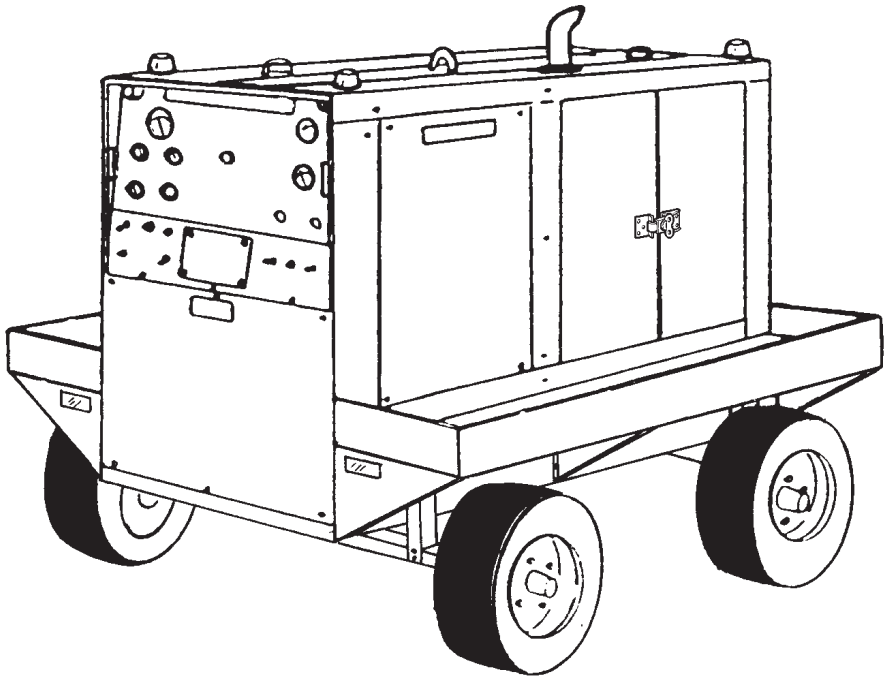
HOBART®
GROUND POWER

OM-2077
123196

Operation and Maintenance Manual



Jet-Ex 4D Generator Sets

Series 7003C

Hobart Brothers Company
Airport Systems Group
Ground Power Equipment
Troy, Ohio 45373

WARRANTY

HOBART BROTHERS COMPANY, TROY, OHIO, U.S.A.
GROUND POWER DIVISION

1. Hobart Brothers Company (hereinafter called **HOBART**) warrants that each new and unused Hobart Ground Power Equipment, (hereinafter called the **PRODUCT**) is of good workmanship and is free from mechanical defects, provided that (1) the **PRODUCT** is installed and operated in accordance with the printed instructions of **HOBART,** (2) the **PRODUCT** is used under the normal operating conditions for which it is designed, (3) the **PRODUCT** is not subjected to misuse, negligence or accident, and (4) the **PRODUCT** receives proper care, lubrication, protection, and maintenance under the supervision of trained personnel.

2. This warranty expires 15 months after shipment by **HOBART** to the first user, or 12 months after installation, whichever first occurs.

3. This warranty does not apply to: primary and secondary switch contacts, cable connectors, carbon brushes, fuses, bulbs, and filters unless found to be defective prior to use.

4. Hobart **DOES NOT WARRANT THE FOLLOWING COMPONENTS:** Engines (gasoline or diesel),storage batteries, engine starters generators, alternators, regulators, governors, tires, axles,transmissions, 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 ERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

HOBART neither assumes nor authorizes any person to assume for **HOBART** any liability in connection with the **PRODUCTS** sold, and there are no oral agreements or warranties collateral to or affecting this written Warranty. This warranty and all undertakings of **HOBART** thereunder shall be governed by the laws of the State of Ohio, United States of America.

WARNING

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

Safety Warnings and Cautions

WARNING

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.

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.

1. General

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

2. Shock Prevention

Bare conductors, or 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, use insulating gloves when dampness or sweat cannot be avoided. Keep clothing dry, and never work alone

a. Installation and Grounding of Electrically Powered Equipment

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

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

b. Output Cables and Terminals

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

3. Service and Maintenance

This equipment must be maintained in good electrical and mechanical 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 electrically-powered equipment, take the following precautions:

a. Shut OFF all power at the disconnecting switch or line breaker before inspecting or servicing the equipment.

b. Lock switch OPEN *(or remove line fuses)* **so that power cannot be turned on accidentally.**

c. Disconnect power to equipment if it is out of service.

d. If troubleshooting must be done with the unit energized, have another person present who is trained in turning off the equipment and providing or calling for first aid.

4. Fire And Explosion Prevention

Fire and explosion are caused by electrical short circuits, combustible material near engine exhaust piping, 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 removing fuel tank cap. **DO NOT** completely fill tank, because heat from the equipment may cause fuel expansion overflow. Remove all spilled fuel **IMMEDIATELY**, including any that penetrates the unit. After clean-up, open equipment doors and blow fumes away with compressed air.

5. Toxic Fume Prevention

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

6. Bodily Injury Prevention

Serious injury can result from contact with fans 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 inspect all labels that cannot be easily read.

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Introduction

This manual contains operation and service information for 28.5 V DC Generator sets identified as **Jet-Ex 4D**. These units are available as stationary, skid- mounted units, or they may be trailer-mounted for portability. Both versions are available with 14 V DC output capability.

Most information in the manual applies to the 28.5 V Jet-Ex 4D in general. Information which applies to options and special equipment is identified as such.

The primary purpose of the manual is to provide information and instructions to experienced operators, electricians, and mechanics who are not familiar with this equipment. The intent of the manual is to guide and assist operators and maintenance personnel in the proper use and care of the equipment.

Read the instructions before starting the unit. Learn to use the manual and to locate information contained in it.

The Table of Contents, which follows this Introduction, lists all Chapters, Sections, and the paragraph titles within each Section. The location of each listing is identified by Chapter, Section and page number.

Each Chapter is divided into as many Sections as necessary. Sections are always referred to by a combination Chapter-Section number, for example: 2-3 refers to Chapter 2, Section 3.

The material within each Section is divided into main subjects with applicable paragraph headings and sub-headings as required. For example, a portion of the Description Section might logically follow this arrangement and paragraphing:

Section 1. Description

1. Engine, Generator and Controls

a. Interior Panel

(1) Protective devices

a. Overload relay

(2) Contactors

Page numbers do not run consecutively throughout the manual. Each page is identified by the Chapter-Section number in which it appears, and by a page number within the Chapter-Section. Therefore, the first page in each Section is page 1. These identifying numbers appear in the lower, outside corner of each page. Each page also bears a date located in the corner opposite the page number. This date is either that of original issue, or of the latest revision. Any revision to the original text is identified by a heavy black line in the left-hand margin. Illustrations follow a numbering system similar to page numbering. The first Figure in each Section is Figure 1.

All tables, charts and diagrams, as well as illustrations, are identified by Figure numbers to avoid confusion.

The general location of any particular information can be found quickly by running through the Table of Contents. For example: to locate any adjustment information, a quick look at the Table of Contents shows that “Adjustment / Test” is located in Chapter 2, Section 3, *(shown as 2-3)*.

Portions of the text are referred to by identifying the paragraph in which the referenced material may be found. When referenced material is located in the same Chapter/Section as the reference, only the paragraph identification is given, for example: *(Ref. Para. 1, A)* means that the material is to be found in paragraph 1, A, of the same Section.

When referenced material is located in another Chapter/Section, both the Chapter and Section numbers and the paragraph identification are given, for example: *(Ref. 1-2, Para. 1, A)* means that the referenced material is located in Chapter-Section 1-2, and paragraph 1,a. within that Chapter-Section.

Components shown in illustrations, and the illustrations themselves, are referenced in a similar manner. When this type of reference is made, the item number of the part and the Figure number in which it appears are given, for example: *(2, Fig.3)* refer to item number 2 in illustration Figure 3 of the same Chapter/Section.

When a referenced figure appears in another Chapter/Section, the reference will include the Chapter/Section number, for example: *(2-3, 1, Fig. 4)* tells the user that the information is in Chapter/Section 2-3, and to refer to item 1 in Figure 4.

Once a Figure number reference has been established, the Figure number is not repeated and only the item numbers of the parts involved are referenced, for example: “Loosen screw *(2, Fig.6)* slide out connector *(4)*, and remove brush *(6)*.

When an item number is referenced without a Figure number, it always applies to the last preceding Figure number mentioned in the text.

A collection of manufacturer’s literature is supplied as part of the information package.

If you have any questions concerning your **Hobart Power Systems Group** equipment, you are invited to contact our Service Department by mail, telephone, or FAX.

Write: Hobart Brothers Company
Ground Power Division
Service Department
1177 Trade Road East
Troy, Ohio 45373
U.S.A.

Call: (937) 332-5060 (Service Assistance)

(937) 332-5050 (Replacement Parts)

FAX: (937) 332-5121

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Chapter 1. Description/Operation

Section 1. Description

1. General

The **Jet-Ex 4D** units covered in this manual *(Figure 1)* are diesel engine driven, self-contained generator sets manufactured by **Hobart Brothers Company, Ground Power Division, Troy, Ohio U.S.A.** A basic unit is identified by a Series Number - 7003C - plus a dash number which defines a specific configuration. The Series number, plus the dash number, make up the Specification Number.

Specification No. 7003C-1 covers a stationary, skid-mounted unit rated at 28.5 Volts DC output. It is equipped with a sheet metal canopy and hinged engine compartment door. Various options are available for use with the basic unit. These options are listed in paragraph 2.B below.

The basic generator set is designed to generate and deliver 28.5 volts DC power to an aircraft when its on-board generators are shut down. In addition to providing continuous, regulated power to the aircraft, the unit is designed for starting any fixed-wing aircraft or helicopter which is equipped with an external 28.5 volt DC power receptacle.

2. Special Features

a. Standard

The “Soft-Start” current limiting feature, recommended by most aircraft engine manufacturers, provide the operator with controls to limit the inrush current to the aircraft engine’s starter. When the operator presets this control, the generator will provide constant voltage to the preset current value. As more current is applied beyond the preset current value, the voltage will decrease to a minimum of 14 volts DC, after which the voltage will remain constant as more current may be delivered beyond the preset current value. Limiting inrush current is recommended by most engine manufacturers to protect the aircraft engine’s starter shear section. The current limiting control is continuously adjustable from 300 amperes, which is recommended for helicopter and small turbine starting, to 2000 amperes, required for starting larger aircraft engines when the control is turned fully clockwise.

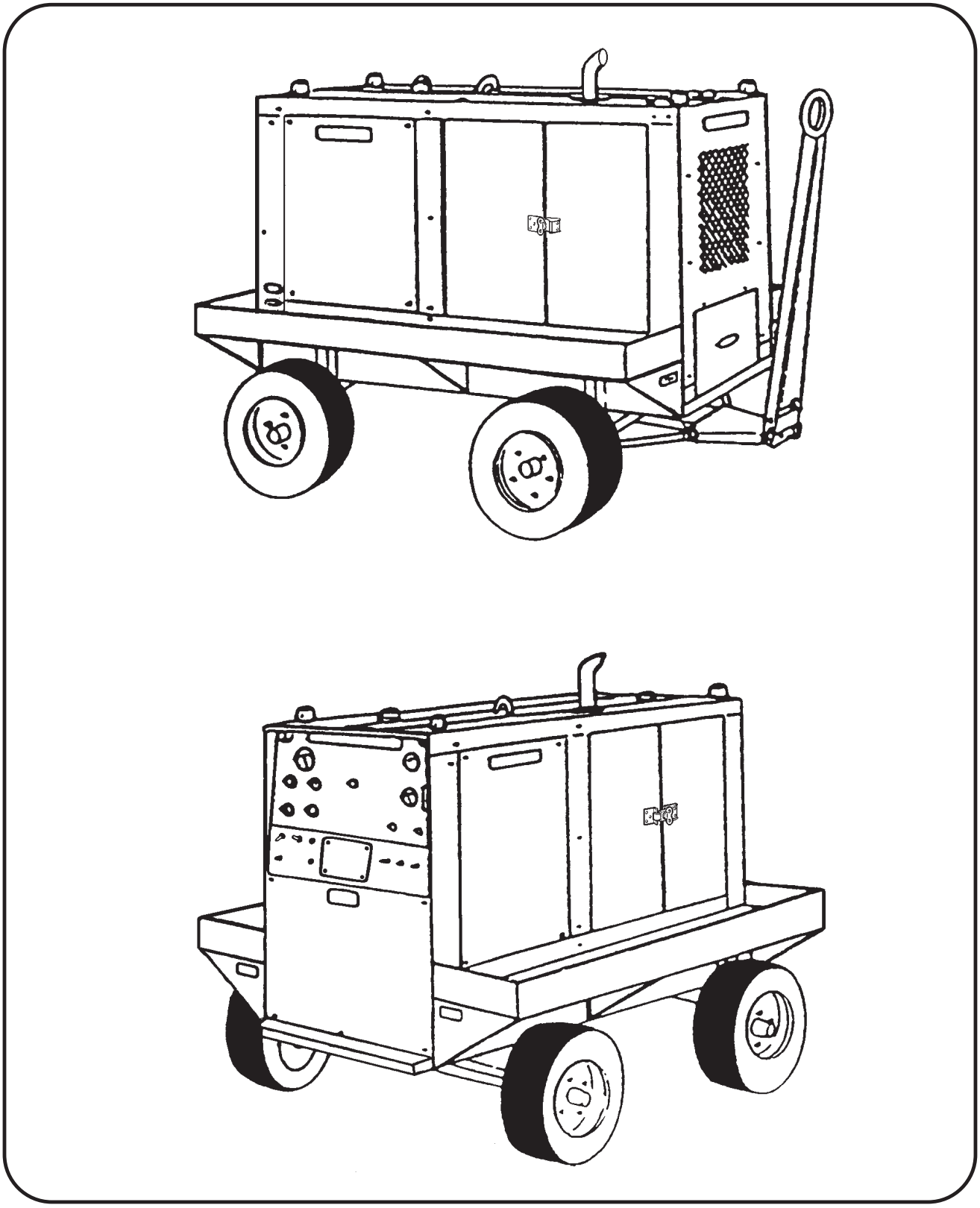
b. Options

Chapters 1-5 of this manual describes Specification No. 7003C-1, a stationary, skid mounted unit. Appendix A lists all options available for this unit. The following is a brief description of mounting configurations.

A four-wheel trailer is available to add mobility to the generator set. It is equipped with pneumatic rubber tires, a drawbar for towing, and hand lever-operated, parking brake. It also includes fenders, bumpers and cable trays. This option is available from Hobart Brothers as Part No.181000-1*(See TO-181)*.

A four-wheel trailer is available to add mobility to the generator set. It is equipped with pneumatic rubber tires, a drawbar for towing, and hand lever-operated, parking brake. It also includes cable hangers which are mounted on the right side of the canopy. This option is available from Hobart Brothers as Part No. 181000-2 *(See TO-181)*.

For mounting the generator set as a stationary unit, a stationary mounting kit is available. This kit, identified as part number 489689, consists of four spacer brackets which support the unit and permit anchoring it to a floor or platform, screws for fastening the spacer brackets to the unit, and two cable hanger brackets. *(See Appendix A for a Complete List of Options)*



Jet-Ex 4D Generator Set (Trailer & Fender Option Shown)
Figure 1

Unit with Cable Hangers & Spacers Under Frame	
Length	65.75 inches (1670 mm)
Width	34.25 inches (870 mm)
Height	53 inches (1346 mm)
Weight (dry fuel tank)	1970 pounds (894 kg)
Unit with Trailer & Cable Hangers (without fenders)	
Length	75.5 inches (1918 mm)
Width	55 inches (1397 mm)
Height	63.75 inches (1632 mm)
Weight (dry fuel tank)	2280 pounds (1043 kg)
Ground Clearance	7.5 inches (191 mm)
Unit with Trailer, Fenders & Cable Tray	
Length	75.5 inches (1918 mm)
Width	58 inches (1473 mm)
Height	63.75 inches (1632 mm)
Weight (dry fuel tank)	2410 pounds (1093 kg)
Ground Clearance	7.5 inches (191 mm)
Generator	
Output Power Rating	15.7 kW
Voltage	28.5 volts DC
Rated Load Capacity	550 amperes continuous at 28.5 volts DC
Starting Current Capacity	2000 amperes maximum
Current Limiting Capability	300 to 2000 amperes, continuously adjustable
Operating Speed	2000 RPM
Engine	
Manufacturer	Perkins Diesel
Model	4.236
Type	4-cylinder, 4-stroke, direct injection
Fuel	ASTM D975 66T Numbers 1D or 2D
Displacement	236 cubic inches (3.68 liters)
Rated Power at 2000 RPM	70 Horsepower
Oil Capacity (without filter change)	8 quarts (7.57 liters)
Coolant Capacity	3.5 U.S. gallons
Electrical System	12 volt DC, negative ground
Governed Speed at No Load	2000 +/- 50 RPM
Idle Speed	1000 +/- 50 RPM
Fuel Tank Capacity	20.5 U.S. gallons (77.6 liters)
Protective Devices	
Generator	**Engine**
28.5 volt overvoltage module trips at 32 to 34 volts.	Water Temperature Switch opens engine circuit at 225 F.
14 volt overvoltage module trips at 18 to 20 volts.	Low Oil Pressure Switch opens at 20 PSI (138 kPa).

3. Orientation

The radiator end of the Jet-Ex 4D is the front. Right and left are determined by standing at the rear of the unit, facing it. The control panel is located at the rear.

4. Identification

The Jet-Ex 4D unit is identified by Specification numbers as described in paragraph 1, above. There may be any number of Generator sets with the same Specification number. Individual machines are identified by a Serial number, assigned to one machine only.

Each generator set has an Identification plate attached inside the hinged control panel door. This nameplate lists the machines Model No. **(Jet-Ex 4D)**, Specification No., Serial No., and electrical rating.

If any of the options described in paragraph 2.b. are included, they will be listed by name and part number on a separate option nameplate located next to the Identification plate.

5. Canopy

The standard canopy is a sheet metal enclosure which protects the engine, generator, and electrical controls. It has two hinged doors on each side at the front to provide access for service and maintenance. Panels at the rear provide access to the generator. A Lexan window is mounted above the control panel to allow observation of the instruments while protecting them from the weather.

6. Engine, Generator, and Controls

a. General (Fig. 2)

The engine *(7)* and generator *(5)* are mounted on a welded steel frame *(6)*. A fuel tank support *(11)* located at the rear of the unit supports the fuel tank *(2)* and provides a mounting frame for the load contactor (10) and output terminals. The radiator *(18)* is mounted to the front canopy. A heavy U-bolt is attached to the centrally located lifting yoke *(1)* for moving the generator set with a crane or hoist.

b. Engine

(1) General

The engine used in the Jet-Ex 4D generator set is a Perkins four-cylinder, four-stroke, direct injection diesel engine. It has a 236 cubic inch *(3.86 liter)* cylinder displacement and a 16:1 compression ratio. Engine firing order is 1-3-4-2.

A spring-loaded relief valve in the pump limits maximum pressure in the system. A full-flow oil filter *(24, Figure 2)* cleans the entire output of the pump before it enters the oil distributing system. A valve in the filter provides a bypass to an oil gallery in case the filter becomes clogged. A low oil pressure switch is mounted on the engine block as a protective device. The primary ignition circuit is wired through the contacts of this switch, which closes at 20 PSI *(138 kPa)*. This prevents the engine from running if oil pressure will not build up, and also shuts down the engine if oil pressure drops radically during operation.

See the engine operator's manual for additional engine specifications.

The generator and engine are mounted on a welded steel skid, and are enclosed by a sheet metal canopy that bolts to the skid. Access to engine serviceable components *(oil filter, air cleaner, etc.)* is through two doors at the front on each side of the machine.

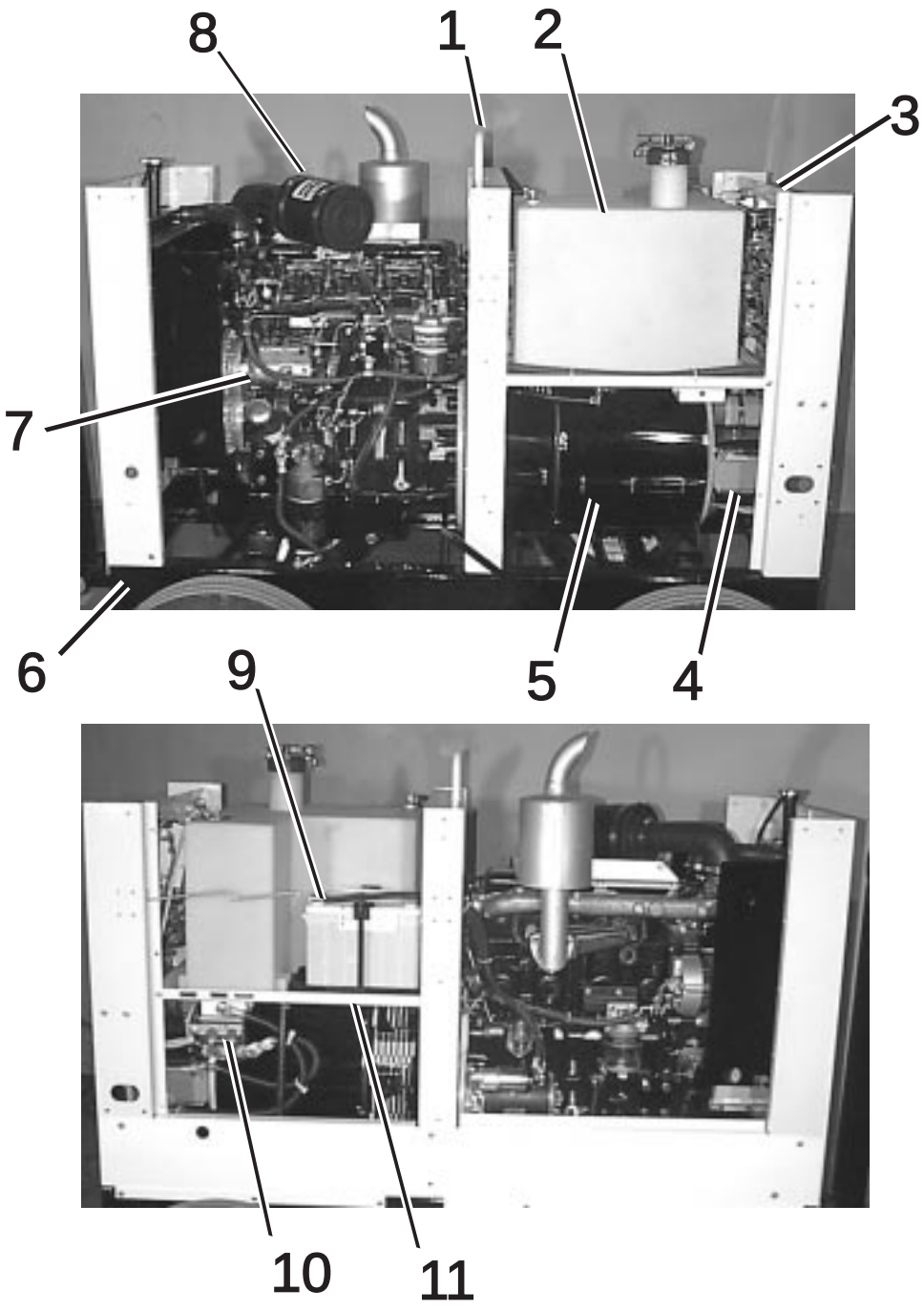
Two removable panels, one on each side at the rear allow access to the other components such as the load contactor and output terminals. The rear panel is removable and permits access to the rectifier assembly.

(2) Cooling fan

The cooling fan on the engine is designed to blow air out through the radiator rather than to draw it in. This prevents hot air, heated by the engine, from entering the generator.

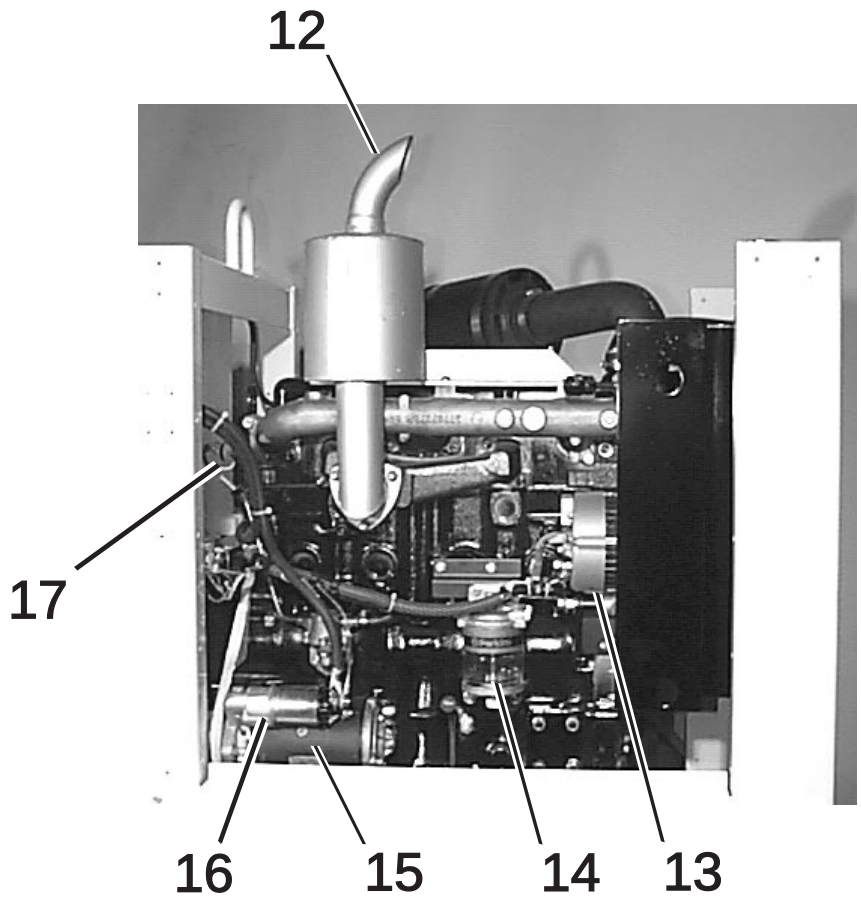
(3) Fuel system

The fuel system consists of an 20.5-gallon *(77.6 liters)* plastic fuel tank *(2, Figure 2)* with all the necessary fittings and hoses.



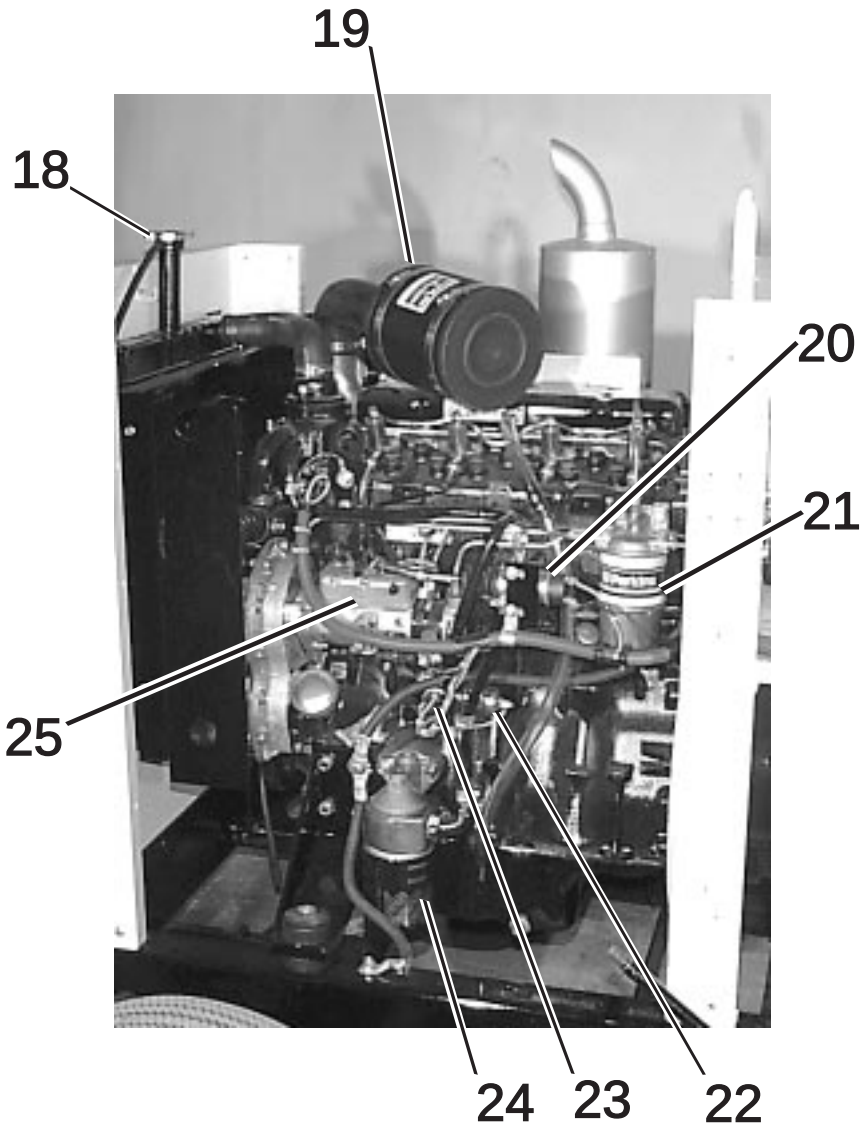
1. Lifting yoke
2. Fuel tank
3. Control panel
4. Rectifier assembly
5. Generator
6. Frame
7. Engine
8. Air cleaner
9. Battery
10. Contactor
11. Fuel tank support

Generator Set Components (Sheet 1 of 3)
Figure 2



12. Muffler
13. Alternator
14. Fuel filter
15. Starter
16. Starter solenoid
17. Water temp. switch and sender

Generator Set Components
(Sheet 2 of 3)
Figure 2



18. Radiator
19. Air cleaner
20. Throttle control assembly
21. Fuel filter
22. Oil pressure sender
23. Oil pressure switch
24. Oil filter
25. Engine fuel pump/governor

Generator Set Components
(Sheet 3 of 3)
Figure 2

(4) Alternator and regulator

The battery charging alternator *(13, Figure 2)* is rated at 62 amperes. The voltage regulator is an integral part of each of the alternator.

(5) Starter solenoid

The starter solenoid *(16, Figure 2)* is mounted on the starter motor *(15)*, on the right side of the engine.

(6) Exhaust muffler *(12, Figure 2)*

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

c. Generator

The generator *(5, Figure 2)* is a multi-phase, synchronous salient pole, revolving field, AC generator whose output is rectified. The output is rectified by a rectifier assembly *(4)* made up of twelve rectifiers connected into a full wave configuration. The generator is self-excited and receives excitation from a three phase full wave rectified stator winding. One positive and one negative brush in contact with slip rings supply controlled excitation current from the stator winding through the voltage regulator to the rotating field winding. The voltage regulator controls the excitation current and maintains a constant output voltage. Access to the brushes is through holes in the anti-drive end bracket. The rotor is supported at the anti-drive end *(slip ring end)* by a single-row ball bearing. The drive end is connected to the engine fly-wheel by a flexible disc and hub coupling assembly and is supported by the engine main bearings. A radial-blade fan of formed and welded sheet metal construction is mounted on the coupling hub and draws cooling air over the generator windings.

