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Revised 032293

OPERATION AND MAINTENANCE MANUAL

for

SELF-PROPELLED GENERATOR SETS

SPECIFICATION NUMBER 7006-1*
AND
SPECIFICATION NUMBER 7124-1

Model Number 90GM24S
90-kVA, 400-Hz, 115/200-V AC, 3-Phase

with

General Motors Diesel Engine
Model 8.2N, 174-HP

*** Spec 7006-1 is equipped with two 28.5-V DC Transformer-Rectifiers,**
Hobart Part No. 487750-1, Model TR-1528

HOBART BROTHERS COMPANY
GROUND POWER DIVISION
GROUND POWER EQUIPMENT
TROY, OHIO 45373
U.S.A.

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Safety Instructions and Warnings for Electrical Power Equipment

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.

c. Service and Maintenance

(1) 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.

(2) Before inspecting or servicing electrically-powered equipment, take the following precautions:

(3) Shut **OFF** all power at the disconnecting switch or line breaker before inspecting or servicing the equipment.

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

(5) Disconnect power to equipment if it is out of service.

(6) 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.

3. 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.

4. 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.

5. 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.

6. 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

7. 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 maintenance information for self-propelled 400-Hertz generator sets manufactured by **Hobart Brothers Company, Power Systems Group, Troy, Ohio 45373.**

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

Use of the manual should not be put off until a trouble or need for help develops. Read the instructions before starting the unit. Learn to use the manual and to locate information contained in it. Its style and arrangement are very similar to commercial aircraft manuals. The manual is divided into six chapters. Each chapter is divided into as many sections as required. Each new section starts with page 1. Each page is identified by chapter, section and page number, which are located in the lower, outside corner. When information located in another portion of the manual is referred to, its location is identified by a chapter, section, and paragraph, or figure number. For example, "*(See 2-3, Para. B)*" refers to information located in Chapter 2, Section 3, Paragraph B. If a Chapter and Section are not indicated in a reference, the referenced material is located in the same section as the reference, Example, *(See Para. B).*

In addition to operation and maintenance instructions, the manual contains an illustrated parts list in Chapter 4, and a collection of manufacturer's literature and supplemental information in Chapter 6.

Content of the manual is arranged as follows:

Chapter 1. Description/Operation
Chapter 2. Servicing
Chapter 3. Troubleshooting
Chapter 4. Illustrated Parts List
Chapter 5. Optional Equipment
Chapter 6. Manufacturer's Literature

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Chapter 2. Service

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SECTION 1. TROUBLESHOOTING

CHAPTER 4. ILLUSTRATED PARTS LIST

SECTION 1. INTRODUCTION

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CHAPTER 1. DESCRIPTION/OPERATION

SECTION 1. DESCRIPTION

1. General

The generator sets covered by this manual, Specification No. 7006-1 and Specification No. 7124-1 are self-propelled units *(See Fig.1)* manufactured by Hobart Brothers Company, Power Systems Group, Troy, Ohio 45373. They are powered by a V-8 diesel engine manufactured by General Motors Corporation.

From Specification No. 7006-1 generator sets, electrical power of three different voltage ratings can be produced and delivered:

(1) It can produce and deliver regulated 400-Hz, 115-V AC power to an aircraft whose electrical system and equipment is rated for this voltage.

(2) The generator set is equipped with two 28.5-V DC transformer-rectifier *(T-R)* packages and is thus capable, through one of these T-R packages, of supplying 28.5-V DC power to an aircraft whose electrical system is rated for this voltage.

(3) This generator set is also equipped with a switch box into which the two transformer-rectifiers *(T-Rs)* are connected. The purpose of this switch box is to make available either 28-V DC power for aircraft having 28-V electrical systems, or 56-V DC power for Russian MIG fighter aircraft. This switch box is located at the right rear of the generator set. *(See Figure 1).*

Specification No. 7124-1 generator sets are not equipped with transformer-rectifier *(T-R)* packages. These units deliver only regulated 400-Hz, 115-V AC power.

Power for mobile operation is supplied by the same engine which drives the 400-Hz generator. The generator rotor is coupled directly to the engine flywheel and actually becomes part of the drive train for mobile operation. A single-disc, pressure-plate type clutch is mounted on a flywheel at the rear of the generator rotor. A conventional, four-speed transmission is mounted directly to the rear of the generator exciter housing.

A short drive shaft, with universal joints at each end, transmits power from the transmission to a drop-type reduction gear mounted on the rear axle assembly. Power is then transmitted to the rear drive wheels through a conventional differential and axle shafts. The rear axle is equipped with shackle-mounted, semi-elliptical leaf springs.

The front axle is a solid-beam type with pivoting-wheel spindles. It is also equipped with semi-elliptical leaf springs.

Steering is mechanical, through a worm and roller type steering gear assembly.

Service brakes are four-wheel hydraulic. The parking brake is a mechanical, contracting-band type, mounted at the rear of the transmission. It operates on a drum attached to the output shaft of the transmission.

All controls for mobile operation are conventional mechanical type.

All vehicles are equipped with a single driver's seat mounted on the left side to allow space on the right side of the driver for mounting optional T-R *(transformer-rectifier)* packages.

The engine, generator, and electrical controls are protected by a sheet metal housing assembly identified as a canopy. The canopy is equipped with hinged doors on both sides for access to the engine and electrical components mounted on the forward ane of the control box. A panel on the left side of the rear canopy provides access to panel mounted instruments. A radiator grille and housing assembly forms the front part of the canopy. The housing has a hinged cover for access to the radiator cap.

Heavy-gauge steel fenders protect the equipment and operator against road splash, etc. A large fuel tank is located in the body on the right side of the vehicle. Four 6-volt batteries are stored in the body on the right side. A cable storage box is located behind the seat assembly.

The vehicle is equipped with all necessary driving lights, including headlights, tail and stop lights, clearance lights, back-up lights, and turn signals. A fire extinguisher is also provided.

Refer to Figure 2 for specifications and capabilities, and refer to Figure 3 for locations of principal components.

2. Orientation

For purposes of orientation, and to avoid confusion in the location of components, front, rear, right, and left are determined from the operator's position in the driver's seat.

3. Special Features

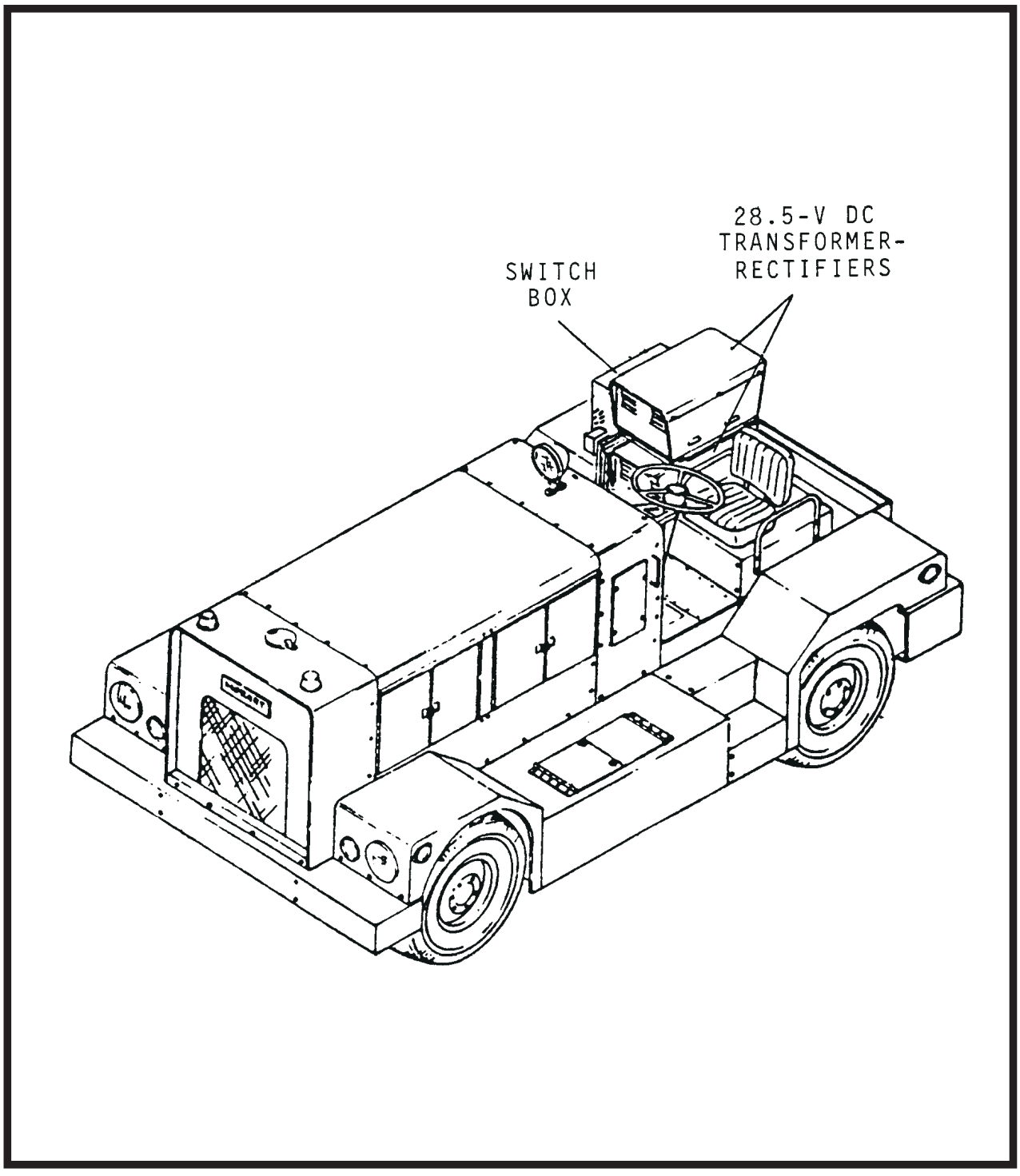
The generator set has many special features which are later described more fully under the assemblies in which they appear. Some of the main features are mentioned here and described briefly.

A. Protective Monitor

A single solid-state device *(1, Fig. 7)* receives signals from all of the fault sensing units in the generator output circuit, and functions to cause the load to be disconnected from the generator if an abnormal condition of voltage, frequency, or load develops.

B. Pull-out Trays

The control box is equipped with pull-out, drawer-type trays *(15, 16, and 17, Fig. 5)* which provide easy access to controls and equipment mounted in them. Each tray may be removed as an assembly by disconnecting a single quick-disconnect connector and tripping two safety latches.



Generator Set, Self Propelled

(Specification No. 7006-1 Illustrated)

Figure 1

Specifications 7006-1 and 7124-1 *(90 kVA)*

PHYSICAL	
Length *(approx.)*	**157 inches *(3988 mm)***
Width *(approx.)*	**88 inches *(2235 mm)***
Height *(approx.)*	**64 inches *(1626 mm)***
Wheel tread	**75 inches *(1905 mm)***
Weight, Specification 7124-1 *(approx.)*	**7400 pounds *(3356.6 Kg)***
Weight, Specification 7006-1 *(approx.)*	**7980 pounds *(3622.9 Kg)***
GENERATOR	
Output power rating	**90 kVA**
Output voltage	**115/200 V AC**
Rated load capacity	**260 A**
Frequency *(cycles-per-second)*	**400 Hz**
Output kilowatts	**72 kW**
Power factor	**0.8 PF**
Duty cycle	**100%**
Operating speed	**2400 RPM**
Overload capacity *(125% rated load)*	**325 A**
Output cable size *(Refer to your electrical code when applicable)*	**2/0 minimum**
GENERATOR PROTECTIVE SYSTEM	
Overvoltage relay, Specification 7006-1	**Trips at 125 V to 127 V**
Overvoltage relay, Specification 7124-1	**Trips at 130 V to 134 V**
Undervoltage relay, Specification 7006-1	**Trips at 105 V or below**
Undervoltage relay, Specification 7124-1	**Trips at 102 V or below**
Overfrequency relay, Specification 7006-1	**Trips at 408 Hz to 410-Hz**
Overfrequency relay, Specification 7124-1	**Trips at 415 Hz to 425 Hz**
Underfrequency relay, Specification 7006-1	**Trips at 390 Hz to 392 Hz**
Underfrequency relay, Specification 7124-1	**Trips at 375 Hz to 385 Hz**
Undervoltage time delay	**4 to 12 seconds, depending upon adjustment**
Overload relay	**Trips at 125% rated load in 5 minutes**
ENGINE	
Manufacturer	**General Motors *(Detroit Diesel)***

Specifications and Capabilities
(Sheet 1 of 3)
Figure 2

7006-1 and 7124-1 (90 kVA)

ENGINE (Continued)	
Type	**V-8, Diesel**
Number of cylinders	**8**
Bore	**4.25 inches *(108 mm)***
Stroke	**4.41 inches *(112 mm)***
Displacement	**500 cubic inches *(8.2 liters)***
Idle speed	**650 RPM +/- 25 RPM**
Normal governed speed	**2400 RPM**
Electrical system	**12-V DC**
Ground	**Negative**
Firing order *(RH rotation)*	**1-8-4-3-6-5-7-2**
Lubricating oil capacity *(oil pan)*	**20 quarts *(18.9 liters)***
Lubricating oil capacity [including 4 quarts *(3.7 liters)* for filter]	**24 quarts *(22.7 liters)***
Coolant capacityapprox.	**38 quarts *(36.0 liters)***
CHASSIS	
Make	**Hobart**
Model	**Single seat, Super-Jet**
Wheelbase	**98 inches *(2498.2 mm)***
Clutch	**Single dry disc**
Transmission	**Manual, four-speed forward, one reverse**
Transmission Gear Ratios:	
1st Gear	**6.324 to 1**
2nd Gear	**3.092 to 1**
3rd Gear	**1.686 to 1**
4th Gear	**1.000 to 1**
Reverse	**7.439 to 1**
Transmission Lubricant Capacity	**8 pints *(3.78 liters)***
Rear axle	**Combination differential and axle with transfer case**

Specifications and Capabilities

(Sheet 2 of 3)

Figure 2

7006-1 and 7124-1 (90 kVA)	
Axle Gear Ratios:	
Transfer case	**2.304 to 1**
Differential *(bevel gears)*	**4.111 to 1**
Final drive	**9.472 to 1**
Differential Lubricant Capacity	**5 quarts *(4.73 liters)***
Transfer case lubricant capacity	**1-1/2 pints *(0.71 liters)***
Steering	**Worm and roller type**
Brake, service	**4-wheel, hydraulic**
Brake, parking	**On drive shaft, contracting band type**
Tires	**6-ply, 7:00 x 16 in.**
Springs	**Semi-elliptic, leaf type, front and rear**
Fuel tank capacity *(approximate)*	**50 gallons *(189.2 liters)***
Tire pressure	**60 PSI**

Specifications and Capabilities

(Sheet 3 of 3)

Figure 2

C.Voltage Regulator

An adjustable voltage regulator *(Figure 9)* provides automatic voltage regulation of the aircraft. The regulator is adjustable for a variety of output cable sizes and lengths. *(See TM-759 in Chapter 6)*

D.Test Circuitry

A receptacle connector *(25, Fig. 5)* with wiring to various test points throughout the electrical circuitry is provided for the attachment of a test box manufactured by **Hobart Brothers.** This test circuitry allows electricians to perform as many as twenty-four tests and checks from one location, conveniently and easily.

E. Electric Governor

The engine is equipped with an electric governor kit and other special equipment, and is more fully described under the engine description.

4. Identification

A. Specification Number

Generator sets are identified by their Specification number which consists of the Series number *(i.e. 7006)* plus a dash number suffix *(i.e. -1, -2, etc.).* The suffix number indicates the mounting design of the generator set. For example, Specification number 7006-1 identifies a Series 7006 generator set that is self-propelled.

B. Special Equipment

Specification 7006-1 generator sets are equipped with two 28.5-V DC transformer-rectifier *(T-R)* packages. Each T-R receives 115/200-V, 400-Hz, AC power from the generator and converts it to a 28.5 V DC output. Thus a generator set, through these T-R packages, is capable of supplying 28.5-V DC power simultaneously to two aircraft loads whose electrical equipment are rated for this voltage. These transformer rectifier packages are identified by Hobart Part No. 487750-1.

5. Engine, Generator, and Control Box

The engine, generator, and control box comprise the principal components of the generator set. They are mounted on the welded steel frame of the chassis. The engine coolant radiator is also mounted on the frame just forward of the engine-generator combination. Figure 3 is a group of illustrations showing the location of various components which might not be easily located or recognized.

A. Basic Engine

The basic engine is a V-8. See Figure 2 for general specifications.

B. Engine Manufacturer's Equipment

As received from the engine manufacturer, the engine includes the following equipment, which is more fully described in the Detroit Diesel Operation and Maintenance Manual in Chapter 6.

- **(1)Fuel filter**

  The fuel filter is a vacuum type connected between the fuel supply and the pump. It has two throw-away type elements located side-by-side on a single head.

- **(2) Oil filters**

  The two engine oil filters are full-flow type with replaceable cartridges.

- **(3) Engine cooling fan**

  Reverse-flow, engine cooling fan to blow air outward through the radiator.

C. Hobart Installed Engine Equipment

- **(1) Electric engine control governor**

  This component is described in detail in Chapter 6 in the Service Manual for the electric engine control governor.

- **(2) Engine electrical system**

  Items in the 12-volt engine electrical system that are provided by Hobart Brothers are:

  (a) A heavy-duty motor starter

  (b) Alternator with voltage regulator

  (c) Starting switch

  (d) Wiring harness

- **(3) Engine protective devices**

(a) High coolant temperature switch

A high coolant temperature switch is mounted in the front of the cylinder block to monitor the coolant temperature. If the coolant temperature reaches 210 degrees F *(99 degrees C),* this normally closed switch opens and actuates the fuel valve solenoid which shuts down the engine.

(b) Oil pressure switch

A diaphragm-type switch monitors the pressure in the lubricating oil system. It's mounted in the side of the cylinder block *(18, Fig. 3).* If the pressure in the lube oil system falls to 10 psi *(69 kPa),* this switch opens and actuates the fuel valve solenoid which shuts down the engine.

- **(4) Air cleaner**

The diesel-engine air cleaner *(Fig. 4)* is a dry-cartridge type. It is equipped with a precleaner and a service indicator. The indicator functions to signal the operator when the cartridge needs changing. A red cylindrical "flag" *(2)* is forced upward in a glass enclosed viewing chamber *(1)* when air pressure within the air cleaner housing drops below the outside air pressure.

As the cartridge becomes loaded with dirt and air pressure within the cleaner lessens, the "flag" gradually rises higher in the glass viewing chamber. When the "flag" reaches the top of the chamber, it locks in that position to warn the operator that the cartridge must be changed. The "flag" is reset *(unlocked)* by pushing the reset button *(3)* located on the bottom of the indicator.

NOTE: The service indicator is mounted on the engine control panel and connected to the air cleaner by a rubber hose. The indicator flag is visible only when the engine is running, or when the flag is locked in WARNING position.

- **(5) Radiator**

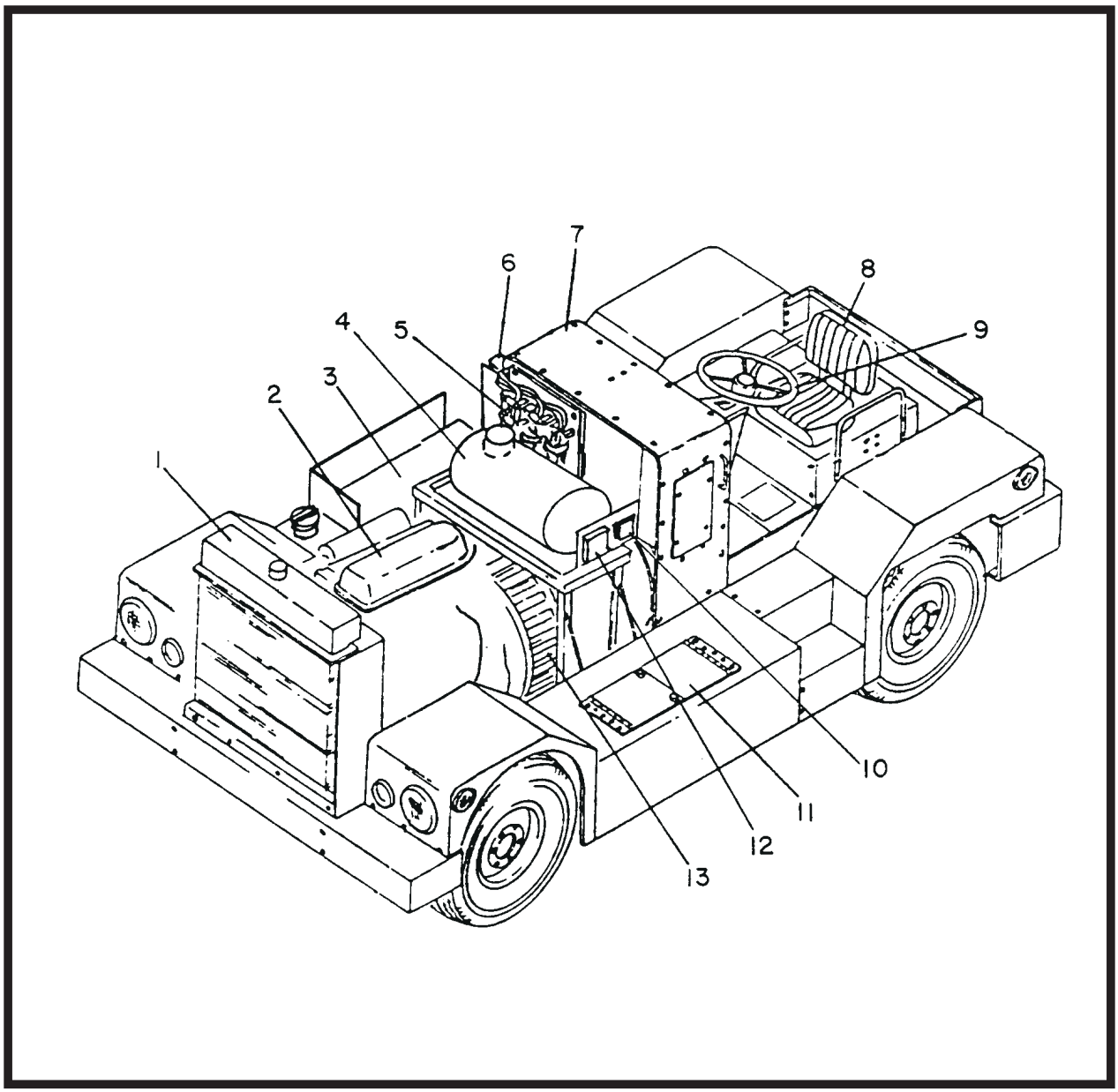
The radiator *(16, Fig. 3)* is high-efficiency type which can be cleaned by periodically flushing it just as with other radiators.

- **(6) Mufflers**

On the eight-cylinder engine, each bank of cylinders has its own complete exhaust system. The mufflers are a special design, combining the exhaust muffler and exhaust manifold into a welded, one-piece, replaceable unit. Mufflers are not interchangeable.

D. Generator

The 400-Hz generator is a brushless, revolving field, three-phase, alternating current type. The rotor is mounted by two, permanently lubricated, sealed, ball bearings. The front bearing is supported by the fan housing; the rear bearing is mounted in the exciter housing. Both of these housings are attached to the main generator stator housing. The front end of the rotor shaft extends forward beyond the rear bearing and into the exciter stator housing. The exciter rotor is mounted on this shaft exten-sion with a Woodruff key and is secured by a washer and 1/2"-13 thd, cap screw. A rectifier with six diodes is mounted on the exciter rotor and converts exciter AC output to DC for excitation of the generator revolving fields. The exciter DC output to the generator fields, and consequently the generator output, is controlled by the amount of DC voltage supplied to exciter fields by the static voltage regulator. A centrifugal, radial-blade fan which is part of the hub and coupling assembly, draws cooling air over all internal windings. Air enters at exciter end and is discharged at drive end. The complete generator is bolted to the engine flywheel housing.

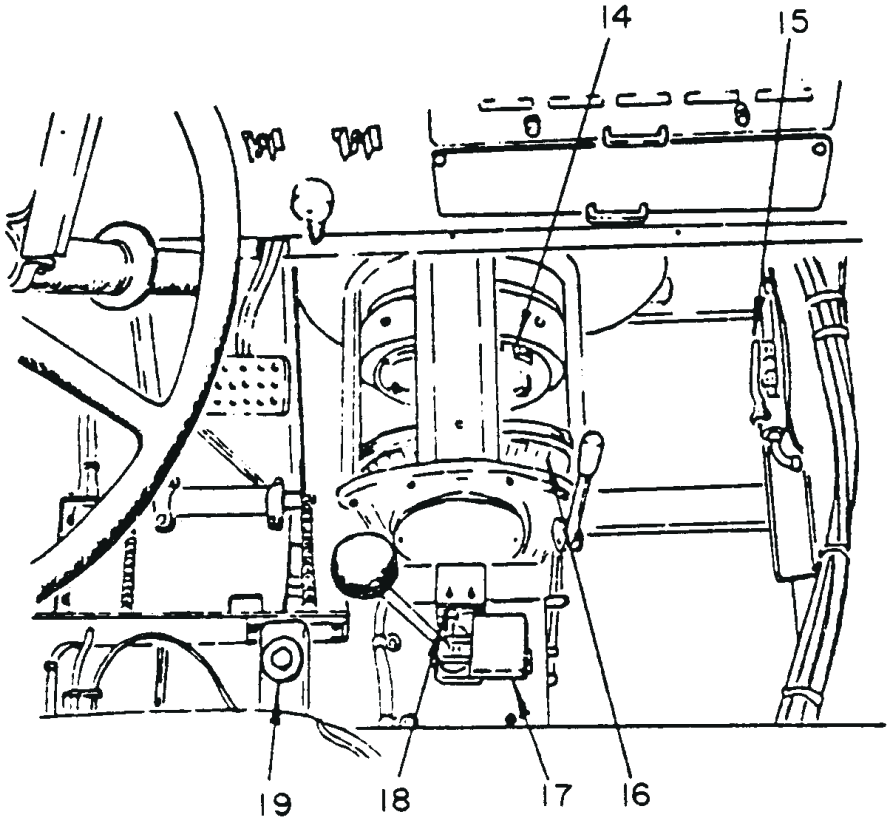


1. Radiator
2. Engine
3. Fuel tank location
4. Air cleaner
5. Power module panel
6. Fuel/water separator
7. Control box
8. Seat
9. Steering wheel
10. Overspeed control
11. Battery compartment
12. Engine governor
13. Generator

Generator Set Components

(Sheet 1 of 2)

Figure 3

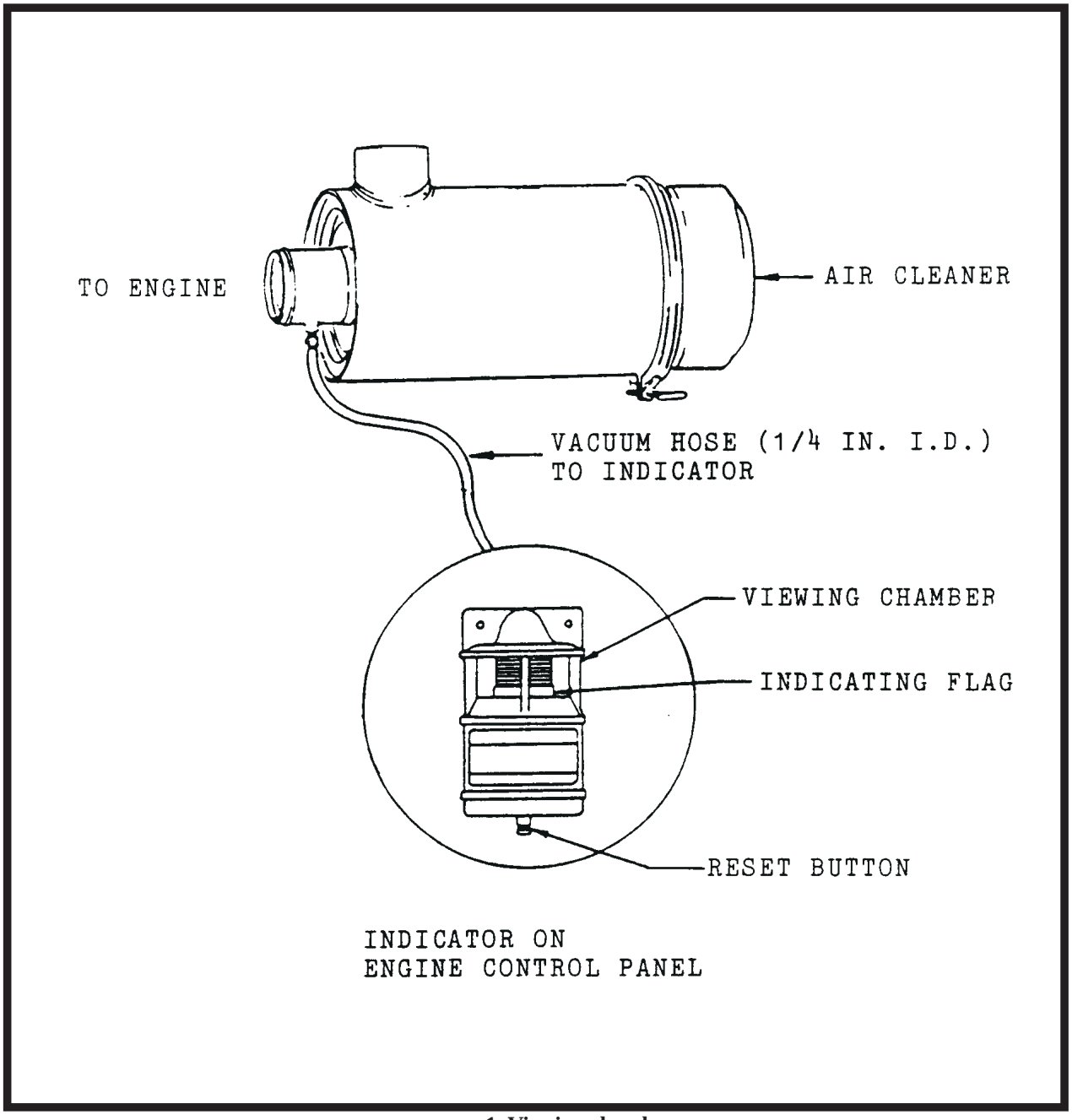


14. Exciter
15. Fuel shut-off valve
16. Clutch
17. Gearshift safety switch
18. Back-up light switch
19. Master cylinder

Generator Set Components

(Sheet 2 of 2)

Figure 3



1. Viewing chamber
2. Indicating "flag"
3. Reset button

Air Cleaner and Service Indicator

Figure 4

E. Control Box Assembly

The control box *(Fig. 5)* is a sheet metal enclosure which houses and provides mounting facilities for generator and engine controls and monitoring equipment. The box is equipped with two, drawer type trays which contain generator output control devices and monitoring instruments. Trays slide in and out on nylon rollers for easy access to internally mounted components. Each tray is easily removable by disconnecting an “Amphenol” connector, unlocking safety latches, and sliding the complete tray assembly out of the control box.

