2

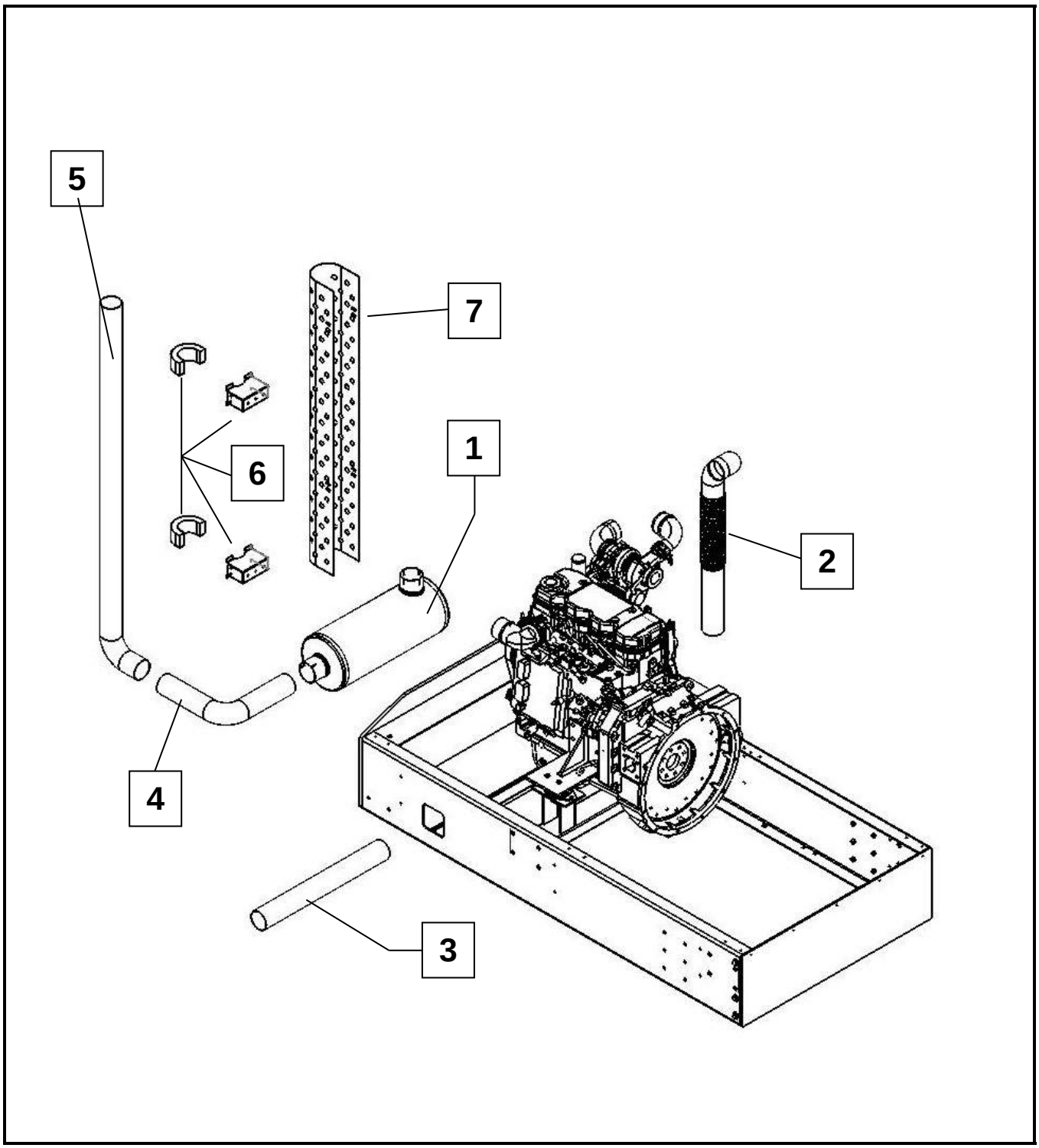


Figure 10 Exhaust System Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
10 -	1	291168	Muffler and Exhaust Ay.		1
		IN5016	…Muffler Wrap Insulation		3.5 ft^2
		288052-002	…Accuseal Clamp (3.0”)		2
	2	291077	Exhaust Flex Pipe Assembly		1
		EB5224	…Muffler Wrap Insulation		1.7 ft^2
		404154-013	…Full Circle Clamp (3.0”)		1
		W10869-006	…Stainless Steel Hose Clamp		7
	3	291169	Exhaust Outlet Pipe *(optional exhaust routing)*		1
		288052-002	…Accuseal Clamp (3.0”)		1
		EB5224	…Muffler Wrap Insulation		1.5 ft^2
		W10869-006	…Stainless Steel Hose Clamp		2
	4	291379	Exhaust Outlet Elbow		1
		288052-002	…Accuseal Clamp (3.0”)		1
		EB5224	…Muffler Wrap Insulation		3.0 ft^2
		W10869-006	…Stainless Steel Hose Clamp		2
	5	291380	Exhaust Pipe		1
		288052-002	…Accuseal Clamp (3.0”)		2
	6	291383	Stainless Steel Exhaust Clamp		2
	7	291382	Stainless Steel Exhaust Guard		1
*	8	291394	Exhaust Hole Cover (used to cover optional opening)		1

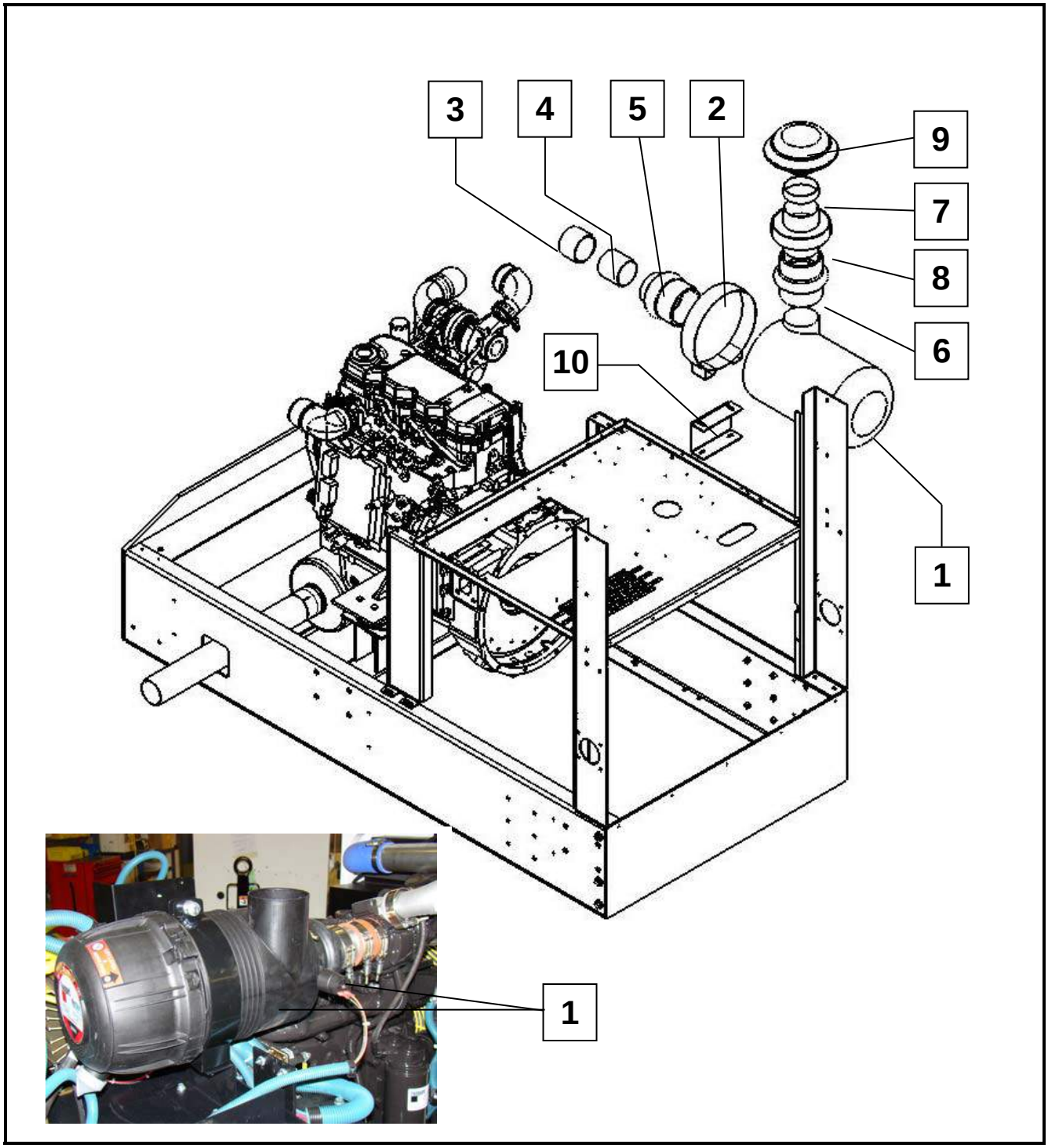


Figure 11 Engine Air Intake Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
11 -	1	290938	Air Cleaner *(V1DL99 # AH19261)*		1
		282918	…Air Restriction Indicator *(V18265 #REX77-0062)*		1
		282919	…Indicator Adapter Fitting		1
	2	290940	Air Cleaner Bracket *(V1DL99 # 3918197S)*		1
	3	290936	3 in. I.D. Straight Hose		1
	4	291453	Air Cleaner Tube		1
	5	288197-001	3 in to 4 in. Hump Hose Fitting *(V1DL99 # 3316617S)*		1
*		290597-001	…3 in Floating Bridge Clamp *(V54646 # 94143-0325)*		2
*		290597-006	…4.5 in Floating Bridge Clamp		1
			(V54646 # 94143-0450)		1
*		290597-007	…3.5 in Floating Bridge Clamp		1
			(V54646 # 94143-0350)		
	6	290953	4 in. Hump Hose Fitting		1
	7	290952	Hump Hose Sleeve		1
	8	290951	Intake Air Extension		1
	9	290939	Weather Hood *(V1DL99 # 3946458S)*		1
	10	291078	Air Filter Mounting Bracket		1

