OM-2201
05/31/2013 – REV A

Operation and Maintenance Manual with Illustrated Parts List for JetEx 7

28.5 Volt, 600 Amp Generator Set

Series 500284

Hobart Ground Systems
Palmetto, Florida 34221
U.S.A.
http://www.hobartsystems.com

Warranty

Data Sheet 165
Index: 990223
Replaces:
980601

HOBART GROUND SYSTEMS
PALMETTO, FL 34221

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

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

Record of Change

Rev. No.	Release Date	By	Description
A	May 31, 2013	CAL	Original –

Safety Warnings and Cautions

WARNING

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

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

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

IMPORTANT

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

WARNING

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

1) General

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

2) Shock Prevention

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

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

a) Installation and Grounding of Electrically Powered Equipment

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

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

- Shut off all power at the disconnecting switch, or line breaker, or by disconnecting battery, before inspecting or servicing the equipment.
- Lock switch OPEN (or remove line fuses) so that power cannot be turned on accidentally.
- Disconnect power to equipment if it is out of service.
- 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 fuel that penetrates the unit. After clean up, open equipment doors and blow fumes away with compressed air.

5) Toxic Fume Prevention

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

6) Bodily Injury Prevention

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

7) Medical and First Aid Treatment

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

EMERGENCY FIRST AID

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

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

8) Equipment Precautionary Labels

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

Table of Contents

The column on the right shows the Chapter – Section / Page Number.

Front

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Introduction

This manual contains operation and maintenance information for a JetEx7, 28.5 VDC Generator Set manufactured by ITW GSE Group, Hobart Ground Systems, 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 people in the proper use and care of the equipment.

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

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

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

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

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

Contents of the manual is arranged as follows:

Chapter 1. Description/Operation

Chapter 2. Servicing/Troubleshooting

Chapter 3. Overhaul/Major Repair

Chapter 4. Illustrated Parts List

Chapter 5. Manufacturer’s Literature

Appendix A

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

Write:	Hobart Ground Systems Service Department 11001 US Highway 41, North Palmetto, FL 34221 U.S.A.
Call Inside U.S.A.:	(800) 899-1841 (Parts) (877) 874-5322 (Service)
Call From Foreign Countries:	(941) 721-1025 (Parts) (941) 721-1092 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartsystems.com
Web Page :	www.hobartsystems.com

1) Terminology

Canopy: The sheet metal enclosure, identified as a canopy, provides protection for the engine, generator and electrical controls. The canopy reduces the operational noise level in the immediate area of the machine.

Generator and Generator Set: The term “generator set” refers to entire unit including the engine, the generator, and the electronic controls. The term “generator” refers only to the power-generating unit that is turned by the engine.

Line-Drop Compensation: The voltage at the aircraft will be less than the voltage at the generator due to voltage losses (“line-drop”) in the output cable. The voltage losses are directly proportional to the output current. The generator set compensates for these losses by raising or lowering the generator output voltage, depending on the output current, to provide the correct voltage to the aircraft.

2) Abbreviations

This manual uses the following abbreviations:

3PST	3-pole, single throw	switch/contactor configuration
A, or AMP	Ampere	measure of current
AC	alternating current	
Ay.	assembly	
ºC	degrees Celsius	measure of temperature
DC	direct current	
ºF	degrees Fahrenheit	measure of temperature
Fig.	figure	
ft.	feet	
ft-lbs	foot-pounds	measure of torque
GPU	ground power unit	for example, this generator set
hd.	head	fastener description
hex	hexagon	fastener description
LED	light-emitting diodes	
HP	horsepower	
Hz	Hertz (cycles-per-second)	measure of frequency
I.D.	Inside diameter	
ID	identification	
in.	inch	
lb.	pound	
kVA	Kilovolt-Ampere	measure of apparent power
N.C.	normally closed	switch configuration
N-m	Newton-meters	measure of torque

No.	number	
N.O.	normally open	switch/contactor configuration
O.D.	outside diameter	
Ref	reference	(either not a physical part or included with another part)
T-R	Transformer-Rectifier	module that converts AC to DC
V	Volt	measure of electrical potential
VAC	Volts AC	
VDC	Volts DC	

3) Related Documentation

a) Engine Documentation

Cummins manufactures the engine used in this generator set. They produce the following documentation:

- Operation and Maintenance Manual
  Cummins Bulletin # 3666417
  Included with this generator set
- Service Manual
  Cummins Bulletin # 4021540
  Not included – purchase separately from Cummins

b) Hobart Documentation

(1) Diagrams

Hobart provides the following diagrams for your generator set. These are located in the Appendix of this manual:

Diagram Number	Diagram Description
291902 4/23/13 -	Diagram, Schematic and Connection

Contact Hobart Ground Systems if copies of these drawings or manuals are not with this manual (unless otherwise noted above).

(2) Additional Manuals

Some of the available options include user manuals. Where appropriate, those manuals are included in the appendix of this document.

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Chapter 1: Description/Operation

Section 1-1: Description

This manual describes a 28.5 V generator set manufactured by Hobart Ground Systems, Palmetto, FL 34221 This generator system is designed to provide ground power for maintenance and startup of aircraft or other loads.

This section includes the following information:

1) Part Numbers

The model number of your generator set is Jet-Ex 7, which is a family of 28.5 VDC generators. The more specific part number (or spec number) is the combination of the Series number (500284) and a dash number, which indicates the specific configuration. Table 1 shows the part number variations covered in this manual.

Part Number	Mounting	Cable Management	Model Description	Power Rating
500284-001	Trailer	Cable Trays	Standard	all units rated 28.5 VDC, 600 A continuous (17 kW), 1400 A peak (40 kW), single output

Table 1: Series 500284 Generator Part Number Descriptions

To identify the generator set part number (series and dash number), refer to the data plate located next to the control panel.

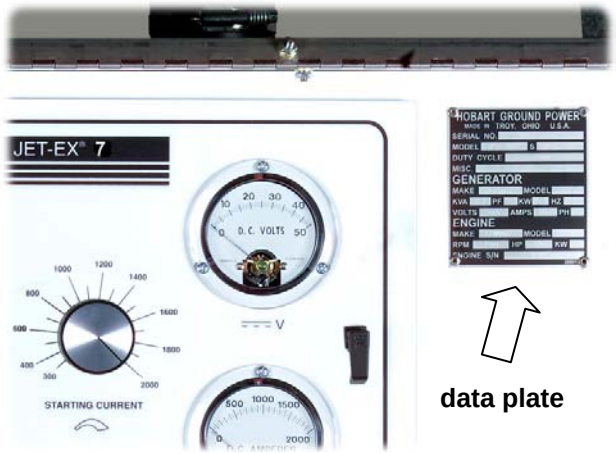


Figure 1: Model Identification

2) Specifications

a) Physical Specifications

Physical (includes trailer)	
Length	94.5 in. (240 cm) (w/ tow bar up)
Width	67 in. (170 cm)
Height	66 in. (167.6 cm)
Weight (dry fuel tank)	2670 lbs. (1211 kg.)
Ground Clearance	9 in. (22.86 cm)

b) Generator Set Specifications

Output power rating	17.1 kW continuous
Output voltage	28.5 VDC
Rated load capacity	600 A continuous at 28.5 VDC
Starting current capacity	1500 A maximum
Current limiting capability	300 to 1500 A, continuously adjustable
Operating speed	1800 RPM
Idle speed	1200 RPM

c) Protective System Specifications

Condition	Trip Point
Over voltage	32 to 34 volts
High engine coolant temperature	210º F (98.8º C)
Low engine oil pressure	31 PSI (214 kPa)

d) Normal Engine Operating Characteristics

Engine oil pressure (warm and at rated speed 1800 RPM)	60 - 90 PSI (413.7 - 620.5 kPa)
Engine coolant temperature (normal operation)	180 ºF - 230º F (82ºC to 95ºC)

e) Engine Specifications

Manufacturer	Cummins, Inc.
Model No.	4BT3.3-G5
Type	4 cylinder, 4 cycle diesel with turbocharger and fuel injection
Bore and Stroke	3.74 in x 4.53 in (95 mm x 115mm)
Displacement	199 in^3 (3.3 L)
Horsepower	69 hp @ 1800 RPM
Low Idle speed	1,100 – 1,300 rpm
Electrical system	12 VDC
Ground	Negative
Lubricating oil capacity (w/ filter)	2 gallons – 3.1 gallons (7.9L – 11.6L)
Coolant capacity system	1.75 gallons
Fuel tank capacity	25.1 gallons (6.24 liters)

3) Component Parts

a) Orientation

For purpose of orientation, the radiator end of the Jet-Ex 7 is considered to be at the FRONT of the unit. The control panel is at the REAR. Right and left are determined by standing at the rear of the unit, facing it.

Figure 2: Orientation

b) External Components

1. Control Panel
2. Fuel Filler Cap
3. Emergency Stop Switch
4. Exhaust Outlet
5. Canopy
6. Output Cable
7. Tow Bar
8. Fifth-Wheel Assembly
9. Radiator
10. Brake Lever
11. Cable Tray
12. Rear Axle

Figure 3: External Components

c) Right Side Components

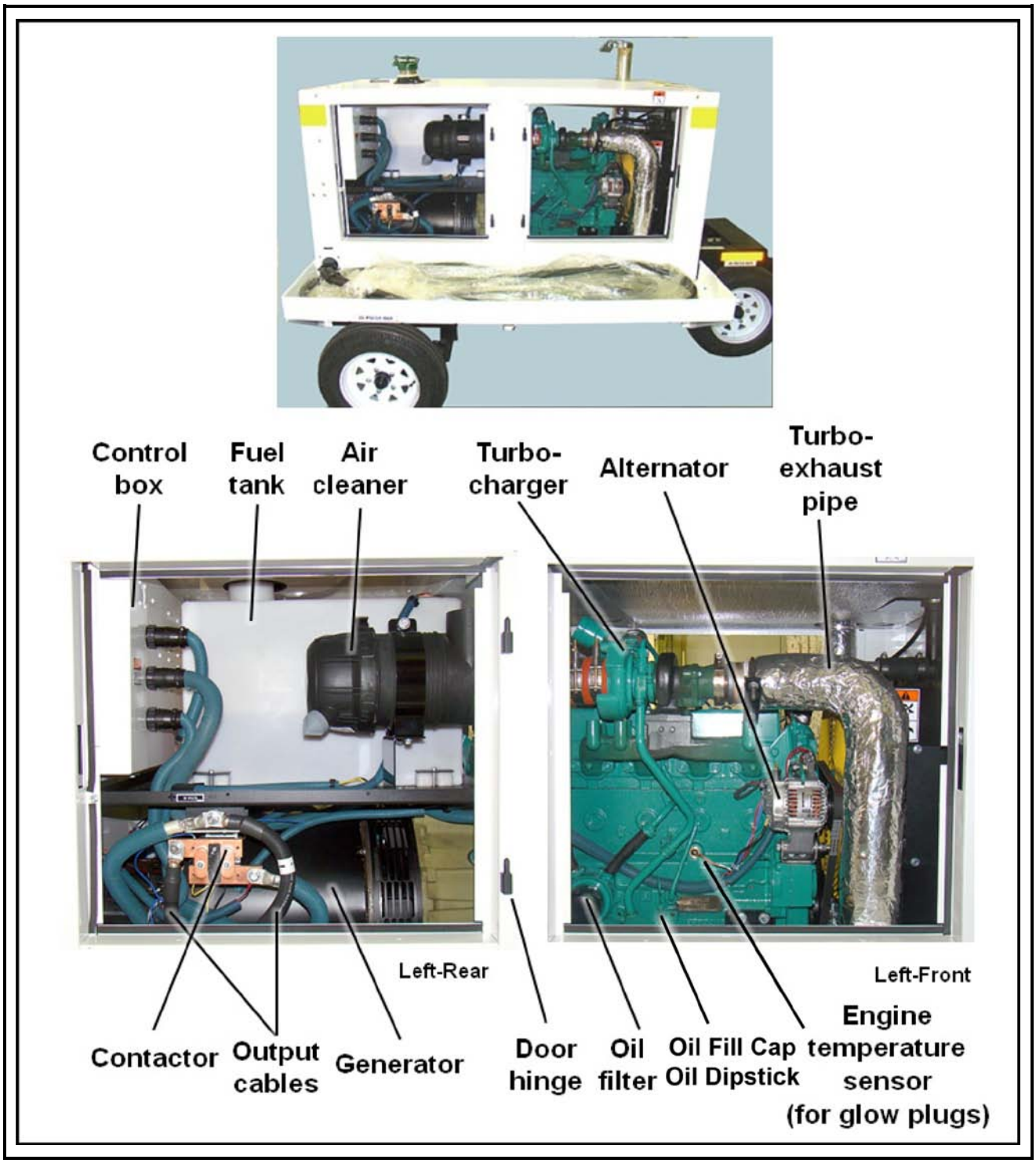


Figure 4: Right Side Components

d) Left Side Components

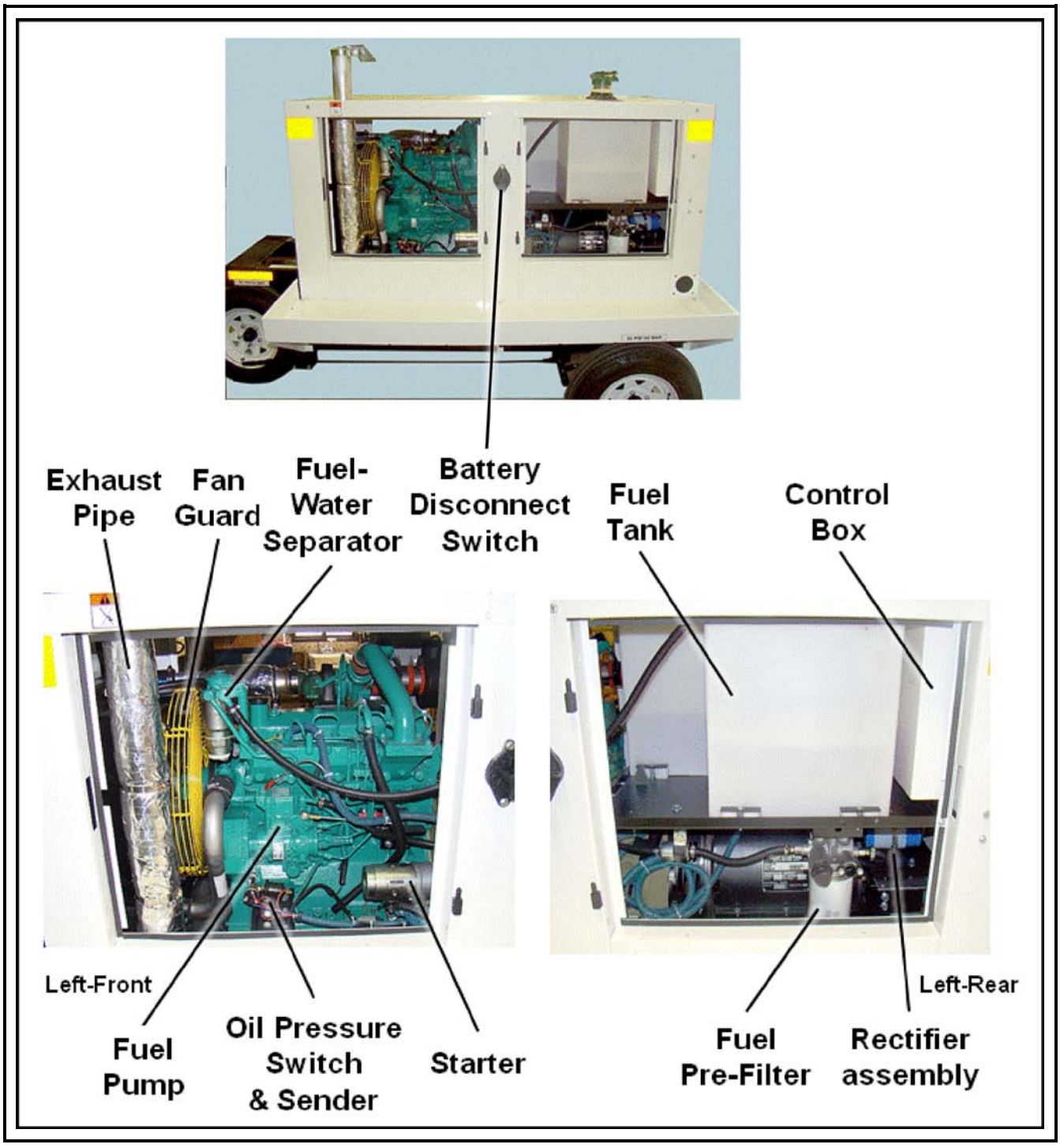


Figure 5: Left Side Components

4) Optional Equipment

The following is a list of options available for the Jet-Ex 7, 28.5 VDC Generator Set. This chart contains the description, part number, and document number (if applicable) of the option/feature.

Description	Part Number	Document Number
Cable, Aircraft, DC, 4/0, 30 ft	402025-3	
Crate, Shipping, Export	489848	
Kit, Beacon, Low Fuel	291365-005	
Kit, Beacon, Operating	289210-004	
Kit, CE Certification, Trailer	287589-3	
Kit, Tie-Down	284706	
Support, Fork Lift Assembly	288257	

5) Engine Description

The basic diesel engine is a 3.3 Liter, 4-cylinder, fuel-injected, turbo-charged engine rated at 69 horsepower. This engine does not have an electronic control module (ECM). Instead, Hobart uses an external controller to drive the electric fuel pump.

a) Electrical System

The 12 VDC electrical system includes a battery, the engine alternator with voltage regulator, the starter with solenoid switch and a battery disconnect switch.

b) Fuel System

The following diagram shows the fuel system components. The arrows indicate the direction of fuel flow.

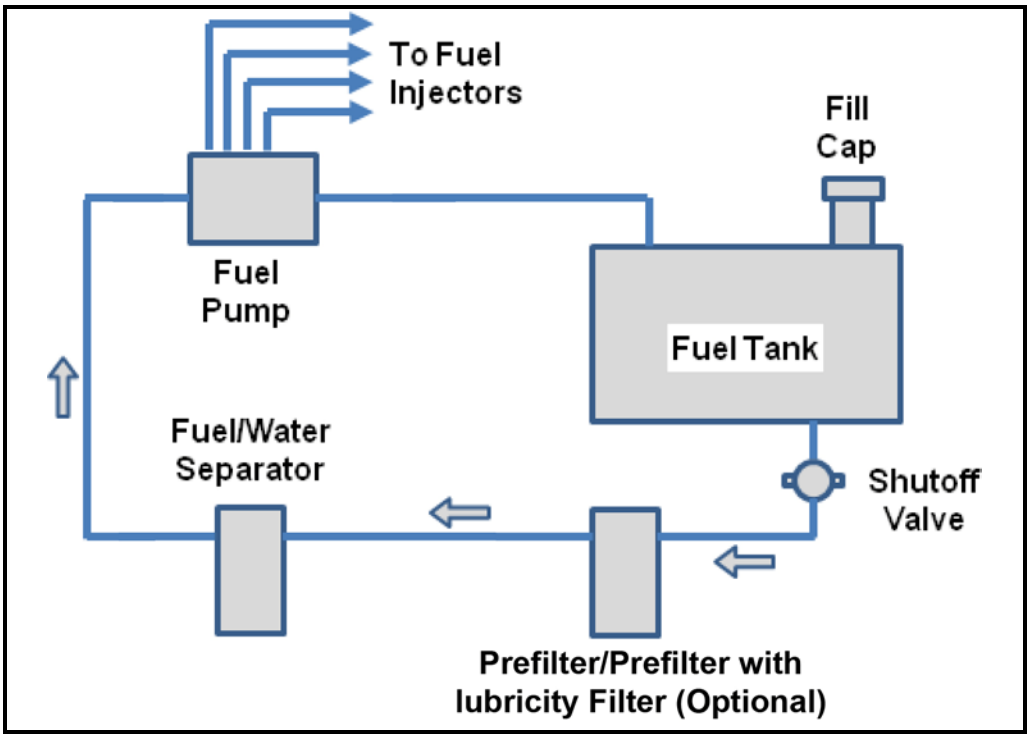


Figure 6: Fuel System

The fuel tank is located at the rear of the generator set. A fuel level sensor inside the tank controls the fuel gauge on the operator panel. The shutoff valve is attached to the lower side of the tank.

The pre-filter is on the left side of the generator set near the back. For North American applications, this is a fuel-water separator with a manual pump. The pump on this filter allows the operator to prime the system following filter element replacement or if the fuel was previously drained from the system.

For other worldwide applications, the pre-filter is a lubricity filter (optional). A lubricity filter adds lubricity to the fuel to allow use alternative fuels such as aircraft fuel.

The fuel pump is part of the engine. It delivers fuel to the fuel injectors. Fuel not used by the injector passes through a fuel-water separator on the way back to the fuel tank.

c) Cooling System

The cooling system consists of the radiator, fan, and sensors. The engine fan blows air outward through the radiator, rather than pulling the air inward as a conventional fan does. One coolant temperature sensor drives the water temperature gauge on the control panel. Another coolant temperature sensor drives the glow plug controller. A coolant temperature switch shuts down the engine if the maximum coolant temperature is exceeded.

d) Lubrication System

The following figure shows the locations of the oil filter, dip stick, and oil fill cap on the right side of the engine. There is another oil fill location on top of the engine.

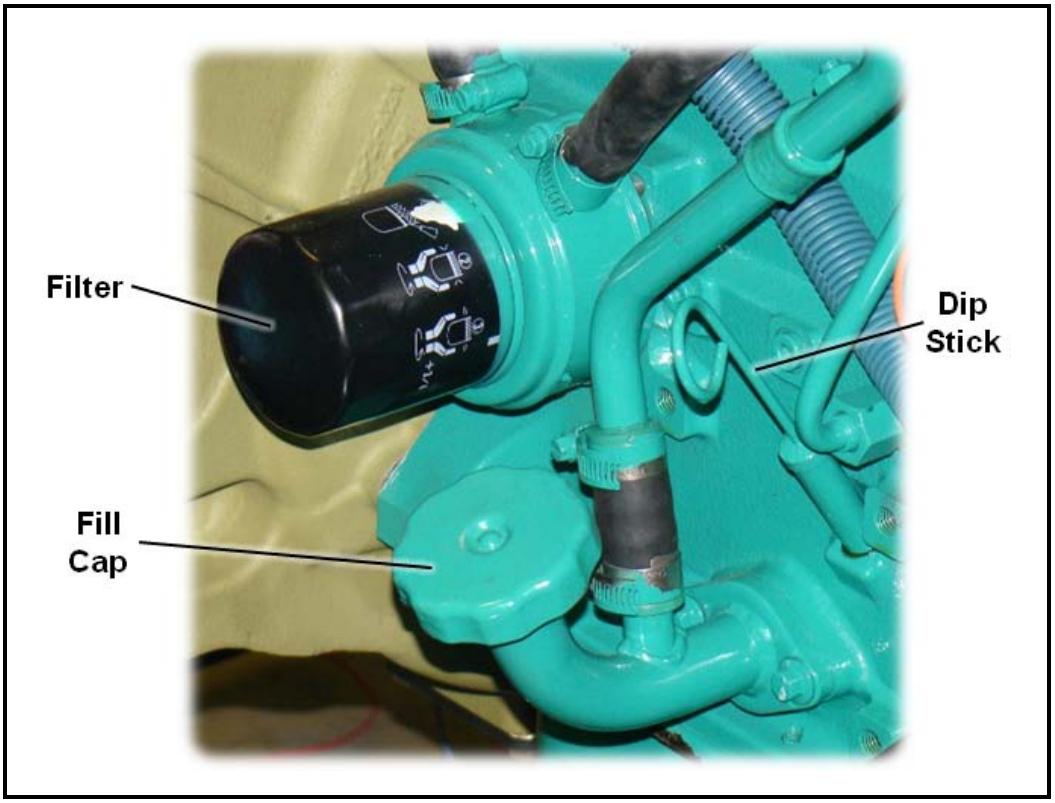


Figure 7: Lubrication Components

An oil pressure switch, located behind the front, right door, shuts down the engine if the oil pressure falls below 12 PSI (82.7 kPA). An oil pressure sender operates the oil pressure gauge on the control panel. Both the switch and the sender are located on the left side toward the front. Refer to Figure 5.

e) Air Intake System

The figure below shows the Air Intake System components. Clean air enters the air cleaner from an intake on top of the canopy. The air passes through two concentric filter elements on its way to the input of the turbocharger. A vacuum switch located between the air cleaner and the turbocharger serves as an air restriction sensor. When the air filters require replacement, the air restriction sensor turns on a light on the control panel to alert the operator.

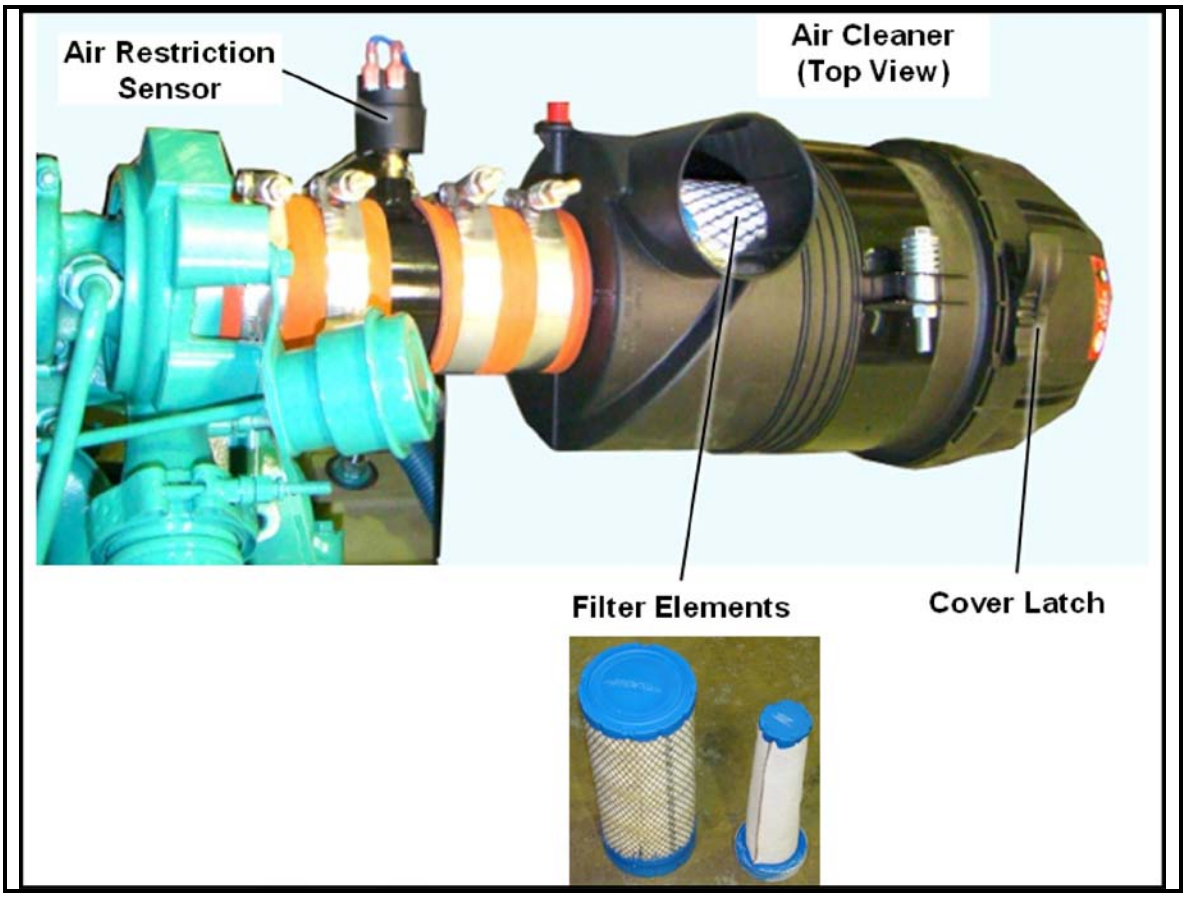


Figure 8: Air Intake System

f) Speed Control System

A speed control unit, which is located in the control box, controls the speed of the engine by electrically regulating the fuel pump. The inputs to the speed control are the ENGINE SPEED switch on the control panel and a magnetic pickup on the flywheel. Adjustments on the control unit configure the idle and run ("rated") speed. The idle speed is 1200 RPM and the rated speed is 1800 RPM.

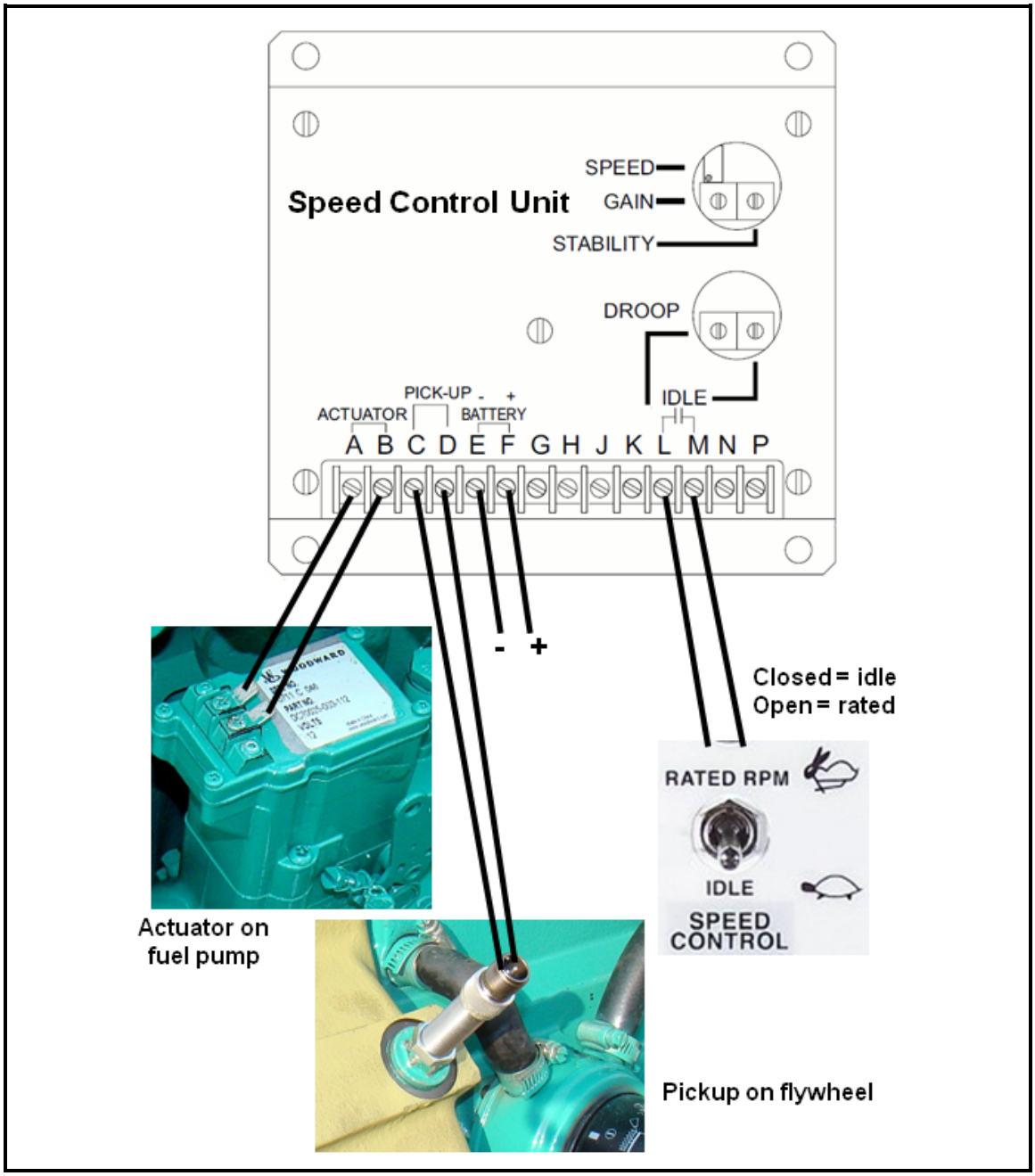


Figure 9: Engine Speed Control System Components

g) Cold Weather Starting System

This engine uses glow plugs for cold weather starting. The glow plug control system includes an engine-coolant temperature sensor, an external control, and a power relay (solenoid). When the glow plugs are activated (for up to 30 seconds), the controller turns on an ENGINE HEATER light on the front panel.

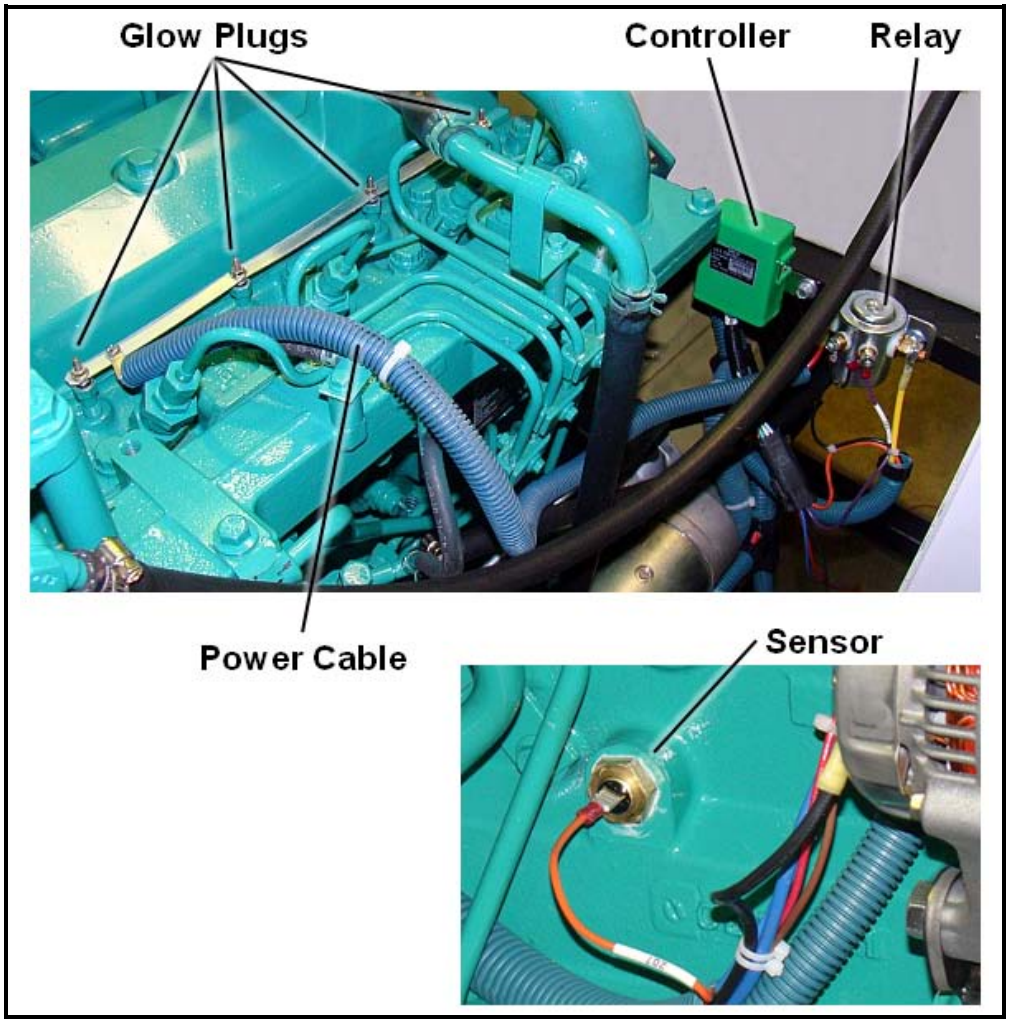


Figure 10: Engine Glow Plugs

6) Generator Description

The generator is a three-phase AC generator whose output is rectified. The generator consists of the generator housing assembly, which holds the stator windings, and a rotor, which holds the control winding. The generator housing assembly bolts to the engine flywheel housing. A flexible coupling assembly connects the front end of the rotor to the engine flywheel. At the rear of the generator, a bearing supports the rotor and brushes and slip rings provide the electrical connection to the exciter winding.

The generator stator consists of six windings, which result in 12 numbered output leads. When connected at the rectifier assembly, these windings form two three-phase delta connections. The rectifier assembly, described later in this section, converts the three-phase AC to the DC for the generator set output.

The generated is self-excited. Part of the generator's output powers the rotating control winding. One positive and one negative brush in contact with slip rings supply controlled excitation current. The voltage regulator controls the excitation current and maintains a constant output voltage. Access to the brushes is through holes in the rear end bracket.