Air flows over the rectifier assembly (4) and then enters through the anti-drive end of the generator and is discharged through openings in the flywheel housing at the drive end. The generator housing assembly, which contains the generator stator, is bolted to the engine flywheel housing.

d. Control Panel Assembly *(Front) (Figure 3)*

(1) General

The hinged control panel *(3, Figure 2)* houses and provides mounting facilities for controls, monitoring instruments, voltage regulator, relays, etc. The panel is mounted at the rear of the canopy. Its control are accessible behind a hinged Lexan cover.

(2) Lights

Two panel lights *(1, Figure 3)* provide illumination for instruments and controls. One green pilot light (9) glows when the output load contactor is closed, and another one *(12)* glows green when the engine is running.

(3) Monitoring instruments

The voltmeter *(4, Figure 3)* indicates generator output voltage, and the ammeter *(5)* displays generator current.

A tachometer *(2)* displays the engine speed in RPM. This instrument receives its operating signal from the alternator.

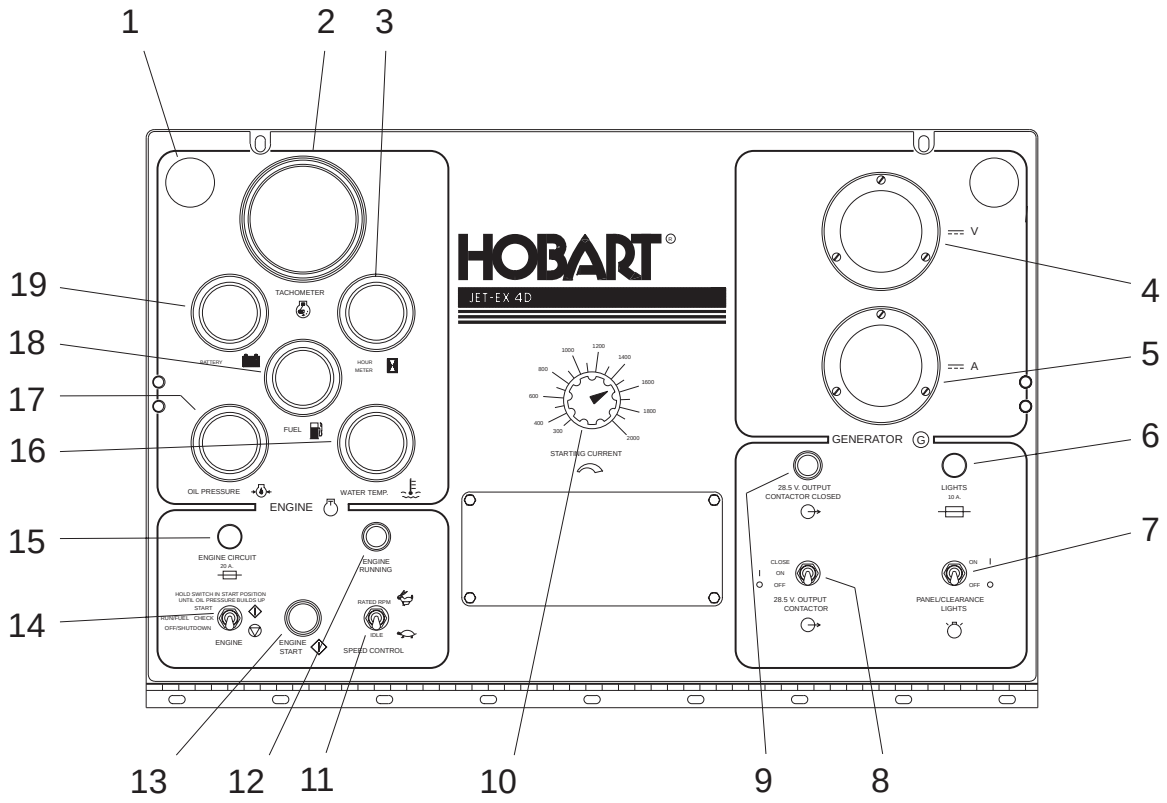
A water temperature gauge *(16)* indicates the engine coolant temperature and is actuated by a temperature sender *(17, Figure 2)* mounted on the engine's water jacket.

An oil pressure gauge *(17, Figure 3)* displays the pressure in the engine's lubrication system. It is operated by a sender *(22, Figure 2)* mounted on the engine block.

The battery voltmeter *(19, Figure 3)* indicates the battery voltage of the engine's 12 volt DC electrical system.

The hourmeter *(13)* records the total hours of engine operation for scheduling maintenance.

The fuel gauge (18) indicates the amount of fuel remaining in the fuel tank.



1. Panel light
2. Tachometer
3. Hourmeter
4. Voltmeter *(Generator)*
5. Ammeter
6. Panel lights fuse *(10 Amp)*
7. Panel lights switch
8. Contactor control switch
9. Contactor closed light
10. Current limit control
11. Speed control switch
12. Engine on light
13. Engine start switch
14. Engine circuit switch
15. Engine circuit fuse *(20 Amp)*
16. Water temperature gauge
17. Air Cleaner Indicator
18. Oil pressure gauge
19. Fuel gauge
20. Voltmeter *(Engine)*

Control Panel Assembly
(Front View)
Figure 3

(4) Potentiometer

The current limiting potentiometer *(10)* is used to select the starting current recommended for various aircraft. The current limiting setting is continuously adjustable from 300 to 2000 amperes.

(5) Switches

The contactor control switch *(8)* is a three-position toggle switch used to close and open the output load contactor. The top **CLOSE** position is spring-loaded and is held momentarily until the contactor closed light *(9)* glows, then it is released to the center **ON position.** In this position the switch provides holding current to the load contactor to keep it closed. Protective devices in the load contactor circuit provide protection against overvoltage by opening the load contactor if that condition occurs. In the bottom **OFF** position, the contactor is opened.

The panel lights switch *(7)* turns the lights *(1)* on and off. The engine start switch *(13)* is a momentary contact push-button which closes the starter solenoid *(16, Figure 2)* and cranks the engine. This switch is operable only when the engine switch *(14)* is held in its top spring-loaded **START** position.

The engine switch *(14)*, when released from its top **START** position after the engine starts, will return to center **RUN** position. The engine **ON** light *(12)* will glow as long as the switch is in **RUN** position. In the bottom **STOP** position, the switch will stop the engine and the light *(12)* will go out.

The speed control switch, *(11)* is a two-position toggle switch wired to a throttle solenoid on the engine. In the **IDLE** position, used for starting, the engine speed is controlled to approximately 1000 RPM. In the Rated RPM position, engine speed is controlled to approximately 2000 RPM.

(6) Fuses

Two cartridge-type fuses protect the engine ignition circuit, and the panel lights circuit. The engine circuit fuse *(15)* is rated at 20 amperes, and the panel lights fuse *(6)* at 10 amperes..

e. Control Panel Assembly *(Rear) (Figure 4)*

(1) Voltage regulator

The voltage regulator *(2)* is a solid-state device which regulates the 28.5 volt DC generator output after the voltage is built up.

(2) Overvoltage module

The overvoltage relay *(1)* is a solid-state protective device on a printed circuit board. A normally closed relay in the circuit is wired into the load contactor coil circuit. An overvoltage condition causes the relay contacts to open, which in turn prevents the contactor from closing, or opens the load contactor and discontinues the power delivery. The overvoltage module is adjusted to trip at 32 to 34 volts DC in .5 seconds or less.

(3) Excitation rectifiers

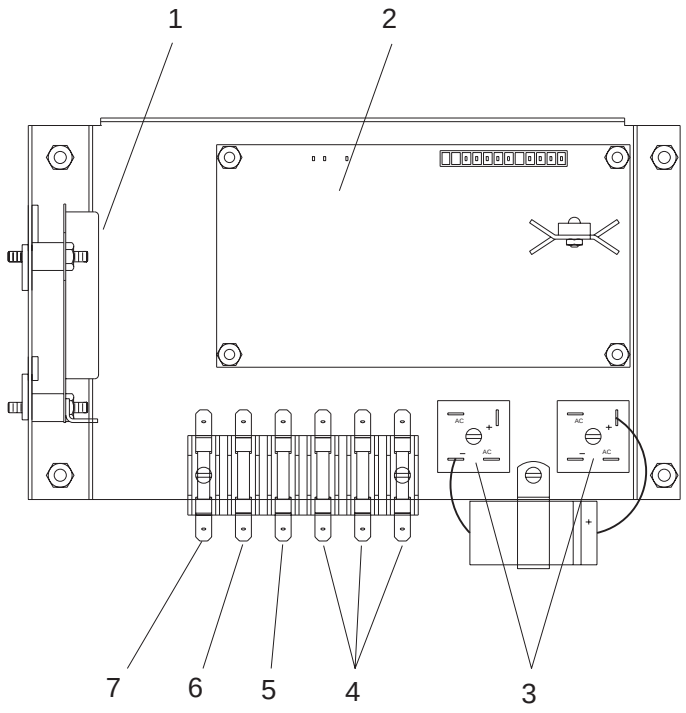
Two diode bridge rectifiers, CR417 and CR418, *(3, Fig. 4)* convert an AC voltage from the generator armature to the DC voltage needed for the generator revolving field.

(4) Fuses

Six cartridge-type fuses are located below the voltage regulator. All of them are rated at 10 amperes. They include the control windings fuses (4), the voltage build-up fuse (5), the voltage regulator fuse (6), and a spare fuse (7).

f. Contactor

The load contactor, which is mounted on the right side of the unit below the fuel tank, provides a safe and convenient means of connecting and disconnecting the generator from the load. Initial power for closing the load contactor is supplied by the generator through the spring-loaded momentary contacts of the contactor control switch *(8, Figure 3)*. Holding power, to keep the contactor closed, passes through the normally open auxiliary contacts in the load contactor. Output power connection is made by attaching the positive lead to the top terminal of the load contactor, and the negative lead to the negative output terminal located above the load contactor.



1. Overvoltage relay
2. Voltage regulator
3. Excitation rectifiers
4. Control windings fuses (10 Amp)
5. Voltage build-up fuse (10 Amp)
6. Voltage regulator fuse (10 Amp)
7. Spare fuse (10 Amp)

Control Panel Assembly
(Rear View)
Figure 4

g. Rectifier Assembly

This assembly consists of two aluminum heat sinks with six diodes on each heat sink. The rectifier assembly converts the AC output of the generator to 28.5 VDC.

h. Ammeter Shunt

The ammeter shunt is connected in the generator's negative output circuit. It supplies a small voltage proportional to output current for operation of the generator ammeter *(5, Fig. 3)* and for sensing output current for the current limit circuit of the voltage regulator *(2, Fig. 4)*. This shunt is mounted on the negative heat sink of the rectifier assembly *(4, Fig. 2)*.

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Section 2. Preparation for Use, Storage or Shipping

1. Preparation for Use

a. General

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

CAUTION

Read operating instructions in Section 1-3 before operating the unit.

b. Inspection/Check

Inspect the unit completely prior to operation.

(1) Remove crating, blocking, banding, ties, and other securing and protective material. After shipping carton is removed, remove the four carton supports from the bases of the clearance lights. Then install the attached clearance light lenses in their bases.

(2) Inspect exterior for shipping damage such as broken glass, damaged sheet metal, etc.

(3) Open canopy door and inspect interior for foreign material such as rags, tools or shipping papers.

(4) Check fuel, coolant, and oil hoses and connections for visible leaks. If leaks are discovered, correct by tightening hose clamps, tube fittings, etc., as required.

(5) Check security of attaching and retaining hardware.

(6) Check the following for sufficient quantity.

a. Fuel

Fuel tank capacity is 20.5 gallons (77.6 liters).

b. Engine coolant

The radiator cap is located above the front canopy, Coolant level should be approximately one inch below the filler neck. Allow a sufficient capacity for coolant expansion.

CAUTION

Be sure the cooling system antifreeze solution is adequate to protect below lowest temperature expected.

c. Engine lubricating oil

The oil level dipstick is located on the right side of the engine. Refer to Perkins User's handbook for oil recommendations.

c. Output Cable Installation

Units are normally supplied without a generator-to-aircraft cable.

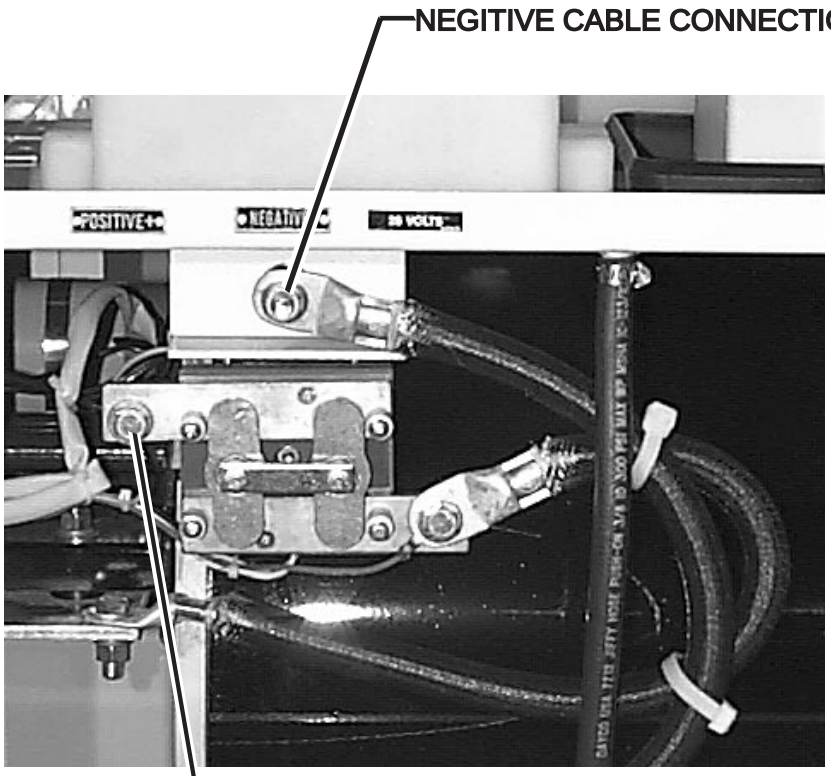
(1) Cable requirements

- Cable length is determined by the customer's requirements. It is recommended that the cable be no longer than 30 feet (9 m). The cable should be two conductor with lug-type terminals on one end and an AN-2551 plug connector on the other.
- The recommended single conductor sizes for 28.5 volt DC, continuous rated amperage and 90^{o} C *(194 ^{o}F)* rise is as follows: for 285 amperes use 2/0 size for 385 amperes use 4/0 size for 530 amperes use 350 MCM size

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

(2) Cable connection

- Remove the screws that secure the right rear side panel). Set the panel aside.
- Loosen the output cable clamp and thread the lugged end of the output cable through the opening in the side of the unit.
- Connect the POSITIVE cable lead to the output terminal on the contactor. Connect the NEGATIVE cable lead to the negative output terminal located above the load contactor. ALWAYS place the lead under the flat washer shown.
- Tighten the cable clamp and install the lower panel.
- Store cables in cable tray provided on top of fender, or on hangers on side of canopy if fenders are not used.



Output Cable Connections
Figure 1

2. Preparation for Storage

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

a. General

The unit should be prepared for storage as soon as possible after being removed from service.

Storage should be in a building which is dry and which may be heated during winter months.

b. Temporary Storage

When storing the unit for one month, prepare as follows:

(1) Lubricate the unit completely in accordance with instructions in Section 2-2. This will include changing engine oil, and filter elements.

(2) Make certain the cooling system antifreeze solution is adequate to protect below the lowest temperatures expected during the storage period.

(3) Clean the exterior of the engine with fuel oil and dry with clean cloths and compressed air.

(4) Seal all engine openings. Use a waterproof, vaporproof material that is strong enough to resist puncture damage from air pressure.

c. Long Time Storage

(1) Engine Protection

The Jet-Ex 4D generator set may be stored for long periods if the engine is given proper protection from rust and corrosion. Refer to the Perkins Diesel Users Handbook (Series 4.236) for proper procedures to be followed.

(2) Generator Protection

To protect the generator and other electrical components, the complete unit should be packaged, using moisture proof packaging and sealing materials. Place packages of moisture absorbing chemicals, such as silica-gel, in the unit before packaging.

CAUTION

Place warning tags in several places to make certain that the individual who takes the unit out of storage is warned that engine oil and coolant have been drained.

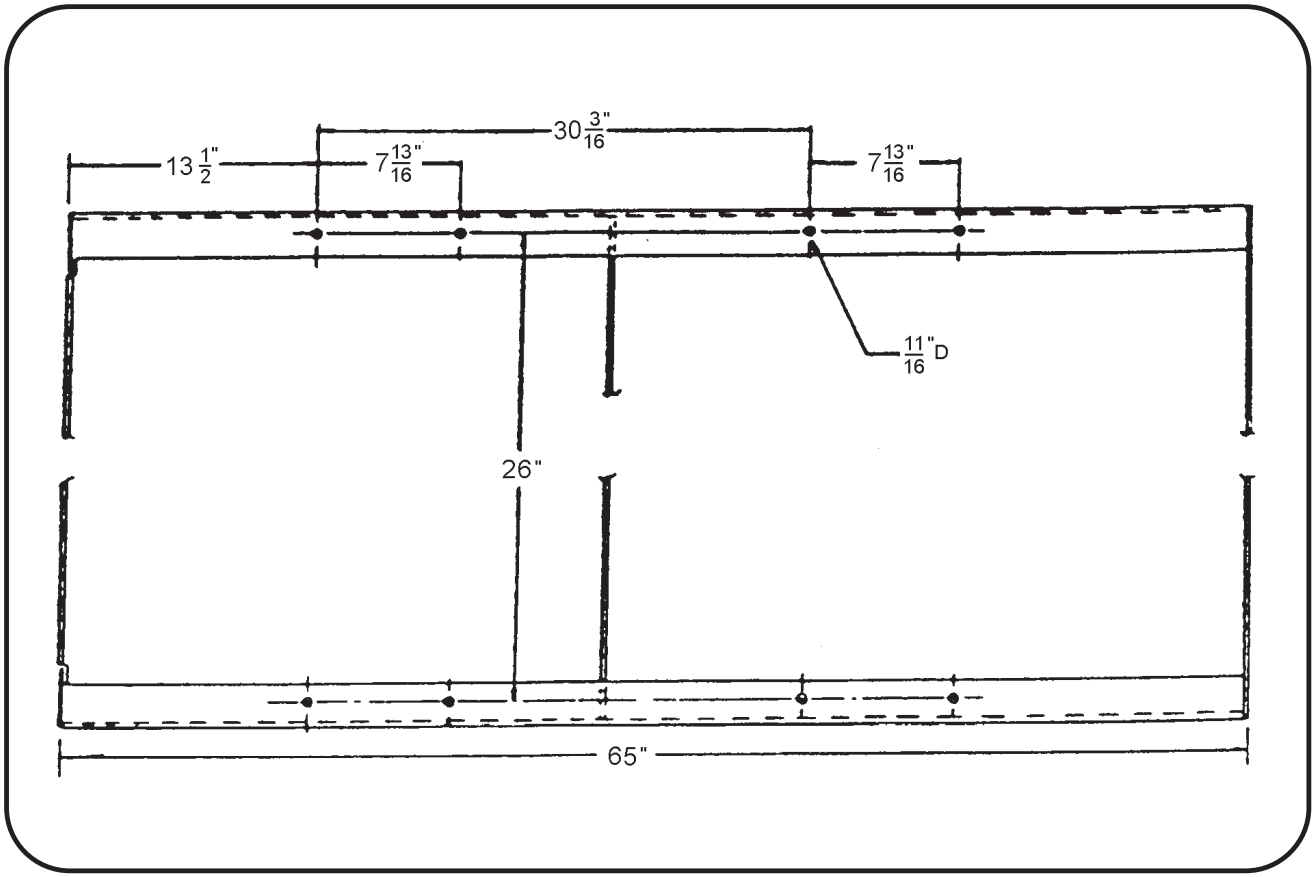
(3) Battery Care

Remove battery and store in a cool dry place. Store the battery on wood rather than directly on cement or metal.

3. Preparation for Shipping

Prepare the unit for shipping as follows:

- Seal all engine openings to prevent the entrance of water, dirt, and dust.
- Disconnect battery cables.
- Drain all fuel from tank and fuel lines as required by carrier rules.
- Crate the unit solidly to prevent damage to instruments, glass, and sheet metal.



Stationary Unit Mounting Holes
Figure 2

4. Stationary Unit Mounting

Figure 2 illustrates the mounting hole pattern in the base of the stationary **Jet-Ex 4D** generator set, Each of the eight holes is 11/16" *(17.5 mm)* in diameter.

Section 3. Operation

1. General

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

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

WARNING

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

2. Operating the Generator Set

a. Pre-start Inspection

(1) Always be sure there is sufficient oil and coolant in the engine.

(2) Be sure the fuel shutoff valve is open. The valve is located at the fuel tank outlet. Observe the fuel gage. Make certain of sufficient fuel to complete the job to be done.

(3) If the unit is trailer mounted and is not connected to a tow vehicle, be sure the parking brake is applied and that the drawbar is raised and locked in the vertical position.

(4) Open the engine compartment doors and inspect interior for rags, tools, and foreign material.

b. Pre-start Instructions

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

(1) Check the supply of fuel, crankcase oil and radiator coolant. See Perkins Engine User's Manual for specifications.

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

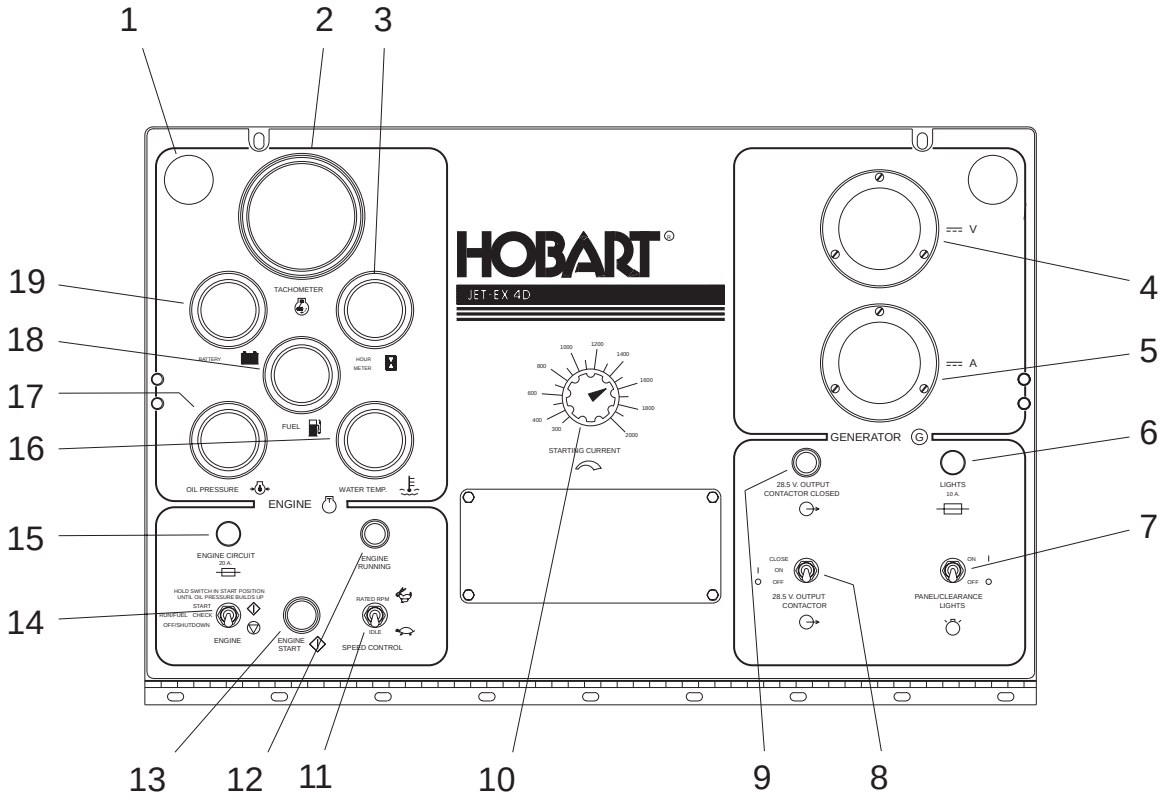
(3) Wipe off the entire unit and clean the air passages, control panel and other hard to reach places with compressed air not over 25 psi *(172 kPa)*.

(4) Make sure that no loose bars, tools, parts, etc., are in or on any part of the engine as they could cause serious damage to the engine, generator, or personal injury to anyone standing nearby.

(5) If the unit is operated indoors, make sure that an exhaust line is properly connected to the engine exhaust system, and discharged out of doors. Avoid short bends or reduction in line sizes in exhaust pipes. Locate the unit so as to necessitate the shortest possible exhaust line to insure the least amount of back-pressure on the engine. Back-pressure can cause engine damage and loss of power.

(6) Check the electrical system to make sure the connections are secure and properly connected. Check the battery electrolyte level.

(7) Check air cleaner service indicator, and replace air cleaner element if indicator window is red.



1. Panel Light
2. Tachometer
3. Hour meter
4. Voltmeter (Generator)
5. Ammeter
6. Panel Lights Fuse
7. Panel Lights Switch
8. Contactor Control Switch
9. Contactor Closed Light
10. Current Limit Control
11. Speed Control Switch
12. Engine On Light
13. Engine Start Switch
14. Engine Circuit Switch
15. Engine Circuit Fuse
16. Water Temperature Gauge
17. Oil Pressure Gauge
18. Fuel Gauge
19. Voltmeter (Engine)

Operating Controls and Indicators
Figure 1

c. Starting The Engine *(Figure 1)*

Make sure that all Prestarting Instructions have been carried out, and reference to Initial Preparation For Use has been checked for operating details.

(1) Check engine oil, fuel and coolant levels.

(2) Place speed control switch *(11)* in **IDLE** *(down)* position.

CAUTION

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

(3) Hold engine **START-RUN-STOP** switch (14) in **START** position.

(4) Press and hold **ENGINE START** push-button (13). Release as soon as engine starts.

(5) Release engine **START-RUN-STOP** switch (14) to RUN position when oil pressure builds up.

(6) Observe engine RPM on the tachometer, and observe engine for excessive vibration. Idle speed should be 1000 RPM + 50 RPM. If there is excessive vibration, adjust engine idle speed, gradually increasing or decreasing it - whichever is necessary - until vibration is reduced. For idle speed adjustment procedure, refer to Section 2-3, Para. 2,b, (4).

(7) Allow engine to warm up before applying a load.

WARNING

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

d. Generator Operation *(Figure 1)*

(1) Place speed control switch *(11)* in **RATED RPM** *(up)* position. Engine speed will be 2000 RPM, and the generator will automatically build up to produce rated voltage.

(2) Adjust **STARTING CURRENT** potentiometer (10) if necessary.

e. Deliver Power

(1) Connect output cable to **AIRCRAFT**.

(2) Hold **CONTACTOR** switch *(8)* in CLOSE position. Release to **ON** position as soon as green **CONTACTOR CLOSED** light *(9)* comes on.

f. Stop Operation (Shutdown)

(1) When power delivery is completed (aircraft discontinues drawing current), place **CONTACTOR** switch *(8)* in **OFF** position. Light *(9)* should go off to indicate load contactor has opened and power is no longer available at the aircraft.

(2) Place speed control switch *(11)* in **IDLE** (down) position. Allow engine to run for 2 to 3 minutes.

(3) Disconnect output cable from aircraft receptacle and store cable in cable trays or on cable hangers as the case may be.

(4) Place **START-RUN-STOP** switch *(14)* in **STOP** position.

CAUTION

THE BATTERY WILL DRAIN if the **START-RUN-STOP** switch *(14),* is not placed in **STOP** position after shutdown,

g. Adverse Weather Precautions

(1) Cold weather operation

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

(2) Fuel system

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

(3) Fuel

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

(4) Cooling system

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

(5) Lubrication

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

(6) Electrical system

In cold weather, the most efficient electrical system is needed to start the cold engine. Check the entire system for loose connections or indication of bad wiring or shorted conditions.

(7) Battery

Battery efficiency decreases sharply with lower temperatures. Maintain the specific gravity of the battery between 1.275 and 1.300 *(fully charged condition)*. Make sure of full charge before attempting to start engine in sub-zero conditions.

h. Operation in Hot and Humid Conditions

(1) Cooling system

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

(2) Battery

The specific gravity and proper level of the battery electrolyte should be maintained. Observe recommendations in the Perkins Diesel User's Manual for proper care of the battery.

i. Operation in Extremely Dusty Conditions

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

(1) Fuel system

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

(2) Oil filter and air cleaner

These both need more frequent attention under dusty conditions, Check air cleaner daily. Replace oil filter cartridge as needed.

(3) Crankcase

The crankcase oil level will bear 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.

j. Operation in Salt Water Areas

(1) Canopy

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

(2) Covering

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

(3) Brushes

The brushes of the generator should be inspected regularly to make certain that they are free in the holders. Lift the brushes in the brusholders 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. See **MAINTENANCE** for brush care.

(4) Field coils

The fields should be dried as thoroughly as possible. If they have become damp, proceed with recommended procedure in **MAINTENANCE** section.

(5) Battery terminals

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

k. Miscellaneous

Once a month, oil hinges on the engine compartment doors and the hinged plexiglas cover.

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Chapter 2. Servicing / Troubleshooting

Section 1. Maintenance Inspection/Check

1. General

To make certain that generator set is always in good operating condition, it must be inspected, maintained, and lubricated regularly and systematically.

WARNING

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

2. Maintenance Schedule

a. General

Figure 1 provides a suggested schedule for periodic checks and services. Refer to Section 2-2 for lubrication requirements.

b. Maintenance Schedule Check Sheet

It is strongly recommended that the customer use a maintenance schedule check sheet. The check sheet will provide a record of maintenance specific operation.

c. Time Intervals

The schedule is based on both hours of operation and calendar intervals. These two intervals are not necessarily the same. The calendar period is included to make certain services are performed regularly when equipment is being operated infrequently, or at manufacturer's recommendations. Perform all services on a "whichever comes first" basis.

NOTE: Refer to the **Perkins Diesel User's Manual** for detailed engine maintenance information.

3. Engine and Related Components

See the Perkins Diesel User's Manual for Series 4.236 engines.

4. Inspection and Cleaning

Every day, check for oil, coolant, or fuel leaks. Also check for loose electrical connection. Check oil pressure with engine running at rated RPM *(2000)*. Do not operate engine if oil pressure is less than 15 psi. Wipe accumulated water off from all electrical connections and instruments. Make sure that the battery voltmeter reads proper voltage.