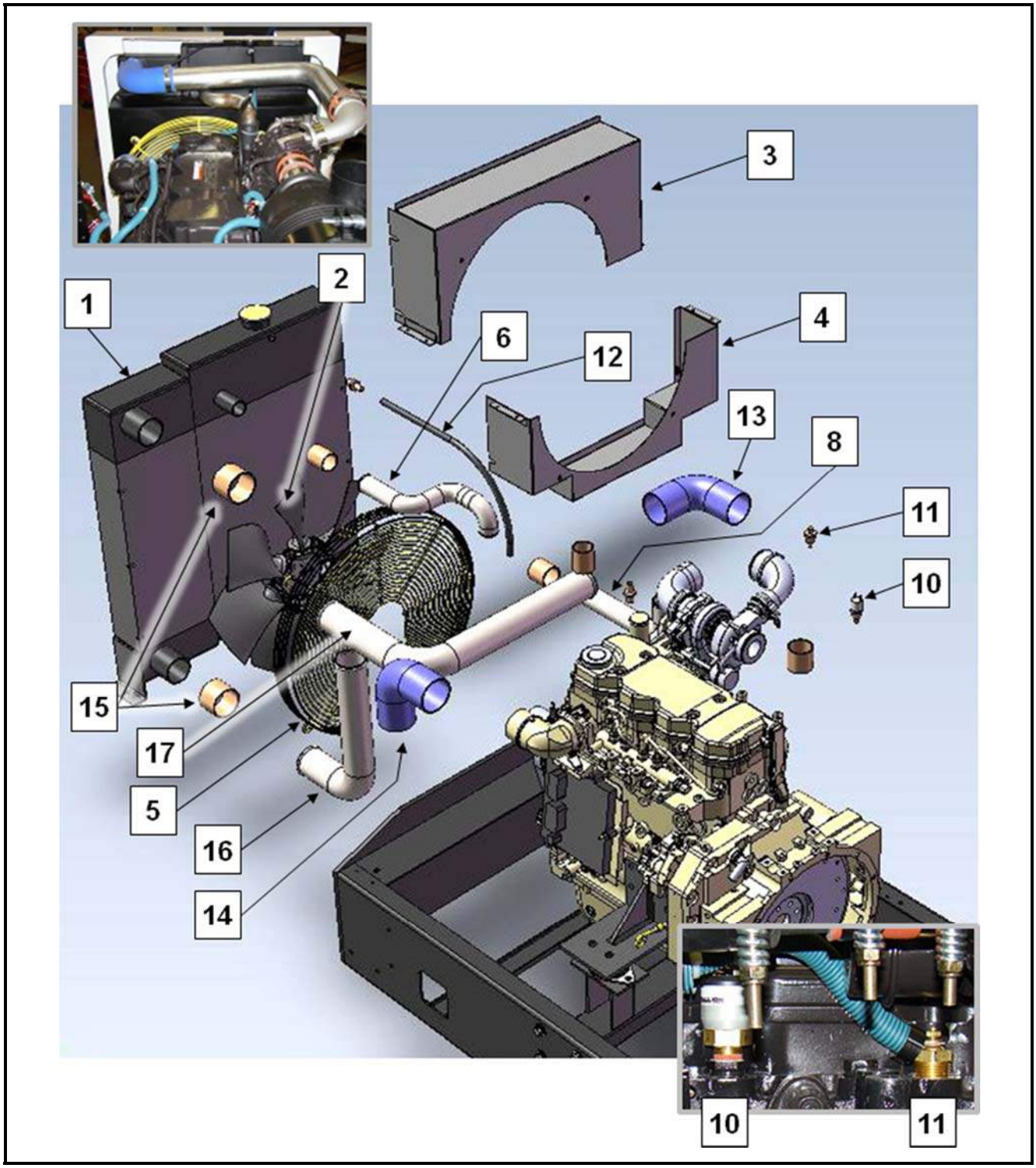


Figure 12 Engine Cooling System Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
12 -	1	291223	Radiator/CAC Assembly		1
*		290145	…Coolant Level Sensor		1
*		283873	…Radiator Drain Valve		1
	2	291224	Radiator Fan, 22” Diameter		1
	3	291070	Top Fan Shroud		1
		291097	…Access Panel		1
	4	291071	Bottom Fan Shroud		1
	5	291225	Fan Guard		1
	6	291072	Top Radiator Hose		1
	7	289200-001	…1.75” ID Hose (each piece is 3” long)		2
	8	291073	Bottom Radiator Hose		1
	9	289200-002	…2.25” ID Hose (each piece is 3” long)		2
	10	403782-002	210° F Shutdown Switch *(V75418 #1002-04880-36)*		1
	11	287909	Water Temperature Sender		1
*		W7814-004	…Bushing, Pipe, Steel 3/8 x 1/2		1
	12		Deaeration Line		1
		288123-001	…Male Connector		2
	13	289828	3.00” ID 90° Elbow		1
	14	289827	3.00” ID 90° Elbow		1
	15	290936	3.00” ID Connection Hose		2
	16	291075	CAC Intake Manifold Hose		1
*		290597-001	…CAC Cooler Hose Clamps		4
	17	291074	CAC Turbo Outlet Hose		1
*		290597-001	…CAC Cooler Hose Clamps		4

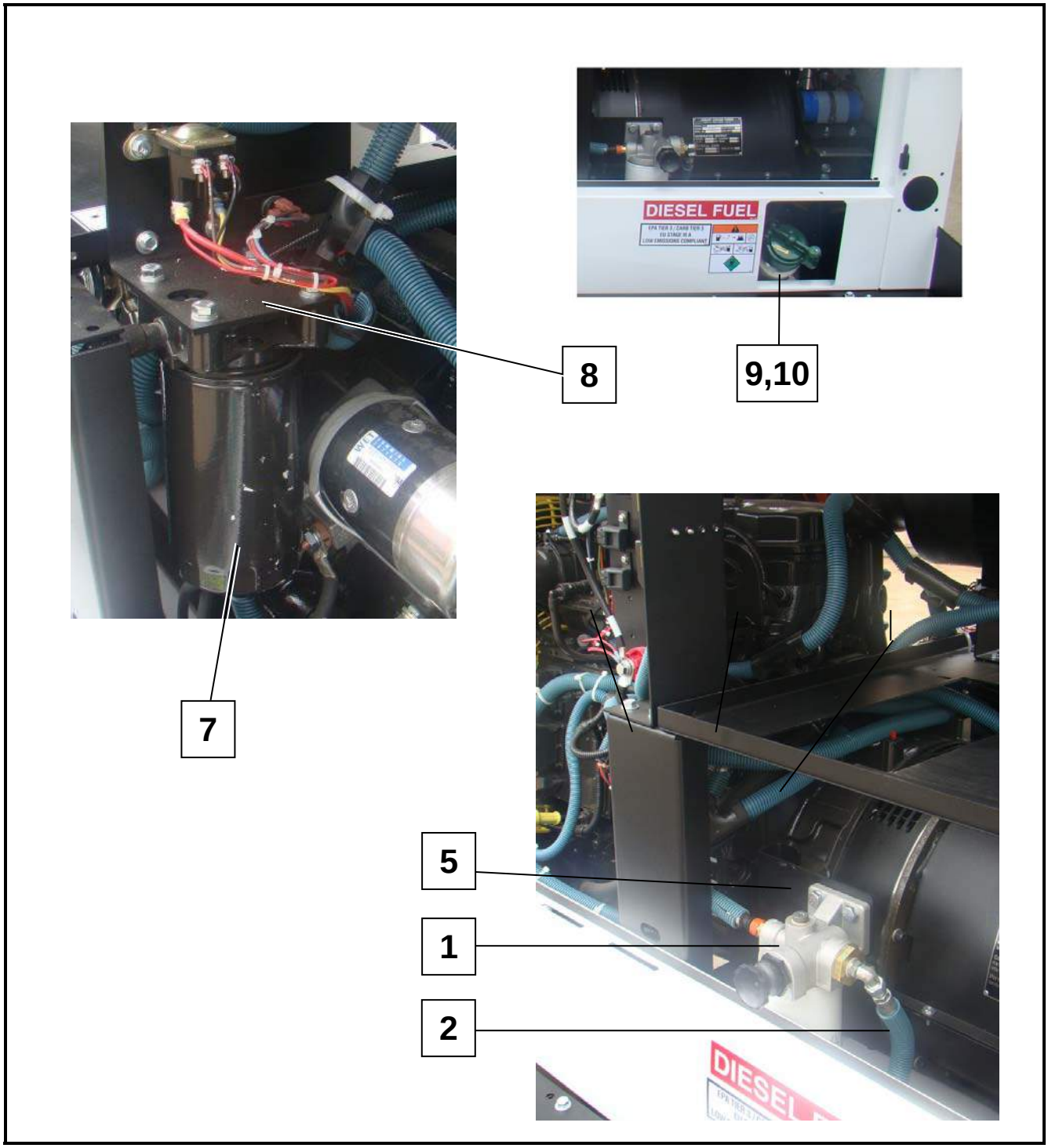


Figure 13 Fuel System Components

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
13 -	1	286897-031	Lubricity Fuel Filter		1
	2	290685	Tank to Filter Fuel Line		1
*		290388	…12 mm x 3/8 MJIC Adapter		1
*	4	Call Factory	Filter to Pump Fuel Line *(supplied with engine)*		1
	5	291076	Lubricity Fuel Filter Bracket		1
*	6	290686	Fuel Return Line		1
	7	286897-036	Filter, Primary Fuel		1
	8	289037	Primary Fuel Filter Bracket		1
	9	291420	50 Gallon Composite Fuel Tank (See Figure 2)		1
*		486719-005	…12 V Fuel Gauge Sender		1
*		291407	… Fuel Tank Bellypan		1
*		291408	… Fuel Tank Strap		2
*		291409	…Fuel Tank Rubber Strap		2
	10	282562	Cap, Fuel Fill, Diesel Green		1
	11	287461	Label, Fuel Warning		1
	12	76B1148	Diesel Fuel Label (near filler neck)		1