- **(1) Engine instruments**

  (a) Oil pressure gage and oil pressure switch

  The oil pressure gage *(10)* is a bourdon tube type and indicates engine lubricating oil pressure. It is graduated from 0 PSI to 75 PSI. An oil pressure switch is mounted in a tee fitting directly behind the gage.

  The switch connects 12-V DC power to the engine control system and to the generator 12-V DC control system when the engine is running.

  (b) Ammeter

  The ammeter *(12)* indicates the direction and value of current flow in the 12-V DC electrical system. Its graduated range is from -60 A through 0 A, to +60 A.

  (c) Temperature gage

  The temperature gage *(13)* is a mechanical type of unit construction. It consists of a panel mounted indicating mechanism which is connected by a capillary tube to a bulb mounted in the engine cooling system. The gage indicates engine coolant temperature in the range of 100F to 220F.

  (d) Hourmeter

  The hourmeter *(2)* is electrically driven from the 12-V DC battery system. The hourmeter measures and records engine running time and will record up to 9999.9 hours on five revolving drums. The hourmeter operates only when the engine is running and the oil pressure switch is closed.

  (e) Fuel gauge (not on control panel)

  A mechanical fuel gauge mounted in the tank indicates the quantity of fuel in the 50-gallon tank. The dial face is graduated in fractions from E *(empty)* to F *(full).*

- **(2) Panel lights**

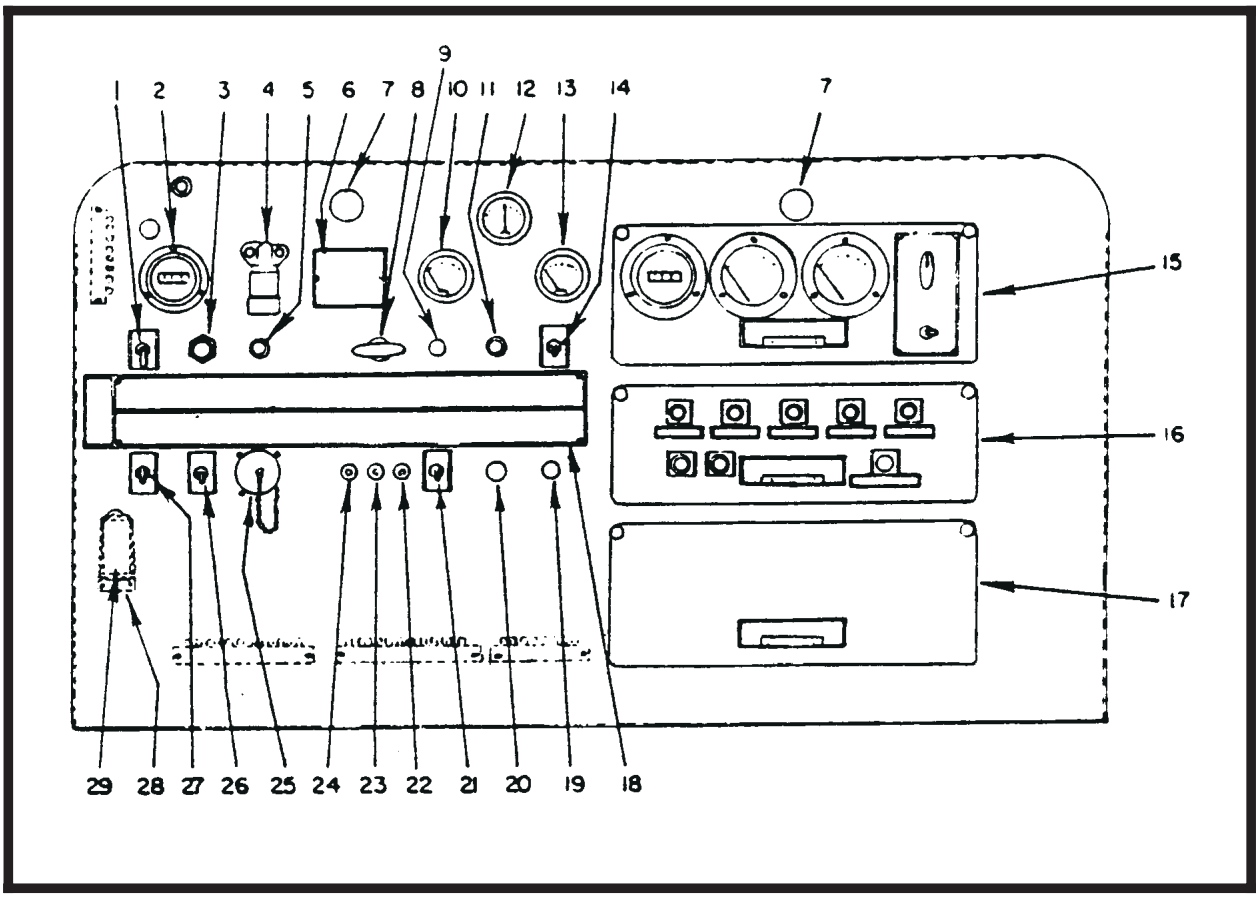
  Two shielded instrument panel lights *(7)* provide illumination for instruments and controls during night-time operation.

- **(3) Indicating lights**

  There are two indicating lights mounted on the control panel.

  (a) Engine “ON” indicating light

  This light *(5)* glows green when the engine is running and engine oil pressure is holding the diaphragm switch closed.



1. Engine control switch, start/stop
2. Hourmeter, engine
3. Pushbutton start switch
4. Air cleaner indicator, service
5. Engine "ON" indicating light
6. Identification plate
7. Instrument panel lights
8. Starting aid control
9. Hole plug button
10. Oil pressure gage
11. Contactor CLOSED indicating light
12. DC Ammeter, battery
13. Coolant temperature gage
14. Contactor control switch
15. Generator control tray
16. Protective relays tray
17. Voltage regulator tray
18. Identification and instruction plate
19. Hole plug button
20. Hole plug button
21. Operating mode control switch
22. Engine circuit fuse (20-A,slow-blow)
23. Panel light fuse (5-A)
24. Headlight fuse (20-A)
25. Test receptacle connector and cap
26. Panel light switch
27. Headlight switch
28. Capacitor (6.8 mfd, 35-V)
29. Excitation-deenergization relay (28 and 29 on back of panel)

Control Box

Figure 5

(b) Load contactor indicating light

The output load contactor holding coil circuit has an indicating light *(11)* which glows green when the circuit is energized and is holding the contactor closed. When the load contactor opens for any reason, the light is turned off.

- **(4) Switches**

(a) Starter switch

This pushbutton switch *(3)* connects 12-V DC power to the starter solenoid coil, which actuates the solenoid switch to connect power to the engine starting motor.

(b) Engine control switch

The engine control switch *(1),* sometimes referred to as the “permissive-start” switch, is a three-position, toggle type. The three positions are identified as **START, RUN** and **STOP.** The switch is spring-loaded in **START** position and must be manually held in this position. When released from **START** it automatically returns to **RUN** position. When held in **START** position, 12-VDC power is supplied directly to the fuel shut-off valve solenoid and engine shutdown safety switches are by-passed. This direct current is necessary for engine starting because the low oil pressure switch is **OPEN** until the engine is running normally. When released, the switch will automatically reposition to **RUN** and supply power to the fuel shut-off valve through the engine shut-down safety switch circuit. A green light *(5)* glows to indicate that the engine control switch is in **RUN** *(or START)* position. In **STOP** position the switch contacts are open and holding power is disconnected from the fuel valve, allowing the valve to close and shut-off fuel to the engine.

(c) Operating mode control switch

This is a two-position switch *(21),* sometimes identified as the **GEN-DRIVE** *(generator-drive)* switch, and is used to select the mode of operation desired- either **GENERATE** for supplying power to an aircraft, or **DRIVE** for mobile operation of the vehicle. In **GEN** position, the switch performs a triple function. First, it supplies DC power to the fuel valve solenoid to hold the valve open and allow the engine to run. Second, it supplies DC power to the electric governor control box to allow the governor to function and bring the engine up to governed speed. Third, it supplies DC power to the coil of the excitation-deenergization relay *(29)* which causes it ti close and connect three-phase, 115-V power to the voltage regulator *(Figure 9),* which in turn is then able to supply direct current to the generator exciter field and allow the generator to produce power. A capacitor *(28)* is mounted on the excitation-deenergization relay to prevent any momentary interruption of power to the relay from stopping operations. When the switch *(21)* is in the **GEN** position, all DC power for the above three functions must pass through a “gear-shift” micro switch. Any attempt to move the gear-shift lever from **NEUTRAL** position and place the transmission in gear will automatically open the gear-shift switch and stop all operations. This is a safety feature to prevent mobile operation while delivering power. In **DRIVE** position, Dc power is supplied only to the fuel valve solenoid for engine operation and the gear-shift safety switch is by-passed. For mobile operation, generator excitation is not required, and engine speed is controlled by an accelerator and flexible cable arrangement connected to the governor actuator linkage. For mobile operation *(DRIVE),* power to the fuel valve must pass through a micro switch in the ouput cable plug box (See 1-2, Figure 1), or a series of switches when the unit is equipped with T-Rs *(See 1-2, Figure 3).* Output cable, plug connectors hold the micro switches closed when connectors are properly stored in the boxes. This feature insures that all output cables must be disconnected from the aircraft and plug connectors properly stowed before the vehicle can be driven.

(d) Contactor control switch

This is a three-position toggle switch *(14, Fig. 5),* similar to the engine control switch *(1)* described above. When placed in the spring-loaded **ON** position, it provides 115-V AC power directly to a rectifier which supplies DC power for closing the load contactor. When released, it returns to the normal **ON** position and continues to provide power to the rectifier, but in this switch position, AC power must pass through a plug interlock relay and a fuse interlock to insure that the load contactor will be opened in case the output cable plug connector is accidentally *(or intentionally)* disconnected from the aircraft, or if the protective monitor circuit is disabled by the failure of a fuse. In all cases, power for operation of the load contactor must pass through the protective monitor. In **OFF** position the switch opens the AC circuit to the rectifier, thereby cutting off the source of DC power to the contactor coil, and this allows the contactor to open. An indicating light *(11)* glows green when the load contactor is closed.

(e) Light switches

Two toggle switches, mounted side-by-side below the start switch, control operation of lights. The left switch *(27)* controls headlights. The right switch controls panel and clearance lights.

- **(5) Fuses**

Three cartridge type fuses are conveniently located on the front panel. The engine operating circuit, hourmeter, back-up lights, and generator protective system are protected by a 10-A fuse *(22).* The headlight and tail light circuit is protected by a 20-A fuse *(24).* Panel and clearance lights are protected by a 5-A fuse *(23).* Remotely located fuses include a 14-A fuse in the turn signal circuit, and a 20-A fuse in the horn circuit.

- **(6) Test receptacle connector**

This Amphenol connector *(25)* provides an attaching point for leads which are connected to selected test points throughout the engine and generator electrical systems. Connection and schematic diagrams *(in Chapter 6)* indicate points at which the leads are connected. The receptacle connector is designed to mate with a test box plug connector *(see Fig. 11).*

- **(7) Air cleaner service indicator**

The air cleaner indicator *(4)* is mounted on the control box front panel for easy viewing. Its function was explained in Para. 5, C, *(3)*.

- **(8) Generator control tray**

The generator control tray *(15, Fig. 5)* is the top tray in the control box. It contains instruments and controls for monitoring and controlling generator output.

(a) Resistors

Two 25-ohm, 100-watt ballast resistors *(1, Fig. 6)* are connected in series in the generator DC field circuit.

A variable resistor *(12)* is connected in series between the manual control rectifier *(15)* and rheostat *(14).* Its purpose is to adjust the DC voltage to the rheostat and thus determine the voltage range through which the rheostat can control generator output voltage.

(b) Generator output monitors (meters)

The generator output is monitored by three instruments; a frequency meter *(8)*, a voltmeter *(7)*, and an ammeter *(6)*. The frequency meter is a resonant-reed type, and indicates the frequency of the generator output alternating current in the range of 380 to 420 Hz *(cycles per second)*. The voltmeter indicates the generator output voltage in each phase-to-neutral *(A-N, B-N and C-N)* or phase-to-phase *(A-B, B-C and C-A)* as selected by the meter selector switch *(6)* and the line selector switch *(5)*. *(These switches will be described below.)* The voltmeter has a 3-1/2-inch face and the scale is graduated 0 to 300 V. The ammeter is also 3-1/2-inch size and is graduated 0 to 500 A. The amperage value in each of the three phases may be read on the ammeter by selecting the desired phase with switch *(6)*. Three ammeter current transformers *(Ref. Fig. 10)* lower the output load current to a lesser value, of definite ratio, which will operate the ammeter movement without damage. The ammeter dial scale is graduated and numbered so that the pointer will indicate the true load current value rather than the meter movement current.

(c) Meter and line switches

These switches provide a means of selecting and determining which phase of voltage and current is indicated on the voltmeter and ammeter and whether the voltage is line-to-neutral or line-to-line. The meter switch *(5)* is a four-position, rotary type. A nameplate *(3)*, located under the switch knob, is marked and lettered to indicate the three functional positions of the meter switch. *(When the knob is pointing straight down, the switch is OFF.)* The line switch *(4)* is a two position, toggle switch used to select either line-to-neutral or line-to-line voltage to the voltmeter. The nameplate is also marked to indicate the position of this switch.

(d) Receptacle connector

An “Amphenol” connector *(10)* provides a means of quickly disconnecting all wires to control box components.

(e) Tray

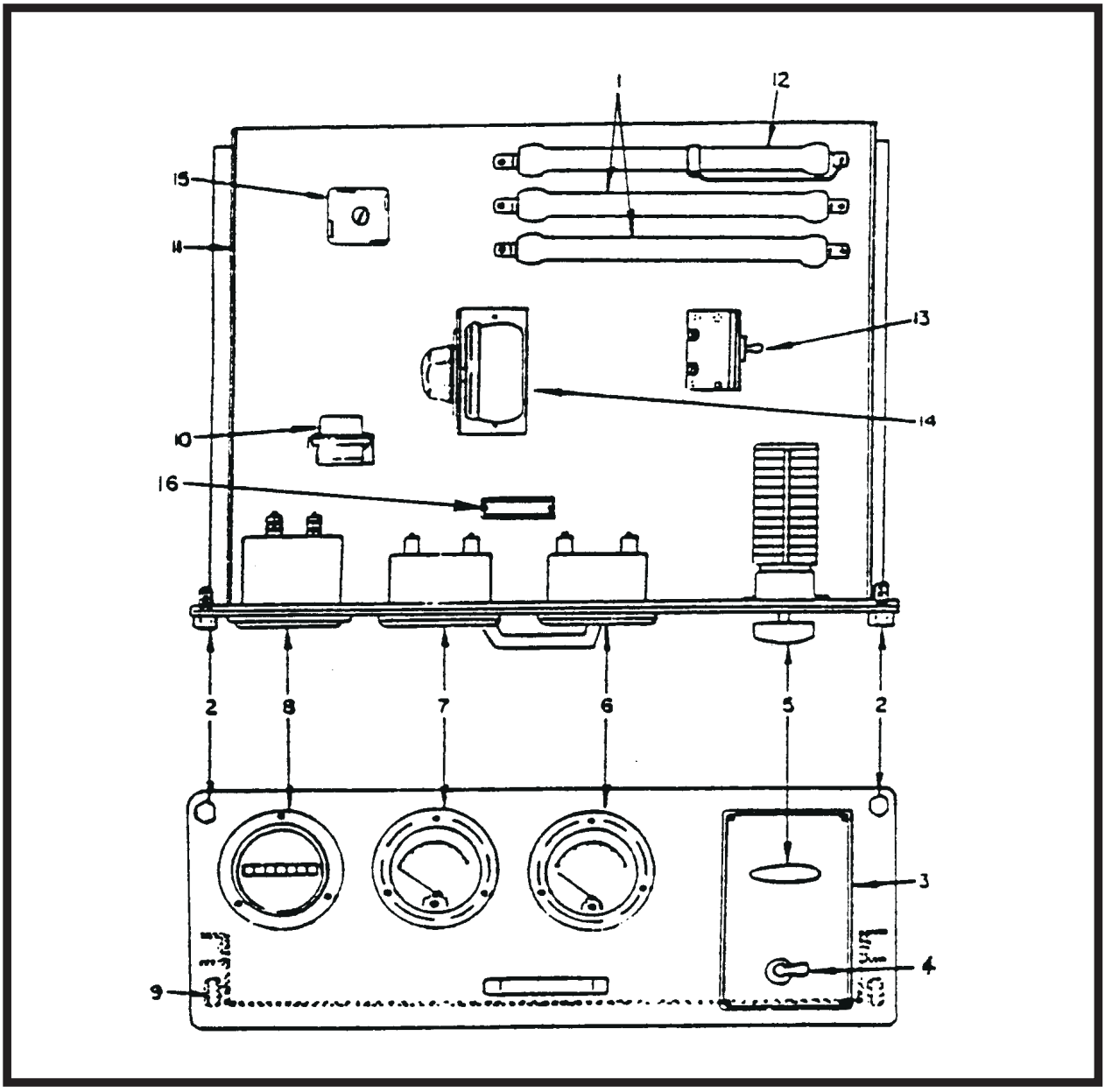
The tray *(11)* slides in and out on nylon rollers *(9)*. It is secured in place by a twist-lock, screw fasteners *(2)*.

(f) Manual voltage control

When the automatic manual switch *(13)* is placed in **MANUAL** position, AC power is supplied to the rectifier *(15)* rather than to the automatic voltage regulator. The DC output of the rectifier is routed to the exciter field through a rheostat *(14)*. The generator output voltage is thereby manually controlled by adjustment of the rheostat.

- **(9) Protective relay tray (see Figure 7)**

The bottom tray in the control box is identified as the protective relay tray *(16, Fig. 7)* and contains electrical and safety devices designed to protect the aircraft electrical system against damage which could result from overvoltage, undervoltage, overfrequency, or underfrequency. The tray also contains devices for the protection and control of the generator output electrical system.



1. Resistor (25 ohm, 100 watt)
2. Fastener
3. Instruction plate
4. Line selector toggle switch
5. Meter selector rotary switch
6. AC Ammeter
7. Voltmeter
8. Frequency meter
9. Nylon roller
10. Receptacle connector, 20 contact
11. Tray
12. Resistor (50 ohm, 100 watt)
13. Automatic-manual switch
14. Manual voltage control rheostat
15. Rectifier
16. Nameplate, identification

Generator Control Tray

Figure 6

(a) Sensing relays

The voltage sensing relay *(6)* underfrequency sensing relay *(4),* and over-frequency relay *(3)* are connected to generator output leads between the generator and load contactor. These solid-state relays sense any abnormal condition of voltage or frequency and signal the solid-state circuitry of the protective monitor module *(1)* to open the load contactor and disconnect output to the aircraft. Trip values are adjustable, however, adjustments should be made **ONLY** under laboratory conditions. A solid-state overload signaling device *(Ref. 7, Fig 10)* is also connected to the protective monitor module and performs a function similar to the voltage and frequency sensing modules. Trip values for protective circuits are as follows:

SPEC No.	RELAY	TRIP POINT	TRIP TIME
7006-1	Overvoltage	125-V to 127-V	Within 4 Seconds
	Undervoltage	105-V or Below	Within 7 Seconds
	Overfrequency	408-Hz to 410-Hz	Within 4 Seconds
	Underfrequency	390-Hz to 392-Hz	Within 4 Seconds
7124-1	Overvoltage	130-V to 134-V	Within 4 Seconds
	Undervoltage	102-V or Below	Within 7 Seconds
	Overfrequency	415-Hz to 425-Hz	Within 4 Seconds
	Underfrequency	375-Hz to 385-Hz	Within 4 Seconds

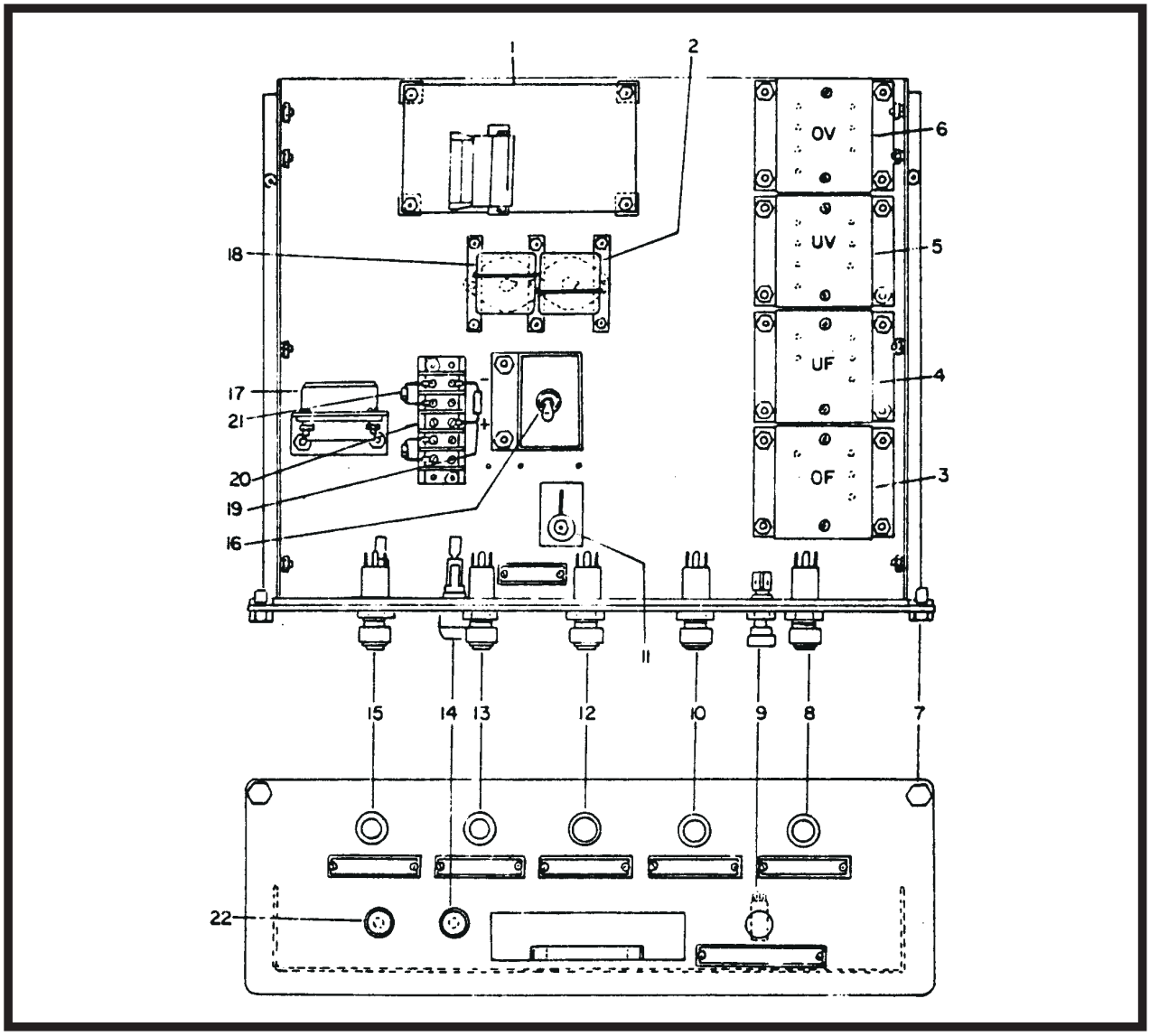
Overload relays on both generator sets trip at 125% of rated load within 5 minutes. See Para 5, E, (12), (c) for more information regarding overload device. Undervoltage time delays are adjustable.

(b) Protective monitor module

The protective monitor *(1)* is sometimes called the memory and time delay module. It is a solid-state device with a hermetically-sealed, reed-type relay. The printed circuit board or “card” includes five memory circuits and a time delay circuit. Each circuit is connected to a corresponding sensing circuit in the sensing modules. All memory circuits are connected to the module relay coil. Any one of the circuits can energize the coil to open the relay contacts. Thus, when a sensing device energizes any one of the module circuits, the module relay is also energized to break the load contactor holding circuit and allow the load contactor to open. All circuits, except the undervoltage circuit, function immediately to open the contactor. A time delay system is designed into the undervoltage circuit to prevent nuisance opening of the contactor under conditions of momentary undervoltage in the generator output. An undervoltage condition which continues uninterrupted for a period of 4 to 12 seconds *(adjustable)* causes the time delay circuit to open the contactor. Each of the five circuits is connected to a corresponding indicating light *(8, 10, 12, 13, and 15)* which is turned on when a fault occurs. The module relay will remain energized *(OPEN)* and the light will remain **ON** until the reset switch *(9)* is pushed to break the module 12-V DC circuit, and allow the relay to return to normal, **CLOSED** position.

(c) Indicating lights

The function of these lights *(8, 10, 12, 13, and 15)* is to indicate, to the operator, the abnormal condition of overvoltage, underfrequency, etc., which caused the protective monitor system to function. Each of the five lights is connected to an actuating circuit within the memory and time delay module. When one of the circuits is activated, it turns on the applicable indicating light. The light will remain on until the reset switch *(9)* is pushed. These are press-to-test type lights in which the lamps *(bulbs)* may be tested by pressing the lens holder momentarily.



1. Protective monitor module
2. Fuse-interlock relay
3. Overfrequency sensing relay
4. Underfrequency sensing relay
5. Undervoltage sensing relay
6. Overvoltage sensing relay
7. Tray fastener
8. Overload indicating light
9. Reset switch
10. Undervoltage indicating light
11. Resistor, 100 Ohm, 25 Watt
12. Overvoltage indicating light
13. Underfrequency indicating light
14. Load contactor circuit fuse (2Amp)
15. Overfrequency indicating light
16. Test-bank switch
17. Receptacle connector
18. Plug-interlock relay
19. Capacitor, 6.8 MFD, 35V
20. Terminal board
21. Diode, 400 PRV, 1.5A
22. Protective monitor circuit fuse (2Amp)

Protective Relay Tray

Figure 7

(d) Plug-interlock relay

The function of the plug interlock relay *(18)* is to cause the output load contactor to open in the event the cable plug connector becomes accidentally disconnected from the aircraft during power delivery, or if an attempt is made to deliver power when the output cable is not connected to the aircraft. Twenty-eight-volt, direct current for operation of the relay is supplied from the aircraft either through an on-board transformer rectifier, or from a twenty-eight-volt, electrical system. Connection from the aircraft to the interlock relay is made through terminals **E** and **F** on the output cable plug connector.

(e) Test-bank switch

A spst, toggle switch *(16)* provides a means of by-passing the interlock relay *(18)* when supplying power to a load bank or to an aircraft not equipped with a plug interlock system.

(f) Resistor

A 100-ohm, 25-watt resistor *(11)* is connected in series with the plug interlock relay to protect the relay in the event that phase **C** contacts in the load contactor should fail to close when the generator **ON** switch is operated.

(g) Fuse-interlock relay

The fuse-interlock relay *(2)* functions to interrupt the load contactor holding coil circuit and remove the load if the fuse *(22)* "blows"in the protective relay coil circuit.