A radial-blade fan behind the coupling hub draws cooling air over the generator windings. Air flows over the rectifier assembly and then enters through the rear end of the generator and is discharged through openings in the flywheel housing at the drive end

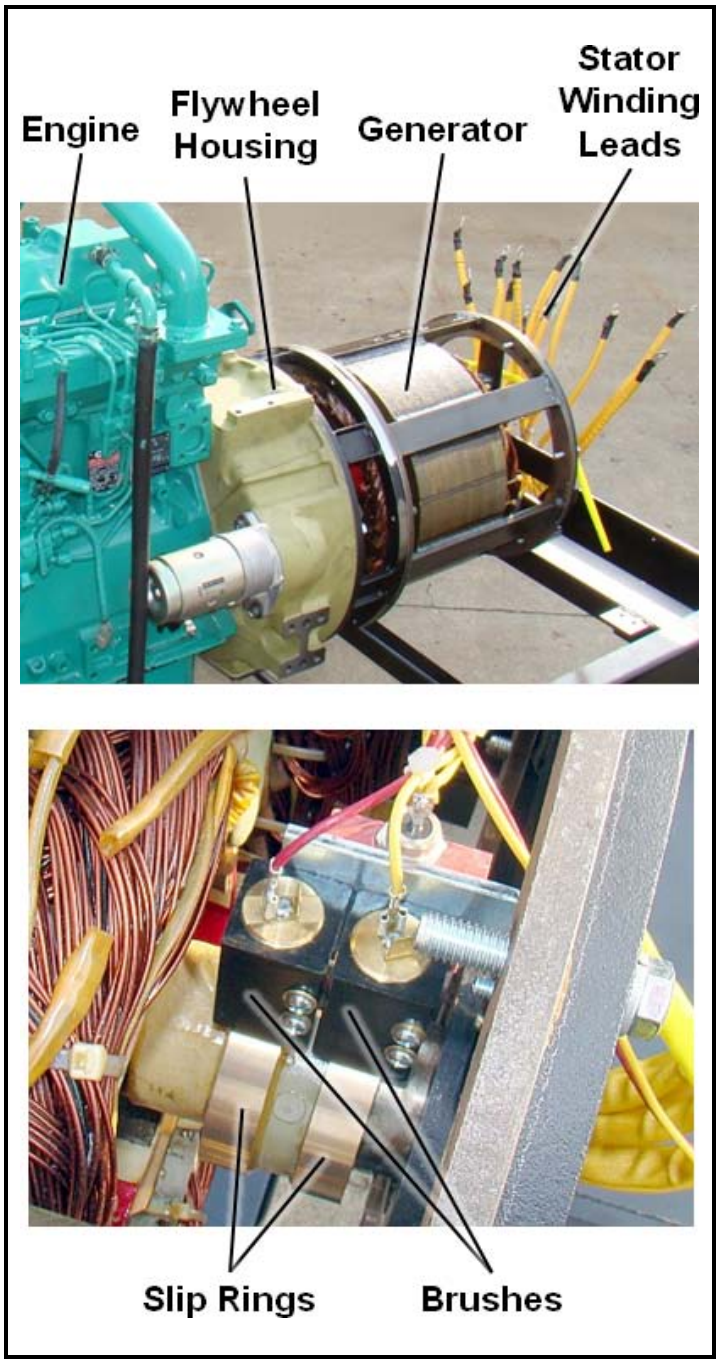
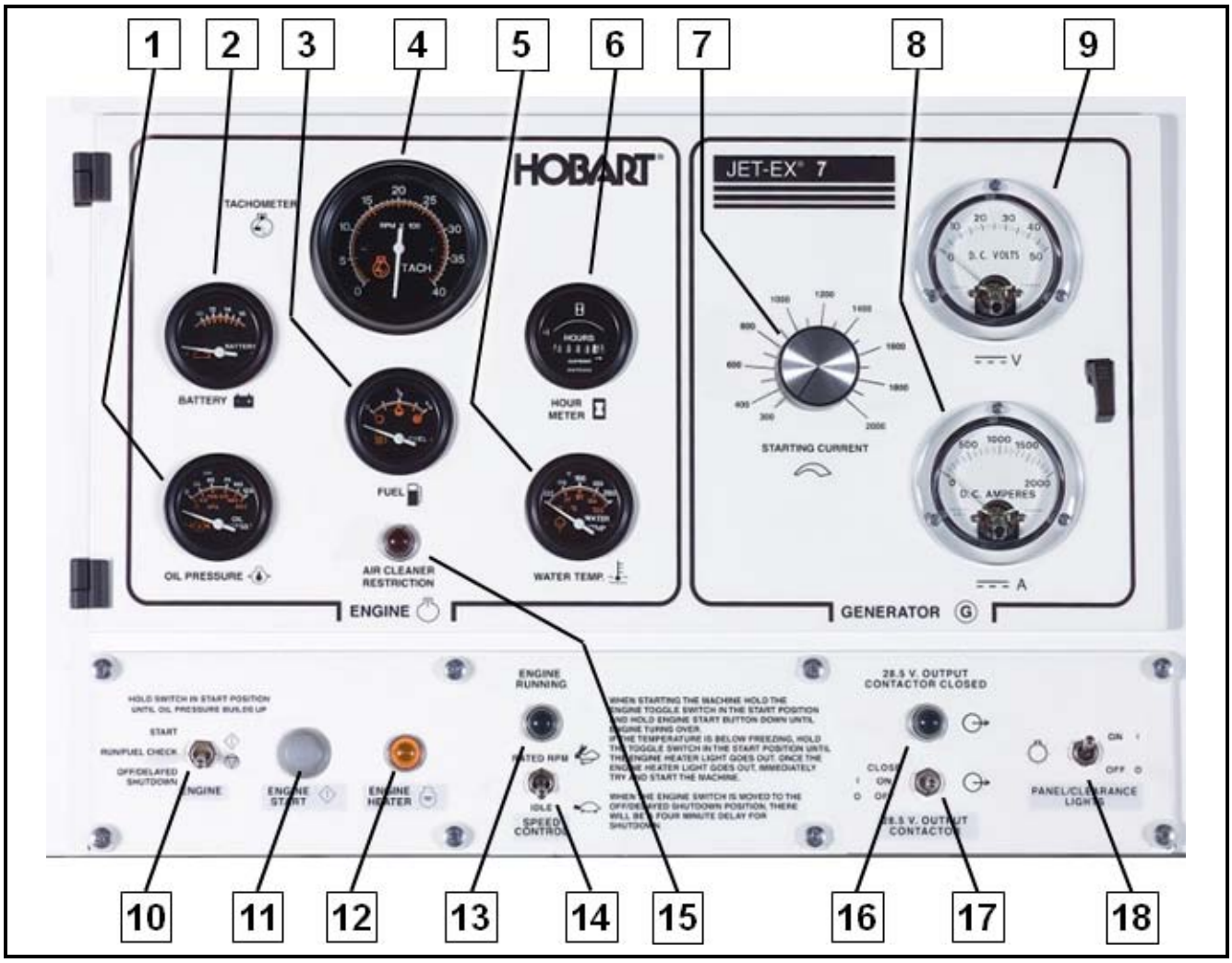


Figure 10: Generator

7) Control Electronics

The control box is a sheet metal enclosure that houses the engine and generator controls and monitoring equipment. The numbers in parentheses refer to the component designators on the schematic diagram.



1. OIL PRESSURE Gauge (M405)
2. BATTERY Gauge (M401)
3. FUEL Gauge (M408)
4. TACHOMETER (M403)
5. WATER TEMP. Gauge (M404)
6. HOUR METER(M402)
7. STARTING CURRENT Control (R402)
8. Output Current (A) Meter (M407)
9. Output Voltage (V) Meter (M406)
10. ENGINE Switch (S404)
11. ENGINE START Pushbutton Switch (S401)
12. ENGINE HEATER Light (DS426)
13. ENGINE RUNNING Light (DS407)
14. SPEED CONTROL Switch (S406)
15. AIR CLEANER RESTRICTION Light (DS412)
16. 28.5 V OUTPUT CONTACTOR CLOSED Light (DS408)
17. 28.5 V OUTPUT CONTACTOR Switch (S408)
18. PANEL/CLEARANCE LIGHTS Switch (S405)

Figure 11: Control Panel Door

a) Engine Controls

The engine controls are mounted on the left side of the control panel.

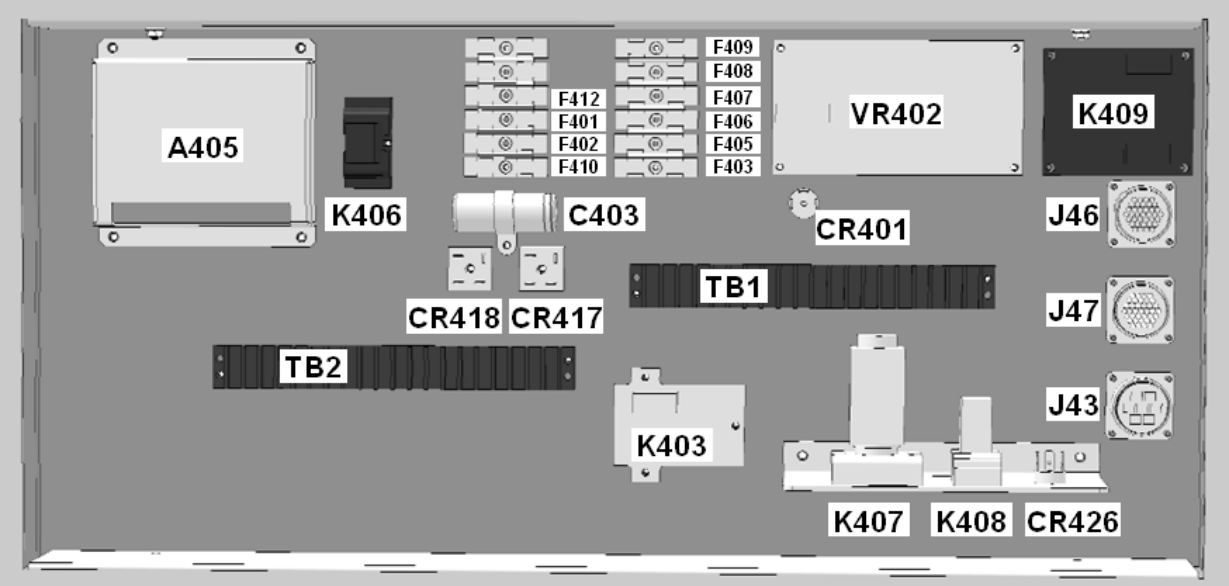
Component		Function	Description
1	OIL PRESSURE gauge (M405)	Indicates engine oil pressure in the range of 0 to 125 PSI (0 to 862 kPA)	Connects by a wire to an oil pressure sensor installed in the engine lubricating system
2	WATER TEMP gauge (M404)	Indicates engine coolant temperature in the range of 100-280 º F (38-138 º C)	Connected by a wire to a water temperature sensor installed in the engine cooling system
3	FUEL gauge (M408)	Indicates fuel level in tank	Connects to a sending unit in the fuel tank. It is on when the ENGINE switch is in the RUN position.
4	TACHOMETER (M403)	Indicates Engine speed in the range of 0 to 4000 RPM	This instrument receives its operating signal from the alternator to display the engine speed in RPM.
5	BATTERY meter (M401)	Shows the voltage on the 12 VDC battery system	Graduated 10 V to 16 V
6	HOUR METER (M402)	Indicates the engine's running time up to 9999.9 hours	Functional only when the engine is running. The hour meter records the total hours of engine operation for scheduling maintenance.
10	ENGINE Switch (S404)	This three-position toggle switch controls engine function. The START position is momentary.	The positions are: • START (up) – used with ENGINE START pushbutton • RUN (center) – engine run or fuel check • OFF (down) – engine off or shutdown
11	ENGINE START Pushbutton Switch (S401)	Press this button to start the engine.	This momentary-contact switch closes the starter solenoid circuit and cranks the engine. This switch is operable only when the engine circuit toggle switch is held in its top spring-loaded START position.
12	ENGINE HEATER Light (DS426)	When lit, this light indicates that the glow plugs are turned on.	If this light is on, wait for it to turn off (less than 30 seconds) before starting the engine.
13	ENGINE RUNNING Light (DS407)	This green light, when lit, indicates that the engine is running.	The light is on when the ENGINE switch is in the RUN position.
14	SPEED CONTROL Switch (S406)	This toggle switch has two positions: IDLE and RATED RPM.	Connects to the engine speed control unit to regulate the speed to 1000 RPM for idle or 1800 RPM for rated speed
15	AIR CLEANER RESTRICTION Light (DS412)	When lit, indicates that the air filter needs to be changed	Connects to a vacuum sensor located between the air filter and the engine

b) Generator Controls

The generator controls are mounted on the right side of the control panel.

Component		Function	Description
7	STARTING CURRENT Control (R402)	This potentiometer sets the output current limit	Continuously adjustable from 300 to 1500 amperes
8	Ammeter (A) (M407)	Shows the generator output current	
9	Voltmeter (V) (M406)	Shows the generator DC output voltage	
16	28.5 V OUTPUT CONTACTOR CLOSED Light (DS408)	This green light, when lit, indicates the output contactor is closed.	When this light is on, 28.5-volt power is available at the output cable.
17	28.5 V OUTPUT CONTACTOR Toggle Switch (S408)	Three-position toggle switch used to close and open the load contactor	The positions are: • CLOSE (up) – to turn on the output, hold in this momentary position until the CONTACTOR CLOSED light turns on. • ON (center) – switch returns to this position when released from the CLOSE position • OFF (down) – moving the switch to this position opens the contactor.
18	PANEL/ CLEARANCE LIGHTS Toggle Switch (S405)	This toggle switch turns the panel and clearance lamps on and off.	

c) Control Box Interior Components



A405	Speed Control Unit	J43	Receptacle, Rectifier
C403	Capacitor – filter for control winding drive	J46	Receptacle, Power
CR401	Blocking Diode, Voltage Regulator	J47	Receptacle, Engine
CR417 – CR418	Bridge Rectifiers – control winding drive	K403	Relay, Over-Voltage
CR426	Diode, Blocking	K406	Relay, Low Coolant (future option)
F401	Fuse, Lights	K407	Relay, Shutdown Timer
F402	Fuse, Engine Circuit	K408	Relay, Timer
F403	Fuse, Voltage Regulator Exciter Current	K409	Low Fuel Board
F405	Fuse, +12 VDC to Bridge Rectifier – control winding drive	TB1	Terminal Block
F406 – F408	Fuse, 3-Phase Output to Bridge Rectifiers – control winding drive	TB2	Terminal Block
F409	(not used)	VR402	Voltage Regulator Board
F410	Fuse, Contactor Coil		
F412	Fuse, Speed Control 15A		

Figure 12: Control Box Interior Components

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Section 1-2: Preparation for Use, Storage, or Shipping

This section contains the following topics:

1) Preparation for Use

a) Inspection/Check

Inspect the unit thoroughly prior to operation:

1. Remove blocking, banding, ties, and other securing material.
2. Inspect the exterior for shipping damage such as broken lights, damaged sheet metal, etc.
3. Open all canopy doors and inspect the interior for foreign material such as rags, tools, shipping papers, etc.
4. Check the fuel, coolant, oil hoses and connections for visible leaks. Visually inspect the compartment floor and ground surface under the unit for signs of leakage. Correct any leaks by tightening hose clamps, tube fitting, etc., as required.
5. Check the security of the generator set retaining components.
6. Turn on the battery disconnect switch. It is located on the right side of the generator set.
7. Check the fuel level. Move the START/RUN/OFF switch to the RUN/FUEL CHECK position to energize the fuel gauge when the engine is stopped.

NOTE: For recommended fuel specifications, refer to the Engine Manufacturers Operation and Maintenance Manual provided with this manual.

8. Check the engine coolant. Remove the radiator cap to check the coolant level. The coolant level should be at the bottom of the filler neck.

CAUTION

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

NOTE: For antifreeze protection, use a solution of 50% permanent antifreeze (Ethylene glycol) and 50% clean water.

Lubricating oil capacity (w/ filter)	2.1 gallons (7.9 L)
Coolant capacity system	4.9 quarts (4.6 L)

Table 1: Engine Oil and Coolant Capacities

9. Check the engine lubricating oil level. The oil gauge rod has an “H” high mark and “L” low-level marks to indicate the operating lubrication oil supply. Oil level should be kept as near the high mark as possible, without going over it. See Table 1 for capacity.

CAUTION

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

NOTE: See the Engine Manufacturer’s Operation Maintenance Manual for oil recommendations.

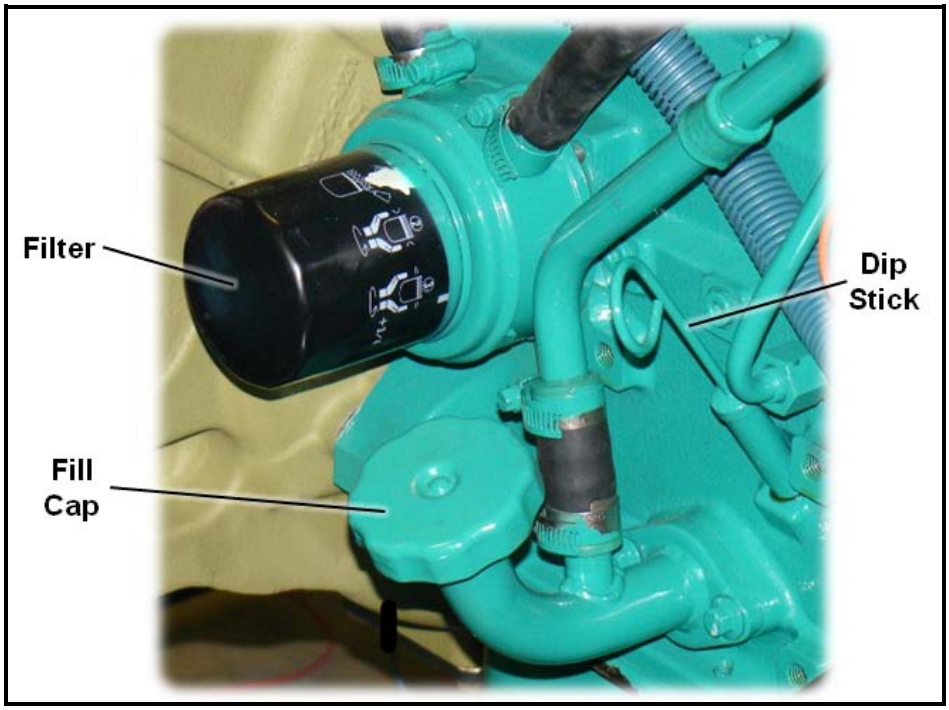


Figure 1: Oil Fill and Oil Level Check Locations

10. Check the batteries. Make sure the terminals are properly connected and free of corrosion. Service or replace if necessary.

b) Install the DC Output Cable (if required)

Jet-Ex7 units are normally supplied with a 30 foot generator-to-aircraft output cable. This output cable consists of two single conductor 4/0 cables.

(1) Cable Requirements

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

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

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

(2) Cable Connections

1. Open and remove the right rear door and the panel below the door. Set aside.
2. Loosen the output cable clamp and thread the lugged end of the output cable through the opening in the right side of the unit.
3. Connect the positive cable lead to the output terminal on the contactor.
4. Connect the negative cable lead to the negative output terminal located above the load contactor. Always place the lead under the flat washer shown.
5. Tighten the cable clamp and install the lower panel, and the door.
6. Store cables in cable tray or on hangers on side of canopy if fenders are not used.

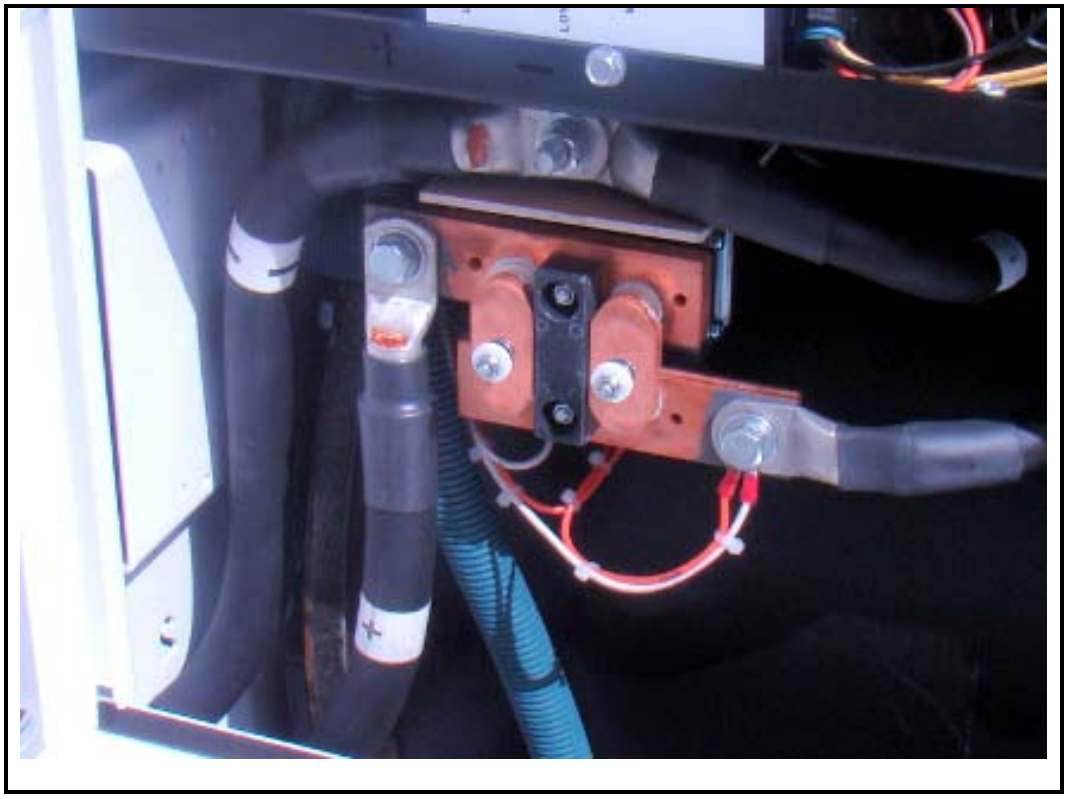


Figure 2: Output Cable Connection

Figure 3: Output Cable Clamp

2) Preparation for Storage

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

a) General

- Turn off the battery master disconnect switch.
- Prepare the unit for storage as soon as possible after being removed from service.
- The unit should be stored in a dry location.
- Moisture-absorbing chemicals (Hobart part number 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 to coat all internal engine components 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 Term Storage (Over 30 Days)

To protect the generator and other electrical components during long-term storage, package the complete unit using moisture proof packaging material and sealing material. Place containers of moisture-absorbing chemicals (Hobart part number 76A1354-001) in the unit before packaging.

The unit may be stored for long periods with no special preparation if it is possible to operate the engine once each week. When starting once a week, proceed as follows:

1. Check the antifreeze to make sure it sufficient to protect the cooling system.

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).
3. While the engine is running, ensure that normal operating controls are in good working condition before shutdown and storage.
4. Turn off the battery disconnect switch.

If weekly operation is not possible, contact the nearest engine manufacturer distributor for instructions.

3) Preparation for Shipment

a) Turn off the battery master disconnect switch.

b) Disconnect the battery negative terminal prior to shipping.

CAUTION

During long shipments, vibration, jolting, etc. may loosen the generator set retaining hardware. 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.

Section 1-3: Operation

This section provides information and instructions for the safe and efficient operation of the equipment. This section contains the following topics:

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

WARNING

To prevent hearing loss, use ear protection equipment when working close to this equipment.

1) Pre-Start Inspection

a) Be sure the fuel shutoff valve on the unit is open. The shutoff valve is located below the fuel tank and can be accessed from the left-rear door.

b) Make sure the battery disconnect switch, located on the left side of the unit, is in the **ON** position.

c) Check the engine and generator compartments to make certain they are free of rags or other foreign materials.

d) Make certain there is sufficient lubricating oil and coolant in the engine.

e) Check the fuel level. Move the **ENGINE** switch to the **RUN/CHECK FUEL** position to activate the fuel gauge.

f) If the unit is operated indoors, make sure that an exhaust line is properly connected to the engine exhaust system and discharged outside.

2) Operator Controls

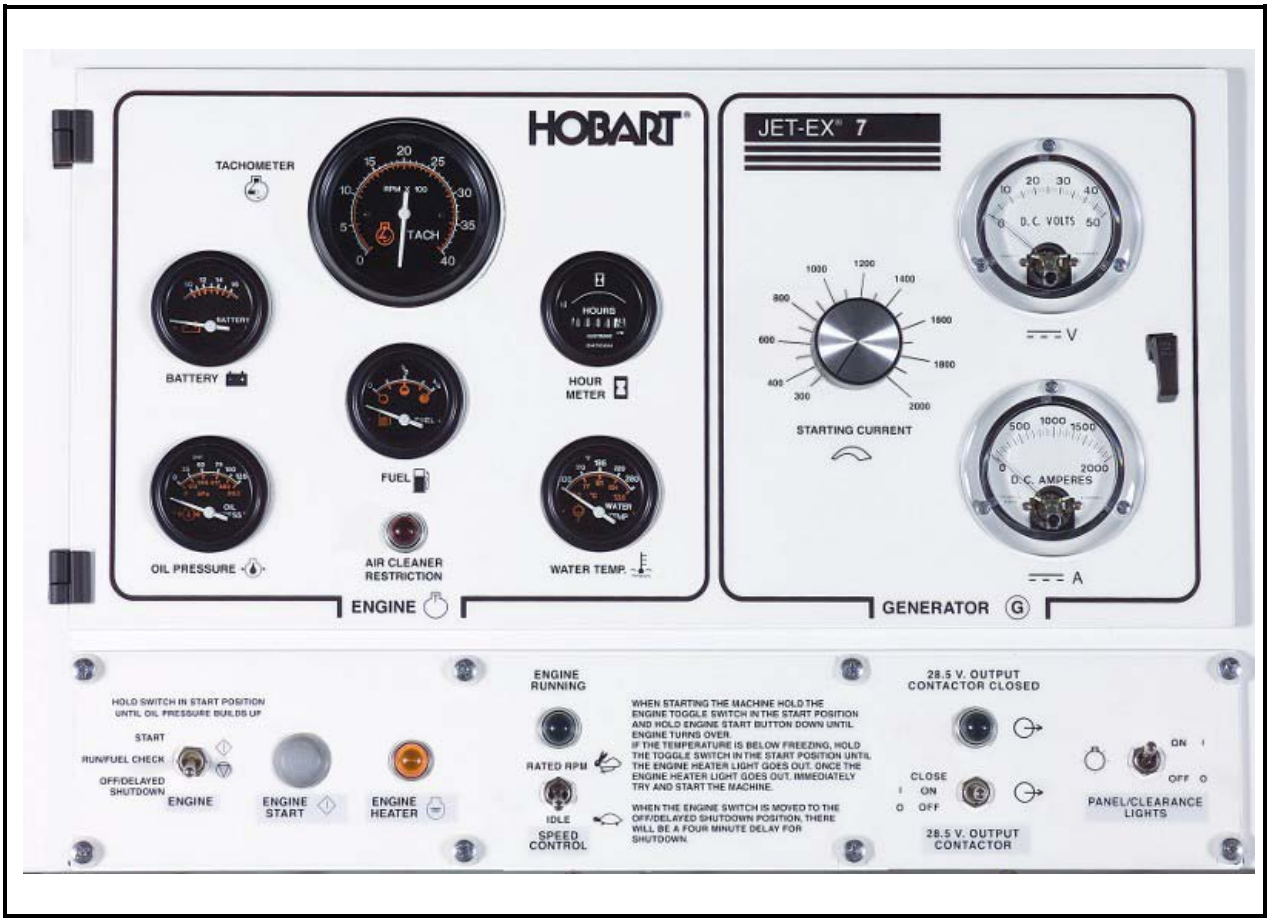


Figure 1: Operator Controls

3) Engine Starting Procedure

CAUTIONS

To prevent possible engine or starter damage, follow these starting guidelines:

- If the engine does not start, wait three or four seconds before re-engaging starter.
- Do not operate the starter for more than 15 seconds at a time.
- Wait at least two minutes between cranking periods.

1. Place the **SPEED CONTROL** switch in the **IDLE** (down) position.
2. Move the **ENGINE** switch to the **RUN** (center) position. The **ENGINE HEATER** light turns on to indicate that the glow plugs are energized (for up to 30 seconds).
3. Wait until the **ENGINE HEATER** light turns off.
4. Hold the **ENGINE** switch in **START** (up) position. This temporarily bypasses the low oil pressure and high coolant temperature protections.
5. Press and hold the **ENGINE START** pushbutton switch until the engine starts.
6. Continue to hold the **ENGINE** switch in **START** (up) position until the engine oil pressure builds up, as shown on the oil pressure gauge. Then release the switch to the **RUN** position.
7. Observe the engine speed on the tachometer. Idle speed should be 1200 RPM ± 50 RPM.
8. Allow engine to warm up before applying a load.

CAUTION

To eliminate the possibility of wet stacking (see the Warranty section) and excessive oil consumption, do not allow the engine to idle for long periods.

WARNING

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

4) Generator Operation

1. Place the **SPEED CONTROL** switch in the **RATED RPM** (up) position. The generator output builds up to produce rated voltage.
2. If required, adjust the **STARTING CURRENT** potentiometer to limit the current, based on the aircraft manufacturer's recommendations.

5) Power Delivery

1. Connect output cable to aircraft.
2. Hold the **28.5 V OUTPUT CONTACTOR** switch in the **CLOSE** position until the green **28.5 V CONTACTOR CLOSED** light turns on.
3. Release the switch to the **ON** position.

WARNING

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

6) Shutdown/Stop Operation

a) Normal Conditions

1. When power delivery is complete (aircraft discontinues drawing current), place the **28.5 V OUTPUT CONTACTOR** toggle switch in the **OFF** position. The **28.5 V CONTACTOR CLOSED** light should turn off to indicate load contactor has opened and power is no longer available at the aircraft.
2. Move the **SPEED CONTROL** switch to the **IDLE** position.
3. Disconnect output cable from aircraft receptacle and store cable in cable trays or on cable hangers, whichever is available.
4. Move the **ENGINE** switch to the **OFF/DELAYED SHUTDOWN** position. The engine will idle for four minutes before shutting down. This allows the engine components to properly cool.

b) Emergency Conditions

Press the **EMERGENCY STOP** button, located on the control box door to the right of the control panel. When pushed, this button instantly shuts the generator set off and must be pulled back out before restarting the generator set.

CAUTION

Do not use the **EMERGENCY STOP** button as a normal shutdown device. Damage to the engine turbo charger may result without proper cooling time. Use the **ENGINE STOP** pushbutton for all normal engine shutdowns.

7) Adverse Weather Operation

a) Cold weather operation

Operation of this generator set at sub-zero temperatures requires special precautions and extra servicing from both operation and maintenance personnel to avoid poor performance or total functional failure. Consult the Engine Manufacturer's *Operation and Maintenance Manual* and follow these recommendations:

(1) Fuel system

Keep system clean and free from water that may collect in a low spot in the fuel line and freeze. Keep the fuel tank as full as possible to mitigate water condensation from the air above the fuel.

(2) 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. This will keep the system cleaner and furnish lubrication for the water pump.

(3) Lubrication

Drain the crankcase (preferably when warm after running) and fill with a lighter grade of oil. Refer to the engine oil recommendation chart in the Engine Manufacture's Operation and Maintenance Manual for recommended viscosity for various atmospheric temperatures. In cold weather, drain the 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 the crankcase may freeze and cause serious damage to the oil pump or shut off the oil supply.

(4) Electrical system

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

(5) Battery

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

b) Operation in Hot and Humid Conditions

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

c) 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 that may offer protection from blowing dust. If the installation is more than temporary, erect a protection shield.

(1) Fuel system

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

(2) Air Cleaner

The air cleaner requires more frequent attention under dusty conditions. Check air filter restriction lamp located on control panel daily.

(3) 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.

d) Operation in Salt Water Areas

(1) Canopy

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

(2) 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. Wipe salt water from the engine and all terminals and connections in the electrical system. Keep all linkages oiled.

(3) Brushes

Inspect the generator brushes 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.

(4) Field coils

The fields should be dried as thoroughly as possible.

(5) Battery terminals

Thoroughly clean the battery terminals and connections. Coat the terminals and connections with grease to prevent corrosion.

Chapter 2: Service and Troubleshooting

Section 1: Maintenance Inspection/Check

To ensure that the generator set is always ready for operation, follow the recommended maintenance schedule to discover and correct any defects before they result in serious damage to components or failure of the equipment.

WARNING

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

1) Maintenance Schedule

A periodic maintenance schedule should be established and maintained. A suggested schedule is provided on the following pages. It may be modified, as required to meet varying operating and environmental conditions.

a) Maintenance Schedule Check Sheet

Use a maintenance schedule check sheet such as the one in the 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.

b) Interval Periods

The schedule is based on both hours of operation and calendar intervals. Perform all services on whichever-comes-first basis.

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

The following chart shows the maintenance intervals. The next section shows the required work for each interval.

Symbol	Hourly Interval	Calendar Interval
AR (As Required)		
A	10 hours	Daily
B	250 hours	3 Months
C	500 hours	6 Months
D	1000 hours	1 Year
E	2000	2 Years

c) Suggested Maintenance Schedule

Hourly Interval	**AR**	**10**	**250**	**500**	**1000**	**2000**
Calendar Interval		**Daily**	**3 Mo.**	**6 Mo.**	**1 Yr.**	**2 Yr.**
Symbol	**AR**	**A**	**B**	**C**	**D**	**E**
Engine Air Intake System						
Air Cleaner Elements - Replace	X					
Air Intake System – Inspect			X			
Engine Cooling System						
Check Coolant Hose and Clamps	X					
Coolant Level – Check		X				
Cooling Fan – Inspect		X				
Radiator Pressure Cap			X			
Cooling System – Check				X		
Cooling System – Drain						X
Engine Fuel System						
Fuel-Water Separator - Drain		X				
Fuel Filters – Change				X		
Fuel Supply Lines – Vent				X		
Injection Pump – Vent				X		
Engine Lubrication System						
Lubricating Oil – Check Level		X				
Lubricating Oil & Filter – Change			X			
Engine Miscellaneous						
Drive Belts – Inspect		X				
Drive Belt Tension – Measure					X	
Crankcase Breather Tube – Check		X				
Valve Lash Clearance – Adjust						X

Maintenance Schedule (Sheet 1 of 2)

Hourly Interval	**AR**	**10**	**250**	**500**	**1000**	**2000**
Calendar Interval		**Daily**	**3 Mo.**	**6 Mo.**	**1 Yr.**	**2 Yr.**
Symbol	**AR**	**A**	**B**	**C**	**D**	**E**
Electrical (12 VDC System)						
Check All Lights		X				
Check Battery Voltage		X				
Clean Battery Terminals			X			
Check Wiring and Connections				X		
Check All Engine Meters		X				
Electrical (28 VDC System)						
Check Output Cable and Connectors		X				
Check Volt, Amp & Frequency Meters		X				
Check and/or Adjust Output Voltage	X			X		
Inspect Wiring and Connectors				X		
Clean and Inspect Generally				X		

Maintenance Schedule (Sheet 2 of 2)

d) Additional Information

The rest of this section (2-1) provides general information about the maintenance tasks required for each interval.

Refer to Section 2-2 for more detailed instructions.

Refer to Section 2-3 for adjustment and test procedures.

2) Inspection/Check

This section describes inspections, checks, and maintenance procedures in general terms. For more specific and detailed information, refer to Sections 2-2 and 2-3, when applicable.

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

System	Items	Description
Engine	Change Air Cleaner	Replace the air filter elements when the AIR CLEANER RESTRICTION light turns on. These filters should not be washed because washing breaks down the material inside the filters.
	Tighten Hose Clamps	Check and tighten, as required, all coolant hose clamps, air intake hose clamps, and exhaust clamps.
	Check Hoses	Check all coolant hoses, air intake hoses, and exhaust pipes for leaks.
Electrical (28.5 VDC System)	Check Output Voltage	Check the output voltage and be sure it is set for 28.5 V. If required, refer to Section 2-3 for adjustment procedures.

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

System	Items	Description
Engine	Check Oil	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. CAUTION: Do not overfill. Do not operate the engine with oil level below the lower bar or above the upper bar on the dipstick.
	Drain the Fuel-Water Separator	To extend the life of the fuel pump and injectors, drain about a cup of fuel from the fuel pre-filter element to remove water and sediment before starting the engine each day. Provide a container for catching drained fuel. Open the drain valve on the fuel/water filter. Refer to the following figure. Drain the filter until clear fuel is visible. Tighten the drain valve. Safely dispose of drained fuel. Purge air from fuel system if necessary. BE SURE to prime and bleed the fuel system after draining the filters, replacing filter element, or if the fuel tank has run empty. Failure to do so can cause engine-starting problems.
	Check Coolant Level	Check coolant level daily or at each fuel fill interval. Investigate for cause of any coolant loss. WARNING: Cooling system is pressurized. To avoid personal injury, DO NOT remove radiator cap when engine is hot.

	Check for Leaks	At each daily start-up, check for coolant, fuel, and oil leaks. Coolant leaks may be more noticeable when components are cold. Observe pumps, hoses, fittings, gasket connections, etc., for signs of leakage. Correct as required.
	Check Air Cleaner Indicator	At each daily start-up, observe the Fault meter on the control panel. If the display shows “air”, change the air cleaner filter.
	Check Exhaust System	Visually inspect muffler and exhaust pipes for rust and signs of approaching failure. Listen for any gasket or joint leaks. Warning: A leaking and defective exhaust system could be a fire hazard.
Electrical System (12 VDC)	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. Refer to the lists of lamps and circuit breakers at the end of this section.
	Check Engine Battery Voltage	Observe the 12-VDC engine voltmeter each time the engine is started to be sure the alternator is functioning correctly and charging the batteries. If the batteries need to be replaced, be sure the replacements meet the specifications for cold cranking amps (CCA) and Reserve Capacity. Refer to section 4-3 for the battery part number.
	Check Engine Meters	Check the operation of all the engine meters.
Electrical (400 Hz System)	Check Output Cables and Connectors	Check the output cable plug connection for damaged insulation and contacts each time the connector is detached from the aircraft.
	Check Meters	Check the operation of voltmeter, ammeter and frequency meter each time the unit is started.

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

System	Items	Description
Engine	Charge-Air-Cooler and Piping	Inspect the charge-air-cooler for dirt and debris blocking the fins. 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.
	Check and Record Oil Pressure	After each oil change, check and record oil pressure at idle speed after oil has warmed to approximately 140º F. Record oil pressure under identical conditions at each oil change interval. A comparison of pressure at idle speed with previous readings will give an indication of progressive wear of oil pump, bearings, shafts, etc. Investigate any abnormal change in pressure readings.
	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.
	Check Fuel Pump	Inspect the fuel injection pump mounting nuts for loose are damaged hardware. **Warning:** Be careful whenever you are inspecting the fuel system. The common rail fuel system is under very high pressure. Failure to comply with common rail fuel system safety procedures could result in injury or death.
Electrical (12 VDC system)	Check Battery	The battery is located on the left side under the cable tray. To access the battery, remove the panel in the bottom of the cable tray. Check battery terminals and clean if necessary. If the cables show corrosion, disconnect the cables and clean battery posts and connectors with a wire brush or battery post-cleaning tool. Coat the posts and connectors with a light film of petroleum lubricant before reconnecting cables to the batteries.
Electrical (400 Hz System)		Check the operation of the E-F bypass system.

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

System	Items	Description
Engine	Check Engine and Generator Mounts	Check engine and generator mounting bolts to ensure they are properly installed have not worked loose. (Torque is set at 122 N-m, 90 ft-lb.). **Caution:** An unstable or loosely mounted engine can create hazardous environment and may also damage equipment.
	Change oil and oil filters	
	Change all fuel filters.	
	Check Coolant	The cooling system protective liquid (nitrite-, amine- and phosphate free) provides effective protection against corrosion, cavitation, and freezing. See engine manufacturer's operation manual for ordering and mixture details.