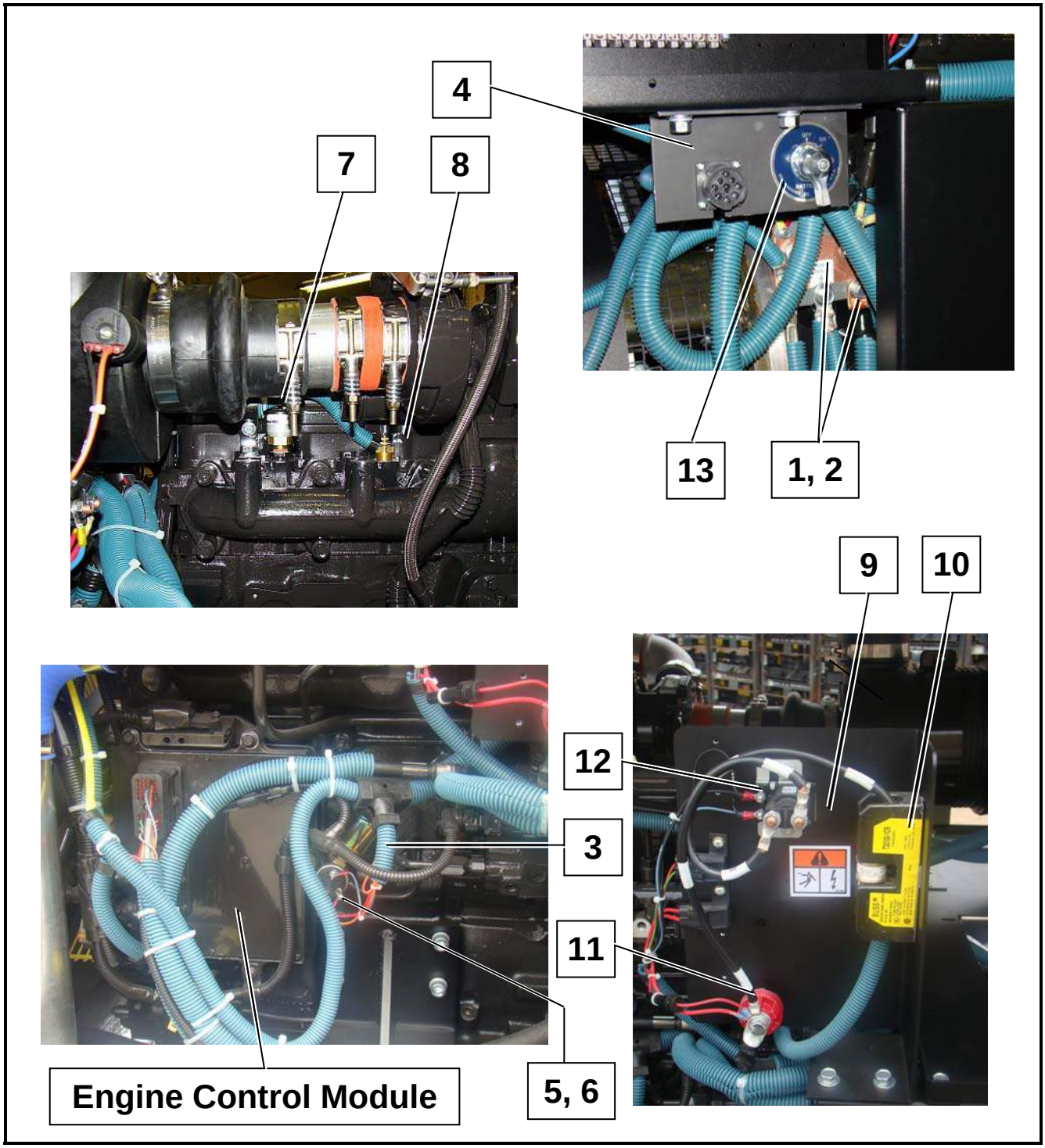


Figure 14 Engine Components

FIGURE - ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	QTY.
14 - 1	W9407-446	Ground Cable		2
2	287735	Ground Plate		1
	405548	…Label, Frame Ground		3
3	290918	Engine Wire Harness (shown throughout)		1
4	291334	Engine Dongle Panel		1
5	78B1118-002	Oil Pressure Sender *(V16476 # 109600)*		1
6	403809-002	Oil Pressure Switch		1
	W7814-000	… Bushing, Pipe, Steel, 1/4 x 1/8		1
	286903	… M14-1.5 x ¼ NPT Adapter		1
	W10910-000	…Tee Fitting		1
	W10750-001	…$^{1}/_{8}$ Pipe Nipple		1
7	403782-002	Water Temperature Switch		1
	W7814-004	…Bushing, Pipe, Steel 3/8 x 1/2		1
8	287909	Water Temperature Sender		1
9	291248	"E" Engine Parts Panel		1
10		**Engine Preheater Fuse Circuit**		
	287145-001	…Fuse Holder		1
	287144-002	…125 A Fast Acting Fuse		1
11	283154-001	Standoff Insulator		1
12	288331	Relay, Grid Heater		1
	489658-007	…Diode Assembly		1
13		**Engine Dongle and Battery Disconnect Panel**		Ref.
	291334	… Engine Dongle/Battery Disconnect Panel		1
	290831	… Battery Disconnect Switch		1
	290847	…… Battery Disconnect Plate		1
	291482	… Cable, Disconnect Switch to Starter		1
	W9360-289	… Cable, Disconnect Switch to Electronics Panel		1