(h) Connector

A twenty-six contact connector *(17)* provides a quick-disconnect facility for all wiring to the tray electrical components so that the complete tray assembly may be removed quickly and easily.

(j) Diode, capacitor and terminal board

A terminal board *(20)* is used to mount and connect a diode *(21)* and capacitor (19) into the fuse-interlock relay coil circuit. Their purpose is to prevent an inductive "spike" in the 12-VDC circuit from triggering an SCR in the protective monitor module (1) and turning on an indicating light when no fault exists.

(k) Fuses

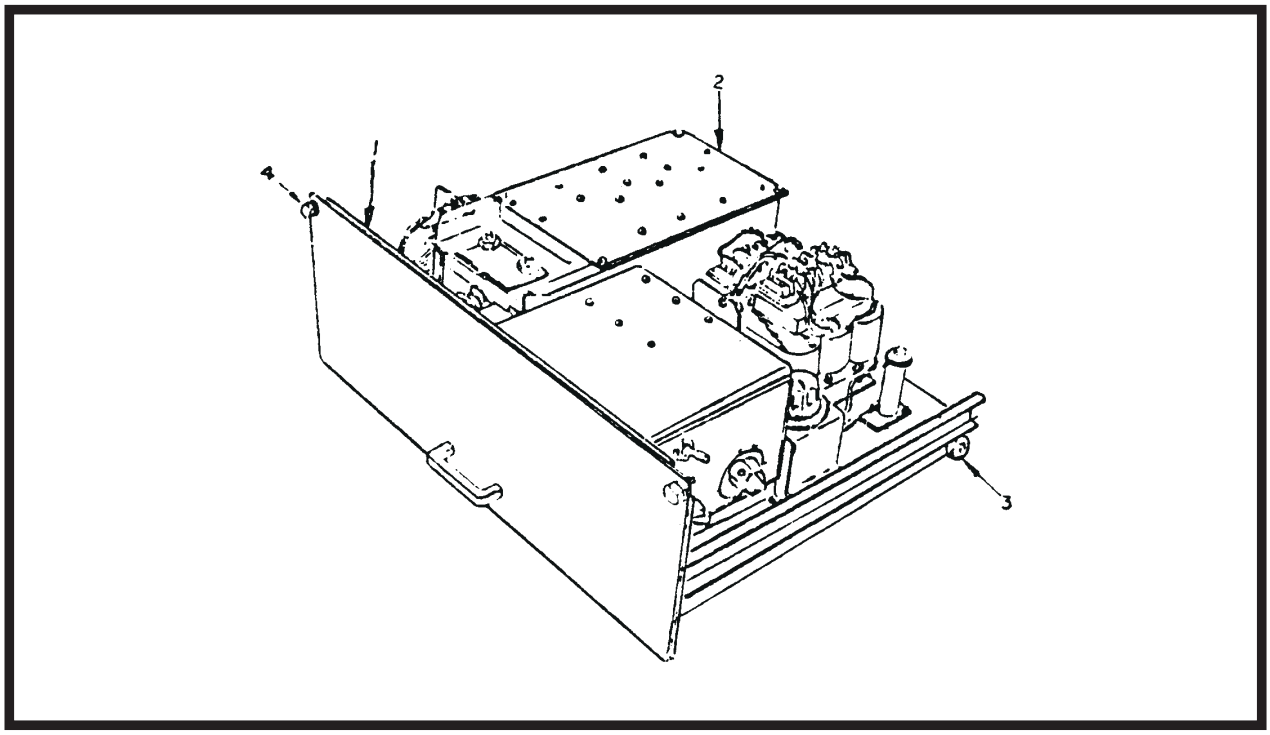
A fuse *(14)* is located in the load contactor hold circuit to protect the power module in case of a rectifier failure. Another fuse *(22)* protects the 12-VDC protective monitor circuit.

- **10. Voltage regulator tray (See Figure 8)**

The voltage regulator tray contains only the static votage regulator *(2).* The tray *(1)* slides in and out on nylon rollers *(3)* and is secured in place by captive screw fasteners the same as the other two trays described above. Although a complete manual for the proper voltage regulator is included in Chapter 6, a brief working description is given here.

The voltage regulator is designed to provide 1% voltage regulation with .25-second recovery time for all loads up to 100% of rated load on a three-phase, four-wire, 115/200-volt, 400-Hz, brushless generator. This regulator provides field excitation power for the rotary exciter, and regulates generator output voltage by varying the exciter field power as required to meet varying load conditions. Thus, the generator output is held at a constant voltage. The maximum continuous rating of this regulator is 4.0 amperes at 140 volts DC.

Any deviation of the generator output voltage from its set, regulated level is sensed by the voltage detection and comparison circuits. A signal is fed from the comparison circuit into the transistorized pre-amplifier, amplified, and used to drive the magnetic amplifier. The magnetic amplifier output changes in response to this signal, changing the field power of the rotary exciter enough to return the generator voltage to its regulated value. The voltage at which the generator is regulated may be adjusted with the voltage adjustment rheostat *(2, Figure 9).*



1. Tray
2. Voltage regulator
3. Nylon roller
4. Fastener

Voltage Regulator Tray

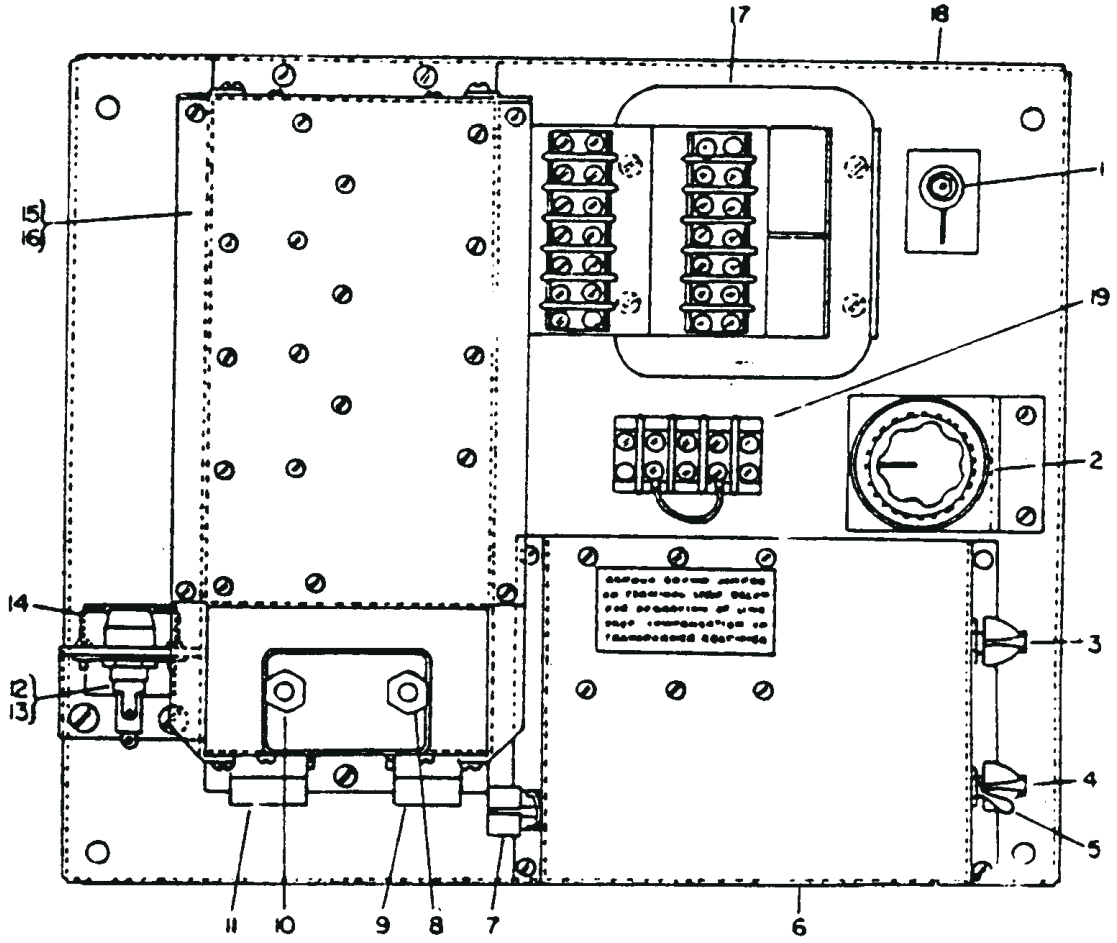
Figure 8

(a) Controls

The rheostat *(2, Figure 9)* is used to adjust the regulated voltage value of the generator output. Compensation for cable size is adjusted by a potentiometer *(4).* Cable length is compensated for by adjustment of another potentiometer *(3).* Cable compensation may be turned **ON** or **OFF** by a toggle switch *(5).* For this application the switch must always be **ON.** An instruction plate under the potentiometer knobs indicates proper setting for various cable sizes and lengths. Regulator stability is adjusted by the damping circuit gain potentiometer *(8).* Regulator response time is adjusted by the damping circuit rate potentiometer *(10).*

(b) Protection

Internal circuitry of the voltage regulator is protected by a cartridge type, 5-ampere fuse *(12).*



1. Resistor, 1000 ohms, 25 watts
2. Regulator rheostat
3. Cable length compensation rheostat
4. Cable size compensation rheostat
5. On-Off switch, line drop compensation
6. Line drop compensation chassis assy.
7. Receptacle connector
8. Damping circuit gain potentiometer
9. Receptacle connector
10. Damping circuit rate potentiometer
11. Receptacle connector
12. Fuse, 5 amps
13. Fuseholder
14. Receptacle connector
15. Sensing & preamplifier chassis assy.
16. High-phase sensing board assy.
17. Reactor
18. Chassis
19. Terminal board

Voltage Regulator

Figure 9

- **11. Power Module Panel Assembly**

The power module panel assembly *(Fig. 10)* sometimes referred to as the “contactor panel”, is located at the right rear of the machine behind the control box. The panel assembly provides sensing and overload protection for the output circuit and provides a means of connecting and disconnecting generator output to and from the load *(aircraft).*

(a) Load contactor

The load contactor *(6, Fig. 10)* is a sealed unit which contains a magnetic operating coil and four sets of contacts. The three larger contacts conduct three-phase AC generator output. A smaller contact set is connected in the protective monitor circuit and supplies 12-V DC power used by sensing relays to signal the protective monitor when a fault occurs. Three-phase, 400-Hz generator output power is conducted to the load contactor by 2/0 cables which pass through 3 sets of current transformers *(3, 4, and 9).*

(b) Current transformers

(1) Ammeter current transformers

Three current transformers *(4)* lower the output load current to a lesser value of definite ratio *(250-A to 5-A)* which will operate the ammeter *(6, Fig. 6)* movement without damage. The ammeter dial scale is graduated and numbered so that the ammeter pointer will indicate the true load current value rather than the meter movement current.

(2) Line-drop current transformers

The three line-drop current transformers *(9),* in conjunction with burden resistors *(8),* detect the magnitude and power factor of current flowing from generator to load. They feed a signal to the voltage regulator which interprets the signal and alters the exciter field current as required to maintain a constant predetermined voltage at the load *(see Voltage Regulator Manual No. TM-759).*

(3) Overload current transformers

Three overload current transformers *(3),* in conjunction with burden resistors *(1),* monitor the output load current in each of the three output phases, and supply a reduced value current signal to the overload module *(7).*

(c) Overload module

The overload module *(7)* is a solid-state device designed to interpret a signal from transformers *(3)* and to send a signal to the protective monitor module *(1, Fig. 7)* when an overload condition exists in any generator output phase. A pull-apart electrical connector is mounted on the overload module to provide quick-disconnect facilities for all wiring to the module. The overload module is equipped with a hermetically sealed, reed-type relay. Relay contacts are normally open. The solid-state circuitry is designed to close relay contacts when output current in **ANY** phase reaches 125% of normal rated output capacity. The closed relay sends a signal to the protective monitor. This signal “gates” the overload SCR *(silicone-controlled rectifier)* in the protective monitor and interrupts the load contactor holding circuit, allowing the load contactor to open.

The following is a list of overload module characteristics:

NOTE*: The overload protective system will function when any phase carries 123% to 127% of rated load.*

At 125% load the module will function in 5 minutes.

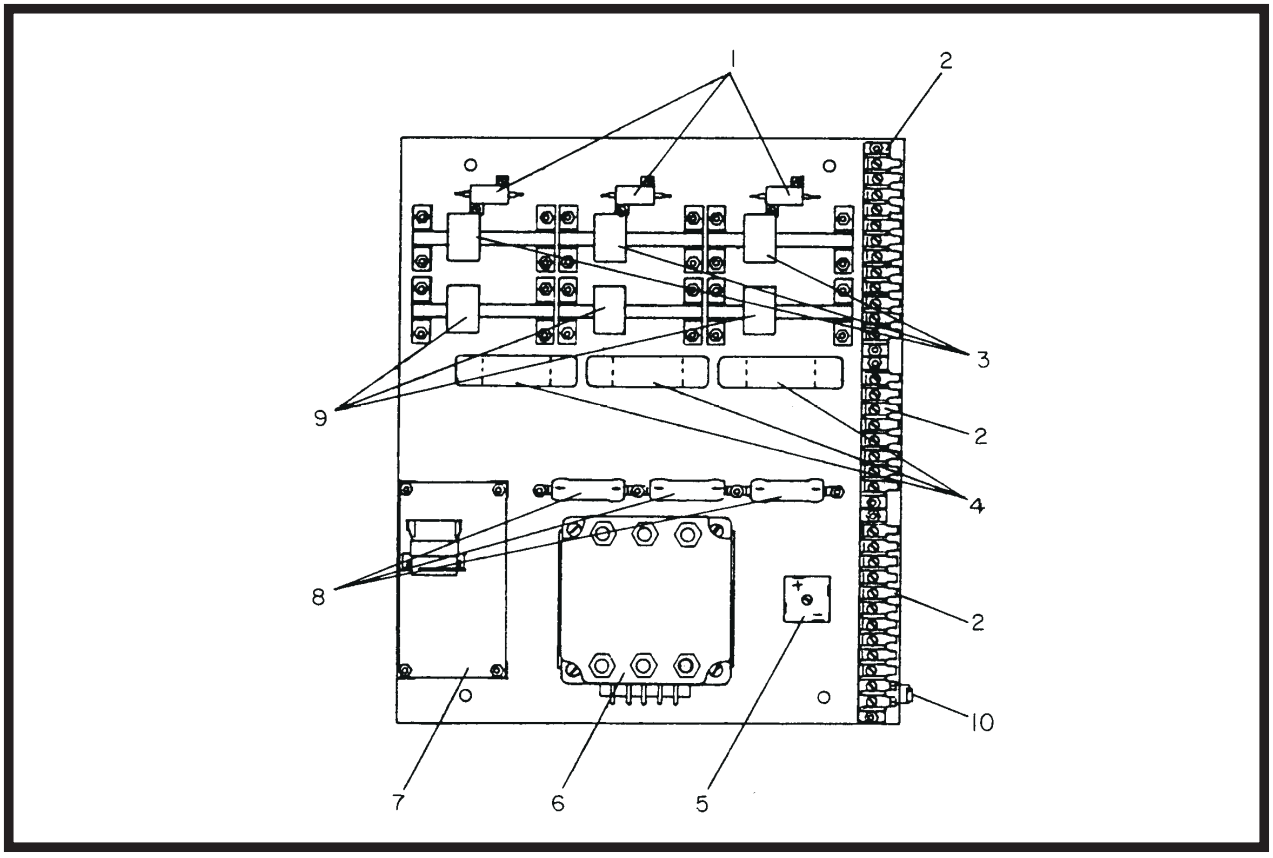
At 150% load the module will function in 16 seconds.

At 200% load the module will function in 4 seconds.

NOTE*: All times are plus or minus 25% and are nonadjustable.*

(d) Rectifier

A diode-bridge rectifier *(5)* receives 400-Hz AC from phase **C** of the generator output an converts it to a pulsating, direct current for energization of the load contactor holding coil only. This DC coil-holding circuit is controlled indirectly be controlling the 400-Hz AC to the rectifier. The ground circuit for the rectifier's AC supply must pass through the relay contacts in the protective monitor module to ground cable **N**. Therefore, any time a protective device functions to open the protective monitor relay, the rectifier's AC circuit is opened. No DC is then available for the load contactor holding coil, hence, the load contactor opens.



1. Overload resistor (16.6 ohm, 25 watt)
2. Terminal board
3. Overload current transformer
4. Ammeter current transformer
5. Rectifier
6. Load contactor
7. Overload module
8. Line drop resistor (50 ohm, 25 watt)
9. Line drop current transformer

Power Module Panel Assembly

Figure 10

(e) Terminal boards

Three terminal boards *(2)* provide connection facilities for small leads.

6. Test Box

The test box is an optional accessory item used for testing the generator set. All generator sets are wired to accommodate a test box, however, the box is supplied only when ordered *(Part Number 388318A-1).*

A. Description (See Fig. 11)

The test box assembly consists of a rotary selector switch, momentary contact pushbutton switch, and two, insulated-tip test jacks, mounted in a small metal box. Connection to the generator set is made through a wiring harness equipped with a 26-contact plug connector which mates with a receptacle connector.

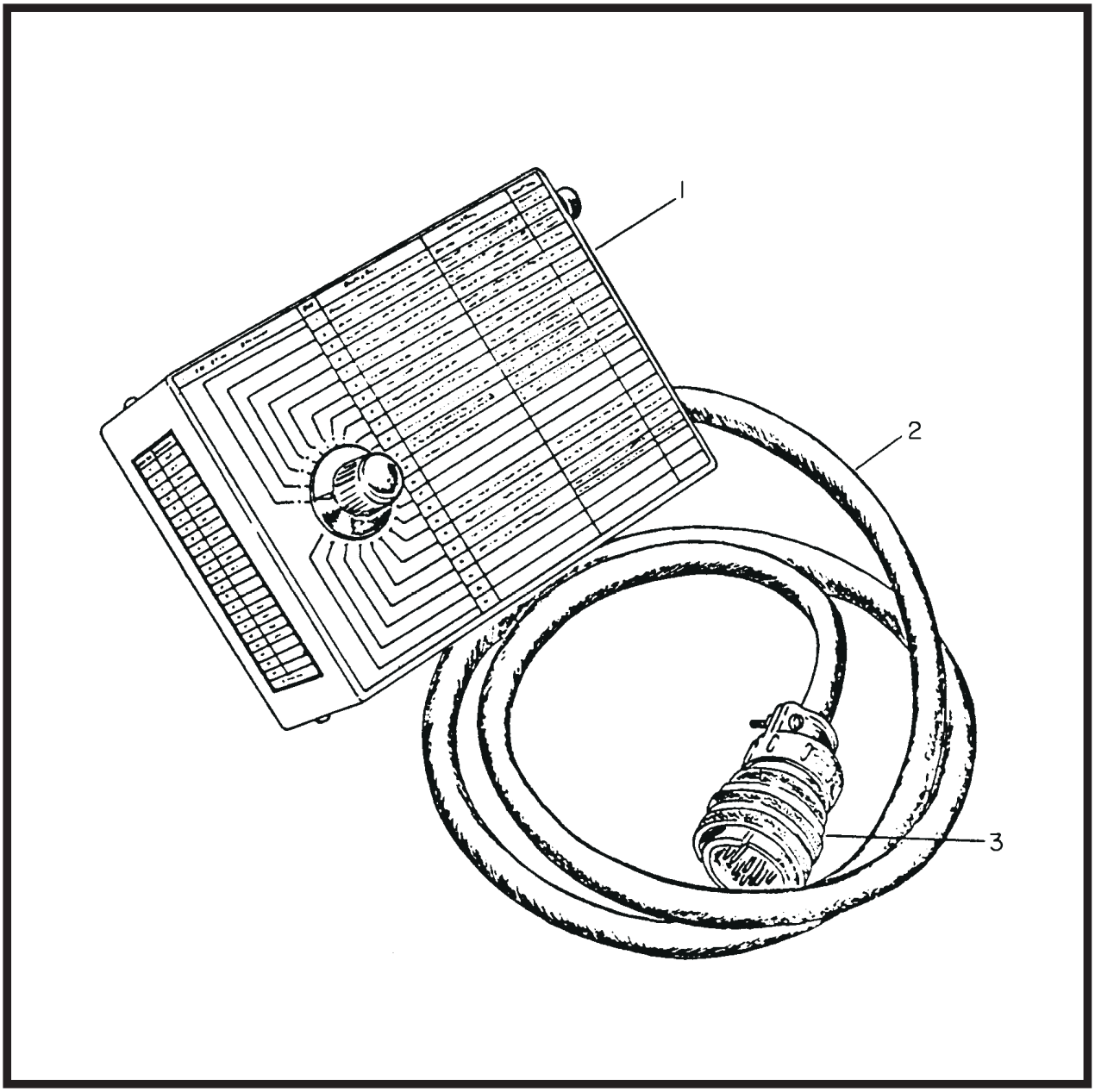
B. Theory of Operation

Wire leads are connected to the electrical circuitry of the generator set at various points and routed to a receptacle connector, mounted on the engine control panel. They are connected to the test box rotary switch by a plug connector and wiring harness.

The rotary selector switch is wired in such a manner that for any switch position, two pre-selected test points in the generator set circuitry are connected for testing. The selector switch may be rotated to any one of 22 positions, however not all positions are used in this installation. An instruction plate mounted under the switch knob indicates switch positions and component tested in each position. Normal voltage for each test is also indicated.

Two test jacks are provided for connection of the test prods of a voltmeter. After the voltmeter is connected and selector switch positioned, the test circuit is closed by pressing the pushbutton switch. A voltage value may then be observed on the voltmeter. This arrangement prevents energization of test circuitry and equipment for extended periods and allows the operator to reset and adjust the voltmeter without disconnecting it from the box.

For operating instructions, see Sect. 1-3, Para. 3.



1. Test box
2. Cable
3. Plug connector

Test Box Assembly

(Optional)

Figure 11

SECTION 2. PREPARATION FOR USE, STORAGE, OR SHIPPING

1. General

The self-propelled generator set is shipped in running condition, and is ready for operation after inspection and check.

WARNING: IMPROPER OPERATION CAN INJURE, KILL, OR CAUSE DAMAGE! READ AND UNDERSTAND OPERATING INSTRUCTIONS IN SECTION 1-3 BEFORE OPERATING THE UNIT.

2. Inspection/Check

Inspect the unit thoroughly prior to operation.

A. Remove blocking, banding, ties, and other securing material.

B. Inspect exterior for shipping damage such broken lights, damaged sheet metal, etc.

C. Open all canopy doors and inspect interior for foreign material such as rags, tools, shipping papers, etc.

D. Check fuel, coolant, and oil hoses and connections for visible leaks. Visually inspect the compartment floor and ground surface under the unit for signs of leakage., If leaks are found, correct by tightening hose clamps, tube fittings, etc., as required.

E. Check air cleaner. Be sure there are no papers, tapes, or other material covering the air inlet area.

F. Check the following for sufficient quantity:

- **(1) Fuel**

  Check fuel quantity as indicated by fuel gauge located in the side of the tank on the right side of the unit. Fill tank, as required, with No. 2 diesel fuel.

CAUTION: BE SURE COOLING SYSTEM ANTIFREEZE SOLUTION IS ADEQUATE TO PROTECT BELOW LOWEST TEMPERATURE EXPECTED.

- **(2) Engine coolant**

  The radiator cap is accessible by opening the hinged access cover on the front canopy housing. Coolant level should be approximately one inch below the filler neck. Allow a capacity for coolant expansion.

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

If difficulty is experienced in removing radiator cap, open left-front door and reach under front canopy to get a better grip on cap. Press **DOWN** and **TURN** at the same time.

CAUTION: NEVER OPERATE THE ENGINE WITH OIL LEVEL BELOW THE LOW-LEVEL MARK OR ABOVE THE HIGH-LEVEL MARK ON THE OIL LEVEL GAGE ROD (DIPSTICK).

- **(3) Engine lubricating oil**

  Oil level should be at **"FULL"** mark on oil level gage rod. See the Detroit Diesel Shop Manual for oil recommendations.

- **(4) Miscellaneous**

  (a) Check battery electrolyte level. Refer to battery service information in Section 2-2.

  (b) Check brake master cylinder fluid level. Refer to brake service information in Section 2-2 and in the Detroit Diesel Shop Manual.

  (c) Check transmission, rear axle, and transfer case lubricant levels. Refer to service information for these components in Section 2-2 and in the Detroit Diesel Shop Manual.

3. Lubrication

Lubricate the equipment in accordance with instructions in Chapter 2-2 as required.

4. Installing Output Cables

Units are generally shipped without generator set-to-aircraft cables.

A. Three-phase, AC output cable assembly installation

The output terminal panel is located under the driver's seat mounting platform at the rear *(See Fig. 1).*

(1) Remove rectangular panel which covers terminal board. It is attached by four screws.

(2) Remove one screw from the left cable clamp in the cable box. Loosen other clamp screw and twist clamp out of the way so that the loose end of the cable assembly may be routed through the clamp to the terminal board.

NOTE: conductor size recommended for AC output is 2/0 size. Use No. 12 size for control (E and F terminals). Large cable (A,B,C,N) should be equipped with terminals having at least a 3/8-inch diameter mounting hole. Mounting hole in small leads (E and F0 should be at least 1/4-inch diameter).

(3) When terminal nuts are tightened, position cables in cable clamps and install clamp screws. Tighten clamp screws securely, but avoid damage to cable insulation.

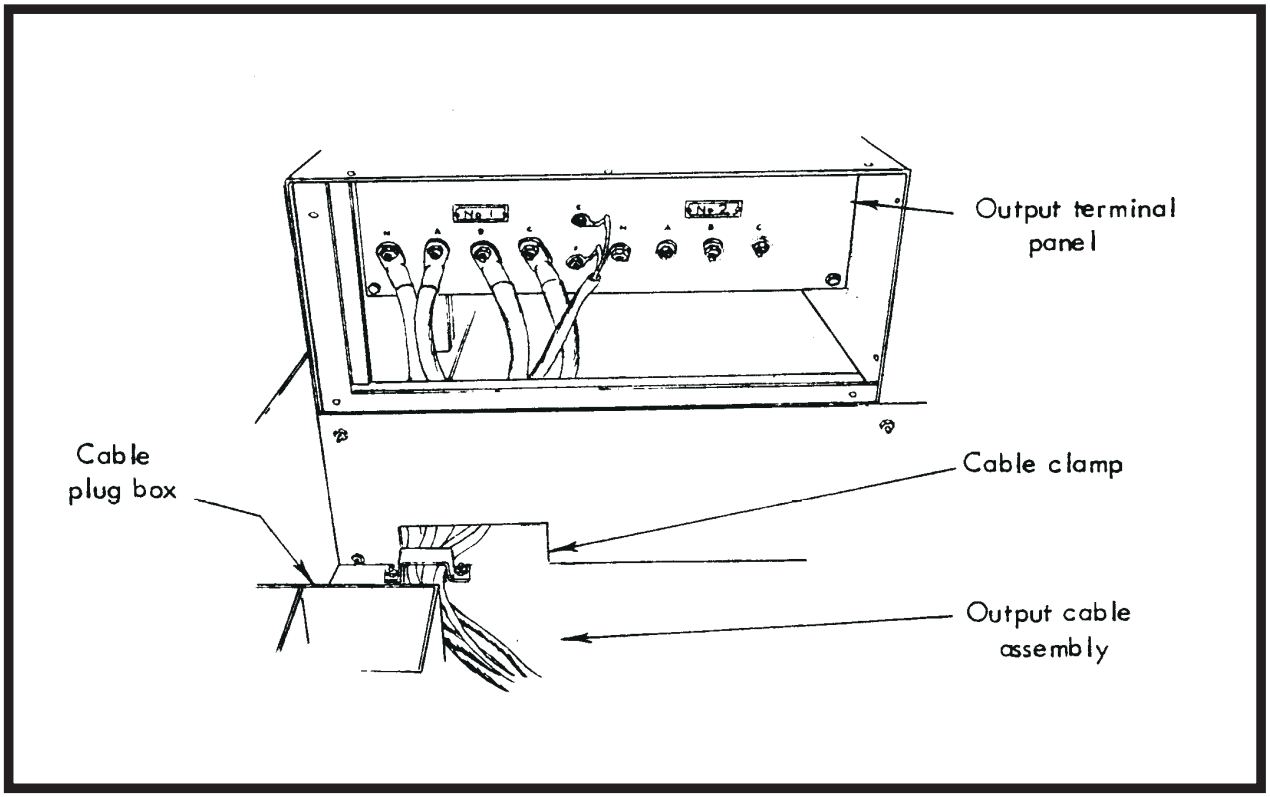
(4) Remove the wooden block from the plug box *(See Figure 2).* Coil the cable into the cable box and place the cable plug connector into the plug box.

NOTE: When an output cable is not supplied with the generator set, a wooden block is placed in the plug box at the factory to allow the machine to be operated in DRIVE mode until a cable assembly is installed.

B. Transformer-Rectifier Output Cable Installation *(Spec 7006-1 Units)*

(1) Install DC output cables as illustrated in Figure 2. Use 4/0 size cables for both 28.5-VDC.