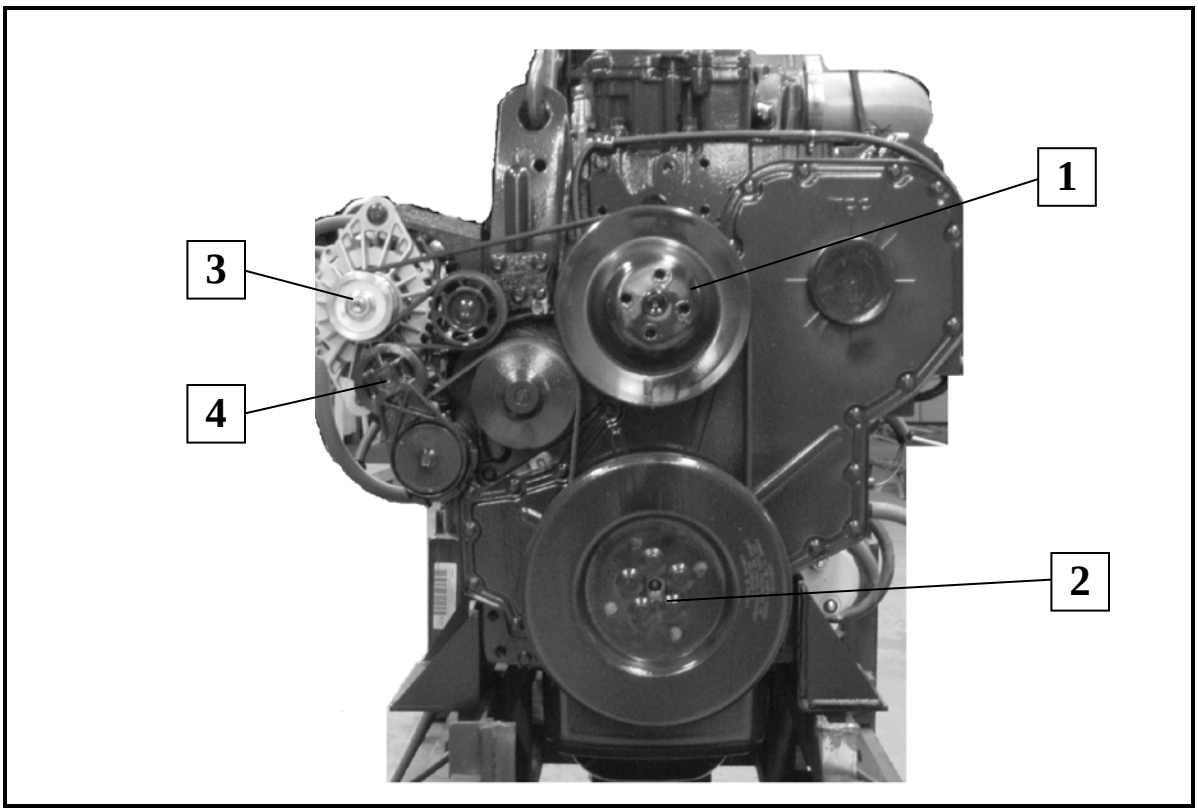
Electrical (12 VDC system)	Wiring	Inspect all cables and leads for worn or damaged insulation.
	Connections	Inspect connectors for damage or corrosion.
Electrical (400 Hz System)	Protective Monitoring Circuits	Check operation of all protective monitoring circuits to make certain they will function if a fault should occurs in the output circuit. Procedures for testing these circuits are contained in the Adjustment/Test section of this manual (Section 2-3).
	Inspect Wiring and Connections	Check all cables, leads, and wiring for broken, worn and damaged insulation. Check all connections for tightness.
	Clean and inspect generally	

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

System	Items	Description
Engine	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.
	Check Hose Clamps on Air Intake Side	Be sure that all clamps are properly secured to prevent leaks and all hose are in good condition.
	Check Belt Condition and Tensioner	Refer to the engine manufacturer's operations and maintenance manual for assistance and the most update to date information.
	Check and/or Adjust Valve Clearance	Refer to the engine manufacturer's operations and maintenance manual for assistance and the most up-to-date information.
	Check Water Pump	Inspect the water pump weep hole for indication of a steady leak. If a steady flow of coolant or oil is observed, replace the water pump with a new or rebuilt unit. Refer to the engine manufacturer's operations manual for assistance.

f) "E" Checks and Operations (1500 Hours or 1.5 Year)

System	Items	Description
Engine	Steam Clean Engine	There are several reasons why the engine exterior should be kept clean. Dirt on the outside will enter fuel and oil filter cases and rocker housings when covers are removed, unless dirt is removed first. A clean engine will run cooler and develop fewer hot-spots. Steam cleaning is one of the most satisfactory methods of cleaning and engine; however, there are some cautions to be observed: **Warning:** Exercise care to avoid injury and damage to eyes and skin. **Cautions:** • 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 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.
	Clean Fuel System	See engine manufacturer's operation manual for instructions.
	Check Alternator and Starter	The alternator and starter on this particular engine require no periodic lubrication.



1. Fan Pulley
2. Vibration Damper
3. Alternator

Figure 1: Engine Accessories

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

System	Items	Description
Engine	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.
	Check Charge-Air-Cooler and Radiator Systems	Check for damaged hoses and loose or damaged hose clamps. Check the radiator for leaks, damage, and build up of dirt in the fins. Clean or replace as necessary.
	Flush cooling system and change coolant	

h) Seasonal Maintenance Checks Spring/Fall (Engine)

System	Items	Description
Engine	Check Fan Mounting	Check fan to be sure it is securely mounted. Check for fan wobble and/or broken/cracked blades. Check fan hub and crankshaft pulley for secure mounting.
	Cooling System	Check cooling system each spring and fall. Clean if necessary.
	Check All Hoses	In addition to daily checks of hoses for leaks, inspect hoses thoroughly each time the cooling system is cleaned and serviced. Inspect for signs of deterioration and collapse. Inspect for cracks and cuts. Inspect for cutting and deformation caused by hose clamps. Replace hoses as required.
	Thermostat	Check thermostat and seals each fall when servicing the cooling system.

3) Lamps, Circuit Breakers, and Fuses

a) Lamps

Light Identification	Location	Lamp (Bulb) Type
Engine Start Indicator	Switch Panel	400613-004
Pre-heater Indicator	Switch Panel	400613-004
Clearance Lights (optional)	Canopy Top	57
Engine Gauge Lights	Inside Each Gauge	53
28.5V ON Indicator	Switch Panel	400613-003
Air Cleaner Restriction		400613-004

Lamp Identification Chart

Section 2-2: Maintenance Procedures

Section 1 of this Servicing chapter provides a maintenance schedule and general descriptions of the maintenance steps. This section provides more details.

WARNING

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

This section contains the following topics:

For generator maintenance procedures, refer to the “Run-in and Periodic Check” topic at the end of Section 3-1.

For additional engine maintenance procedures, refer to the engine maintenance manual.

1) Lubrication System Maintenance

Proper lubrication is one of the most important steps in good maintenance procedure. Proper lubrication means the use of correct lubricants and adherence to a proper time schedule.

Only the engine requires lubrication. The generator, generator controls, and instruments do not require lubrication. 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.

a) Lubrication Specifications

Oil Specification	Class	API Class API CF-4/SG – minimum acceptable API Class API CH-4, CH-4/SJ – acceptable API Class API CI-4/SK, CI-4 – excellent	
	Sulfated Ash Content	Recommended: 1.0 percent Maximum limit: 1.85 percent	
	Viscosity	AMBIENT TEMPERATURE CONDITIONS	VISCOSITY
		0ºF (-18ºC) and above for most climates	SAE 15W40 (Preferred)
		-10ºF to +50ºF (-23ºC to +10ºC) Winter conditions	SAE 10W30
		-20ºF to +50ºF (-29ºC to +10ºC) Arctic Conditions	SAE 5W30
		Continuous use of low-viscosity oils can decrease engine life due to wear. Refer to the engine manufacturer's operation manual for more details.	
	Synthetic Oils	The manufacturer does not recommend extending the oil change intervals when using synthetic oils.	
Capacity	11.6 quarts (11 liters)		
Filters	Oil Filter Replacement -- Hobart No.: FA5023 Oil Filter Replacement – Cummins (Fleetguard) No. LF16011		
Grease, General Purpose	Specification: MIL-G-3545 (Excludes those of sodium or soda soap thickness.)		

b) Lubrication System Maintenance Procedures

Item	Frequency	Procedure Notes
Check Oil Level	Daily	Access the dipstick through the right-front door. Check oil level daily with oil gauge dipstick. Wait at least 3 to 5 minutes after engine shutdown. Keep oil level as near the upper bar as possible. 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 and Record Oil Pressure	250 hours / 3 months	Check and record oil pressure at idle speed after oil has warmed to operating temperature. A comparison of pressure at idle speed with previous readings will give an indication of progressive wear of oil pump, bearings, shafts, etc. Investigate any abnormal change in pressure readings.
Change Oil and Filter	500 hours / 6 months	See instructions below.

c) Changing the Engine Oil

Change the engine oil every 500 hrs of engine operation. 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. If lubricating oil is drained immediately after the unit has been run for some time, most of the sediment will be in suspension and will drain readily.

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

CAUTIONS

- High ash oils may produce harmful deposits on valves that can cause valve burning.
- Do not use solvents as flushing oils in running engines.
- If bearing metal particles are found on the oil filter element or in the shell, the source should be determined before a failure.
- Determine source of moisture, internal leaks, defective seals, gaskets, etc.

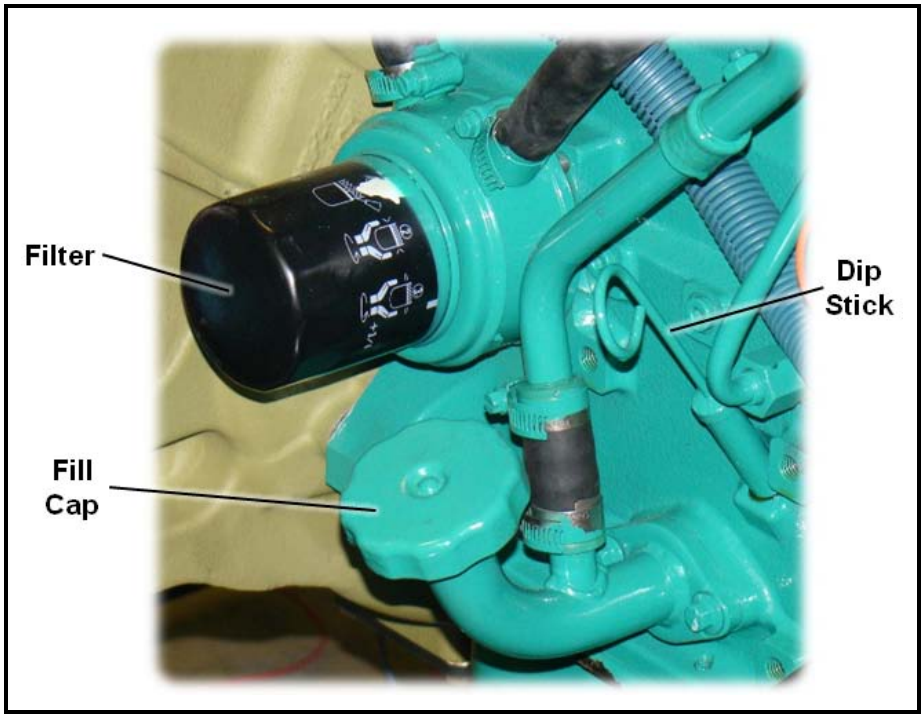


Figure 1: Lubrication System

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 2 gallons – 3.1 gallons (7.9L – 11.6L).
2. Open the drain valve located in the bottom of 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.
   c) Make sure the gasket is not stuck to the filter head. If it is, remove it before installing a new filter.
   d) Fill the new filter with clean lubricating oil before installation.
   e) Apply a light coating of lubricating oil to the gasket-sealing surface and install the filter. DO NOT over tighten the filter.
4. Use the oil refill tube to refill the crankcase with new, clean oil that meets engine manufacturer's recommendations.

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

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

2) Air Intake System Maintenance

The air cleaner assembly, shown in the figure below, contains two air filter elements. A definite time schedule for cleaning or changing the air filters cannot be determined because of varying operating conditions.

To remove the air cleaner filters from the air cleaner housing, unscrew the plastic cover at the end of the air cleaner housing. Air filters may be inspected either at prescribed service intervals or at any time deemed necessary.

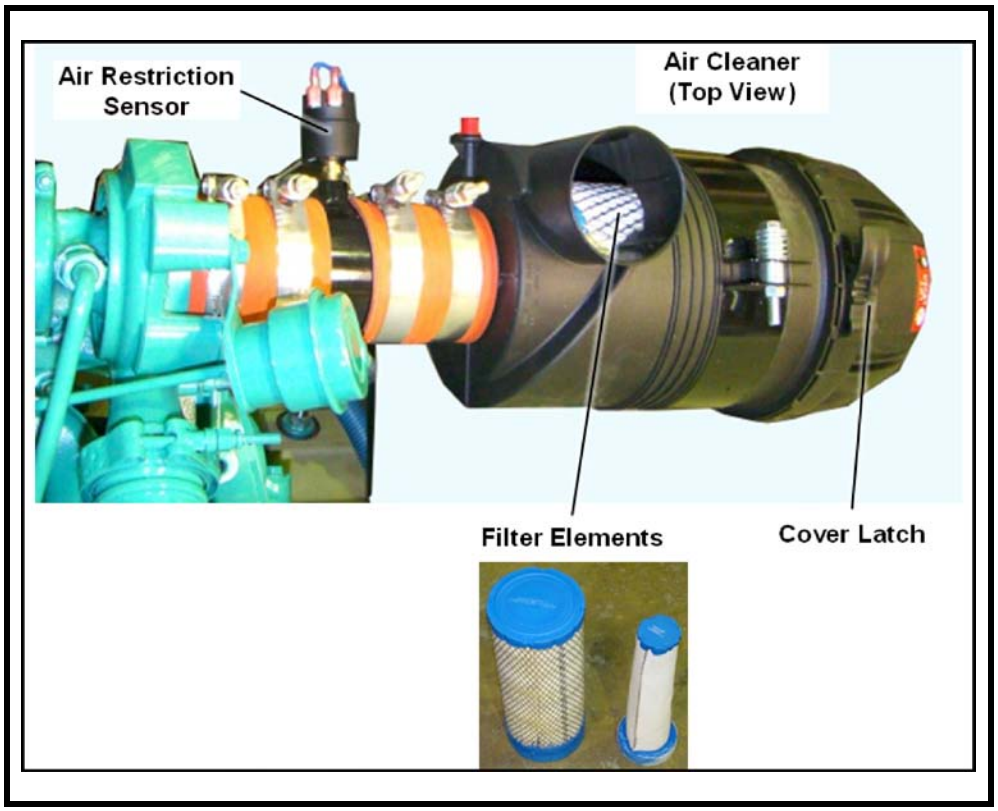


Figure 2: Air Intake System

a) Air Intake System Maintenance Procedures

Item	Frequency	Procedure Notes
Change air filter elements	As required	Change the air cleaner filter when the control panel Air Cleaner Restriction light turns on. See details below.
Inspect	250 hours / 3 months	Check for damages to pipes and hoses, loose clamps, and punctures. Check for corrosion under the clamps and hoses. Disassemble and clean as required.

b) Changing the Air Cleaner Filter Elements

Replacement Filters	Primary filter element:	Hobart 291878	Fleetguard AF26117
	Secondary filter element:	Hobart 291879	Fleetguard AF26118

Figure 3: Air Cleaner

1. Open the right-rear canopy door to access the air cleaner.
2. Lift the lever on the side of the air cleaner
3. Rotate the rear of the air cleaner counterclockwise to the “unlock” position.
4. Pull out air filter elements and replace.
5. Replace end cover on housing, making certain that the filters are centered in the housing.
6. Rotate the rear of the air cleaner clockwise to the “lock” position.

c) Disposal

These air cleaner filters are disposable and should be discarded when dirty. Normal trash pick-up should be acceptable. Never burn the air filter for disposal.

3) Fuel System Maintenance

WARNING

- The pressure of the fuel between the pump and the injectors is sufficient to penetrate the skin and cause serious personal injury. Always wear gloves and other protective clothing when working on the fuel system.
- Fuel is flammable. Avoid all sources of ignition including cigarettes, flames, welding equipment, and switches out of the work area.
- Do not vent the fuel system on a hot engine. This can cause a fire.

CAUTIONS

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

a) Engine Fuel Selection

The quality of fuel oil used in the diesel engine is a major factor in engine performance and life. Fuel oil must be clean, completely distilled, stable and non-corrosive. Use only commercially available ultra-low sulfur diesel (ULSD) fuel with less than 15-ppm sulfur content.

b) Fuel System Maintenance Procedures

Item	Frequency	Procedure Notes
Drain the fuel-water separator	Daily	1. Access the fuel-water separator through the left-front canopy door. It is located above the engine at the front (see Section 1-1). 2. Open the drain valve by unscrewing the knob on the bottom of the first filter. 3. Drain the accumulated water and contaminants. 4. Close drain valve.
Replace the fuel filter	500 hours/6 months	1. Access the fuel filter through the left-rear canopy door (see Section 1-1). 2. Replace the filter. Hobart 288323 Fleetguard FF5079
Replace the front fuel-water separator element Replace the pre-filter fuel-water separator	500 hours/6 months	1. Drain the fuel-water separator at the bottom of the fuel filter. 2. Remove the fuel filter. 3. Clean the gasket surface on the fuel filter head. 4. Apply a coating of clean lubricating oil to the new O-ring and element seal. 5. Fill the fuel filter with clean fuel. 6. Spin the filter onto the fuel filter element Front filter Hobart: 286897-039 Fleetguard FF5432 Pre-filter Hobart: 286897-012 Racor R60P

4) Cooling System Maintenance

WARNING

- To avoid the danger of serious burns, do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 120 °F (50 °C) before removing the pressure cap.
- To avoid the risk of burns when removing the radiator cap, do not turn the cap past the safety stop until any pressure or steam has escaped.
- Do not straighten a bent fan blade or continue to use a damaged fan. The damaged fan can fail during operation, resulting in personal injury or equipment damage.

CAUTIONS

- To avoid engine damage resulting from air locks in the cooling passages, fill the cooling system slowly to allow the air to vent.
- To avoid engine damage due to severe corrosion, always use a proper mix of antifreeze and water. Never use water alone for the coolant.
- To avoid engine damage, allow a hot engine to cool before adding coolant.
- Never use a sealing additive to stop leaks in the cooling system. The additive can cause engine overheating from inadequate coolant flow.
- Use a 50/50 mix of water and ethylene glycol antifreeze to protect the engine to -26 °F (-32 °C). A high concentration of antifreeze can damage the engine.

Item	Frequency	Procedure Notes
Check coolant level	Daily	• To remove, turn the cap to the left (counterclockwise) to the safety stop. When all pressure is released, press down on the cap and continue to turn until the cap is free to be removed. • The coolant should be up to the bottom of the fill neck. • If more coolant was added, run the engine at rated speed long enough for the thermostat to open so trapped air escapes.

Inspect drive belts	Daily	• Replace belts that are cracked, frayed, or missing pieces of material. Small cracks are acceptable. • If the belts have a glazed or shiny surface, which indicates belt slippage, adjust the belt tension.
Inspect cooling fan	Daily	• Inspect the fan for cracks, loose rivets, and bent or loose blades. • Check the fan to make sure it is securely mounted.
Check the radiator pressure cap	250 hours/3 months	• Inspect the cap's rubber seal for damage. • Inspect the radiator fill neck for cracks or other damage. • Pressure-test the radiator cap. It is rated at 7 PSI (50 kPA)
Check the coolant	500 hours/6 months	• Use a refractometer to check the coolant concentration and freezing point protection. Cummins recommends Fleetguard part number C2800.

• Flush the cooling system
• Check the hoses
• Check the radiator for signs of leaks, damage, or buildup of dirt.
	2000 hours/2 years	1. Fill the system with a mixture of sodium carbonate and water (refer to the Cummins Maintenance Manual).
		2. Run the engine at rated speed without the radiator cap.
		3. Operate the engine for 5 minutes with a coolant temperature above 180 °F (82 °C).
		4. Drain, refill with water, and operate for another 5 minutes without the radiator cap.
		5. Drain
		  • If the water is dirty, repeat the flush
		  • Otherwise, refill with the proper mixture of antifreeze.
		6. Operate with the pressure cap until the temperature reaches 180 °F (82 °C).
		7. Check the coolant level.

5) 12-Volt Electrical System Maintenance

Item	Frequency	Procedure Notes
Check all lights	Daily	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. Refer to the lists of lamps and circuit breakers at the end of this section.
Check the battery voltage	Daily	Observe the 12-VDC engine voltmeter each time the engine is started to be sure the alternator is functioning correctly and charging the batteries. If the batteries need to be replaced, be sure the replacements meet the specifications for cold cranking amps (CCA) and Reserve Capacity. Refer to section 4-3 for the battery part number.
Check the engine meters	Daily	Check the operation of all the engine meters.
Check the battery terminals	250 hours / 3 months	Visually check battery cable connectors and battery posts. If the cables show corrosion, disconnect the cables and clean battery posts and connectors with a wire brush or battery post-cleaning tool. Coat the posts and connectors with a light film of petroleum lubricant before reconnecting cables to the batteries.
Check wiring and connections	500 hours / 6 months	Inspect all cables and leads for worn or damaged insulation. Inspect connectors for damage or corrosion.

6) 28-Volt Electrical System Maintenance

Item	Frequency	Procedure Notes
Protective Monitoring Circuits	500 hours / 6 months	Check operation of all protective monitoring circuits to make certain they will function if a fault should occurs in the output circuit. Procedures for testing these circuits are contained in the Adjustment/Test section of this manual (Section 2-3).
Inspect Wiring and Connections	500 hours / 6 months	Check all cables, leads, and wiring for broken, worn and damaged insulation. Check all connections for tightness.

Section 2-3: Test and Adjustment

This section provides instructions for testing and adjusting the generator set after major repair, major parts replacements, or overhaul.

1) Pre-operational Test Procedures

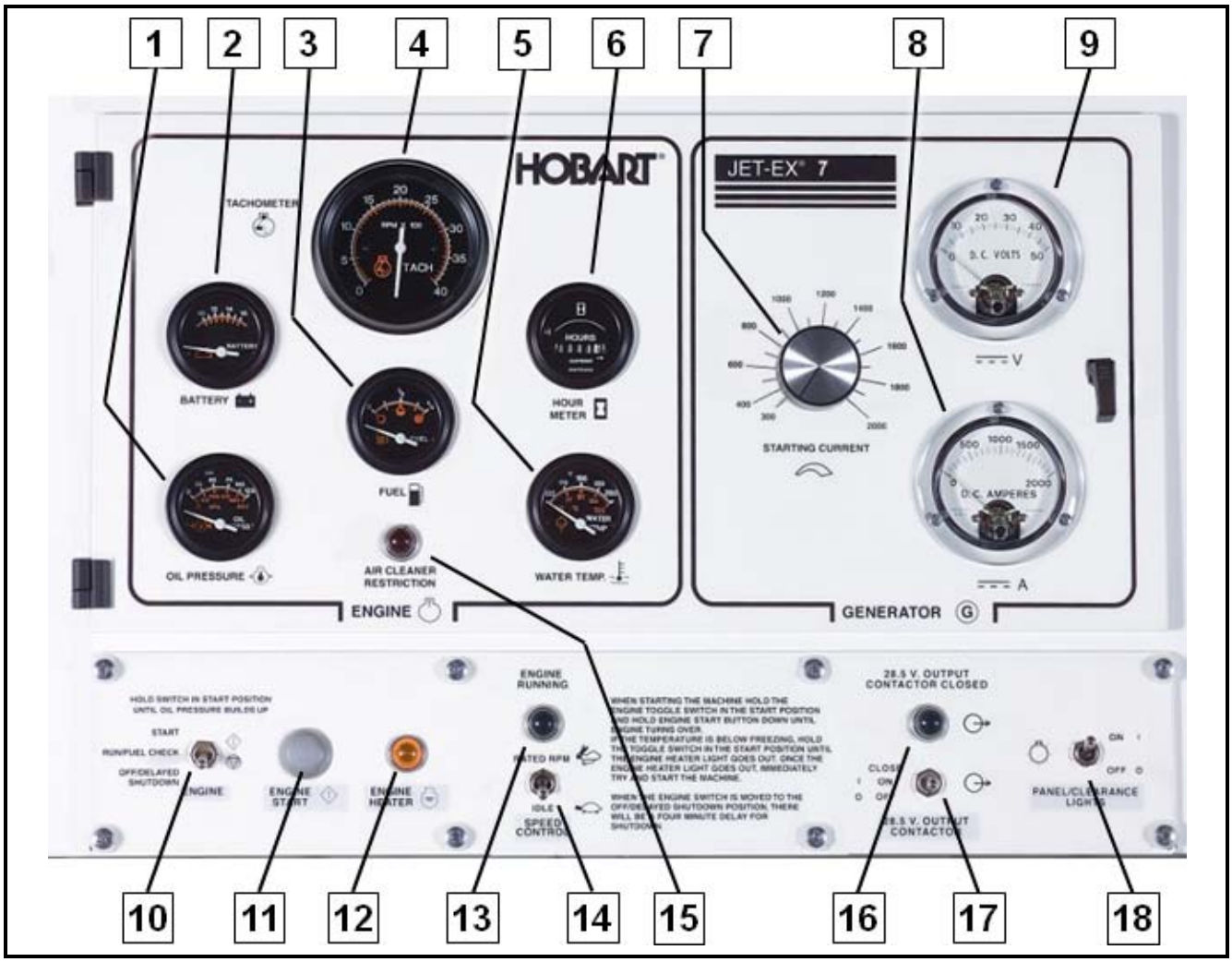
1. Check the engine oil level. The level should be at the high bar on the dipstick.
2. Check the radiator coolant level.
3. Check the tension of drive belt.
4. Inspect for oil, fuel and coolant leaks.
5. Check the control panel lights by turning on the **PANEL/CLEARANCE** light switch.
6. Make a general inspection of all wiring and terminals.
7. Inspect the equipment to be certain no damage will result from starting the engine.
8. Connect the cables from the generator output terminals to a load bank.

   The output cable consists of two single conductor cables not more than 30 feet (9 m) long. Use cables with the a wire gauge that is appropriate for the maximum starting current:

   - Use No. 2/0 cable for 600 A maximum starting current.
   - Use No. 4/0 cable for 1500 A maximum starting current.

2) 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 25 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 is hot.
6. Observe the engine speed on the tachometer. The idle speed should be 1200 ± 50 RPM.
7. Place the **SPEED CONTROL** switch in the **RATED RPM** position. The engine speed should be 1800 ± 50 RPM.
8. Check for 28.5 output voltage on generator voltmeter to assure automatic voltage buildup.
9. Set the **STARTING CURRENT** potentiometer to the maximum, full clockwise position.



1. OIL PRESSURE Gauge (M405)
2. BATTERY Gauge (M401)
3. FUEL Gauge (M408)
4. TACHOMETER (M403)
5. WATER TEMP. Gauge (M404)
6. HOUR METER(M402)
7. STARTING CURRENT Control (R402)
8. Output Current (A) Meter (M407)
9. Output Voltage (V) Meter (M406)
10. ENGINE Switch (S404)
11. ENGINE START Pushbutton Switch (S401)
12. ENGINE HEATER Light (DS426)
13. ENGINE RUNNING Light (DS407)
14. SPEED CONTROL Switch (S406)
15. AIR CLEANER RESTRICTION Light (DS412)
16. 28.5 V OUTPUT CONTACTOR CLOSED Light (DS408)
17. 28.5 V OUTPUT CONTACTOR Switch (S408)
18. PANEL/CLEARANCE LIGHTS Switch (S405)

Figure 1: Control Panel Door

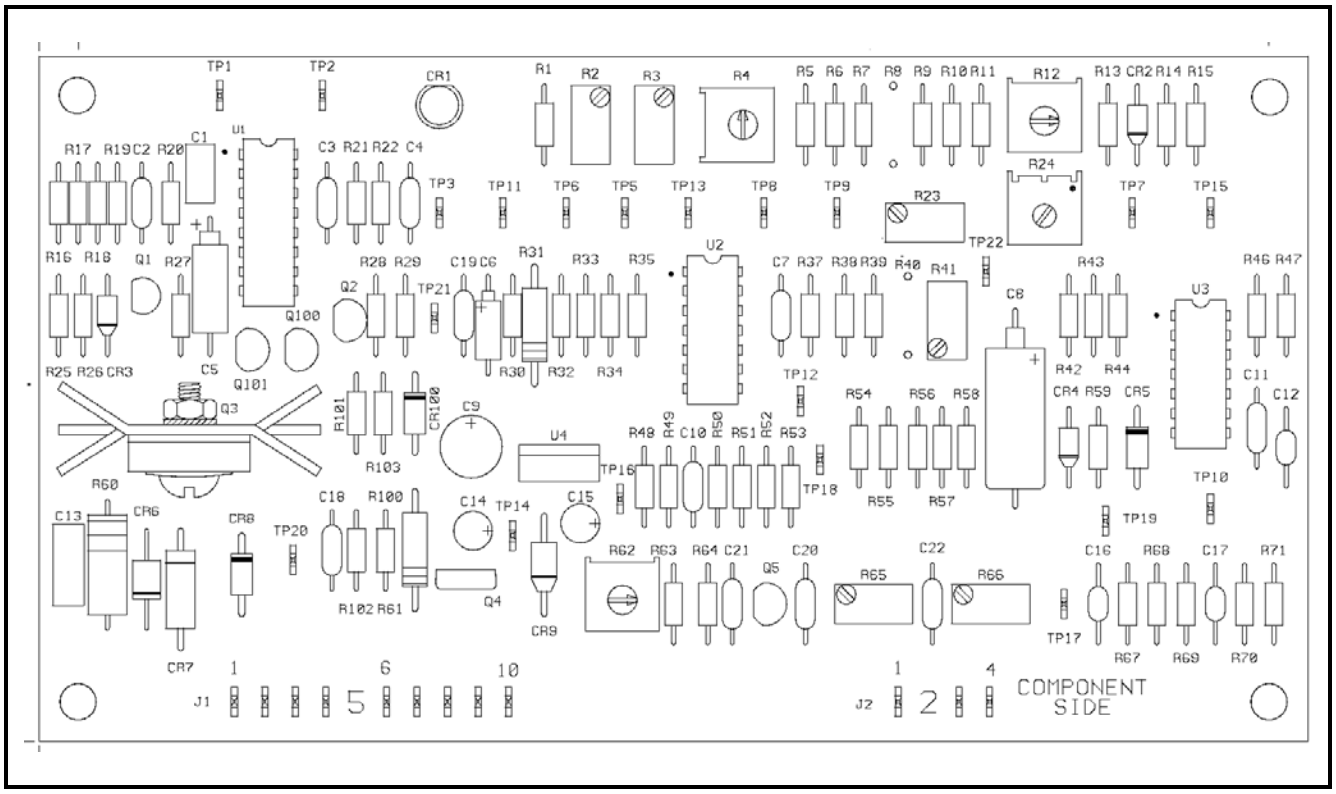


Figure 2: Voltage Regulator Board

10. Adjust the load bank for a load of 600 amperes.
11. Hold the **28.5 V OUTPUT CONTACTOR** toggle switch in the **CLOSE** position until the **28.5 V OUTPUT CONTACTOR CLOSED** light turns on. Then, release the contactor control toggle switch to the center ON position.
12. Make sure the engine speed is still 1800 ± 50 RPM.
13. Check the over-voltage protection:
    a. Remove the load from the load bank.
    b. Adjust voltage regulator potentiometer (R66) to increase the voltage until the over-voltage relay opens the load contactor. The over-voltage relay should trip between 32 and 34 volts.
    c. Readjust the voltage to 28.5 volts.
    d. Set the load bank to 600 A and close the contactor. Make sure the contactor stays closed.
14. Check the voltage regulation:

    Apply the following loads to the load bank, making sure the voltage remains at 28.5 ± 1 volts:

    0, 137, 275, 413, 550, and 600 amperes

15. Check the current limit:
    a. With **STARTING CURRENT** potentiometer set to **1500**, adjust the load bank for a 600 to 700 ampere load.
    b. Set the **STARTING CURRENT** control potentiometer to **400**. The generator ammeter should show 400 ± 40 amperes.

       NOTE: Voltage will not drop below 14 volts.
    c. Set **STARTING CURRENT** potentiometer to **1500** and apply 1200 amperes load.
    d. Then set the **STARTING CURRENT** potentiometer to **1000**. The generator ammeter should show 1000 ± 100 amperes and voltage will not drop below 14 volts.
    e. Remove the load.
16. Move the **SPEED CONTROL** switch to the **IDLE** position.
17. Move the **ENGINE** switch to the **OFF/DELAYED SHUTDOWN** position. This starts the shutdown delay.

3) Voltage Regulator Adjustment

a) 28.5 Volt Adjustment

Use the multi-turn potentiometer R66 to adjust the regulated voltage in the 28.5-volt range. Clockwise (CW) rotation increases the voltage level, and counterclockwise (CCW) rotation decreases the voltage level.

b) Line-Drop Compensation

Line-drop compensation allows the voltage at the load end of the output cable to remain constant despite the voltage drop associated with the output cable. Clockwise (CW) rotation of the single-turn potentiometer R24 increases the compensation. As the load changes, the voltage at the load end of the cable should remain constant.

4) Over-Voltage Relay Adjustment

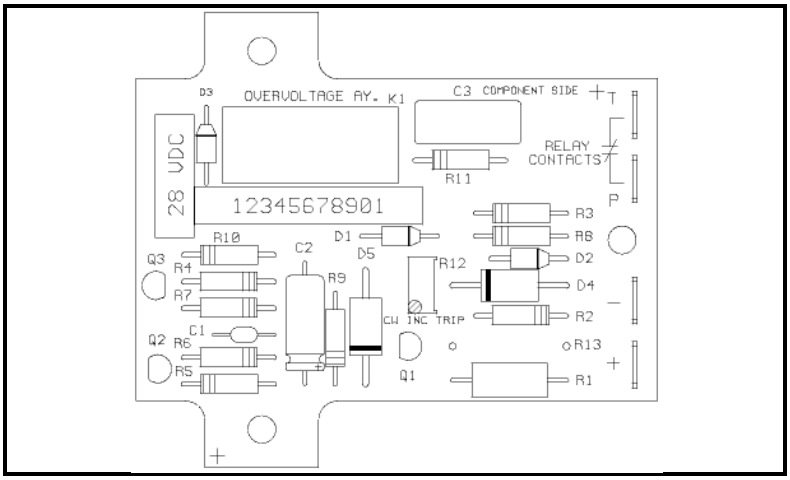


Figure 3: Over-Voltage Relay

The over-voltage relay board is factory set to trip between 32 and 34 volts. If it did not trip in that voltage range, adjust its trip point with multi-turn potentiometer R12.

1. Start the generator set.
2. Close the output contactor.
3. Adjust voltage regulator potentiometer (R66) to increase the voltage to 33 volts.
4. If the output contactor opens before reaching 33 volts output, turn R12 on the over-voltage relay several turns clockwise.
5. Adjust R12 counterclockwise until the output contactor opens.
6. Adjust voltage regulator R66 to set the output back to 28.5 volts.

5) Speed Control Adjustment

The speed control system maintains the engine speed at 1000 RPM for idle and 1800 RPM for power generation. A magnetic sensor on the engine flywheel supplies the engine speed signal to the speed control unit, which is mounted in the control box. The speed control unit drives an actuator on the engine's fuel pump to control the engine speed. Seasonal climate changes may require periodic adjustments of the speed controller.

a) Magnetic Sensor Adjustment

1. With the engine stopped, screw the sensor in until the end just touches the ring gear teeth.
2. Back the sensor out 1/2 turn and tighten it in place
3. Connect an AC voltmeter to the sensor output.
4. Make sure the output voltage is at least 1 VAC RMS during cranking. If the voltage is too low, the sensor is too far away from the gear teeth.

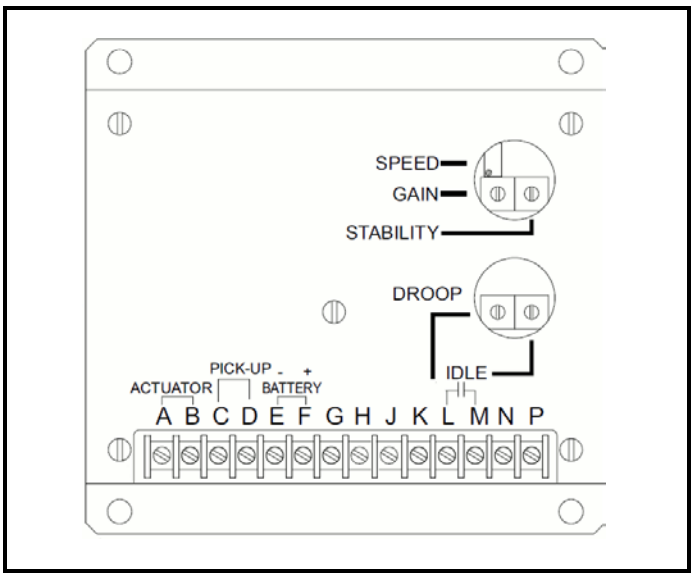


Figure 4: Speed Control Unit

b) Speed Adjustments

1. Open the control box door to access the speed control.
2. Remove the black plastic plugs from the front of the unit to access the controls, which are show in the diagram above.
3. Before starting the engine, turn the **GAIN** and **STABILITY** adjustments to mid position.
4. Set the control panel **ENGINE SPEED** switch to the **RATED RPM** position.
5. Start the engine.
6. If the engine speed is unstable, turn the **GAIN** and **STABILITY** adjustments counterclockwise until the engine is stable.
7. Rotate the speed control's multi-turn **SPEED** adjustment pot until the control panel tachometer shows **1800** RPM.
8. Set the **GAIN** adjustment:
   a) Rotate the **GAIN** adjustment clockwise until the engine speed becomes unstable.
   b) Gradually rotate the **GAIN** back counterclockwise until the engine stabilizes.
   c) Move the adjustment counterclockwise one more division to ensure stability.
9. Set the **STABILITY** adjustment:
   a) Rotate the **STABILITY** adjustment clockwise until the engine speed becomes unstable.
   b) Gradually rotate the **STABILITY** back counterclockwise until the engine stabilizes
   c) Move the adjustment counterclockwise one more division to ensure stability.
10. Set the **IDLE** speed:
    a) Set the control panel **ENGINE SPEED** switch to the **IDLE** position.
    b) Use the speed control unit's **IDLE** adjustment to set the idle speed to **1200** RPM. Rotate the control clockwise to increase the speed and counterclockwise to decrease the speed.
11. Make sure the generator set operates properly when a load is applied. If the speed is not stable under load, make minor adjustments to the **GAIN** and **STABILITY** controls.
12. Replace the black plastic covers over the speed control unit's adjustments.

Section 2-4: Troubleshooting Procedures

This section provides information to help diagnose common faults and malfunctions for all major system components.

1) General Troubleshooting Information

a) Using This Section

This section contains tables of symptoms for problems you may encounter with your generator set. Always check connections and leads to a component suspected of being faulty. The troubleshooting information in this section assumes that connections and wiring have already been checked and that power has not been lost because of defective wiring or connections.

b) Equipment for Troubleshooting

A good quality electrical multi-meter 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.

c) Replacement Parts

Chapter 4 of this manual contains an illustrated parts list. The parts diagrams show the parts that are considered service parts. To order replacement parts, refer to the Hobart part numbers listed in the tables with each diagram.