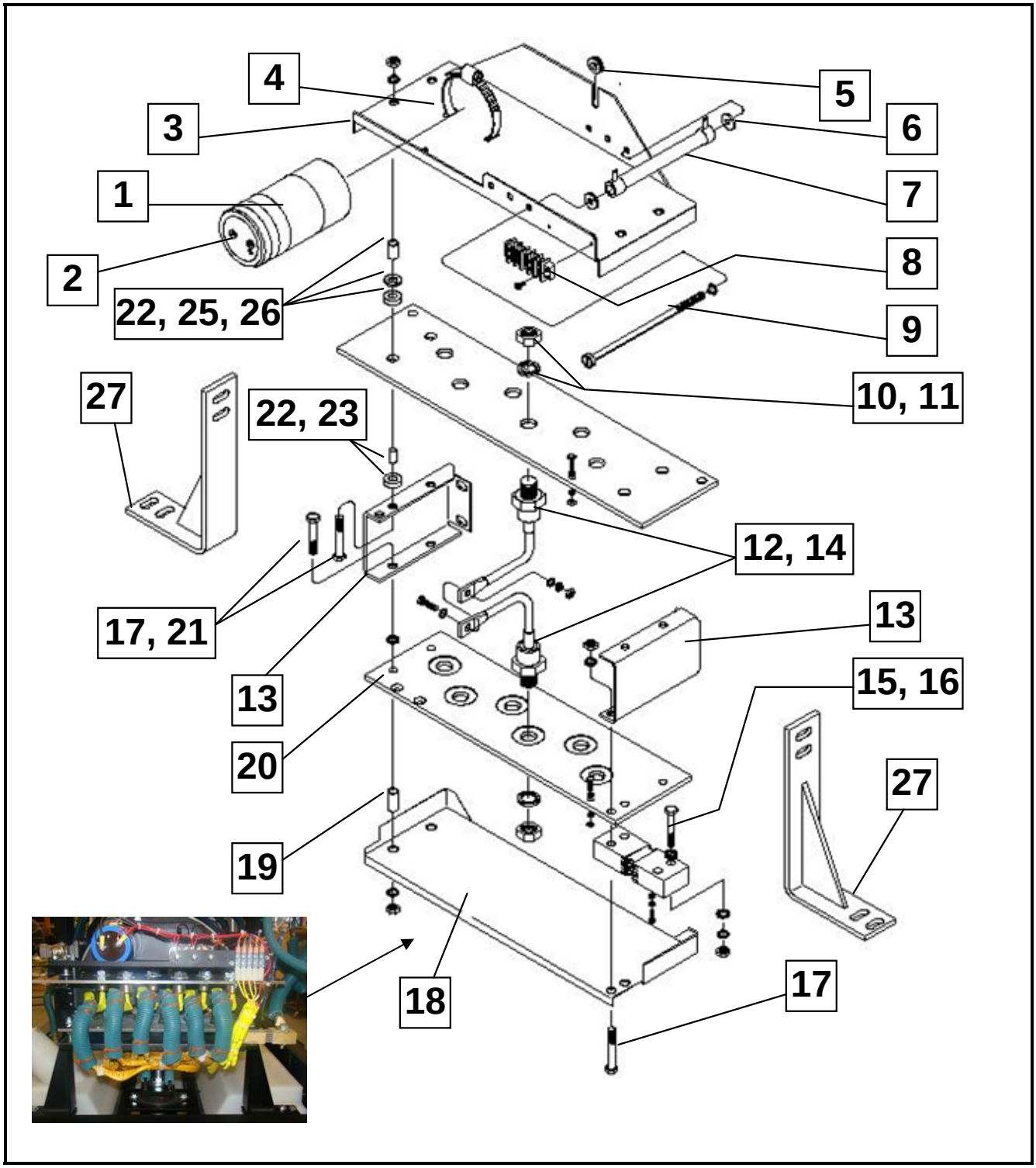


Figure 15 Rectifier Components

FIGURE - ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	QTY.
15 -	**288306**	**Rectifier Assembly**		**Ref.**
1	287184-003	Capacitor Insulator		1
2	405278-006	Capacitor, 90,000 MFD, 75 VDC		1
3	286887	Shroud, Air, Top, Rectifier		1
4	W10869-006	Capacitor Clamp		1
5	402037-004	Rubber Grommet		1
6	16DA3493	Insulating Washer		6
7	288380-001	10 OHM, 100 W Resistor *(V44655 #61917)*		3
8	400589-001	5 Station Terminal Block *(V6S553)*		1
		Preload Resistor Hardware		
9	W11114-012	…Screw, 1/4-20 X 7-1/4 inches Lg.		3
		Diode Hardware		
10	W11280-015	…Nut, Jam, Hex, 3/4-16		12
11	494681-001	…Spring Washer		12
12	DR11171	Positive Rectifier *(V81483 #300U30A)*		6
13	286884	Heat Sink Bracket		2
14	DR11170	Negative Rectifier *(V81483 #300UR30A)*		6
		Shunt Hardware		
15	W11097-007	…Screw, HHC, 3/8-16 x 2 inches Lg.		1
16	180065	2000 A Shunt		1
		Top and Bottom Connection Hardware		
17	W11097-007	…Screw , 3/8-16 x 2 inches Lg.		5
18	285647	Bottom Rectifier Air Shroud		1
19	180600	Rectifier Spacer		3
20	282239	Negative Rectifier Heat Sink		1
		Top and Bottom Connection Hardware		
21	W11097-022	…Screw , 3/8-16 x 2-1/2 inches Lg.		4
22	A25	Insulating Washer		8
23	AW626	Bushing, Insulating		4
24	286813	Positive Rectifier Heat Sink		1
		Top and Bottom Connection Hardware		
25	W11242-018	…Washer, Flat, 3/8”		8
26	283063	…Rectifier Spacer		8
27	291433	Rectifier Mounting Bracket		2
* 28	288015	Wire Harness		1
* 29	291358	Splice, Solder		3

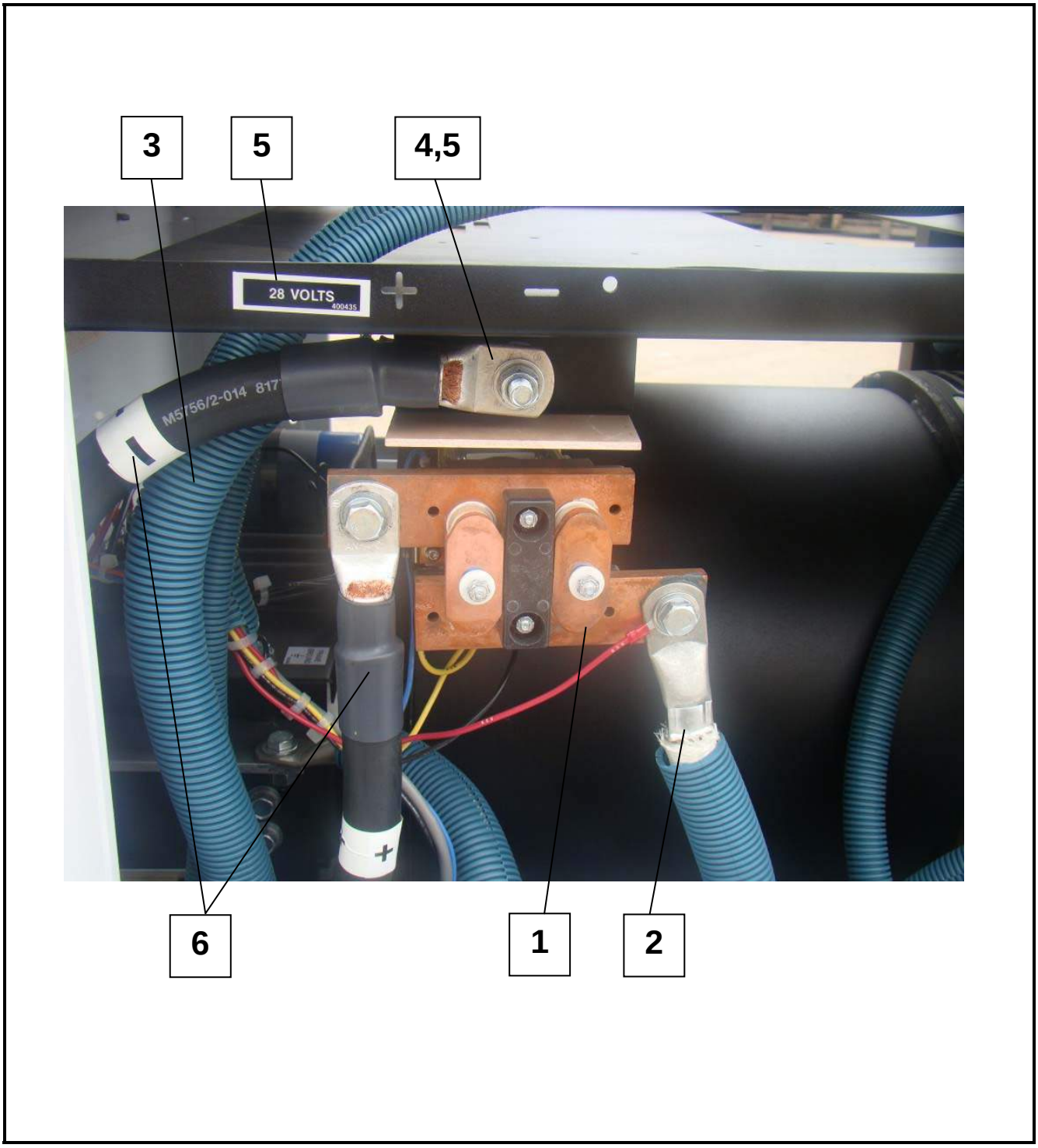


Figure 16 Contactor Components

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
16 -	1	286810-001	800 AMP DC Contactor *(V01XD4 #CT800A-24C2)*		1
		286849	…Contactor Insulator		1
*		489658-010	… Fly-back Diode		1
	2	W9218-251	Positive Output Cable		1
	3	W9218-251	Negative Output Cable		1
	4		**Negative Cable Connection**		
		A25	…Insulating Washer		2
		AW626	… Insulating Bushing		1
	5	400435	28 V Label		1
	6	402025-003	…30 ft DC Output Cable		1