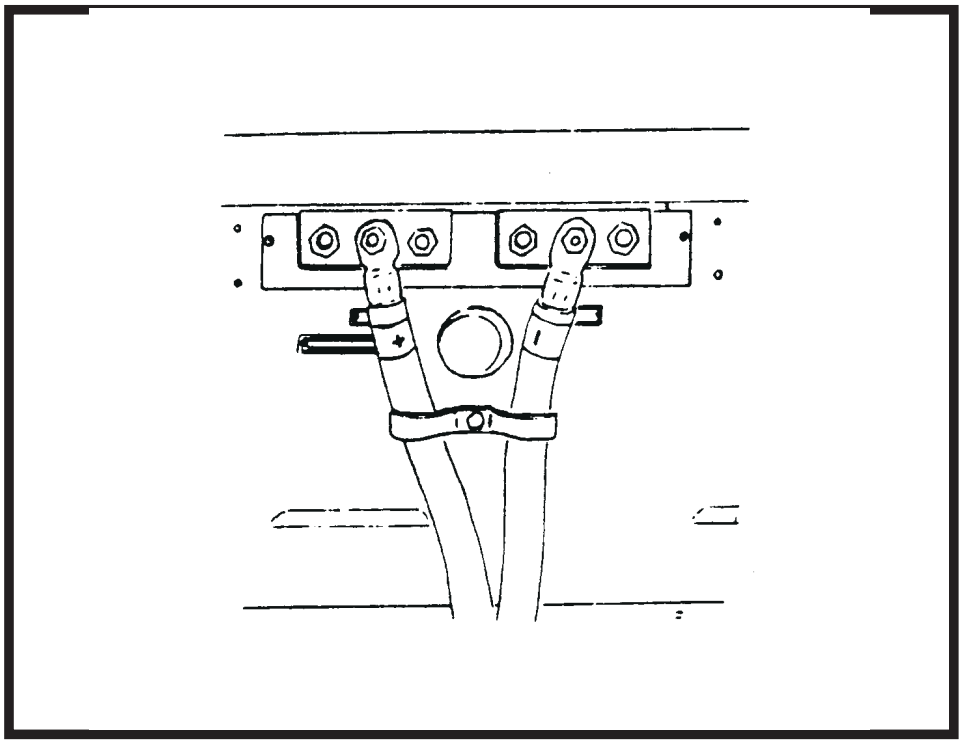
(2) Remove wooden blocks from plug boxes *(See Figure 3)* and place cable connectors in plug boxes. Stow cables in cable box and on cable hangers.



Output Terminal Panel

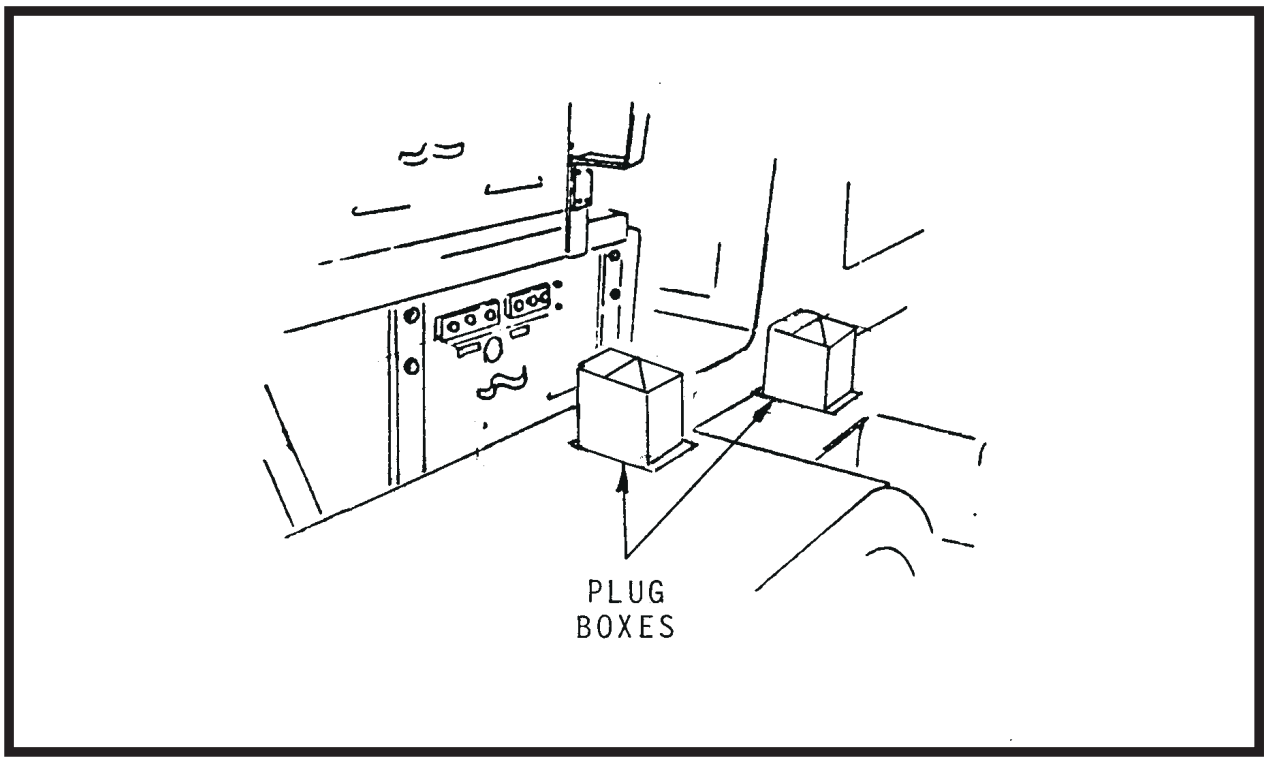
(With Output Cables Attached)

Figure 1



T-R Output Cable Installation

Figure 2



T-R Cable Plug Box Locations

Figure 3

SECTION 3. OPERATION

1. General

This section contains information and instructions for the safe and efficient operation of the equipment. Operating instructions are presented in a step-by-step sequence of procedures to be followed in supplying 400-Hz power to an aircraft. Operation of the self-propelled unit as a mobile vehicle will be covered first.

WARNING: IMPROPER OPERATION CAN KILL, INJURE, OR CAUSE DAMAGE! READ AND UNDERSTAND THE INSTRUCTIONS BEFORE OPERATING. DO NOT TOUCH ELECTRICALLY ALIVE OR MOVING PARTS. DO NOT USE UNIT FOR PUSHING OR TOWING. WEAR EAR PROTECTION WHEN WORKING IN CLOSE PROXIMITY TO THIS EQUIPMENT. USE PROTECTIVE CLOTHING AND MAINTENANCE EQUIPMENT.

2. Moving the Unit Without Engine Power

If it becomes necessary to push and move the vehicle without using the engine, make certain that the parking brake *(6, Fig. 2)* is **RELEASED** and the transmission gearshift lever *(5)* is in **NEUTRAL** position. Push the brake lever *(6)* forward to release. **BE SURE THAT THE TERRAIN ALLOWS THE EQUIPMENT TO BE STOPPED AND CONTROLLED.**

3. Operating the Unit

A. Prestart Inspection

(1) Verify that Chapter 1, Section 2 inspection has been done. Be sure that fuel shutoff valve is OPEN. The valve is located at the fuel tank outlet *(see 1-1; Fig. 3, item 19).* Check fuel gage and verify existence of sufficient fuel to complete the job to be done.

(2) Be sure the gearshift lever *(5, Fig. 2)* is in **NEUTRAL** position.

(3) Be sure parking brake is applied. Pull the lever *(6)* upward and backward to apply the brake. The brake lever operates on an overcenter locking principle. Brake application pressure applied to the brake band is adjustable by a threaded knob located on top of the brake lever handle. Turning the knob **CLOCKWISE** increases brake pressure and causes an increase in the effort required to apply the brake and pull the handle into automatically locked position. The brake lever handle points almost straight upward when in locked position. The brake is released by pushing the lever **FORWARD.**

(4) Make certain all output cable plug connectors are properly stored in plug boxes.

(5) Be sure there is sufficient coolant and lubricating oil in the engine, and that there are no rags or other foreign material in the engine and generator compartment.

B. Normal Engine Starting Procedures

Engine starting procedures are outlined below. Engine operating controls and monitoring instruments are illustrated in Fig. 1.

(1) If illumination is required, place light switch *(16)* in **ON** position.

(2) Place operating mode switch *(21)* in **DRIVE** position.

(3) Be sure contactor control switch *(14)* is in **OFF** position.

(4) Place and hold engine control "permissive start" switch *(1)* in **START** position. The green light **(5)** should glow to indicate that power is available to the engine protective circuit and fuel shutoff valve.

(5) Press start switch button *(3)* to crank the engine. Release start switch as soon as engine starts. Release engine control switch *(1)* as soon as oil pressure reaches 12 pounds or more.

CAUTION: (a) IF ENGINE FAILS TO START WITHIN 30 SECONDS, RELEASE THE START SWITCH AND ALLOW THE STARTING MOTOR TO COOL FOR A FEW MINURES. IF THE ENGINE FAILS TO START AFTER FOUR ATTEMPTS, AN INSPECTION SHOULD BE MADE TO DETERMINE THE CAUSE.

(b) IF THE ENGINE FIRES SUFFICIENTLY TO DISENGAGE THE STARTER GEAR, BUT DOES NOT START, RELEASE THE START BUTTON AND ALLOW THE STARTING MOTOR TO COME TO A COMPLETE STOP BEFORE ATTEMPTING TO ENGAGE THE STARTER AGAIN.

(c) DO NOT ATTEMPT TO START UNIT BY TOWING OR PUSHING.

(6) Observe all engine instruments for normal operation.

(7) Allow engine to idle and warm before applying load.

CAUTION: DO NOT ALLOW THE ENGINE TO IDLE FOR LONG PERIODS OF TIME.

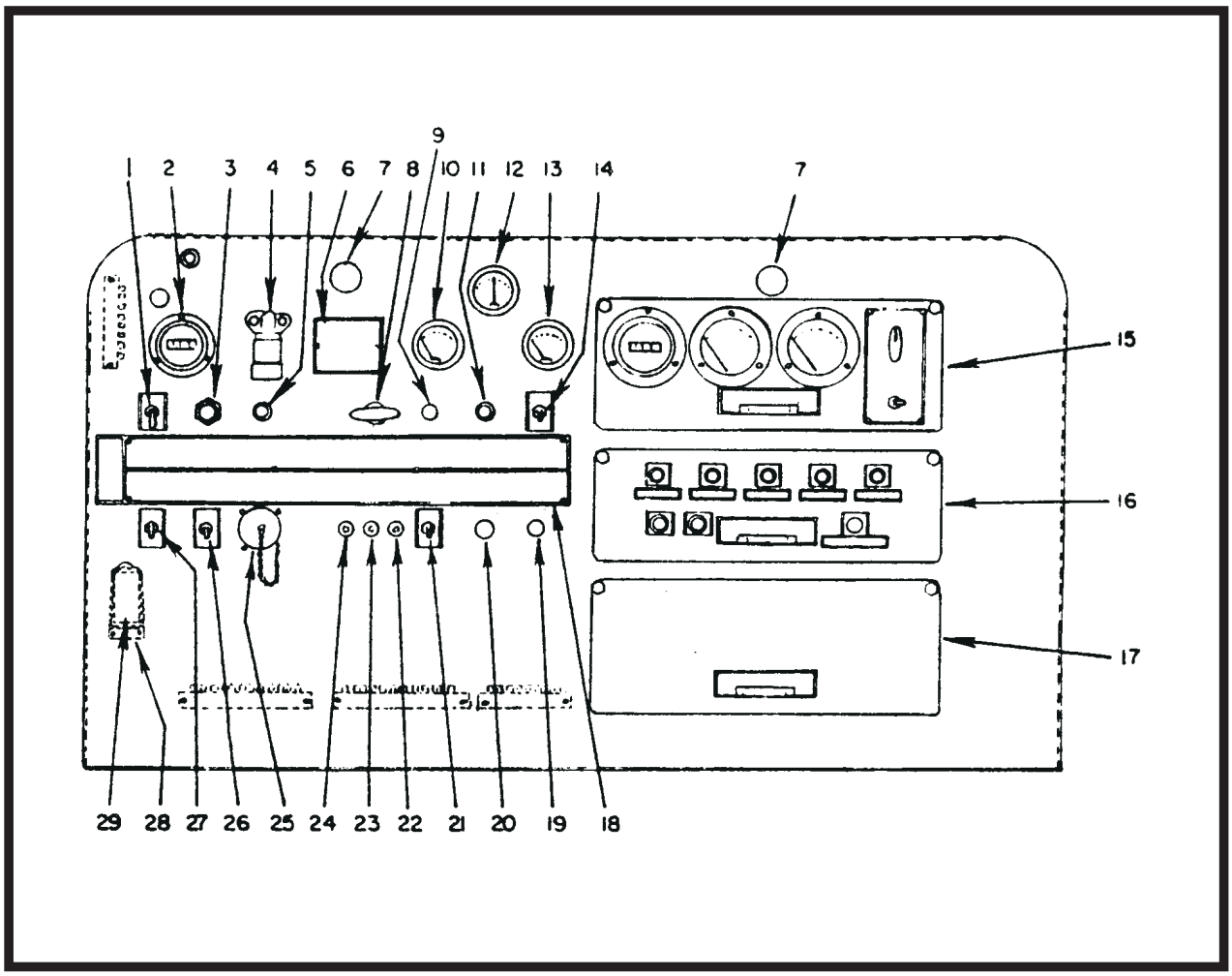
C. Cold Weather Engine Starting Procedures

A cold weather starting-aid kit *(Fig. 6)* is provided to assist in starting the engine at temperatures below 50 degree F. To start the engine, using the starting aid, proceed as follows:

(1) Position switches and controls as instructed in steps *(1)* through *(4),* paragraph B, Normal Engine Starting Procedures, above.

(2) Prepare starting aid for use. The starting aid is shipped in a safe condition and is not operable until assembled. Assemble as follows:

WARNING: FIRES, FUMES, AND FLYING PARTS CAN KILL OR INJURE! STARTING FLUID IS EXTREMELY FLAMMABLE. IT IS UNDER PRESSURE. USE CAUTION WHEN HANDLING. AVOID CONTACT WITH SKIN AND AVOID BREATHING VAPOR.



1. Engine control switch, start/stop
2. Hourmeter, engine
3. Pushbutton start switch
4. Air cleaner indicator, service
5. Engine "ON" indicating light
6. Identification plate
7. Instrument panel lights
8. Starting aid control
9. Hole plug button
10. Oil pressure gage
11. Contactor CLOSED indicating light
12. DC Ammeter, battery
13. Coolant temperature gage
14. Contactor control switch
15. Generator control tray
16. Protective relays tray
17. Voltage regulator tray
18. Identification and instruction plate
19. Hole plug button
20. Hole plug button
21. Operating mode control switch
22. Engine circuit fuse (20-A, slow-blow)
23. Panel light fuse (5-A)
24. Headlight fuse (20-A)
25. Test receptacle connector and cap
26. Panel light switch
27. Headlight switch
28. Capacitor (6.8 mfd, 35-V)
29. Excitation-deenergization relay
(28 and 29 on back of panel)

Operating Controls and Instruments

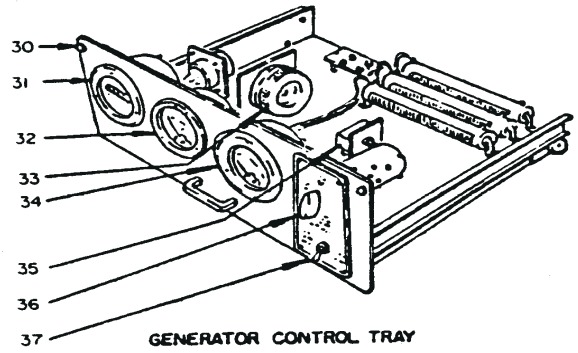
(Sheet 1 of 2)

Figure 1

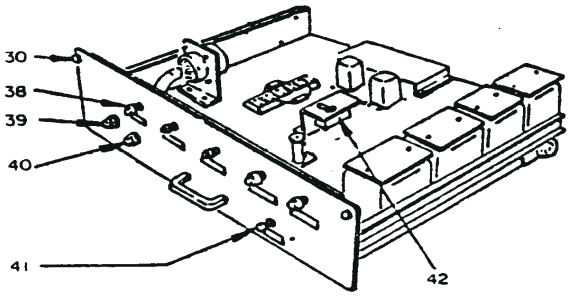
30. Tray fastener
31. Frequency meter
32. AC Voltmeter
33. Manual control rheostat
34. AC Ammeter
35. Automatic-manual switch
36. Meter switch
37. Line switch

38. Fault indicating light (5)
39. Protective monitor system fuse
40. Load contactor circuit fuse
41. Protective monitor system reset switch
42. Test bank switch

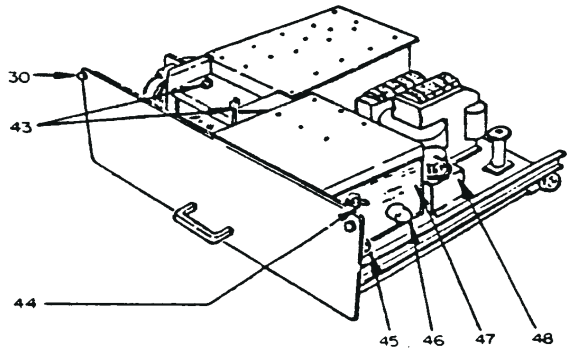
43. Rate and gain adjustments
44. Line drop compensation switch
45. Cable size compensation adjustment
46. Cable length compensation adjustment
47. Instruction plate
48. Voltage adjusting rheostat



GENERATOR CONTROL TRAY



PROTECTIVE RELAY TRAY



VOLTAGE REGULATOR TRAY

Operating Controls and Instruments (Sheet 2 of 2)

Figure 1

(a) Loosen clamp screws *(1, Fig. 2)* and slide the cylinder *(2)* upward sufficiently to remove protective cap (3) and plug *(4).*

(b) Use bottle opener to remove cylinder cap *(3)*. Unscrew and remove plug *(4).*

(c) Slide the cylinder *(2)* downward and thread into the valve *(5)*. Tighten securely. The starting aid is now ready to use.

D. Mobile Operation

- **(1) General**

WARNING: FOR OPERATOR SAFETY, OPERATOR MUST BE SEATED ON GROUND POWER UNIT BEFORE STARTING OR SUPPLYING POWER. DEATH OR SERIOUS INJURY COULD RESULT OTHERWISE.

For this portion of instructions, we shall identify the self-propelled unit as a vehicle. With some critical differences, operation of the vehicle is similar to operation of a conventional truck with four-speed, mechanical transmission. All controls are conveniently located in approximately the same positions that they are found on an ordinary truck or passenger car *(see Fig. 3)*. The operator should familiarize himself with the different steering and performance characteristics of the vehicle before attempting to position it to an aircraft because some **PRECAUTIONS** *(not usually associated with driving a truck)* must be observed. The operator should remember: first, that because the engine must be large enough to drive the generator at full capacity, it has much more horsepower than is required for driving the vehicle; second, that the generator rotor is attached directly to the engine and acts the same as a very large flywheel weighing approximately 400 pounds; third, that a great amount of inertia is developed in the rotor “flywheel” even at low engine speeds, and a tremendous amount is developed at higher engine speeds. It is for these reasons that a great amount of torque is available at the clutch and **CAUTION MUST** be exercised when operating the clutch in starting and stopping the vehicle. Sudden engagement of the clutch, when the engine is running at high speed, can destroy the clutch or some other part of the drive train. For reliable and quicker stopping of the vehicle, the clutch must be disengaged before the brakes are applied because rotor inertia continues to propel the vehicle against the braking effort. Engine compression **CANNOT** be used to slow the vehicle.

- **(2) Driving the vehicle**

(a) Use switches *(26)* and *(27),* Figure 1, to turn **ON** lights as required.

(b) Start the engine in accordance with instructions in Para. 3, A through B, above.

(c) The operating mode switch *(21, Figure 1)* must be in **DRIVE** position.

(d) Depress the clutch pedal *(9, Figure 3)* fully.

(e) Select starting gear with lever *(5).* See shift pattern on instruction plate *(18, Figure 1).*

NOTE: Because of low, final gear reduction (9.4 to 1), it is not necessary to start the vehicle in 1st gear.

WARNING: WRECKS OR ACCIDENTS CAN KILL OR INJURE !
1. MAKE CERTAIN OF ADEQUATE HEAD CLEARANCE. THE OPERATOR'S HEAD IS ABOVE THE HIGHEST POINT OF THE VENICLE
2. BE CERTAIN THE OPERATING AREA IS CLEAR BEFORE MOVING THE VEHICLE.
3. DO NOT RELEASE THE CLUTCH PEDAL SUDDENLY.
4. DO NOT ACCELERATE THE ENGINE TO A HIGH RATE OF SPEED BEFOREENGAGINGTHECLUTCH.
5. AVOID SUDDEN TURNS AND STOPS.

(f) Release the clutch pedal smoothly. Release the pedal fully as soon as the vehicle begins to move. Accelerate and change gears as required.

(g) OBSERVE ALL RULES FOR SAFE VEHICULAR OPERATION ON AN AIRPORT.

- **(3) Stopping the vehicle**

Stopping the self-propelled unit is different from stopping an automobile or truck. Because of the great force of inertia built up in the generator rotor, engine compression has no braking effect on the engine when the accelerator is released. In fact, a sensation of acceleration may be felt. To stop the vehicle:

(a) ALWAYS DEPRESS the clutch pedal before applying the brakes. Thus, the brakes do not need to slow the rapidly turning rotor in addition to stopping the vehicle.

(b) Apply the brakes smoothly, and avoid sudden stops, except in case of **EMERGENCY.** Plan ahead for safe operation !

(c) If the vehicle is to be parked, place the gearshift lever in **NEUTRAL** position and apply the parking brake.

(d) Place the engine control switch in **OFF** position to stop the engine.

WARNING: HEAVY EQUIPMENT OUT OF CONTROL CAN KILL OR INJURE ! BE CERTAIN THE GEARSHIFT IS IN NEUTRAL AND THE PARKING BRAKE IS APPLIED BEFORE LEAVING THE VEHICLE.

E. Preparation for Power Delivery (Automatic Voltage Control)

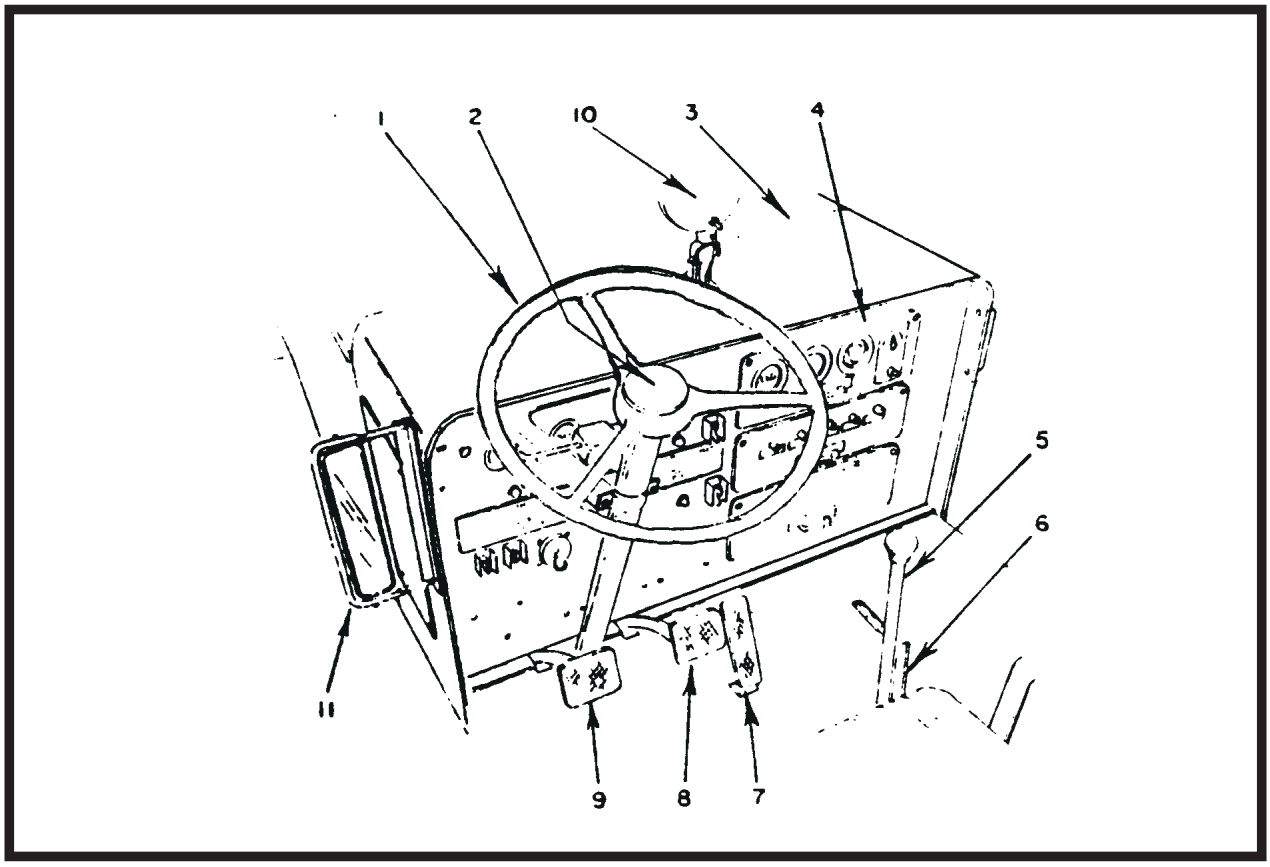
CAUTION: AS SOON AS THE VEHICLE IS PROPERLY POSITIONED, PLACE GEARSHIFT LEVER IN NEUTRAL POSITION, APPLY PARKING BRAKE, AND RELEASE THE CLUTCH.

- **(1) Voltage regulator tray**

(a) The line drop compensation toggle switch *(44, Figure 1)* must be in **ON** position.

(b) Do not disturb the regulator rheostat *(48)* adjustment unless the generator is operating and it is necessary to adjust the output voltage.

(c) Do not disturb other adjustments which are set at the factory.



1. Steering wheel
2. Horn button
3. Canopy
4. Control box (See Fig. 1)
5. Gearshift lever
6. Parking brake lever
7. Accelerator pedal
8. Service brake pedal
9. Clutch pedal
10. Spotlight (Optional)
11. Mirror (Optional)

Driver's Compartment Controls

Figure 2

- **(2) Protective relay tray**

  (a) The test bank switch *(42, Fig.1)* must be in **OFF** position for delivery of power to an aircraft equipped with an interlock control system.

- **(3) Generator control tray**

  (a) Be sure automatic-manual toggle switch *(35)* is in **AUTOMATIC** position.

  (b) The meter selector switch *(36)* may be in any position except **OFF.**

  (c) The line selector switch *(37)* should be in **LINE-TO-NEUTRAL** position.

F. Power Delivery (Automatic Voltage Control)

After controls have been positioned, proceed to deliver power as follows:

(1) Place operating mode control switch *(21)* in **GEN** position. Electric governor will control engine speed.

(2) Observe generator instruments. Frequency meter *(13)* should indicate 400 Hz. Voltmeter *(32)* should indicate 115-VAC when line switch *(37)* is in **LINE-TO-NEUTRAL** position.

(3) Dismount from vehicle to connect cables to aircraft. Remove cable plug connector*(s)* from plug box*(es)* as required. Connect to aircraft receptacle connector*(s)*. Make certain connectors are mated fully and securely.

(4) The final step in power delivery is closing the load contactor or load contactors as required. Momentarily place load contactor control switch *(14 and/or 19)* in top *(spring loaded)* **ON** position. Green indicating light *(11 and/or 20)* should glow at once to indicate that the load contactor, or contactors are closed and power is available at the aircraft. As soon as the light glows, release switch*(es).* Switch will automatically return to center **ON** position.

NOTE: If the indicating light (11 or 20) should go OFF as soon as the switch (14 or 19) is released, and no fault lights are ON, it indicates that 28.5-VDC holding current is not being supplied from the aircraft to the plug-interlock relay. Correct condition and again operate load contactor control switch.

(5) It is recommended that the operator check output voltage and current in each of the three phases early in the power delivery run. Use the meter switch *(36)* to select the phase. Use the line switch *(37)* to select line-to-line or line-to-neutral voltage. If the load is changing, it is good operating practice to observe the instruments until load conditions stabilize.

(6) A condition of overvoltage, undervoltage, underfrequency, overfrequency, or overload in the output circuit will automatically open the load contactor and turn on the applicable indicating light *(38)* to signal the operator which of the above faults caused the protective monitor system to operate. After the fault has been corrected, press the reset switch *(41)* to turn off the indicating light and reset the protective relay system. Proceed with power delivery by operating the load contactor switch *(14 and/or 19).*

G. Preparation for Power Delivery (Manual Voltage Control)

Preparation for power delivery using manual voltage control is exactly the same as for automatic control *(Para. 3, E)* except:

(1) Place automatic-manual switch *(35)* in **MANUAL** position.