Recommended Service Intervals	**10 hrs. or Daily**	100 hrs. A/R 2 Weeks	**200 hrs. or 1 Month**	**400 hrs. or 2 Months**	**800 hrs. or 6 Months**
Engine					
Check oil level	X				
Check coolant level	X				
Check fuel quantity	X				
Check gages and instruments for prpoer operation	X				
Change engine oil			X		
Change oil filter			X		
Check and tighten drive belts			X		
Clean and inspect exterior of radiator			X		
Check exhuast system			X		
Check cooling system				X	
Check and adjust idle speed				X	
Check and refill cooling system	(Twice yearly, summer and winter)				
Replace fuel filter (Drain Daily)					X
Clean engine					X
Electircal System (12V DC)					
Check lights	X				
Check charging rate	X				
Check battery water level		X			
Check battery state of charge					X
Check wiring and connections					X
Check all instruments and gages					X
Check battery terminals and connectors					X
Electrical system (28.5V DC)					
Check indicating light	X				
Check operation of all instruments, meters, etc.	X				
Check generator brushes for length, cleanliness and free operation					X
Check slip rings for smoothness and clealiness					X
Check the entire unit					X
Check overvoltage protection		X			
Check all wiring connections					X
Trailer (Option)					
Lubricate (See Lubrication Chart)					
Check tire inflation					X
Check and adjust wheel bearings					X
Lubricate wheel bearings					X
Check brake tension				X	

Inspection/Check/Maintenance Schedule
Figure 1

Every week, wipe off accumulated dust, dirt and oil from the engine and generator. Check all parts for loose connections and wear. If arcing has occurred at any electrical connections, recondition them and securely refasten. Check engine oil and coolant levels.

Every month, check generator for amperage and voltage output. Blow out generator windings with compressed air, not over 25 psi *(172 kPa)* pressure or remove with a suction-type cleaner with a non-metalic nozzle. If windings should become slightly damp, use space heaters or electrical light bulbs to effectively dry out the windings. If dampness is excessive, apply external heat under a canvas cover, well vented. Heating should not exceed 194^{o} F *(90 ^{o} C)*.

Pound out any dents in the canopy. Sand, prime, and repaint any dented or rusted spots.

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Section 2. Maintenance Procedures

1. General

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

WARNING

Stop operation immediately if a serious or possibly dangerous fault is discovered.

2. Lubrication

a. General

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

b. Lubrication Chart

Lubrication points are illustrated and identified by name on Lubrication Chart, Figure 1. Number symbols used to designate the kind of lubricant required and the specification recommended are identified in Figure 2. Letter symbols used to designate the normal lubrication period are identified in Figure 3.

c. Generator

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

d. Generator Controls

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

e. Engine

Although the engine and its accessories require no more attention than any other similar installation, they still inherently require a major portion of the generator set lubrication and maintenance. Recommendations regarding engine lubrication have been taken from the Perkins Diesel Users Manual for Series 4.236 engines.

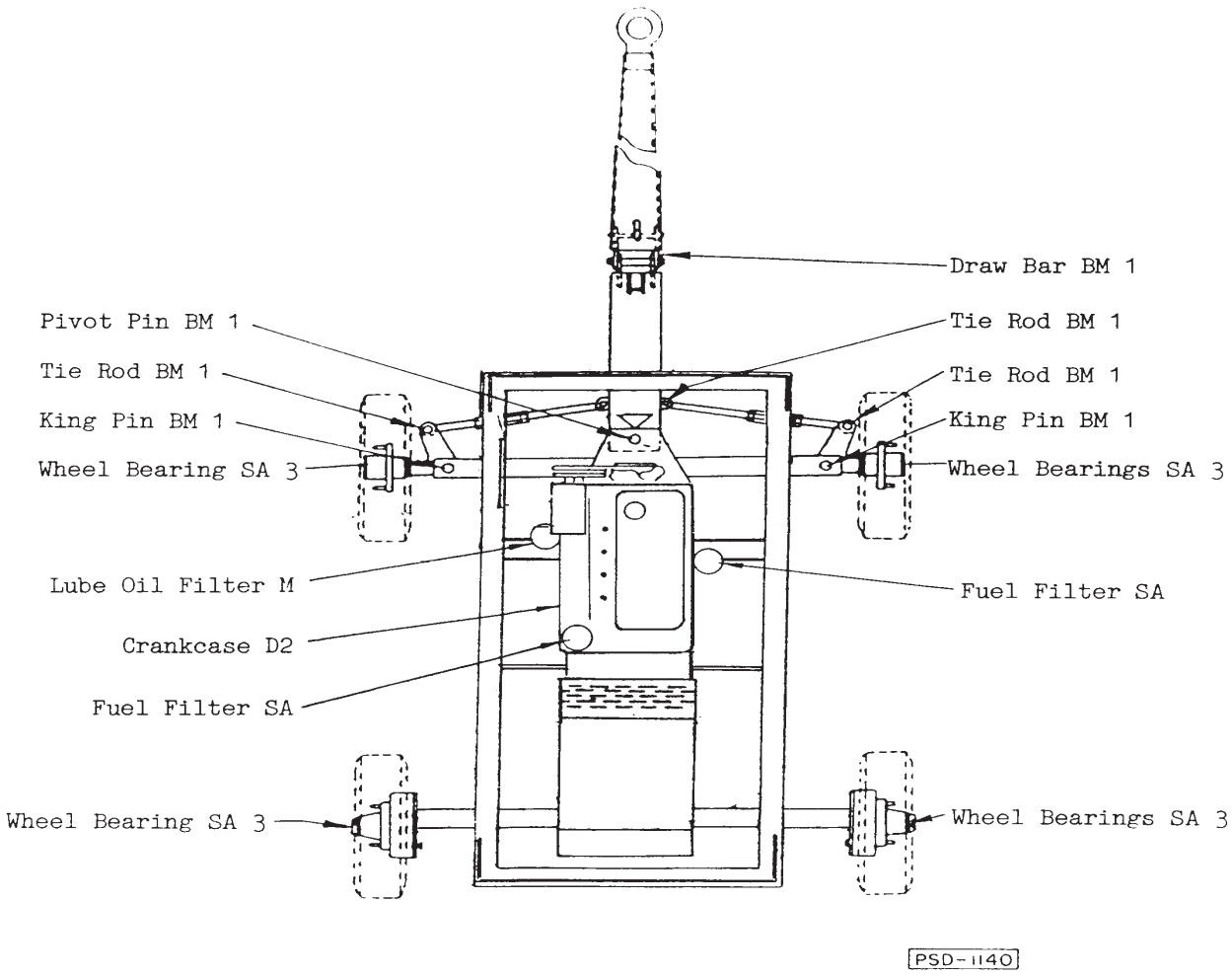
(1) Lubrication Schedule

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

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

(2) Oil Specification

Lubricating oils must be equal to the U.S. Ordnance specification MIL-L-46152 or MIL-L-2104C. See Perkins engine user's handbook for recommended oil viscosity.



* Check crankcase oil daily; change 200 hours.
** Change oil filter after 200 hours.

Lubrication Chart
Figure 1

Symbol	Name	Specification	Notes
1	Grease, Automotive and Industrial	Federal VV-G-632	Sinclair LItholene Industrial No.2; Mobile-Mobilplex 47 or equivalent.
2	Oil, Engine, Heavy Duty	MIL-L-46152 or MIL-L-2104C	See Perkins Engine User's Handbook for recommended oil viscosity
3	Grease, Automotive	Military MIL-G-10924B	Wheel bearings

Lubricants
Figure 2

Symbol	Time Interval
D	10 hours or Daily
BW	100 hours or Biweekly
M	200 hours or Monthly
BM	400 hours or Bimonthly
SA	800 hours or Semiannually

Symbols and Time Intervals
Figure 4

(3) Change lubrication engine oil (200 hours)

Oil should be changed after each 200 hours of engine operation. The generator set is equipped with an hourmeter which records actual engine operating time. The ideal time to change oil is soon after a power delivery run when the engine is at operating temperature.

NOTE: If lubricating oil is drained immediately after the unit has been run for some time, most of the sediment will be in suspension and oil will drain readily without clinging to internal surfaces.

CAUTION

DO NOT use solvents as flushing oils in running engines.

NOTE: Change the oil filter each time the oil is changed.

(4) Change oil as follows:

a. Provide a container for catching used oil. Capacity should be greater than 2 gallons.

b. Remove drain plug located in oil pan. Allow sufficient time for oil to drain from valve train, timing gear case, etc., before reinstalling plug.

c. Change oil filter while oil is draining.

(5) Change oil filter as follows:

a. Place a container under the oil filter to catch oil drippings.

b. Loosen filter with a special oil filter removal wrench. Several types are available. Discard oil filter.

c. Coat the gasket on the new filter with oil.

d. Place the new filter in position on the cylinder block and spin on until the gasket contacts the adapter face; then hand tighten another 1/2 turn. Do not over-tighten.

e. Clean drain plug and reinstall. **DO NOT** over-tighten.

f. Remove filler cap on valve cover and refill crankcase with new, clean oil of proper specification and viscosity, (*see Para. 2, E, (2) and Figure 2)* Seven quarts are required when oil filter is changed.

g. Start engine and allow it to idle. Oil pressure should come up to normal quickly. Check for oil leaks at filter and drain plug.

h. Stop engine. Allow several minutes for oil to drain to crankcase, then check oil level. It should be at **FULL** mark on dipstick.

i. Check hourmeter and record time of oil change.

3. Servicing the Air Cleaner

The air cleaner is a dry type with a "C" flow cartridge. A definite time schedule for changing the filter cartridge cannot be determined because of varying operating conditions, therefore an air restriction indicator is mounted on the intake manifold. Change the filter when the red indicator "flag" becomes fully visible in the viewing chamber and locks in that position.

a. Cartridge Removal

(1) Open left front canopy door to gain access to the air cleaner.

(2) Loosen the clamps which secure the air cleaner to the bracket.

(3) Loosen and remove the clamp and air cleaner from the intake hose.

CAUTION

DO NOT attempt to clean or re-use old cartridge.

b. Cartridge Installation

(1) Attach the new air cleaner to the intake hose and tighten the clamp.

(2) Secure the air cleaner to the bracket with the two large clamps. DO NOT overtighten.

4. Servicing the Fuel Filter

Refer to Perkins Diesel User's Handbook for instructions on removal and replacement of fuel filter elements.

5. Drive Belt Service

Check all drive belts and adjust if necessary each 200 hours. Refer to Perkins Diesel User's Manual for proper procedures.

6. Engine Cooling System

NOTE: Refer to the Perkins Diesel User's Manual for detailed instructions on servicing the engine's cooling system.

During warm weather operation, if plain water is used as a coolant, the cooling system MUST be protected against rust by a rust inhibitor additive. During cold weather operation the system MUST be protected against freezing. The system should NEVER be operated on plain water, without a rust inhibitor or antifreeze.

WARNING

When removing the cap from a very hot radiator, cover the cap with a thick cloth and turn it slowly counterclockwise to the first stop. When pressure is completely released, press downward and finish removing cap.

CAUTION

DO NOT add coolant to an extremely hot engine. This can result in a cracked block or cylinder head.

a. Rust Inhibitor

Use only a corrosion inhibitor that is compatible with aluminum. Do not use inhibitors labeled as “acid neutralizer”.

b. Antifreeze

A permanent type *(Ethylene Glycol)* antifreeze is recommended for use in the cooling system. The coolant, when mixed as equal parts of water and the recommended antifreeze, will provide protection to -35 degrees F.

7. Battery Service

a. General

A 12-volt battery supplies power for operation of the engine electrical system, clearance and panel lights, and for flashing the generator. The battery supplied with a new unit is a maintenance free type. Some of the following topics apply to non-maintenance free type battery, which requires additional maintenance such as checking liquid levels.

b. Battery Location and Accessibility

The battery is located on the fuel tank support on the right side of the unit. The battery is easily accessible for service by removing two 1/4-inch screws and removing the right rear side panel.

c. Battery Care

(1) Never allow a battery which has been removed from a unit to sit on concrete, ground, or metal, unless proper insulation is provided. A wooden platform or board will provide sufficient insulation.

(2) Maintain stored batteries in a charged condition,

(3) Be sure battery is fastened securely in their compartment to avoid damage from vibration.

(4) Maintain battery fluid at proper level.

(5) Keep battery terminal posts and lead cable connectors clean.

WARNING

Never allow sparks or open flame near battery. Avoid spilling electrolyte on hands or clothing.

d. Liquid Level (If battery is not a maintance free type)

The electrolyte in each cell should be above the plates at all times to prevent battery failure. Check the level of the electrolyte every two weeks. When electrolyte level is low, add pure distilled water. Do not use hydrant water or any water which has been in contact with a metal container. Acid should never be added except by a skilled battery man.

CAUTION

Never add any special battery dopes, solutions, or powders.

NOTE It is especially important to keep the battery at full charge for cold weather operation. Add distilled water to the battery in freezing temperatures only when the engine is to operate for several hours, to thoroughly mix the water and the electrolyte, or damage to the battery will result from the water freezing.

e. Cleaning the Battery

If the top of the battery are dirty, they may be cleaned with a brush dipped in ammonia or soda solution. Disconnect lead connectors from battery posts. Vent plugs should be tightened to prevent cleaning solution from entering cells. Clean battery as required, using brush and cleaning solution. Flush off the battery with clean water. Special terminal cleaning tool. Make certain that vent holes in filler caps are not clogged.

f. Testing a Battery

Tests are made on a battery to determine the state of charge and also its condition. The results of these tests show whether the battery is good, needs recharging, or must be replaced. If a battery has failed, is low in charge, or requires water frequently, the reason for the condition must be found and corrected. Visually inspect the battery before testing, to determine if it has been damaged. Moisture on the outside of the case, or low fluid level in one or more cells indicates possible battery damage *(cracked case, etc.).* The battery may be tested by two methods. A battery-starter tester may be used to determine the battery's ability to deliver current. A battery hydrometer test determines the charge condition of the battery.

- Test with Battery-Starter Tester

  Connect battery to the tester according to instructions furnished with the instrument. Test battery according to tester instructions. If the test determines that the battery has acceptable voltage, this indicates that the battery has output capacity and will accept a charge if required.

- Test with Hydrometer

  a. Remove filler caps and check the specific gravity of the electrolyte in each cell. If specific gravity is 1.230 or below, add water if necessary and charge the battery until it is fully charged. A fully charged battery will give a specific gravity reading of 1.265 to 1.285. The specific gravity of a fully discharged battery may range from 1.140 down to 1.120.

NOTE: The battery is fully charged when all cells are gassing freely, and the specific gravity ceases to rise for three successive readings taken at hourly intervals.

b. If the battery starter test indicated that battery voltage was below the acceptable voltage value, test each cell with the hydrometer. If the difference in specific gravity readings between any two cells is 50 points (0.050) or more, the battery isn't satisfactory for service and should be replaced.

8. Generator Maintenance

a. General

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

b. Brush Service

If inspection reveals that brushes are gummy or sticking in the brusholders, they should be removed and cleaned. Clean both the brushes and brusholders. Use a good, **SAFE**, commercial cleaner. **DRY ALL PARTS THOROUGHLY**. Be sure brushes can move freely in brusholders.

WARNING

DO NOT use a flammable solvent. DO NOT use steam cleaner, or soaps and detergents under pressure.

c. Generator Revolving Field Brush Replacement

(1) Disconnect leads *(A, Fig. 5)* from connectors on brusholder caps (B).

CAUTION

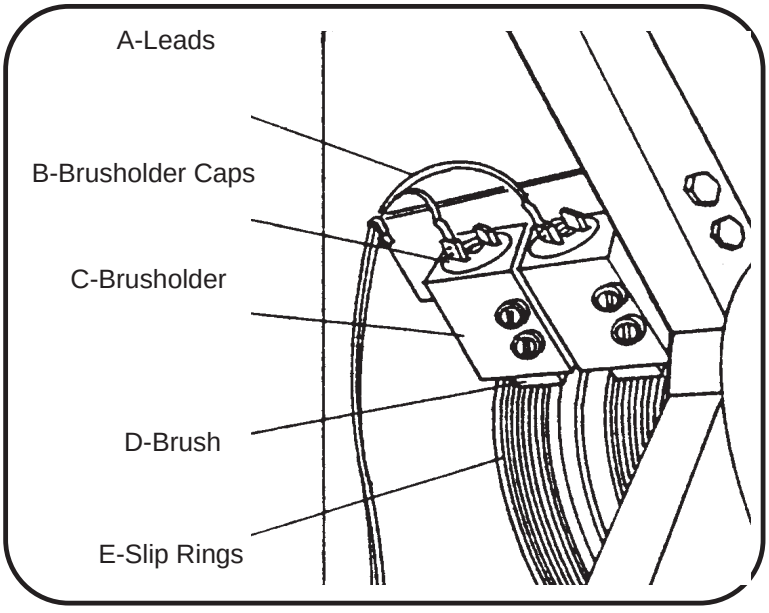
When removing the lead wires, do so one at a time and replace each brush accordingly, to insure that the lead wires are put pack onto the proper brushes.

(2) Lift brush (D) from brushholder (C) for inspection. If brushes are worn unevenly or are shorter than 7/16 inch *(11 mm)*, replace them.

(3) Inspect slip rings whenever brushes are removed for servicing brushes or brusholders. Note surface conditions of rings. Surface should appear smooth and clean. Scoring or roughness of slip rings may be caused by grit or abrasive substance in brushes, or by oil on the rings. Moderately rough slip rings can be smoothed by holding grade 00 flint paper against their surface while the rings are revolving slowly. If the rings are badly scored, the unit must be sent to an overhaul facility for repair. After cleaning slip rings, blow dirt and grit out of the unit with compressed air. Do not use over 25 psi *(172 kPa)* air pressure to blow dirt out.

(4) Slip new brushes into brush-holder guides, and place caps on top, and screw them into the guides to a “bottomed” position. The spring attached to the brush will determine the pressure at which the brush contacts the slip rings.

(5) To fit new brushes to the slip rings, lay a strip of No. 00 sand- paper, smooth side down, on slip ring surface, and draw the sandpaper in the direction of rotation of the slip ring, lifting the brush on the return stroke. Continue until the brushes have same curvature as the slip rings. Blow all carbon dust out of the machine using not over 25 psi *(172 kPa)* air pressure.



Generator Revolving Field Brushes
Figure 5

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Section 3. Adjustment/Test

1. General

The adjustments and test procedures presented below are required after major repairs, parts replacement, or long storage.

2. Testing the Generator Set

Test values listed below will result when the generator set is operating properly. If your test results are not within the limits shown, perform the applicable troubleshooting procedures given in Chapter 3.

If major repairs have been made or if critical components have been replaced, make sure that the applicable adjustments have been made before testing the generator set. Adjustment procedures are described in Para. 3 of this Section.

a. Pre-operational Test Procedures

(1) Open engine compartment doors and inspect the interior for rags, tools, and other foreign materials.

(2) Check engine oil level.

(3) Check coolant level.

(4) Check battery water level (if required)

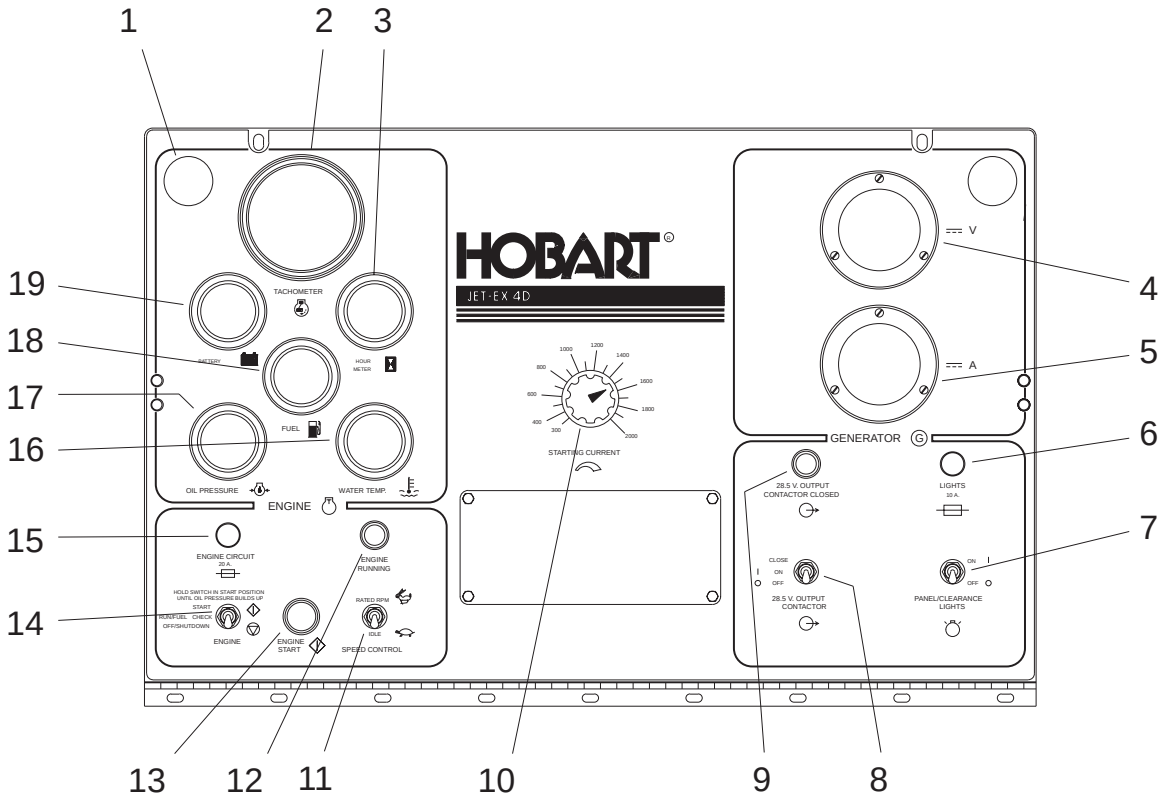
(5) Check for sufficient fuel.

(6) Check drive belts. Each belt should have approximately 1/2 inch *(13 mm)* slack.

(7) Inspect all wiring for possible trouble spots such as loose wires or terminals, frayed insulation, obvious shorts, etc.

(8) Check panel lights, panel light switch, and fuse.

(9) Connect cables from generator output terminals to a load bank. Use cables of the same size and length as those used in service, preferably No. 2/0, not more than 30 feet *(9 m)* long.



1. Panel light
2. Tachometer
3. Hourmeter
4. Voltmeter *(Generator)*
5. Ammeter
6. Panel lights fuse *(10 Amp)*
7. Panel lights switch
8. Contactor control switch
9. Contactor closed light
10. Current limit control
11. Speed control switch
12. Engine on light
13. Engine start switch
14. Engine circuit switch
15. Engine circuit fuse *(20 Amp)*
16. Water temperature gauge
17. Oil pressure gauge
18. Fuel gauge
19. Voltmeter *(Engine)*

b. Operational Tests *(Figure 1)*

(1) Start the engine as described in 1-3; Para. 3 *(a)*, and let it warm at idle speed.

(2) Inspect for oil, fuel and coolant leaks.

(3) Check the engine voltmeter *(19)* for proper voltage. Check oil pressure gauge *(17)*. It should read 35 to 60 psi *(241 to 414 kPa)*. Check coolant temperature gauge *(16)*. It should read 180 to 200 deg. F *(82 to 93 deg. C.)* when engine is hot.

(4) Observe engine RPM on the tachometer (2), and observe engine for excessive vibration. Idle speed should be 1000 RPM ± 50 RPM. If there is excessive vibration within this range, adjust engine idle speed, gradually increasing or decreasing it - whichever is necessary - until vibration is reduced. Refer to Figure 2 below. To adjust idle speed, loosen idle speed retaining nut and adjust idle speed screw on throttle assembly to raise idle speed, while observing tachometer and observing engine vibration. turning idle speed screw **INWARD** increases idle speed, and turning it **OUTWARD** decreases idle speed. When vibration has been satisfactorily reduced, tighten idle speed retaining nut.

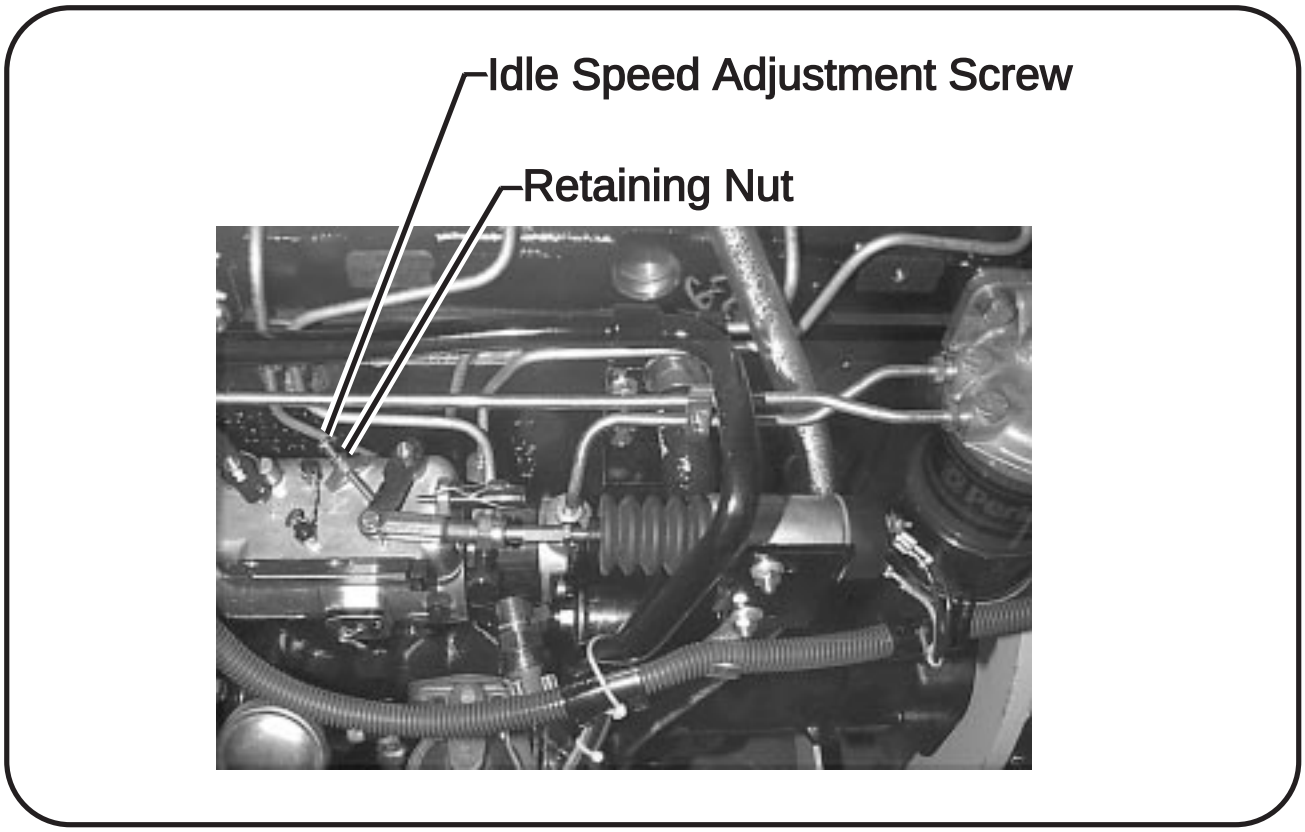
(5) Place the speed control switch *(11)* in the **RATED RPM** position. Check engine RPM's at operating speed: 2000 RPM

(6) Check for 28.5 output voltage on generator voltmeter *(4)* to assure automatic voltage buildup.

(7) Set current limit control *(10)* to maximum, full clockwise, position.

(8) Adjust the load bank for a load of 550 amperes.

(9) Place the contactor control switch *(8)* in the **CLOSE** position. **CONTACTOR CLOSED** light *(9)* will glow and the contactor will close. Release the switch to the center **ON** position. The tachometer *(2)* will indicate 1950 ± 25 RPM.



Idle Speed Adjustment

(10) Disconnect the load bank and check the overvoltage protection by adjusting voltage regulator potentiometer R46 *(1, Fig. 3)* to increase the voltage. The overvoltage relay will trip and open the load contactor at 32 to 34 volts.

(11) Readjust the voltage to 28.5 volts, connect the load bank, set it at 550 amperes, and close the contactor.

(12) Remove load bank and check voltage regulation at no load. Voltage will be 28.5 volts. Reconnect load bank and check voltage regulation with load bank set at 137, 275, 413, 550, and 660 amperes and check voltage at each setting. Voltage will be 28.5 ± 1 volts at each different load.

(13) With current limit control *(10)* set to 2000, apply 600 to 700 amperes load to the generator and then set the current limit control *(10)* to 400. Current displayed on ammeter *(5)* will be 400 ± 40 amperes.

NOTE: Voltage will not drop below 12 volts.

(14) Set current limit control to 2000 and apply 1200 amperes load. Then set current limit control to 1000. Current displayed on ammeter will be 1000 ± 100 amperes and voltage will not drop

(15) Stop and restart the engine, check the instruments as directed in step *(3)*, and check the entire generator set for unusual vibration and noises.

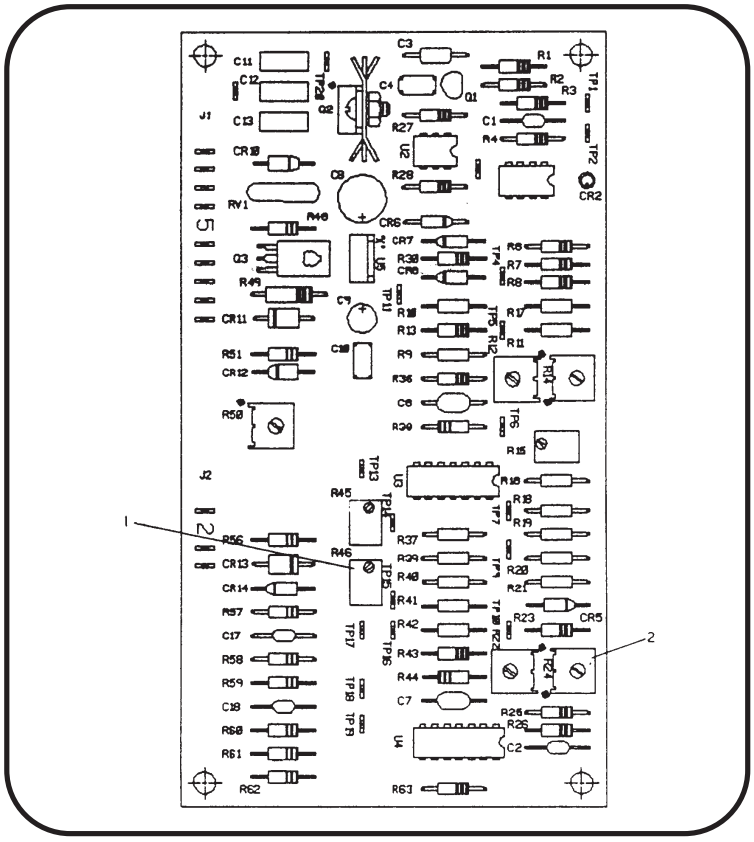
3. Voltage Regulator Adjustment *(Figure 3)*

a. 28.5 Volt Adjustment

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

b. Line Drop Compensation

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



Voltage Regulator PC Board
Figure 3

Section 4. Troubleshooting Procedures

1. General

Troubleshooting is an orderly process of checking and eliminating possible causes of trouble until the exact cause of a trouble is found. As a rule, the best place to start looking for the cause of a trouble in a circuit is at the source of power. Continue testing and checking the circuit, step-by-step, in an orderly manner, until the cause of trouble is located. See connection and schematic diagrams.