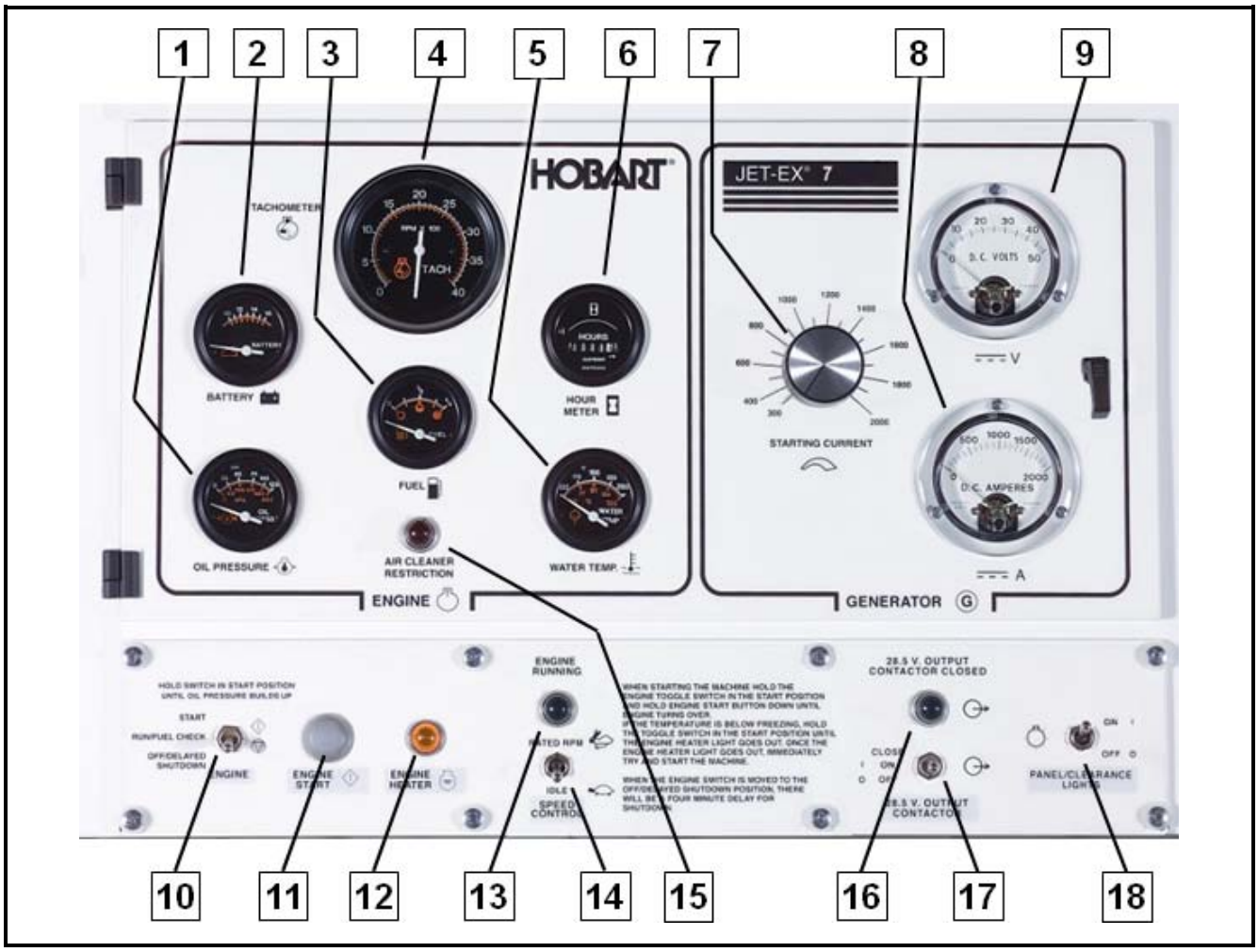
The following items must be replaced as complete units – they do not have field-replaceable components:

- Voltage Regulator Board
- Over-Voltage Relay
- Speed Control Unit
- Glow Plug Controller

2) Parts Location Diagrams

In addition to the following control box diagrams, refer to Sections 1-1 and 4-3 for component locations.

a) Control Panel



1. OIL PRESSURE Gauge (M405)
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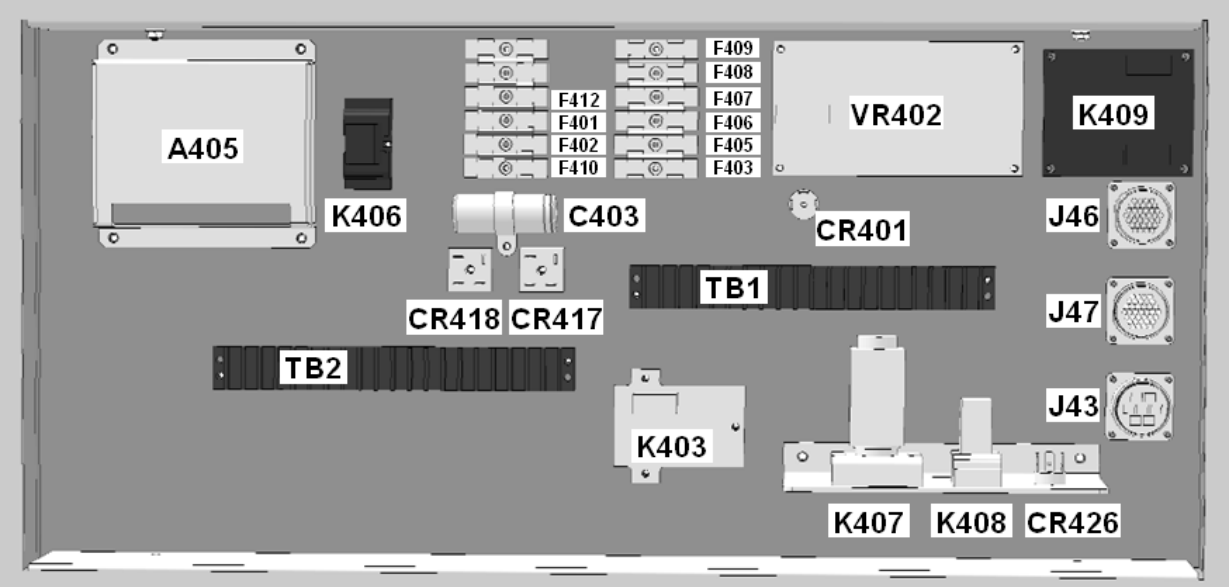
Figure 1: Control Panel Door

b) Control Box Interior Components



A405	Speed Control Unit	J43	Receptacle, Rectifier
C403	Capacitor – filter for control winding drive	J46	Receptacle, Power
CR401	Blocking Diode, Voltage Regulator	J47	Receptacle, Engine
CR417 – CR418	Bridge Rectifiers – control winding drive	K403	Relay, Over-Voltage
CR426	Diode, Blocking		
F401	Fuse, Lights	K407	Relay, Shutdown Timer
F402	Fuse, Engine Circuit	K408	Relay, Timer
F403	Fuse, Voltage Regulator Exciter Current	K409	Low Fuel Board
F405	Fuse, +12 VDC to Bridge Rectifier – control winding drive	TB1	Terminal Block
F406 – F408	Fuse, 3-Phase Output to Bridge Rectifiers – control winding drive	TB2	Terminal Block
F409	(not used)	VR402	Voltage Regulator Board
F410	Fuse, Contactor Coil		
F412	Fuse, Speed Control 20A		

Figure 2: Control Box Interior Components

3) Troubleshooting Tables

a) Engine Controls

Engine Controls		
Trouble, Symptom, Condition	**Probable Cause**	**Test, Check, and/or Remedy**
1. The starter will not turn the engine.	a. Problem with battery or connections	Check the following: • Battery voltage OK? (about 12.8 volts) • Battery terminals clean? • Connections tight at disconnect switch, starter solenoid input terminal, and ground? • 12.8 volts at solenoid input terminal? • Battery disconnect switch turned on?
	b. Defective engine start button (S401)	Temporarily connect a jumper between the hot side of the starter solenoid (L401) and the start switch terminal on the starter relay wire. If the starter operates, replace faulty switch.
	c. Defective starter solenoid (L401)	Temporarily connect a large capacity jumper cable between the hot side of the starter relay and the starter input terminal. If the starter attempts to crank the engine, the starter solenoid is defective.
	d. Defective starter (B401)	If the engine will not crank after the previous steps, the starter is defective. Replace starter. If starter did attempt to operate but couldn't turn engine, proceed to the next step.
	e. Internal engine seizure	**CAUTION**: make certain that engine start switch is in "stop" position so that engine does not start. Use a socket wrench on the front crankshaft pulley to try to turn engine by hand. If engine will not turn, internal damage is indicated.
2. Starter turns but engine does not start.	a. Defective engine circuit fuse (F402)	Replace fuse.
	b. Fuel problem	Check the following: • Fuel in the tank? • Fuel valve at tank turned on? • Fuel filter OK?
	c. Defective ENGINE switch (S404)	Check for 12 volts at terminal 4 of the switch in the **START** position. If 12 VDC is not measured, replace defective switch.

Engine Controls		
Trouble, Symptom, Condition	**Probable Cause**	**Test, Check, and/or Remedy**
	d. Defective battery or wiring	Check the voltage while the engine is cranking. It should be at least 7 VDC. If not, try replacing the battery.
	e. Speed controller problems	Make sure the actuator output from the speed control is approximately 2 volts DC. If not, make sure the speed control is getting an AC signal from the magnetic sensor when the engine is cranking (approximately 3 to 5 VAC RMS) and check the fuse to the speed control.
	f. Defective fuel valve solenoid (L404)	Attempt to start engine while applying 12-V DC to the fuel valve solenoid. If the engine starts, the solenoid is defective and should be replaced.
	g. Defective fuel pump	Check the fuel pump according to instructions in the Engine Manufacture's Operation and Maintenance Manual.
3. Engine starts then stops when ENGINE toggle switch (S404) is released to "ON" position.	a. Low oil pressure or defective oil pressure switch	The oil pressure switch closes when the oil pressure increases above 10 PSI. This switch is bypassed when the **ENGINE** switch is in the **START** position. Place a clip-lead jumper across the "C" and "NO" terminals of the oil pressure switch. If that works, replace the switch.
	b. Defective coolant temperature switch (S402)	This normally closed switch is bypassed when the **ENGINE** switch is in the **START** position. Check the coolant temperature switch with an ohmmeter.
	c. Defective **ENGINE** switch (S404)	Check the switch with an ohmmeter.
4. Engine starts then stops.	a. Fuel not turned on	Turn on fuel shutoff valve.
	b. Oil pressure is low or oil pressure switch (S403) is intermittent	If the oil pressure gauge shows that the pressure is OK when the engine starts, place a jumper across the oil pressure switch. If that fixes the problem, replace the oil pressure switch.
	c. Clogged fuel filter, restriction in air cleaner, or air in fuel system	Check for these faults according to instructions in the Cummins Operation and Maintenance Manual.
5. Engine does not attain normal rated RPM.	a. Problem with speed controller	The actuator voltage for rated RPM is somewhat higher than the voltage for idle (perhaps just 0.1 VDC without a load). Verify the actuator voltage changes between the **IDLE** and **RATED** positions of the **ENGINE SPEED** switch.

Engine Controls		
Trouble, Symptom, Condition	**Probable Cause**	**Test, Check, and/or Remedy**
	b. Defective speed control switch (S406)	With the power off, check the ENGINE SPEED switch with an ohmmeter to verify proper operation.
6. Engine lacks power.	a. Insufficient air to engine	Check air filter restriction indicator lamp for illumination. Replace or clean as required.
	b. Restricted exhaust system	Check exhaust pipe for restrictions. Check muffler for clogged condition. Replace as required.
	c. Low compression	Check compression in all cylinders according to the Engine Manufacture's Operation and Maintenance Manual.
7. Engine Overheats.	a. Low coolant	Check the coolant level.
	b. Broken or slipping fan belt	Tighten belt or replace as required
	c. Defective thermostat	Follow recommendations in the Cummins Operation and Maintenance Manual for testing the thermostat.
	d. Dirt or sludge in coolant	Drain coolant, flush radiator, put in clean coolant. Refer to the Engine Manufacture's Operation and Maintenance Manual.
	e. Debris and dirt in radiator core	Clean radiator core carefully. Refer to the Engine Manufacture's Operation and Maintenance Manual.
8. Engine runs rough – excessive exhaust smoke	a. Fuel pump timing	Make sure the timing advance circuit has +12 volts and ground. Adjust the timing of the mechanical fuel pump by rotating it. This should never be necessary unless the fuel pump is replaced. This should be done by a Cummins service technician.

b) Generator and Controls

Generator and Controls		
Trouble, Symptom, Condition	**Probable Cause**	**Test, Check, and/or Remedy**
1. Generator does not build up voltage when **ENGINE SPEED** switch (S406) is placed in **RATED RPM** position.	a. Problem with brushes	Remove, clean, and reinstall the generator brushes, replacing them if they are worn.
	b. Voltage build-up fuse (F405) is blown	Replace voltage build-up fuse. Proceed to Step b to determine cause of blown fuse.
	c. Defective excitation rectifier (CR417 or CR418)	Check excitation rectifiers with an ohmmeter to see if they are good. If either rectifier is defective, replace it. If both rectifiers are good, proceed to Step c.
	d. Defective capacitor (C403)	Check capacitor with an ohmmeter to see if it is good.
	e. Defective diode on control winding (CR419)	The diode is located on the generator's brush holder mounting bracket. Check it with an ohmmeter to see if it is good.
	f. Voltage regulator fuse (F403) is blown	Replace the voltage regulator fuse.
	g. Defective rectifier (CR401)	This rectifier supplies voltage to the voltage regulator. Use an ohmmeter to check rectifier CR401.
	h. Generator voltage regulator (VR402) defective	Replace voltage regulator.
	i. Defective generator control winding (L406)	Measure resistance between these two wires coming from CR419. It should be 10 to 11 ohms. It is defective if shorted or open.
	j. Defective generator armature G402	If no problem was found with the control winding, the generator stator is defective. Send unit to overhaul.
2. Generator output voltage too low	a. Defective excitation rectifier (CR417 or CR418)	Check excitation rectifiers with an ohmmeter to see if they are good. If either rectifier is defective, replace it. If both rectifiers are good, proceed to Step b.
	b. Generator voltage regulator VR402 defective	Replace voltage regulator.

Generator and Controls		
Trouble, Symptom, Condition	**Probable Cause**	**Test, Check, and/or Remedy**
3. Generator output voltage too high	a. Defective **ENGINE SPEED** switch (S406)	Check the switch with an ohmmeter
	b. Defective blocking rectifier (CR401)	Check the rectifier with an ohmmeter
	c. Defective voltage regulator board (VR402)	Replace the voltage regulator board.
4. Load contactor will not close when the O**UTPUT CONTACTOR** switch (S408) is placed in **CLOSE** position. Engine running normally, voltage normal, no load applied to output cable.	a. Possible burned out light bulb in the CONTACTOR CLOSED indicator	Observe contactor to make sure it is not functioning. Measure the voltage at the contactor output to verify that it did not close.
	b. Defective **OUTPUT CONTACTOR** switch (S408)	Temporarily connect a jumper lead between terminals on the OUTPUT CONTACTOR switch. If the load contactor closes, replace switch.
	c. Defective load contactor (K402)	If load contactor still does not close with the OUTPUT CONTACTOR switch jumpered, it is likely that the contactor is defective.
	d. Overvoltage relay (K403) not working properly	The overvoltage relay may be defective or out of adjustment. Connect a jumper lead between terminals T and P on the overvoltage relay. If the contactor works, adjust or replace the overvoltage relay. Refer to Section 2-3 for adjustment procedures.
5. Load contactor opens as soon as the **OUTPUT CONTACTOR** switch (S408) is released from the **CLOSE** position to the **ON** position.	a. Defective **OUTPUT CONTACTOR** switch (S408)	Connect a jumper lead between terminals on the **OUTPUT CONTACTOR** switch. If the load contactor now remains closed, replace the switch.
	b. Load contactor (K402) defective	Replace load contactor.
6. Load contactor (K402) opens during power delivery.	a. Contactor opening could have been normal because of an overvoltage condition	Resume operation and closely observe voltmeter for evidence of overvoltage. If contactor opens when no overvoltage condition exists, proceed to Step b.

Generator and Controls		
Trouble, Symptom, Condition	**Probable Cause**	**Test, Check, and/or Remedy**
	b. Overvoltage relay (K403) not working properly	The overvoltage relay may be defective or out of adjustment. Connect a jumper lead between terminals T and P on the overvoltage relay. If the contactor works, adjust or replace the overvoltage relay. Refer to Section 2-3 for adjustment procedures.
	c. Load contactor (K402) defective.	If no fault was found in above steps, replace load contactor
7. STARTING CURRENT potentiometer (R402) does not limit the output current.	a. Defective current limiting control potentiometer	Shut down engine and check potentiometer with an ohmmeter. Disconnect the plug (P404) from the regulator board and take resistance measurements from pin 2 to pin 9 and then from pin 2 to pin 10 on the plug. For each measurement, slowly turn current limiting control potentiometer through its entire range, while observing the ohmmeter readings. Resistance should be from 0-10 k ohms. Replace if necessary.
	b. Defective voltage regulator (VR402)	Try a known-good voltage regulator board.

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Chapter 3: Overhaul/Major Repair

Section 3-1: Rebuilding the Generator

This chapter provides basic instructions for removal, service, and installation of the generator's flexible coupling. The flexible coupling connects the generator shaft to the flywheel of the diesel engine. The flexible coupling assembly compensates for slight misalignment between the engine and the generator due to manufacturing tolerances.

This chapter includes the following topics:

1) Company Contact Information

If you need assistance or need to order parts, contact Hobart or your Hobart distributor.

Write: Hobart Ground Systems
Service Department
11001 US Highway 41, North
Palmetto, FL 34221
U.S.A.

E-Mail : service@hobartsystems.com

Web Page : www.hobartsystems.com

Phone Numbers	**Inside U.S.A.**	**International**
Parts	(800) 899-1841	(941) 721-1025
Service	(877) 874-5322	(941) 721-1092
FAX	(800) 367-4945	(937) 332-5121

2) Generator Overview

a) The Flexible Coupling Assembly

The flexible coupling assembly consists of a stack of four flexible disks and a fan assembly, and a center hub. The flexible disks bolt to the engine flywheel and the hub connects to the generator shaft.

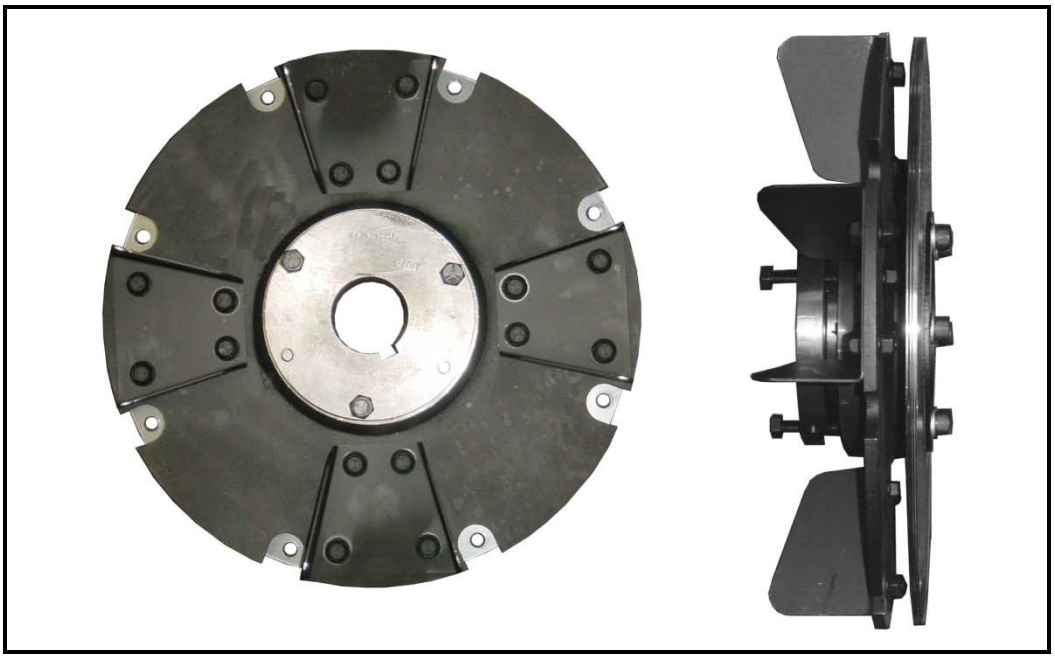
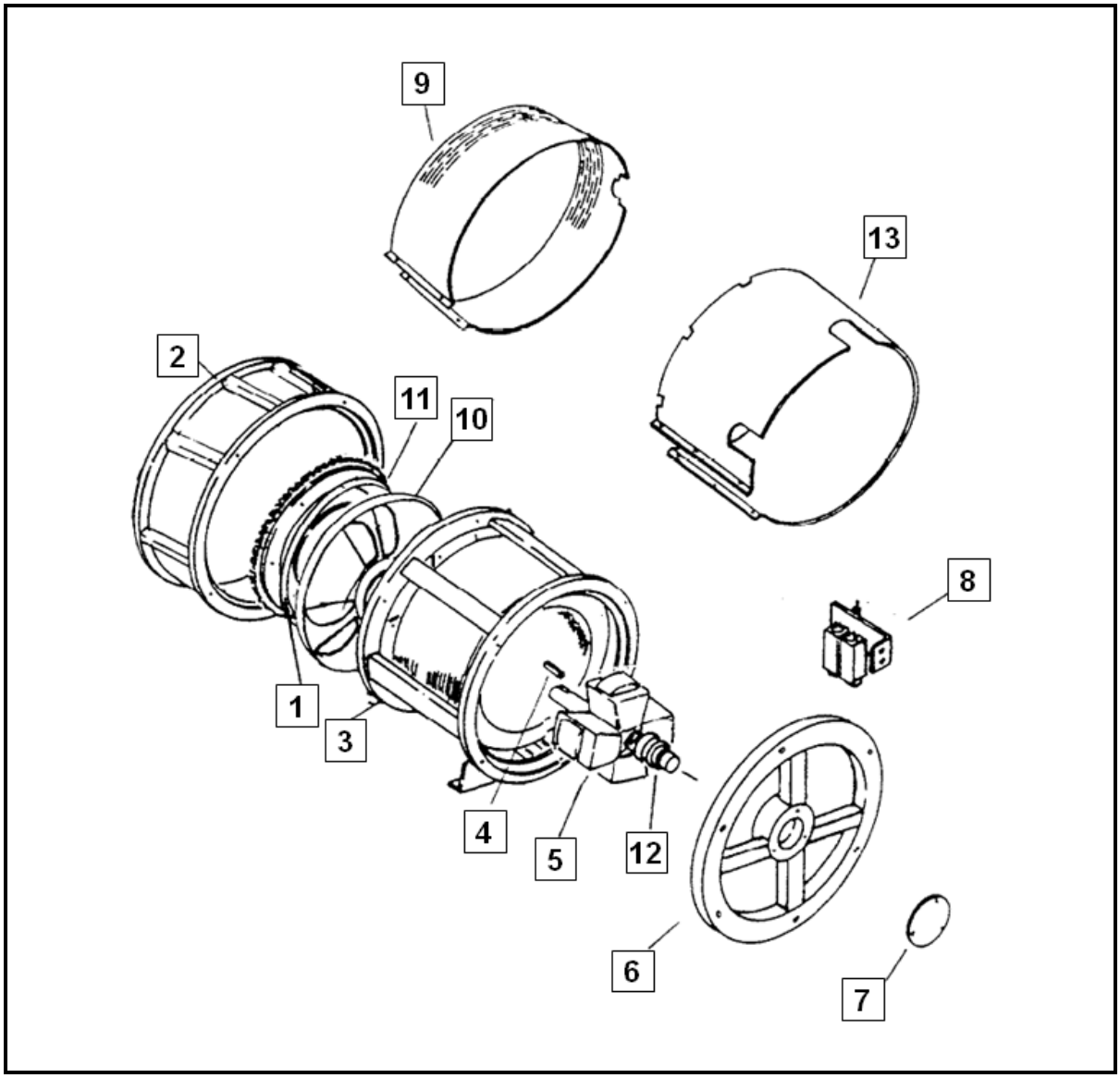


Figure 1: Flexible Coupling

b) The Generator Assembly

The diagram below shows the main components of the generator.



1. Adapter Ring
2. Flywheel Housing
3. Generator Housing and Coils
4. Coupling Key
5. Generator Rotor
6. Bearing Housing
7. Bearing Cap
8. Brush Holder Assy.
9. Flywheel Housing Cover
10. Flexible Coupling
11. Engine Flywheel
12. Slip Rings
13. Generator Housing Cover

Figure 2: Generator Components

The engine side of the generator is considered the front.

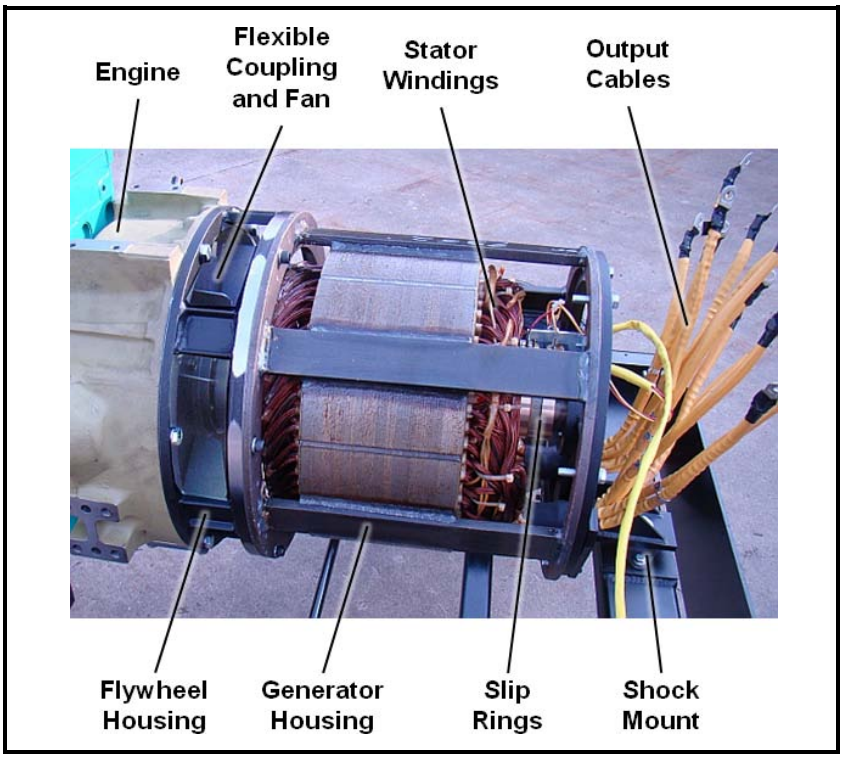


Figure 3: Generator Assembly

3) Tools and Supplies

In addition to standard wrenches, the following equipment is helpful for rebuilding the generator:

Item	Specification	Application
Torque wrenches	Up to 100 ft-lbs (136 N-m)	Generator reassembly
Hoist	Lift at least 500 pounds (227 kg)	Required if you are going to remove the generator
Pry bar	N/A	Prevents the generator from rotating while loosening or tightening screws
Jack stand		Support rear of engine when generator is removed

4) Routine Inspection

If the generator set is function properly,

servicing the coupling assembly is limited to checking the screws that attach the flexible coupling to the engine flywheel. Check these eight (8) screws periodically to make sure that the screws are tightened to the proper torque.

Note: The screws are Hobart part number 402789-004, socket-head, 3/8 – 16 x 3/4 inch long. The head requires a 5/16-inch Allen wrench.

Follow these steps to check the screws:

1. Remove the sheet metal covers from around the generator housing and the flywheel housing.
2. In the following steps, prevent the generator from turning by holding a pry bar against the generator fan blades, using the flywheel housing for support. Do this carefully to avoid damaging the fan blades.
3. Make sure the screws are torqued to **40 – 45 foot-pounds (54 – 61 N-m)**. There are eight (8) screws.
4. Reinstall the covers around the housings.

5) Generator Disassembly

Repair of the generator armature, generator bearings, or the flexible coupling requires separation of the engine and generator and removal of the flexible coupling.

drain the tank or schedule service after most of the fuel has been used.

a) Before You Begin

Consider the following items before starting the disassembly:

- The service procedure requires lifting the generator with a hoist. Position the generator set near a hoist before you begin disassembly.
- Disassembly requires removal of the fuel tank. To aid in tank removal, you might want to schedule service after most of the fuel has been used or arrange to drain the tank.
- Have a supply of tags to mark items such as wires and cables and containers to hold fasteners.

b) Accessing the Generator

The diagram below shows the generator set components that must be removed before removing the generator. Follow these steps to remove those components and the associated parts:

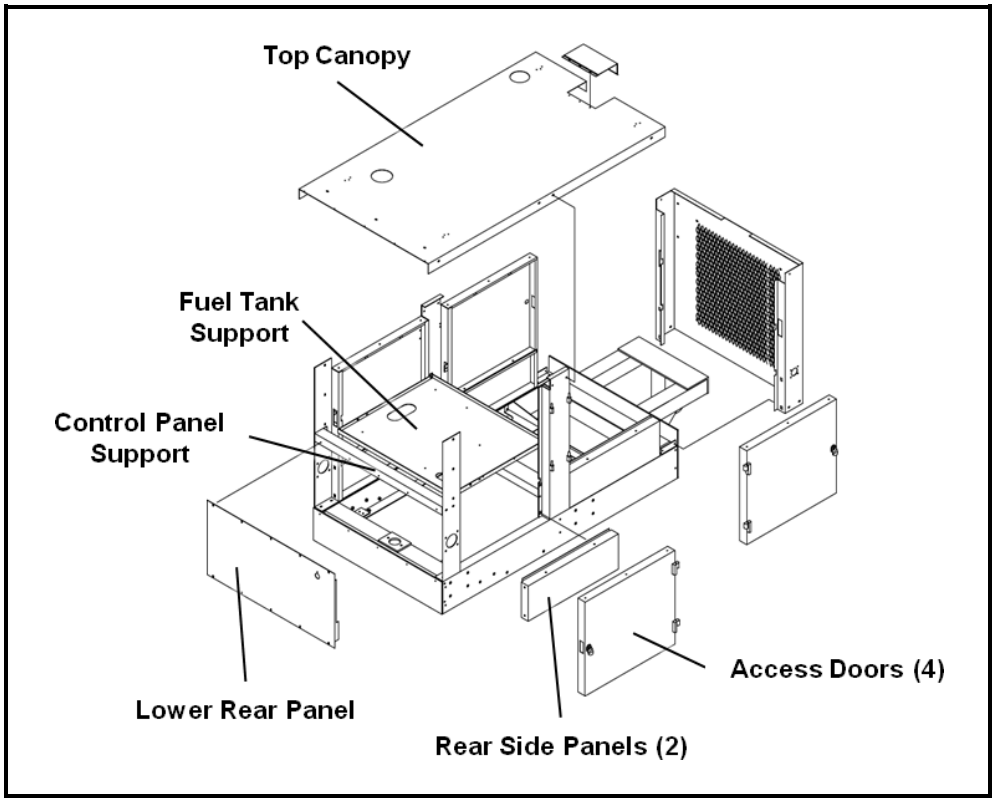


Figure 4: Component Removal Required for Access to Generator

1. Turn the battery disconnect switch to the OFF position.
2. Carefully remove the four access doors by lifting them off their hinges.
3. Remove the Plexiglas cover over the control panel.
4. Remove the fuel tank cap and the exhaust pipe cap.
5. Remove the top canopy.
6. Remove the rear side panels and the lower rear panel.
7. Disconnect and remove the 28.5 VDC output cables.
8. Disconnect and remove the air cleaner.
9. Disconnect and remove the control box.
10. Remove the control panel support.
11. Shut off the fuel valve under the fuel tank. Then disconnect and remove the fuel tank.

12. Remove the following items from the front side of the fuel tank support, letting them hang by their wires:
    - On the right side: the starter cut-out solenoid and the rectifier
    - On the left side: the glow plug controller and the glow plug solenoid
13. Remove the lower rear panel.
14. Disconnect the generator wires from the rectifier assembly by disconnecting the generator wires from the diode leads. Do not remove the diodes from the heat sinks.
15. Disconnect the output contactor from the rectifier assembly.
16. Remove the fuel tank support.

c) Separate the Engine and Generator

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

d) Remove the Coupling and Bushing

The split taper bushing attaches the coupling assembly to the generator shaft. Refer to the diagram on the next page.

1. Remove the three screws that secure the bushing to the hub of the flexible coupling assembly.
2. Using a 3/16-inch Allen wrench, loosen the setscrew in the bushing to release pressure on the key.
3. 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 the bushing pops loose from the hub.
4. Remove the coupling assembly and set it aside.
5. When the bushing is loose on the shaft, use a mallet to GENTLY tap the bushing off the shaft.
6. Slide the bushing off the shaft and remove the key.

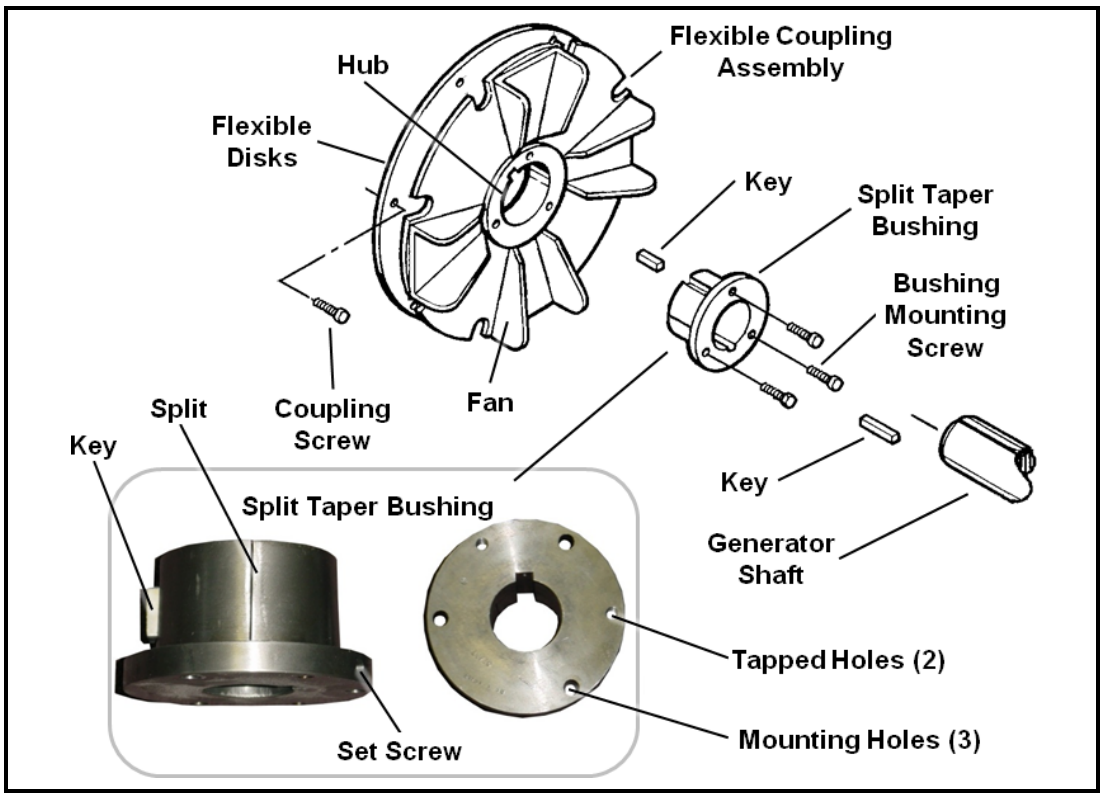


Figure 5: Split Taper Bushing

e) Inspect the components

1. Check for deformed fan blades and damage to the disk.
2. Check the hub and bushing for cracks, evidence of galling, or rust pits. Light rust is permissible on the bushing and the tapered bore of the hub.
3. Check the flexible coupling disks for warping, cracks, or worn mounting holes.
4. Check the screws that attach the flexible disks to the hub. If they are loose, cracked, stretched, or have stripped threads, replace them. The screws are socket-head screws 3/8–16 x 2 inches, Hobart part number 287935-003.

   Note: Use only the screws specified above. There are no acceptable substitutes for these screws.

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

f) Cleaning

Make sure that the following are thoroughly cleaned free of dirt and grit:

- Generator shaft
- Bushing bore and outside
- Inside of the hub

CAUTION

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

6) Assembly

a) Assemble the Generator

Follow these steps to reassemble the generator set. Refer to the previous figure.

1. If required, attach the four flexible disks to the coupling hub.
   - Screws: six – Hobart Part No. 287935-003 (3/8 – 16 x 2, socket head)
   - Use Loctite 262 or equivalent on the screw threads
   - Torque: **60 Ft-Lbs (81 N-m)**
   - Tightening Method:

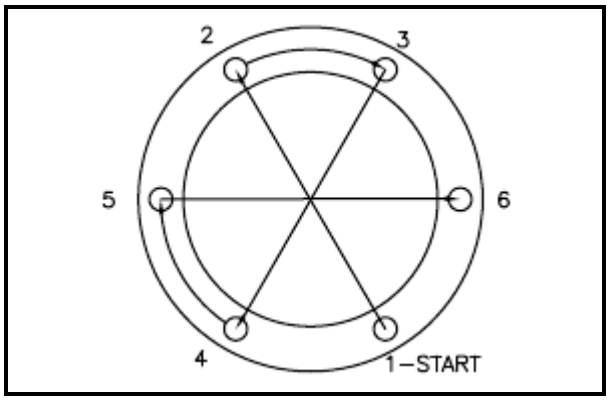


Figure 6: Screw Tightening Method

2. Attach the coupling assembly to the engine flywheel
   - Screws: eight (Hobart part number 402789-004, 3/8-16 x 3/4 inch long, socket head)
   - Use Loctite 262 or equivalent on the screw threads.
   - Do not tighten until all screws are installed.
   - Torque: **40 - 50 Ft-Lbs (54 - 68 N-m)**
3. Install the key in the keyway of the generator shaft.
4. Slide the bushing onto the shaft, aligning the keyway of the bushing with the keyway of the shaft.
5. Using a hoist, align the bushing to the coupling keyway and the generator housing to the engine flywheel housing.
6. Start the screws that attach the generator housing to the engine flywheel housing, inserting them just enough to ensure thread engagement. Do not tighten until all the screws are installed.
7. Tighten the screws in the generator housing to **30 Ft-Lbs (41 N-m)**.
8. Remove the bearing cap from the back of the generator assembly.
9. Inspect the rear bearing. If it has moved out of the rear bearing support hub, it will need to be reset. The rear bearing should be within 1/8 inch from the rear surface of the bearing hub.
10. Slide the coupling bushing forward until it is snug in the coupling hub.