(2) Set the manual voltage control rheostat *(33)* near its mid-range position.

(3) Output voltage must be constantly monitored and adjusted to prevent damage to sensitive loads.

H. Power Delivery (Manual Voltage Control)

Power delivery using manual voltage control is the same as automatic delivery *(Para. F, 1 thru 5)* except:

(1) Control generator output voltage by adjusting the rheostat *(33)* to maintain a steady 115-VAC reading on the voltmeter. Turn the rheostat knob **CLOCKWISE** to **INCREASE** voltage and **COUNTERCLOCKWISE** to **DECREASE** voltage.

(2) Adjust voltage to 115-VAC.

(3) During manual power delivery the operator **MUST** remain with the generator set to adjust output voltage for varying loads and conditions.

J. Discontinue Power Delivery

(1) Place the load contactor switch *(14 and/or 19)* in **OFF** position. Green light *(11 and/or 20)* should go **OFF** immediately to indicate that the load contactor has opened and power is no longer being delivered to the aircraft.

(2) Disconnect output cable*(s)* at aircraft. Stow cable*(s)* and place plug connector*(s)* in plug box*(es).*

WARNING: HIGH VOLTAGE - ELECTRIC SHOCK CAN KILL! ARC FLASH CAN INJURE! NEVER DISCONNECT THE OUTPUT CABLE WHILE POWER IS BEING DELIVERED.

(3) Place operating mode switch *(21)* in **DRIVE** position to allow engine to idle.

NOTE: If the engine is stopped without first placing switch (21) in DRIVE position, an underfrequency fault may be indicated in the next "start-up".

K. Stopping the Engine

(1) Allow the engine to idle a few minutes before stopping, to permit cooling.

(2) To stop engine, place engine control switch *(1)* in **OFF** position.

4. Operating Transformer-Rectifiers

A. General

The transformer-rectifiers *(T-Rs)* mounted on the Specification No.7006-1self-propelled unit may be operated either for 28.5-V DC output from one of the T-Rs, or for 57-V DC from both T-Rs, through a series connection arrangement made within a specially designed changeover box. *(Shown as Item 12 of Figure 1 in Section 4-3 of this manual)*. Circuitry for this changeover box is shown in Schematic Diagram No. 181567 in Chapter 6.

All model TR-1528 transformer-rectifiers are equipped with a PC board that can connect to the voltage regulator of the AC generator. When this PC board is connected to the voltage regulator, the T-R will have line drop compensation and current limiting capabilities. However, when two T-Rs are used in series to produce 57-V DC for starting, **only one T-R** - the bottom or **"master"** T-R - is connected to the AC generator. And in this case the bottom T-R will control the line drop for both T-Rs.

Since the top or "slave" T-R is used primarily to develop the extra 28.5-V DC needed for 57-V DC aircraft starting, it is **not** individually connected to the voltage regulator of the AC generator, thus it is **not** provided with line drop compensation or current limiting capabilities. If this T-R is operated alone, there will be **no line drop compensation or current limiting,** and the voltage will drop off as loads are applied.

B. Direct Current Power Delivery

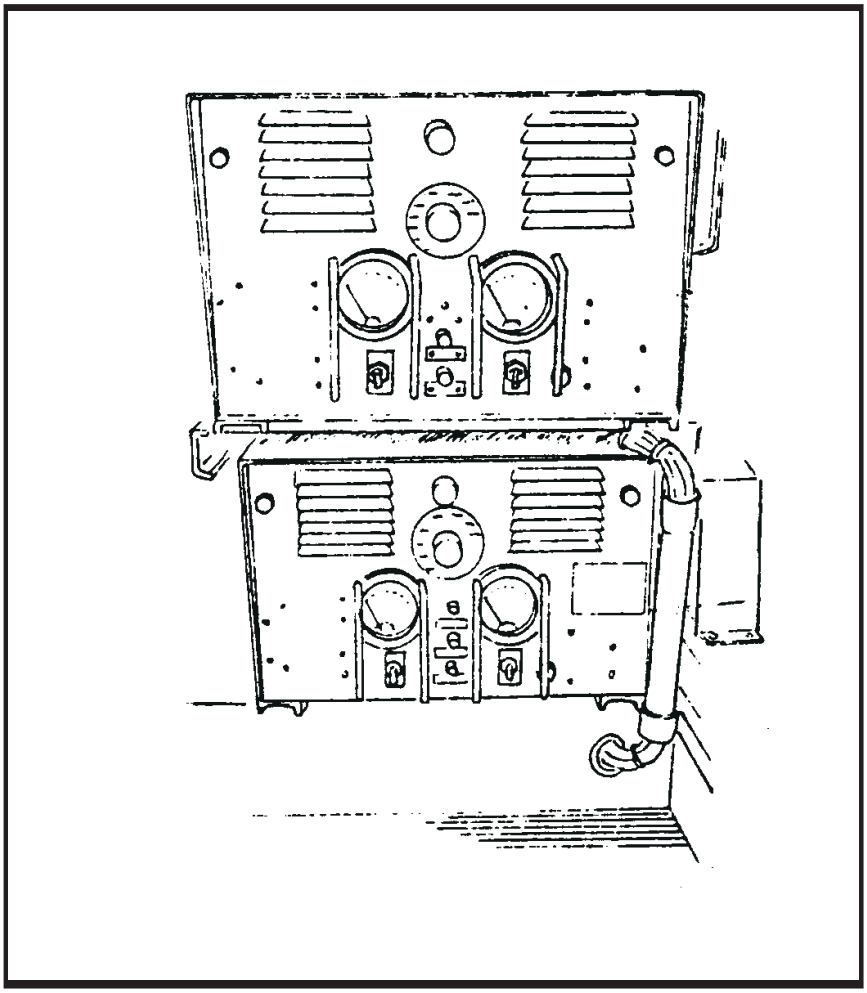
(1) To deliver power from either one or both of the T-Rs, prepare the generator set for DC power delivery the same as for AC delivery, except do not connect AC output cable and do not close AC load contactor *(see Para. 2, D and E).*

(2) For individual T-R operating instructions, see Hobart Manual No. OM-433.

DO NOT attempt to operate the **top** T-R alone, as this T-R is **not** individually provided with line drop compensation capabilities. If this T-R is operated alone, its voltage will drop off as loads are applied.

C. Simultaneous 28.5-V DC and 115-V AC Power Delivery

This generator set is **not** designed for simultaneous 28.5-V DC and 115-V AC power delivery.



Transformer-Rectifiers

Figure 3

5. Operating the Test Box

The test box is useful and convenient in testing the generator set after repair or overhaul and also in trouble shooting. To operate the test box, proceed as follows:

A. Connect the test box plug connector *(see 1-1; 3, Fig. 11)* to the test receptacle connector *(Fig. 5).*

B. Connect the test prods of a voltmeter at the test jacks *(3 and 4, Fig. 4).* Test jacks are color coded. **RED** indicates **POSITIVE. BLACK** indicates **NEGATIVE.**

C. Locate the component or circuit to be tested in the **DESCRIPTION** column on the instruction plate and set the selector switch *(1, Fig. 4)* to the number indicated opposite the description.

D. Note the normal voltage value and kind of current *(AC or DC)* to be expected at the position and set voltmeter accordingly.

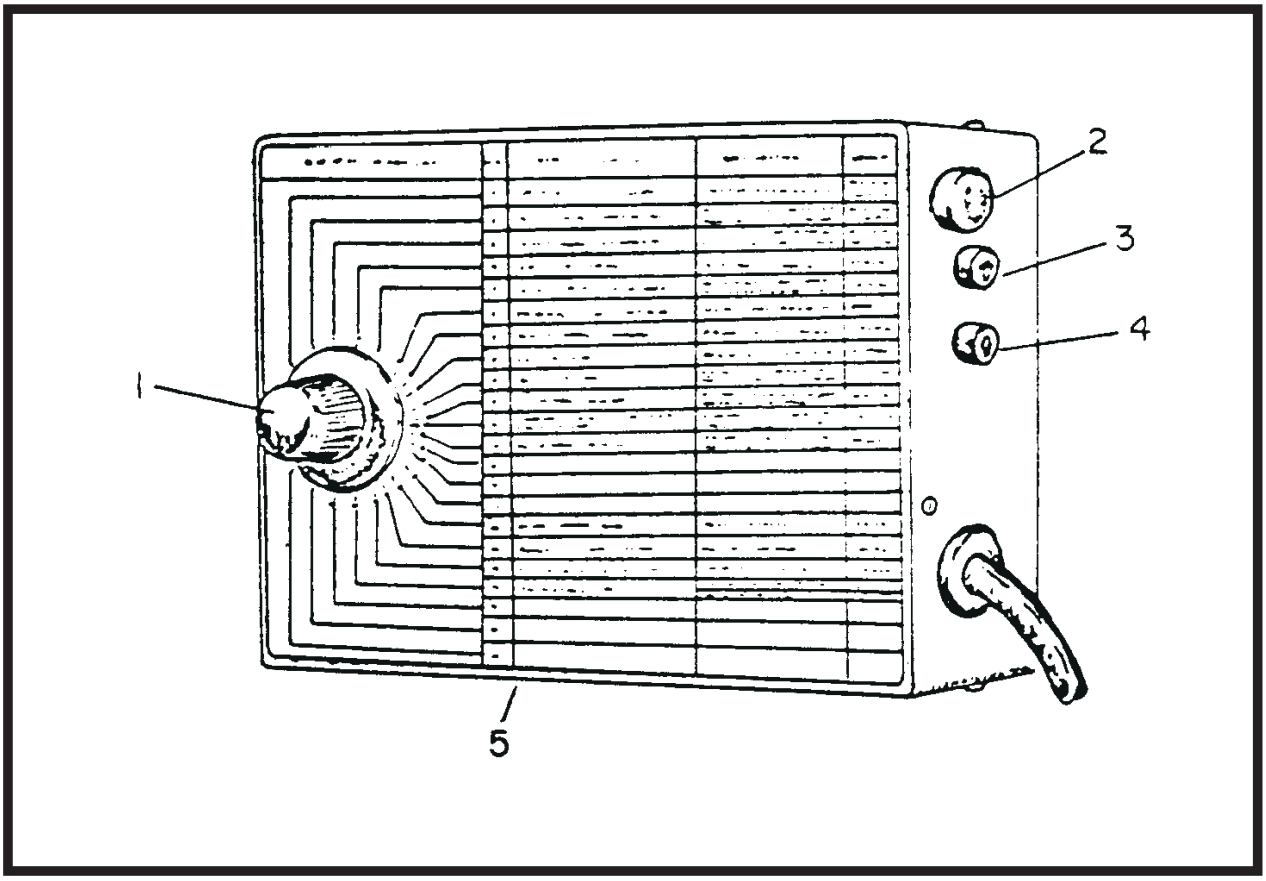
E. Comply with conditions indicated in **CONDITIONS** column for the particular test being performed.

F. Press the pushbutton switch *(2)* and observe voltage indicated by the voltmeter. Compare to normal voltage indicated in **VOLTAGE** column.

G. Release pushbutton switch.

H. Repeat steps C thru G for other test as required.

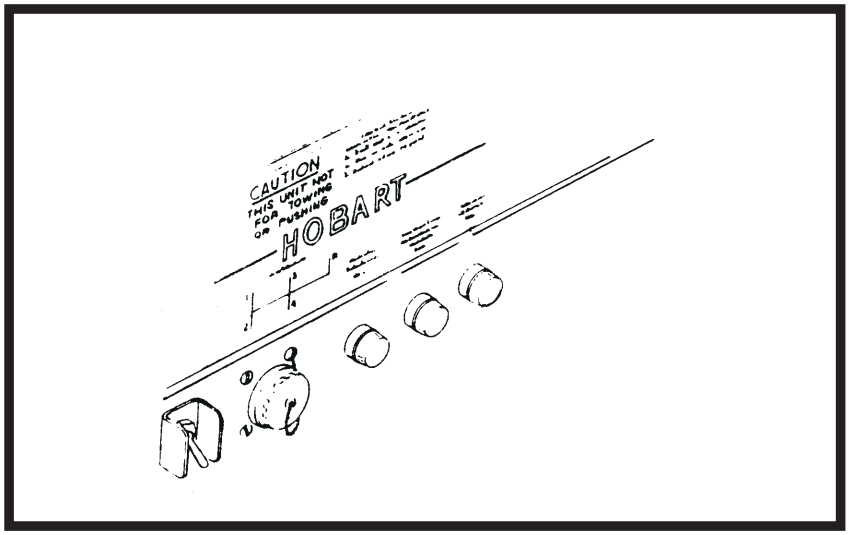
J. When test are completed, disconnect the test equipment.



1. Selector switch
2. Pushbutton switch
3. Positive test jack (red)
4. Negative test jack (black)
5. Instruction plate

Test Box Operating Controls

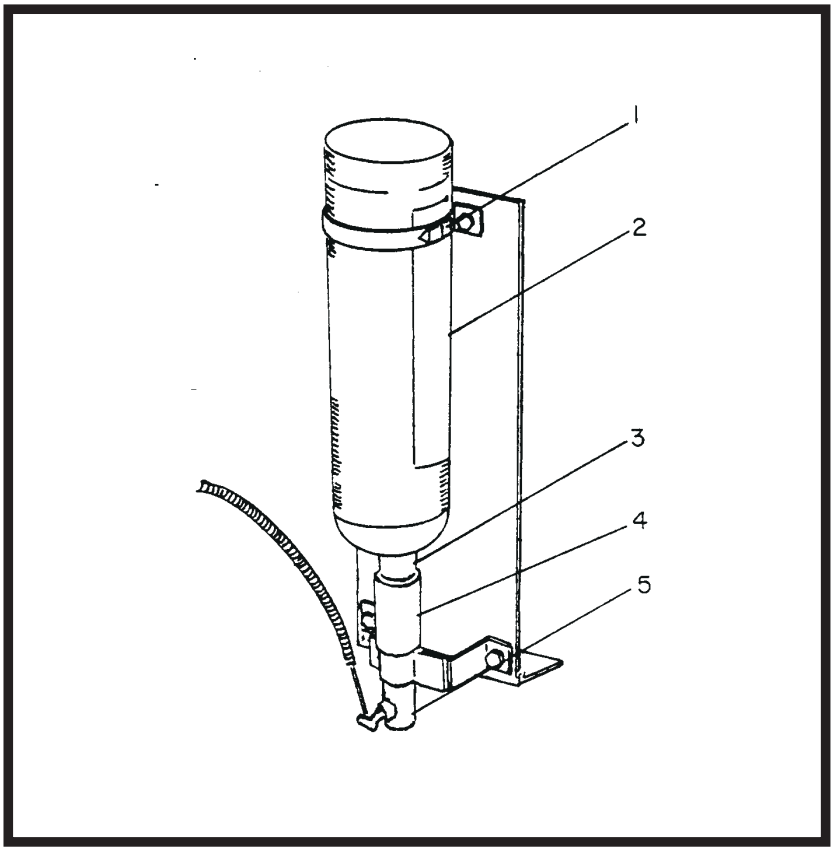
Figure 4



Test Receptacle Connector

(with protective cap installed)

Figure 5



Cold Weather Starting Aid

(Mounted behind engine-generator control panel)

Figure 6

CHAPTER 2. SERVICE

SECTION 1. MAINTENANCE

1. General

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

WARNING: ELECTRIC SHOCK, FLYING PARTS, OR FIRE CAN KILL OR INJURE! STOP OPERATION IMMEDIATELY IF A SERIOUS OR POSSIBLY DANGEROUS FAULT IS DISCOVERED.

2. Maintenance Schedule

A. General

A periodic inspection should be established and maintained. A suggested inspection/check schedule is provided in Figure 1. It may be modified, however, as required to meet varying operating and environmental conditions.

B. Time Intervals

The schedule is based on both hours of operation and calendar intervals. These two intervals are not necessarily the same. For example, in normal operation, the oil change period - based on hours of operation - may be reached long before the three months calendar period. The calendar period is included to make certain that services are performed regularly when the equipment is stored or is being operated less than normally. Lubricating oils that are left standing in engines that are stored, or are used very little, may tend to oxidize and may require changing although it is not dirty. In developing the maintenance schedule, primary consideration was given to the engine. Hourly time intervals are based on the engine manufacturer's recommendations. Under abnormal operating conditions of load, temperature, dust, etc., perform all services on a "whichever comes first" basis and shorten time intervals.

C. Identification of Interval Periods

Each interval period on Figure 1 is identified by a letter A, B, C, etc. For example, services under "B" schedule should be performed at the end of each 200 hours of operation, or every three months if the equipment is operated less than 200 hours in the three months period. "AR" servicing is performed on as **AS REQUIRED** basis.

HOURLY INTERVAL CALENDAR INTERVAL	A/R	10 HRS. OR DAILY	200 HRS. OR 3 MTHS	800 HRS. OR 1 YR.	1200 HRS. OR 1 YR.	6000 HRS. OR 5 YRS.
SYMBOL	AR	A	B	C	D	E
ENGINE						
Check air cleaner cartridge	X					
Check engine blow-by	X					
Check crankcase oil level		X				
Drain fuel filter element		X				
Check coolant level		X				
Checl for leaks & cracks		X				
Check air cleaner indicator		X				
Check exhaust system		X				
Change crankcase oil			X			
Change oil filter element			X			
Check & record oil pressure			X			
Change fuel filter elements			X			
Clean radiator core (external)			X			
Check governor linkage			X			
Change water filter			X			
Check/adjust “V” belt tension			X			
Tighten manifold nuts				X		
Check fan hub & drive pulley				X		
Steam clean engine					X	
Clean fuel pump screen & magnet					X	
Check vibration damper					X	
Adjust injector & valves	X				X	
Check fuel manifold pressure					X	
Check water pump					X	
Check fan hub					X	
Check alternator					X	
Check cranking motor					X	
Clean/calibrate injectors & install rebuilt if required						X
Check fuel pump calibration						X
Clean oil cooler						X
Overhaul cylinder heads						X
Replace piston rings						X
Inspect pistons & cylinder liners						X
Replace cylinder liner seals						X
Inspect bearings & journals						X
Check fan mounting		Spring and Fall				
Clean cooling system		Spring and Fall				
Check hoses		Spring and Fall				
Clean electric connections		Spring and Fall				
Check thermostats & seals		Fall				
Check starting aid		Fall				

Maintenance Schedule

Figure 1 (Sheet 1 of 2)

HOURLY INTERVAL CALENDAR INTERVAL	A/R	10 HRS. OR DAILY	200 HRS. OR 3 MTHS	800 HRS. OR 1 YR.	1200 HRS. OR 1 YR.	6000 HRS. OR 5 YRS.
SYMBOL	AR	A	B	C	D	E
ELECTRICAL SYSTEM (12-VDC)						
Check battery & fluid level			X			
Clean battery terminals	X		X			
Check all lights		X				
Check charging rate		X				
Check wiring & connections			X			
(400 Hz System)						
Check output cable & connectors		X				
Check voltmeter, ammeter, & frequency meter		X				
Check protective relays			X			
Inspect wiring & connections			X			
Clean & inspect generally			X			
DRIVE TRAIN						
Check transmission lubricant level			X			
Check rear axle lubricant level			X			
Check transfer case lubricant level			X			
Lub universal joints & slip yoke						X
Lubricate clutch linkage			X			
Check universal joints & rear axle			X			
BRAKES						
Check brake fluid level			X			
Check & adjust brakes	X			X		
Lubricate linkage			X			
STEERING						
Check lubricant level in gear box			X			
Lubricate		See Lubrication Chart				
Adjust steering gear	X				X	
CHASSIS						
Check tire inflation			X			
Check & adjust front wheel bearings	X				X	
Inspect springs & shackles					X	
Lubricate		See Lubrication Chart				

Maintenance Schedule

Figure 1 (Sheet 2 of 2)

3. Inspection/Check

A. General

Inspections, checks, and maintenance are described in general here. More specific and detailed information is contained in 2-2 and 2-3, will be referenced when applicable.

B. "AR" Checks and Operations (As Required)

- **(1) Engine**

  (a) Change air cleaner cartridge

  A definite time schedule for changing the air cleaner cartridge cannot be established. Observe the indicator when the engine is stopped. When the flag is locked in full view, change the cartridge. See 2-2, Para. 3.

  (b) Check engine "blow-by" as required if the engine lacks power or uses oil excessively. Refer to the Engine Operation and Maintenance Manual.

  (c) Tighten manifold, muffler, and exhaust pipe attaching hardware *(nuts, and capscrews)* as required.

  (d) Tighten all attaching hardware as required.

- **(2) Electrical system (12-VDC)**

  (a) Check battery terminals

  Anytime the battery compartment doors *(Ref. 2-2, Fig.15)* are opened for any reason, visually check battery cable connectors and battery posts. If corrosion is observed, disconnect cables and clean battery posts and connectors with a wire brush or special battery post-and-connector cleaning tool. Coat posts and connectors with a light film of petroleum lubricant before reconnecting the cables.

- **(3) Drive train**

  (a) Clutch pedal travel

  Maintain at least 1 *(one)* inch free clutch pedal travel. Adjust as required in accordance with instructions in 2-3 Para. 4, A, (2).

- **(4) Brakes**

  (a) Brake pedal travel

  Maintain at least 1/4 inch free brake pedal travel. Adjust as required. See 2-3, Para. 4, B.

  (b) Brake shoe adjustment

  Adjust brake shoes in accordance with 2-3, Para. 4, D, anytime pedal may be depressed over halfway to the floor board when applying the brakes.

- **(5) Steering**

  Check the following anytime vehicle is raised for service.

  (a) Check steering linkage for looseness. Correct as required by adjustment or replacement of parts.

(b) Check gearbox for excessive lash by turning the steering wheel while observing the front wheels. Any movement of the steering wheel should cause a movement of the front wheels. Adjust gear box as required.

- **(6) Chassis**

(a) Front wheel bearings

Check front wheel bearings when the vehicle is raised for service of any kind.

(aa) Alternately pull outward, and push inward on the tire at points near the floor. If looseness is found, make certain it is not in the spindle and bushings by observation.

(bb) If any looseness in the bearings is felt, adjust to eliminate looseness. **DO NOT OVERTIGHTEN.**

(cc) Be **CERTAIN** hub nut cotter pins are installed securely.

C. "A" Checks and Operations (10 hours or Daily)

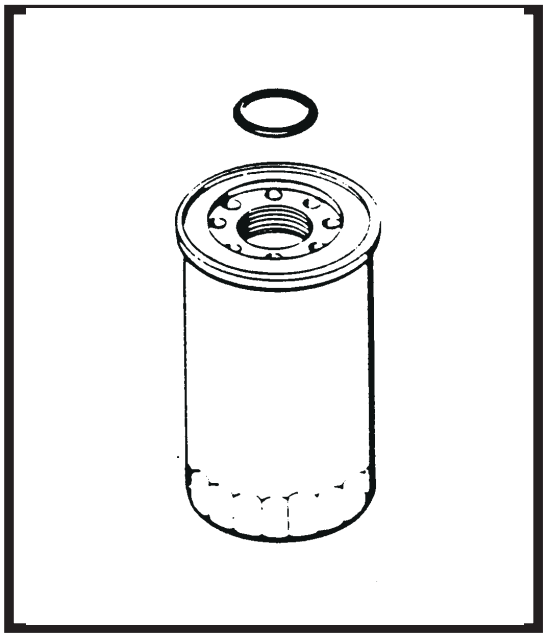
- **(1) Engine**

(a) Check crankcase oil level

Maintain the oil level between the full and low marks *(the distance between the full and low marks is equal to two quarts)* on the dipstick, and never allow it to drop below the low mark. No advantage is gained by having t he oil level above the full mark. The best time to check the oil level is before operating the engine. Or, check the oil level 3 to 5 minutes after engine shutdown. This will allow the oil accumulation in the engine to drain back into the crankcase. To check oil level, remove the oil gage rod *(dipstick),* wipe it clean, and reinsert it firmly for an accurate reading. Dipsticks are normally marked for use only when the engine is on a level surface. Improper oil levels can result if the oil level is checked with the engine on a grade.

(b) Check fuel filter elements

The engine on this generator set has two fuel filter elements, both of which are located on the right side of the engine, near the rear of the engine. Figure 2 shows an element typical of the two that are used on this generator set. The primary filter element is the topmost of the two elements, and the secondary filter element is just beneath it. Check both fuel filter elements to see that they are properly tightened. Refer to Maintenance Schedule *(Figure 1)* to determine when fuel filter element should be changed. If element requires changing, refer to the Section 2-2, Para. 4, B, and to Detroit Diesel manual in Chapter 6.



Fuel Filter Element (Typical)

Figure 2

(c) Check coolant level

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

(d) Check for leaks

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

(e) Check air cleaner indicator

Observe the position of the red flag on the air cleaner indicator that is mounted on the engine-generator control panel. If the red flag is riding high in the viewing chamber, this indicates that the cartridge is approaching change time and should be checked each day.

(f) Check exhaust system

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

CAUTION: A LEAKING AND DEFECTIVE EXHAUST SYSTEM COULD BE A FIRE HAZARD.

- **(2) Electrical (12-VDC system)**

(a) Check all lights

Check all indicating lights to be sure they will operate when they shouls. Check all vehicular lights. If any light fails to operate, check both the lamp and its protective fuse. Figure 4 lists all lamps with their location and part number. Figure 5 lists all fuses.

(b) Check alternator charging rate

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

- **(3) Electrical (115-VAC system)**

(a) Monitoring instruments

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

(b) Indicating lights

Check lamps *(bulbs)* in all of the indicating lights at each start up. Fault indicating ilghts in the protective relay tray may be tested by pressing the lens housing. Check fuses if lights fail to operate.

(c) Output cable plug connector

Check the output cable plug connector for damaged contactors each time the connector is attached to an aircraft.

D. “B” Checks and Operations (200 Hours or 3 Months)

- **(1) Engine**

(a) Change crankcase oil

See 2-2, Para. 2, D, (4) for details.

(b) Change oil filter elements

Change oil filter elements each time the crankcase oil is changed. See 2-2, Para. 2, D, (5) for details.

(c) Check and record oil pressure

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

(d) Alternator and starter lubrication

Most alternators contain sealed bearings and require no periodic lubrication. The starting motor is lubricated at assembly and should be re-lubricated only when the starter is removed and disassembled. Check both of these accessories to determine if they have lubrication fittings.

(e) Change fuel filters

Refer to 2-2, Para. 4, B for instructions.

(f) Clean radiator core

Refer to 2-2, Para. 5, H for instructions.

(g) Check governor linkage

Check all attaching hardware. Check ball joints for wear and looseness. Check linkage for free movement throughout its complete travel range.

(h) Change water filter

Change water filter *(2-2, Fig. 14)* every 200 to 250 hours and at each coolant change. See 2-2, Para 5, K, for service instructions. See Engine Manual for instructions on how to test coolant chemically.

(j) Check and adjust “V” belts

See 2-2, Para. 8, C, for tension check and adjustment instructions.

- **(2) Electrical (12-VDC system)**

(a) battery electrolyte level

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

WARNING: ACID CONTACT CAN INJURE OR DAMAGE ! DO NOT OVERFILL.

(b) Check battery

If the battery requires water frequently, or is low in charge, the reason for the condition must be found and corrected. See 2-2, Para. 6, for detailed battery testing and maintenance.

(c) Battery terminals

Check battery terminals and clean if necessary in accordance with Para. 3, B (2), (a) above.

- **(3) Drive train**

  Check lubricant level in the transmission, rear axle, and transfer case *(Ref. 2-2, Para. 2, G).* Lubricate linkage, etc., in accordance with instructions under 2-2, Para. 2, F, and Figure 1.

- **(4) Brakes**

  (a) Check master cylinder fluid level.

  (b) Lubricate service brake and parking brake linkage *(See 2-2, Figure 1).*

- **(5) Steering**

  Lubricate the steering linkage and gear box in accordance with 2-2, Para. 2, F, and Figure 1.

- **(6) Chassis**

  (a) Lubricate in accordance with 2-2, Para. 2, F, and Figure 1.

  (b) Check tire inflation. Keep tires inflated to 60 PSI.

  (c) Inspect tires for cuts, breaks, and uneven wear. If “scuffiing” and excessive wear on the outer edges of the front tires are observed, check and align the front wheels to 1/8-inch toe-in.

E. “C” Checks and Operations (400 Hours or 6 Months)

- **(1) Electrical (12-VDC system)**

  (a) Wiring

  Inspect all cables and leads for worn or damaged insulation.

  (b) Connectors

  Inspect connectors for security and damaged or corroded condition.

- **(2) Electrical (115-VAC system)**

  (a) Protective relays

  Check operation of all protective relays to make certain they will function if a fault should occur in the output circuit. Procedures for testing these relays are contained in the Adjustment/Test Section, 2-3, Para. 2, B (38) thru (41).

  (b) Wiring and connectors

  (aa) Check all cables, leads, and wiring for broken, worn, and damaged insulation.

  (bb) Check all connections for tightness.

- **(3) Brakes**

  (a) Pedal adjustment

  Check “free-travel” of brake pedal. “Free-travel” of the pedal, before it starts to move the piston in the master cylinder, should be approximately 1/4-inch. This travel may be checked by moving the pedal with the hand.