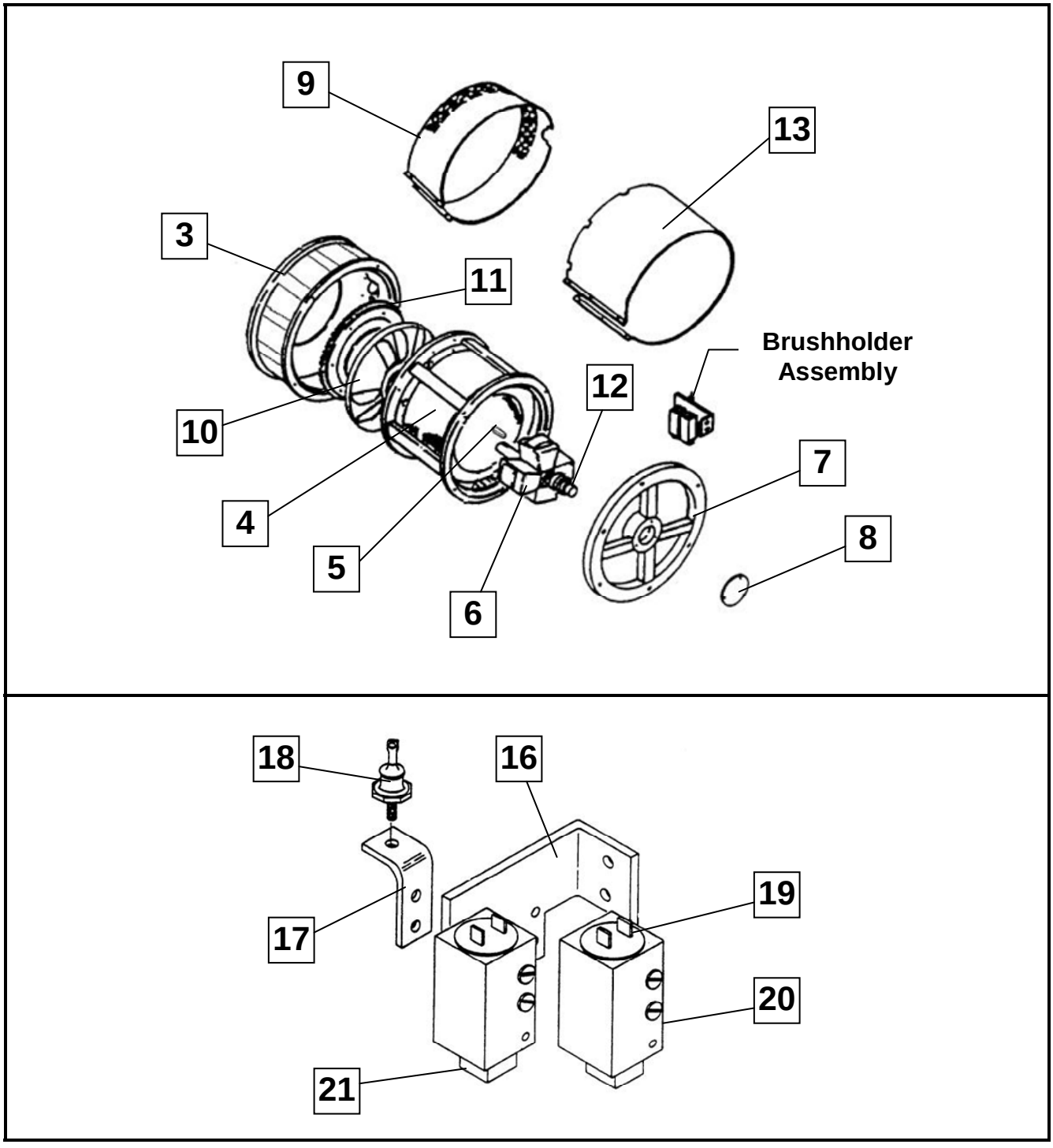


Figure 17 Generator Components and Brush Holder Assembly

FIGURE - ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	QTY.
17 -	1	288210	Spare Generator (Replacement Only)		1
*	2	284371-002	Shock Mount *(V5P059 # 51508-2)*		1
		288985	**Generator Assembly**		**Ref.**
	3	287564	Fan Housing		1
	4	288984-001	Housing & Stator Assembly		1
	5	489135	Coupling Key		1
	6	180776	Armature		1
	7	488555-001	Housing, Bearing Assembly		1
	8	287401	Bearing Cap		1
	9	288003	Fan Housing Cover		1
	10	290646	Fan and Coupling Assembly		1
*		85C1004-002	…Split Taper Bushing		1
	11		Flywheel - (Supplied with Engine)		Ref.
	12	354592	Slip Ring		2
	13	281688	Generator Housing Cover		1
*	14	W10072-063	Bearing, Rear *(V23803 #6207LLUC3)*		1
*	15	291262	Rear Generator Support Bracket		1
		488784	**Brush Holder Assembly**		**Ref.**
	16	488562	Brush Holder Bracket		1
	17	488628	Diode Bracket		1
	18	408999-001	Diode, Silicon, 30 A, Positive Assembly		1
	19	402531	Cap		2
	20	402530	Guide		2
	21	402788	Brush, AC		2
	22	489426	Chart, Wire, Brush Holder		1

This page intentionally left blank.

Chapter 5 Manufacturer's Literature

Vendor Literature

Type	Diagram Description
Engine	Operation and Maintenance Manual (Included) Parts Catalog: Cummins Bulletin #4056563 (Not included. Purchased separately from Cummins)

Diagram Number	Diagram Description
291870-A Rev. A	Diagram, Schematic & Connection

Contact ITW GSE if copies of these drawings or manuals are not with this manual (unless otherwise noted above). Refer to Appendix A for specific information on optional equipment for the JetEx6D, 28 VDC Generator Set.

This page intentionally left blank.

Appendix A Features

The following is a list of features available on the Standard and Deluxe JetEx6, 28.5 VDC Generator Set. This chart contains the description, part number, and document number (if applicable) of the feature.

Option/Features Available			
Description	**Part Number**	**Document Number**	**In This Section**
Kit, Block Heater, 120V	292215-001		
Kit, Block Heater, 240V	292215-002		
Battery Blanket, 120V	287917		
Battery Blanket, 240V	287917-001		
Support, Fork Lift Assembly	291374		
Kit, Tie-Down	284706		
Kit, CE Certification, Trailer	287589-020		
Kit, Clearance Lights	288234		
Package, 120 VAC Generator (Factory Inst.)	181735		
Package, 120 VAC Generator (Field Inst.)	181735-001		
Reel, Grounding	83A1103		
Kit, Unit Operating Light, Specify Color(Amber or Blue)	288482-XXX		
Kit, Cable Interlock	289942		
Kit, Wheel Chocks	287609		
Kit, Low Fuel Beacon	291365-XXX		
Cable, Output, 28 VDC [different lengths available]	402025-XXX		
Kit, Cable Tray Rollers	288987-006		
Kit, Non Split C Cable	292230		

Write: ITW GSE
Technical Support
11001 US Highway 41, North
Palmetto, FL 34221 U.S.A.

Call Inside U.S.A./Canada: (866)-845-0441 (Parts)
(877) 874-5322 (Technical Support)

Call From Foreign Countries: (941) 721-1092 (Technical Support)
(941) 721-1000 (Spare Parts)

FAX inside U.S.A. (877) 874-5321

FAX From Foreign Countries: (941) 721-1091

E-Mail: technicalsupport@itwgse.us
parts@itwgse.us

Web Page: www.itwgse.com

This page intentionally left blank.

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.

This page intentionally left blank.

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

ZONE	LTR	DESCRIPTION	ECR NO.	REV BY	DATE	APPD
	A	PRELIMINARY RELEASE	FP13516	EFU	7/26/16	DJ
	B	SHT6 @ J43 & S408 "F413" WAS "F411"	FP13601	GSB	01-16-17	CMD

NOTES:

1. APPLICABLE DRAWING STANDARDS/SPECIFICATIONS:
   ASME Y14.5M, DIMENSIONS AND TOLERANCES.
   ASME Y14.100, ENGINEERING DRAWING PRACTICES.

LEGEND

AB(+)	AUX, POSITIVE BATTERY TERMINAL
A401	SENDER, WATER TEMPERATURE
A402	SENDER, OIL PRESSURE
A404	SENSOR, AIR RESTRICTION
B401	STARTER, ENGINE
BH1	PRE-HEATER
BT401	BATTERY, 12 V.
BT402	BATTERY, 12 V.
C401	CAPACITOR, 41,000 MFD., 75 V.
C403	CAPACITOR, 100 MFD., 350 V.DC
CB4	BREAKER, CIRCUIT, 10 A.
CB7	BREAKER, CIRCUIT, 5 A.
CB11	BREAKER, CIRCUIT, 10 A.
CR401-CR402	RECTIFIER, BLOCKING
CR403-CR404	DIODE, BLOCKING
CR405-CR410	DIODE, NEGATIVE
CR411-CR416	DIODE, POSITIVE
CR417,CR418	RECTIFIER, CONTROL WINDING
CR419-CR422	DIODE, FLYBACK (WHEN FURNISHED)
CR425	DIODE, FLYBACK (WHEN FURNISHED)
CR426	DIODE, BLOCKING
CR427	DIODE, FLYBACK
DS9	LIGHT, SPOT WITH SWITCH (WHEN FURNISHED)
DS67, DS68	LIGHT, ENGINE DIAGNOSTIC
DS70	LIGHT, STRIP, CONTROL BOX
DS403-DS406	LIGHT, MARKER, AMBER
DS407	INDICATOR, ENGINE RUNNING, GREEN
DS408	INDICATOR, CONTACTOR CLOSED, GREEN
DS412	INDICATOR, RESTRICTION, AIR, RED
DS413	BEACON, UNIT OPERATING (WHEN FURNISHED)
DS414	BEACON, LOW FUEL (WHEN FURNISHED)
DS421	LIGHT, OIL PRESSURE GAUGE, WHITE
DS422	LIGHT, WATER TEMPERATURE GAUGE, WHITE
DS423	LIGHT, FUEL LEVEL GAUGE, WHITE
DS424	LIGHT, VOLTMETER GAUGE, WHITE
DS425	LIGHT, TACHOMETER GAUGE, WHITE
DS426	LIGHT, PRE-HEATER
ECM1	CONNECTOR, ELECTRONIC CONTROL MODULE (MAIN)
ECM2	CONNECTOR, ELECTRONIC CONTROL MODULE (DONGAL)
ECM4	CONNECTOR, ELECTRONIC CONTROL MODULE (POWER)
F23	FUSE, SPOT LIGHT, IN-LINE, 10 A, 250V, AGC (WHEN FURNISHED)
F101	FUSE, "E" ENGINE, 5 A., 32V, ATO
F102	FUSE, ECM POWER, 30 A., 32V, ATO
F104	FUSE, ECM DONGLE, 1A, 250V, AGC
F110	FUSE, PRE-HEATER, 125 A., 160 VDC, CLASS T
F403	FUSE, VOLTAGE REGULATOR, 10 A., 32V, AGC
F405	FUSE, VOLTAGE BUILD-UP, 10 A., 32V, AGC
F406-F408	FUSE, CONTROL WINDINGS, 10A., 32V, AGC
F411	FUSE, 28 V .DC PROTECTION, 5A, 250V, AGC (WHEN FURNISHED)
F412	(REPLACEMENT) FUSE, 20A, 250V, AGC (WHEN NEEDED)
F413	FUSE, ISO6858 INTRLK, 5A, 250V, AGCD)
G401	ALTERNATOR, ENGINE, 12 V.
G402	GENERATOR STATOR
GP1	GROUND PLATE
J1, J2	RECEPTACLE, LOW FUEL BEACON (WHEN FURNISHED)
J404, J405	RECEPTACLE, VOLTAGE REGULATOR
J43	RECEPTACLE, RECTIFIER
J46	RECEPTACLE, POWER
J47	RECEPTACLE, ENGINE
K104	RELAY, GRID HEATER
K402	LOAD CONTACTOR
K403	RELAY, OVERVOLTAGE
K406	RELAY, FOUR MINUTE TIMER
K407	RELAY, TIMER
K408	RELAY, LOW FUEL (WHEN FURNISHED)
K409	RELAY, UNIT OPERATING LIGHT (WHEN FURNISHED)
L401	SOLENOID, STARTER
L402	SOLENOID, STARTER CUT-OUT
L406	FIELD, REVOLVING, GENERATOR
M401	VOLTMETER, BATTERY
M402	RUNNING TIME METER
M403	TACHOMETER
M404	GAUGE, WATER TEMPERATURE
M405	GAUGE, OIL PRESSURE
M406	VOLTMETER, GENERATOR
M407	AMMETER, GENERATOR
M408	GAUGE, FUEL, ELECTRIC
P1, P2	PLUG, LOW FUEL BEACON (WHEN FURNISHED)
P43	PLUG, RECTIFIER
P46	PLUG, POWER
P47	PLUG, ENGINE
P404	PLUG, VOLTAGE REGULATOR
R402	POTENTIOMETER, CURRENT LIMITING, 10 K.OHM, 2W.
R403-R405	RESISTOR, 10 OHM, 100W.
R406	RESISTOR, 50 OHM, 10 W.
R407	SHUNT, AMMETER
R408	SENDER, GAUGE, FUEL, ELECTRIC
R410	RESISTOR, 180 K OHM, 1/4 W.
R412	RESISTOR, 62 OHM, 5 W.
S80	SWITCH, ENGINE DIAGNOSTIC
S82	SWITCH, INCREMENT-DECREMENT
S401	SWITCH, PUSHBUTTON, ENGINE START
S402	SWITCH, WATER TEMPERATURE
S403	SWITCH, OIL PRESSURE
S404	SWITCH, ENGINE, START-RUN-DELAYED SHUTDOWN
S405	SWITCH, ILLUMINATING LIGHTS
S406	SWITCH, SPEED CONTROL (SHOWN IN "IDLE" POSITION)
S408	SWITCH, CONTACTOR, CLOSE-ON-OFF
S412	SWITCH, PUSHBUTTON, THERMOSTART
S413	SWITCH, PUSHBUTTON, EMERGENCY STOP
S413A	SWITCH, EMERGENCY STOP, MALE CONNECTOR
S413B	SWITCH, EMERGENCY STOP, FEMALE CONNECTOR
S416	SENSOR, COOLANT LEVEL
S417	SWITCH, MASTER DISCONNECT
TB1	TERMINAL BLOCK, CONTROL BLOCK
TB3	TERMINAL BLOCK, RECTIFIER
VR402	VOLTAGE REGULATOR, GENERATOR