CAUTION

In the following step, make certain that only the screws are lubricated, and that no lubricant is permitted to get inside the bushing where it contacts the generator shaft.

11. Lubricate the three bushing screws SPARINGLY and start them into the three (unthreaded) holes finger-tight.
12. Insert and hold a pry bar through the flywheel housing against the fan blades to prevent the shaft from turning when the screws are tightened.
13. Tighten the bushing screws alternately and evenly as follows:
14. Set a torque wrench to **29 ft-lbs (39 N-m)** and tighten all three screws to that value.
15. Repeat step (a) above until the screws can no longer be tightened. You may need to repeat the step as many as five times to assure proper torque on the bolts.
16. Position the generator shaft so the brushes are centered on the slip rings.
17. Using a 3/16-inch Allen wrench, tighten the setscrew in the bushing to apply pressure on the key.

b) Check the Generator Bearing

The next steps ensure that the rear bearing outer race does not spin in the bearing support hub. Refer to the following diagram:

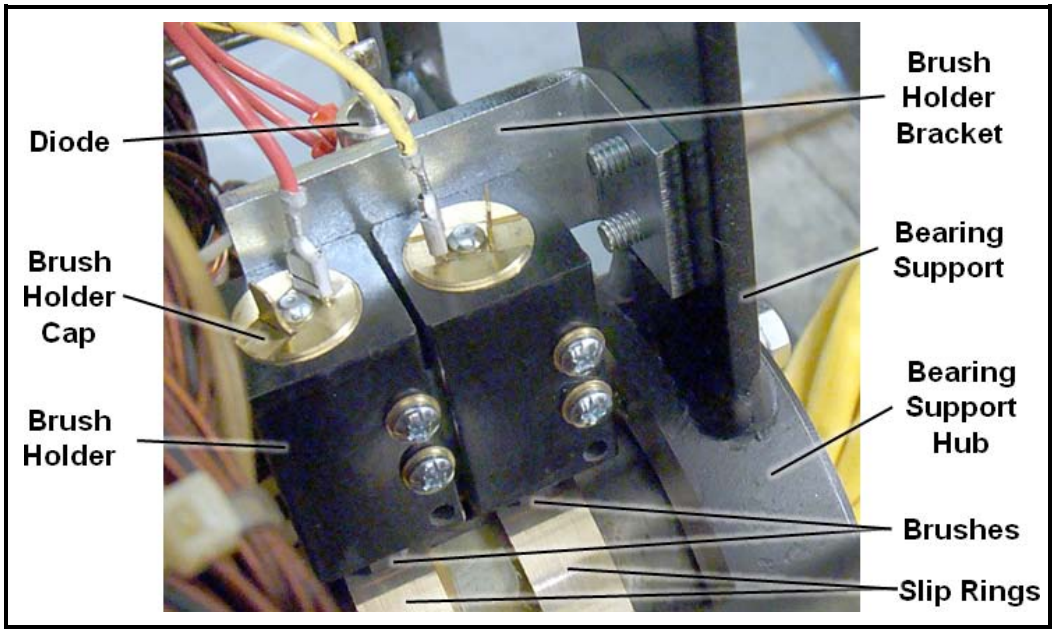


Figure 7: Generator Brushes

1. Remove the screws that attach the brush holder bracket to the bearing support.
2. Remove the six (6) bolts that attach the bearing support to the generator housing.
3. Slide the bearing support hub off the bearing.
   - If the bearing support will not slide off the bearing or the bearing begins to slide on the shaft, STOP – the bearing is secure. Go on to the next step
   - If you were able to remove the bearing support, apply a thin bead of Loctite RC-680 Retaining Compound to the inside of the bearing support hub and then re-install the bearing support hub on the bearing.
4. Reattach the bearing support hub to the generator housing.
5. Re-install the brush holder.
6. Re-install the bearing cap on the back of the bearing support hub.
7. Re-install the generator housing cover and the flywheel housing cover.

c) Re-assemble the Generator Set

Refer to the “Generator Disassembly” section earlier in this section. Reinstall the generator components in the reverse order of removal. Do not install the canopy components until the unit is tested.

7) Run-in and Periodic Check

a) Inspect the Coupling Bolts

Move the generator set to a suitable test area and operate it for a two-hour run-in.

1. Shut down the engine after two (2) hours and re-torque all coupling bolts to **40 to 45 ft-lbs (54 to 61 N-m)** to compensate for normal torque relaxation.
2. Complete the reassembly.
3. Return the unit to normal service.
4. After 200 hours of operation, re-check all coupling bolts.
5. Return the unit to normal service.
6. After each additional 2,000 hours of operation (or every year), recheck all coupling bolts to maintain the same torque value.

b) Brush Inspection and Replacement

Refer to the previous figure.

1. Disconnect the leads from the connectors on the brush holder caps while noting which wire goes to which brush.
2. Remove the brush holder caps from the brush holder.
3. Lift the brush from the brush holder for inspection. If brushes are worn unevenly or are short than 7/16 inch (11 mm), replace them.
4. While the brushes are removed, inspect the surface of the slip rings. The surface should be smooth and clean. Grit or oil on the slip rings may cause scoring or roughness.
   - If the rings are badly scored, send the unit to an overhaul facility for repair.
   - If the rings are moderately rough, hold grade 00 sandpaper against the rings as they rotate slowly. After cleaning the slip rings, blow the dirt and grit out with low-pressure compressed air – under 25 psi (172 kPa).
5. Slip new brushes into the brush holder guides, place the caps on top, and screw them into the guides to a “bottomed” position. Springs attached to the brushes determine the pressure at which the brushes contact the rings.
6. To fit the new brushes to the slip rings, lay a strip of grade 00 sandpaper, smooth side down, on the slip ring surface and draw the sandpaper in the direction of rotation of the slip rings, lifting the brush on the return stroke.
7. Continue until the brushes have the same curvature as the slip rings.
8. Blow all the carbon dust out of the machine with low-pressure air – under 25 psi (172 kPa).

Chapter 4: Illustrated Parts List

Section 4-1: Introduction

The illustrated parts list identifies, describes, and illustrates main assemblies, subassemblies, and detail parts of the 500284 series generator set manufactured by Hobart Ground Systems, Palmetto, Florida, USA.

The purpose of this list is to provide parts identification and descriptive information to service and maintenance personnel for procuring spare parts.

This illustrated parts list chapter contains the following sections:

- Section 1 – Introduction (this section): Information about the parts lists located in Section 3 of this chapter
- Section 2 – Numerical Index: A list of all parts, in order by part number, with references to the figures in Section 3 in which they appear
- Section 3 – Parts List: Diagrams on the left-hand pages that show the location of parts and charts on the opposite (right-hand) pages that list the part number, description, and other information, as explained below

1) Which Parts Are Included

The parts lists include field-replaceable parts. These parts lists do not include the following items:

- Standard hardware items such as nuts, screws, washers, and other fasteners that are available commercially
- Bulk items such as wire, cable, sleeving, tubing, etc., which are commercially available
- Permanently attached parts, which lose their identity by being welded, soldered, riveted, etc., to other parts, weldments, or assemblies

2) Explanation of the Parts List Columns

The chart below shows an example of the parts list forms. The form has six standard columns.

FIGURE - ITEM NO.	HOBART PART NO.	DESCRIPTION	EFF	QTY.
9- 1	288340	Running Gear/Frame Assembly	A,C	1
*	287950	Mounting Frame	B	1
*	489689	Stationary Mounting Spacer	B	1
2		Mounting Frame Components (See Figure 2)		Ref.
3	77A1157	Switch, Maintained, Push-Pull		1
	285125	…Guard, Mushroom Button		1
	288300	…Label, Emergency Stop		1

Sample Parts List

The **figure number**, shown in the first column on the left, shows the number of the illustration that identifies the parts. An asterisk (*) in this column indicates that the item is not shown on the diagram.

The **item number** column shows the number of the part called out in the diagram. Parts that are subassemblies of numbered parts are generally not identified on the diagram and not given an item number. The numerical index (Chapter 4, Section 2) combines the figure and item numbers to assist the user in finding the illustration of a part when the part number is known. For example, “1-3” refers to the part for Figure 1, Item 3.

All part numbers appearing in the **Hobart Part No.** column are Hobart part numbers. Hobart part numbers are generally either six digits or six digits with three dash numbers. Items that do not have part numbers are reference assemblies rather than physical parts.

The **Description** column contains the identifying names for the parts. An indentation of the part name (starting with three dots …) indicates that the part is a component of the non-indented assembly listed above it.

The **EFF** (effective) column indicates the applicability of parts to different models of equipment. When more than one model of equipment is covered by a parts list, some parts are used on only one model. The EFF column uses a code letter A, B, etc., to identify the model the part is used on. If there is no letter code in the EFF column, that part is used on all models.

EFF Code	Part & Dash Number	Mounting	Generator Meters	AC Outputs	28.5 V DC Output	Fuel Tank
A	500181A-001	Trailer	Analog	2	--	Stainless
B	500181A-002	Fixed/Truck	Analog	2	--	Stainless
C	500181A-003	Trailer	Digital	2	Yes	Stainless
D	500181A-004	Fixed/Truck	Analog	2	Yes	Stainless
E	500181A-005 (Special Configuration)	Trailer	Digital	2	--	Stainless
F	500181A-006 (Special Configuration)	Trailer	Analog	2	--	Stainless
G	500181A-101	Trailer	Analog	2	--	Composite
H	500181A-102	Fixed/Truck	Analog	2	--	Composite
J	500181A-103	Trailer	Analog	2	Yes	Composite
K	500181A-104	Fixed/Truck	Analog	2	Yes	Composite
L	500181A-105 (Special Configuration)	Trailer	Digital	2	--	Composite
M	500181A-106 (Special Configuration)	Trailer	Analog	2	--	Composite
N	500181A-107 (Special Configuration)	Trailer	Digital	2	--	Composite

The **Qty.** 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. “Ref.” in this column indicates that the item is a reference assembly and not a single replaceable part.

Section 4-2: 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.
12-	040201
12-	040213
10-	056534
7-	056535
13-7	16DA2162
15-18	16DA3493
15-27	180068
14-3	180593-003
15-15	180600
17-6	180776
14-6	181022C-005
14-9	181022C-005
10-2	281423
17-10	281688
9-1	281881-001
15-14	282239
2-12	282554-003
1-4	282562
7-1	282562
2-15	282658
18-41	282720
6-7	282918
6-6	282919
15-7	283063
5-8	283597
5-7	283824
7-	284203
3-	284372-002
9-18	285062-001
1-	285125
15-16	285647
18-27	285844
18-17	285850
18-16	285851
18-3	285911
19-1	285911
19-3	285915-001
19-7	285915-002
19-5	285915-003
19-6	285915-004
19-4	285915-005
19-2	285915-006
18-	285917
18-42	286201
18-4	286205
18-22	286205
12-1	286388-001
12-	286477-002
12-10	286485-001
13-	286607-001
14-7	286611
13-2	286699-001
18-23	286734
18-18	286735
18-19	286735-001
18-20	286735-002
18-21	286735-003
18-24	286735-004
18-25	286735-005
18-26	286735-006

FIGURE – ITEM NO.	HOBART PART NO.
16-6	286810-001
15-8	286813
16-5	286849
9-11	286850
9-16	286850
15-13	286884
15-2	286887
7-	286897-012
11-6	286897-037
7-8	286897-038
18-29	286978
18-34	286981
18-30	286982
18-	286984
18-	286985
15-3	287184-003
17-8	287401
11-5	287419
2-17	287459
2-16	287460
2-1	287461
2-4	287462
2-8	287463
2-29	287464
2-13	287465
2-21	287466
5-9	287526-002
5-10	287542-001
5-	287542-002
17-1	287564
2-10	287565
18-2	287587
18-6	287626

FIGURE – ITEM NO.	HOBART PART NO.
18-7	287626-001
18-8	287626-002
18-9	287626-003
18-11	287626-004
18-12	287626-005
18-13	287626-006
18-5	287627
18-10	287628
7-6	287639
2-18	287696
1-14	287698-001
9-8	287735
5-	287785
9-2	287796
13-5	287908
1-	287950
4-	287950
4-8	287955
17-18	287956
4-11	287972
5-6	287977
5-5	287978
5-2	287981
4-5	287984
3-6	287986
4-7	287986
18-40	287993
18-39	287994
18-38	287996
4-12	287998
5-3	287999
17-9	288003
15-9	288008

FIGURE – ITEM NO.	HOBART PART NO.
15-28	288015
14-	288019-004
1-	288020
12-9	288020
1-2	288021
1-	288022
1-1	288023
8-4	288052-002
6-5	288057-001
8-6	288059-001
1-5	288060-001
8-9	288060-001
5-	288064-001
5-	288064-002
5-	288064-003
4-	288064-004
4-	288064-004
5-	288064-005
7-9	288215-001
7-10	288221-002
7-	288224
1-	288300
2-20	288300
3-13	288306
1-12	288340
4-	288340
18-	288340
5-4	288352
7-	288358
7-	288358
8-7	288374
8-5	288376-001
15-19	288380-001

FIGURE – ITEM NO.	HOBART PART NO.
7-	288383
7-	288384
2-11	288388
18-1	288389
18-14	288390
18-37	288391
18-15	288392
18-28	288393
18-31	288394
18-32	288395
18-35	288396
18-36	288397
18-33	288398
12-7	288836-001
12-6	288836-002
2-14	288862
2-22	288866
3-11	288985
17-	288985
12-8	288999-001
4-1	289080
4-10	289081
5-1	289086
12-5	289092
12-	289104-001
10-	289200-001
10-	289200-003
10-	289200-004
2-19	289842-001
7-	289940
6-8	290597-001
17-3	290646
2-6	290836

FIGURE – ITEM NO.	HOBART PART NO.
14-11	290927
12-4	290931
6-4	290936
14-10	290948
13-14	290957
14-4	290958
13-18	290981
10-6	291097
12-3	291307
15-29	291358
12-2	291431
3-5	291611
9-6	291611
2-3	291708
3-	291766
4-4	291767
10-3	291771
10-4	291778
10-7	291781
10-5	291828
6-3	291832
8-3	291839
3-4	291855
7-11	291867
8-8	291868
7-	291872
7-	291873
3-7	291874
7-	291874
10-8	291875
14-1	291876
3-14	291877
6-1	291877

FIGURE – ITEM NO.	HOBART PART NO.
6-	291878
6-	291879
6-2	291880
9-5	291883
9-7	291889
4-3	291890
3-8	291893
9-15	291895
9-10	291899
14-8	291901
9-4	291903
8-1	291917
12-	291937
4-2	291939
15-	291996
9-14	291997
7-2	291998
13-11	30GH1119
2-9	400435
16-2	400435
13-	400613-003
13-	400613-004
13-8	400641-011
13-9	400642-003
2-28	401842
15-20	401911-005
15-17	402037-004
17-16	402530
17-15	402531
13-	402663
17-13	402788
17-	402789-004
10-	402927-003

FIGURE – ITEM NO.	HOBART PART NO.
2-7	402987
1-11	403091-008
13-10	403189
13-17	403189
10-11	403782-002
11-1	403809-002
7-	404030-002
14-2	404065-002
8-2	404154-013
13-	404172-001
13-	404172-002
13-	404172-003
13-	404173
15-4	405278-006
2-5	407366
9-13	407948
14-5	407948
14-13	407948
14-	408352
13-4	408596-001
2-	408665-001
2-	408665-002
17-11	408999-001
17-7	488555-001
17-4	488557-008
17-14	488562
17-12	488628
1-8	488640
17-5	489135
9-12	489658-007
9-17	489658-007
16-8	489658-010
1-	489689

FIGURE – ITEM NO.	HOBART PART NO.
13-3	494134-001
9-3	494295
15-23	494681-001
2-2	76B1148
1-10	77A1157
2-25	78A1000
13-1	78A1117-002
13-6	78A1120-001
11-2	78B1118-002
14-	78B1138
2-26	79A1110
1-	79A1127-002
14-12	79B1140
1-9	7J422-000
7-	80A1117
2-27	81B1084
1-13	83A1103
14-	84A1075
17-	85C1004-002
15-5	A25
16-3	A25
15-10	AW626
16-4	AW626
13-12	HF2518-005
13-13	HF2518-008
13-15	HF2518-008
13-16	HF2518-008
14-	W10051-014
17-17	W10072-063
11-4	W10750-004
15-1	W10869-006
7-	W10869-014
10-	W10869-014

FIGURE – ITEM NO.	HOBART PART NO.
11-3	W10910-000
15-24	W10931-003
15-25	W10933-003
15-11	W11097-007
15-26	W11097-007
15-12	W11097-022
15-21	W11114-012
14-	W11166-003
15-6	W11242-018
12-	W11254-003
17-	W11254-005
15-22	W11280-015
10-	W7814-000
16-1	W9218-227
16-7	W9218-251
9-9	W9407-446

Section 4-3: Illustrated Parts List

This section contains the following illustrations:

Parts having an asterisk (*) in the first column of the parts list are not shown in the illustration.

For more information about this section, refer to Section 4-1. For information about abbreviations used in this manual, refer to the Introduction.

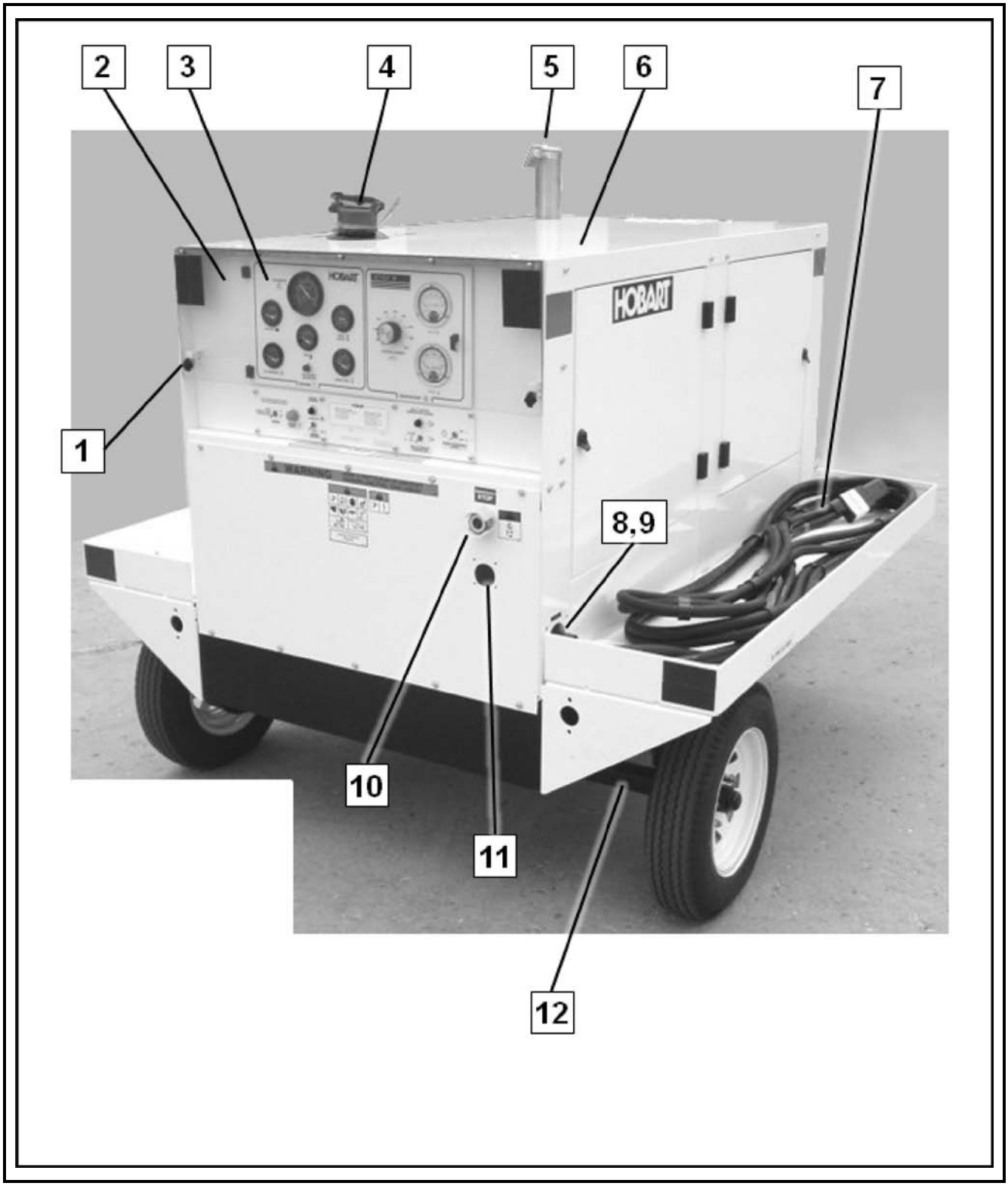


Figure 1: Exterior Components

FIGURE – ITEM NO.		HOBART PART NO.	DESCRIPTION	EFF	QTY.
1 -	1	288023	Wing Nut Latch		2
		288020	…Cover Support Bracket		2
	2	288021	Controls Cover		1
		288022	…Controls Cover Hinge		1
	3		Control Box (see Figures 12, 13 ,and 14)		Ref.
	4	282562	Cap, Fuel (also see Figure 7)		1
		79A1127-002	…Filler Neck Guard		1
	5	288060-001	Exhaust Rain Cap (also see Figure 8)		1
	6		Canopy Assembly (see Figure 5)		Ref.
	7		DC Output Cable (specified by user)		1
	8	488640	Output Cable Bracket		1
	9	7J422-000	Output Cable Clamp		1
	10	77A1157	Switch, Maintained, Push-Pull (emergency stop)		1
		285125	Guard, Mushroom Button		1
		288300	Label, Emergency Stop		1
	11	403091-008	Plastic Hole Cover (in block heater power hole)		1
	12	288340	Trailer (see Figure 18)	A,C	1
		287950	Mounting Frame (see Figure 4)	B	1
*		489689	Stationary Mounting Spacer	B	1
*	13	287698-001	Cover, Output Cable (not illustrated)		1

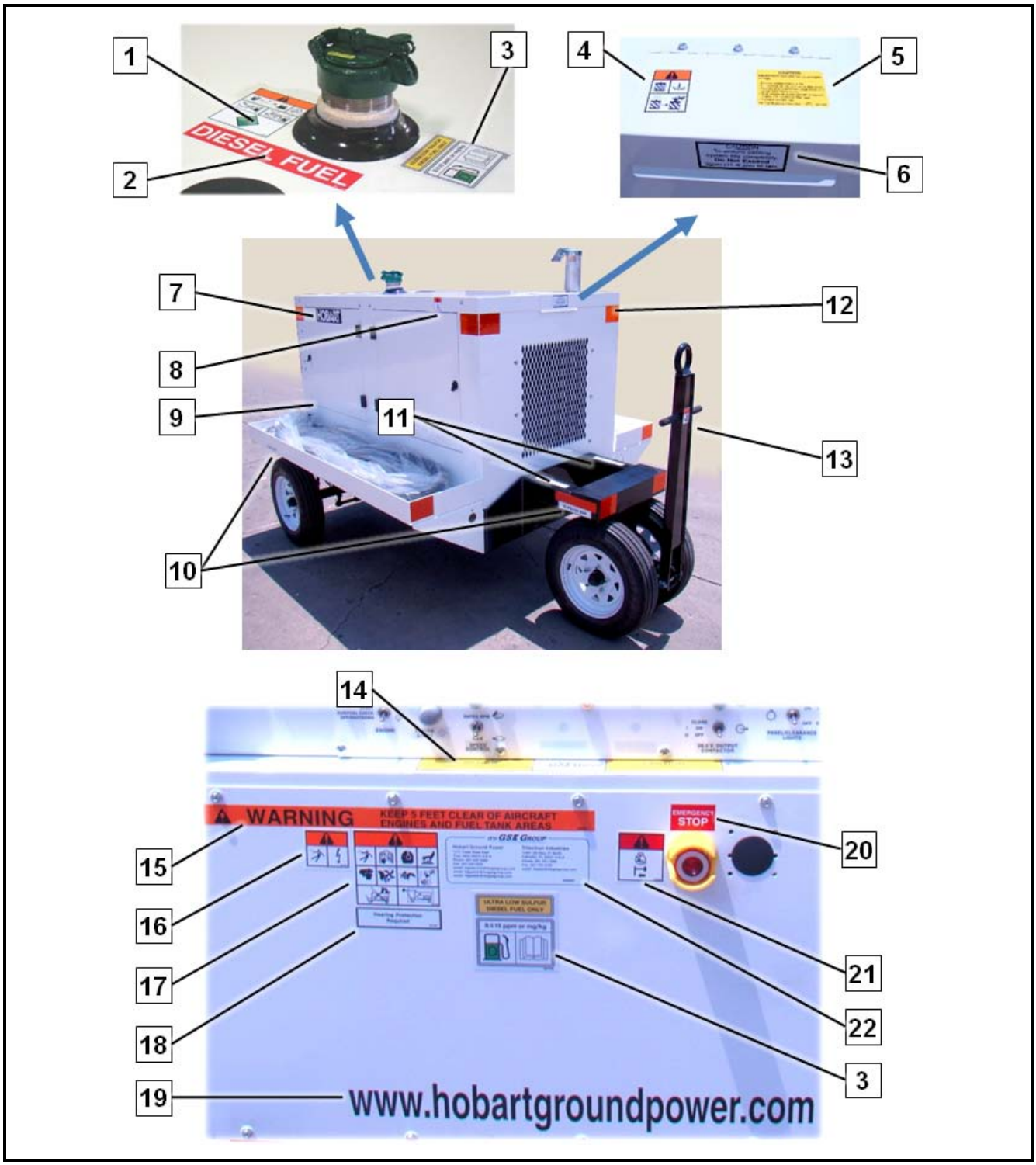


Figure 2: Labels and Reflectors

FIGURE – ITEM NO.		HOBART PART NO.	DESCRIPTION	EFF	QTY.
2 -	1	287461	Label, Fuel Warning		1
	2	76B1148	Label, Diesel Fuel		1
	3	291708	Label, Ultra Low Sulfur Diesel		2
	4	287462	Label, Engine Coolant		1
	5	407366	Label, Caution – Insufficient Cooling		1
	6	290836	Label, Radiator Fill Rate		1
	7	402987	Hobart Nameplate		2
	8	287463	Label, Hot Muffler		2
	9	400435	Label, 28 V		1
	10	287565	Label, Tire Pressure	A,C	4
	11	288388	Label, Not A Step	A,C	2
	12	282554-003	Reflector Kit		Ref
		408665-001	…Reflector, Rectangular, Red	A,C	8
		408665-001	…Reflector, Rectangular, Red	B	4
		408665-002	…Reflector, Rectangular, Amber	A,C	24
		408665-002	…Reflector, Rectangular, Amber	B	12
	13	287465	Label, Falling Objects (tow bar)	A,C	2
	14	288862	Label, Caution, Engine Speed		1
	15	282658	Label, Clearance		1
	16	287460	Label, Danger, High Voltage		3
	17	287459	Label, Dangers, General Identification		1
	18	287696	Label, Hearing Protection		1
	19	289842-001	Label, www.hobartgroundpower.com		1
	20	288300	Label, Emergency Stop		1
	21	287466	Label, Emergency Stop		1
	22	288866	Label, Support Center		1
*	25	78A1000	Label, ID.		1
*	26	79A1110	Label, Option		1
*	27	81B1084	Label, 28.5 Volts		1
*	28	401842	Tag, Attention – Engine Coolant		1
*	29	287464	Label, Moving Parts		2

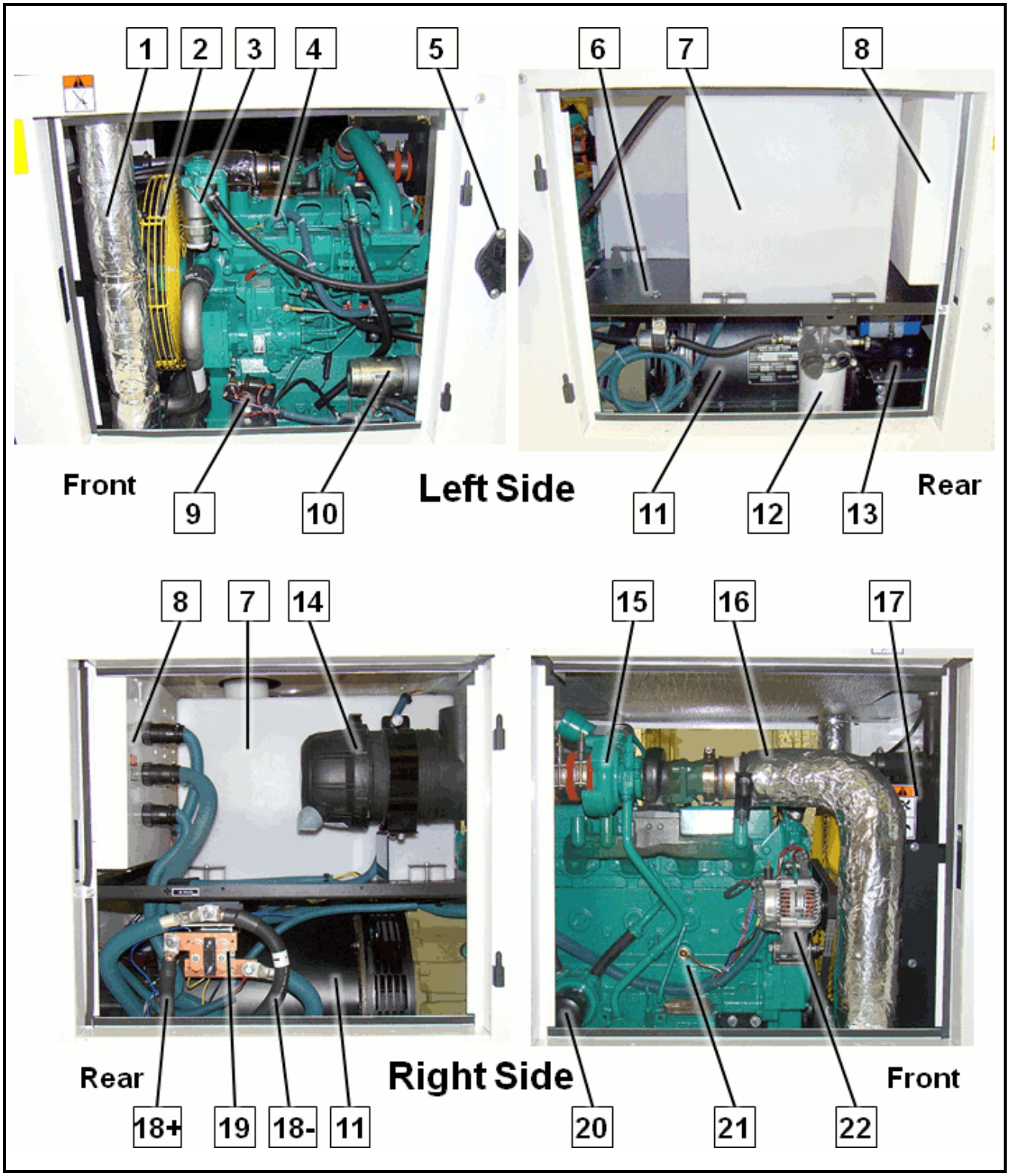


Figure 3: Interior Components

FIGURE – ITEM NO.		HOBART PART NO.	DESCRIPTION	EFF	QTY.
3 -	1		Exhaust Pipe (see Exhaust Components, Figure 8)		1
	2		Engine Fan (see Cooling Components, Figure 10)		1
	3		Fuel-Water Separator – Cummins (see Fuel, Figure 7)		Ref.
	4	291855	Engine, Cummins, 4BT3.3-G5		1
*		291766	Bracket, Engine Support		2
*		24656	Engine Isolator, 600 lb max load		2
	5	291611	Switch, Battery Disconnect (see Electrical, Figure 9)		1
	6	287986	Support, Control Panel (see Mounting Frame, Figure 4)		1
	7	282299	Fuel Tank (see Fuel Components, Figure 7)		1
	8	291893	Control Box (see Figures 12, 13, and 14)		1
	9		Oil Pressure Switch and Sender (see Lubrication, Figure 11)		
	10		Starter		Ref.
	11	288985	Generator, JetEx		1
	12		Pre-Filter (see Fuel, Figure 7)		1
*		24656	Isolator, 600 lb max load		1
	13	288306	Rectifier Assembly (see Rectifier Components, Figure 15)		1
	14	291877	Air Cleaner (see Air Intake System Components, Figure 6)		1
	15		Turbocharger		Ref.
	16		Turbo Exhaust Pipe (see Exhaust Components, Figure 8)		1
	17		Radiator (see Cooling System Components, Figure 10)		1
	18		DC Output Cable (customer option)		1
	19		Output Contactor (see Contactor Components, Figure 16)		1
	20		Oil Filter (see Lubrication System Components, Figure 11)		Ref.
	21		Engine Temperature Sensor (for glow plugs, see Figure 9)		Ref.
	22		Alternator		Ref.

In this figure, “Ref.” indicates components included with the engine.