If adjustment is required, See 2-3, Para. 4, B, (1) thru (8).

(b) Brake shoe adjustment

Check adjustment by depressing the brake pedal with the foot. If the pedal can be depressed over halfway to the floorboard, the brake shoes should be adjusted.

Adjust shoes in accordance with 2-3, Para. 4, D, (1) thru (8).

F. "D" Checks and Operations (800 Hours or 1 Year)

- **(1) Engine**

(a) Check and tighten all manifold nuts if required.

(b) Inspect and check turbocharger for leaks *(See Engine Operation and Maintenance Manual).*

(c) Check and tighten turbocharger mountings if required.

(d) Check fan hub and drive pulley *(See Engine Manual).*

G. "E" Checks and Operations (1200 Hours or 1 Year)

- **(1) Engine**

(a) Steam clean engine

There are several reasons why the engine exterior should be kept clean. Dirt on the outside will enter fuel and oil filter cases and rocker housings when covers are removed unless dirt is removed first. A clean engine will run cooler and develop less "hot-spots".

Steam cleaning is one of the most satisfactory methods of cleaning an engine, however, there are some **CAUTIONS** to be observed.

WARNING: ELECTRICAL SHOCK, FIRE, AND FUMES CAN KILL OR INJURE!

1. DO NOT USE A FLAMMABLE SOLVENT.

2. EXERCISE CARE TO AVOID INJURY AND DAMAGE TO EYES AND SKIN.

3. DO NOT USE MINERAL SPIRITS OR SOLVENTS ON A HOT ENGINE.

4. IF A CLEANING COMPOUND IS USED, SELECT ONE WHICH IS FREE FROM ACID AND WHICH WILL NOT REMOVE PAINT.

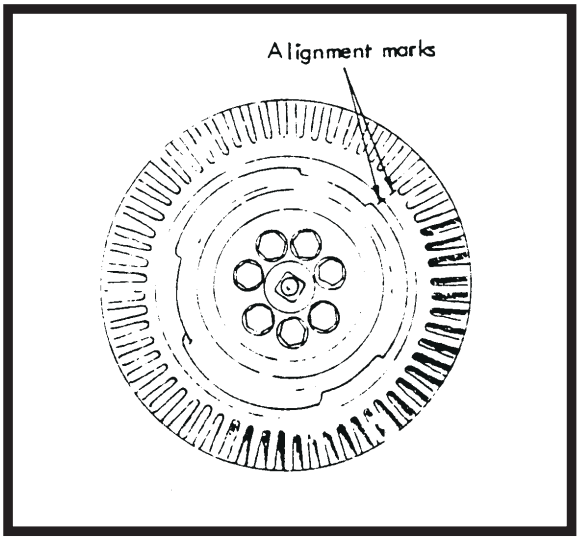
5. PROTECT (OR REMOVE) ALL ELECTRICAL ACCESSORIES, SUCH AS VOLTAGE REGULATOR, ALTERNATOR, AND ELECTRICAL WIRING. SEAL ALL OPENINGS.

(b) Clean fuel pump screen and magnet

See 2-2, Para. 4, C, (1) for screen and magnet removal and cleaning.

(c) Check vibration damper

The damper hub and inertia member are stamped with index marks to permit detection of movement between the two parts *(See Figure 3).* There should be no indication of movement between the hub and the inertia member. If index marks are not aligned, replace the vibration damper.



Vibration Damper Hub

Figure 3

(d) Adjust injectors and valves

Injectors and valves must be in correct adjustment at all times for best engine performance. Refer to the Engine Manual for injector and valve adjusting instructions.

(e) Check fuel manifold pressure

This check is necessary only if there is an apparent or suspected loss of power. Refer to the Engine Manual for tools required and test instructions.

(f) Check water pump

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

(g) Check fan hub

Check fan hub for signs of lubricant loss. Replace with a new prepacked hub if lubricant is leaking.

(h) Check alternator and cranking motor

The alternator and cranking motor on this particular engine require no periodic lubrication. See 2-2, Para. 2, E, (1) and (2) for details.

- **(2) Drive train**

  (a) Check universal joints for looseness.

  (b) Check security of drive shaft attaching hardware.

  (c) Check rear axle nuts to be sure they are tight.

  (d) Be certain cotter pins are installed.

- **(3) Steering**

  Check steering gear and linkage for excessive looseness.

  (a) Raise the front end of the vehicle, so that the front wheels are off the floor.

  (b) Turn the steering wheel while observing the front wheels. Any movement of the steering wheel should result in a movement of the front wheels.

  (c) If front wheels do not respond at once to a movement of the steering wheel, adjust steering gear.

- **(4) Chassis**

  (a) Front wheel bearings

  Check front wheel bearings as follows:

  (aa) Raise the front end of the vehicle until front wheels are off of the flor.

  (bb) Alternately pull outward, and push inward on the tire at points near the floor. If looseness is found, make certain it is not in the spindle and bushings by observing spindle and axle while checking the wheel.

  (cc) If looseness in the bearings is felt, adjust bearings. **DO NOT OVERTIGHTEN.**

  (dd) Be certain hub nut cotter pins are installed securely.

  (b) Springs

  Inspect all springs for broken leaves.

H. “F” Checks and Operations (6000 Hours or 5 Years)

- **(1) Engine**

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

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

  (a) Clean and calibrate injectors

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

  (b) Check fuel pump calibration

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

  (c) Inspect bearings.

  (d) Inspect cylinder liners.

  (e) Inspect pistons.

  (f) Inspect crankshaft journals.

  (g) Rebuild cylinder heads.

(h) Replace piston rings.

(j) Replace cylinder liner seals.

(k) Replace front and rear crankshaft seals.

(l) Replace vibration damper.

(m) Clean oil cooler.

J. Seasonal Maintenance Checks (Engine)

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

(a) Check fan to be sure it is securely mounted.

(b) Check for fan wobble and/or bent blades.

(c) Check fan hub and crankshaft pulley for secure mounting.

(2) Check cooling system each spring and fall. Clean if necessary. See 2-2, Para. 5, G and H, for cooling system maintenance.

(3) Check all hoses:

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

(a) Inspect for signs of deterioration and collapse.

(b) Inspect for cracks and cuts.

(c) Inspect for cutting and deformation caused by hose clamps.

(d) Replace hoses as required.

(4) Check and adjust “V” belts each time the cooling system is cleaned, or on an “as required” basis. See 2-2, Para. 8, check and adjustment procedures.

(5) Check thermostat and seals.

(6) Check thermostat each fall when cooling system is serviced. See 2-2, Para. 5, L, for instructions.

(7) Check cold weather starting aid each fall.

Refer to 2-2, Para. 4, D, for instructions.

LIGHT IDENTIFICATION	LOCATION	LAMP MANUFACTURER	LAMP (Bulb) NUMBER
Headlights	Front fenders	Guide Lamp L.I. Trade No.	5947212 T-3
Tail and Stop Light	Rear fenders	Lamp Industry Trade No.	1034
Back-up Lights and Front Turn Lights	Rear fenders	Lamp Industry Trade No.	1073
Clearance Lights	Front canopy housing and seat housing	Lamp Industry Trade No.	57
Instrument Panel Lights	Control box and instrument panel	Lamp Industry Trade No.	67
Engine On Indicating Light	Control box instrument panel	Lamp Industry Trade No.	1815
Contactor CLOSED Indicating light	Control box instrument panel	Lamp Industry Trade No.	NE-51H
Fault Indicating Lights	Protective relay tray	Lamp Industry Trade No.	1815

Lamp Identification Chart

Figure 4

ITEMS PROTECTED	LOCATION	ILLUSTRATION	SIZE	TYPE
Headlights and Tail/Stop Lights	Control Box	Sect. 1-1,Fig. 6	20A	AGC (3AG)
Instrument Lights	Control Box	Sect. 1-1,Fig.6	20A	AGC (3AG)
Horn	Rear of Control Box	NONE	20A	AGC (3AG)
Engine and Generator Circuit	Control Box	Sect. 1-1, Fig.6	10A	AGC (3AG)
Protective Relay Circuit	Protective Relay Tray	Sect. 1-1, Fig.8	2A	AGC (3AG)
Voltage Regulator	Voltage Regulator	Sect. 1-1, Fig.10	5A	AGC (3AG)
Turn Signal Flasher	Flasher Signal Switch	NONE	14A	AGC (3AG)
Contactor Circuit	Protective Relay Tray	Sect. 1-1, Fig.3	2A	AGC (3AG)

Fuse Chart

Figure 5

SECTION 2. MAINTENANCE PROCEDURES

1. General

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

WARNING: ELECTRIC SHOCK, FIRE, FLYING PARTS, AND ACCIDENTS CAN KILL OR INJURE! 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 procedures. Proper lubrication means the use of correct lubricants and adherence to a proper time schedule. Frequency of lubrication and recommended lubricants are indicated in Figure 3.

B. Generator

The 400-Hz generator requires **NO** lubrication. The rotor is supported by two ball bearing assemblies which are lubricated and sealed at the factory for lifetime, maintenance-free operation. It is suggested that generator bearings be checked after 5000 hours of operation.

C. Generator Controls

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

D. Engine

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

- **(1) Lubrication schedule**

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

Although both hours of operation and calendar intervals are included in the Symbols and Time Interval Chart, Figure 3, maintenance **MUST** be based on **HOURS OF OPERATION.** The calendar intervals are included only to make certain that maintenance services are performed regularly when the equipment is operated less than normally.

- **(2) Oil specification**

Oil recommended by the engine manufacturer is identified by a military specification number, MIL-L-2104C. Because of the substantial increase in additive concentration in some MIL-L-2104C oils to meet service "MS" requirements, recommended oil is qualified still further by the following limitations.

(a) Zinc, as zinc diorganodithiophosphate, between a minimum of 0.07 and a maximum of 0.10 percent by weight.

(b) Sulfated ash *(ASTM D-874)* of 1.00 percent maximum by weight, except lubricants that contain only barium detergent-dispersants where 1.50 percent by weight is allowed.

For additional oil specification information, refer to Section 13.3, Page 5, Table L-1 of the Detroit Diesel 8.2 L Service Manual *(included with Chapter 6 of this manual).*

- **(3) Oil viscosity**

For information regarding oil viscosity, refer to Section 13.3, Page 5, Table L-2 of the Detroit Diesel 8.2 L Service Manual *(included with Chapter 6 of this manual).*

- **(4) Changing engine oil**

Change engine lubricating oil following the instructions in Section 4.6, Page 1 of the Detroit Diesel 8.2 L Service Manual *(included with Chapter 6 of this manual).*

- **(5) Changing engine oil filter elements**

Change the oil filter elements following the instructions in Section 4-2, Page 1 of the Detroit Diesel 8.2 L Service Manual *(included with Chapter 6 of this manual).*

E. Engine Accessories Lubrication

See Figure 1 for identification of engine and accessories lubrication points, lubrication intervals, and lubricants.

- **(1) Alternator**

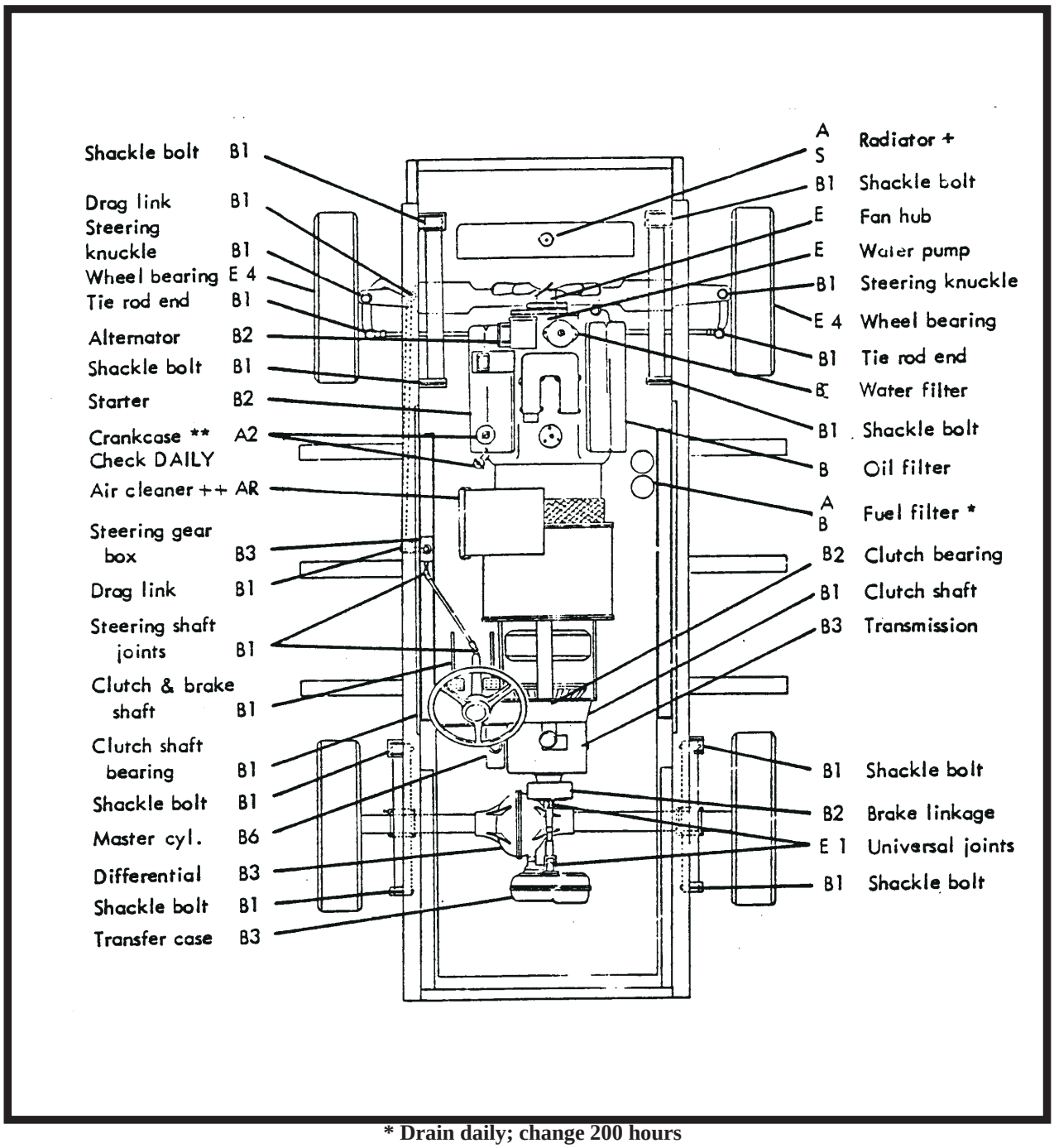
Most alternators contain sealed bearings and require no periodic lubrication. Check, however, to make certain there are no lubrication points on your particular alternator.

- **(2) Starter**

Most starting motors are lubricated at assembly and should be relubricated only when the starter is removed and disassembled. **INSPECT** the starter to make certain it has no lubrication points.

- **(3) Water pump**

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



*** Drain daily; change 200 hours**
**** Check daily; change 200 hours**
+ Check daily; change seasonally
++ Check daily; change as required

Lubrication Chart

Figure 1

SYMBOL	NAME	SPEC.	NOTES
1	Grease, Automotive and Industrial	Federal VV-G-632	Sinclair-"Litholene Industrial", No. 2; Mobil-"Mobilplex" 47; or equivalent.
2	Oil, Engine, Heavy Duty	API Class CC/CD	Must contain ash, but no more than 1.85%.
3	Lubricant, Gear, Multi-purpose	Military, MIL-L-2105B	Texaco- “Multigear” EP-90, Humble-"Humblegear" GP-90 Sinclair-"Extra Duty Gear Lube" #90, or equivalent
4	Grease, Automotive	Military MIL-G-10924B	Wheel Bearings
5	Grease, General Purpose	Military MIL-G-3545	Excludes those of sodium or soda soap thickeners.
6	Fluid, Hydraulic Brake	Federal VV-B-680	Heavy-duty, brake fluid

Lubricants and Fluids Chart

Figure 2

SYMBOL	TIME INTERVAL HOURS	CALENDAR
AR	As Required	None
A	10 Hours or	Daily
B	200 Hours or	3 Months
C	400 Hours or	6 Months
D	800 Hours or	1 Year
E	1200 Hours or	1 Year
F	6000 Hours or	5 Years
S	Seasonally	Spring and/or Fall

Symbols and Time Intervals

Figure 3

Oil capacity (including filter)	24 quarts (22.7 liters)
Oil capacity (oil pan)	20 quarts (18.9 liters)
Coolant capacity	38 quarts (35.9 liters)

Oil and Coolant Capacities

Figure 4

- **(4) Fan hub**

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

F. Chassis Lubrication

- **(1) General**

Most chassis lubrication points, such as spring shackle bolts, tie rod ends, etc., are equipped with high-pressure lubrication fittings.

- **(2) Cleanliness**

It is important that all grease fittings be cleaned before attaching a grease gun or applicator. Use a clean cloth to wipe dirt from fittings.

- **(3) Grease application**

Place pressure gun securely on the fitting, so that there is no leakage between the fitting and applicator. Apply pressure until old grease is forced out and new grease appears. This will insure that the grease cavity has been filled with clean grease and that old, contaminated grease has been forced out.

CAUTION: DO NOT FORCE GREASE OUT OF THE DRIVE SHAFT UNIVERSAL JOINTS. APPLY ONLY ONE OR TWO STROKES OF A HAND GUN, OR ONE OR TWO CYCLES OF PNEUMATIC PRESSURE EQUIPMENT. GREASE SEALS MAY BE FORCED OUT IF TOO MUCH GREASE IS APPLIED.

Use an oil can to lubricate points such as linkage, etc., which are not equipped with grease fittings. A very light grease such as “Lubriplate” may also be used if it is preferred to lubricating oil.

G. Transmission, Rear Axle, and Steering Gear Lubrication (See Fig. 9)

- **(1) General**

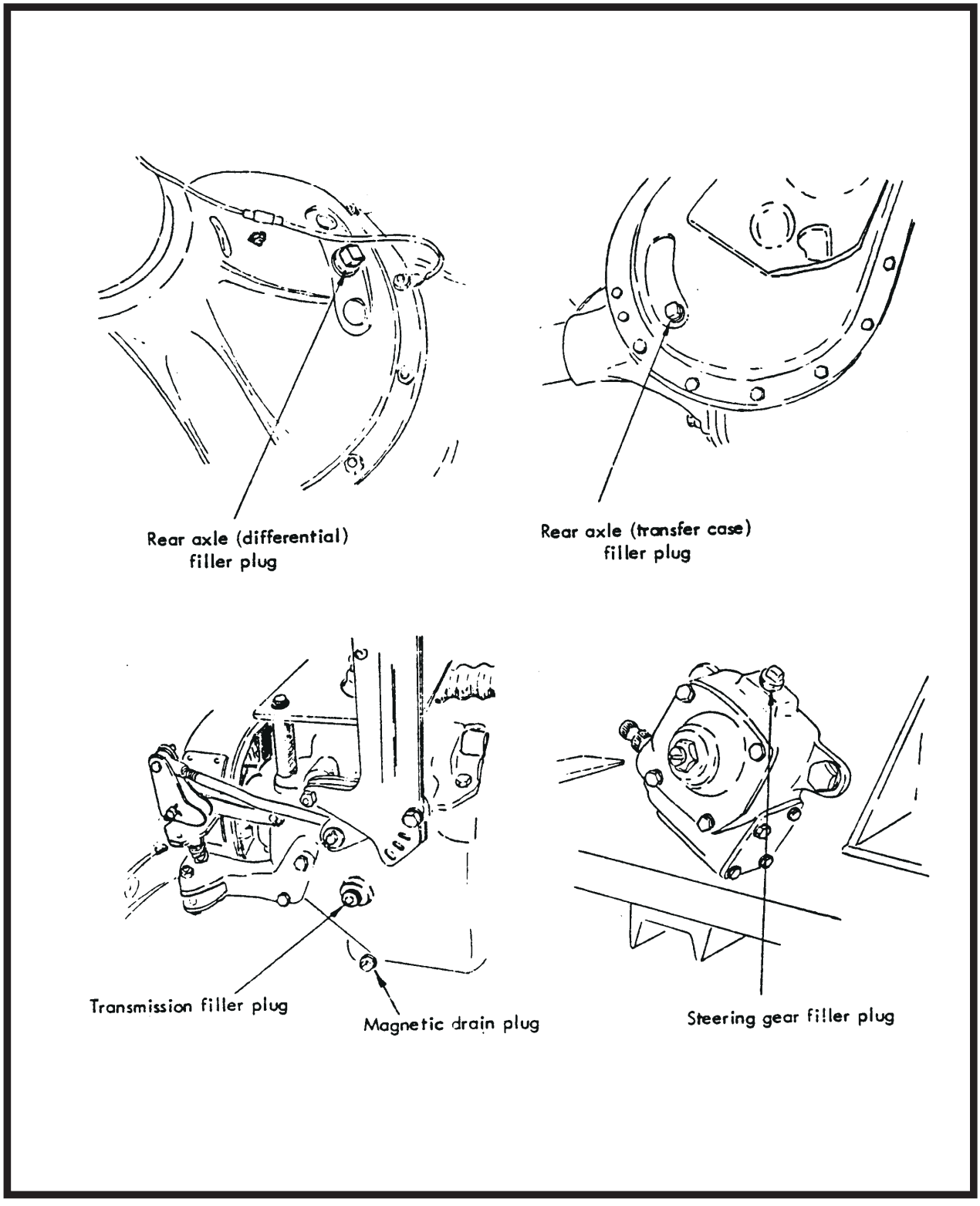
A common, multi-purpose gear lubricant is used in each of the above units. Since mobile operation of the self-propelled unit is very limited, it is unlikely that the lubricant will require changing except after repair or overhaul. However, it is important to check the lubricant level regularly in accordance with Lubrication Chart, Figure 1.

NOTE: Be sure the vehicle is LEVEL when the following checks are made.

- **(2) Transmission**

(a) Remove the topmost pipe plug on the right side of the transmission (See Fig. 9). This is the filler plug. Lubricant should be level with the bottom of the filler hole, or slightly above this level, causing a very small flow from the filler hole when the plug is removed. If lubricant is below proper level, add lubricant in accordance with Lubrication Chart, Fig. 1, until lubricant flows slightly from the filler hole.

(b) If the transmission is equipped with a magnetic drain plug, remove and clean the drain plug annually. The plug has 3/4-14 pipe threads. Install a standard pipe plug of this size in the drain hole while cleaning the magnetic plug.



Rear Axle, Transmission and Steering Gear Grease Filler Plugs

Figure 5

- **(3) Rear axle**

Remove rear axle lubricant filler plug *(see Fig. 5).* Lubricant level should be even with the bottom of the filler plug hole. If not, add proper lubricant *(See Fig. 1).*

- **(4) Transfer case**

Remove lubricant filler plug *(see Fig. 5).* Lubricant level should be even with the bottom of the filler plug hole. If not, add proper lubricant *(See Fig. 1).*

- **(5) Steering gear**

Remove filler plug in top of steering gear housing *(see Fig. 6).* Lubricant level should be near top of housing and cover all moving parts. If not, add approved lubricant.

3. Servicing the Air Cleaner

The air cleaner is a dry type with replaceable filter cartridges. A definite time schedule for changing the filter cartridge cannot be determined because of varying operating conditions. Change the filter cartridge when the red indicator "flag" reaches the top of the viewing chamber and locks in that position. Change the cartridge as follows:

A. Cartridge Removal (See Fig. 6)

(1) Open canopy door.

(2) Remove clamp assembly *(3)* from air cleaner.

(3) Remove baffle assembly *(7).*

(4) Remove primary element *(4),* and replace with new element.

CAUTION: DO NOT CLEAN OR RE-USE CARTRIDGE.

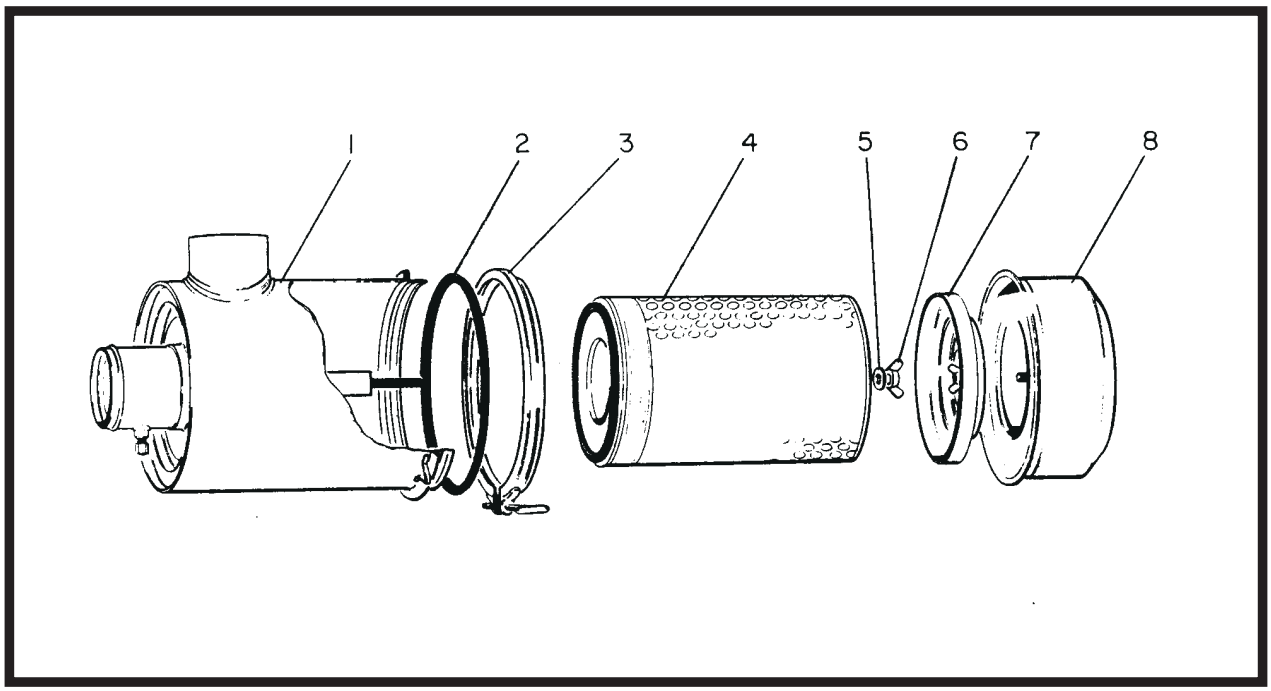
(5) Inspect the interior of the cleaner housing *(1).* Make certain it is free from all foreign material.

B. Cartridge Installation (See Fig. 6)

(1) Carefully install the new cartridge into the housing. Avoid bumping the cartridge tubes against the housing sealing flange. Seat the cartridge properly within the housing. Press all edges and corners of the cartridge firmly with fingers to effect a positive air seal against the sealing flange of the housing.

CAUTION: UNDER NO CIRCUMSTANCES SHOULD THE CARTRIDGE BE POUNDED OR STRUCK IN THE CENTER TO EFFECT A SEAL.

(2) Lock the cartridge in place by installing the baffle assembly *(7)* and clamp assembly with cup assembly *(8)* in place. Tighten clamp *(3)* down in place.



1. Body Assembly
2. "O" Ring
3. Clamp Assembly
4. Primary Element
5. Washer Gasket
6. Wing Nut
7. Baffle Assembly
8. Cup Assembly

Air Cleaner Cartridge Replacement

Figure 6

4. Engine Fuel

A. Quality

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

The Detroit Diesel engine has been developed to take advantage of the high energy content and generally lower cost of No. 2 diesel fuel. The engine will also operate satisfactorily on No. 1 fuel. If other fuels are being considered, refer to the Detroit Diesel 8.2 L Service Manual for fuel specifications and recommended fuel oil properties.

B. Fuel filter elements

The fuel filter elements are located on the right side of the engine, near the rear of the engine. The primary filter element is the topmost of the two elements, and the secondary filter element is just beneath it. *(Refer to Figure 2, Section 2-1).*

The function of these two filter elements is to remove foreign particles from the fuel before it enters the fuel pump. The filter elements operate under vcacuum. Elements are of the "throw-away" type, in which the case and element are made as one disposable part.

- **(1) Check fuel filter restriction**

  The most accurate method of determining filter change and determining change period is by measuring the fuel restriction. As foreign material accumulates in filter elements, fuel flow becomes more and more restricted, and vacuum pressure in the fuel inlet line between the filter and pump rises. Check the degree of filter restriction as follows:

  (a) Connect a vacuum gage in the inlet fuel line at the pump. An adapter may be required.

  (b) Operate the engine at governed speed and under full load. In a clean system, the maximum pump inlet restriction must not exceed 6 Hg *(inches of of mercury).* If the vacuum gage indicates 12 In Hg *(inches of of mercury)*, elements require changing *(or there are other sources of restriction).*

- **(2) Changing fuel filter elements**

  Change elements after each 400 hours of operation unless a restriction test indicates that the time period should be extended.

  (a) Unscrew element and discard.

NOTE: The element should be removable by hand. If not, there are several types of filter element removal tools.

(b) Fill **NEW** element with **CLEAN** fuel.