THIRD ANGLE PROJECTION

FILE NO. 291870-A

MATERIAL:

500074-A	JET-EX 6	
NEXT ASSY.	USED ON	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES TOLERANCES ON:
FRACTIONS ±1/32 DECIMALS .XX=± .03 .XXX=± .015 ANGLES ±.50

DRAWN	EFU	07/26/16
CHECKED	DJ	07/26/16
ENGINEER	EFU	07/26/16
APPROVED		

ITW GSE
11001 US HWY. 41 NORTH, PALMETTO, FLORIDA 34221

DIAGRAM, SCHEMATIC & CON DISTRIBUTION

SIZE	CAGE	DRAWING NO.	REV.
D	12867	291870-A	B

SCALE NONE | WEIGHT | SHEET 1 OF 6

BT401 BT402 S417 TO AB+ L401 B+ S A B401 CR402 CR421 L402 S401 CB11 10A. S405 DS70 DS421 DS422 DS423 DS424 DS425 DS403 DS404 DS405 DS406 AMBER MARKER LIGHTS (WHEN FURNISHED)

C403 CR417 CR418 R410 F405 10A. F407 10A. F408 10A. F406 10A. G402 CR419 L406 F403 10A.

SPOTLIGHT (WHEN FURNISHED) F23 DS9

K406 C S K407 R408 G S I M408 CB4 10A. S80 NC O P S403 S402 F101 5A. ECM1 K407 CR426 E-STOP S413 1 2 S404 K406 S80 NO DS68 DS67 DS412 A404 S416 S82 S80 NO

CR403 R406 IND B+ A G401 M403 DS407 M402 M401 M404 M405 A401 A402 S406

G402 G402 5,11 3,9 6,12 4,10 2,8 1,7 CR410 CR409 CR408 CR407 CR406 CR405 CR416 CR415 CR414 CR413 CR412 CR411

K403 C401 M406 R403 R404 R405 S406 RATED RPM CR401 CE FUSE (OPTIONAL) F412 20A R402 CW P404 J404 8 6 2 10 9 1 7 4 3 VR402 1 3 P405 J405

S408 CB7 5A. CR422 DS408 CR427 Y X K402 S406 K403 RATED RPM P T INTERLOCK

K407 DS413 UNIT OPERATING LIGHT (WHEN FURNISHED)

BH1 F110 125A AB+ TO S417 K104 F104 10A F102 30A DS426 ENGINE PRE-HEATER

M407 R407 + − + 28.5V. D.C. OUTPUT

A B C D E ECM2 1 3 ECM4 ENGINE DATA LINK

ECM1 pins: 39, 44, 43, 28, 32, 24, 25, 2, 4, 34, 42, 40, 46, 47, 37

MATERIAL:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES TOLERANCES ON:
FRACTIONS ±1/32 DECIMALS .XX=± .03 .XXX=± .015 ANGLES ±.50

ITW GSE
11001 US HWY. 41 NORTH, PALMETTO, FLORIDA 34221

DIAGRAM, SCHEMATIC & CON DISTRIBUTION

DRAWN	EFU		07/26/16
CHECKED	DJ		07/26/16
ENGINEER	EFU		07/26/16
APPROVED			

SIZE	CAGE	DRAWING NO.	REV.
D	12867	291870-A	B

SCALE NONE WEIGHT SHEET 2 OF 6

500074-A	JET-EX 6	
NEXT ASSY.	USED ON	

FILE NO. 291870-A

THIRD ANGLE PROJECTION

P46

L401 + 200 YL
251 BK GP1
204 BU S413A-1
L402-1 205 YL
BK 253 GP1
203 RD S413A-2

BT401
290902 GP1
291481 S417
BT402

221 BK GP1
215 RD P47-34
R408
FUEL TANK

G401
ALTERNATOR
L401 + 246 BK
B+
B 208 RD P47-3
A 209 BR P47-8
GRD
GP1 239 BK

MASTER DISCONNECT
S417
BT401+ 291481
289 AB+
291482 L401+

WATER TEMPERATURE SWITCH
S403-NO 240 RD
P47-28 212 RD
P47-12 211 BR
NO
C
NC
S402

STARTER CUTOUT
L402
L401-S 225 RD
CR402 228 RD
205 YL P46-6
CR402 229 BR
226 BK GP1
CR421

WATER TEMPERATURE SENDER
A401
P47-35 216 YL

COOLANT LEVEL
S416
ECM-28 236 BU
ECM-32 237 GY

AIR RESTRICTION
A404

CR402
L402-2 228 RD
S403-NC 230 BU
229 BR L402-3

P43
R407 301 BU
K402-SWITCH 303 BU
CONTROL PIN 323 RD
R407 300 BU
K402-SWITCH 302 YL
K402 305 RD
TB3-B2 308 YL
315 SPLICE 309 SHIELD
TB3-A3 311 BU
TB3-A4 312 BR
306 BK GRD-GEN. HSG.
304 BK K402
307 RD TB3-B1
309 RD R407
310 BK GRD-GEN. ENG.
313 OR TB3-A5
309 WT R407

P47
G401-B 208 RD
F101-A 227 GN
S403-C 206 OR
ECM1-24 222 WT
ECM1-2 210 GY
S402-NC 211 BR
ECM1-44 232 OR
ECM1-46, ECM2-C 250 RD
ECM1-47, ECM2-D 250 BK
ECM1-34 202 YL
R408 215 RD
A401 216 YL
ECM1-4 207 GN
209 BR G401-A
233 BK K104-1
223 BK ECM1-25
252 BU K104-2
231 RD ECM1-43
212 RD S402-C
250 DRAIN ECM1-37, ECM2-E
214 YL DS403/404
218 BU A404-1
213 YL DS405/406
OR 217 A402

OIL PRESSURE SWITCH
S403
NO
NC
P
240 RD S402-C
230 BU CR402
P47-1 206 OR

STARTER SOLENOID
L401
S417 291482
G401 + 246 BK
P46-1 200 YL
L402-2 225 RD
B+
S
W9407-446 GP1
B401
STARTER

OIL PRESSURE SENDER
A402
P47-36 217 OR

S413A S413B
P46-5 204 BU
P46-4 203 RD
220 BU S413-1
219 RD S413-2
S413B-1 220 BR
219 RD S413B-2
S413
E-STOP

C401
NEG. HEAT SINK 316 BK
R403 - 318 BK
R403 + 319 RD
POS. HEAT SINK 317 RD
66 YL TB3-A2
65 RD TB3-A1

G402
310 BK P43-27
306 BK P43-13
315 BK SPLICE 309
322 BK NEG. HEAT SINK
320 BK

R403 R404 R405
C401 - 318 BK
C401 + 319 RD
RD 321

63 YL
64 RD
CR419
L406
SLIP RINGS

P43-33 313 OR
P43-31 312 BK
P43-29 311 BU
CR419 66 YL
CR419 65 RD
"A" SIDE
"B" SIDE
C B A
SOLDER SPLICE
28 VOLT DC OUTLET
TB3
307 RD P43-15
308 YL P43-17