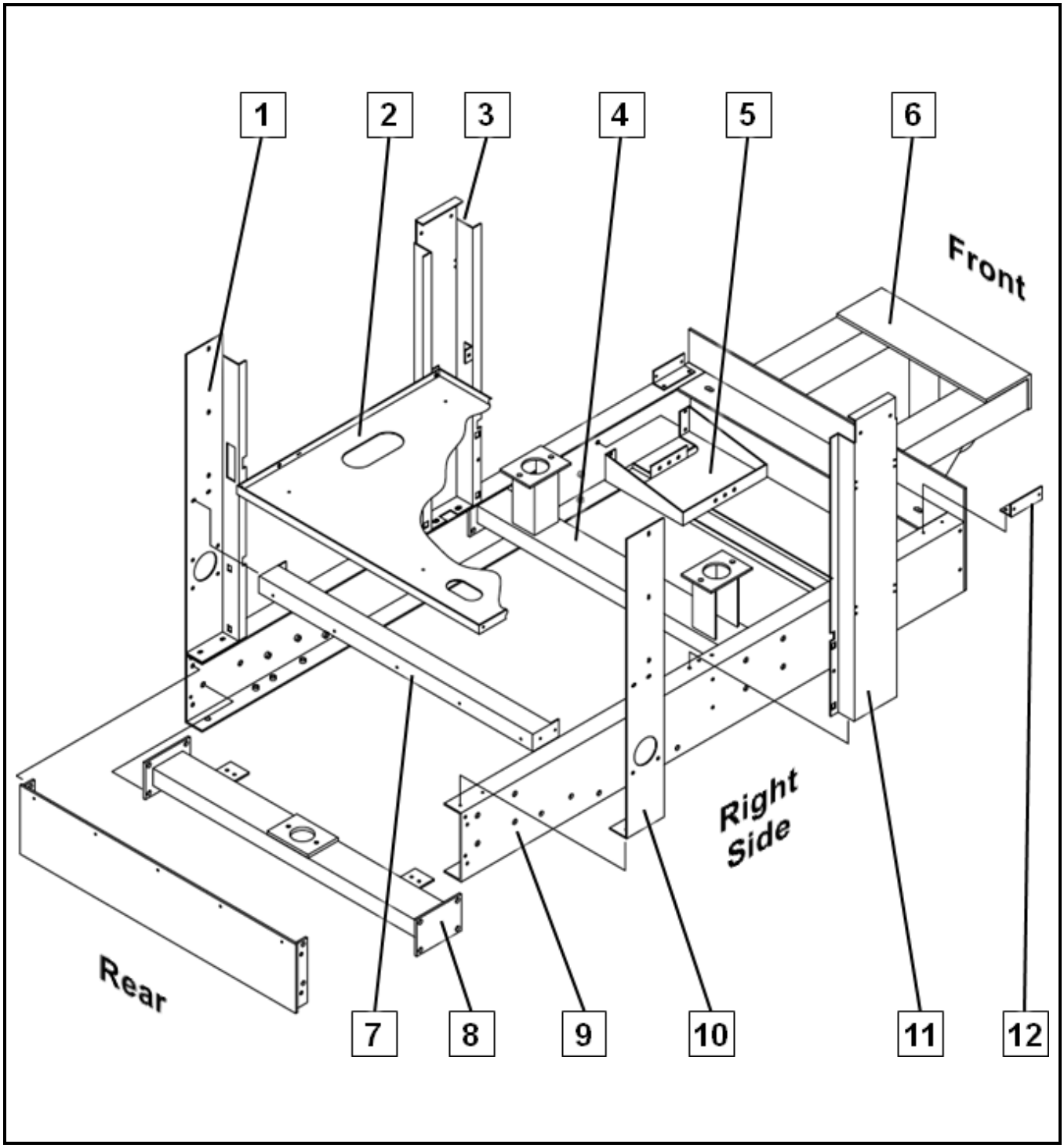


Figure 4: Mounting Frame Components

FIGURE – ITEM NO.	HOBART PART NO.	DESCRIPTION	EFF	QTY.
4 - 1	289080	Left Control Panel Support		1
2	291939	Support, Fuel Tank		1
3	291890	Door Support Panel with Disconnect Switch		1
	288064-004	...Door Support Insulation		1
4	292065	Engine Support		1
5	287984	Battery Tray		1
6		Fifth Wheel Section of Trailer (see Fig. 18)	A,C	Ref.
7	287986	Control Panel Support		1
8	292064	Generator Support		1
9		Mounting Frame Options		Ref.
	287950	Stationary Mounting Frame	B	1
	288340	Trailer Assembly (see Figure 18)	A,C	1
10	289081	Control Panel Support, Right		1
11	287972	Door Support Panel		1
	288064-004	...Door Support Insulation		1
12	287998	Front Panel Bracket		2
13	292075	Battery Cover (not illustrated)		
14	288388	Label “Not a Step” (not illustrated)		

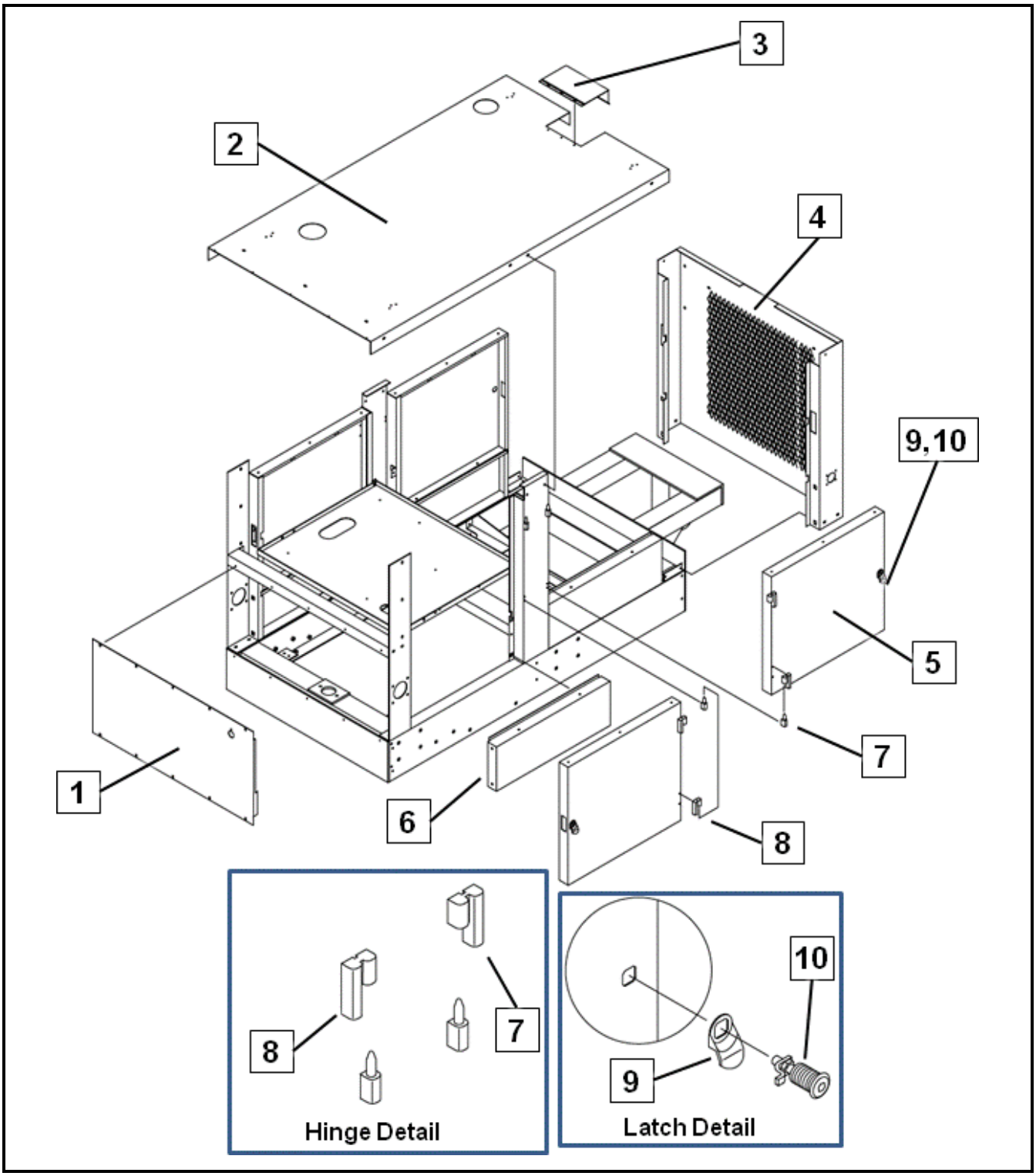


Figure 5: Canopy Assembly

FIGURE – ITEM NO.		HOBART PART NO.	DESCRIPTION	EFF	QTY.
5 -	1	289086	Lower Rear Panel		1
	2	291941-002	Canopy, top fuel tank, l-shaped		1
*		288064-003	…Top Canopy Insulation		1
*		288064-005	…Top Canopy Insulation		1
	3	287999	Radiator Cap Access Door		1
	4	288352	Front Panel		1
	5	287978	Access Door		4
*		288064-001	…Access Door Insulation		4
	6	287977	Side Panel		4
*		288064-002	…Side Panel Insulation		4
*		287785	…Panel Fastener		16
	7	283824	Right Hand Hinge		4
	8	283597	Left Hand Hinge		4
	9	287526-002	Door Latch Pull	A,B	4
	10	287542-001	Door Latch – Hex	A,B	4
		287542-002	Door Latch – T-Handle	C	4

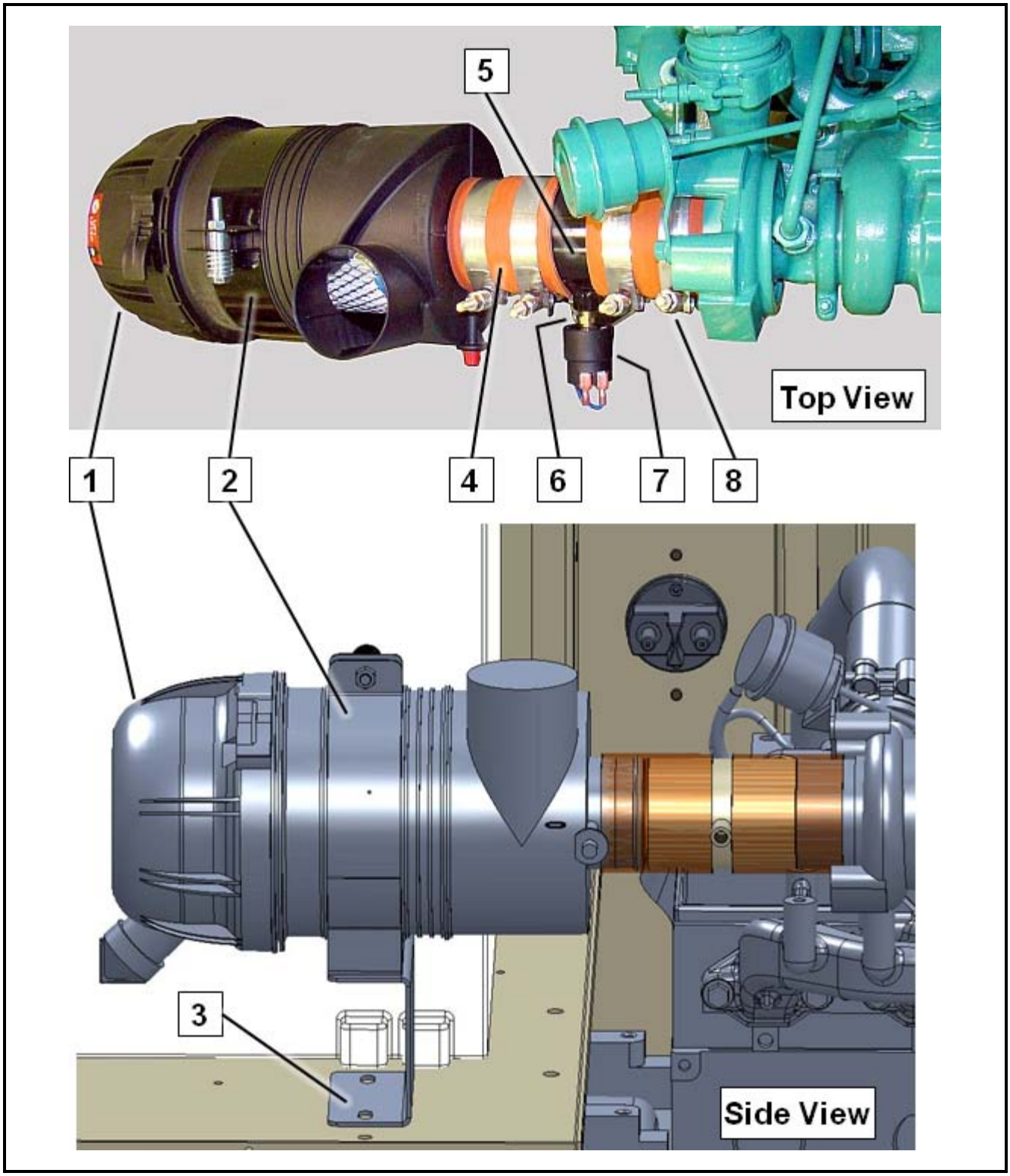


Figure 6: Air Intake System Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
6 -	1	291877	Air Cleaner		1
*		291878	…Filter Element – Primary		Ref.
*		291879	…Filter Element – Secondary		Ref.
	2	291880	Bracket, Air Filter		Ref.
	3	291832	Bracket, Air Filter Mounting		1
	4	290936	Hose, CAC, Straight, 3” ID		2
	5	288057-001	Tube, Air Cleaner		1
	6	282919	Adapter, Indicator		1
	7	282918	Sensor, Air Restriction (A404)		1
	8	290597-001	Clamp, Floating Bridge, 3.25”		4

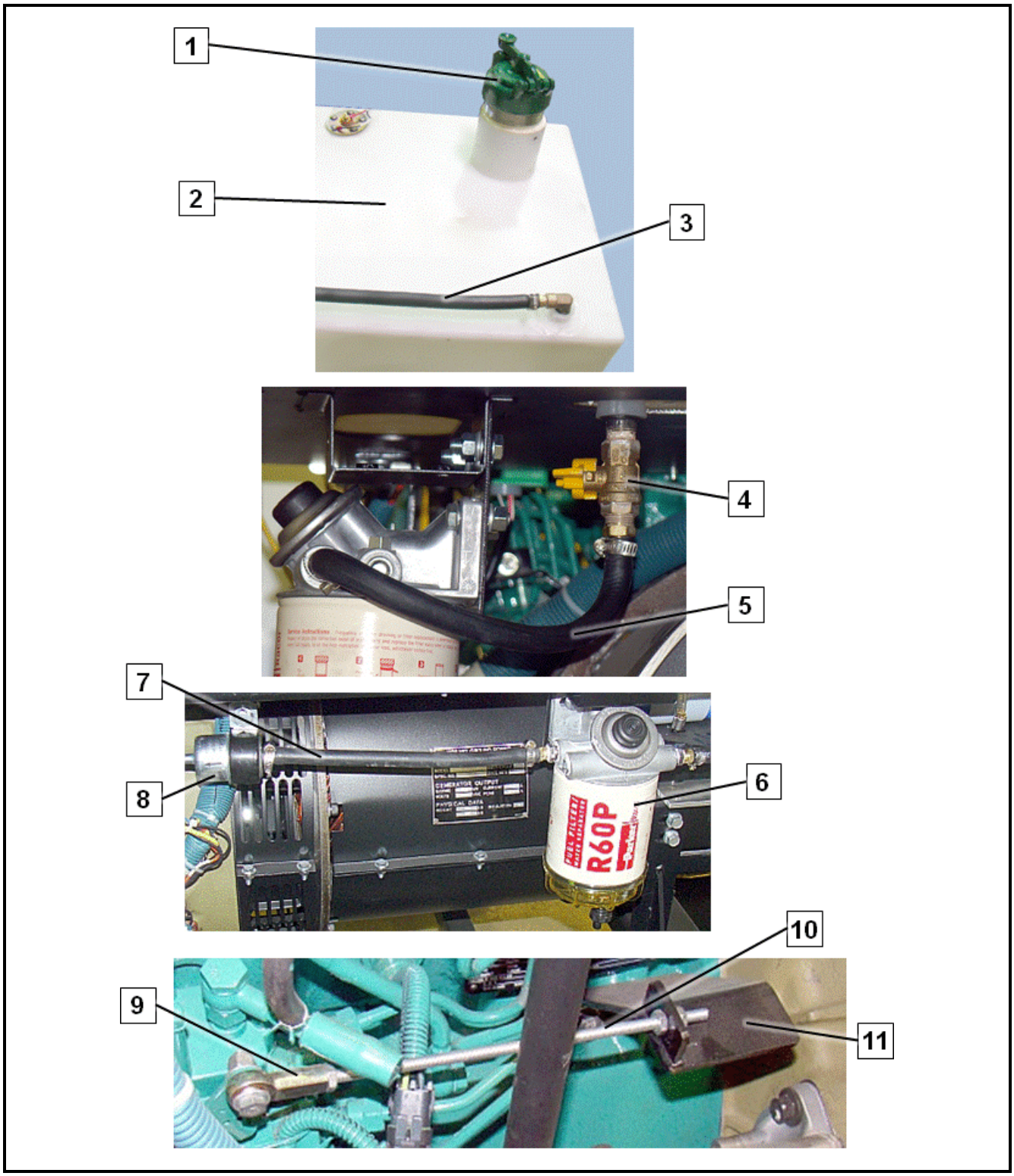


Figure 7: Fuel System Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
7 -	1	282562	Cap, Fuel Fill, Diesel Green		1
	2	291998	Fuel tank Assembly		1
		291874	…Fuel Tank		1
		404030-002	…Sender Assembly, Fuel Level (R408)		1
*		284203	Mounting Plate, Fuel Tank		4
	3		Line, Fuel Return		Ref.
		288358	…Fitting, Straight, Fuel Line, 3/8 Barb to 3/8 NPT		1
		288224	…Fitting, Fuel Return, Straight		1
		056535	…Hose, 3/8” ID		35”
*		289940	…Valve, Check (Microcheck)		1
	4		Fuel Shut-Off Valve Components		Ref.
		288384	…Nipple, 3/8” – 1 1/2”		1
		288383	…Valve, Fuel Shut-Off		1
		288358	…Fitting, Straight, Fuel Line, 3/8 Barb to 3/8 NPT		1
	5		Fuel Line (Tank to Pre-Filter)		Ref.
		056535	Hose, 3/8” ID		16”
		W10869-014	Clamp, Hose		2
	6	287639	Pre-Filter: Fuel-Water Separator (Racor 460R30)		1
		286897-012	…replacement element (Racor R60P)		Ref.
		291873	Bracket, Pre-Filter		1
	7		Fuel Line (Pre-Filter to Filter)		Ref.
		056535	Hose, 3/8” ID		6”
		W10869-014	Clamp, Hose		2
	8	286897-038	Filter, Inline Fuel		1
		291872	Bracket, Fuel Strainer		1
		80A1117	Clamp, Mtg. Flex Hose		1
	9	288215-001	Bearing, Rod Ends (Fuel Pump Throttle)		1
	10	288221-002	Rod, Threaded, 5/16-24 x 8.5” Lg.		1
	11	291867	Bracket, Fuel Pump Arm Rod		1

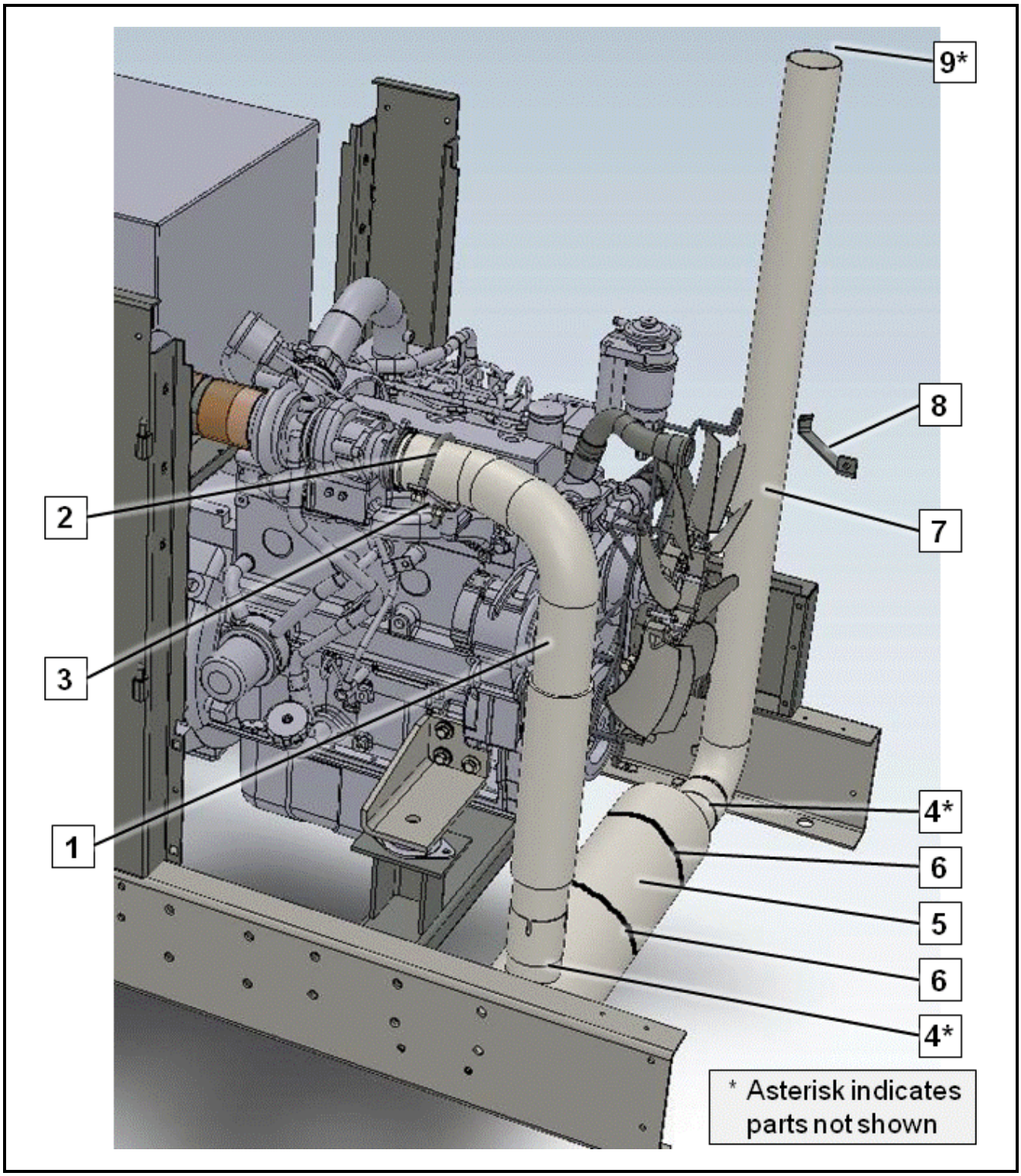


Figure 8: Exhaust System Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
8 -	1	291917	Pipe, Turbo Exhaust Assembly		1
	2	404154-013	Clamp, Full Circle, 3” Diameter		1
	3	291839	Bracket, Support, Exhaust Pipe		1
*	4	288052-002	Clamp, Accuseal, 3.00 (on pipes)		2
	5	288376-001	Muffler Assembly		1
	6	288059-001	Clamp, Hose, Stainless Steel (holds muffler)		2
	7	288374	Pipe, Exhaust Assembly		1
	8	291868	Bracket, Exhaust Pipe		2
*	9	288060-001	Cap, Rain, Exhaust Pipe		1

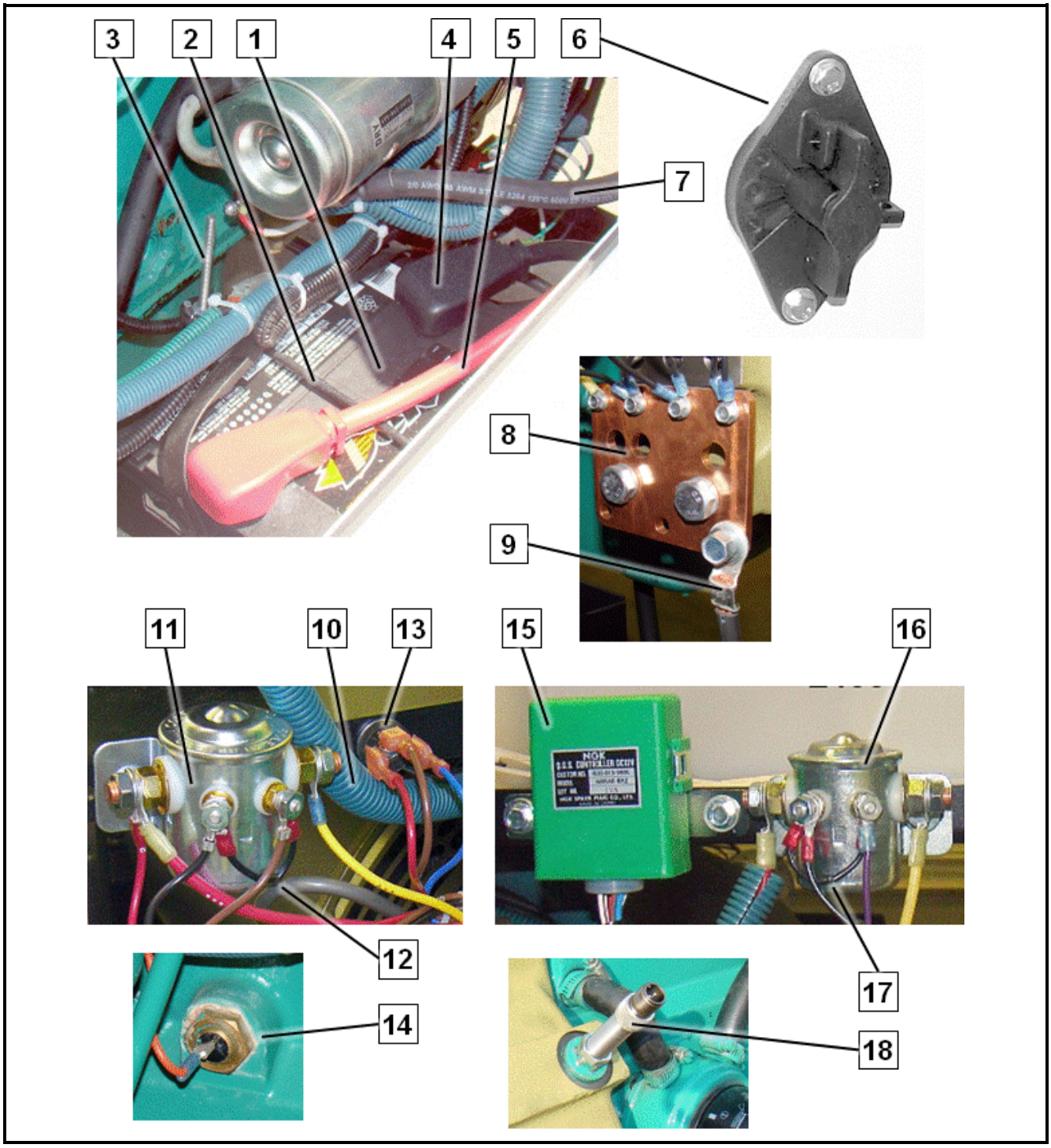


Figure 9: Engine Electrical Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
9 -	1	281881-001	Battery (BT401)		1
	2	287796	Battery Hold Down		1
	3	494295	Battery Hold Down Bolt		1
	4	291903	Cable, Battery, Negative		1
	5	291883	Cable, Battery, Positive to Switch		1
	6	291611	Switch, Battery Disconnect, 2000A, Lock Out (S416)		1
	7	291889	Cable, Disconnect Switch to Starter		1
	8	287735	Ground Plate (GP1)		1
	9	W9407-446	Cable, Ground Plate to Frame		1
	10	291899	Engine Wire Harness		1
	11	286850	Solenoid, Starter Cut-Out (L402)		1
	12	489658-007	Flyback Diode		1
	13	407948	Diode Assembly, Blocking (CR402)		1
	14	291997	Sensor, Engine Block Temperature (A406)		Ref.
	15	291895	Controller, Glow Plug (A407)		Ref.
	16	286850	Solenoid, Glow Plug (L403)		1
	17	489658-007	Flyback Diode		1
	18	285062-001	Magnetic Pickup (A403)		1

Water Temp. Switch & Sender – see Figure 10

Oil Pressure Switch & Sender – see Figure 11

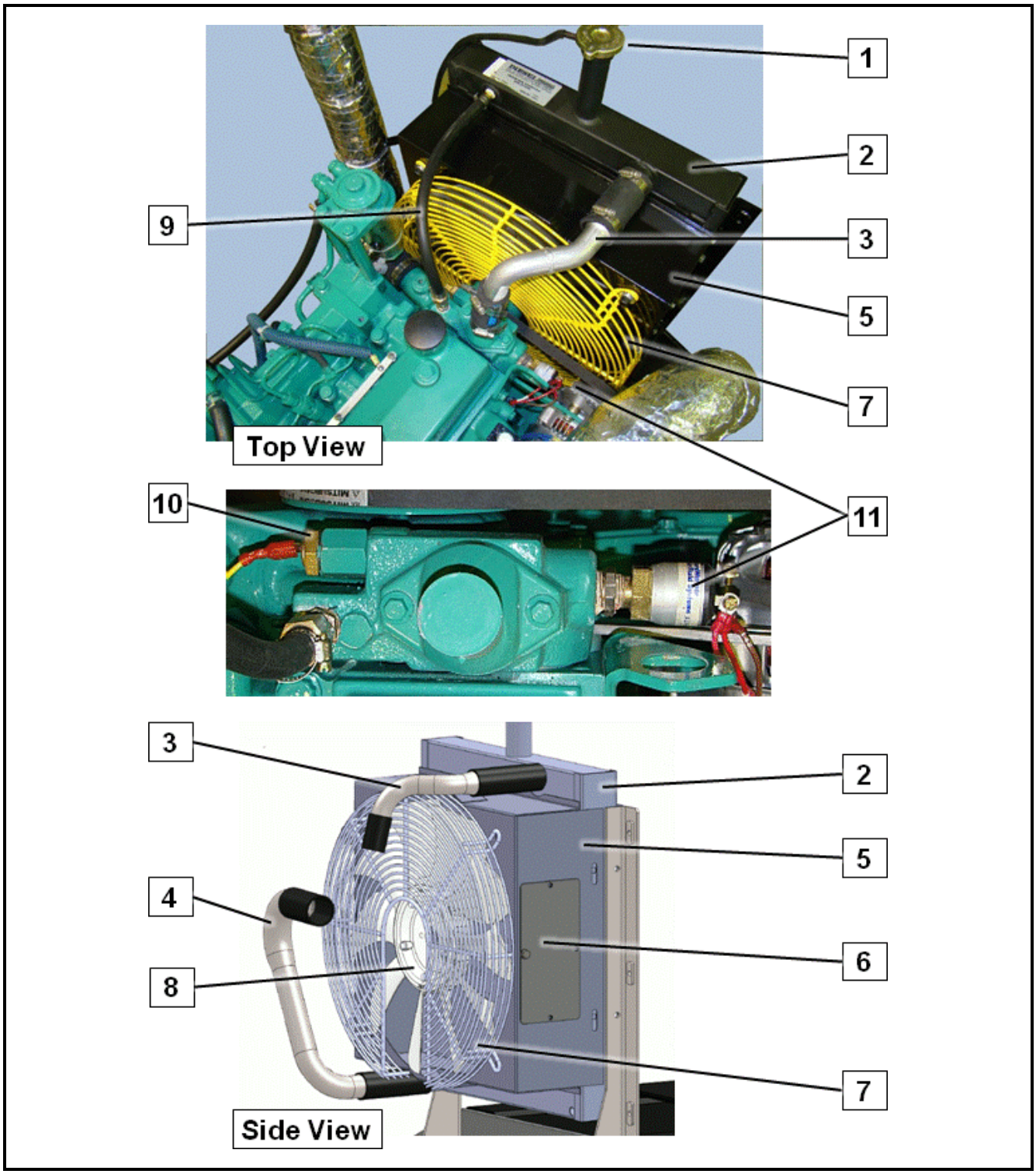


Figure 10: Cooling System Components

FIGURE – ITEM NO.	PART NO.	DESCRIPTION	EFF	QTY.
10 - 1		Radiator Cap, 7 lb. Pressure (included with radiator)		Ref.
2	281423	Radiator		1
3	291771	Pipe, Coolant, Top		1
	289200-003	Hose, Radiator, Straight, 1.25 ID		2.25”
	289200-004	Hose, Radiator, Straight, 1.50 ID		5”
4	291778	Pipe, Coolant, Bottom		1
	289200-001	Hose, Radiator, Straight, 1.75 ID		2 x 5”
5	291828	Shroud, Fan		1
6	291097	Panel, Access		1
7	291781	Guard, Fan		1
8	291875	Fan, Radiator		1
9		Line, Deaeration		Ref.
	W7814-000	Bushing, Pipe, Steel		1
	402927-003	Connector, Male		2
	056534	Hose, 1/4” ID		21.5”
	W10869-014	Clamp, Hose, Ss		2
10		Sender, Water Temperature (A401 supplied with engine)		Ref.
11	403782-002	Switch, Water Temperature, SPDT, 210° (S402)		1

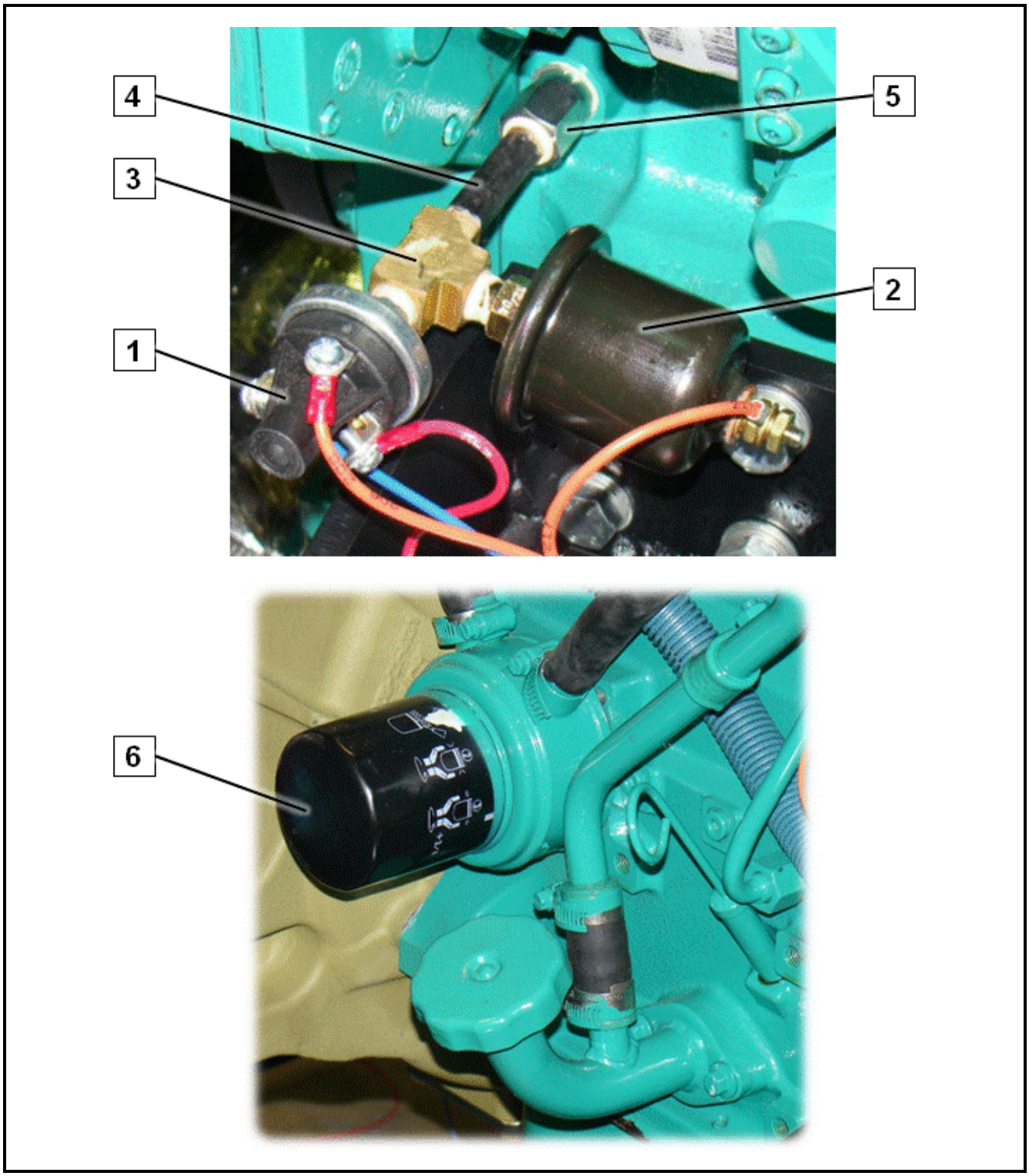


Figure 11: Lubrication System Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
11 -	1	403809-002	Switch, Oil Pressure (S403)		1
	2	78B1118-002	Sender, Oil Pressure (A402)		1
	3	W10910-000	Tee Fitting		1
	4	W10750-004	1/8” Pipe Nipple		1
	5	287419	Adapter, M10 to 1/8 NPT		1
	6	286897-037	Oil Filter (Fleetguard LF16001)		Ref.

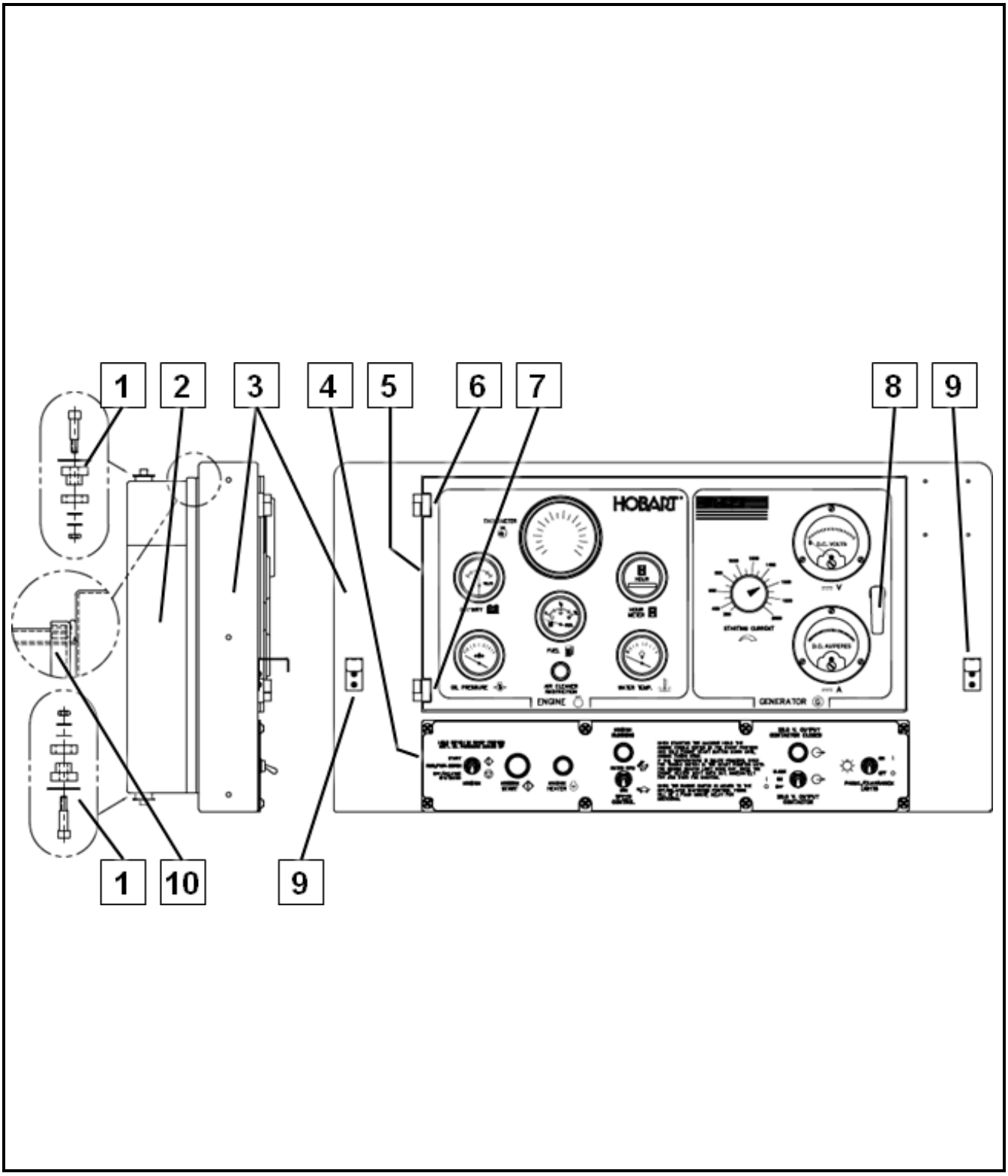


Figure 12: Control Box Mechanical Components

FIGURE – ITEM NO.	HOBART PART NO.	DESCRIPTION	EFF	QTY.
12 - 1	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
2	291431	Control Box Mounting Panel		1
3	291307	Control Box Housing		1
4	290931	Switch Panel		1
	040213	Neoprene Door Gasket		4.1 ft.
5	289092	Control Box Door		1
	291937	Control Box Label		1
	040201	Neoprene Switch Panel Gasket		5.3 ft
6	288836-002	Hinge, Offset, Miniature, Type B		1
7	288836-001	Hinge, Offset, Miniature, Type A		1
8	288999-001	Latch, Control Box		1
9	288020	Cover Support Bracket		2
10	286485-001	Sealing Gasket		124 In.