Install new element and tighten by hand until seal touches filter head. Tighten an additional one-half to three-fourths turn.

CAUTION: DO NOT OVERTIGHTEN. TIGHTENING WITH MECHANICAL TOOL MAY DISTORT OR CRACK FILTER HEAD.

C. Fuel Pump Service

Refer to fuel pump service information in Section 2.0, Page 9 of the Detroit Diesel 8.2 L Service Manual, included with Chapter 6 of this generator set manual.

5. Engine Cooling System

Refer to cooling system maintenance information in Section 5, Pages 3 through 8 of the Detroit Diesel 8.2 L Service Manual *(included with Chapter 6 of this manual).*

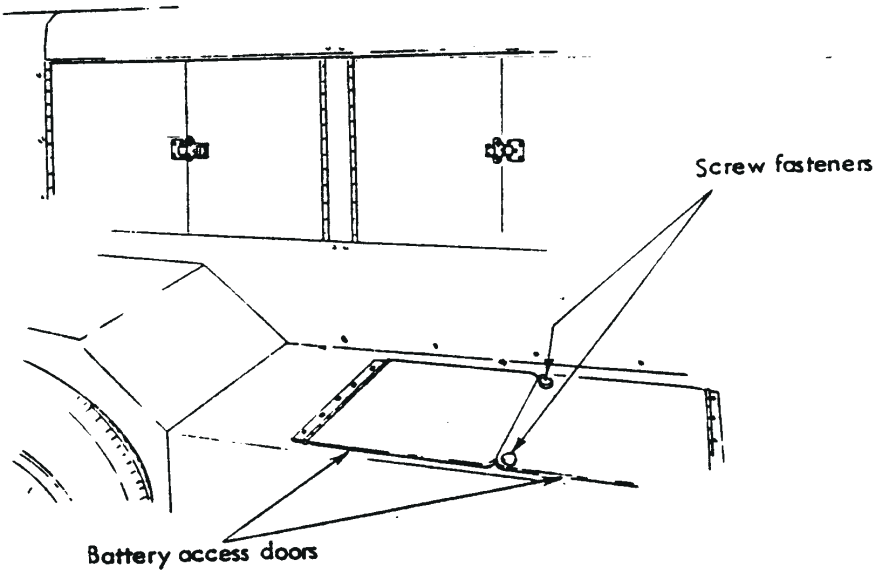
6. Battery Service

A. General

Twelve-volt DC power is supplied by two pairs of 6-V batteries *(four batteries in all).* Each pair is connected in series to produce 12-V DC. The two pairs are connected parallel to provide maximum amperage for engine cranking. The 12-V DC system provides power for operation of engine electrical system, governor system, and all DC lights on the unit.

B. Battery Location and Accessibility

Batteries are mounted on a support tray located in the body left side of the vehicle, to the rear of left front fender *(See Fig. 7).* They are easily accessible by loosening two screw-type fasteners and opening two hinged access doors.



Battery Access Doors

Figure 7

C. Battery Care

(1) Never allow a battery which has been removed from the 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 batteries are fastened securely in their compartment to avoid damage from vibration.

(4) Maintain battery fluid at proper level.

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

WARNING: NEVER ALLOW SPARKS OR OPEN FLAME NEAR BATTERIES. AVOID SPILLING ELECTROLYTE ON HANDS OR CLOTHING.

D. Liquid Level

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 batteryman.

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 is dirty, it 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. Brighten terminal and post surfaces with steel wool, a wire brush, or special terminal cleaning tool. Make certain that vent holes in filler caps are not clogged.

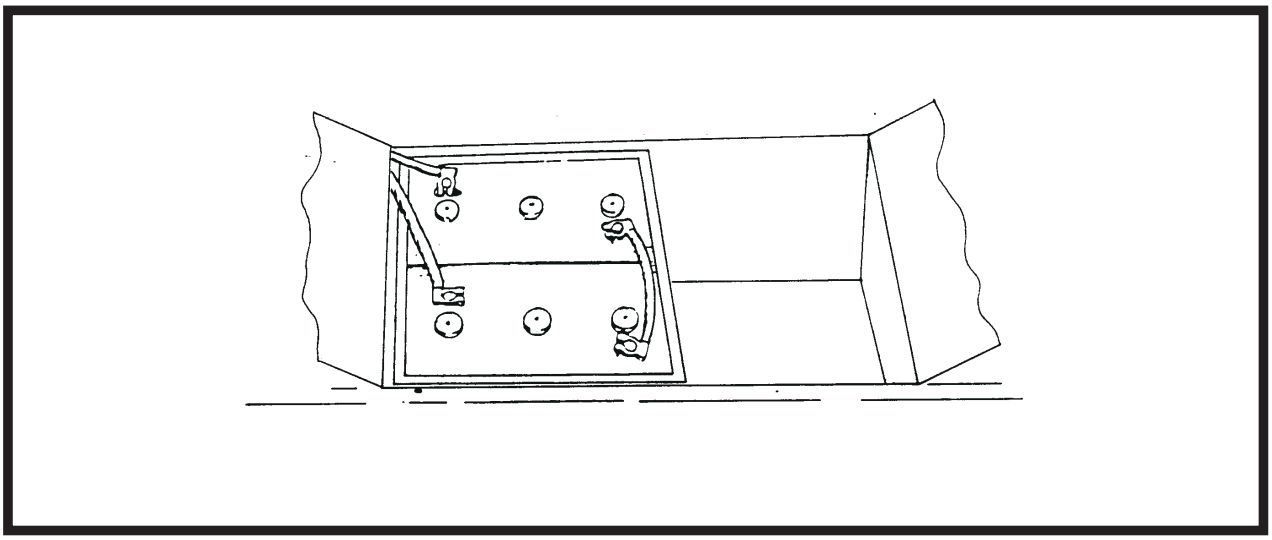
F. Testing the Battery

Tests are made on a battery to determine the state of charge and also the condition. The results of these tests show that 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.

- **(1) 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 battery has acceptable voltage, this indicates that battery has output capacity and will accept a charge, if required.

- **(2) Test with Hydrometer**



Battery Installation

Figure 8

(a) Remove filler caps and check the specific gravity of 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 from 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 gas-sing freely, and 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 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.

7. Brake Fluid Check

Check and add brake fluid as follows:

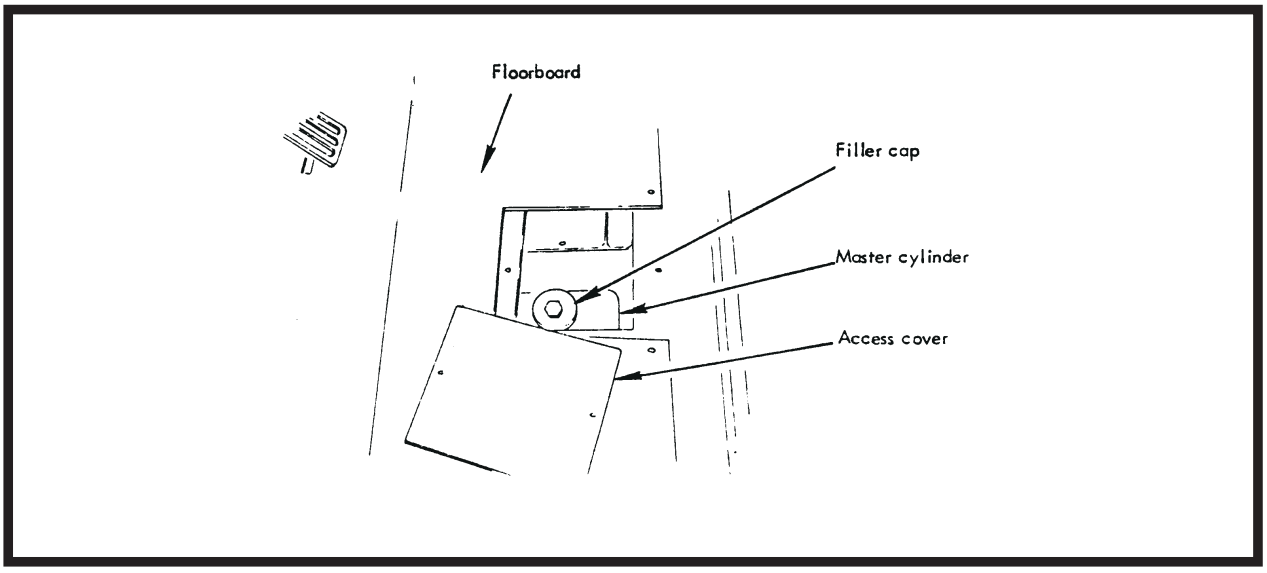
A. Remove two screws which arrach the access cover to the floorboard. Lift off access cover.

B. Clean all dirt from filler cap and surrounding area on master cylinder reservoir so that no foreign material can fall into the opening as the cap is removed.

C. Use a 3/4-inch open end or socket wrench to loosen filler cap. Remove cap.

D. Visually check brake fluid level. The proper level of fluid in the reservoir is approximately 3/8-inch below the bottom edge of the filler hole. This space is required to prevent surge losses through the air vent in the filler cap.

E. Add only clean, good quality, heavy duty brake fluid. Specification *(Federal)* VV-B-680, or equivalent, is recommended.



Master Brake Cylinder

Figure 9

CAUTION: EXERCISE CARE TO PREVENT DIRT FROM ENTERING THE RESERVOIR.

NOTE: If air has entered the system and bleeding is required, See 2-3, Para. 4, E, (1) and (2) for instructions.

F. Make certain that air vent holes in the filler cap are open, and that the cap gasket is in good contidion.

G. Install cap and tighten securely.

H. Position access cover and secure with two screws.

8. Drive Belts

A. General

The engine cooling fan and water pump are driven by a matched set of V-belts, which must be replaced as a matched set. The 12-V alternator is driven by a single V-belt.

B. Preparation for Belt Check and Adjustment

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

C. Checking Belt Tension

A belt which is too tight is destructive to bearings of the driven part. A loose belt will slip and cause inefficient operation of the part being driven as well as wear to the belt.

New drive belts stratch during the first few hours of operation. Run the engine 30 seconds to seat the belts, then readjust the tension after 10 hours of operation. Thereafter, check belt tension every 200 hours, or each 3 months, whichever comes first.

Adjust belt tension using belt tension gage J 23600-B or equivalent.

Adjust belt tension as outlined in the chart below.

ALTERNATOR DRIVES		FAN/ACCY. DRIVES
One 1/2" belt	Two 1/2" belts	One 1/2" belt
60 +/- 10	45 +/- 5	90 +/- 10

Belt Tension Chart (lbs/belt)

Figure 10

For further information on V-belt service procedures, refer to Section 15.1, Pages 4 and 5 of the Detroit Diesel 8.2 L Service Manual (included with Chapter 6 of this manual).

9. Generator Maintenance

The 400-Hz generator requires no maintenance or service other than periodic cleaning. Clean the generator when other components of the unit are cleaned. The unit is brushless, and bearings are permanently lubricated and sealed.

A. Cleaning

WARNING: FIRE OR ELECTRIC SHOCK CAN KILL OR INJURE. DO NOT USE A FLAMMABLE SOLVENT. BE SURE THAT THE UNIT IS COMPLETELY DRY BEFORE OPERATING.

The generator may be cleaned by careful use of compressed air and/or a good SAFE commercial cleaner. Steam cleaning of the generator is not recommended, because the use of steam and harsh chemical compounds may result in damage to insulation and generator components.

B. Adjustment

The generator itself requires no adjustment. Adjustment procedures for generator controls are covered in Section 2-3.

10. Tire Inflation

Tires used on this self-propelled generator set are high-pressure truck type. They must be kept properly inflated to avoid uneven wear, side-wall damage, etc. Keep inflated to 60 PSI, front and rear.

NOTE: (1) Use an accurate tire pressure gage. (2) Check pressure when tires are cool.

SECTION 3. ADJUSTMENT/TEST

1. General

Adjustment and test procedures are most applicable to testing and adjusting the generator set after major repaies, replacement of parts, or overhaul.

2. Testing the Generator Set

The following test procedures may be used for testing the unit after major repairs or overhaul.

A. Preoperational Test Procedures

Perform the folowing checks, tests, and operations before starting the unit.

(1) When testing the unit, open all engine access doors and remove canopy access panel on the left side of the vehicle. A test box *(Figure 1)* is recommended for testing convenience. All units have a test receptacle connector to accommodate the box. The test box is available from Hobart Brothers under Part No. 388318-1.

(2) Connect cables from the generator output terminals to a load bank. Use cables of the same size and length as those to be used in service *(See 1-2, Para. 4, A).* Be certain that all connections are secure, and the generator “N” cable is grounded.

(3) Check engine oil level. Oil should be at, or near “H” mark on gage rod.

(4) Check lubricant level in transmission and rear axle.

(5) Check radiator coolant level (Ref. 2-2, Para. 5, J, (3), (b).

(6) Check brake fluid and check battery water.

(7) Check tension of fan and alternator V-belts. *(See 2-2, Fig. 18 & 19).*

(8) If governor throttle linkage was disturbed, check all linkage to make certain engine speed may be controlled when the engine is started. See Figures 11 & 15.

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

(10) If the setting of the voltage regulator rheostat *(48, Fig. 2)* has been disturbed, set it at **CENTER** position *(halfway between full clockwise position and full counterclockwise position).*

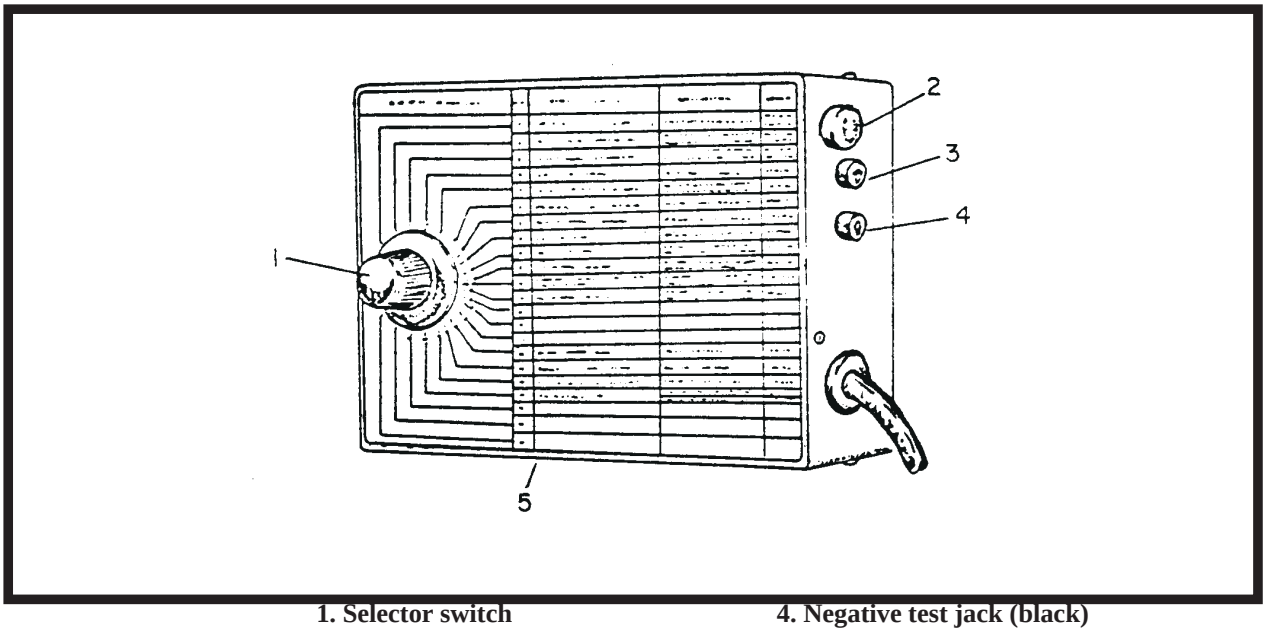
(11) Check engine circuit fuse *(22, Fig. 2)* by placing panel light switch *(26)* in the **ON** position. If panel lighs *(7)* operate, the fuse *(22),* switch *(26)* and lamps are good.

(12) Check fault indicating lights *(38)* by pressing lens holders. If lights glow, fuse *(39)* and indicating lamps are good.

(13) Check operation of all vehicular lights.

(14) Make a general inspection of all wiring and terminals. Inspect the equipment to be certain no damage will result from starting the engine.

(15) At initial start-up after generator overhaul and repair, “flash” the exciter field with the engine **NOT RUNNING** by momentarily applying 12-VDC the field windings as follows:



1. Selector switch
2. Pushbutton switch
3. Positive test jack (red)
4. Negative test jack (black)
5. Instruction plate

Test Box Operating Controls (Option)

Figure 1

(a) Flashing exciter field using test box

If a test box *(Fig. 1)* is available, connect it to receptacle connector *(25, Fig. 2).*

(aa) Rotate the selector knob (Sect. 1, Fig. 1) to position 8.

(bb) Use two jumper leads, each equipped with an alligator clip and a test prod, to connect 12-V DC power to test jacks *(2 and 3)* on the test box. A convenient place to pick up 12-V DC is at the “BATT” terminal of the engine voltage regulator. Connect positive jumper from input terminal on starter solenoid to red test jack. Connect negative lead from starter ground terminal to black test jack.

(cc) Momentarily pressing pushbutton switch *(2, Fig. 1)* will flash the exciter field.

(dd) Disconnect jumper leads.

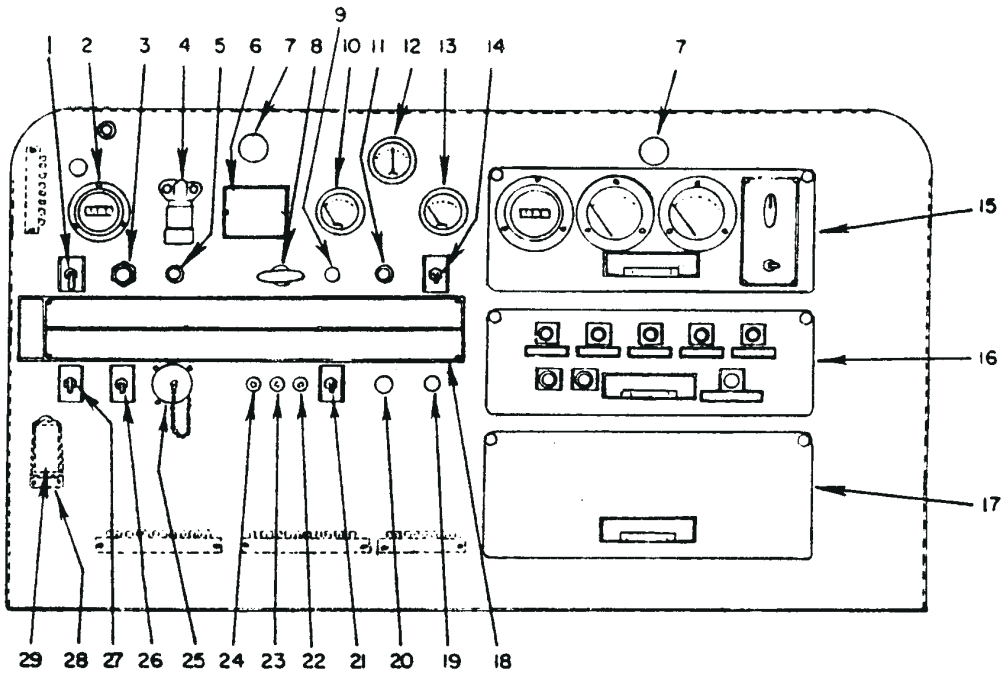
(b) Flashing exciter field without test box.

(aa) Remove test receptacle cover *(1-3; Fig. 4).* Use two test leads equipped with a test prod on one end and an “alligator” clip on the other. Insert the test prod of one lead in terminal “D” of the test receptacle *(see Fig. 2),* and connect the other end of the lead to a good **GROUND**. Insert the test prod of the second lead in terminal “F” of the test receptacle and momentarily touch the other end *(alligator clip)* to the “hot” terminal on the starter solenoid to flash the field.

CAUTION: FLASHING THE FIELD IN A REVERSE DIRECTION COULD CAUSE DAMAGE TO VOLTAGE REGULATOR DIODES.

NOTE: If test leads with test prods are not available, insert short pieces of wire in proper test terminals to make connections.

(bb) Disconnect leads and install receptacle cover.



1. Engine control switch, start/stop
2. Hourmeter, engine
3. Pushbutton start switch
4. Air cleaner indicator, service
5. Engine "ON" indicating light
6. Identification plate
7. Instrument panel lights
8. Starting aid control
9. Hole plug button
10. Oil pressure gage
11. Contactor CLOSED indicating light
12. DC Ammeter, battery
13. Coolant temperature gage
14. Contactor control switch
15. Generator control tray
16. Protective relays tray
17. Voltage regulator tray
18. Identification and instruction plate
19. Hole plug button
20. Hole plug button
21. Operating mode control switch
22. Engine circuit fuse (20-A, slow-blow)
23. Panel light fuse (5-A)
24. Headlight fuse (20-A)
25. Test receptacle connector and cap
26. Panel light switch
27. Headlight switch
28. Capacitor (6.8 mfd, 35-V)
29. Excitation-deenergization relay

(28 and 29 on back of panel)

Operating Controls and Instruments

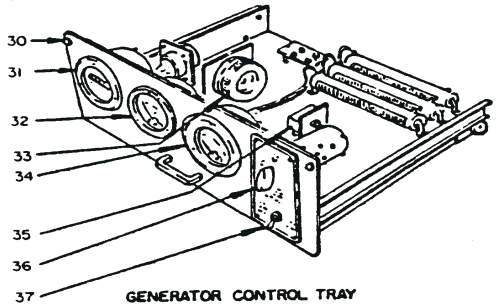
(Sheet 1 of 2)

Figure 2

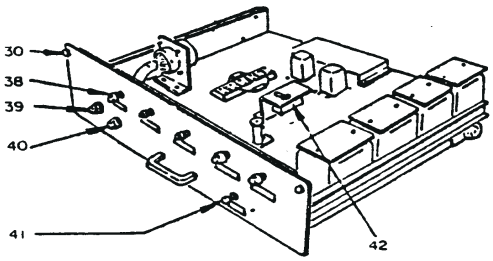
30. Tray fastener
31. Frequency meter
32. AC Voltmeter
33. Manual control rheostat
34. AC Ammeter
35. Automatic-manual switch
36. Meter switch
37. Line switch

38. Fault indicating light (5)
39. Protective monitor system fuse
40. Load contactor circuit fuse
41. Protective monitor system reset switch
42. Test bank switch

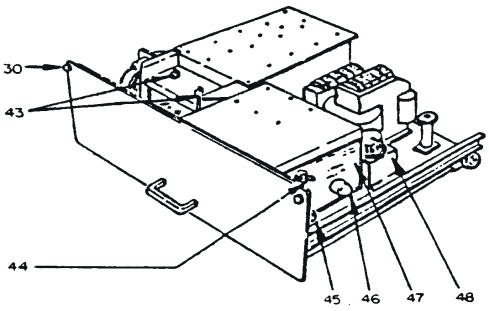
43. Rate and gain adjustments
44. Line drop compensation switch
45. Cable size compensation adjustment
46. Cable length compensation adjustment
47. Instruction plate
48. Voltage adjusting rheostat



GENERATOR CONTROL TRAY



PROTECTIVE RELAY TRAY

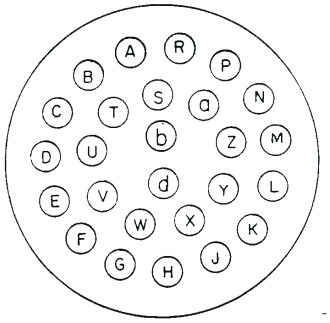


VOLTAGE REGULATOR TRAY

Operating Controls and Instruments

(Sheet 2 of 2)

Figure 2



Test Receptacle Connection Terminals Identification

Figure 3

(16) Place load contactor control switch *(14, Fig 2)* in **OFF** position, and place operating mode switch *(21)* in **DRIVE** position.

B. Operational Test Procedures

(1) Start the engine in accordance with instructions in 1-3; Para. 3, b or C.

(2) Check operation of engine instruments: DC ammeter *(12, Fig. 2),* coolant temperature indicator *(13),* oil pressure gage *(10),* hourmeter *(2),* and engine circuit indicating light *(5).*

(3) Record hourmeter reading for future reference.

(4) Check engine idle speed. Should be 700 RPM +/- 25 RPM.

NOTE: A stroboscope is required for this check. Adjust, if necessary, in accordance with instructions in Engine Operator's Operator's Manual.

(5) Again check for oil, fuel, and coolant leaks and correct any leaking condition.

(6) Position switches and controls for automatic voltage regulation and power delivery as follows:

(a) Place automatic-manual switch *(35, Fig. 2)* in **AUTOMATIC** position.

(b) Place test-bank switch *(42)* in **AIRCRAFT** position.

(c) Meter switch *(36)* may be in any position except pointing straight down.

(d) If the adjustment of the voltage regulator rheostat *(48)* has been disturbed, position the knob to mid-range position.

(7) Bring the engine up to governed speed and also energize the generator by placing the operating mode switch *(21)* in **GEN** position.

If the engine "comes-up" to governed speed, indicated by a 400-Hz reading on the frequency meter *(31)* and a voltage value appears on the voltmeter *(32),* the electric governor and excitation-deenergization relay circuits are functioning.

(8) Observe frequency meter *(31).* If engine speed is properly adjusted, frequency will be exactly 400 Hz. If not, adjust engine governed speed in accordance with Para. 3, E, (3).

(9) Observe voltmeter *(32).* Use rheostat *(48)* to adjust voltage to 115 V AC.

(10) Measure magnetic pickup voltage at terminals 10 and 11, Fig. 9. Voltage should be at least 4 V-AC at no load and governed speed.

(11) Check governor voltage at no load/governed speed. Voltage from control box to actuator should be 5.2-V DC.

(12) Check adjustable voltage range in automatic operating mode.

(a) Observe voltmeter *(32, Fig. 2)* and turn rheostat *(37)* **CLOCKWISE** to full clockwise position. Maximum voltage should be at least 134-V AC, or higher.

NOTE: If voltage should decrease *when the knob is turned clockwise, it indicates that internal wiring of the voltage regulator is incorrect. Replace the complete regulator tray assembly.*

(b) Observe voltmeter and turn rheostat knob to full **COUNTERCLOCKWISE** position. Minimum voltage should be 108-V AC, or lower.

(13) Observe voltmeter and adjust rheostat to obtain 115-V AC voltmeter reading.

(14) Check adjustable voltage range in **MANUAL** operating mode.

(a) Open the generator control tray and place the automatic-manual switch *(35)* in **MANUAL** position.

(b) Observe voltmeter *(32)* and turn manual control rheostat *(33)* **CLOCKWISE** to full clockwise position. Maximum voltage should be at least 160-V AC.

(c) Observe voltmeter and turn rheostat *(33)* to full **COUNTERCLOCKWISE** position. Minimum voltage should be 95-V AC or less.

(d) Adjust voltage to 115-V AC, then return the automatic-manual switch to **AUTOMATIC** position.

(15) Position load bank switches, etc., to apply a light load to the generator.

(16) Place the load contactor “on-off” switch *(14, Fig. 2)* in the top, spring loaded, **CLOSE** position. Hold in this position momentarily. Hold in this position momentarily. The indicating light *(11)* should glow **GREEN** and an amperage value should appear on the AC ammeter *(34).*

(17) Release the switch *(14)* and allow it to return to the center **ON** position. The load contactor should open immediately, and the generator “on” indicating light should go **OFF.** This is because the plug interlock relay *(Ref. 1-1; 18, Fig. 7)* is not receiving power from an outside source of 28 V DC. It indicates that the plug interlock contacts are **OPEN** as they should be when the interlock coil is not receiving 28-V DC power.

(18) Open the protective relay tray and place the test bank switch *(42, Fig. 2)* in **TEST BANK** position.

(19) Again place the load contactor switch *(14)* in the top, **CLOSE** position. Light *(11)* should glow **GREEN** and remain **ON** when the switch is released and allowed to return to the center **ON** position. This indicates that the test bank switch *(42)* is functioning to by-pass the plug interlock relay.

(20) Return the test bank switch to **AIRCRAFT** position. The load contactor should open at once and the green indicating light *(11)* should go off.

(21) Connect a source of 24-V DC power *(two twelve-volt batteries connected in series)* to terminals “N” and “F” *(or “E”)* at the output terminal panel. Connection polarity should be: MINUS to terminal N and PLUS to terminal E or F.

(22) With test-bank switch in **AIRCRAFT** position, hold the contactor operating switch *(14)* in top, CLOSE position momentarily. The generator “on” indicating light should glow **GREEN** and remain on when the switch is released and allowed to return to the center **ON** position. This indicates that the load contactor is closed and the plug interlock relay is functioning properly.

(23) Apply 1/3 to 1/2 load at the load bank and allow the unit to run for 15 to 30 minutes. Observe operation of all monitoring instruments.

(24) Increase load bank resistance to apply a full load.

(25) Check operation of the governor by observing the frequency meter *(31, Fig. 2)* when generator is switched from no-load to full-load and vice versa. Use the contactor control switch *(14)* to apply and remove load several times. Frequency drop should be no more than 1 Hz. Adjust governor if necessary (see Para. 3, E, (3)).