2. Troubleshooting Chart

a. Description

The troubleshooting chart lists information under three headings:

(1) Trouble, symptom, and condition,

(2) Probable cause

(3) Test, check and remedy

b. Use of the Troubleshooting Chart

Read the trouble symptoms and conditions before proceeding to causes and remedies. For example, at the beginning of the troubleshooting chart under **ENGINE**, the first trouble listed is: “Engine will not start. Starter will **NOT** crank engine.” If the starter WILL crank the engine, then obviously this is not your symptom and condition. Go the next trouble and symptom directly below. If the starter will **NOT** crank the engine, look to the right under **PROBABLE CAUSE** and **TEST**, **CHECK, AND REMEDY** and find the various things which could cause the trouble and what to do to check and remedy them.

3. Equipment for Troubleshooting

A good quality, multi-scale voltmeter is the only instrument required similar clips, will be required. The 12 volt engine electrical system may be used for a 12 volt DC power source.

4. Safety Precautions

WARNING

Loose garments, neckties, and other hanging items must not be worn by personnel near the fan or other exposed moving parts of this equipment while it is running. Also, avoid contact with live electrical parts. death or serious injury could result!

5. Diagrams

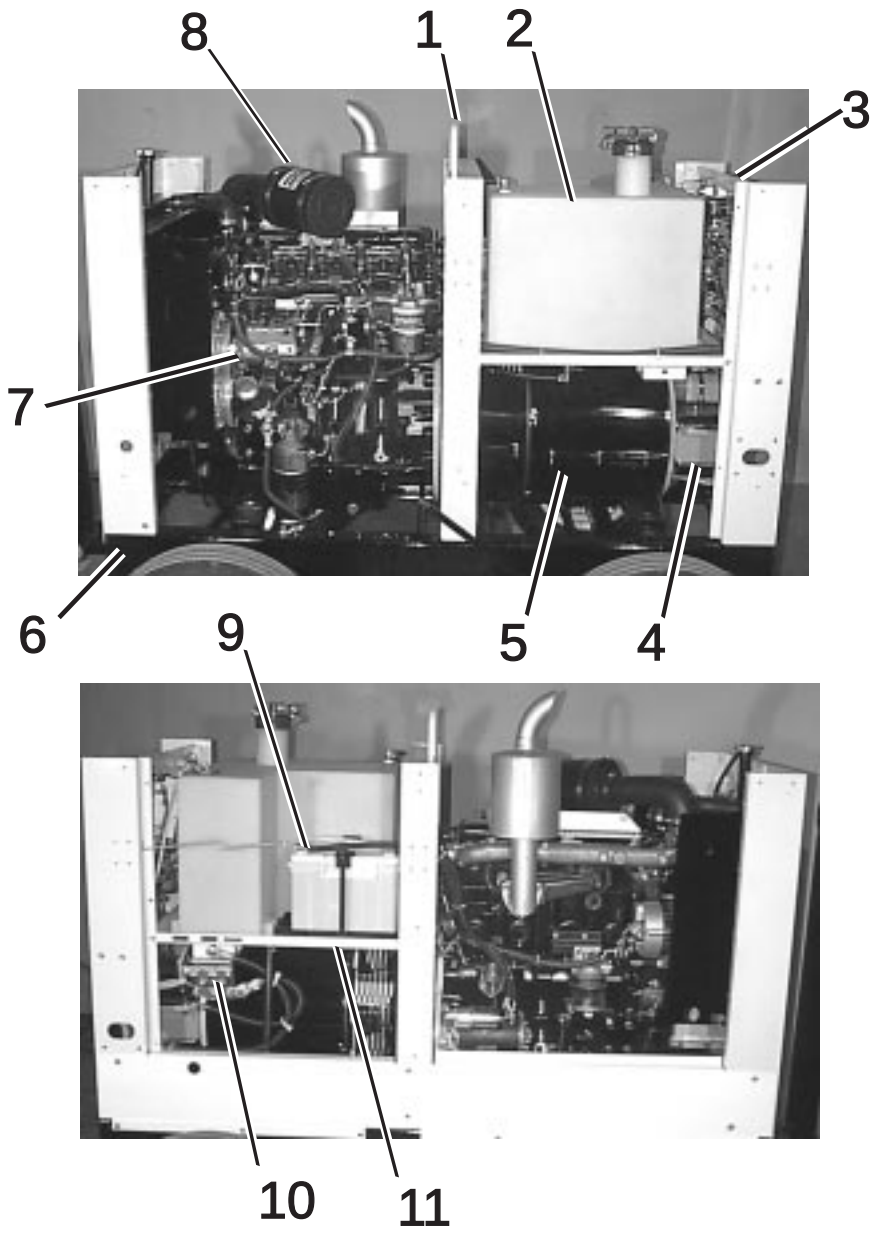
A schematic/connection diagram of the generator set is provided in Chapter 5. This diagram can be very helpful in troubleshooting. Components shown in the diagram are identified by reference designators *(or item names in some instances)*. A legend appearing on the diagram identifies each reference designator by its full item name. For example, the symbol K403 identifies the overvoltage relay, and M406 identifies the voltmeter.

6. Illustrations

To aid maintenance personnel with troubleshooting, three illustrations are provided in this section, showing the locations of various components of the generator set.

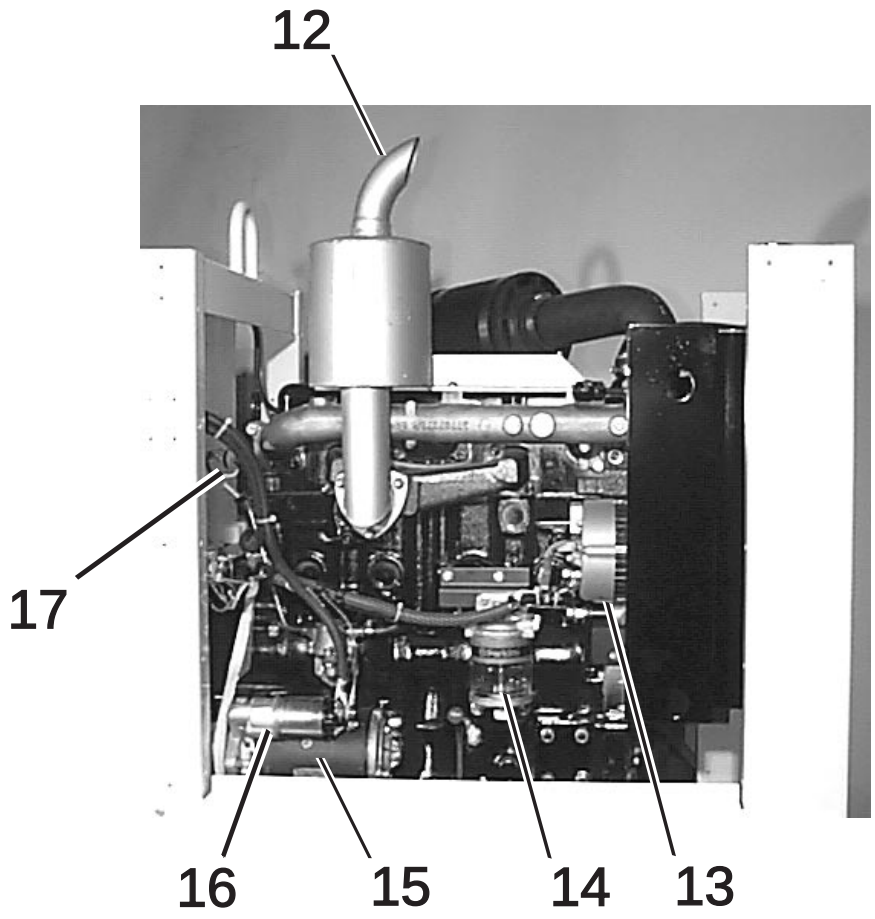
7. Connections and Wiring

Before condemning any electrical component, check all connections and wiring which could affect its operation. In many instances a component may be non-functional simply because it is not receiving power because of a loose connection or a poor ground. In most cases throughout the troubleshooting chart, it will be assumed that connections and wiring have been checked.



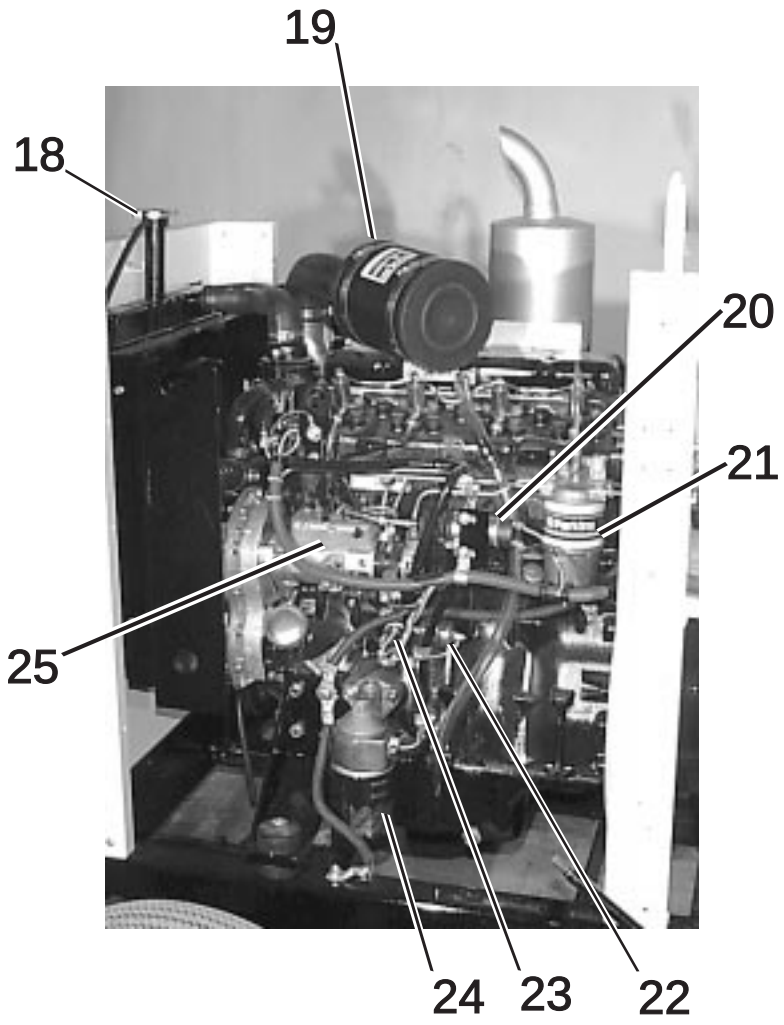
1. Lifting yoke
2. Fuel Tank
3. Control Panel
4. Rectifier assembly
5. Generator
6. Frame
7. Engine
8. Air Cleaner
9. Battery
10. Contactor
11. Fuel tank support

Generator Set Components
(Sheet 1 of 3)
Figure 1



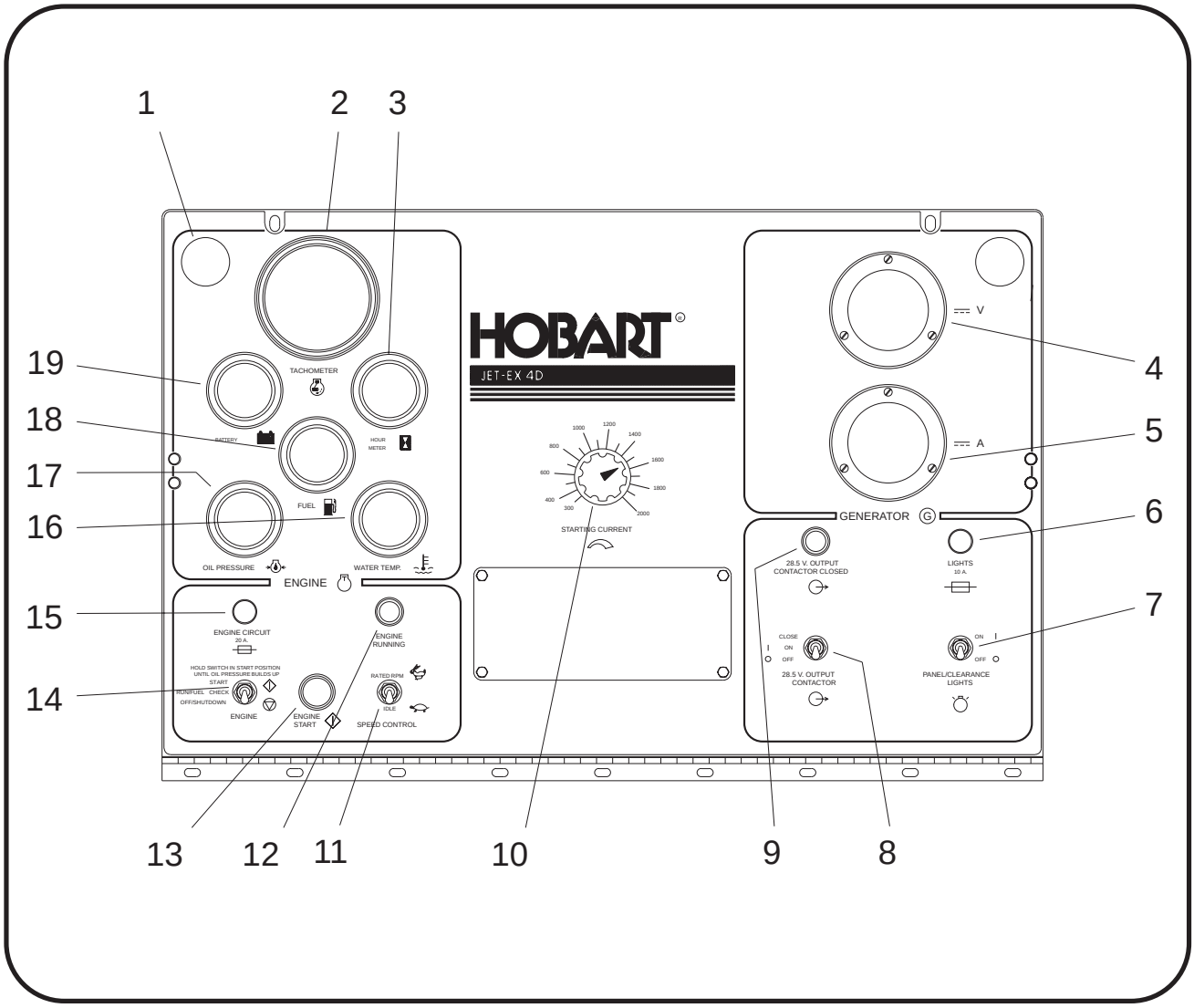
12. Muffler
13. Alternator
14. Fuel filter
15. Starter
16. Starter solenoid
17. Water temp. switch and sender

Generator Set Components
(Sheet 2 of 3)
Figure 1



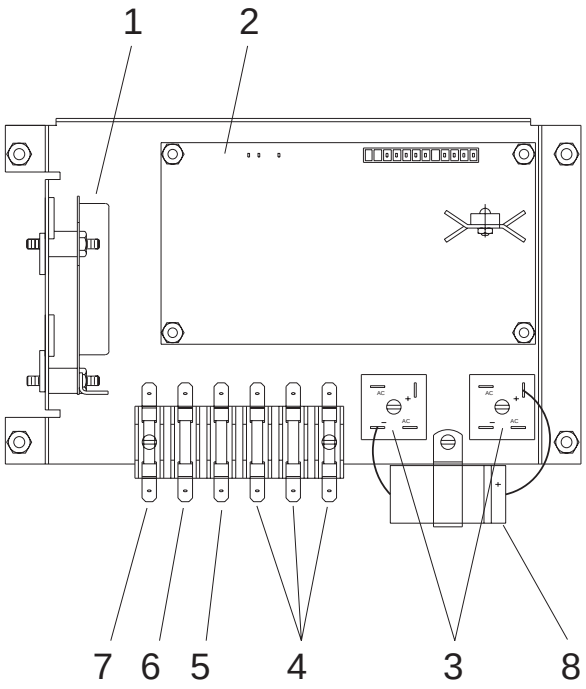
18. Radiator
19. Air cleaner
20. Throttle control assembly
21. Fuel filter
22. Oil pressure sender
23. Oil pressure switch
24. Oil filter

Generator Set Components
(Sheet 3 of 3)
Figure 1



1. Panel light
2. Tachometer
3. Hourmeter
4. Voltmeter (Generator)
5. Ammeter
6. Panel lights fuse (10 Amp)
7. Panel lights switch
8. Contactor control switch
9. Contactor closed light
10. Current limit control
11. Speed control switch
12. Engine on light
13. Engine start switch
14. Engine circuit switch
15. Engine circut fuse (20 Amp)
16. Water temperature gauge
17. Oil pressure gauge
18. Fuel gauge

Control Panel Assembly (front)
Figure 2



1. Overvoltage relay
2. Voltage regulator
3. Excitation rectifiers
4. Control windings fuses (10 Amp)
5. Voltage build-up fuse (10 Amp)
6. Voltage regulator fuse (10 Amp)
7. Spare fuse (10 Amp)
8. Capacitor, 100MFD, 350 VDC

Control Panel Assembly (Rear)
Figure 3

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Section 5. Troubleshooting Charts

See section 2-4 for all figures referenced in this section.

Engine and Controls

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
1. Engine will not start. Starter will not crank engine.	**a.** Batteries discharged, sure this voltage is reaching or loose battery or ground connection.	Check battery connections and check voltage across battery. Voltage should be approximately 12.8 VDC. starter relay input terminal. If battery and connections are good, proceed to **Step b.**
	b. Engine push button start switch *(S401)* defective.	Momentarily connect a jumper between the hot side of the starter relay *(L401)* and the start switch terminal on the starter relay (yellow-blue) wire. If the starter operates, check push-button start switch *(13, Fig. 2)*. Replace faulty switch. If starter doesn't crank, proceed to **Step c.**
	c. Defective starter relay *(L401)*.	Momentarily connect a large capacity jumper cable between the hot side of the starter relay *(16, Fig. 1)* and the starter input terminal. If the starter attempts to crank the engine, the starter solenoid is defective. Replace it. If engine still won't crank, proceed to **Step d**.
	d. Defective starter *(B401)*.	If starter did not attempt to operate in Step C above, the starter is defective. Replace starter. If starter did attempt to operate, but couldn't turn engine, proceed to **Step e**.
	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.

Engine and Controls (continued)

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
Engine will not start. Starter will not crank engine *(continued).*		**NOTE:** If engine is overcharged with ether for cold weather starting, it could seize up. If so, wait approx. 1/2 hour until it will be possible to turn engine.
2. Engine will not start. Starter **DOES** crank engine.	**a.** Engine circuit fuse *(F402)* blown -or-	Replace engine circuit fuse*(15, Fig. 2)*. Use type AGC-2O fuse.
	b. Fuel valve at tank closed, or no fuel in tank, engine has lost its prime -or-	Check and correct as required.
	c. Defective engine start switch *(S404)* -or-	Check for 12-V DC from terminal 4 of S404 in “START” position. If 12-V DC is not measured, replace defective switch.
	d. Defective fuel valve solenoid *(L404)*.	Attempt to start engine while applying 12-V DC to the fuel valve solenoid. If the engine starts, the solenoid is defective, and should be replaced. If engine still doesn’t start, proceed to **Step e.**
	e. Defective fuel pump.	Check fuel pump according to instructions in the **Perkins Diesel User’s Manual.**
3. Engine starts then stops.	**a.** Fuel not turned on.	Turn on fuel shutoff valve.
	b. Defective oil pressure switch *(S403)* located on engine block.	Connect a jumper wire across the “C” and “No” terminals of oil pressure switch. Start engine and check oil pressure. If it is below 10 PSI *(69 kPa)* shut down the engine and check lubrication system for leaks. Check also the oil pump. If oil pressure comes up to normal and the engine continues to run, the oil pressure switch is defective. Replace oil pressure switch.
4. Engine starts then stops when engine switch *(S404)* is released to “ON” position.	**a.** Open overtemperature switch *(S402)* or defective engine switch *(S404)*.	Place a clip-lead jumper wire on the water temperature switch terminals and check for normal operating temperature. If engine then starts properly, replace water temperature switch. If not, replace engine switch.

Engine and Controls (continued)

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
Engine starts then stops when engine switch *(S404)* is released to "ON" position *(continued).*	**b.** Choked fuel filter, restriction in air cleaner, or air in fuel system.	Check for these faults according to instructions in **Perkins Diesel User's Manual**.
5. Engine does not attain normal idle RPM, or idles too fast.	**a.** Idle speed set either too high or too low.	Adjust idle speed to approximately 1000 $^{+}$ 50 RPM.
	b. Loose throttle linkage	If solenoid core is pulled into the full throttle solenoid *(L403)* when S406 is in **RATED RPM** position, check for loose control rod between solenoid and throttle. Tighten if required. If solenoid core does not pull in, proceed to **Step c**.
	c. Defective full throttle solenoid *(L403).*	Check for l2-V-DC across two terminals of solenoid when S406 is in **RATED RPM** position. If l2-V DC is measured, but solenoid core does not pull in, replace the solenoid.
6. Engine will not run at rated speed *(2000 RPM)*	**a.** Speed control switch (S406) defective.	If engine will not go from idle to rated speed when speed control switch *(11, Fig. 2)* is in **RATED RPM** position, turn off engine and take resistance measurements at speed control switch terminals with switch in the **RATED RPM** position. Zero resistance should be measured between terminals having red-blue and orange yellow wires. Replace speed control switch if measurement is improper.
7. Engine lacks power.	**a.** Insufficient air to engine.	Check and service air cleaner for clogged condition. Replace 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 **Perkins Engine User's Manual.**

Engine and Controls (continued)

Trouble, Symptom and Condition	Probable Cause	Test, Check and Remedy
8. Engine Overheats.	**a.** Dirt or sludge in Coolant	Drain coolant, flush radiator, put in clean coolant. Refer to **Perkins Engine User's Manual** in Chapter 5 for instructions.
	b. Debris and dirt in radiator core.	Clean radiator core carefully. Refer to **Perkins Engine User's Manual.**
	c. Fan belt slips or is broken.	Tighten belt or replace as required

Generator and Controls

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
1. Generator will not build up voltage when speed control switch (S406) (2- 4, 11, Fig. 2) is placed in RATED RPM position.	**a.** Voltage build-up fuse (F405) is blown.	Replace voltage build-up fuse (5, Fig. 3). Proceed to Step b. to determine cause of blown fuse.
	b. Defective excitation rectifier (CR417 and/or CR418).	Check excitation rectifiers (3, Fig. 3) with an ohmmeter to see if they are good. If either rectifier is defective, replace it. If both rectifiers are good, proceed to **Step c**.
	c. Defective capacitor (C403).	Check capacitor (8, Fig. 3) with an ohmmeter to see if it is good. If defective, replace it; otherwise proceed to **Step d**.
	d. Defective flyback diode (CR419).	Check diode, on brushholder mounting bracket, with an ohmmeter to see if it is good. If defective, replace it; otherwise proceed to **Step e**.
	e. Generator revolving field (L406) defective.	Locate yellow and red-orange wires on the right terminal strip at lower rear of control panel. Disconnect the yellow and red-orange wires which go down to the generator. (Refer to connection diagram 282654, Chapter 5.) Measure resistance between these two wires. It should be 10 to 11 ohms. If reading indicates an open, short or lower than normal resistance, proceed to **Step f**.
	f. Defective generator armature (G402).	If check of the generator revolving field (Step f. above) revealed no trouble, the generator stator is defective. Send unit to overhaul.
	g. Voltage regulator fuse (F403) is blown.	Replace voltage regulator fuse (6, Fig. 3). Proceed to **Step d**. to determine reason for blown fuse.
	h. Defective rectifier (CR401).	Use ohmmeter to check rectifier (CR401) beside ENGINE RUNNING pilot light on rear of control panel. Replace rectifier if defective.

Generator and Controls (continued)

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
	i. Generator voltage regulator (VR402) defective.	Replace voltage regulator (2, Fig. 3).
2. Generator builds up to only a low voltage when speed control switch (S406) (2-4, 11, Fig. 2) is placed in RATED RPM position.	**a.** Defective excitation rectifier (CR417 and/or CR418).	Check excitation rectifiers (3, Fig. 3) 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 (2, Fig. 3).
3. Generator builds too high a voltage.	**a.** Defective speed control switch (S406).	Use ohmmeter to check speed control switch (11, Fig. 2). Replace switch if defective.
	b. Defective rectifier (CR401).	Use ohmmeter to check rectifier (CR401) beside ENGINE RUNNING pilot light on rear of control panel. Replace rectifier if defective.
	c. Generator voltage regulator (VR402) defective.	Replace voltage regulator (2, Fig. 3) with a voltage regulator known to be good, and resume operation of generator set. If new voltage regulator produces normal operating voltage, send old voltage regulator to factory for service.
4. Load contactor will not close when contactor close switch*(S408)* is operated. Engine running normally, voltage normal, no load applied to output cable.	**a.** Defective contactor close switch *(S408)*.	Momentarily connect a jumper lead between terminals with red and yellow-red wires on the contactor close switch *(8, Fig. 2)*. If the load contactor closes momentarily, replace contactor close switch.
	b. Defective load contactor *(K402)*.	If load contactor *(10, Fig. 1)* will not close when contactor close switch is jumpered, it is likely that the contactor is defective. Replace contactor.
	c. Overvoltage relay *(K403)* defective.	Connect a jumper lead between terminals T and P on the overvoltage relay *(1, Fig. 3)*. If contactor will now close, replace overvoltage relay.

Generator and Controls (continued)

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
5. Load contactor opens as soon as contactor close switch is released from its top *(spring-loaded)* position	**a.** Defective contactor close switch *(S408)*.	Connect a jumper lead between terminals with red and blue-orange wires on the contactor close switch *(8, Fig. 2)*. If the load contactor now remains closed, replace contactor close switch.
	b. Load contactor *(K402)* defective.	If no fault was found in steps 4-a, b, and c above, the load contactor *(10, Fig. 1)* is defective. Replace load contactor.
6. Load contactor opens during power delivery.	**a.** Contactor opening could have been normal because of an overvoltage condition.	Resume operation and closely observe voltmeter *(4, Fig. 2)* for evidence of overvoltage. If contactor opens when no overvoltage condition exists, proceed to **Step b**.
Load contactor opens during power delivery. *(continued)*	**b.** Overvoltage relay *(K403)* defective.	Check overvoltage relay by operating the machine under load and gradually raising voltage at the voltage regulator *(2, Fig. 3)* while observing voltmeter *(4, Fig. 2)*. Start with a low voltage *(25V DC)* and gradually increase voltage until relay functions to open load contactor.
	c. Overvoltage board out of adjustment.	If relay trips at less than 32-V DC, adjust potentiometer (P1) on the overvoltage board *(1, Fig. 3)*. If this does not correct problem, return old board to factory for service.
	d. Load contactor *(K402)* defective.	If no fault was found in **Step b or c,** replace load contactor *(10, Fig.1)*

Generator and Controls (continued)

Trouble, Symptom and Condition	Probable Cause	Test, Check, and Remedy
7. Output current cannot be limited by operating current limiting potentiometer	**a.** Defective current limiting potentiometer *(R402)*	Shut down engine and check current limiting potentiometer (10, Fig. 2) with an ohmmeter. To do this, disconnect the plug (P404) from the regulator board (2, Fig. 3) 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 potentiometer through its entire range, while observing the ohmmeter readings. Resistance should be from 0-10kΩ. Replace if necessary. If it isn't defective, proceed to **Step b.**
	b. Defective voltage regulator *(VR4O2)*.	Replace voltage regulator with one known to be good, and then operate the generator set under sufficient load to observe current limiting. If current limiting potentiometer now controls current properly, send old voltage regulator to factory for service.

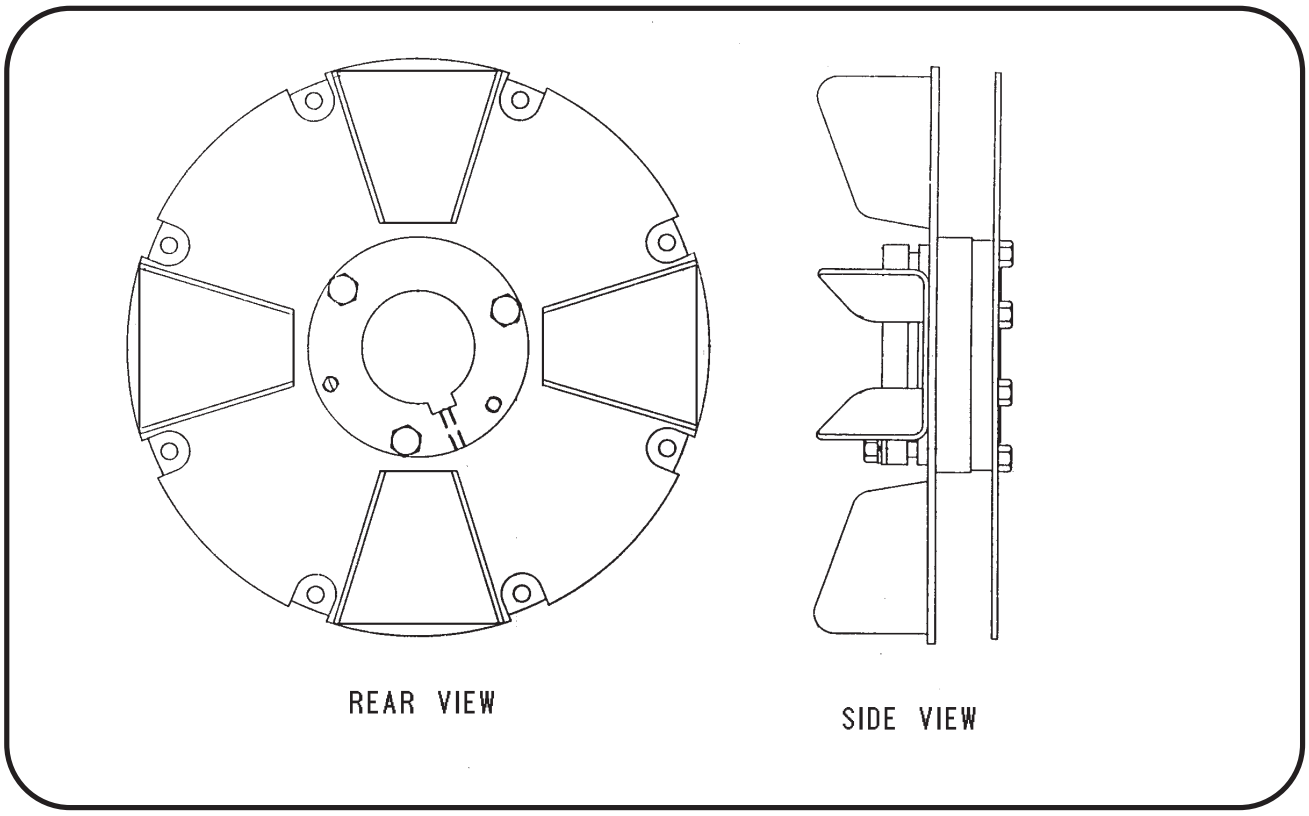
Chapter 3. Overhaul/Major Repair

Section 1. Flexible Coupling

1. General

This chapter provides basic instructions for removal, service and installation of a flexible coupling kit, with fan attached, manufactured by **Hobart Brothers Company** and identified as **Part Number 489123.** This flexible coupling kit is designed for use with Series 7003C single-bearing generator sets.