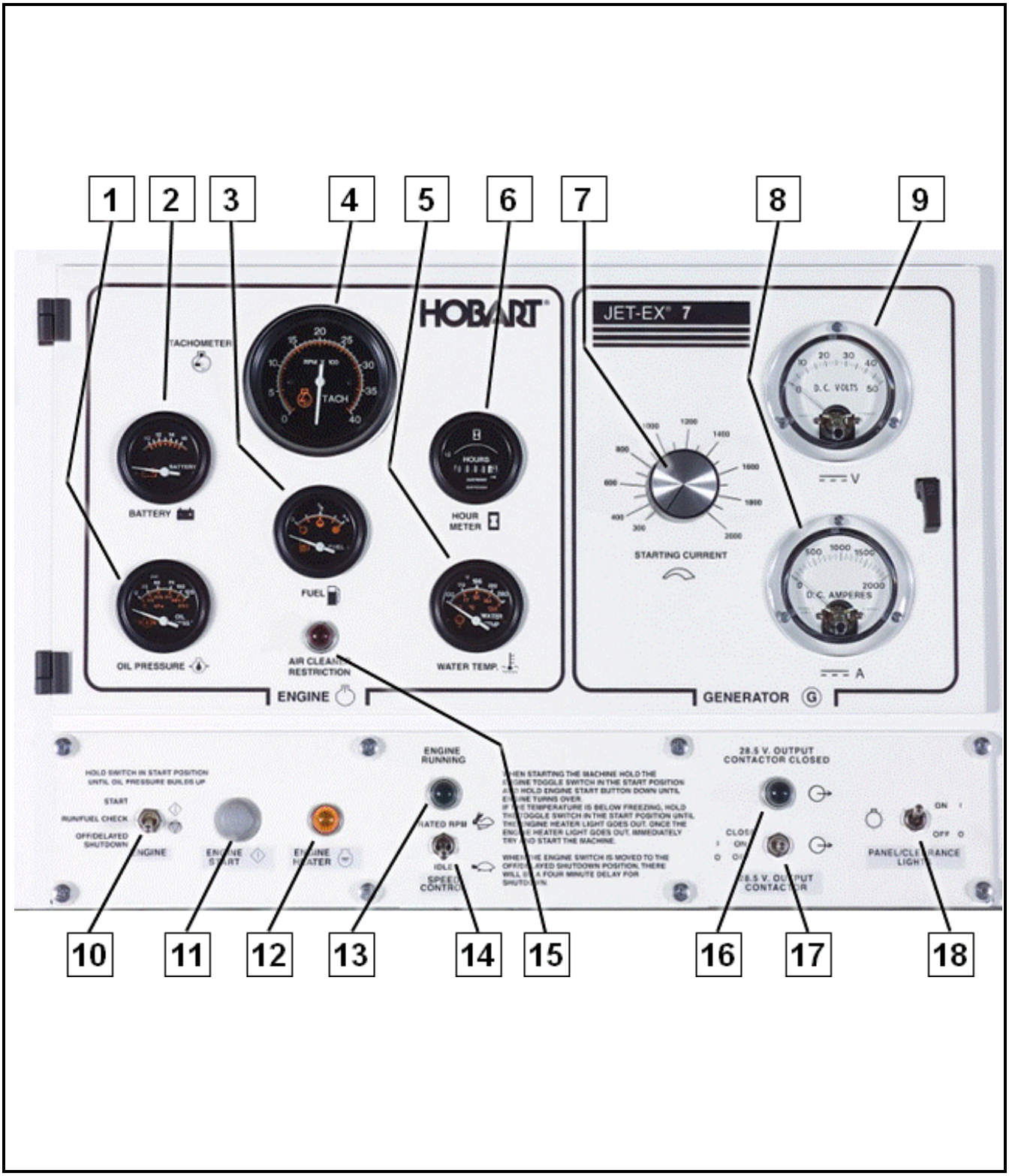


Figure 13: Control Box Controls and Indicators

FIGURE – ITEM NO.		HOBART PART NO.	DESCRIPTION	EFF	QTY.
13 -	1	78A1117-002	Oil Pressure Gauge		1
	2	286699-001	Battery Voltmeter		1
	3	494134-001	Fuel Gauge		1
	4	408596-001	Tachometer		1
	5	287908	Water Temperature Gauge		1
	6	78A1120-001	Hour Meter		1
	7	16DA2162	Rheostat Knob		1
		286607-001	Potentiometer, 10K, 2W, Linear		1
		402663	Lock Nut, Potentiometer		1
	8	400641-011	DC Ammeter, 0 – 1600 A scale, 50 mV		1
	9	400642-003	DC Voltmeter, 0 – 50 V scale		1
	10	403189	Switch, Toggle, 3 Position, 2 Pole (Start-Run-Off)		1
	11	30GH1119	Switch, Pushbutton (Engine Start)		1
	12	HF2518-005	Pilot Light Assembly, 12 V, Amber (Heater)		1
*		404173	…Light Base		1
*		404172-002	…Amber Lens		1
*		400613-004	…Bulb (Type 1815)		1
	13	HF2518-008	Pilot Light Assembly, 12 V, Green (Running)		1
*		404173	…Light Base		1
*		404172-003	…Green Lens		1
*		400613-004	…Bulb (Type 1815)		1
	14	290957	Switch, Toggle, 2 Position, 4 Pole (Speed)		1
	15	HF2518-008	Pilot Light Assembly, 12 V, Red (Air Restriction)		1
*		404173	…Light Base		1
*		404172-001	…Red Lens		1
*		400613-004	…Bulb (Type 1815)		1
	16	HF2518-008	Pilot Light Assembly, 28 V, Green (Contactor)		1
*		404173	…Light Base		1
*		404172-003	…Green Lens		1
*		400613-003	…Bulb (Type 757)		1
	17	403189	Switch, Toggle, 3 Position, 2 Pole (Contactor)		1
	18	290981	Switch, Toggle, 2 Position, 2 Pole (Lights)		

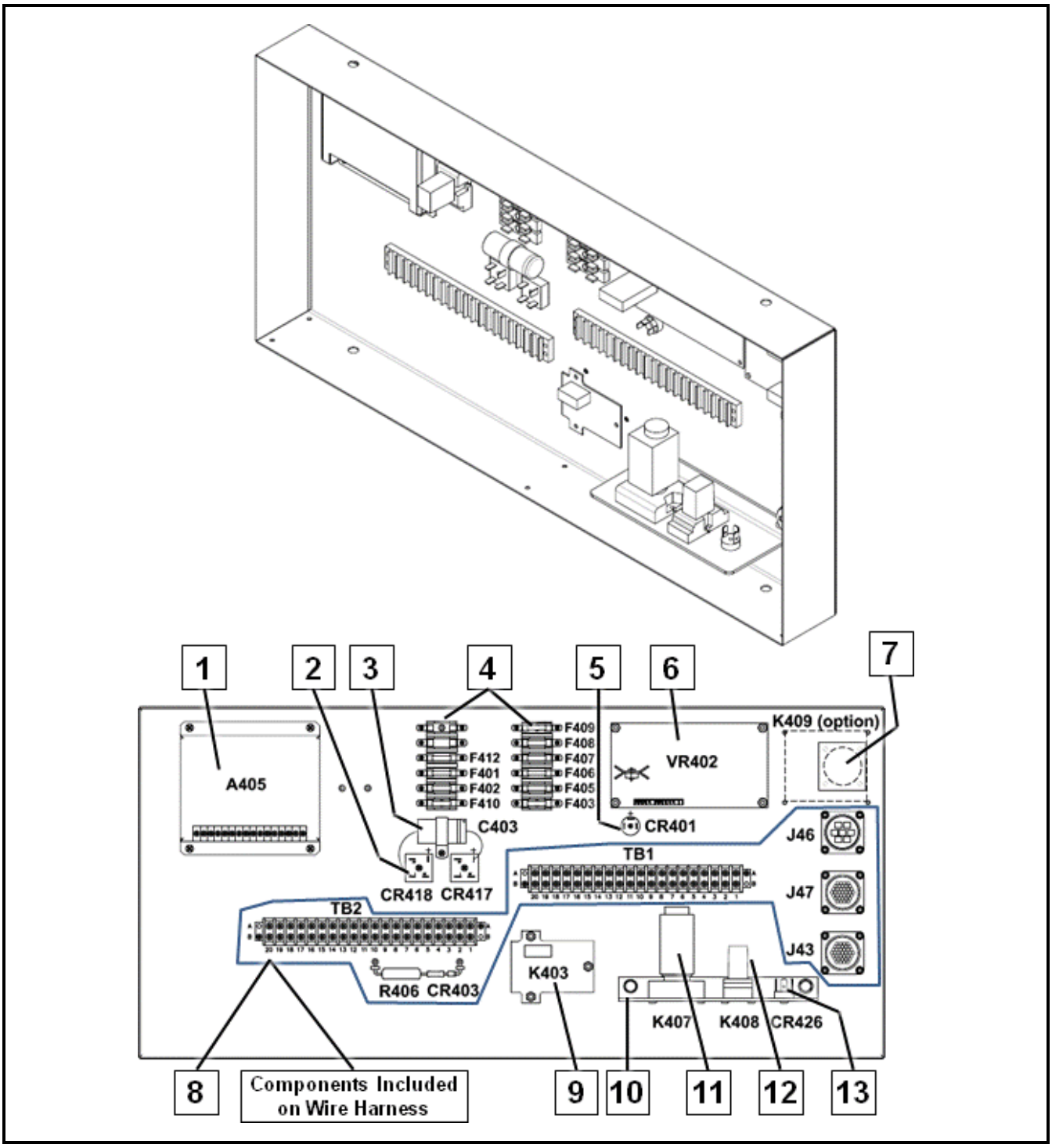


Figure 14: Control Box Interior Components

FIGURE – ITEM NO.		HOBART PART NO.	DESCRIPTION	EFF	QTY.
14 -	1	291876	Speed Control Unit (A405)		1
*		84A1075	Mount, Rubber		8
	2	404065-002	Rectifier, Bridge (CR417 & CR418)		2
	3	180593-003	Capacitor, 100 MFD, 350 VDC (C403)		1
		W10051-014	Clamp, Wire, Plastic		1
	4	290958	Fuse Block, 6 Pole		2
		W11166-003	Fuse, 10 A		8
			(F401, F402, F403, F405, F406, F407, F408, F410)		
		288019-004	Fuse, 20A, Slow Blow		2
			(F412)		
		FU11183	Fuse, 30A, Slow Blow		
			(F409)		
	5	407948	Rectifier, Dual, Isolated Base, 600 V, 10A (CR401)		1
	6	181022C-005	Board, PC, Voltage Regulator (VR402)		1
		84A1075	Mount, Rubber		8
	7	286611	Label, Blank (covers option hole)		1
	8	291901	Harness, Control Box		1
			The harness includes the following items:		
			…Terminal Block, 20-Position (TB1 & TB2)		2
			…Resistor , Axial Lead, 50 Ohm, 10 W (R406)		1
			…Diode, 150 PIV, 4 Amp (CR403)		1
			…Connector, Circular Plastic, 37-pin (J43 & J47)		2
			…Connector, Circular Plastic, 7-pin (J46)		1
	9	181022C-005	Board, PC, Overvoltage (K403)		1
		84A1075	Mount, Rubber		3
	10	290948	Support, Relays		1
	11	290927	Relay, Timer, 12 VDC, 2-Pole (K407)		1
		78B1138	Socket, Relay, 11 Pin		1
	12	79B1140	Relay, 12 VDC, 4-Pole, (K408)		1
		408352	Socket, Relay		1
	13	407948	Rectifier, Dual, Isolated Base, 600 V, 10A (CR426)		1

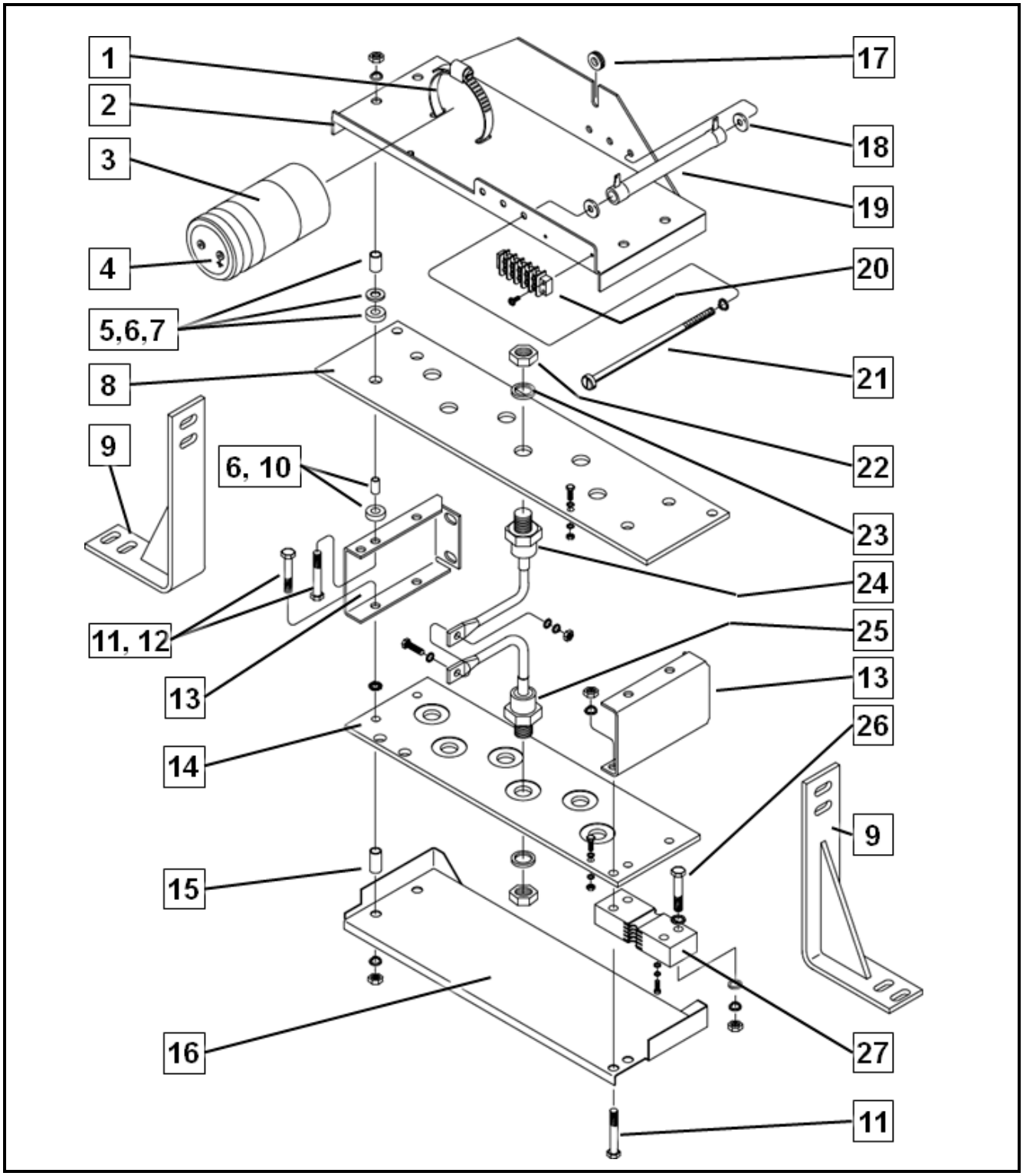


Figure 15: Rectifier Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
15 -		**291996**	**Rectifier Assy**		Ref.
	1	W10869-006	Capacitor Clamp		1
	2	286887	Shroud, Air, Top, Rectifier		1
	3	287184-003	Insulator, Capacitor		1
	4	405278-006	Capacitor, 90000 MFD, 75		1
	5	A25	Insulating Washer		8
	6	W11242-018	Washer, Flat, 3/8”		8
	7	283063	Rectifier Spacer		8
	8	286813	Heat Sink, Rectifier, Positive		1
	9	288008	Rectifier Mounting Bracket		2
	10	AW626	Bushing, Insulating		4
	11	W11097-007	Screw , 3/8-16 x 2 inches Lg.		5
	12	W11097-022	Screw , 3/8-16 x 2-1/2 inches Lg.		4
	13	292081	Heat Sink Bracket		2
	14	282239	Heat Sink, Rectifier, Negative		1
	15	180600	Shroud Spacer		3
	16	285647	Shroud, Air, Bottom, Rectifier		1
	17	402037-004	Rubber Grommet (V02231)		1
	18	16DA3493	Insulating Washer		6
	19	288380-001	Resistor, 10 OHM, 100 WATT		3
	20	401911-005	5 Station Terminal Block *(V6S553)*		1
	21	W11114-012	Screw, 1/4-20 X 7-1/4 inches Lg.		3
	22	W11280-015	Nut, Jam, Hex, 3/4-16		12
	23	494681-001	Spring Washer		12
	24	W10931-003	Rectifier, Positive Base*, 1N4049, 275 A, 300 PRV*		6
	25	W10933-003	Rectifier, Positive Base*, 1N4049R, 275 A, 300 PRV*		6
	26	W11097-007	Screw, HHC, 3/8-16 x 2 inches Lg.		1
	27	180068	Shunt, 1600 A, 50 mV		1
*	28	288015	Wire Harness, Rectifier		1
*	29	291358	Splice, Solder		3

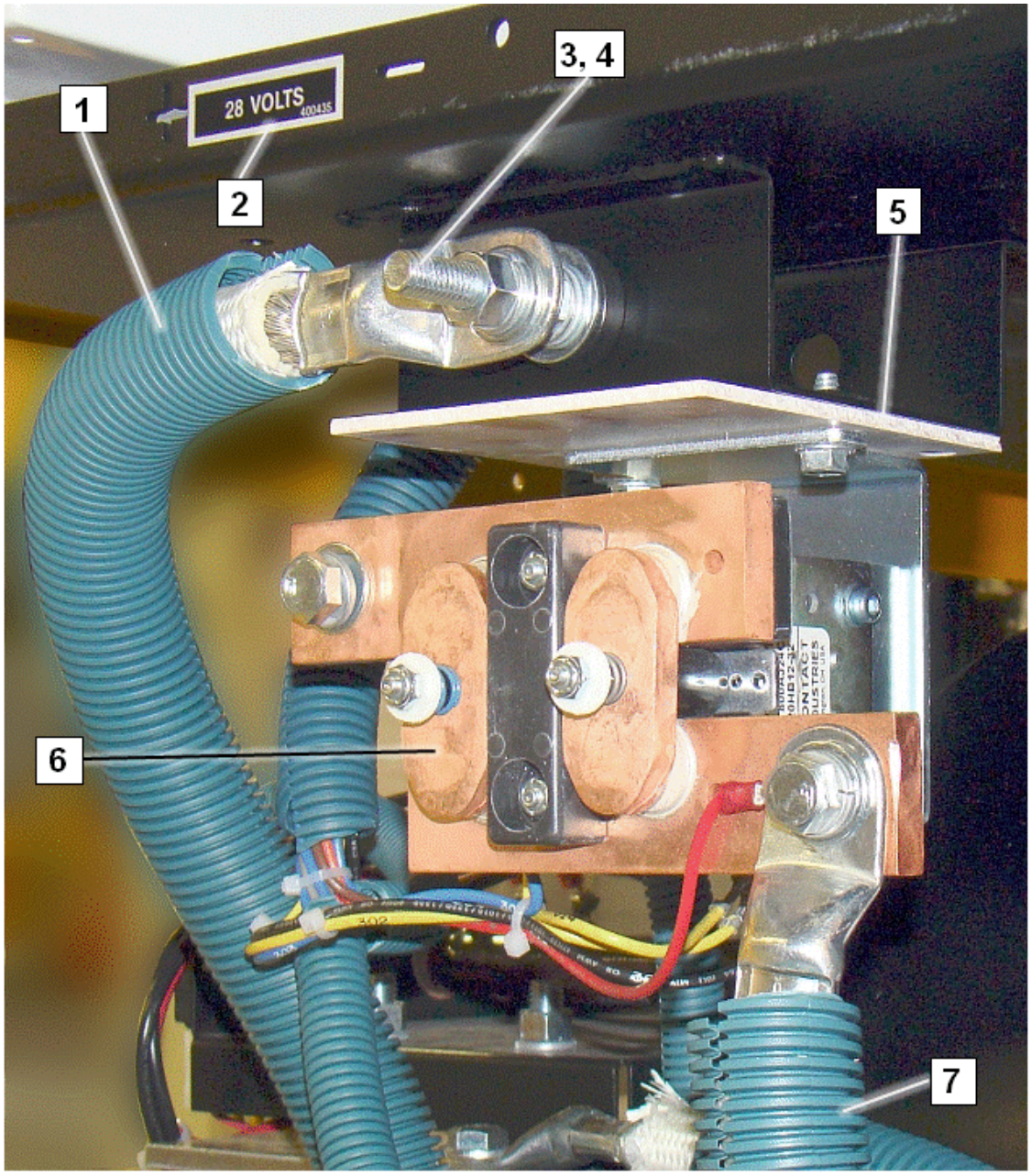


Figure 16: Contactor Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
16 -	1	W9218-227	Cable, Negative Output		1
	2	400435	Label, 28 Volts		1
	3	A25	Insulating Washer		2
	4	AW626	Insulating Bushing		1
	5	286849	Contactor Insulator		1
	6	286810-001	Contactor, DC, 800 A		1
	7	W9218-251	Cable, Positive Output		1
*	8	489658-010	Diode Assembly		1

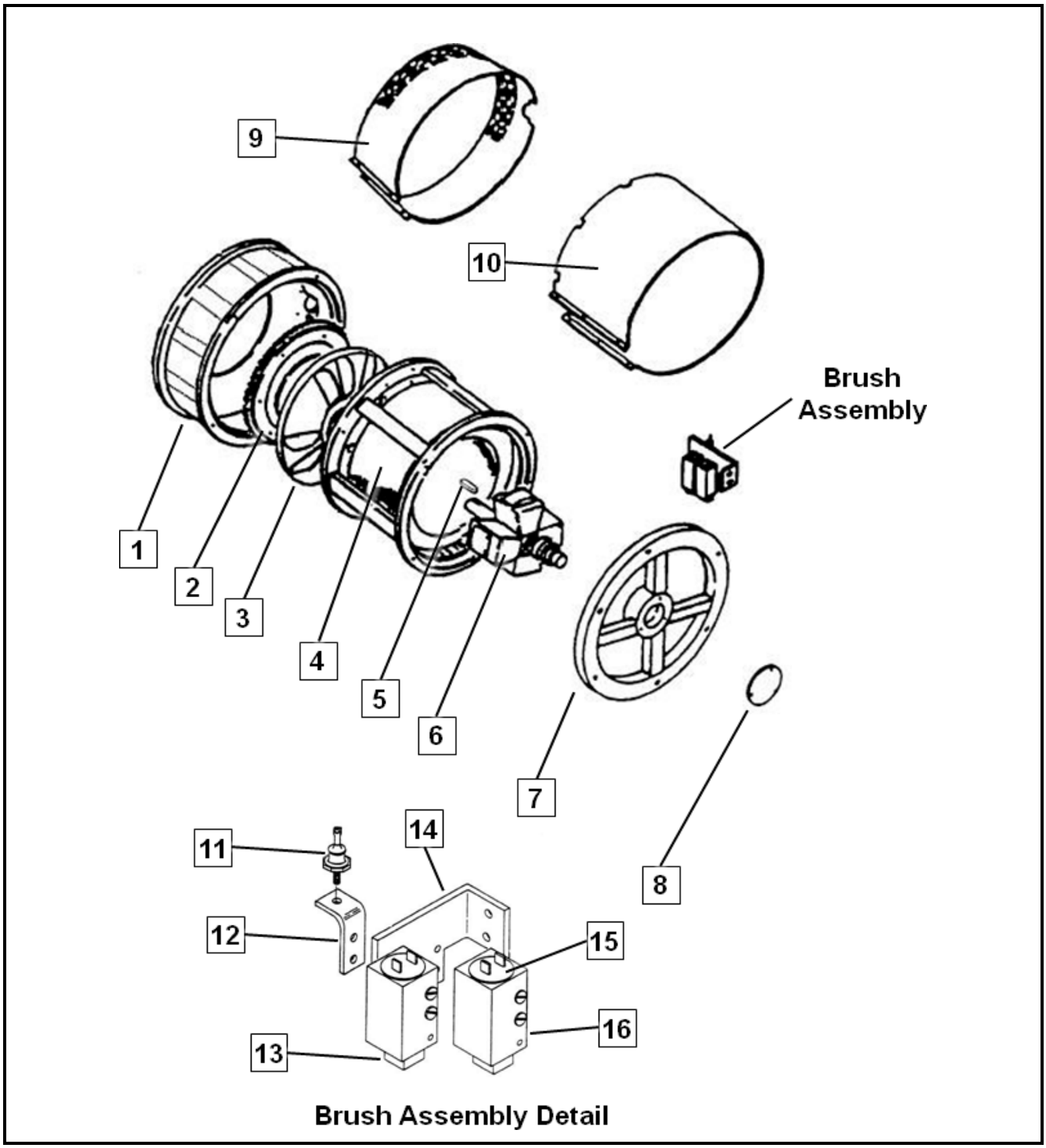


Figure 17: Generator Assembly

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
17 -		**288985**	**Generator Assembly**		1
	1	287564	Fan Housing		1
	2		Flywheel (supplied with engine)		Ref.
	3	290646	Fan and Coupling Assembly		1
*		402789-004	…Screw, Cap, 3/8 – 24 x 3/4 inch Nylok		6
*		W11254-005	…Washer, Lock, Std., 3/8 inch		6
*		85C1004-002	…Spit Taper Bushing		1
	4	488557-008	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	Flywheel Housing Cover		1
	10	281688	Generator Housing Cover		1
	11	408999-001	Diode, Silicon, 30 A, MR1396, Positive Assembly		1
	12	488628	Bracket, Diode		1
	13	402788	Brush		2
	14	488562	Bracket, Brush Holder		1
	15	402531	Cap		2
	16	402530	Guide		2
*	17	W10072-063	Bearing		1
*	18	287956	Bracket, Rear Generator Support		1

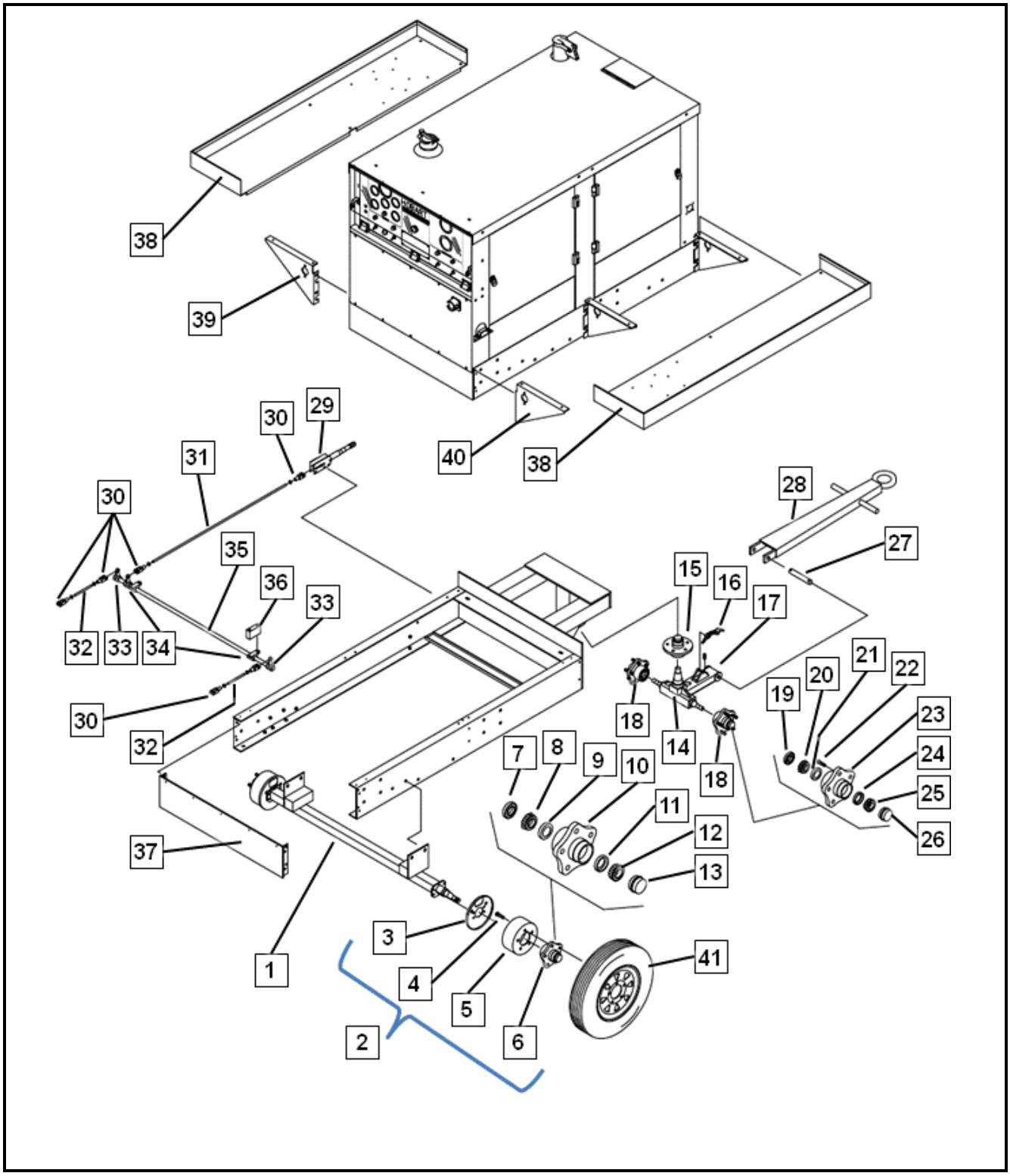


Figure 18: Trailer Components

FIGURE – ITEM NO.	PART NO.	DESCRIPTION	EFF	QTY.
18 -	**291920-002**	**Trailer Assembly**		
1	288389	Rear Axle Weldment	A,C	1
2	287587	Hub and Brake Assembly	A,C	2
	285917	…Lug nut	A,C	5
3	285911	…Dust Shield	A,C	1
4	286205	…Hub Bolt	A,C	5
5	287627	…Brake Drum	A,C	1
6	287626	…Hub Assembly	A,C	1
7	287626-001	……Grease Seal	A,C	1
8	287626-002	……Inner Bearing Cone	A,C	1
9	287626-003	……Inner Bearing Cup	A,C	1
10	287628	……Hub	A,C	1
11	287626-004	……Outer Bearing Cup	A,C	1
12	287626-005	……Outer Bearing Cone	A,C	1
13	287626-006	……Wheel Hub Cap	A,C	1
14	288390	Front Axle Weldment	A,C	1
15	288392	Hub Assembly	A,C	1
16	285851	Latch Pedal	A,C	1
17	285850	Compression Spring	A,C	1
18	286735	Hub Assembly	A,C	2
	285917	…Lug Nut	A,C	5
19	286735-001	…Grease Seal	A,C	1
20	286735-002	…Inner Bearing Cone	A,C	1
21	286735-003	…Inner Bearing Cup	A,C	1
22	286205	…Hub Bolt	A,C	5
23	286734	…Wheel Hub	A,C	1
24	286735-004	…Outer Bearing Cup	A,C	1
25	286735-005	…Outer Bearing Cone	A,C	1
26	286735-006	…Wheel Hub Cap	A,C	1
27	285844	…Drawbar Pin Assembly	A,C	1
28	288393	…Drawbar Weldment	A,C	1
29	286978	Brake Lever Assembly	A,C	1
30	286982	Clevis	A,C	6
31	288394	Brake Handle Rod	A,C	1
32	288395	Brake Lever Rod	A,C	2
33	288398	Shaft Lever	A,C	3
*	286985	Collar, Set Screw	A,C	2
*	286984	Roll Pin	A,C	3
34	286981	Shaft Bearing	A,C	2
35	288396	Brake Cross Bar	A,C	1
36	288397	Spacer Block	A,C	1
37	288391	Rear Frame Plate	A,C	1
38	287996	Fender	A,C	2
39	287994	Fender Mounting Bracket	A,C	3
40	287993	Fender Mounting Bracket	A,C	3
41	282720	Wheel and Tire Assembly	A,C	4
42	286201	Brake Assembly (See Figure 19)	A,C	2

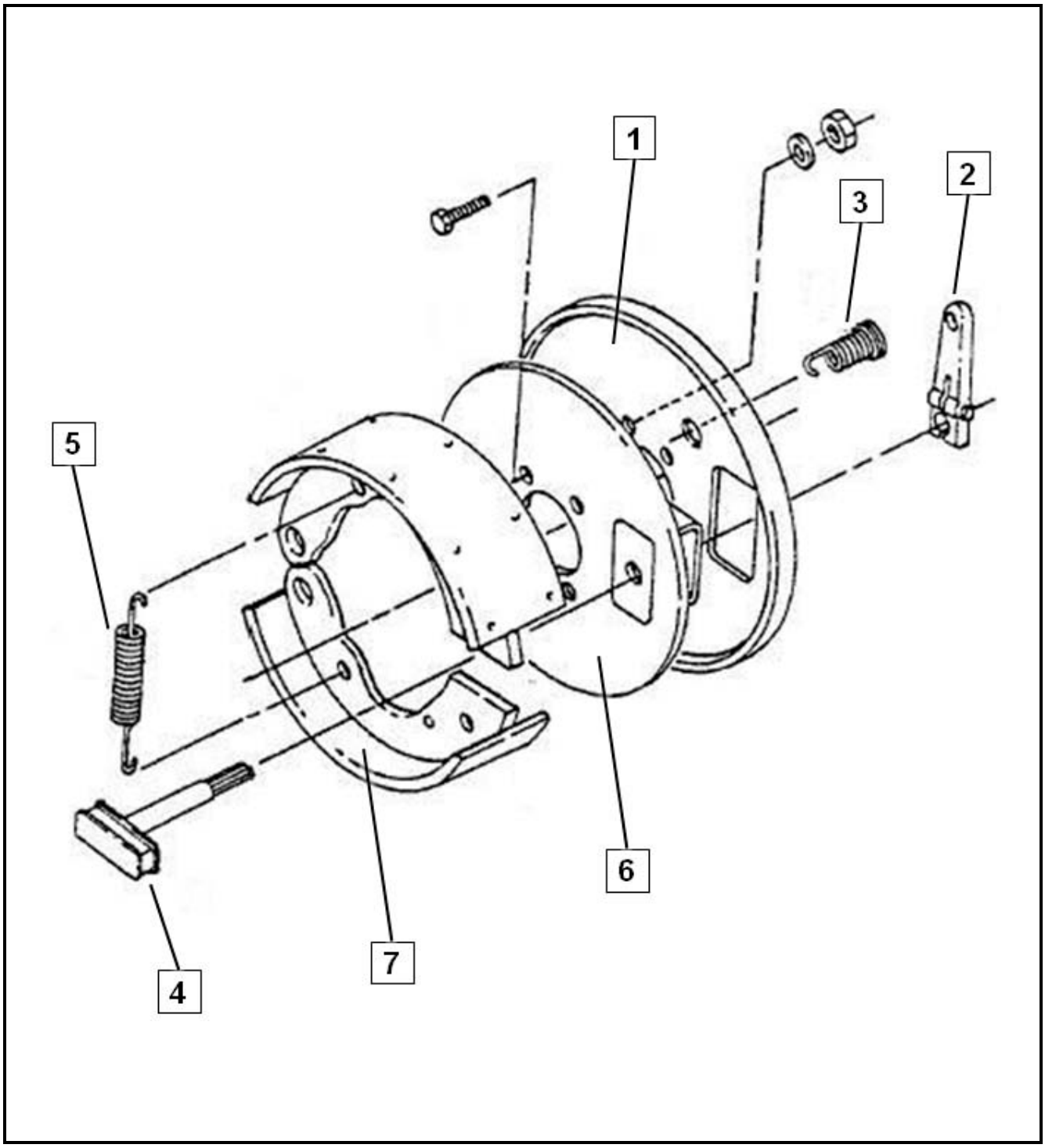


Figure 19: Brake Components

FIGURE – ITEM NO.		PART NO.	DESCRIPTION	EFF	QTY.
19 -	1	285911	Dust Shield	A,C	Ref.
	2	285915-006	Cam Assembly	A,C	1
	3	285915-001	Hold Down Spring	A,C	2
	4	285915-005	Cam Shaft	A,C	1
	5	285915-003	Shoe Return Spring	A,C	1
	6	285915-004	Support Plate	A,C	1
	7	285915-002	Shoe Assembly	A,C	1

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Chapter 5 Manufacturer's Literature

Diagram Number	Diagram Description
291902 4/23/13	Diagram, Schematic and Connection

Contact Hobart Ground Systems if any of the above documentation is not within this manual (unless otherwise noted above).