DC CONTACTOR
K402
305 RD P43-11
302 YL P43-5
304 BK P43-9
303 BU P43-7
314 YL
CR427

CR413 CR412 CR415 CR411 CR416 CR414
317 RD C401 +
C401 - 316 BK
322 BK GRD-GEN. ENG.
R407
10 CR407
8 CR406
9 CR409
7 CR405
11 CR410
12 CR408
4 2 3 1 5 6
300 BU P43-1
309 WT P43-19
309 RD P43-21
301 BU P43-3

P46-7 253 BK
ECM4-1 241 BK
ECM2-A 244 BK
L402-3 226 BK
A404-2 224 BK
R408 221 BK
251 BK P46-2
239 BK G401-GND
GRD STUD ON FRAME
GP1
W9407-446
L401 W9407-446
BT401 - 290902
GROUND PLATE

A) FP12546 11/25/13
B) FP12684 3/13/14
C) FP12687 3/19/14
D) FP12750 6/12/14
E) FP13470 5/25/16

COLOR CODE			
BK	BLACK	RD	RED
BU	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GN	GREEN	WT	WHITE
GY	GRAY	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT(PREFIX)

THIRD ANGLE PROJECTION

FILE NO. 291870-A

MATERIAL:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES TOLERANCES ON:
FRACTIONS ±1/32 DECIMALS .XX=± .03 .XXX=± .015 ANGLES ±.50

DRAWN	EFU	07/26/16	
CHECKED	DJ	07/26/16	
ENGINEER	EFU	07/26/16	
APPROVED			

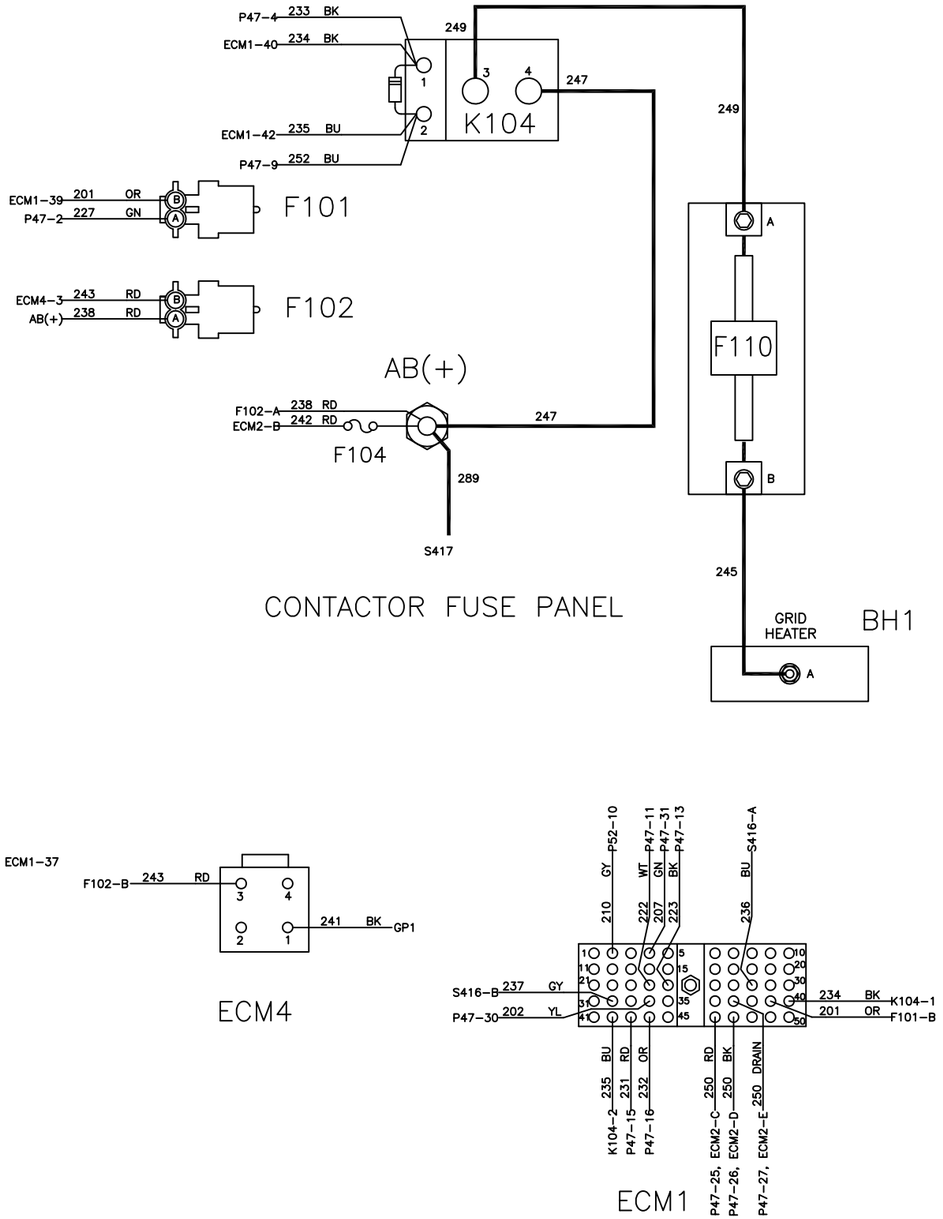
500074-A JET-EX 6
NEXT ASSY. USED ON

ITW GSE
11001 US HWY. 41 NORTH, PALMETTO, FLORIDA 34221

DIAGRAM, SCHEMATIC & CON DISTRIBUTION

SIZE	CAGE	DRAWING NO.	REV.
D	12867	291870-A	B

SCALE NONE | WEIGHT | SHEET 3 OF 6



COLOR CODE			
BK	BLACK	RD	RED
BU	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GN	GREEN	WT	WHITE
GY	GRAY	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT(PREFIX)

THIRD ANGLE PROJECTION

FILE NO. 291870-A

MATERIAL:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES TOLERANCES ON:
FRACTIONS ±1/32 DECIMALS .XX=± .03 .XXX=± .015 ANGLES ±.50

DRAWN	EFU	07/26/16	
CHECKED	DJ	07/26/16	
ENGINEER	EFU	07/26/16	
APPROVED			

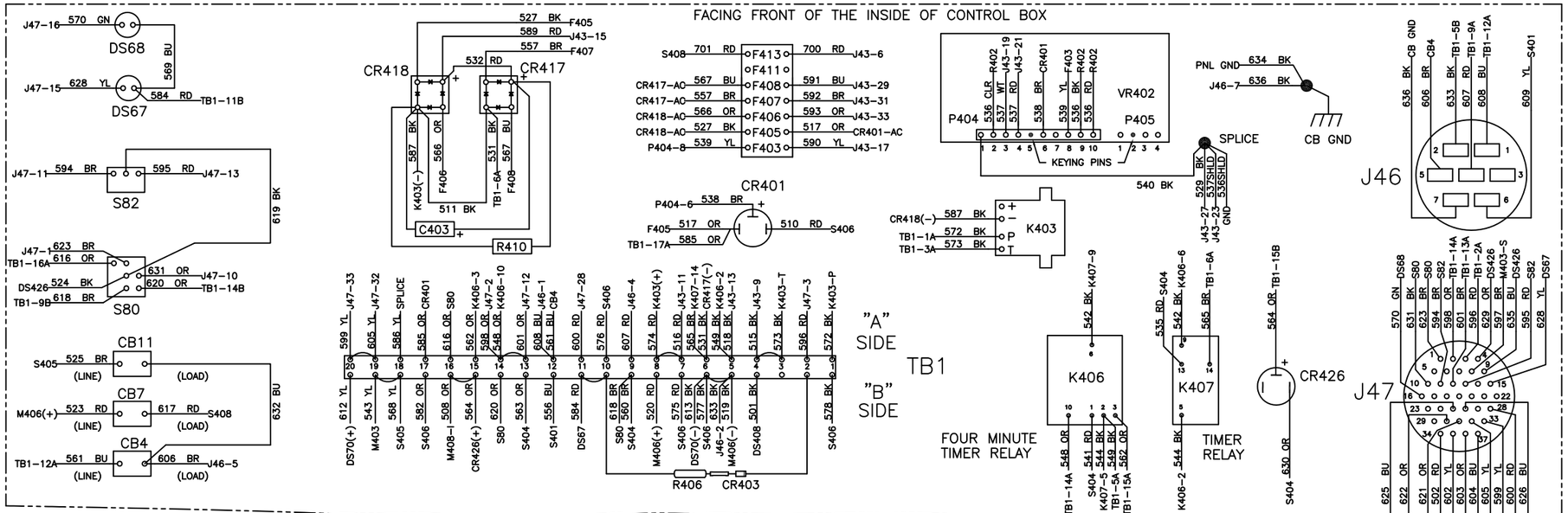
500074-A | JET-EX 6
NEXT ASSY. | USED ON

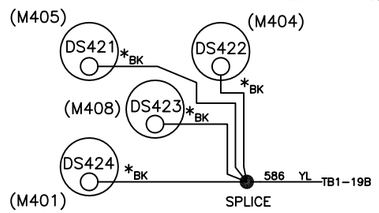
ITW GSE
11001 US HWY. 41 NORTH, PALMETTO, FLORIDA 34221