Figure 1 shows a rear view and side view of the flexible coupling assembly. The primary function of this assembly is to couple a Hobart generator set to a diesel engine. The flexible coupling assembly compensates for slight misaligment between the engine and the generator, due to manufacturing tolerances. A split taper bushing secures the coupling to the generator's armature shaft. *(See Fig. 3 & 4)*.



Coupling Assembly

Figure 1

2. Coupling Screws (Routine Coupling Maintenance)

CAUTION

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

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

a. Remove the sheet metal covers from around the generator housing and the flywheel housing.

b. Refer to Figure 2. Hold a short iron bar through the flywheel housing against the fan blades of the fan and coupling assembly to block the armature against clockwise rotation. Do this carefully to avoid damaging the fan blades.

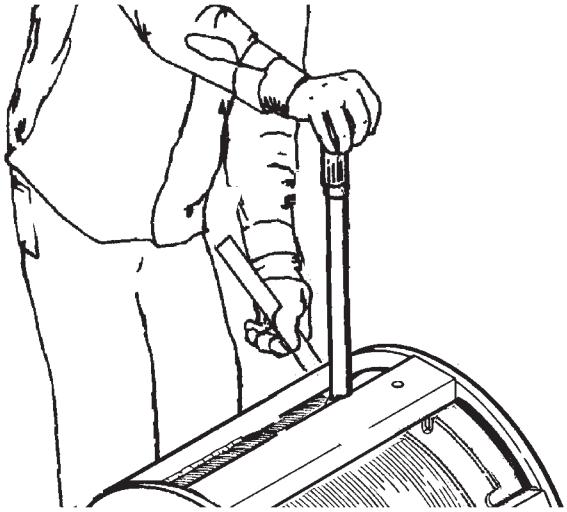
c. Use a long-handled, reversible ratchet drive fitted with a 5/16-inch Allen wrench to remove one coupling screw. Examine the screw. Screws specified for this coupling are Hobart Part No. 181166, which are socket-head, self-locking, 3/8 - 24 X 1 inch long.

NOTE: Use of the proper coupling screws for replacement is very important. Replacement screws **MUST** be those specified above, torqued to 40 - 45 foot-pounds (54 - 61 Nm). There is **NO ACCEPTABLE SUBSTITUTE** for these screws.

d. Check the threads of the screw for stripping and replace it if the threads are stripped. If the screw is not stripped, reinstall it and torque it to 40 - 45 foot-pounds (54 - 61 Nm).

e. Repe**at** the steps b, c, and d above for the remaining seven screws.

f. Reinstall covers around housings.



Access to Coupling Screws (for removal and installation)

Figure 2

3. Disassembly

Removal of the flexible coupling is required for servicing the generator armature, generator bearings, or the coupling itself. To remove the coupling, for any reason, it is necessary to separate the engine and generator. Many mechanics prefer to remove the engine and generator as an assembly, and then separate them. Others may prefer to remove the engine or the generator separately to reach the coupling. However, separating the engine and generator while they are installed in the ground power unit is **VERY DIFFICULT** because of the limited working space.

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

a. Separate Engine and Generator

(1) Remove fuel tank and canopy components.

(2) Remove the sheet metal cover from around the generator housing and the flywheel housing.

(3) Attach a hoist to the generator housing.

(4) Use a long-handled, reversible ratchet drive fitted with a 5/16-inch Allen wrench to remove the screws which attach the flexible coupling disk to the engine flywheel.

(5) Support the rear of the engine with a jack stand.

(6) Remove the bolts and shock mounts attaching the generator housing to the frame.

(7) Remove the bolts attaching the generator housing to the engine flywheel housing.

(8) Separate the generator from the engine with the hoist and move it to a clear working area.

b. Remove Coupling Assembly *(Figure 3)*

(1) Using a socket wrench, remove all three of the 3/8-16 X 3/4 inch screws (3) that secure the bushing (1) to the hub of the fan and coupling assembly.

(2) To separate the bushing from the hub, lubricate two of the 3/8-16 X 3/4 inch screws and insert them into the threaded holes (4) in the bushing. With socket wrench, screw these screws into the bushing such that the bushing pops loose from the hub.

(3) Using a 3/16-inch Allen wrench, loosen the set screw (6) in the bushing to release pressure on the key (5).

(4) When the bushing (1) is loose in the hub, use a mallet to **GENTLY** tap the bushing out of the hub.

(5) Slide the coupling assembly off the shaft and remove the key (5).

(6) Using a 9/16-inch socket wrench, remove the screws which attach the flexible disks to the hub.

(7) Inspect the coupling assembly components carefully as follows:

a. Check for deformed fan blades and damage to the disk.

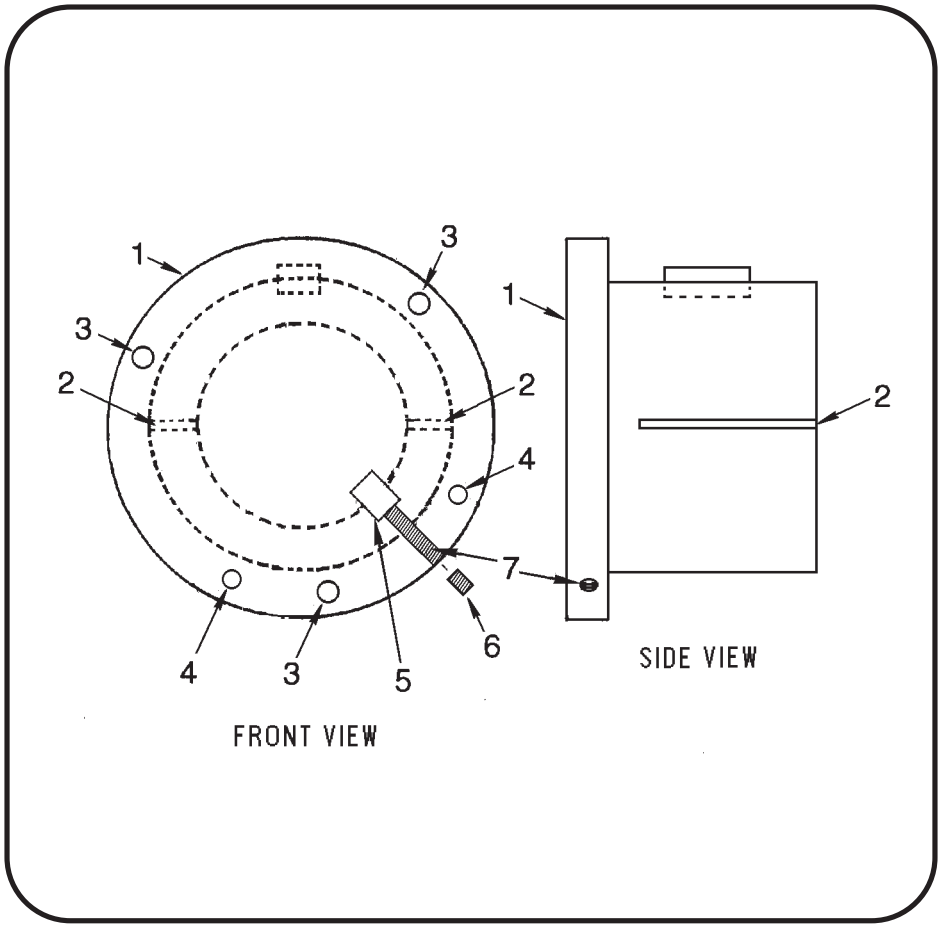
b. Check hub and split bushing for cracks, evidence of galling, and rust pits. Light rust is permissible on the split bushing and the tapered bore of the hub.

c. Check the flexible coupling disks for warping, cracks, or worn mounting holes.

d. Check the screws which attach the flexible disks to the hub. The screws are Hobart Part No. 181153, which are hex-head, self-locking 3/8 - 16 X 3/4 inch long. If they are cracked, stretched, have stripped threads, or the nylon pellet imbedded in the threads is worn or damaged, replace them.

NOTE: Use of the proper coupling screws and washers for replacement is very important. Replacement screws and washers **MUST** be those specified above, torqued to 40 - 45 foot-pounds *(54 - 61 Nm)*. There is **NO ACCEPTABLE SUBSTITUTE** for these screws or washers.

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



1. Bushing
2. Split
3. Mounting Holes (3)
4. Tapped holes (2)
5. Key
6. Setscrew
7. Tapped setscrew hole

Split Taper Bushing

Figure 3

4. Coupling Service

If you have any questions concerning your **Hobart Power Systems Group** equipment, you are invited to contact our **Service Department** by mail, telephone or FAX. When ordering coupling kits or other parts from your Hobart Brothers Company Distributor, be sure to include all pertinent information from the unit's identification plate: Specification No., Model No., and unit rating.

Write:	Hobart Brothers Company Airport Systems Group Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A
In U.S.A. Call:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
From Foreign Countries, Call:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
Fax:	(937) 332-5121

5. Coupling Installation and Reassembly of Engine and Generator

CAUTION

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

a. Cleaning *(Figure 4)*

It is **VERY IMPORTANT** that the shaft, the bore and the outside of the split bushing, and the tapered inside of the hub be thoroughly **CLEANED FREE OF DIRT AND GRIT.**

CAUTION

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

b. Assembly *(Figure 4)*

CAUTION

Use of the proper coupling screws is very important. Failure to use the proper screws, as outlined below, can result in coupling failure and damage to the generator set.

Proceed as follows to reassemble engine and generator.

(1) Using a 9/16-inch socket wrench, attach the four flexible disks to the coupling hub with the six hex-head 3/8 - 16 X 3/4 inch screws *(Hobart Part No. 181153)*. The screws must be torqued to 40 - 45 foot-pounds *(54 - 61 Nm)*.

(2) Attach the coupling assembly to the flywheel, using the socket-head 3/8 - 24 X 1 inch screws *(Hobart Part No. 181166)*. DO NOT tighten with a wrench. See Figure 4.

(3) Torque all of the coupling screws to 40 - 50 foot-pounds *(54 - 68 Nm)*. Be sure the flexible disks are all seated evenly into the seat of the flywheel.

(4) Install the key in the keyway of the armature shaft.

(5) Place the coupling bushing on the shaft of the armature, aligning the keyway of the bushing with the keyway of the shaft.

(6) Using a hoist, align the bushing to the coupling keyway and also the generator housing flange to the engine flywheel housing, and insert the attaching screws for the housing. Start the screws into the tapped holes just enough to ensure thread engagement. DO NOT TIGHTEN.

(7) Tighten the generator housing attaching screws at this time.

(8) Remove the bearing cap from the back of the generator assembly.

(9) Slide the armature rearward so that it extends approximately 1/8-inch out the back of the bearing housing. It may be necessary to use a bearing puller to break the bearing loose from the hub.

(10) Slide the coupling bushing forward until it is snug in the coupling hub.

CAUTION

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

(11) Lubricate the three 3/8-16 X 3/4 screws **SPARINGLY** and start them into the three *(unthreaded)* holes finger-tight. See Figure 4.

(12) Refer to Figure 2. Insert and hold a short iron bar through the flywheel housing against the fan blades of the fan and coupling assembly to block the armature against clockwise rotation. Do this carefully to avoid damaging the fan blades.

(13) Tighten the 3/8-16 X 3/4 screws alternately and evenly as follows:

a. Set a torque wrench to 30 foot-pounds *(41 N-m)* and tighten all three 3/8-16 screws to that value. As illustrated in Figure 2, insert and hold a short iron bar through the fan housing against the fan blades of the fan and coupling assembly to block the coupling against clockwise rotation. Do this carefully to avoid damaging the fan blades. Note that as these screws are tightened, the armature will be pulled back into the bearing hub.

b. Repeat step *(a)* above until 3/8-16 screws can no longer be tightened.

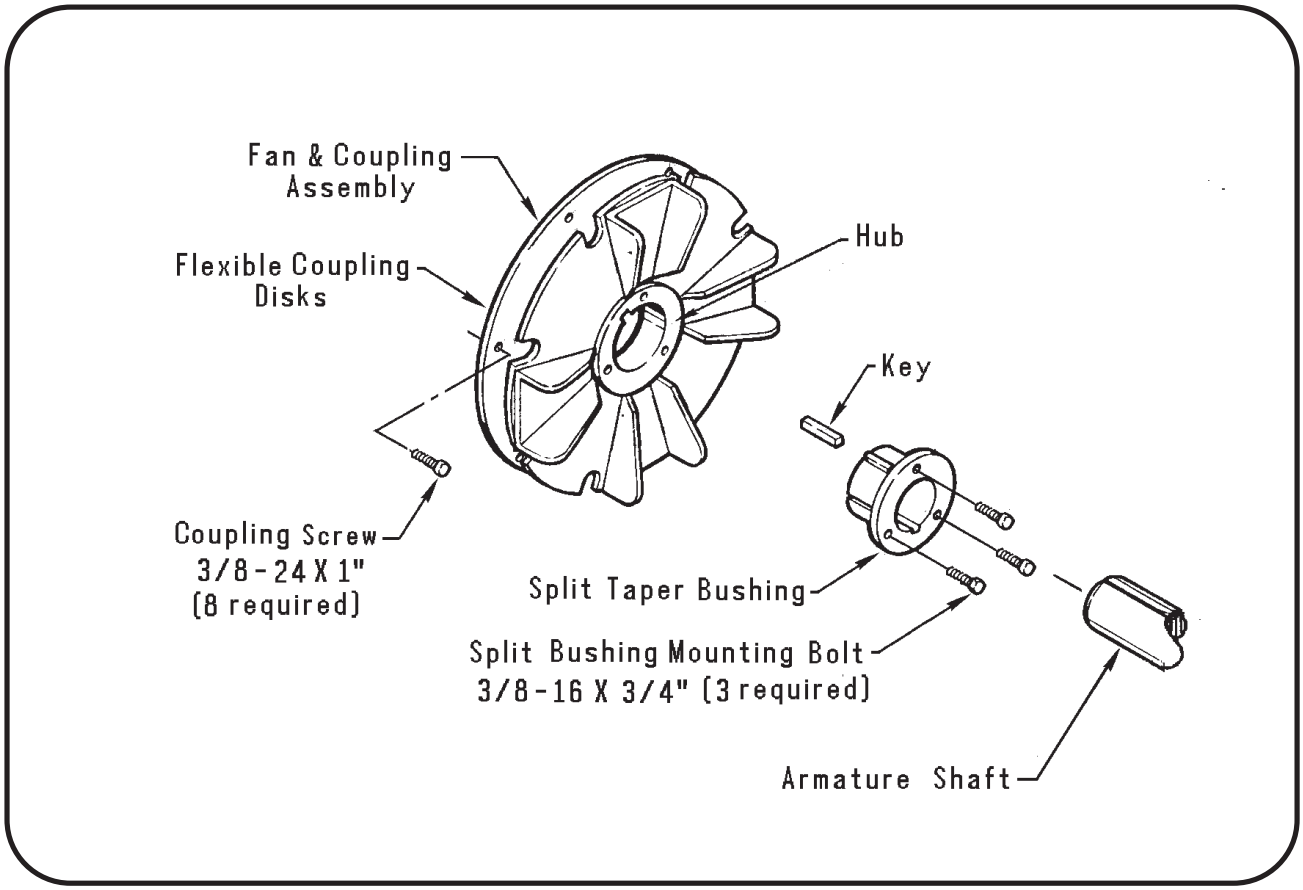
(14) Make certain that the armature is pulled slightly into the bearing hub *(so that it does not interfere with the bearing cap).*

(15) Using a 3/16-inch Allen wrench, tighten the set screw in the bushing to apply pressure on the key.

(16) Re-install the bearing cap that was removed in step *(8).*

(17) Re-install the generator housing cover and the flywheel housing cover.

(18) Re-install the fuel tank and canopy components.



Assembly Procedure Illustration

Figure 4

6. Run-in and Periodic Check

a. Mount the engine-generator assembly in a suitable test area and operate it for a 2-hour run-in.

b. Shut down the engine after 2 hours and re-torque all coupling screws to 40 - 45 foot-pounds *(54 - 61 Nm)* to compensate for normal torque relaxation.

c. Return the unit to normal service.

d. After 200 hours of operation, check all coupling screws and taper-lock bolts with a torque wrench set at 40 - 45 foot-pounds *(54 - 61 Nm)* .

e. Return the unit to normal service.

f. After each additional 2,000 hours of operation (or every year) recheck all coupling screws to maintain the same torque value.

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Chapter 4. Illustrated Parts List

Section 1. Introduction

1. General

The illustrated Parts List identifies, describes, and illustrates main assemblies, sub-assemblies, and detail parts of the **Jet-Ex 4D Generator Sets** manufactured by **Hobart Brothers Company, Power Systems Division, Troy, Ohio 45373.**

2. Purpose

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

3. Arrangement

CHAPTER 4 is arranged as follows:

Section 1 - Introduction

Section 2 - Manufacturer's Codes

Section 3 - Parts List Section 4 - Numerical Index

4. Explanation of Parts List

a. Contents

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

(1) ***Standard hardware items*** *(attaching parts)* such as nuts, screws, washers, etc., which are available commercially.

(2) Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available.

(3) Permanently attached parts which lose their identity by being welded, soldered, riveted, etc., to other parts, weldments, or assemblies.

b. Parts List Form

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

(1) "FIGURE-ITEM NO." Column

This column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on an illustration is connected to the part to which it pertains by a leader line. Thus the figure and item numbering system ties the parts list to the illustrations and vice versa. The figure and index numbers are also used in the numerical index to assist the user in finding the illustration of a part when the part number is known.

(2) “HOBART PART NUMBER” Column

ALL part numbers appearing in this column are Hobart numbers. In all instances where the part is a purchased item, the vendor’s identifying five-digit code and his part number will appear in the “Nomenclature” column. Parts manufactured by Hobart reflect no vendor code or part number in the “NOMENCLATURE” column.

(3) “NOMENCLATURE” Column

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

(4) “EFF”(Effective) Column

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

(5) “UNITS PER ASSEMBLY” Column

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

Section 2. Manufacturer's Codes

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

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

Code	Vendor's Name and Address
02231	**Anchor Rubber Company,** 840 S. Patterson Blvd. Dayton, Ohio 45402
04713	**Motorola Inc.**, Semiconductor Products Div. Phoenix, Arizona 85008
12293	**Leubbe Sales Co.**, 3832 Kettering Blvd., Dayton, OH 45439
13445	**Cole-Herse**, 20 Old Colony Ave. Boston, MA 02127
13446	**Perkins Engines**, Inc. 32500 Van Born Road Wayne, MI 48184
16476	**Datcon Instrument Co.**, P.O. Box 128, East Petersburg, PA 17520
44655	**Ohmite Mfg. Co.**, 3601 W. Howard St., Skokie, IL 60076
46992	**Phoenix Electric**, 3625 N. Halstead St., Chicago, IL 60613
5P059	**Tech Products Corp**, 2348 Sandridge Dr., Dayton, OH 45439
71400	**Bussman Division of McGraw-Edison Company**, 114 Old State Rd., St. Louis, Missouri 63178
74542	**Hoyt Electrical Instruments**, P.O. BOX 8798, Penacook, NH 03303
74559	**Carling Switch Co.,** 505 New Park Ave., West Hartford, CT 06110
78377	**SCP Inc.,** 9115 George Ave., Cleveland, OH 44105
78388	**Synchro-Start Products, Inc**., 8109 N. Lawndale Ave., P.O. Box 147 Skokie, IL 60076-9990
88136	**Trombetta Corp.**, 1633 E. North Ave., Milwaukee, WI. 53202
92489	**Attwood Corp**., 1016 Monroe Ave., Lowell MI, 49331
94177	**Modine Mfg. Co**., 1500 Dekoven Ave., Racine, WI 53401
94222	**Southco Inc.,** 210 N. Brinton Lk. Rd., Concordville, PA 19331

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Section 3. Parts List

1. Explanation of Parts List Arrangement

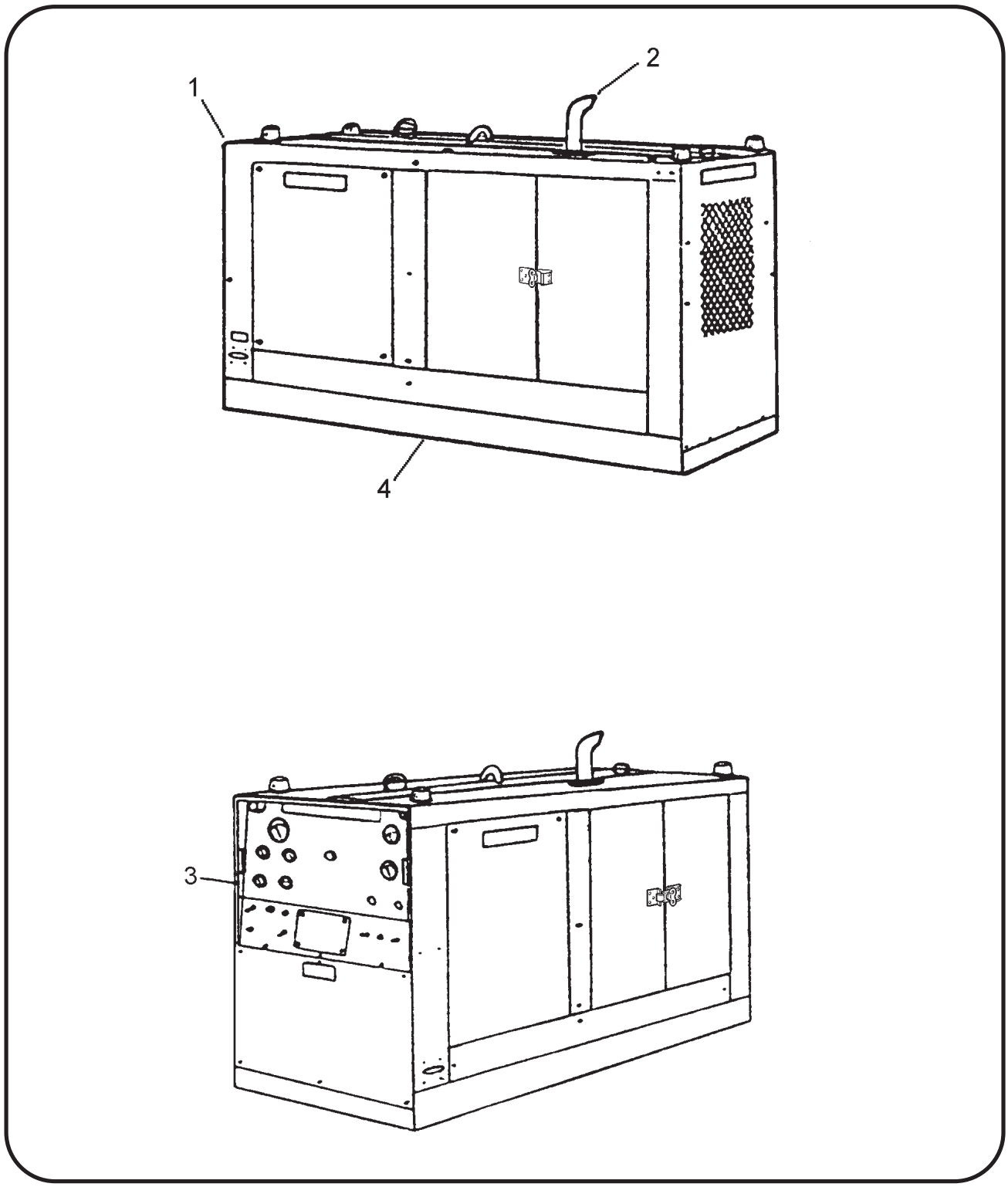
The parts list is arranged so that the illustration will appear on a left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

2. Symbols and Abbreviations

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

***** - item not illustrated
A, or AMP - ampere
AC - alternating current
AR - as required
DC - direct current
Fig. - Figure
hd. - head
hex - hexagon
Hz - Hertz *(cycles-per-second)*
I.D. - inside diameter
IN - inch
kVA - kilovolt-ampere
uF - microfarad
No. - number
OM - Owners Manual
PRV - peak reverse voltage
PSI - pounds per square inch
Ref - reference *(the item has been listed previously)*
TM - Technical Manual
v - volt *(when used as a prefix to a five-digit number, indicates vendor code)*

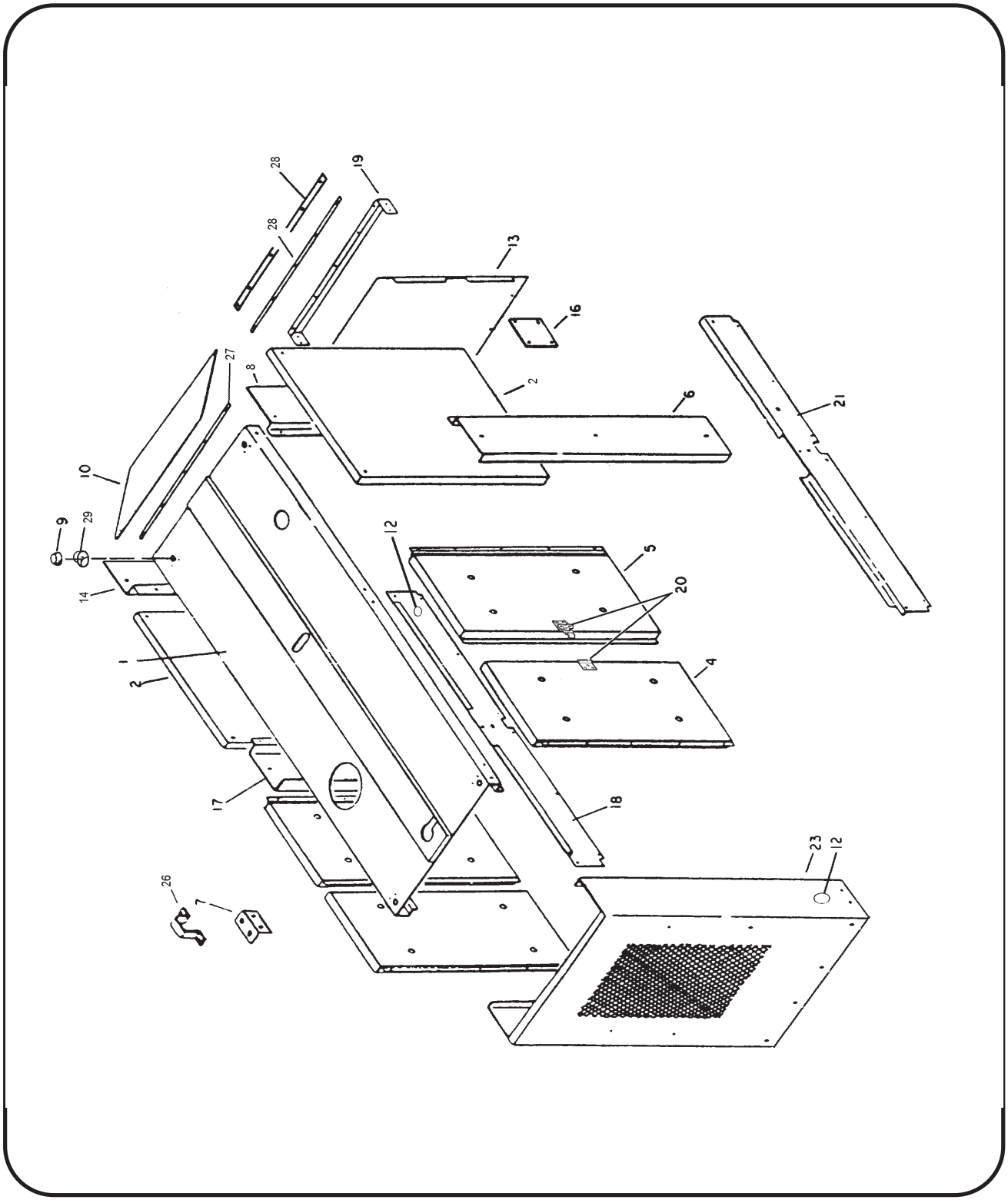
NOTE: An item which does not reflect an index number is an assembly which is not illustrated in its assembled state, or it is similar (right-hand, left-hand, top, etc.) to an item which is illustrated.