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Jet-Ex 7 Schematic

Legend

Designator	Description	Sheet
A401	Sender, Water Temperature	2,6
A402	Sender, Oil Pressure	2,6
A403	Pickup, Magnetic, Engine Speed Control	2,6
A404	Sensor, Air Restriction	2,6
A405	Controller, Engine Speed	2,5
A406	Sender, Engine Temperature (Glow Plugs)	2,6
A407	Controller, Glow Plug	2,6
B401	Starter, Engine	2,6
BT401	Battery, 12-Volt	2,6
C401	Capacitor, 41000 uF, 75V	3,6
C403	Capacitor, 100 uF, 350 VDC	3,5
CR401 - CR402	Rectifier, Blocking	2,3,6
CR403	Diode, Blocking	2,5
CR405 - CR410	Diode, Negative	3,6
CR411 - CR416	Diode, Positive	3,6
CR417, CR418	Rectifier, Control Winding	3,5
CR419 - CR422	Diode, Flyback (option)	2,3,5,6
CR425	Diode, Flyback (option)	7
CR426	Diode, Blocking	2,5
DS9	Light, Spot with Switch (option)	2,7
DS70	Light, Strip, Control Box	2,5
DS403 - DS406	Light, Marker, Amber	2,6
DS407	Indicator, Engine Running, Green	2,5
DS408	Indicator, Contactor Closed, Green	3,5
DS409	Light, Engine Heater	2,5
DS412	Indicator, Air Restriction, Red	2,5
DS413	Beacon, Unit Operating (option)	2,7
DS414	Light, Low Fuel (option)	7
DS421	Light, Oil Pressure Gauge, White	2,5
DS422	Light, Water Temperature Gauge, White	2,5
DS423	Light, Fuel Level Gauge, White	2,5
DS424	Light, Voltmeter Gauge, White	2,5
DS425	Light, Tachometer Gauge, White	2,5
F23	Fuse, Spot Light, Inline, 10A (option)	2,7
F401	Fuse, Fuse, Lights, 10A	2,5
F402	Fuse, Engine Circuit, 10A	2,5
F403	Fuse, Voltage Regulator, 10A	3,5
F404		
F405	Fuse, Voltage Build-up, 10A	3,5
F406 - F408	Fuse, Control Windings, 10A	3,5
F409	Fuse, Glow Plugs, 30A, SLOW BLOW	2,5
F410	Fuse, 28 VDC Protection, 5A	3,5
F412	Fuse, Speed Control, 20A, SLOW BLOW	2

Designator	Description	Sheet
G401	Alternator, Engine, 12 V	2,6
G402	Generator Stator	3,6
GP1	Ground Plate	6
J1, J2	Receptacle, Low Fuel Beacon (option)	7
J404, J405	Receptacle, Voltage Regulator	5
J43	Receptacle, Rectifier	4
J46	Receptacle, Power	4
J47	Recepacle, Engine	4
K402	Load Contactor	3,6
K403	Relay, Overvoltage	3,5
K407	Timer, Delayed Shutdown	2,5
K408	Relay, Delayed Shutdown	2,5
K409	Board, Low Fuel (option)	7
L401	Solenoid, Starter	6
L402	Solenoid, Starter Cut-Out	2,6
L403	Solenoid, Glow Plug	2,6
L404	Solenoid, Fuel Pump Advance	2,6
L405	Actuator, Fuel Pump Flow	2,6
L406	Field, Revolving, Generator	3,6
M401	Voltmeter, Battery	2,5
M402	Running Time Meter	2,5
M403	Tachometer	2,5
M404	Gauge, Water Temperature	2,5
M405	Gauge, Oil Pressure	2,5
M406	Voltmeter, Generator	3,5
M407	Ammeter, Generator	3,5
M408	Gauge, Fuel, Electric	2,5
P1, P2	Plug, Low Fuel Beacon (option)	7
P43	Plug, Rectifier	4
P46	Plug, Power	4
P47	Plug, Engine	4
P404	Plug, Voltage Regulator	5

Designator	Description	Sheet
R402	Potentiomenter, Starting Current, 10K, 2W	3,5
R403 - R405	Resistor, 10 Ohm, 100W	3,6
R406	Resistor, 50 Ohm, 10W	2,5
R407	Shunt, Ammeter	3,6
R408	Sender, Fuel Level	2,6
R410	Resistor, 180K, 1/4W	3,5
S401	Switch, Pushbutton, Engine Start	2,5
S402	Switch, Water Temperature	2
S403	Switch, Oil Pressure	2,6
S404	Switch, Engine, Start-Run-Stop	2,5
S405	Switch, Panel & Clearance Lights	2,5
S406	Switch, Speed Control	2,3
S408	Switch, Contactor, Close-On-Off	3
S413	Switch, Pushbutton, Emergency Stop	2,6
S413A	Switch, E-Stop Male Connector	6
S413B	Switch, E-Stop Female Connector	6
S416	Switch, Battery Disconnect	2
TB1	Terminal Block, Control Block	4
TB2	Terminal Block, Control Box	4
TB3	Terminal Block, Rectifier	6
VR402	Board, Voltage Regulator	3,5

Contents

-	-
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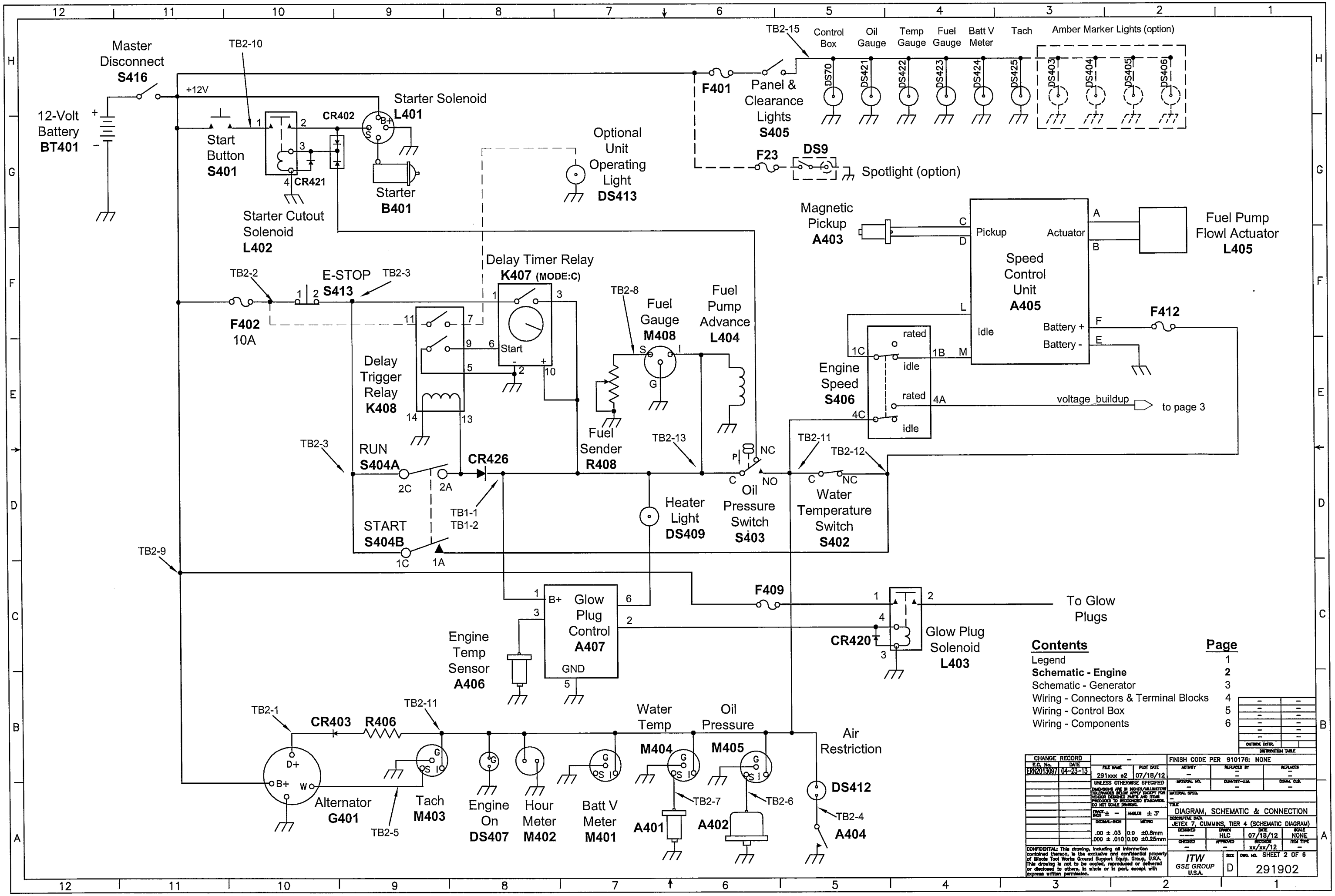
-	-
OUTSIDE DISTR.	

DISTRIBUTION TABLE

CHANGE RECORD		–	FINISH CODE PER 910176: NONE		
E.C. No.	DATE	FILE NAME / PLOT DATE	ACTIVITY	REPLACED BY	REPLACES
DRN2013097	04-23-13	291902 s1 07/18/12	–	–	–
		UNLESS OTHERWISE SPECIFIED	MATERIAL NO.	QUANTITY-U.M.	COMM. CLS.
		DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.	–	–	–
			MATERIAL SPEC.		
			–		
			TITLE		
		FRACT. INCH ± – ANGLES ± 3°	DIAGRAM, SCHEMATIC & CONNECTION		
		DECIMAL-INCH / METRIC	DESCRIPTIVE DATA		
		.00 ± .03 / 0.0 ±0.8mm	JETEX 7, CUMMINS, TIER 4 (SCHEMATIC DIAGRAM)		
		.000 ± .010 / 0.00 ±0.25mm	DESIGNED	DRAWN	DATE / SCALE
			–	HLC	07/18/12 / NONE
			CHECKED	APPROVED	RECORDER / ITEM TYPE
			–	–	---- / ---

ITW GSE GROUP U.S.A.

SIZE D | DWG. NO. 291902 | SHEET 1 OF 6



Contents	Page
Legend	1
Schematic - Engine	**2**
Schematic - Generator	3
Wiring - Connectors & Terminal Blocks	4
Wiring - Control Box	5
Wiring - Components	6

CHANGE RECORD			
E.C. No.	DATE	FILE NAME	PLOT DATE
ERN2013097	04-23-13	291xxx_s2	07/18/12

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

FRACT. INCH	± –	ANGLES	± 3°
DECIMAL-INCH		METRIC	
.00	± .03	0.0	±0.8mm
.000	± .010	0.00	±0.25mm

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FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES
–	–	–
MATERIAL NO.	QUANTITY-U.M.	COMM. CUS.
–	–	–

MATERIAL SPEC.: –

TITLE: DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA: JETEX 7, CUMMINS, TIER 4 (SCHEMATIC DIAGRAM)

DESIGNED	DRAWN	DATE	SCALE
———	HLC	07/18/12	NONE
CHECKED	APPROVED	RELEASED	ITEM TYPE
–	–	xx/xx/12	–

ITW GSE GROUP U.S.A.

SIZE: D | DWG. NO.: 291902 | SHEET 2 OF 6

DISTRIBUTION TABLE
OUTSIDE DISTR.

Power Rectifiers

28.5 VDC Output

Stator Windings

Stator Windings

From Page 2

voltage_buildup

5,11

6,12

3,9

1,7

4,10

2,8

G402

G402

CR416 CR415 CR411 CR414 CR413 CR412

CR410 CR409 CR405 CR408 CR407 CR406

C401

R403 R404 R405

F410

TB1-18

M406

Contactor **K402**

Contactor Switch **S408**

ON

CLOSE

TB1-9

CR422

DS408

Over Voltage **K403**

TB1-3

Meter Shunt **R407**

Engine Speed **S406**

rated 2A

2C idle

rated 3A

3C idle

Ammeter **M407**

TB1-13

TB1-14

TB2-16

TB2-17

TB2-18

TB1-11

ControlWinding **L406**

F403

CR401

CR419

TB1-12

F405 F406 F407 F408

CR418 CR417

C403

R410

Starting Current **R402**

CW

Voltage Regulator **VR402**

TB1-16

Contents

CHANGE RECORD		–	FINISH CODE PER 910176: NONE
E.O. No.	DATE	FILE NAME / PLOT DATE	ACTIVITY / REPLACED BY / REPLACES
ERN2013097	04-25-13	291902 s3 / 07/18/12	– / – / –
		UNLESS OTHERWISE SPECIFIED	MATERIAL NO. / QUANTITY-U.M. / COMM. CUS.
		DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PROCURED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.	– / – / –
		FRACT. INCH ± – ANGLES ± 3°	MATERIAL SPEC. –
		DECIMAL-INCH: .00 ± .03, .000 ± .010 / METRIC: 0.0 ±0.8mm, 0.00 ±0.25mm	TITLE: DIAGRAM, SCHEMATIC & CONNECTION
			DESCRIPTIVE DATA: JETEX 7, CUMMINS, TIER 4 (SCHEMATIC DIAGRAM)
			DESIGNED ---- / DRAWN HLC / DATE 07/18/12 / SCALE NONE
			CHECKED – / APPROVED – / RELEASED xx/xx/12 / ITEM TYPE –

ITW GSE GROUP U.S.A.

SIZE D | DWG. NO. 291902 | SHEET 3 OF 6

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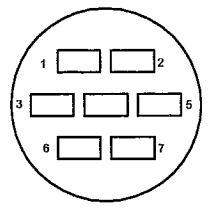
–	–
–	–
OUTSIDE DISTR.	

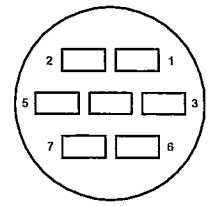
DISTRIBUTION TABLE

P46



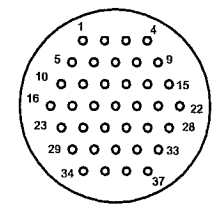
1	200	YL	S416
2	201	YL	L403-1
3	202	BU	G401-B+
4	203	BR	S413A-2
5	204	BR	S413A-1
6	205	YL	L402-1
7	---		

J46



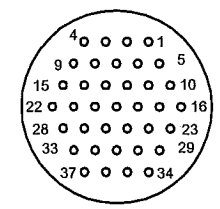
1	611	YL	F409
2	610	YL	F409
3	608	BU	TB2-A9
4	607	BR	TB2-A3
5	606	BR	TB2-A2
6	609	YL	TB2-A10
7			

P43

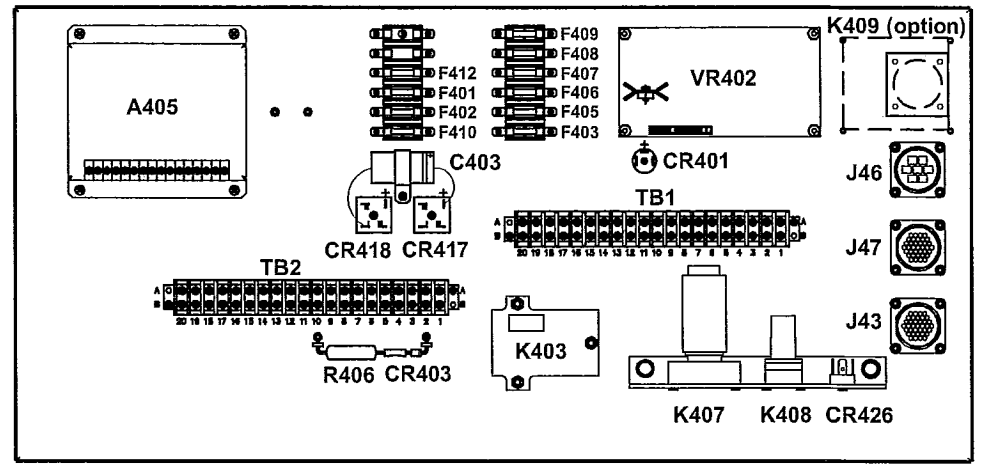


1	300	BU	R407
3	301	BU	R407
5	302	YL	K402-SWITCH
7	303	BU	K402-SWITCH
9	304	BK	K402
11	305	RD	K402
13	306	BK	GRD-GEN. HSG.
15	307	RD	TB3-A1
17	308	YL	TB3-A2
19	309	WT	R407
21		RD	R407
23		SHIELD	315 SPLICE
27	310	BLK	GRD-GEN.ENG.
29	311	BU	TB3-A3
31	312	BR	TB3-A4
33	313	OR	TB3-A5

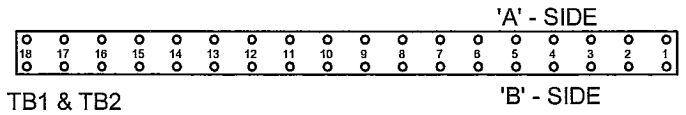
J43



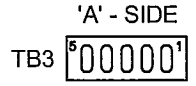
1	503	BU	TB1-A14
3	504	BU	TB1-A13
5	513	YL	TB1-A8
7	514	BU	TB1-A7
9	515	BK	TB1-A9
11	516	RD	TB1-A18
13	518	BK	TB1-A16
15	589	RD	TB1-A11
17	590	YL	TB1-A12
19	537	WH	P404-3
21	537	RD	P404-4
23	537	SHIELD	SPLICE
27	529	BK	SPLICE
29	591	BU	TB2-A18
31	592	BR	TB2-A17
33	593	OR	TB2-A16



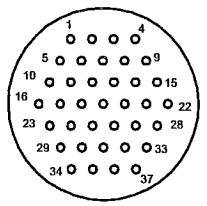
WIRE COLOR CODE			
BK	BLACK	**BU**	BLUE
BR	BROWN	**VT**	VIOLET
RD	RED	**GY**	GRAY
OR	ORANGE	**WT**	WHITE
YL	YELLOW	**CL**	CLEAR
GN	GREEN	**SH**	SHIELD



TB1 & TB2

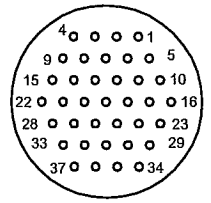


P47



P47			
1	206	OR	S403-C
3	208	RD	G401 - D+
4	246	OR	L404 J48-1
5	249	RD	L405-1
6	249	BK	L405-2
8	209	BR	G401 - W
12	211	BR	S402-NC
14	245	BU	A407-1
15	244	RD	A407-6
16	250	SH	
17	250	BK	A403-A
18	250	CL	A403-B
28	212	RD	S402-C
32	213	YL	DS405 / 406
33	214	YL	DS403 / 404
34	215	RD	R408
35	216	YL	A401
36	217	OR	A402
37	218	BU	A404-1

J47



J47			
1	594	OR	TB2-A13
3	596	RD	TB2-A1
4	672	OR	TB2-A13
5	673	RD	A405-A
6	673	BK	A405-B
8	597	BR	TB2-A5
12	601	BR	TB2-A12
14	666	BL	TB1-A1
15	665	RD	DS409
16	674	SH	
17	674	BL	A405-D
18	674	RD	A405-C
22	264	RD	K408-11
28	600	RD	TB2-A11
32	605	YL	TB2-A15
33	599	YL	TB2-A15
34	500	RD	TB2-A8
35	602	YL	TB2-A7
36	603	OR	TB2-A6
37	604	BU	TB2-A4

TB2		
	A-Top	**B-Bottom**
1	596 RD J47-3	CR403
2	606 BR J46-5	507 BR F402
	263 RD K408-7	
3	607 BU J46-4	560 BR S404
4	604 BU J47-37	506 BU DS412
5	597 BR J47-8	544 BR M403-S
6	603 OR J47-36	549 OR M405-S
7	602 YL J47-35	548 YL M404-S
8	500 RD J47-34	502 RD M408-S
9	561 BU F402	556 BU S401
	608 BU J46-3	
10	609 YL J46-6	562 YL S401
11	600 RD J47-28	R406
		576 RD S406-4C
12	598 OR J47-10	583 YL S405
	601 BR J47-12	675 F412
13	594 OR J47-1	508 OR M408-1
	672 OR J47-4	564 OR S404-2A
14		582 OR S406-4A
		585 OR CR401-1
15	599 YL J47-33	612 YL DS70+
	605 YL J47-32	586 YL SPLICE
		543 YL M403
		568 YL S405-2C
16	593 OR J43-33	533 OR F406
17	592 BR J43-31	534 BR F407
18	591 BU J43-29	535 BU F408
19		
20		

JUMPERS

TB1		
	A-Top	**B-Bottom**
1	564 OR TB2-B13	676 RD CR426+
	620 RD S404	
	666 BL J47-14	
2		684 BU K407-10
3	584 BK TB1-4	578 BK S406-2C
4	584 BK TB1-3	572 BK K403-P
5		
6		
7	514 BU J43-7	569 BU S408-2A
8	513 YL J43-5	570 YL S408-1A
9	515 BK J43-9	501 BK DS408
		573 BK K403-T
10		
11	589 RD J43-15	565 RD CR418+
12	590 YL J43-17	542 YL F403
13	504 BU J43-3	521 BU M407-
14	503 BU J43-1	522 BU M407+
15	677 K407-2	670 A405-E
	679 K408-5	
16		519 BK M406-
	518 BK J43-13	531 BK CR417-
		613 DS70
		577 S406-2A
17		
18	516 RD J43-11	520 RD M406+
		574 RD K403+
		575 RD S406
19		
20		

TB3		
	A-Top	**B-Bottom**
1	307 RD P43-15	BRUSH +
2	308 YL P43-17	BRUSH -
3	311 BU P43-29	PHASE A
4	312 BR P43-31	PHASE B
5	313 OR P43-33	PHASE C

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OUTSIDE DISTR	

DISTRIBUTION TABLE

CHANGE RECORD		–	FINISH CODE PER 910178: NONE		
E.C. No.	DATE	FILE NAME / PLOT DATE	ACTIVITY	REPLACED BY	REPLACES
HW2013097	04-23-13	291902 s4 07/18/12	–	–	–
		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± ANGLES ± 3° DECIMAL-INCH .00 ± .03 .000 ± .010 METRIC 0.0 ±0.8mm 0.00 ±0.25mm. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994. MACHINED EDGES NOT TO HAVE SHARP CORNERS. REMOVE BURRS AND SLIVERS. DO NOT SCALE DRAWING.	MATERIAL NO. –	QUANTITY–U.M. –	COMM. CUS. –
			MATERIAL SPEC. –		
			TITLE: DIAGRAM, SCHEMATIC & CONNECTION		
			DESCRIPTIVE DATA: JETEX 7, CUMMINS, TIER 4 (SCHEMATIC DIAGRAM)		
			DESIGNED ———	DRAWN HLC	DATE 07/18/12	SCALE NONE
			CHECKED –	APPROVED –	RECORDER ———	ITEM TYPE –

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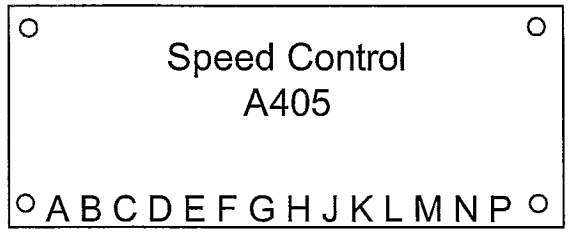
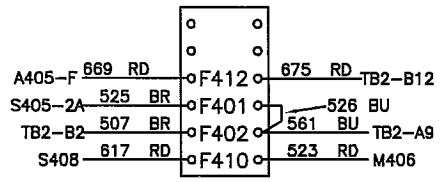
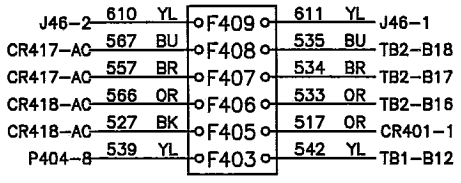
SIZE D | DWG. NO. 291902 | SHEET 4 OF 6

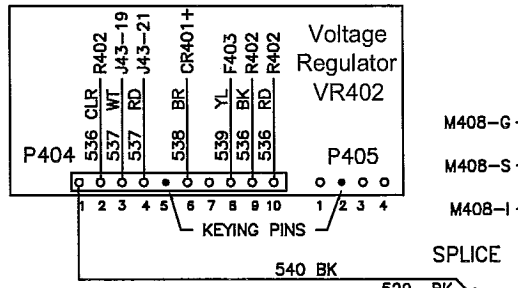


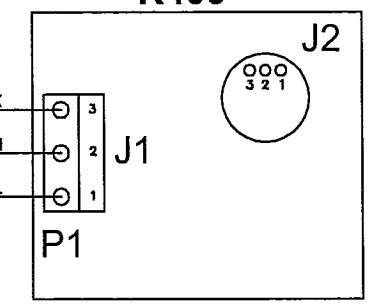
A	673 RD J47-5
B	673 BK J47-6
C	674 RD J47-18
D	674 BK J47-17
E	670 BK TB1-15
F	669 RD F412
L	667 YL S406-1C
M	668 VT S406-1B
CASE	671 BK GND STUD



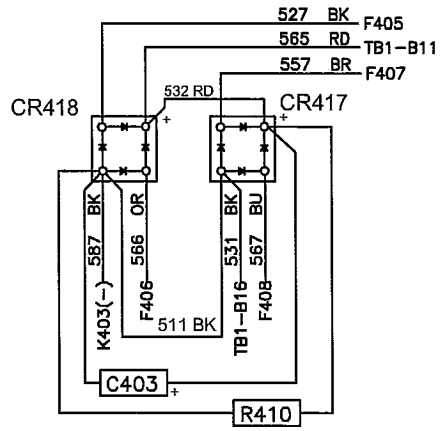


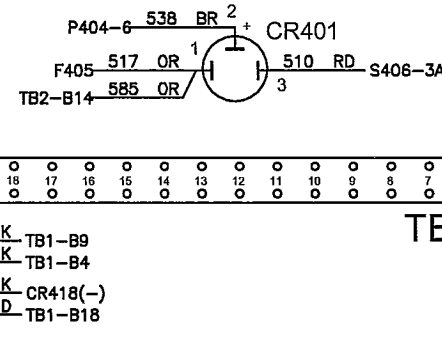
Control Box Interior

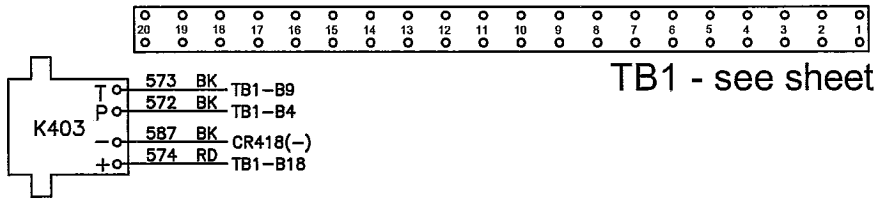




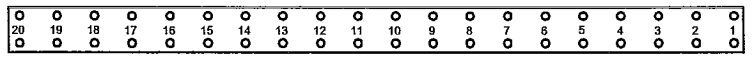
WIRE COLOR CODE			
BK	BLACK	BU	BLUE
BR	BROWN	VT	VIOLET
RD	RED	GY	GRAY
OR	ORANGE	WT	WHITE
YL	YELLOW	CL	CLEAR
GN	GREEN	SH	SHIELD



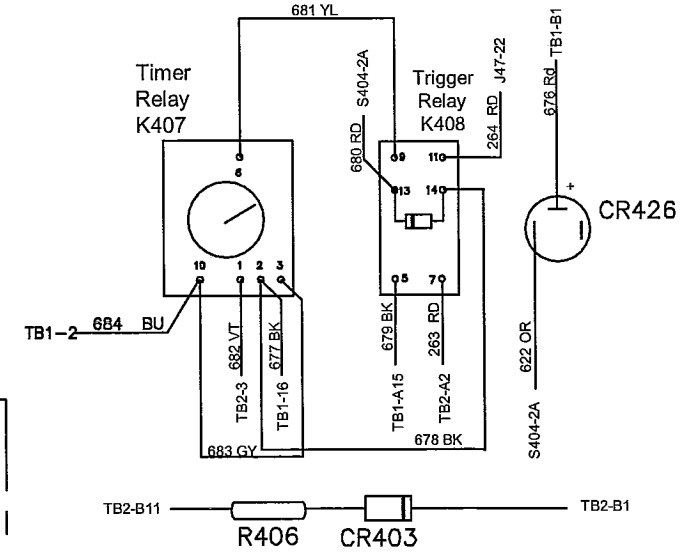




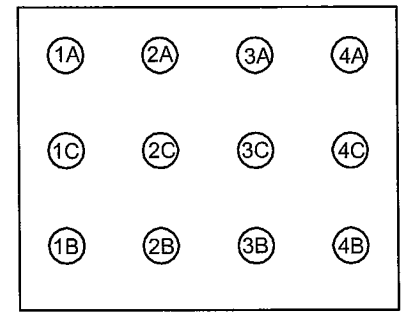
TB1 - see sheet 4

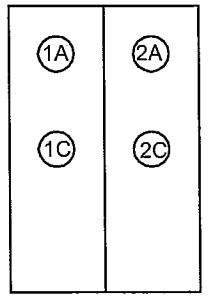


TB2 - see sheet 4



Switch Contact Numbering





A = Rated, C = Common, B = Idle
Viewed with panel folded down.

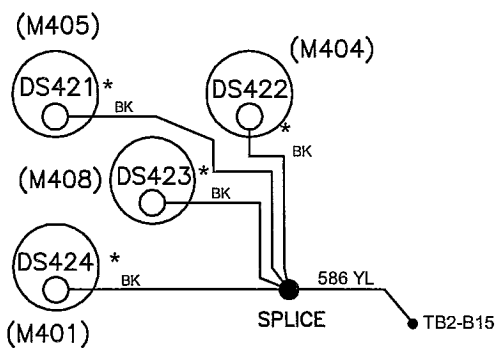
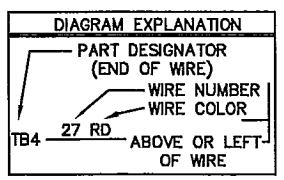


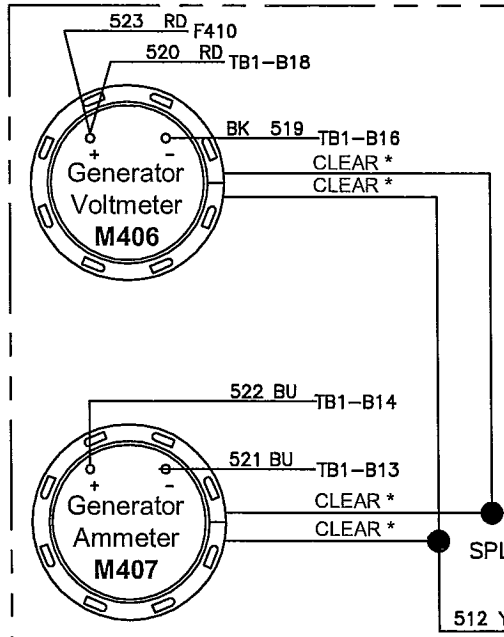
DIAGRAM OF INSTRUMENT LIGHTS

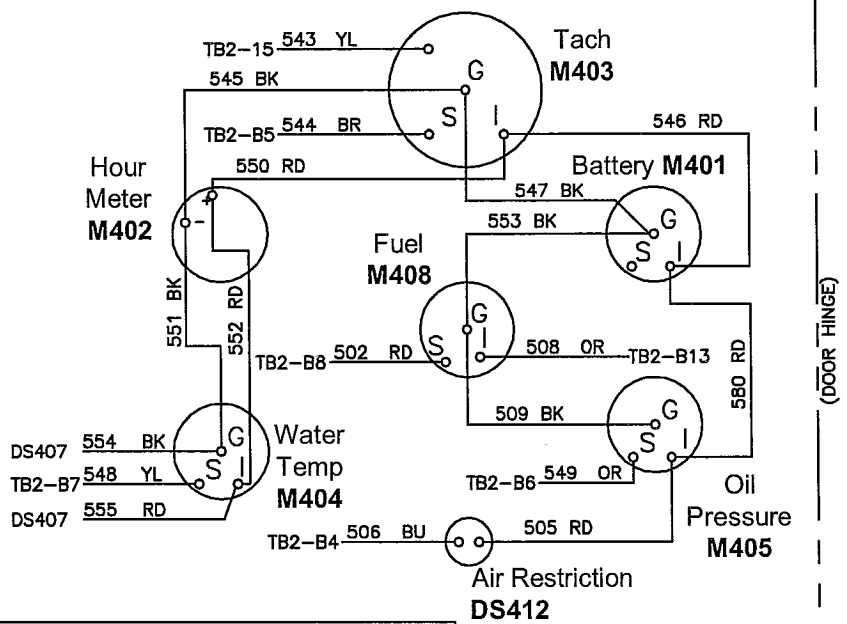
NOTES:

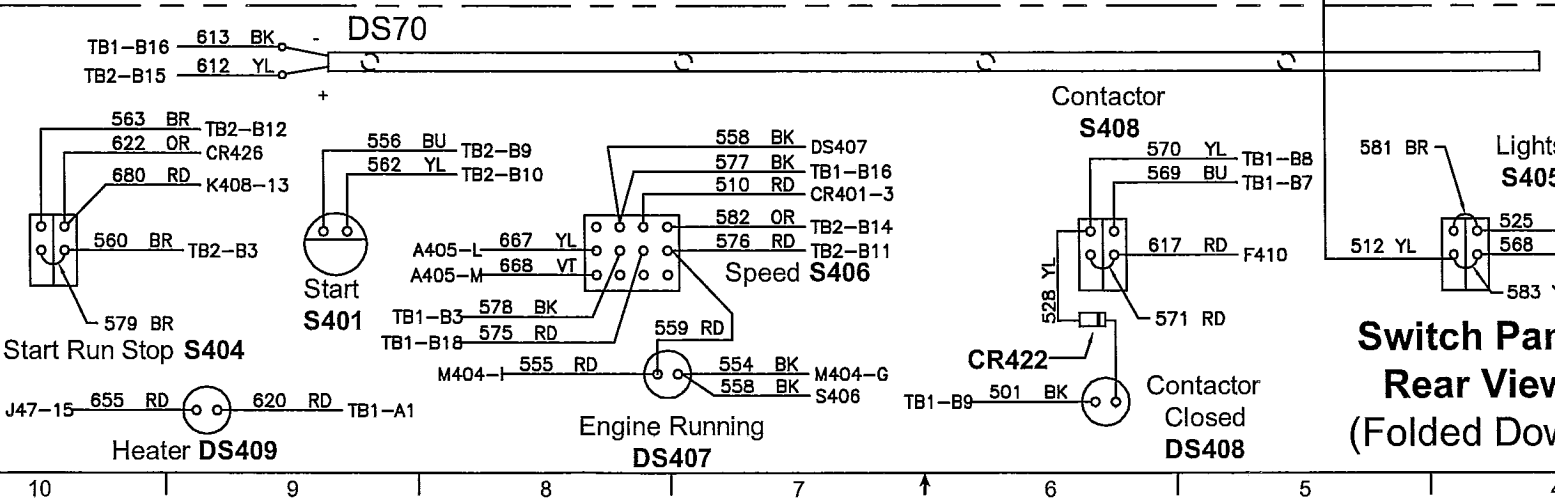
1. * WIRES FURNISHED
2. WHEN USING TWO QUICK CONNECT TERMINALS ON THE SAME CONNECTION FOR THE LIGHTS, (EX. DS407) POSITION THE SECOND QUICK CONNECT TERMINAL TOWARD THE OUTSIDE OF THE LIGHT TO PREVENT A POSSIBLE SHORT.



Control Panel Door Rear View (open on hinges)







Contents

CHANGE RECORD			
E.C. No.	DATE		
ERN2013097	04-23-13		

FINISH CODE PER 910176: NONE

FILE NAME	PLOT DATE
291902 a5	07/18/12

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

CONST. MGT.	ANGLES
± --	± 3°

DECIMAL-INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.25mm

ACTIVITY	REPLACED BY	REPLACES
--	--	--

MATERIAL NO.	QUANTITY-U.M.	COMM. CLS.
--	--	--

MATERIAL SPEC.
--

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA
JETEX 7, CUMMINS, TIER 4 (SCHEMATIC DIAGRAM)

DESIGNED	DRAWN	DATE	SCALE
-----	HLC	07/18/12	NONE
CHECKED	APPROVED	RECORDED	ITEM TYPE
--	--	----	--

OUTSIDE DISTR.	
-	-
-	-
-	-
-	-
-	-
-	-

DISTRIBUTION TABLE

ITW GSE GROUP U.S.A.

SIZE D | DWG. NO. 291902 | SHEET 5 OF 6

Other Components

Water Temp Sender **A401**
P47-35 YL 216

Oil Pressure **A402**
P47-36 OR 217

Magnetic Pickup **A403**
250 SH P47-16
250 BL P47-17
250 WT P47-18

Air Restriction **A404**
224 BK GP1
218 BU P47-37

Engine Temp **A406**
207 OR A407-3

GLOW PLUG CONTROLLER A407
1 2 3 4 5 6

1	245 BU - P47-14
2	242 VT - L403-3
3	207 OR - A406
4	
5	248 BK - GP1
6	244 RD - P47-15

Battery **BT401**
GP1
Disconnect **S416**
YL 200 P46-1
WO-34978-2
Starter **B401**
Starter Solenoid **L401**
225 RD
233 BU
W9407-446 GP1

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

Alternator **G401**
P46-3 202 BU
B+
D+ 2 208 RD P47-3
W 3 209 BR P47-8
GRD
GP1 239 BK

WIRE COLOR CODE			
BK	BLACK	BU	BLUE
BR	BROWN	VT	VIOLET
RD	RED	GY	GRAY
OR	ORANGE	WT	WHITE
YL	YELLOW	CL	CLEAR
GN	GREEN	SH	SHIELD

A407 BK 248
L402-3 BK 228
A404-2 BK 224
R408 BK 221
236 BK L403-3
239 BK G401-GND
GRD STUD ON FRAME
W9407-446
Ground Plate **GP1**
247 BK L404-2
B401 W9407-446
BT401 -

Starter Cut-out Solenoid **L402**
CR402 228 RD
GP1 226 BK
205 YL P46-6
229 BR CR402
CR421

Glow Plug Solenoid **L403**
Glow Plugs 241 RD
GP1 236 BK
201 YL P46-2
242 VT A407-2
CR420

P47-5 249 RD
P47-6 249 BK
Fuel Pump Flow Actuator **L405**

P47-4 OR 246
GP1 BK 247
J48
Fuel Pump Advance Solenoid **L404**

Rectifier Components

316 BK
318 BK
317 RD
319 RD
C401

320 BK 320 BK
318 BK
R403 R404 R405
319 RD 321 RD 321 RD

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

C 313 OR P43-33
B 312 BR P43-31
A 311 BU P43-29
308 YL P43-17
307 RD P43-15
TB3

65 RD
66 YL
63 YL
64 RD
L406
CR419
SLIP RINGS

28 VOLT DC OUTLET

CR413 CR412 CR415 CR411 CR416 CR414
317 RD
316 BK
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

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

300 BU P43-1
309 WT P43-19
309 RD P43-21
301 BU P43-3

901 RD
902 BK
DS414
LOW FUEL BEACON
G401-B+ OR 900
P2
PLUG BACKSIDE LOW FUEL BOARD

221 BK GP1
215 RD P47-34
Fuel Level **R408**

240 RD
Oil Pressure **S403**
BU 230 CR402
P47-1 OR 206
P47-28 212 RD
P47-12 211 BR
Water Temp Switch **S402**

* RD
SPLICE RD 260 P47-22
UNIT OPERATING BEACON
DS413

S413A S413B
P46-5 204 BR
P46-4 203 BR
220 BR
219 BR
E-Stop Switch **S413**

* BK 241 YL * BK
DS403 CONTROL BOX SIDE **DS404**
214 YL P47-33

Marker Lights
DS405 213 YL P47-32 **DS406**
* BK 241 YL * BK
RADIATOR SIDE

Contents

CHANGE RECORD					
E.C. No.	DATE				
ERN2013097	04-23-13				

FILE NAME 291902 s6 | PLOT DATE 07/18/12
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS INVALUED TO REFERENCED STANDARDS.
DO NOT SCALE DRAWING
FRACT. ± — | ANGLES ± 3°
DECIMAL-INCH: .00 ± .03, .000 ± .010 | METRIC: 0.0 ±0.8mm, 0.00 ±0.25mm

FINISH CODE PER 910178: NONE
ACTIVITY | REPLACED BY | REPLACES
MATERIAL NO. | QUANTITY-U.M. | COMM. CUS.
MATERIAL SPEC.
TITLE: DIAGRAM, SCHEMATIC & CONNECTION
DESCRIPTIVE DATA: JETEX 7, CUMMINS, TIER 4 (SCHEMATIC DIAGRAM)
DESIGNED — | DRAWN HLC | DATE 07/18/12 | SCALE NONE
CHECKED — | APPROVED — | RECORDS — | ITEM TYPE —
ITW GSE GROUP U.S.A. | SIZE D | DWG. NO. 291902 | SHEET 6 OF 6
OUTSIDE DISTR.
DISTRIBUTION TABLE

Appendix A

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, as well as, excessive soot around the exit point area. Liquid fuel, in the form of droplets, may be also 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.

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 or safety to surrounding personnel.

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.

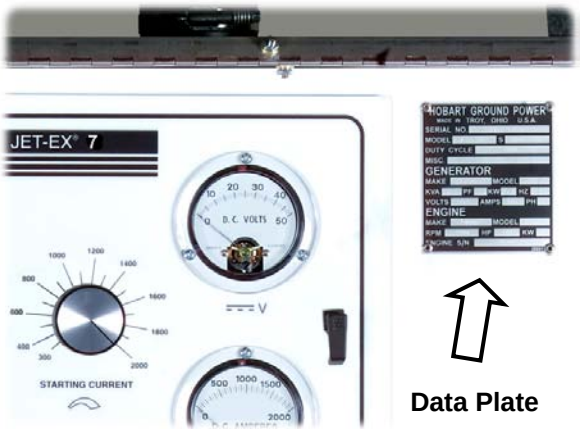
5) Operation in poorly ventilated areas.

Preventive Maintenance

Here are the replacement filters for Jet-Ex 7 (500284) 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	Fleetguard Part Number
Oil Filter Element		
Filter, Lubricity Element		FA15700
Filter, Inline Fuel	288323	FF5079
Filter, Fuel/Water Separator Element		
Air Filter Element - Primary	291878	AF26117
Air Filter Element - Secondary	291879	AF26118

Hobart Ground Power - Supply Contact Information

Contact the Hobart Ground Systems Spare Parts department for all the preventative maintenance parts:

e-mail: spareparts@hobartsystems.com

call (inside USA) (800) 899-1841

call (other countries) (941) 721-1025

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

Filter Pictures

Air Cleaner

Oil Filter

Lubricity Filter

Inline Fuel Filter

Fuel-Water Separator