DIAGRAM, SCHEMATIC & CON DISTRIBUTION

SIZE	CAGE	DRAWING NO.	REV.
D	12867	291870-A	B

SCALE NONE | WEIGHT | SHEET 4 OF 6





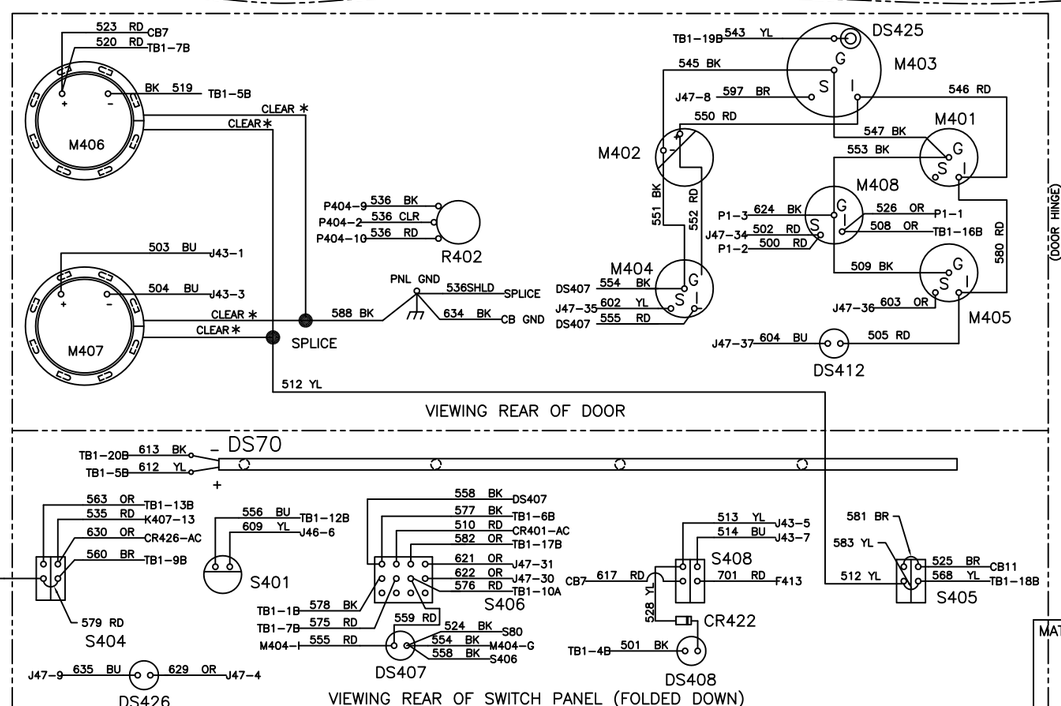


DIAGRAM OF INSTRUMENT LIGHTS

NOTES:

1. * WIRES FURNISHED
2. WHEN USING TWO QUICK CONNECT TERMINALS ON THE SAME CONNECTION FOR THE LIGHTS, (EX. DS407) POSITION THE SECOND QUICK CONNECT TERMINAL TOWARD THE OUTSIDE OF THE LIGHT TO PREVENT A POSSIBLE SHORT.

DIAGRAM EXPLANATION
PART DESIGNATOR (END OF WIRE)
WIRE NUMBER / WIRE COLOR
TB4 — 27 RD — ABOVE OR LEFT OF WIRE

COLOR CODE			
BK	BLACK	RD	RED
BU	BLUE	TN	TAN
BR	BROWN	VT	VIOLET
GN	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

THIRD ANGLE PROJECTION

FILE NO. 291870-A

500074-A	JET-EX 6	
NEXT ASSY.	USED ON	

MATERIAL:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES TOLERANCES ON:
FRACTIONS ±1/32 DECIMALS .XX=± .03 .XXX=± .015 ANGLES ±.50

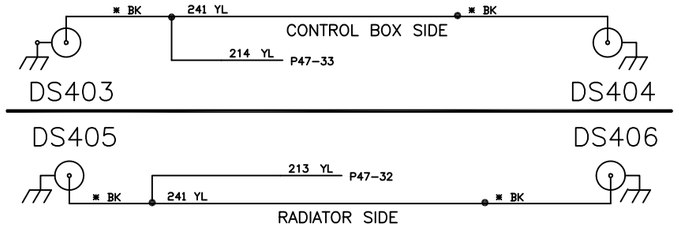
DRAWN	EFU	07/26/16
CHECKED	DJ	07/26/16
ENGINEER	EFU	07/26/16
APPROVED		

ITW GSE
11001 US HWY. 41 NORTH, PALMETTO, FLORIDA 34221

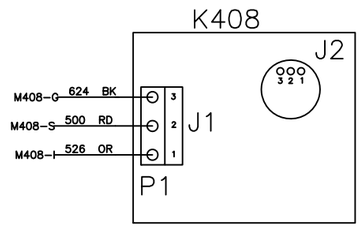
DIAGRAM, SCHEMATIC & CON DISTRIBUTION

SIZE	CAGE	DRAWING NO.	REV.
D	12867	291870-A	B

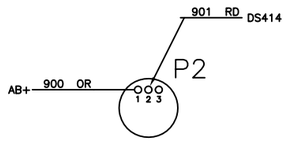
SCALE NONE | WEIGHT | SHEET 5 OF 6



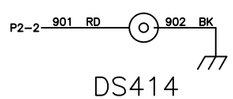
AMBER MARKER LAMPS



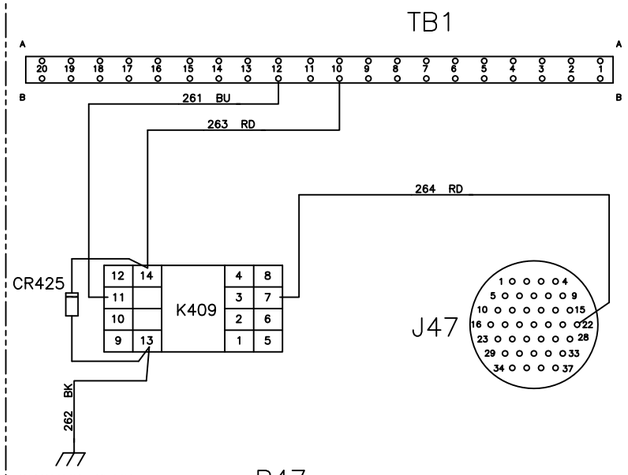
LOW FUEL BOARD



PLUG BACKSIDE LOW FUEL BOARD

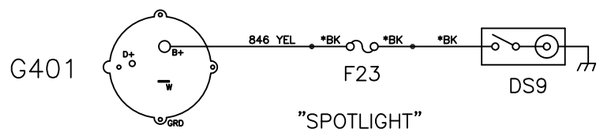


LOW FUEL BEACON



UNIT OPERATING BEACON OPTION CONNECTION DIAGRAM

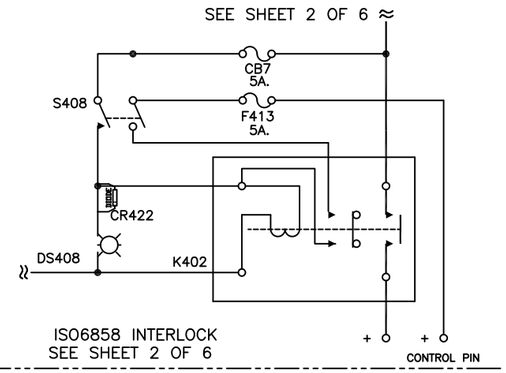
* WIRE FURNISHED WITH DS9 AND F23



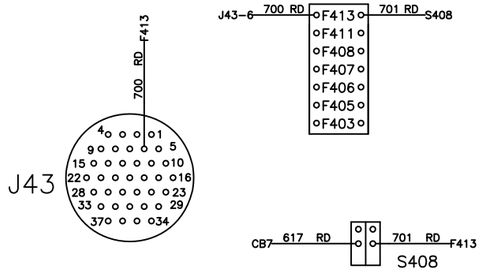
"SPOTLIGHT"

CE FUSE KIT

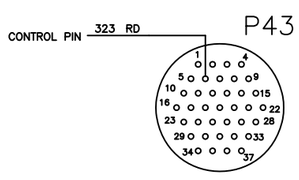
NOTES:
1. CONNECT SIGNAL WIRE #323 TO INTERLOCK STAND OFF.
2. ADD 5A FUSE TO FUSE TERMINAL IN CONTROL BOX.
3. ATTACH 619RD TO SWITCH (S408).



ISO6858 INTERLOCK
SEE SHEET 2 OF 6



ISO6858 INTERLOCK
SEE SHEET 5 OF 6



ISO6858 INTERLOCK
SEE SHEET 3 OF 6

THIRD ANGLE PROJECTION

FILE NO. 291870-A

MATERIAL:

		DRAWN EFU	07/26/16
		CHECKED DJ	07/26/16
500074-A	JET-EX 6	ENGINEER EFU	07/26/16
NEXT ASSY.	USED ON	APPROVED	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES TOLERANCES ON:
FRACTIONS ±1/32 DECIMALS .XX=± .03 .XXX=± .015 ANGLES ±.50

ITW GSE
11001 US HWY. 41 NORTH, PALMETTO, FLORIDA 34221

DIAGRAM, SCHEMATIC & CON DISTRIBUTION

SIZE	CAGE	DRAWING NO.	REV.
D	12867	291870-A	B

SCALE NONE | WEIGHT | SHEET 6 OF 6