Generator Set Assembly
Figure 1

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
1-	**7003C-1**		**GENERATOR SET ASSEMBLY**	**A**	**REF**
1-	**7003C-2**		**GENERATOR SET ASSEMBLY, WITH SPECIAL MODS., FOR ISRAEL**	**B**	**REF**
1-	**7003C-3**		**GENERATOR SET ASSEMBLY, WITH SPECIAL MODS., FOR FED. EXPRESS**	**C**	**REF**
1-1	286924		. CANOPY ASSY *(See Fig. 2)*		REF
1-2	No Number		. GENERATOR SET INTERIOR COMPONENTS (ENGINE MODULE AY.) *(See Fig. 3)*		REF
1-3	282633		. PANEL, CONTROL ASSY, *(See Fig. 4)*		REF
1-4	No Number		. YOKE AND FRAME ASSY *(See Fig. 15)*		REF
* 1-5	79A-1127-2		. GUARD, FILLER NECK	A,C	1
* 1-6	282554-1		. KIT, REFLECTOR		1
* 1-7	181263		. LABEL, OPERATING INSTRUCTIONS		1
* 1-8	81B-1064		. LABEL, ENGINE DRIVE		1
* 1-9	400435		. LABEL, NAMEPLATE, 28V		1
* 1-10	283887		. NAMEPLATE, HOBART		3
* 1-11	78A-1000		. NAMEPLATE, ID		1
* 1-12	79A-1110		. NAMEPLATE, OPTION		1
* 1-13	283533		. LABEL, SUPPORT CENTERS		1
* 1-14	81B-1084		. LABEL, 28 VOLTS		1
* 1-15	351541		. LABEL, CAUTION - FAN		2
* 1-16	406001		. LABEL, DANGER - MOVING PARTS		2
* 1-17	405309		. LABEL, LUBE OIL FILTER		1
* 1-18	407366		. LABEL, CAUTION - INSUFFICIENT COOLING		1
* 1-19	81B-1063		. LABEL, HOT WATER & STEAM		1
* 1-20	76B-1148		. LABEL, DIESEL FUEL		1
* 1-21	406000		. LABEL, ENGINE FUEL		1
* 1-22	81B-1061		. LABEL, ELECTRIC SHOCK		1
* 1-23	282658		. LABEL, CLEARANCE		1
* 1-24	401842		. TAG, ATTENTION - ENGINE COOLANT		1
* 1-25	40201		. TAPE, SEALANT, NEOPRENE		150"
* 1-26	281991		. RETAINER, FUEL DRIP, AY.	B	1

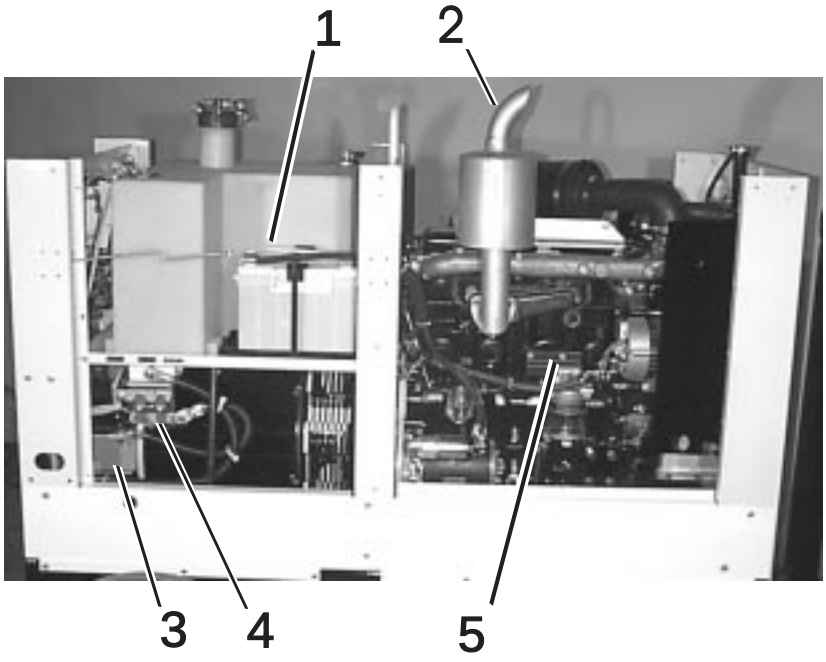
*** Not Illustrated**



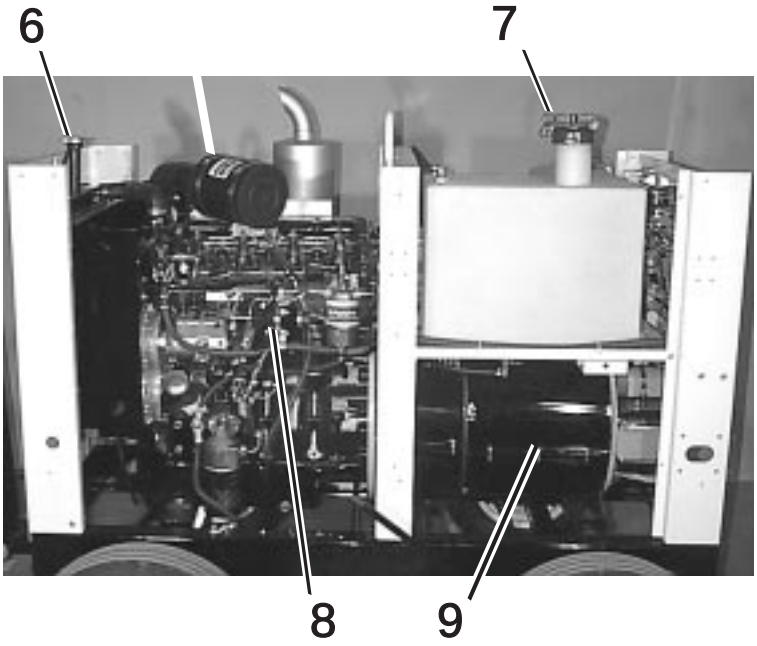
Canopy Assembly

Figure 2

	FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
	2-	**286924**		**CANOPY ASSY**		**1**
	2- 1	283734		. PANEL, TOP, A SSY.	A,C	1
		282641		. PANEL, TOP, ASSY.	B	1
	2- 2	286816		. PANEL, SIDE, UPPER REAR		2
*		402119-9		. . SCREW, 1/4-20 X 1-3/4		4
*		W-11254-4		. . WASHER, LOCK, 1/4		4
*		W-11242-5		. . WASHER, FLAT, 1/4		4
*		W-11280-2		. . NUT, HEX, 1/4-20		8
	2- 3					
	2- 4	282226		. DOOR, CANOPY, ASSY.		2
	2- 5	282225		. DOOR, CANOPY, ASSY.		2
	2- 6	489270		. PANEL, CENTER, LEFT, CANOPY		1
	2- 7	488640		. BRACKET, OUTPUT CABLE ASSY.		1
	2- 8	489167		. SUPPORT, CONTROL PANEL, LT. ASSY.		1
	2- 9	282732-1		. LIGHTS, CLEARANCE,	A,C	4
		6FW-3430A-5		. LIGHTS, CLEARANCE	B	4
	2- 10	283752		. COVER, CONTROLS ASSY.		1
*		287049-1		. . FASTENER, RETRACTABLE SCREW (V94222 #47-11-606-10)		2
*		W-11112-3		. . SCREW, #10-24 X 3/4		5
*		W-11245-3		. . WASHER, FLAT, #10		5
*		W-11254-3		. . WASHER, LOCK, #10		5
*		W-11287-4		. . NUT, HEX #10-24		5
	2-11					
	2-12	403091-9		. PLUG, HOLE, PLASTIC		2
	2-13	489235		. PANEL, LOWER REAR		1
	2-14	489168		. SUPPORT, CONTROL PANEL, RT ASSY.		1
	2-15					
	2-16	488799		. COVER, OUTPUT CABLES		1
*		402119-2		. . SCREW, 1/4-20 X 1/2		4
*		50MS-732-0		. . NUT, 1/4-20, KEPS		4
	2-17	489810		. PANEL, CENTER, RIGHT, CANOPY		1
	2-18	286872		. PANEL, SIDE, RIGHT LOWER		1
	2-19	489220		. SUPPORT, CONTROL PANEL		1
	2-20	30GHP-391		. LATCH, CANOPY (V94222 #K5-2812-07)		2
	2-21	286871		. PANEL, SIDE, LEFT LOWER		1
	2-22					
	2-23	282005		. PANEL, FRONT		1
	2-24					
	2-25	DELETED		.		
	2-26	7J-422-0		. CLAMP, OUTPUT CABLE		1
	2-27	180015		. STRAP, BACKUP, COVER CONTROLS		1
	2-28	181161		. STRAP, REINFORCING, HINGE		2
	2-29	286847		. GUARD, CLEARANCE LIGHT	A,C	4
*	2-30	DWP-982		. CABLE HANGER	B	2
*	2-31	283621		. HANDLE, GRIP		1



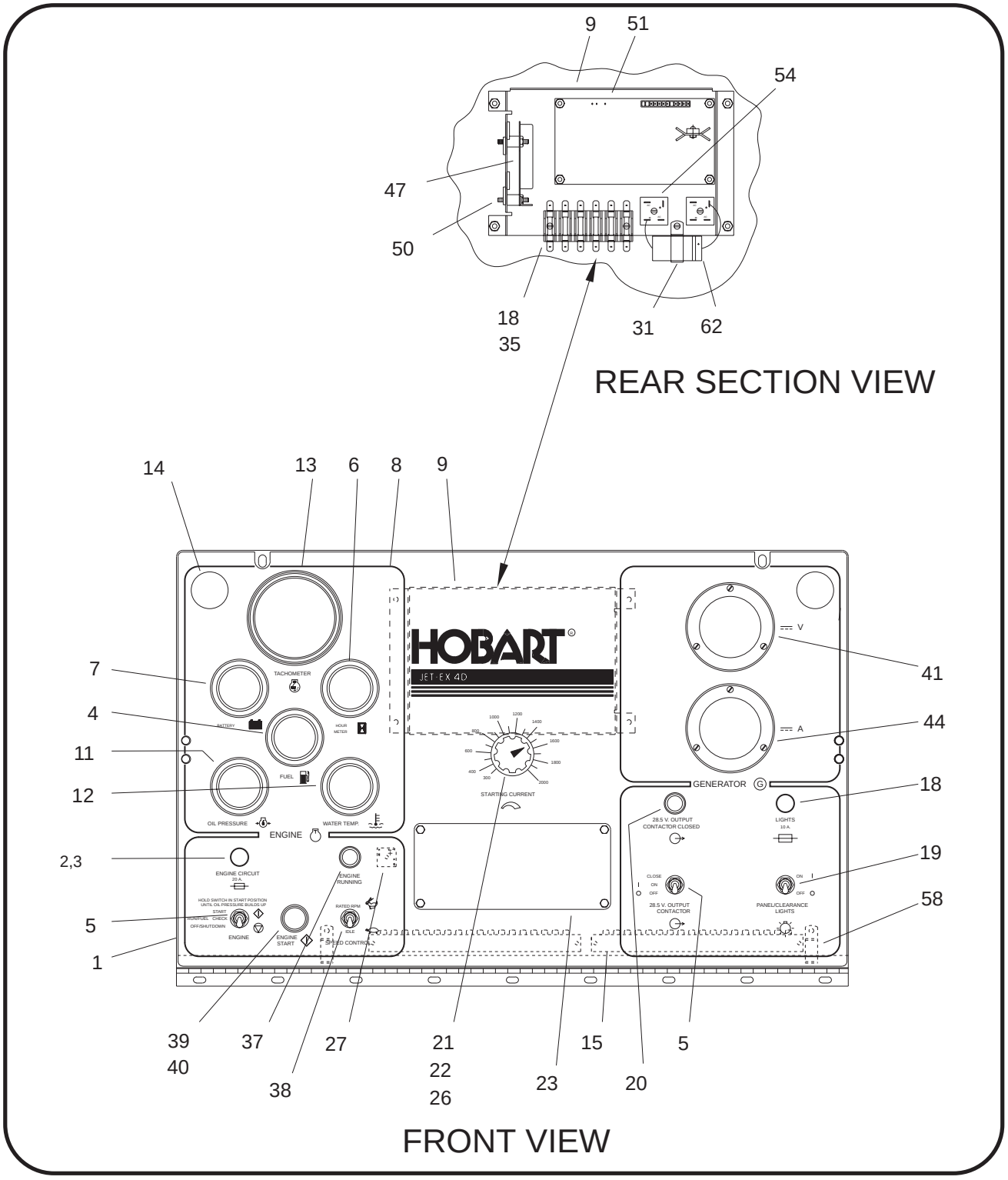
Generator Set Interior Components
(Right Side)
Figure 3A



Generator Set Interior Components
(Left Side)
Figure 3B

*** Not Illustrated**

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 67	EFF	QTY
3A & 3B	**No Number**		**GENERATOR SET INTERIOR COMPONENTS**		**REF**
3A- 1	No Number		. BATTERY COMPONENTS *(See Fig. 5)*		REF
3A- 2	No Number		. MUFFLER & AIR CLEANER COMPONENTS *(See Fig. 6)*		REF
3A- 3	286848		. RECTIFIER ASSEMBLY *(See Fig. 7)*		REF
3A- 4	286810-1		. CONTACTOR, DC, 800 AMP *(See Fig. 8)*		REF
3A- 5	No Number		. ENGINE COMPONENTS *(See Fig. 9A & 9B)*		REF
3B- 6	No Number		. COOLING SYSTEM *(See Fig. 10)*		REF
3B- 7	No Number		. FUEL SYSTEM COMPONENTS *(See Fig. 11A & 11B)*		*REF*
3B- 8	282220		. SOLENOID, FULL THROTTLE ASSY. *(See Fig. 12)*		REF
3B- 9	281333		. GENERATOR ASSEMBLY *(See Fig. 13)*		REF



Control Panel Assembly
Figure 4

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
4-	**282633**		**CONTROL PANEL ASSY (For NHA See Fig. 1)**		**1**
4- 1	282632		. PANEL, CONTROL, ASSY.		1
4- 2	W-11166-5		. FUSE, AGC, 20A, V71400		1
4- 3	402658		. HOLDER, FUSE (V714OO #TYPE HKP-HH)		1
4- 4	494134-1		. GAUGE, FUEL, ELECTRIC, 12V		1
4- 5	403189		. SWITCH, TOGGLE,		1
4- 6	78A-1120-1		. GAUGE, HOURMETER (V16476 #56288)		1
4- 7	286699-1		. VOLTMETER, BATTERY (V16476 #06351-001)		1
4- 8	282639		. LABEL, CONTROL PANEL		1
4- 9	286812		. BRACKET, MOUNTING, CONTROLS		1
* 4-10	50MS-732-7		. . NUT, KEPS, #6-32		4
4-11	78A-1117-1		. GAUGE, OIL PRESSURE (V16476 #06340)		1
4-12	78A-1116-1		. GAUGE, WATER TEMP., (V16476 #06343)		1
4-13	408596-1		. TACHOMETER (V16476 #71076-00)		1
4-14	82B-1047		. LIGHT, PANEL, 12V,		2
4-15	401937-4		. BLOCK, TERMINAL, 20A.,		2
* 4-16	W-11245-2		. . WASHER, FLAT, #6		4
* 4-17	50MS-732-4		. . NUT, KEPS, #6-32		4
4-18	W-11166-3		. FUSE, AGC, 10A.		7
4-19	402662		. SWITCH, TOGGLE, DPST, (V74559 #2GK71-73)		1
4-20	180913-2		. LIGHT, PILOT, GREEN, 28V.		1
4-21	16DA-2162		. KNOB, RHEOSTAT, (V44655 #5150)		1
4-22	401428-1		. POTENTIOMETER, 10K OHM, 2W. (V44655, #CMU-1031)		1
4-23	286923		. COVER, 14V OPTION		1
* 4-24	5CW-3884-2		. . SCREW, #10-24 X 1/2		4
* 4-25	50MS-732-5		. . NUT, KEPS, #10-32		4
4-26	402663		. NUT, POTENTIOMETER, LOCK		1
4-27	407948		. RECIFIER, ISOLATED BASE		1
* 4-28	W-11245-2		. . WASHER, FLAT, #6, BRASS		1
* 4-29	W-11254-1		. . WASHER, LOCK, #6		1
* 4-30	W-11287-2		. . NUT, #6-32		1
4-31	W-10051-14		. CLAMP, WIRE, PLASTIC		1
* 4-32	W-11112-1		. . SCREW, #10-24 X 1/2		1
* 4-33	W-11245-3		. . WASHER, FLAT, #10, BRASS		1
* 4-34	W-11254-3		. . WASHER, LOCK, #10		1
4-35	405129-1		. BLOCK, FUSE		1
* 4-36	W-11221-1		. . SCREW, #6-20 X 3/8		2
4-37	180913-1		. LIGHT, PILOT, ENGINE, GREEN, 12V.		1
4-38	402682		. SWITCH, TOGGLE, 3 PDT (V74559, HLA-211-73)		1
4-39	30GH-1119		. SWITCH, PUSHBUTTON		1
4-40	406815		. BOOT, PUSHBUTTON SWITCH (V13445 #83280)		1
4-41	400642-3		. VOLTMETER, DC (V74542		1
* 4-42	W-11110-3		. . SCREW, #6-32 X 3/8		3
* 4-43	50MS-732-4		. . NUT, KEPS, #6-32		3

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FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
4-	**282633**		**CONTROL PANEL ASSY (Continued)**		**REF**
4-44	400641-12		. AMMETER (V74542		1
* 4-45	W-11110-3		. . SCREW, #6-32 X 3/8		3
* 4-46	50MS-732-4		. . NUT, KEPS, #6-32		3
4-47	180289		. BOARD, PC, OVERVOLTAGE, ASSY.		1
* 4-48	W-11245-15		. . WASHER, FLAT, #8 BRASS		3
* 4-49	50MS-732-1		. . NUT, KEPS, #8-32		3
4-50	84A-1075		. MOUNT, RUBBER (V5P059 #51083)		7
4-51	181022A-1		. BOARD, PC, REGULATOR		1
* 4-52	W-11245-15		. . WASHER, FLAT, #8 BRASS		4
* 4-53	50MS-732-1		. . NUT, KEPS, #8-32		4
4-54	404065-2		. RECTIFIER, SILICON (V04713 #5DA-10270-2)		2
* 4-55	W-11111-8		. . SCREW, #8-32 X 3/4,		2
* 4-56	W-11245-15		. . WASHER, FLAT, #8, BRASS		2
* 4-57	W-11254-2		. . WASHER, LOCK, #8		2
4-58	W-10051-13		. CLAMP, WIRE, PLASTIC		2
* 4-59	W-11245-3		. . WASHER, FLAT, #10		2
* 4-60	50MS-732-5		. . NUT, KEPS, #10-24		2
* 4-61	400828-1		. TIE, WIRE, PLASTIC		120
4-62	180593-3		. CAPACITOR, 100MFD, 350VDC		1
* 4-63	283754		. SUPPORT, COVER, CONTROLS		2
* 4-64	286815		. BRACKET, ROD SUPPORT		1
* 4-65	286811		. RETAINER, DOOR		1

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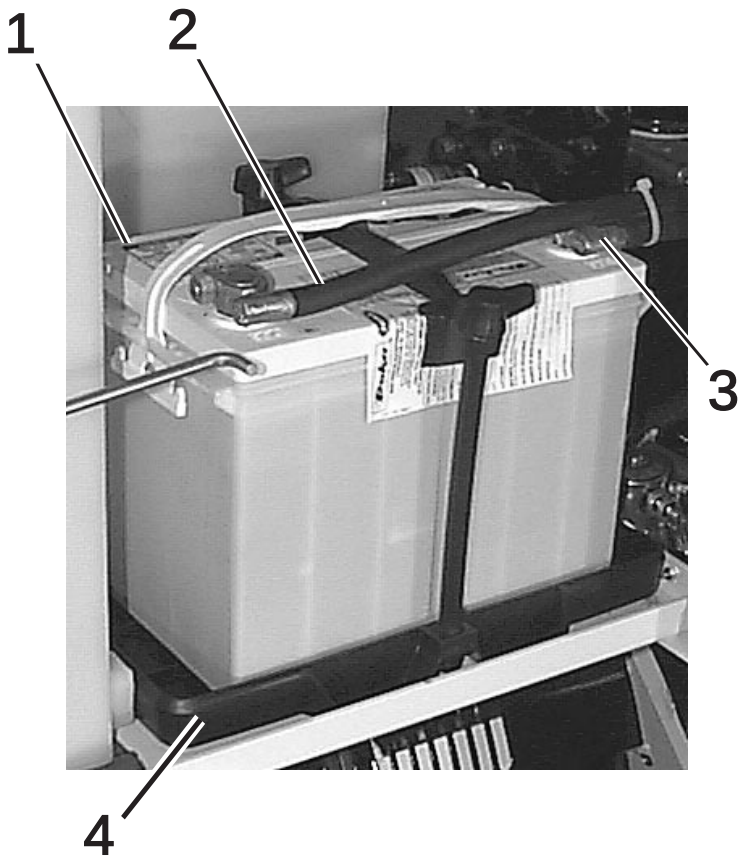
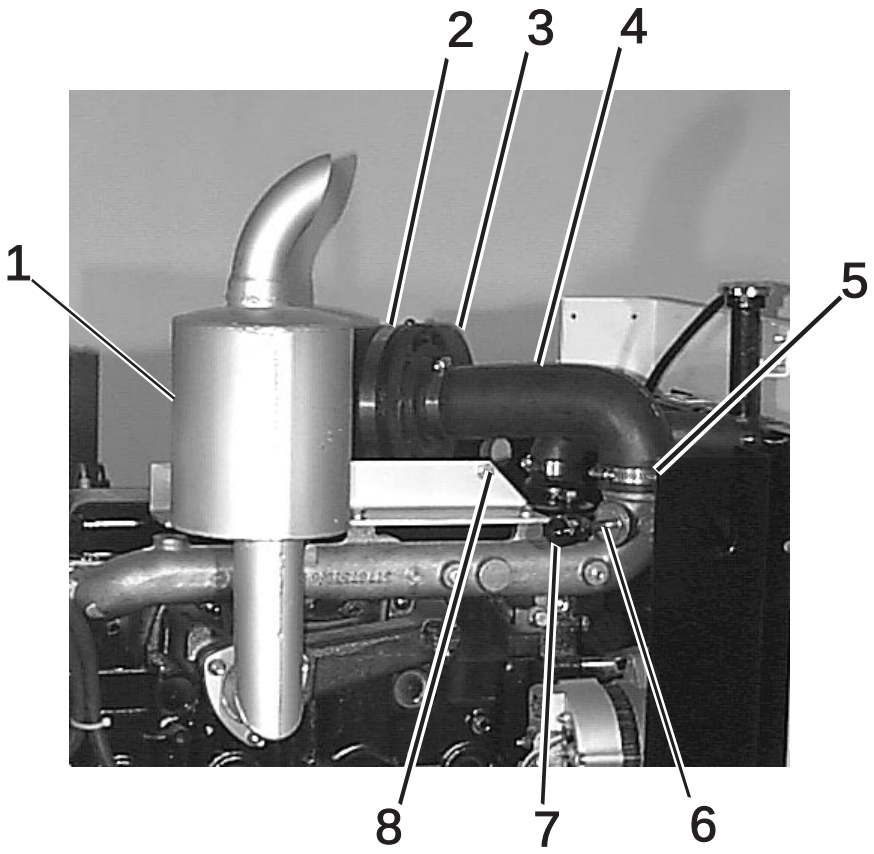


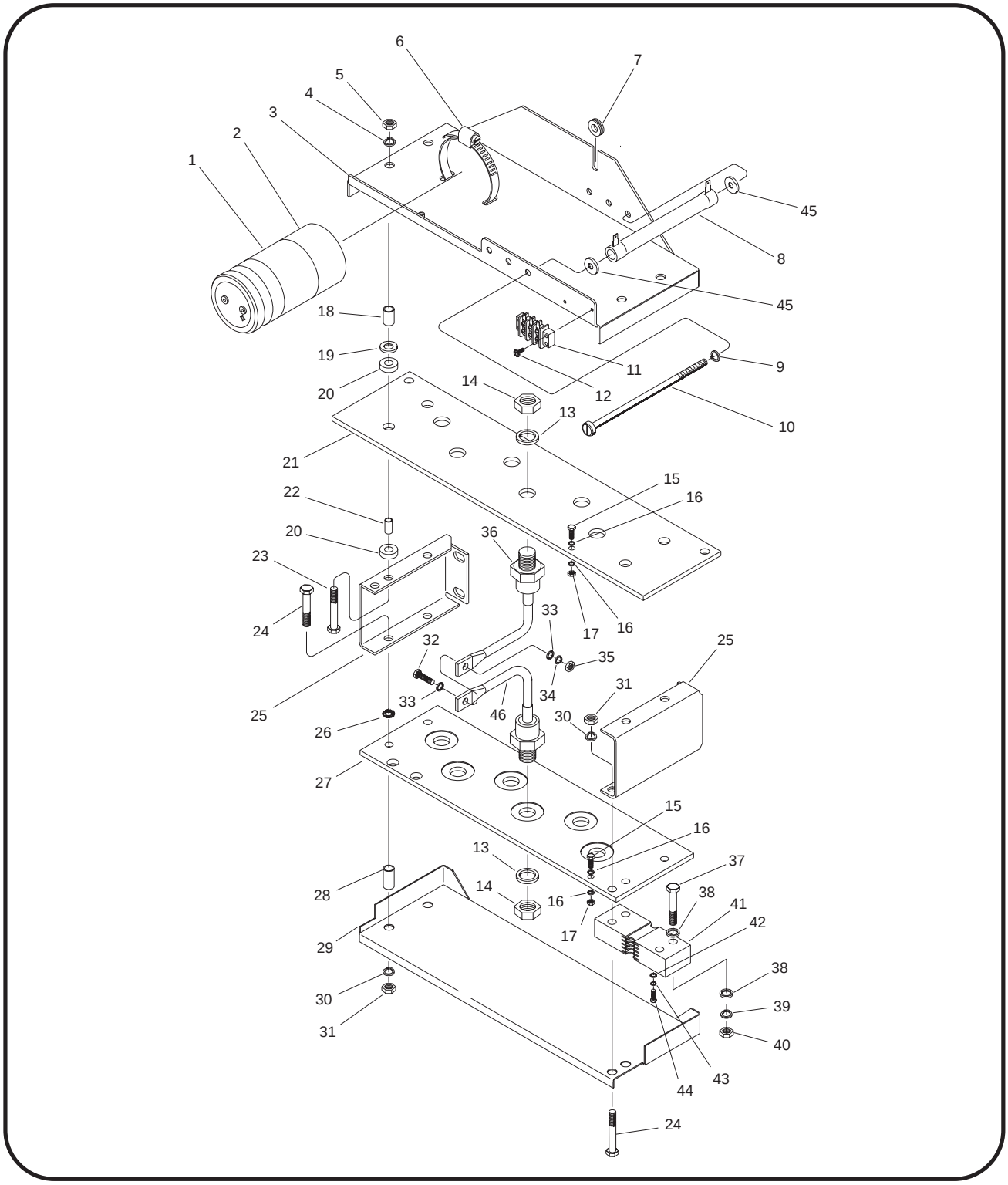
Battery Components
Figure 5

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
5-	No Number		BATTERY COMPONENTS		REF
5- 1	281881-1		. BATTERY, 12 V.		1
5- 2	388827-19		. BATTERY CABLE, POSITIVE, ASSY.		1
5- 3	388828-9		. BATTERY CABLE, NEGATIVE, ASSY.		1
5- 4	282784		. TRAY, BATTERY (V92489 #9091-1)		1



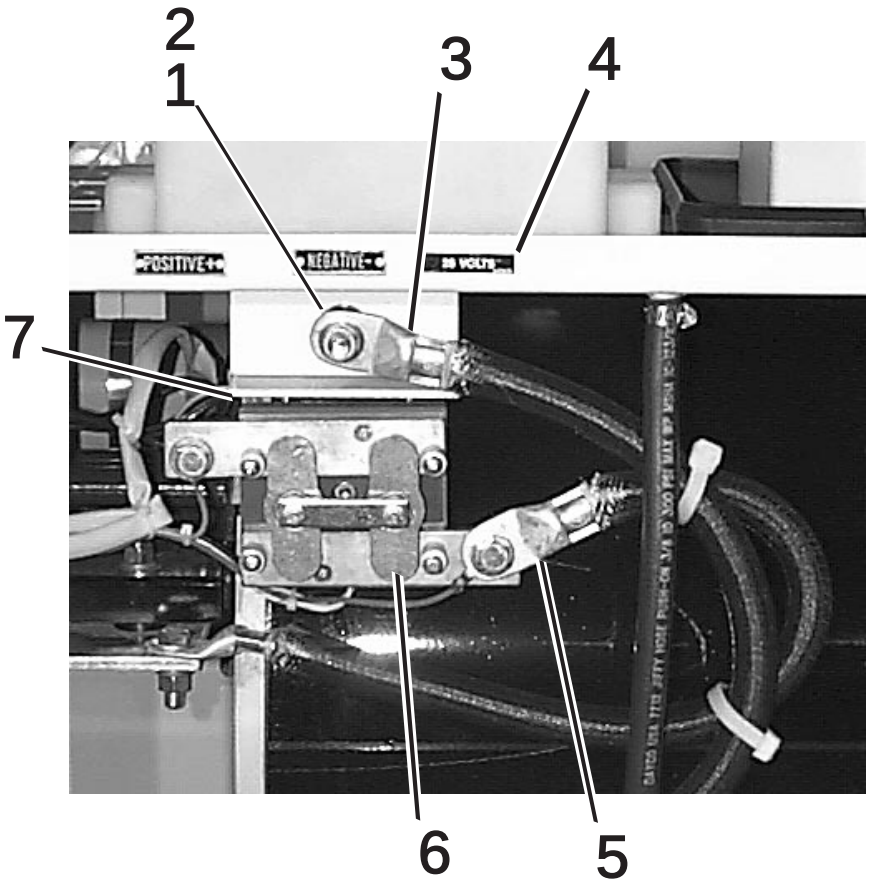
Muffler and Air Cleaner Components
Figure 6

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
6-	**No Number**		**MUFFLER AND AIR CLEANER COMPONENTS**		**REF**
6- 1	282388		. MUFFLER ASSEMBLY		1
6- 2	402433		. CLAMP, AIR CLEANER		2
6- 3	282569		. AIR CLEANER		1
6- 4	282571		. HOSE, AIR CLEANER		1
6- 5	W-10869-5		. CLAMP, HOSE, AIR CLEANER		2
6- 6	W-10750-3		. NIPPLE, PIPE, 1/8 X 2		1
6- 7	406768-1		. INDICATOR, AIR RESTRICTION		1
6- 8	282570		. BRACKET, AIR CLEANER		1



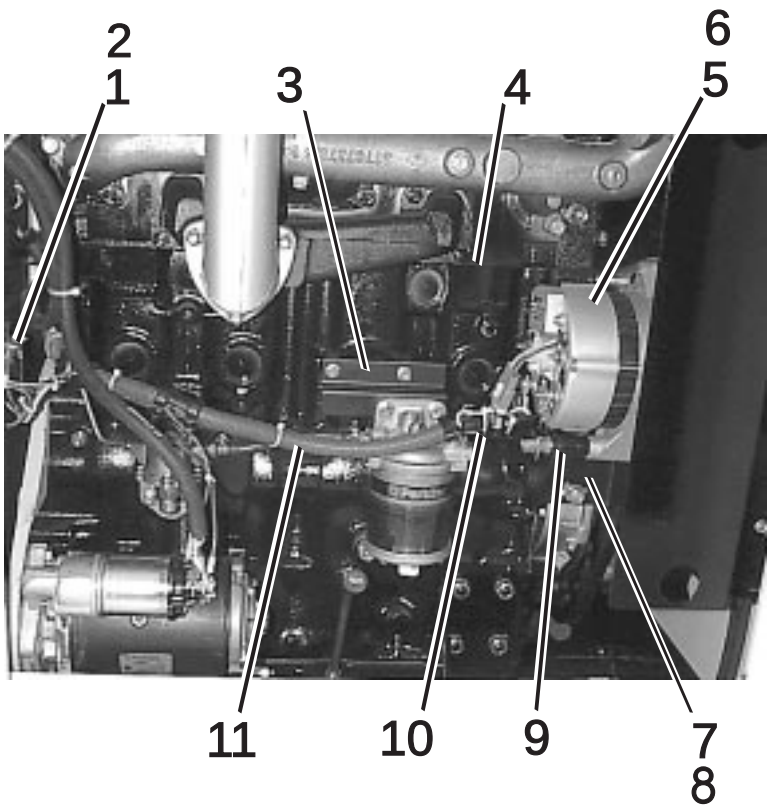
Rectifier Assembly
Figure 7

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
7 -	**286848**		**RECTIFIER ASSY.**		**1**
7 - 1	287184-3		. INSULATOR, CAPACITOR		1
7 - 2	405278-6		. CAPACITOR, 41000MFD, 75 VDC, V22751, #75-95		1
7 - 3	286887		. SHROUD, AIR, TOP, RECTIFIER		1
7 - 4	W-11254-6		. WASHER, LOCK, 3/8		4
7 - 5	W-11278-5		. NUT, HEX, 3/8-16		12
7 - 6	W-10869-6		. CLAMP, CAPACITOR		1
7 - 7	402037-4		. GROMMET, RUBBER (V02231 #ACW-5001)		1
7 - 8	405154-6		. RESISTOR, 10OHM, 100 WATT (V44655 #61917)		3
7 - 9	W-11254-4		. WASHER, LOCK, 1/4		3
7 -10	W-11114-12		. SCREW, 1/4-20 X 7-1/4		3
7 -11	400589-8		. BLOCK, TERMINAL, 3 STATION		1
7 -12	405117-2		. SCREW, #8-18 X 3/4		2
7 -13	494681-1		. WASHER, SPRING		12
7 -14	W-11280-15		. NUT, JAM, HEX, 3/4-16		12
7 -15	402119-4		. SCREW, HHC, 1/4-20 x 3/4"		2
7 -16	W-11242-5		. WASHER, FLAT, 1/4		4
7 -17	50MS-732-0		. NUT, KEPS, 1/4		2
7 -18	283063		. SPACER, RECTIFIER		4
7 -19	W-11242-18		. WASHER, FLAT, 3/8		8
7 -20	A-25		. WASHER, INSULATING		8
7 -21	286813		. HEAT SINK, RECTIFIER, POSITIVE		1
7 -22	AW-626		. BUSHING, INSULATING		4
7 -23	W-11097-22		. SCREW, HHC, 3/8-16 x 2-1/2"		4
7 -24	W-11097-7		. SCREW, HHC, 3/8-16 x 2"		5
7 -25	286884		. BRACKET, MTG., HEAT SINK		2
7 -26	W-11263-6		. WASHER, LOCK, IET, 3/8		5
7 -27	282239		. HEAT SINK, RECTIFIER, NEGATIVE		1
7 -28	180600		. SPACER, SHROUD		3
7 -29	285647		. SHROUD, AIR, BOTTOM, RECTIFIER		1
7 -30	W-11254-6		. WASHER, LOCK, 3/8		5
7 -31	W-11278-5		. NUT, HEX, 3/8-16		5
7 -32	5CW-1308-0		. SCREW, 5/16-18 X 1-1/4		6
7 -33	W-11242-6		. WASHER, FLAT, 5/16		12
7 -34	W-11254-5		. WASHER, LOCK, 5/16		6
7 -35	W-11278-6		. NUT, HEX, 5/16-18		6
7 -36	W-10931-3		. RECTIFIER, POS., BASE (V12293 #IN4049)		6
7 -37	W-11097-7		. SCREW, HHC, 3/8-16 x 2"		1
7 -38	W-11242-10		. WASHER, FLAT, 3/8		2
7 -39	W-11254-6		. WASHER, LOCK, 3/8		1
7 -40	W-11278-5		. NUT, 3/8-16		1
7 -41	180065		. SHUNT, 2000 AMP		1
7 -42	W-11245-3		. WASHER, FLAT, #10		2
7 -43	W-11254-2		. WASHER. LOCK, #8		2
7 -44	W-11111-9		. SCREW, RHM, #8-32 x 1/4"		2
7 -45	16DA-3493		. WASHER, INSULATING		6
7 -46	W-10933-3		. RECTIFIER, SILICON, NEG. BASE		6



Contactor Components
Figure 8

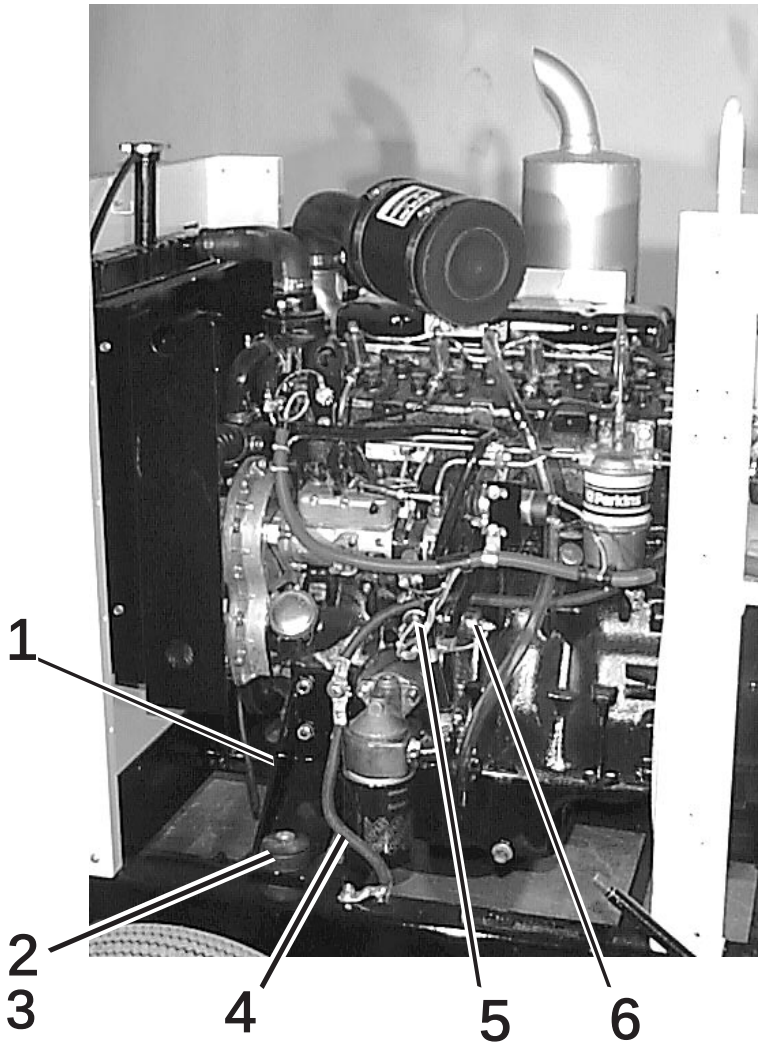
FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
8-	No Number		CONTACTOR COMPONENTS		REF
8- 1	A-25		. WASHER, INSULATING		2
8- 2	AW-626		. BUSHING, INSULATING		1
8- 3	W-9218-227		. CABLE, OUTPUT, NEGATIVE		1
8- 4	400435		. LABEL, 28 VOLTS		1
8- 5	W-9218-251		. CABLE, OUTPUT, POSITIVE		1
8- 6	286810-1		. CONTACTOR, DC, 800 AMP		1
8- 7	286849		. INSULATOR, CONTACT		1



Engine Components
(Right Side)
Figure 9A

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
9A-	No Number		ENGINE COMPONENTS (RIGHT SIDE)		REF
9A- 1	286850		. SOLENOID, STARTER CUT-OUT		1
9A- 2	407948		. RECTIFIER, SOLENOID, STARTER CUT-OUT		1
9A- 3	359985		. BRACKET, FUEL FILTER MOUNTING		1
9A- 4	408409		. ENGINE (V13446 #LD70195)		1
9A- 5	405015		. ALTERNATOR		1
* 9A- 6	405099		. FAN, ALTERNATOR		1
9A- 7	181098		. BRACKET, ALTERNATOR MOUNTING		1
9A- 8	181099		. SPACER, BRACKET, ALTERNATOR		1
9A- 9	181100		. SPACER, SCREW, ALTERNATOR		1
9A- 10	492098		. BRACKET, SUPPORT, WIRE, ALTERNATOR		1
9A- 11	286925		. HARNESS, WIRE, ENGINE, ASSY.		1
* 9A-12	285795		. FILTER, FUEL/WATER, RACOR	C	1
* 9A-13	78B-1010		. WIRE, ALTERNATOR, W/DIODE		1

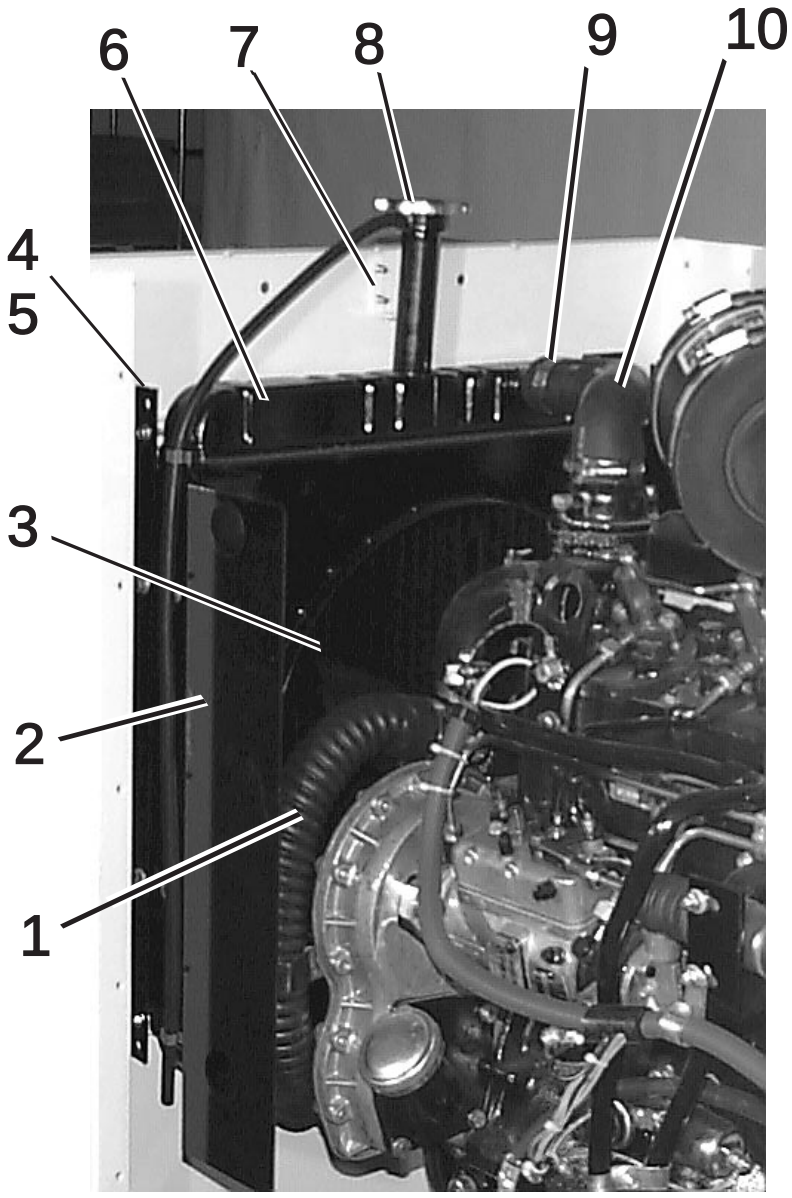
*** Not Illustrated**



Engine Components
(Left Side)
Figure 9B

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
9B-	No Number		ENGINE COMPONENTS (LEFT SIDE)		REF
9B- 1	489114		. SUPPORT, MOUNTING, ENGINE		2
9B- 2	406254-2		. MOUNT, SHOCK, ENGINE		2
9B- 3	491799		. WASHER, MOUNT, SHOCK		4
9B- 4	W-9360-229		. CABLE, ENGINE TO GROUND		1
9B- 5	403809-2		. SWITCH, OIL PRESSURE		1
9B- 6	78B-1118-1		. SENDER, OIL PRESSURE		1
* 9B- 7	W-10750-3		. NIPPLE, PIPE, 1/8" X 2		1
* 9B- 8	W-10910-0		. TEE, PIPE, BRASS, 1/8"		1

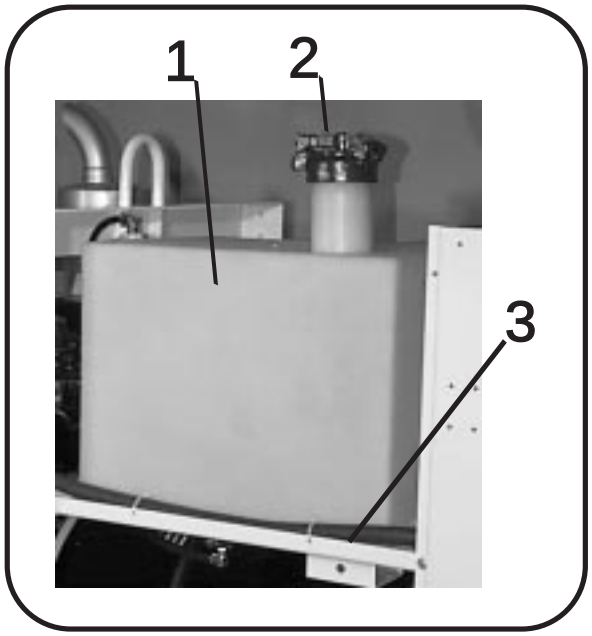
*** Not Illustrated**



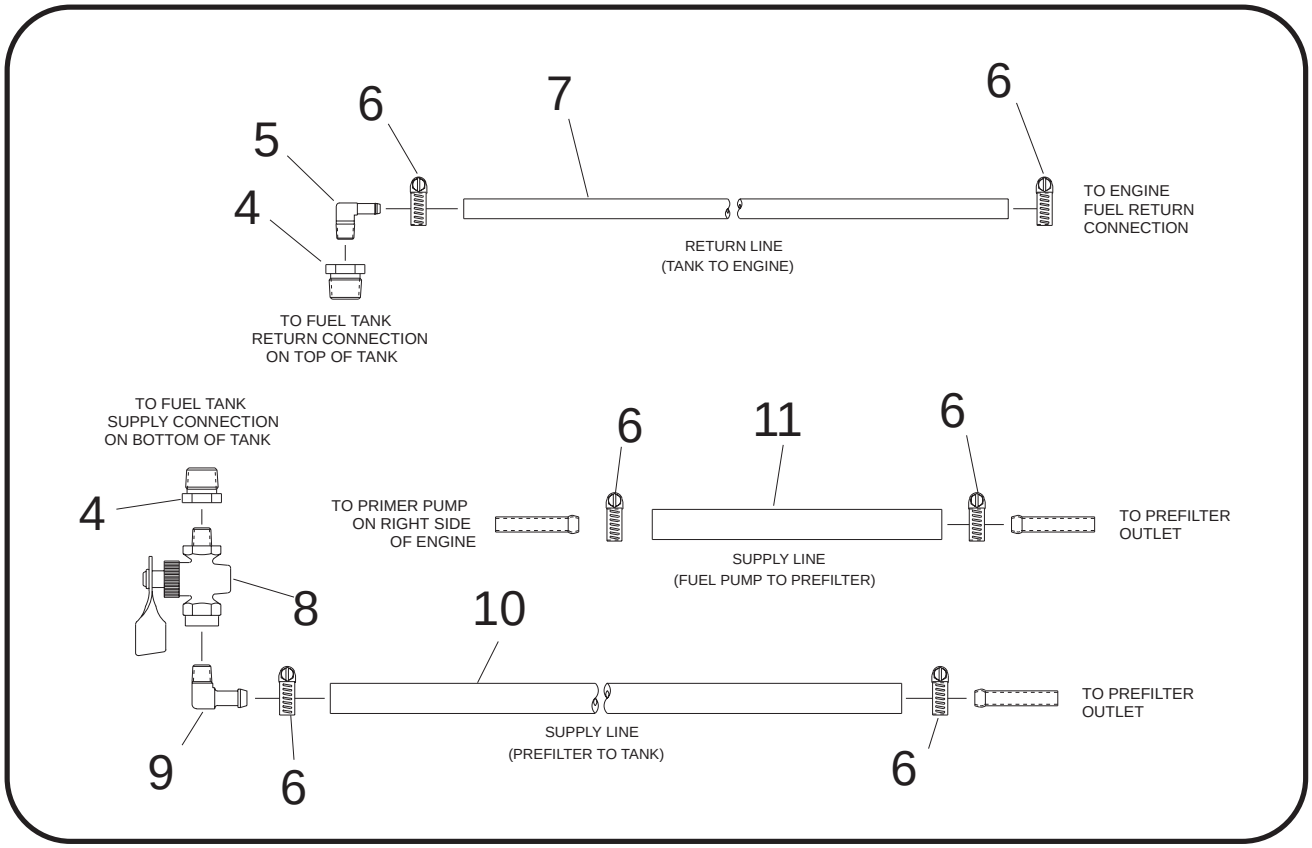
Cooling System Components
Figure 10

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
10 -	**No Number**		**COOLING SYSTEM COMPONENTS**		**REF**
10- 1	281874		. HOSE, RADIATOR, BOTTOM		1
*	80A-1117		. CLAMP, HOSE, BOTTOM		1
10- 2	489641		. GUARD, FAN, LEFT		1
*	489639		. GUARD, FAN, RIGHT		1
10- 3	406149		. FAN, ENGINE, 15"		1
10- 4	489122		. SUPPORT, RADIATOR		1
* 10- 5	489547		. BAFFLE, RADIATOR		2
10- 6	281423-1		. RADIATOR, PRESSURIZED (V94177 #1A15628D)		1
*	489121		. SHROUD, RADIATOR		1
10- 7	489533		. SUPPORT, RADIATOR NECK		1
*	W-10869-2		. CLAMP, RADIATOR, NECK		1
10- 8	405743		. CAP, RADIATOR, 7LB.		1
10- 9	W-10869-12		. CLAMP, HOSE, RADIATOR		3
10- 10	406655		. HOSE, RADIATOR, TOP		1
* 10- 11	W-10869-3		. CLAMP, HOSE, ENGINE OUTLET		1
* 10- 12	403618-6		. BELT, FAN		1
* 10- 13	403782-0		. SWITCH, WATER TEMP.		1
* 10- 14	78B-1119-1		. SENDER, WATER TEMP.		1
* 10- 15	W-7814-4		. BUSHING, PIPE, 3/8" X 1/2"		2
* 10- 16	5CW-1932-0		. DRAIN, BLOCK		1

*** Not Illustrated**



Fuel System Components
Figure 11A

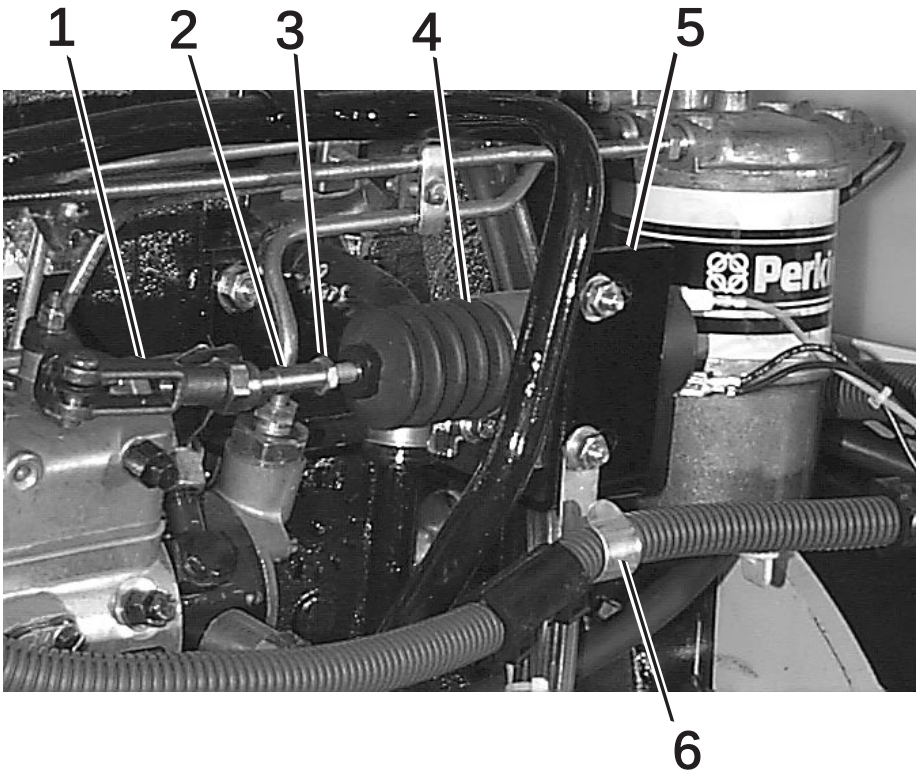


Fuel Lines
Figure 11B

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
11A-	**No Number**		**FUEL SYSTEM COMPONENTS**		**REF**
11A-1	282299		. TANK, FUEL ASSEMBLY	A,B	1
	282257		. . TANK, FUEL	A,B	1
	486719-010		. . SENDER, FUEL	A,B	1
*	286938		. TANK, FUEL ASSEMBLY	C	1
	486719-10		. . SENDER, FUEL	C	1
*	284203		. PLATE, MTG., FUEL TANK		5
11A-2	282562		. FUEL CAP, GREEN		1
11A-3	282699		. SUPPORT, FUEL TANK		1
11B-	**282717**		**. FUEL LINES**		**REF**
11B-4	W-7814-1		. BUSHING, PIPE, 1/8 X 3/8		2
11B-5	282734		. ELBOW, MALE, 90DEG.		1
11B-6	W-10869-14		. CLAMP, HOSE		6
11B-7	491889-5		. HOSE, RUBBER, 3/16 I.D.		1
11B-8	402265		. VALVE, SHUT-OFF, 1/4 TURN		1
11B-9	405091-1		. ELBOW, MALE, BARBED, 90DEG.		1
11B-10	355325-4		. HOSE, RUBBER, 5/16 I.D.		1
11B-11	355325-6		. HOSE, RUBBER, 5/16 I.D.		1

486719-010 Fuel Sender

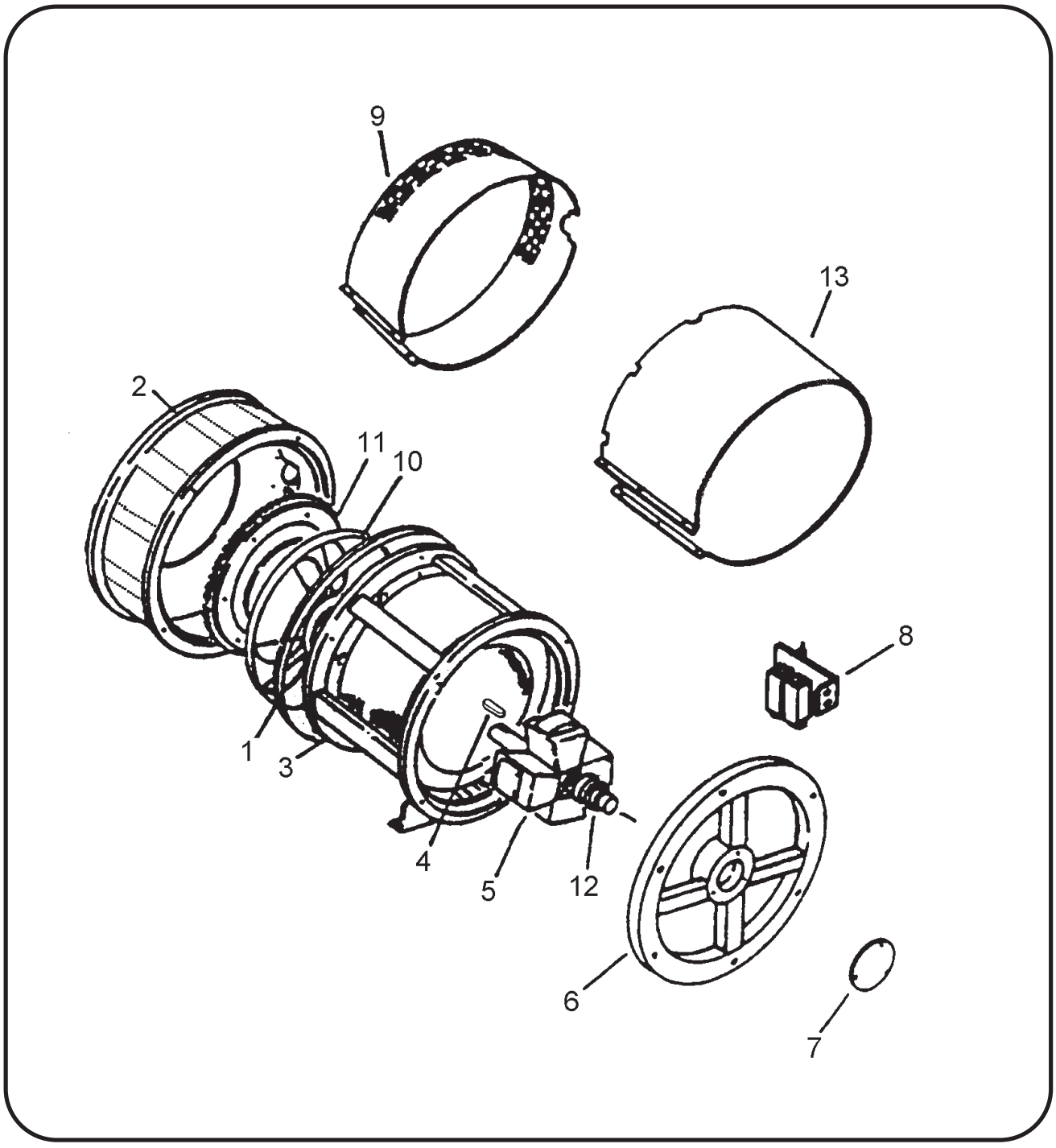
*** Not Illustrated**



Full Throttle Solenoid Assembly
Figure 12

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
12-	**282220**		**FULL THROTTLE SOLENOID ASSY.**		**1**
12- 1	12CW-2146		. YOKE, CLEVIS		1
12- 2	282218		. FITTING, SWIVEL (V78388 #SA-4049)		1
12- 3	W-11280-3		. NUT, 1/4-28, HEX		1
12- 4	282217		. SOLENOID (V88136 #D610-A1V12)		1
12- 5	282219		. SUPPORT, SOLENOID		1
12- 6	482496-1		. CLAMP, WIRE		1
* 12- 7	W-11563		. PIN, CLEVIS		1
* 12- 8	W-11337-1		. PIN, COTTER		1

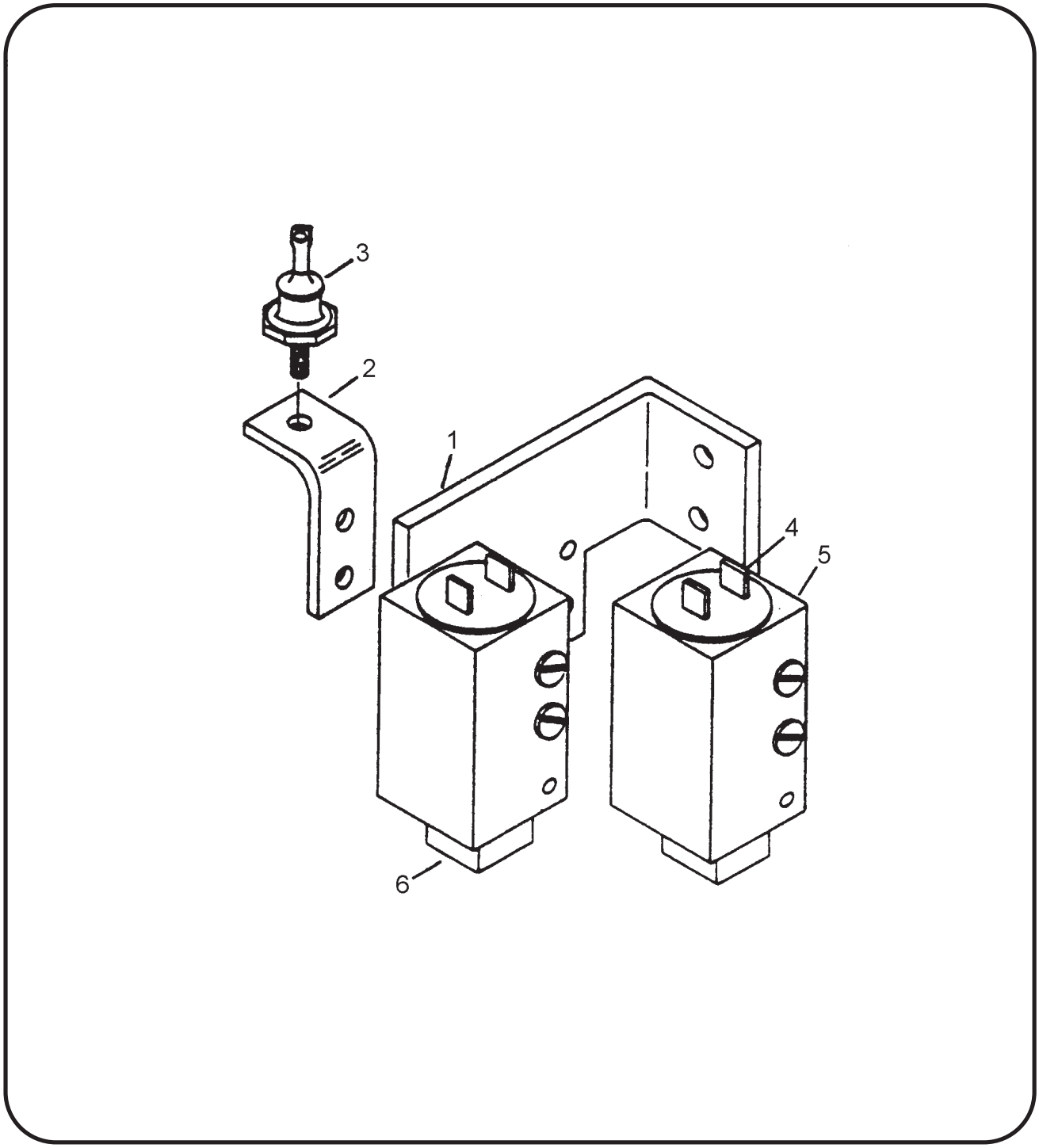
*** Not Illustrated**



Generator Assembly
Figure 13

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
13-	**284575**		**GENERATOR, ASSY.**		**1**
13- 1	491784		. RING, ADAPTER		1
13- 2	489077-1		. FLYWHEEL HOUSING		1
13- 3	488557-5		. HOUSING & STATOR ASSY.		1
13- 4	489135		. KEY, COUPLING		1
13- 5	180776		. ARMATURE, ASSY.		1
13- 6	488555-1		. HOUSING, BEARING ASSY.		1
13- 7	5J-260-0		. CAP, BEARING		1
13- 8	488784		. BRUSHHOLDER ASSY. *(For Details See Fig. 14)*		1
13- 9	489086		. COVER, FLYWHEEL HOUSING		1
13-10	489125		. COUPLING, GEN. TO GEN. ASSY.		1
*	181166		. . SCREW, CAP, HH, 3/8-24 X 1, NYLOK		8
*	W-11254-5		. . WASHER, LOCK, STD., 3/8		8
*	85C-1004-2		. . BUSHING, SPLIT TAPER		1
13-11	No Number		. FLYWHEEL - *(Supplied w/Engine)*		REF
13-12	354592		. RING, SLIP		2
13-13	281688		. COVER, GENERATOR HOUSING		1
* 13-14	402037-34		. GROMMET		2
* 13-15	284507		. PANEL, GROMMET		1
* 13-16	W-10072-063		. BEARING		1

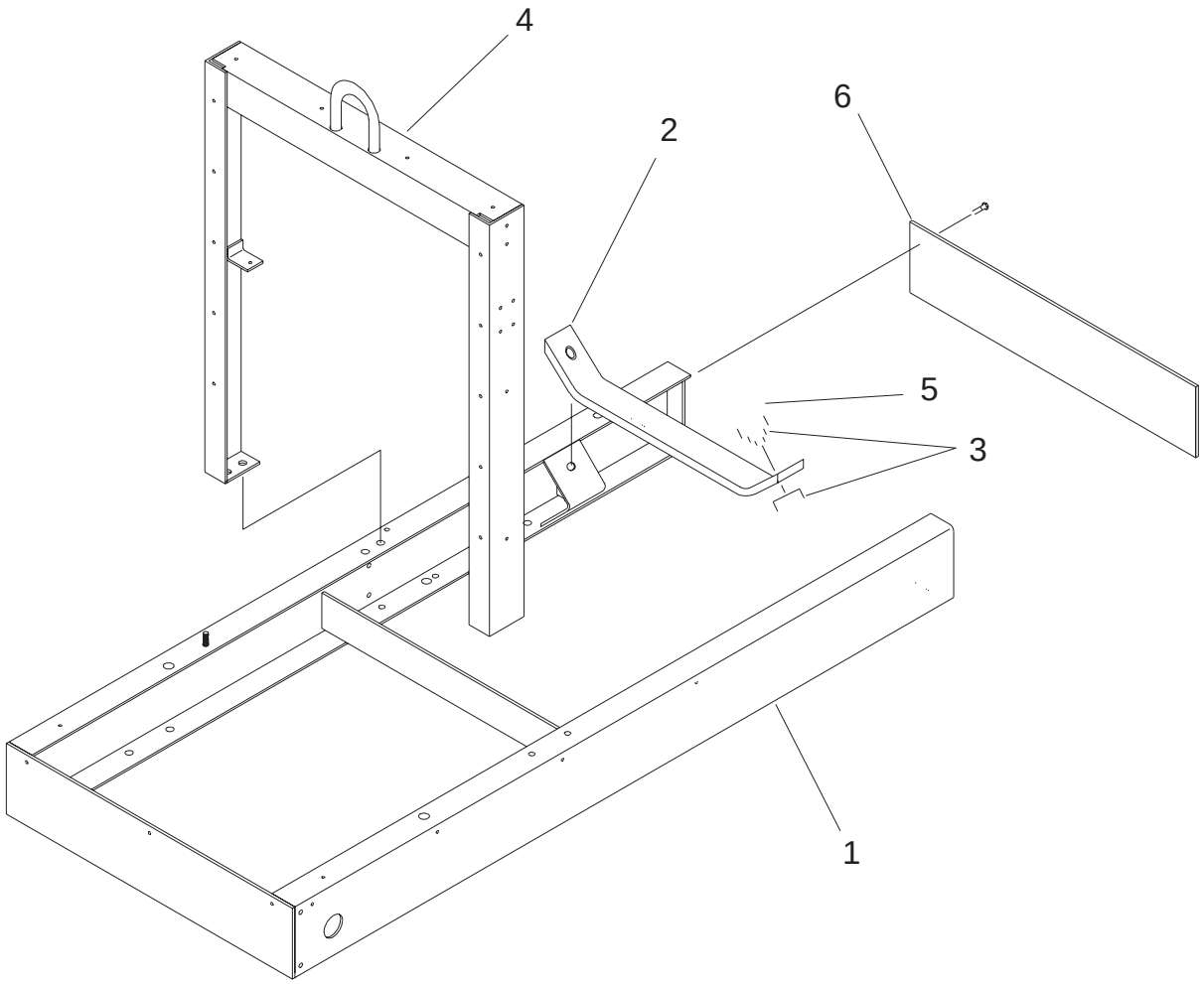
*** Not Illustrated**



Brush-Holder Assembly
Figure 14

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
14 -	**488784**		**BRUSHHOLDER ASSEMBLY**		**REF**
14- 1	488562		. BRACKET, MTG., BRUSHHOLDER		1
14- 2	488628		. BRACKET, MTG, DIODE		1
14- 3	489658-010		. DIODE, SILICON, 30A, POS. ASSEMBLY		1
14- 4	402531		. CAP, BRUSHHOLDER, (V46992 #DE-55)		2
14- 5	402530		. GUIDE, BRUSHHOLDER, (V46992 #661-D-23)		2
14- 6	402788		. BRUSH, A.C., (V78377 #443E)		2

*** Not Illustrated**



Frame Assembly
Figure 15

FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6 7	EFF	QTY
15 -	**No Number**		**FRAME, LIFTING YOKE ASSEMBLY**		**REF**
15- 1	282006		. FRAME, MOUNTING ASSEMBLY		1
15- 2	180543		. BAR, MTG., GENERATOR		1
15- 3	406254-3		. MOUNT, SHOCK, GENERATOR (RED)		2
15- 4	489203		. YOKE, LIFTING		1
15- 5	491799		. WASHER, SHOCK MOUNT		2
15- 6	282008		. PLATE, REAR		1

*** Not Illustrated**

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Section 4. Numerical Index

1. Explanation of Numerical Index

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

FIG-ITEM	PART NUMBER	FIG-ITEM	PART NUMBER
12-1	12CW-2146	12-	282220
4-21	16DA-2162	3B- 8	282220
7 -45	16DA-3493	2-5	282225
2-27	180015	2-4	282226
7 -41	180065	7 -27	282239
4-47	180289	11A-1	282257
15- 2	180543	11A-1	282299
4-62	180593-3	6-1	282388
7 -28	180600	1-6	282554-1
13- 5	180776	11A-2	282562
4-37	180913-1	6-3	282569
4-20	180913-2	6-8	282570
4-51	181022A-1	6-4	282571
9A- 7	181098	4- 1	282632
9A- 8	181099	4-	282633
9A- 9	181100	4-	282633
2-28	181161	1-3	282633
13-10	181166	4-8	282639
1-7	181263	2-1	282641
3B- 9	281333	1-23	282658
10-6	281423-1	11A-3	282699
13-13	281688	11B-	282717
10-1	281874	2-9	282732-1
5-1	281881-1	11B-5	282734
1-26	281991	5-4	282784
2-23	282005	7 -18	283063
15- 1	282006	1-13	283533
15- 6	282008	2-31	283621
12-1	282217	2-1	283734
12-1	282218	2- 10	283752
12-1	282219	4-63	283754

FIG-ITEM	PART NUMBER	FIG-ITEM	PART NUMBER
1-10	283887	4-41	400642-3
11A-1	284203	4-61	400828-1
13-15	284507	4-22	401428-1
13-	284575	1-24	401842
7 -29	285647	4-15	401937-4
9A-12	285795	1-25	40201
4-7	286699-1	13-14	402037-34
3A- 4	286810-1	7-7	402037-4
8-6	286810-1	2-16	402119-2
4-65	286811	7 -15	402119-4
4-9	286812	2-2	402119-9
7 -21	286813	11B-8	402265
4-64	286815	6-2	402433
2-2	286816	14- 5	402530
2-29	286847	14- 4	402531
3A- 3	286848	4-2	402658
7 -	286848	4-19	402662
8-7	286849	4-26	402663
9A- 1	286850	4-38	402682
2-21	286871	14- 6	402788
2-18	286872	2-12	403091-9
7 -25	286884	4-4	403189
7 - 3	286887	10- 12	403618-6
4-23	286923	10- 13	403782-0
1-1	286924	9B- 5	403809-2
2-	286924	4-54	404065-2
9A- 11	286925	9A- 5	405015
11A-1	286938	11B-9	405091-1
2-11	287049-1	9A- 6	405099
7 - 1	287184-3	7 -12	405117-2
4-39	30GH-1119	4-35	405129-1
2-20	30GHP-391	7-8	405154-6
1-15	351541	7 - 2	405278-6
13-12	354592	1-17	405309
11B-10	355325-4	10-8	405743
11B-11	355325-6	1-21	406000
9A- 3	359985	1-16	406001
5-2	388827-19	10-3	406149
5- 3	388828-9	9B- 2	406254-2
8- 4	400435	15- 3	406254-3
1-9	400435	10- 10	406655
7 -11	400589-8	6-7	406768-1
4-44	400641-12	4-40	406815

FIG-ITEM	PART NUMBER	FIG-ITEM	PART NUMBER
1-18	407366	7 -17	50MS-732-0
4-27	407948	4-49	50MS-732-1
9A- 2	407948	4-53	50MS-732-1
9A- 4	408409	4-17	50MS-732-4
4-13	408596-1	4-43	50MS-732-4
12-1	482496-1	4-46	50MS-732-4
11A-1	486719-010	4-25	50MS-732-5
11A-1	486719-10	4-60	50MS-732-5
13- 6	488555-1	4-10	50MS-732-7
13- 3	488557-5	7 -32	5CW-1308-0
14- 1	488562	10- 16	5CW-1932-0
14- 2	488628	4-24	5CW-3884-2
2-7	488640	13- 7	5J-260-0
13- 8	488784	2-9	6FW-3430A-5
14 -	488784	1-	7003C-1
2-16	488799	1-	7003C-2
13- 2	489077-1	1-	7003C-3
13- 9	489086	1-20	76B-1148
9B- 1	489114	1-11	78A-1000
10-6	489121	4-12	78A-1116-1
10-4	489122	4-11	78A-1117-1
13-10	489125	4-5	78A-1120-1
13- 4	489135	9A-13	78B-1010
2-8	489167	9B- 6	78B-1118-1
2-14	489168	10- 14	78B-1119-1
15- 4	489203	1-12	79A-1110
2-19	489220	1-5	79A-1127-2
2-13	489235	2-26	7J-422-0
2-6	489270	10-1	80A-1117
10-7	489533	1-22	81B-1061
10-5	489547	1-19	81B-1063
10-2	489639	1-8	81B-1064
10-2	489641	1-14	81B-1084
14- 3	489658-010	4-14	82B-1047
2-17	489810	4-50	84A-1075
13- 1	491784	13-10	85C-1004-2
15- 5	491799	7 -20	A-25
9B- 3	491799	8- 1	A-25
11B-7	491889-5	7 -22	AW-626
9A- 10	492098	8- 2	AW-626
4-3	494134-1	2-30	DWP-982
7 -13	494681-1	4-58	W-10051-13
2-16	50MS-732-0	4-31	W-10051-14

FIG-ITEM	PART NUMBER	FIG-ITEM	PART NUMBER
13-16	W-10072-063	4-28	W-11245-2
6-6	W-10750-3	2-11	W-11245-3
9B- 7	W-10750-3	4-33	W-11245-3
10-9	W-10869-12	4-59	W-11245-3
11B-6	W-10869-14	7 -42	W-11245-3
10-7	W-10869-2	4-29	W-11254-1
10- 11	W-10869-3	4-57	W-11254-2
6-5	W-10869-5	7 -43	W-11254-2
7-6	W-10869-6	2-11	W-11254-3
9B- 8	W-10910-0	4-34	W-11254-3
7 -36	W-10931-3	2-2	W-11254-4
7 -46	W-10933-3	7 - 9	W-11254-4
7 -23	W-11097-22	7 -34	W-11254-5
7 -24	W-11097-7	13-10	W-11254-5
7 -37	W-11097-7	7 -30	W-11254-6
4-42	W-11110-3	7 -39	W-11254-6
4-45	W-11110-3	7-4	W-11254-6
4-55	W-11111-8	7 -26	W-11263-6
7 -44	W-11111-9	7 -31	W-11278-5
4-32	W-11112-1	7 -40	W-11278-5
2-11	W-11112-3	7-5	W-11278-5
7 -10	W-11114-12	7 -35	W-11278-6
4-18	W-11166-3	7 -14	W-11280-15
4	W-11166-5	2-2	W-11280-2
4-36	W-11221-1	12-1	W-11280-3
7 -38	W-11242-10	4-30	W-11287-2
7 -19	W-11242-18	2-11	W-11287-4
2-2	W-11242-5	12-1	W-11337-1
7 -16	W-11242-5	12-1	W-11563
7 -33	W-11242-6	11B-4	W-7814-1
4-48	W-11245-15	10- 15	W-7814-4
4-52	W-11245-15	8- 3	W-9218-227
4-56	W-11245-15	8- 5	W-9218-251
4-16	W-11245-2	9B- 4	W-9360-229

Chapter 5. Manufacturer's Literature

Section 1. Manufacturer's Listing

Perkins Users Handbook for 4.236 Series Diesel Engines:

Perkins Engines, Inc.
P.O. Box 697
32500 Van Born Rd.
Wayne, Michigan 48184

Hobart Diagrams:

Hobart Brothers Company
Power Systems Division
Troy, Ohio 45373

282654 - Connection and Schematic Diagram, Jet-Ex 4D, Series 7003C

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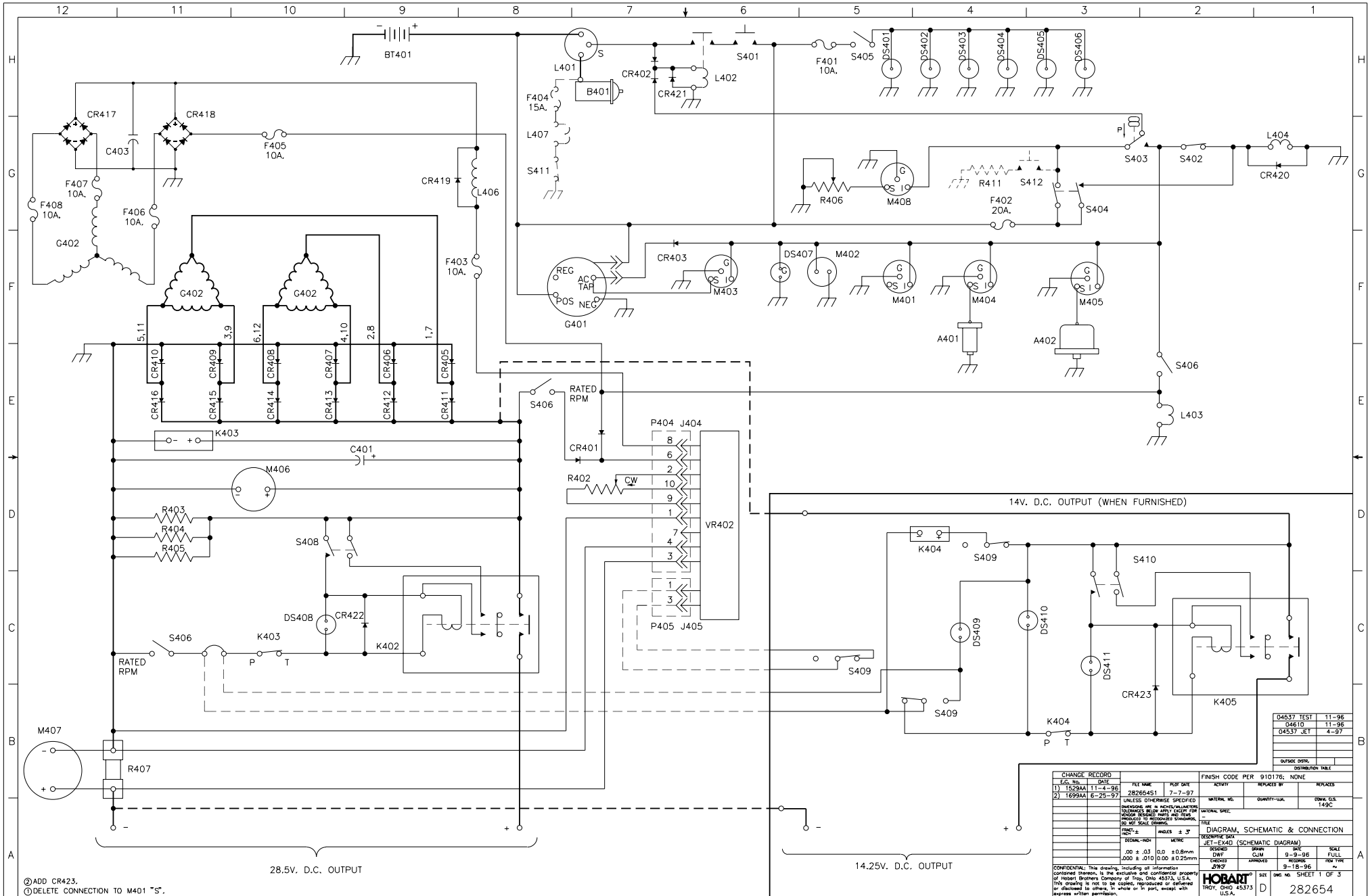


CHANGE RECORD			
E.C. No.	DATE	FILE NAME	PLOT DATE
1) 1529AA	11-4-96	282654S1	7-7-97
2) 1699AA	6-25-97		

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

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

FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY—U.M.	COMM. CLS. 149C

MATERIAL SPEC.: –

TITLE: DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA: JET-EX4D (SCHEMATIC DIAGRAM)

DESIGNED	DRAWN	DATE	SCALE
DWF	CJM	9-9-96	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
BWJ		9-18-96	~

HOBART TROY, OHIO 45373 U.S.A.

SIZE D | DWG. NO. 282654 | SHEET 1 OF 3

OUTSIDE DISTR. DISTRIBUTION TABLE	
04637 TEST	11-96
04610	11-96
04537 JET	4-97

LEGEND

A401	SENDER, WATER TEMPERATURE
A402	SENDER, OIL PRESSURE
B401	STARTER, ENGINE
BT401	BATTERY, 12 V.
C401	CAPACITOR, 41,000 MFD., 75 V.
C403	CAPACITOR, 100 MFD., 350 V.DC
CR401–CR402	RECTIFIER, BLOCKING
CR403	DIODE, BLOCKING
CR405–CR410	DIODE, NEGATIVE
CR411–CR416	DIODE, POSITIVE
CR417,CR418	RECTIFIER, CONTROL WINDING
CR419–CR422	DIODE, FLYBACK
DS401,DS402	LIGHT, ILLUMINATING, WHITE
DS403–DS406	LIGHT, MARKER, AMBER
DS407	INDICATOR, ENGINE RUNNING, GREEN
DS408	INDICATOR, CONTACTOR CLOSED, GREEN
F401	FUSE, LIGHTS, 10 A.
F402	FUSE, ENGINE CIRCUIT, 20 A.
F403	FUSE, VOLTAGE REGULATOR, 10 A.
F404	FUSE, COLD WEATHER START, 15 A. (WHEN FURN.)
F405	FUSE, VOLTAGE BUILD–UP, 10 A.
F406–F408	FUSE, CONTROL WINDINGS, 10A.
G401	ALTERNATOR, ENGINE, 12 V.
G402	GENERATOR STATOR
J404,J405	RECEPTACLE, VOLTAGE REGULATOR
K402	LOAD CONTACTOR
K403	RELAY, OVERVOLTAGE
L401	SOLENOID, STARTER
L402	SOLENOID, STARTER CUT–OUT
L403	SOLENOID, FULL THROTTLE
L404	SOLENOID, FUEL VALVE
L406	FIELD, REVOLVING, GENERATOR
L407	SOLENOID, VALVE, COLD WEATHER START (WHEN FURN.)

M401	VOLTMETER, BATTERY
M402	RUNNING TIME METER
M403	TACHOMETER
M404	GUAGE, WATER TEMPERATURE
M405	GUAGE, OIL PRESSURE
M406	VOLTMETER, GENERATOR
M407	AMMETER, GENERATOR
M408	GAUGE, FUEL, ELECTRIC
P404,P405	PLUG, VOLTAGE REGULATOR
R402	POTENTIOMETER, CURRENT LIMITING, 10 K.OHM, 2W.
R403–R405	RESISTOR, 10 OHM, 100W.
R407	SHUNT, AMMETER
R408	SENDER, GAUGE, FUEL, ELECTRIC
R411	GLOW PLUG, THERMOSTART (WHEN FURN.)
S401	SWITCH, PUSHBUTTON, ENGINE START
S402	SWITCH, WATER TEMPERATURE
S403	SWITCH, OIL PRESSURE
S404	SWITCH, ENGINE, START–RUN–STOP
S405	SWITCH, ILLUMINATING LIGHTS
S406	SWITCH, SPEED CONTROL (SHOWN IN "IDLE" POSITION)
S408	SWITCH, CONTACTOR, CLOSE–ON–OFF
S411	SWITCH, ENGINE TEMP. SENSOR (WHEN FURN.)
S412	SWITCH, PUSHBUTTON, THERMOSTART (WHEN FURN.)
VR402	VOLTAGE REGULATOR, GENERATOR

14V. D.C. OUTPUT (WHEN FURNISHED)

CR423	DIODE, FLYBACK
DS409	INDICATOR, 28V. MODE, AMBER
DS410	INDICATOR, 14V. MODE, BLUE
DS411	INDICATOR, CONTACTOR CLOSED, GREEN
K404	RELAY, OVERVOLTAGE
K405	LOAD CONTACTOR
S409	SWITCH, MODE, 28/14V. (SHOWN IN 14V POSITION)
S410	SWITCH, CONTACTOR, CLOSE–ON–OFF

① ADD CR423.

CHANGE RECORD	
E.C. No.	DATE
1) 1699AA	6-25-97

FILE NAME	PLOT DATE
282654S2	7-7-97

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

04537 JET	6-97	
04537 TEST	6-97	
04610	6-97	
OUTSIDE DISTR.		
DISTRIBUTION TABLE		

FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY–U.M.	COMM. CLS
		149C

MATERIAL SPEC.

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA
JETEX 4D (LEGEND)

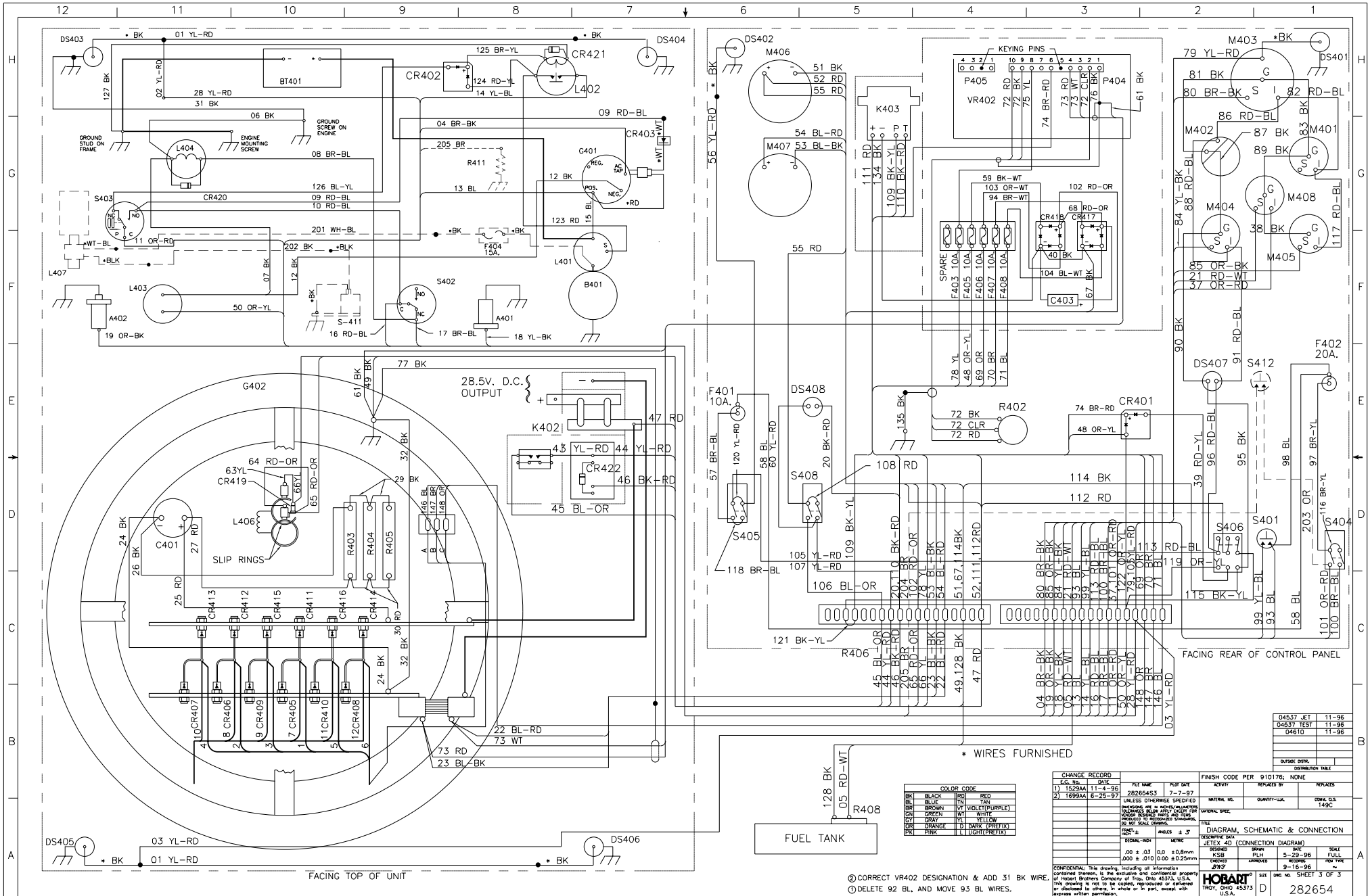
DESIGNED	DRAWN	DATE	SCALE
KSB	PLH	5–30–96	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
SWS		9–16–96	~

HOBART®
TROY, OHIO 45373
U.S.A.

SIZE C

DWG. NO. 282654

SHEET 2 OF 3


DS403
DS404
BT401
CR421
CR402
L402
L404
CR403
G401
R411
S403
CR420
F404 15A.
L401
B401
L407
L403
A402
S402
A401
S-411
DS402
M406
M407
K403
P405
P404
VR402
KEYING PINS
M403
DS401
M402
M401
M404
M408
M405
SPARE
CR418
CR417
C403
DS407
S412
F402 20A.
F401 10A.
DS408
R402
CR401
S405
S408
S401
S406
S404
G402
28.5V. D.C. OUTPUT
K402
CR422
L406
SLIP RINGS
C401
R403
R404
R405
CR413
CR412
CR415
CR411
CR416
CR414
CR407
CR406
CR409
CR405
CR410
CR408
DS405
DS406
R406
R408
FUEL TANK
FACING TOP OF UNIT
FACING REAR OF CONTROL PANEL
* WIRES FURNISHED
COLOR CODE
BK BLACK
BL BLUE
BR BROWN
GN GREEN
GY GRAY
OR ORANGE
PK PINK
RD RED
TN TAN
VT VIOLET(PURPLE)
WT WHITE
YL YELLOW
D DARK (PREFIX)
L LIGHT(PREFIX)
② CORRECT VR402 DESIGNATION & ADD 31 BK WIRE.
① DELETE 92 BL, AND MOVE 93 BL WIRES.
04537 JET 11-96
04537 TEST 11-96
04610 11-96
OUTSIDE DISTR.
DISTRIBUTION TABLE
CHANGE RECORD
E.C. No. DATE
1) 1529AA 11-4-96
2) 1699AA 6-25-97
FILE NAME 28265453
PLOT DATE 7-7-97
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. ± ANGLES ± 3°
DECIMAL-INCH .00 ± .03 .000 ± .010
METRIC 0.0 ±0.8mm 0.00 ±0.25mm
FINISH CODE PER 910176: NONE
ACTIVITY REPLACED BY REPLACES
MATERIAL NO. QUANTITY-UNIT COMM. CLS. 149C
MATERIAL SPEC.
DESCRIPTIVE DATA
TITLE DIAGRAM, SCHEMATIC & CONNECTION
JETEX 40 (CONNECTION DIAGRAM)
DESIGNED KSB DRAWN PLH DATE 5-29-96 SCALE FULL
CHECKED BWB APPROVED RECORDS 9-16-96 ITEM TYPE ~
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HOBART TROY, OHIO 45373 U.S.A.
SIZE D DWG NO. 282654 SHEET 3 OF 3

Appendix A. Options/Features

The following is a list of options available for Spec. 7003C. This chart contains the description, part number, and document number of the option. There is also a column to identify which option is contained in this Appendix.

OPTIONS / FEATURES AVAILABLE			
DESCRIPTION	PART NUMBER	DOCUMEN NUMBER	IN THIS SECTION
Trailer with Fenders & Cable Trays	181000-1	TO-181	
Trailer with Cable Hangers	181000-2	TO-181	
Spacers, Stationary Mounting	489689		
Kit, 14-V Output with Fenders & Cable Trays	286990-1		
Kit, 14-V Output with Cable Hangers	286990-2		
120-V AC Generator Package (Trailer-mounted units with Fenders)	181735	TO-194	
Kit, Water Heater	180630	TO-179	
Kit, Glow Plug	181259	TO-188	
Kit, Fork Lift	181391	TO-243	
Shield, Rain, Muffler	181179	TO-244	
Kit, Fuel / Water Separator, Racor	285795	TO-245	
Kit, Insulation Noise	282427		
Kit, Start, Ether	489782A	TO-211	
Crate, Shipping, Export	489848		

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Unusual Service Conditions

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

Among such conditions are :

1. Exposure to:

Combustible, explosive, abrasive or conducting dusts.

Environments where the accumulation of lint or excessive dirt will interfere with normal ventilation.

Chemical fumes, flammable or explosive gases.

Nuclear radiation.

Steam, salt-laden air, or oil vapor.

Damp or very dry locations, radiant heat, vermin infestation, or atmospheres conducive to fungus growth.

Abnormal shock, vibration or mechanical loading from external sources during equipment operation.

Abnormal axial or side thrust imposed on rotating equipment shafts.

Low and/or high ambient temperatures.

2. Operation at:

Voltages above or below rated voltage.

Speeds other than rated speed.

Frequency other than rated frequency.

Standstill with rotating equipment windings energized.

Unbalanced voltages.

Operation at loads greater than rated.

3. Operation where low acoustical noise levels are required.

4. Operation with:

Improper fuel, lubricants or coolant.

Parts or elements unauthorized by the manufacturer.

Unauthorized modifications.

5. Operation in poorly ventilated areas.

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Wet-Stacking in Generator Set

1. Diesel Engines

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

Wet-stacking is common, and may be expected in diesel engines operated under light load. Light loads do not allow the engine to reach 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 load. The time schedule of 200 hours may be changed as required to suit each user's particular needs and operating conditions.

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