(26) Follow instructions in Para. 3, B, (2) (b) to set voltage regulator line drop compensation potentiometers (Ref. Figure 2, items *(45)* and *(46).* Set knob pointer on cable size potentiometer *(45)* to size *(2/0, 4/0, etc.)* of cable being used. Set knob pointer on cable length potentiometer *(46)* to length *(20 feet, 40 feet, etc.)* of cable being used. See instruction plate *(mounted below knobs).*

(27) Check accuracy of voltmeter.

(a) Open generator control tray.

(b) Connect a master voltmeter of known accuracy to terminals of the voltmeter *(32).*

(c) Compare unit voltmeter reading with master meter. Error must not exceed 2% of full scale.

(28) Check accuracy of AC ammeter.

(a) Connect a master ammeter of known accuracy to the terminals of the AC ammeter *(34).*

(b) Compare unit ammeter reading with master meter under various loads. Error must not exceed 4% of full scale.

(29) Check voltage regulator, at intervals, from no-load to full load, and on up to 125% load. Observe and note voltage at various loads. Voltages should vary no more than plus or minus 1% from 115 V.

(30) Check operation of meter selector switch *(36)* A voltage value should be shown in each switch position.

(31) Check operation of the line switch *(37).* A normal voltage of 115 VAC should be indicated when the switch is in **LINE-TO-NEUTRAL** position. A voltage of approximately 200 V AC should be indicated when the switch is placed in **LINE-TO-LINE** position.

(32) Check accuracy of frequency meter.

(a) Connect a master frequency meter of known accuracy to the frequency meter *(31)* terminals.

(b) Compare meter readings. Error must not exceed 1% of full scale.

(33) Operate the unit not less than 10 minutes under full load. The overload device *(Ref. 1-1; 7, Fig. 10)* **MUST NOT** trip.

(34) Operate at 125% rated load for 5 minutes immediately following the full-load run. The overload device MUST trip within 5 minutes and the overload indicating light (38, Fig. 2) must come **ON** to indicate an overload condition.

(35) Reduce load to normal. Turn off indicating light by pressing reset switch *(41, Fig. 2).*

(36) Check engine oil pressure at governed speed *(2400 RPM).* Gage should indicate at least 38 PSI when the engine is hot. Check engine coolant temperature. Gage should indicate in the range of 165 degrees to 195 degrees depending upon ambient temperature.

(37) Check operation of fuse interlock *(Ref. 1-1; 2, Fig. 7).* With unit operating normally under load, remove protective relay circuit fuse *(Ref. 39, Fig. 2).* The load contactor should open immediately. This indicates that the fuse interlock relay is functioning properly. Replace fuse and apply load.

NOTE: Make all protective relay tests with the unit operating under load.

(38) Check operation of overvoltage relay and indicating light.

(a) With the unit running at normal load, adjust the voltage regulator rheostat (48, Fig. 2) to increase voltage *(turn clockwise)* until the the overvoltage sensing relay actuates the protective monitor to open the load contactor and turn on the overvoltage indicating light. The overvoltage sensing relay should trip when voltage reaches 130-V to 134-V.

(b) Return unit to normal operating conditions by adjusting voltage regulator rheostat and pressing reset switch *(41).*

(39) Check operation of undervoltage sensing relay, indicating light, and time delay. Before starting this check, let us understand the sequence of events which should happen when voltage is reduced to 103 V or lower. At some value between 103-V and 93-V, the undervoltage sensing relay *(Ref. 1-1; 5, Fig. 7)* should function to activate the undervoltage time delay circuit. Five seconds after the time delay circuit is activated, *(if the undervoltage condition continues)* it should function to open the protective monitor relay which, in turn, will open the load contactor to stop power delivery. As a result of the action, the undervoltage indicating light *(38)* should be turned **ON.** A stopwatch or sweep-second-hand watch is required for this check. Proceed as follows:

(a) With unit running at normal load, use the voltage regulator rheostat *(48, Fig. 2)* to reduce voltage to 104V. The load contactor should **NOT** open after a 5-second delay.

(b) Reduce voltage in steps of 1 V, with a delay of at least 5 seconds between steps. Restart stopwatch or note position of sweep-second-hand each time voltage is reduced. At some voltage value between 103-V and 93-V, and 4 to 12 seconds after a new voltage setting is made, the load contactor should be opened and the undervoltage indicating light should be turned on by the step-by-step action of the undervoltage sensing relay, time delay circuit, and protective monitor relay.

NOTE: 1. The 4 to 12 second time delay is generally set at 5 seconds.

2. It may be necessary to switch to MANUAL control to obtain these low voltages.

(c) If the load contactor is not opened at 103 V to 93 V, it will be necessary to refer to the Trouble Shooting Chart, Section 3-1, to determine which component of the undervoltage protective circuit is defective.

(d) If the undervoltage circuit performs satisfactorily, return the unit to normal operation by adjusting the voltage to 115 V, pressing the reset switch, and closing the load contactor.

(40) Check underfrequency sensing relay, protective monitor, and indicating light. At some frequency value *(Hz, cycles-per-second)* from 385 Hz down to 375 Hz, the underfrequency sensing relay should function to signal the underfrequency circuit in the protective monitor module to **OPEN** the load contactor holding circuit, thus **OPENING** the load contactor. To check the underfrequency protective components, proceed as follows:

(a) While the unit is operating normally under load, reduce generator output frequency by reducing engine speed. Use the governed speed setting potentiometer *(Ref. Fig. 9).* Turn adjusting screw **COUNTERCLOCKWISE** gradually to reduce engine speed until frequency meter indicates 386 Hz. Underfrequency protective relay should not function to

open the load contactor at this frequency. Reduce frequency in steps of 1 Hz.

(b) If the protective system functions to open the load contactor and turn on the underfrequency light after some frequency between 385 Hz and 37 Hz is reached, all components of the system are functioning properly. If the load contactor is not opened within the above frequency range, refer to Trouble Shooting Chart to determine which component is defective.

(c) Return unit to normal operating condition.

(41) Check overfrequency sensing relay, protective monitor, and indicating light. This protective circuit operates in exactly the same manner as the underfrequency circuit except its operating range is from 415 Hz to 425 Hz. Its purpose also is to open the load contactor and turn on an indicating light.

(a) Check procedures are the same for overfrequency as for underfrequency *(above)* except that engine speed is **INCREASED** to create a condition of overfrequency.

(b) If the overfrequency system functions to open the load contactor and turn on the overfrequency light after some frequency between 415 Hz and 425 Hz is reached, all components of the system are functioning properly. If the load contactor is not opened within the above frequency range, refer to Trouble Shooting Chart to determine which component is defective.

(42) If the generator is operating under load at this point, place the contactor control switch *(14, Fig. 2)* in **OFF** position to open load contactor and disconnect load. There will be no further need for the load bank in the following checks.

(43) With engine running at normal governed speed and oil hot, oil pressure should be 45 to 75 PSI. Coolant temperature should be 180 F to 195 F, depending on ambient temperature.

(44) With the engine running at normal governed speed, check the entire unit for vibration and for any parts which may have become loosened during the above checks. Tighten any loose attaching hardware as required.

(45) Check 400-Hz generator bearings. Use a stethoscope or metal sounding rod to listen for unusual noises. If using a metal rod, place one end on the generator housing and hold the other end near the ear. Hold the rod with three fingers and use the index finger and thumb to form a “sounding chamber” between the rod and the ear. Do **NOT** allow the rod to touch the ear. Listen for “grinding” or pounding sounds which would indicate a defective bearing. An engine noise may be “telegraphed” to the generator and misinterpreted as a generator noise. Send the unit to overhaul if in doubt of bearing serviceability.

WARNING: ELECTRIC SHOCK, MOVING PARTS, AND NOISE CAN KILL OR INJURE! IF A METAL SOUNDING ROD IS USED TO DETECT BEARING NOISES, EXERCISE EXTREME CARE TO AVOID INJURY.

3. Engine-Generator Components Adjustment

A. Generator Adjustment

The 400-Hz generator is a brushless type requiring no adjustments of any kind.

B. Generator Control Adjustments

The following items may require adjustment at some time during the life of the equipment.

- **(1) Adjust manual voltage control, variable resistor.**

The adjustment of this resistor *(Ref. 1, Fig. 4)* determines the maximum generator output voltage obtainable when using the manual control rheostat for voltage control. To adjust maximum voltage potential, proceed as follows:

(a) Loosen slider-band clamping screw.

(b) Adjust cable length and cable size compensation rheostats. These two adjustment should be made together. Switch *(4, Fig. 5)* must be **ON.** Proceed as follows:

(aa) Adjust the rheostat *(2)* to point to the length, in feet, of output cable being used. Various cable lengths are indicated on a plate mounted behind the rheostat knob.

(bb) Adjust rheostat *(3)* to point to the size of cable being used. Various cable sizes are also indicated on a plate behind the rheostat knob.

(cc) With generator running *(no load),* check output voltage value, which should be exactly 115 V AC. If not, adjust in accordance with Para. 3, B, (2), (a) above.

(dd) Apply a full load to the generator. Observe AC voltmeter. If the voltage observed varies more than 1% *(plus or minus)* from 115 V AC, adjust rheostats *(2)* and *(3)* slightly to obtain a voltage of 115 V AC, or as close to this value as possible. Turn knobs **CLOCKWISE** to **INCREASE** voltage and **COUNTERCLOCKWISE** to **DECREASE.** Turn each knob a small amount at a time to determine which rheostat is having the most effect on output voltage and requires adjustment.

(c) Adjust “damp” and “rate” adjusting potentiometers *(see Figure 5).*

Damping adjustments are very delicate and should not be attempted unless the generator output average phase value varies more than 1 volt, or output voltage is unstable. “Damp” and “rate” adjustments must be made in conjuction with each other because the adjustment of one may affect the other. For example, improving the response by adjusting the “damp” potentiometer *(1)* may affect the stability as adjusted by the “rate” potentiometer *(2).* Adjust as follows:

(aa) If “damp” and “rate” adjustments have been disturbed *(changed from factory setting),* or if the regulator has been repaired, loosen locking nuts and set both potentiometers to mid-position *(halfway between full CLOCKWISE and full COUNTERCLOCKWISE).*

(bb) Connect the generator output to a balanced, three-phase load of 30 kilowatts.

(cc) With generator running at 115 V AC no load, operate the contactor “on-off” switch *(14, Fig. 2).* If the average phase voltage changed more than 1. volt, or if output is unsteady, adjust “damp” and “rate”.

(d) Move the slider-band toward the single wire end of the resistor to increase voltage potential. Move the band toward the double wire end *(two wires connected)* to decrease voltage potential.

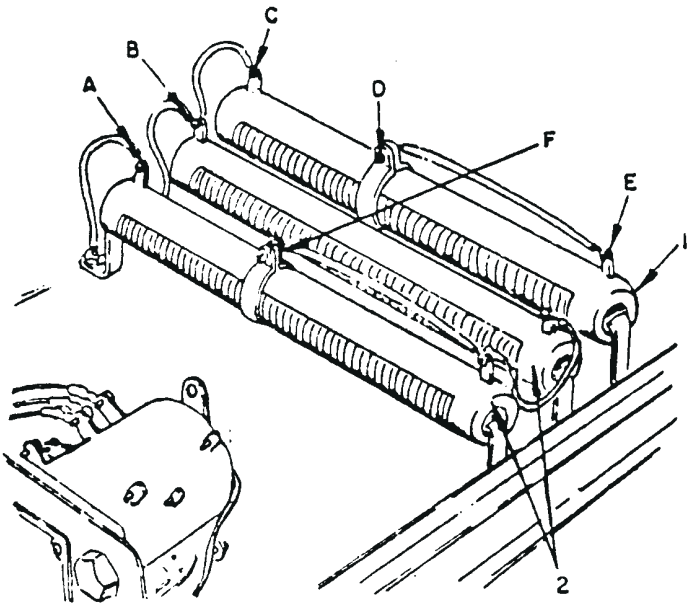
(e) Tighten slider-band clamping screw.

- **(2) Adjust 400-Hz voltage regulator.**

When a voltage regulator is first put into service, or when output *(generator-to-aircraft)* cables are changed, the regulator may require up to five separate adjustments. The five adjustments are for generator output voltage value, damping gain, damping rate, line drop compensation gain, and line drop compensation rate. See Figure 5 for identification of components used for regulator adjustment.

(a) Adjust generator output voltage.

This is a relatively easy adjustment to make. With the generator running at a rated speed *(2400 RPM)* and rated cycles-per-second *(400 Hz),* rotate the rheostat knob *(1)* **CLOCKWISE** to **INCREASE** voltage and **COUNTERCLOCKWISE** to **DECREASE** voltage. Observe the AC voltmeter and adjust output voltage to 115 V AC.



1. Manual control voltage potential adjusting resistor
2. Exciter field ballast resistors

Excitation Resistors

Figure 4

(b) Adjust cable length and cable size compensation rheostats.

These two adjustments should be made together. Switch *(4, Fig. 5)* must be **ON.** Proceed as follows:

(aa) Adjust the rheostat *(2)* to point to the length, in feet, of output cable being used. Various cable lengths are indicated on a plate mounted behind the rheostat knob.

(bb) Adjust rheostat *(3)* to point to the size of cable being used. Various cable sizes are also indicated on a plate behind the rheostat knob.

(cc) With the generator running (no load), check output voltage value, which should be exactly 115-VAC. If not, adjust in accordance with Para. 3, B, (2), (a) above.

(dd) Apply a full load to the generator. Observe AC voltmeter. If the voltage observed varies more than 1% *(plus or minus)* from 115-VAC, adjust rheostats *(2)* and *(3)* slightly to obtain a voltage of 115-VAC, or as close to this value as possible. Turn knobs **CLOCKWISE** to **INCREASE** voltage and **COUNTERCLOCKWISE** to **DECREASE.** Turn each knob a small amount at a time to determine which rheostat is having the most effect on output voltage and requires adjustment.

(c) Adjust "damp" and "rate" adjusting potentiometers *(See Figure 5).*

Damping adjustments are very delicate and should not be attempted unless the generator output average phase value varies more than 1 volt, or output volt6age is unstable. "Damp" and "rate" adjustments must be made in conjunction with each other because the adjustment of one may affect the other. For example, improving the response by adjusting the "damp" potentiometer *(1)* may affect the stability as adjusted by the "rate" potentiometer *(2).* Adjust as follows:

(aa) If "damp" and "rate" adjustments have been disturbed *(changed from factory setting),* or if the regulator has been repaired, loosen the locking nuts and set both potentiometers to mid-position *(halfway between full CLOCKWISE and full COUNTERCLOCKWISE).*

(bb) Connect the generator output to a balanced, three-phase load of 30 kilowatts.

(cc) With generator running at 115-VAC no load, operate the contactor "on-off" switch *(14, Fig. 2).* If the average phase voltage changed more than 1 volt, or if output is unsteady, adjust "damp" and "rate".

(dd) Turn the "rate" *(2)* adjusting screw to near full **COUNTERCLOCKWISE** position. Turn the screw slowly **CLOCKWISE** until the voltage output abruptly becomes **STEADY**. Continue turning the screw **CLOCKWISE,** 5 degree to 10 degrees past this point for best "rate" adjustment.

(ee) Tighten adjusting screw locknuts after adjustment is completed.

C. Basic Engine Adjustments

Adjustment procedures applicable to the diesel engine are included in the Detroit Diesel Handbook which accompanies this Hobart manual. Specific information for this particular engine is listed in 1-1, Figure 2.

D. Engine Accessories Adjustment

- **(1) Generator and fan belt adjustment**

Refer to the Detroit Diesel Handbook in Chapter 6 for fan belt adjustment instructions.

NOTE: Replace fan belts as a matched set.

E. Electric Governor System Adjustment

Two electric governor system main components, namely the magnetic pickup, and control box, have critical adjustments which can affect engine performance and generator output. Actuator-to-fuel control lever adjustment can also affect engine performance.

When the complete system is to be checked, and/or adjusted, a definite sequence of procedures should be followed:

First - Check or adjust actuator linkage.

Second - Check or adjust magnetic pickup.

Third - Check or adjust electric governor controller

- **(1) Actuator linkage adjustment**

The proper adjustment of the mechanical linkage between the electric actuator and engine speed control lever is important to the satisfactory operation of the complete system. In making the adjustment, make certain that the following rules are observed.

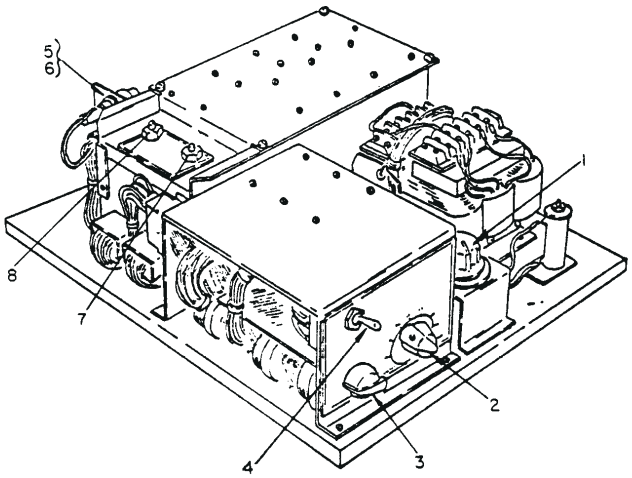
Adjust linkage to use the **FULL TRAVEL** of the actuator lever *(3).*

Linkage must move speed control lever *(7)* from **FULL IDLE** to **FULL SPEED** position, or **VERY CLOSE** to **FULL SPEED** position to allow engine to pull 125% load.

With engine stopped, refer to Figure 6 and adjust linkage as follows:

(a) Place the ball joint that attaches to the actuator lever *(3)* in the **FOURTH** hole from the mounted end of this lever, and place the ball joint that attaches to the fuel control lever *(7)* in the **LAST** hole *(the hole nearest the mounted end of the lever).*

(b) Disconnect ball joint *(4)* from actuator lever *(3),* and make sure that the levers (3 and 7) have not slipped on shafts. If a lever ahs slipped, position it correctly and tighten it securely.



1. Voltage adjusting rheostat
2. Cable length compensation rheostat
3. Cable size compensation rheostat
4. On-off switch, line-drop compensation
5. Fuse (5 Amp)
6. Fuseholder
7. Damp (gain) adjusting potentiometer
8. Rate adjusting potentiometer

Voltage Regulator Adjustments

Figure 5

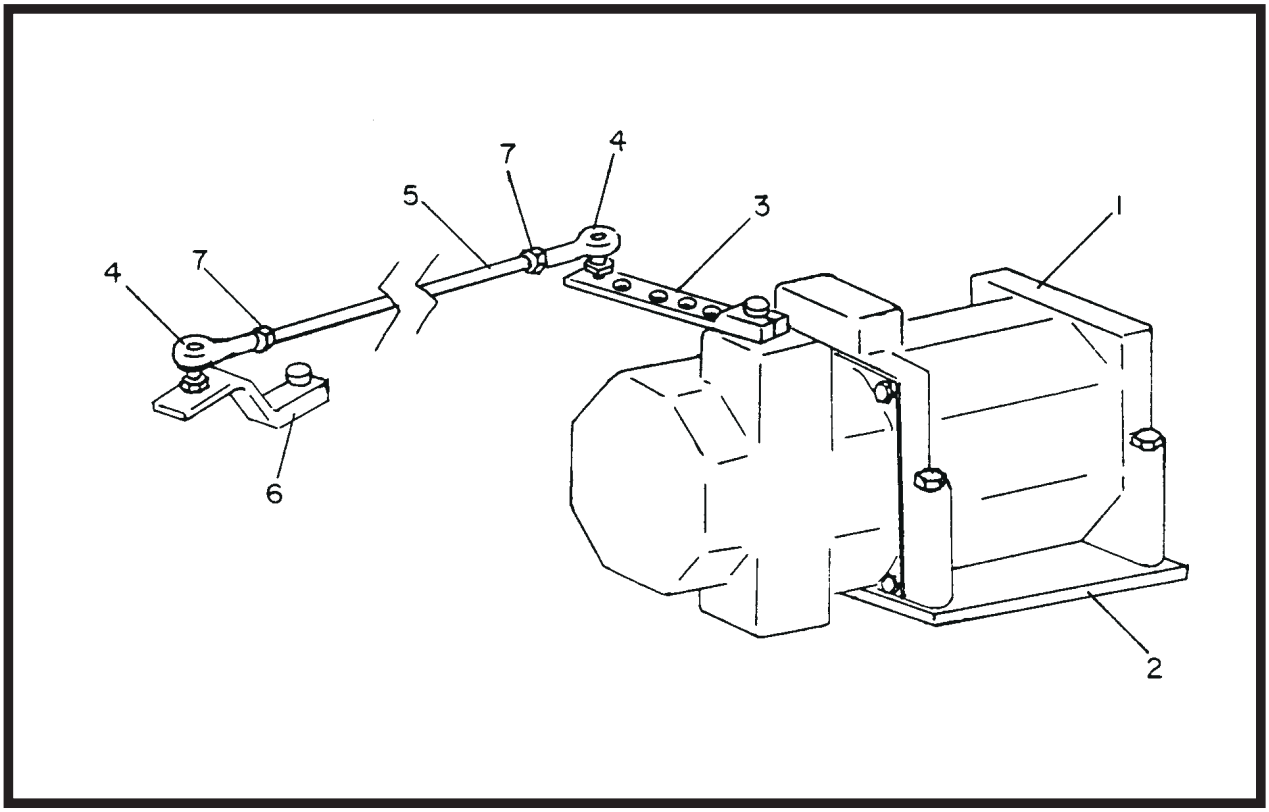
(c) Place both levers *(3 and 6)* in **FULL IDLE** position and attempt to connect ball joint *(4)* at hole in actuator lever *(3)* from which it was removed in step (a). If connection cannot be made, loosen nuts *(7),* and adjust effetcive length of rod assembly so that connection may be made.

(d) Manually operate actuator lever *(3)* back and forth between **FULL IDLE** and **FULL SPEED** positions. With the actuator lever being moved approximately its entire range of travel, speed control lever *(6)* should move freely through its entire range between **FULL IDLE** and **FULL SPEED.**

NOTE: When this adjustment is properly made, the effective length of the rod assembly (items 4, 5 and 7, Fig. 6), measured between ball joint centers - is generally 11-1/2 inches +/- 1/8 inch (See Figure 6A).

(e) If adjustment is unsatisfactory, try another hole mounting in **ACTUATOR** lever and readjust rod length.

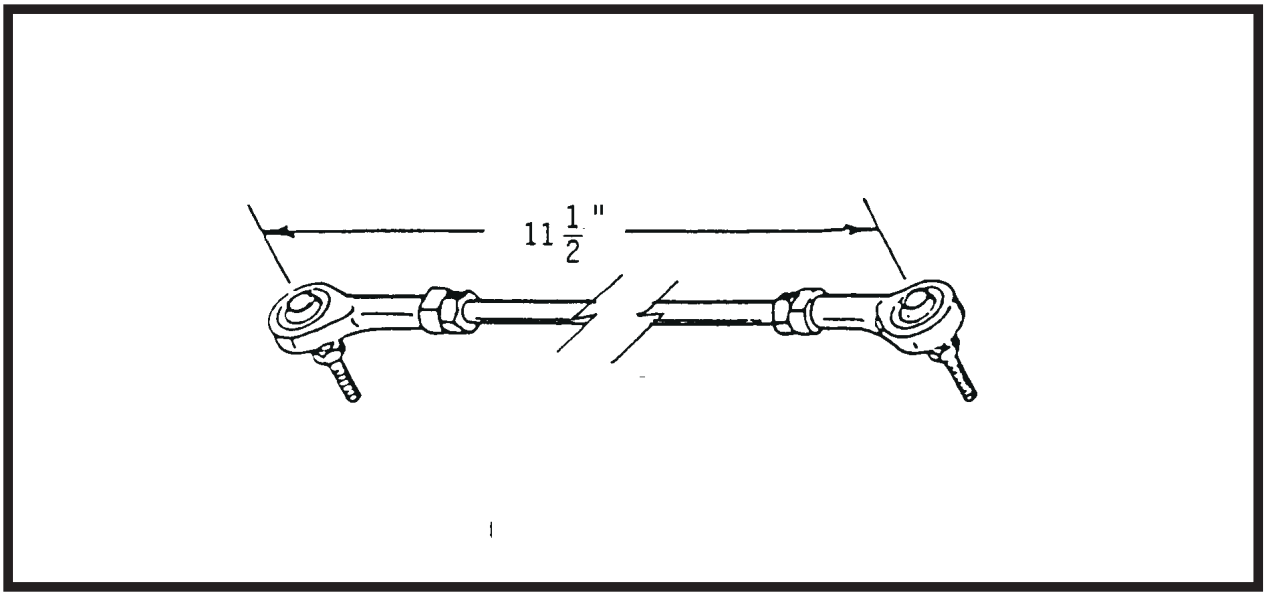
(f) Tighten all parts securely when adjustment is completed.



1. Actuator
2. Mounting bracket
3. Actuator lever
4. Ball joint
5. Rod
6. Engine speed control lever
7. Nut

Governor Actuator Linkage

Figure 6



Length Adjustment of Linkage Rod Assembly

Figure 6A

- **(2) Magnetic pickup adjustment**

The strength of the magnetic pickup signal to the control box can be weakened if the tip of the pickup is too far from the flywheel ring gear. If the pickup is to be removed for any reason, or if the signal is weak, as indicated by test in Para. 4, E, (4), (b), adjust as follows:

(a) Disconnect the magnetic pickup at "pull-apart" connector *(1, Fig. 7).*

(b) Loosen nut *(3)* and remove magnetic pickup *(2).*

(c) Inspect to make certain the tip is not damaged from contact with the ring gear *(replace pickup if damaged).*

(d) Rotate the engine as required to locate a ring gear tooth directly below the tapped, pickup mounting hole. An imaginary line should pass through the center of the mounting hole, the center of a flywheel tooth and the center of the flywheel.

(e) Install the magnetic pickup and thread into the mounting hole until the tip touches the "in-line" flywheel gear tooth.

CAUTION: THE PICKUP TIP MUST BE DIRECTLY OVER A TOOTH AND NOT BETWEEN TEETH WHEN ADJUSTMENT IS MADE.

(f) Back the pickup outward *(counterclockwise)* 1/2 turn. Hold the pickup securely in this position and tighten nut *(3)*. This adjustment will result in a clearance of approximately 0.028 inch between the pickup tip and the flywheel teeth and give an operating AC voltage of 4-V to 10-V at control box terminals 10 and 11 when the engine is running at no load and governed speed. Reconnect pull-apart connector *(1).*

NOTE: As little as 1-V is required for operation of governor control box. Magnetic pickup voltage does not have to be as much as 4-V to 10-V.

- **(3) Governor controller adjustment**

Before making an adjustment to the controller *(Figure 8),* make certain that the linkage between actuator and fuel control lever *(5, Fig. 6)* is free and properly adjusted. There must be no lost motion or “play” in the linkage. Be sure the magnetic pickup is producing a strong, normal output.

The controller has three identical control potentiometers: the **GAIN** potentiometer, the **DROOP** potentiometer, and the potentiometer marked **“I”.** In addition, a **SPEED** control potentiometer is located just next to the **GAIN** potentiometer. Make controller settings as follows:

(a) Preliminary Controller Settings

(aa) With the engine of the generator set turned off, set the **“I” ADJUSTMENT** one division mark from zero.

(bb) Set **GAIN** adjustment at the third division mark from zero.

(cc) Set **DROOP** adjustment **COUNTERCLOCKWISE** to minimum position as shown in Figure 5.

(dd) Start the engine and adjust the controller’s **SPEED** potentiometer until the engine is operating at rated speed *(2400 RPM).* Turning the adjustment **CLOCKWISE** increases engine RPM, and turning it **COUNTERCLOCKWISE** decreases engine RPM.

(ee) If the governor system is unstable, reduce slightly the **“I”** and **GAIN** settings.

(b) Checking No-Load Operation of Controller

(aa) Turn the **GAIN** adjustment **CLOCKWISE** until the actuator lever oscillates *(a faster oscillation than was observed when the actuator lever was first made).*

(bb) Reduce the **GAIN** adjustment slowly **COUNTERCLOCKWISE** until the actuator lever is stable.

(cc) Upset the lever by hand. If the lever oscillates in 3 to 5 diminishing oscillations and stops, the setting is correct.

(c) Checking Operation of Controller Under Load

(aa) Apply a load to the generator set, then remove the load and observe the length of time required for the engine speed to again stabilize. Engine speed should stabilize within 3 to 5 oscillations. If engine speed does not stabilize at the above setting, proceed as follows:

(bb) With the generator set operating at no load, reduce the **GAIN** setting **COUNTERCLOCKWISE** one division mark and turn the **“I”** adjustment fully **CLOCKWISE** while observing the actuator lever.

(cc) If the lever does not become unstable, upset it by hand. When the lever slowly oscillates, turn the adjustment **COUNTERCLOCKWISE** slowly until the lever is stable.

(dd) Upset the lever again. It should oscillate 3 to 5 times and then become stable for optimum response.

- **(4) Electric governor test values**

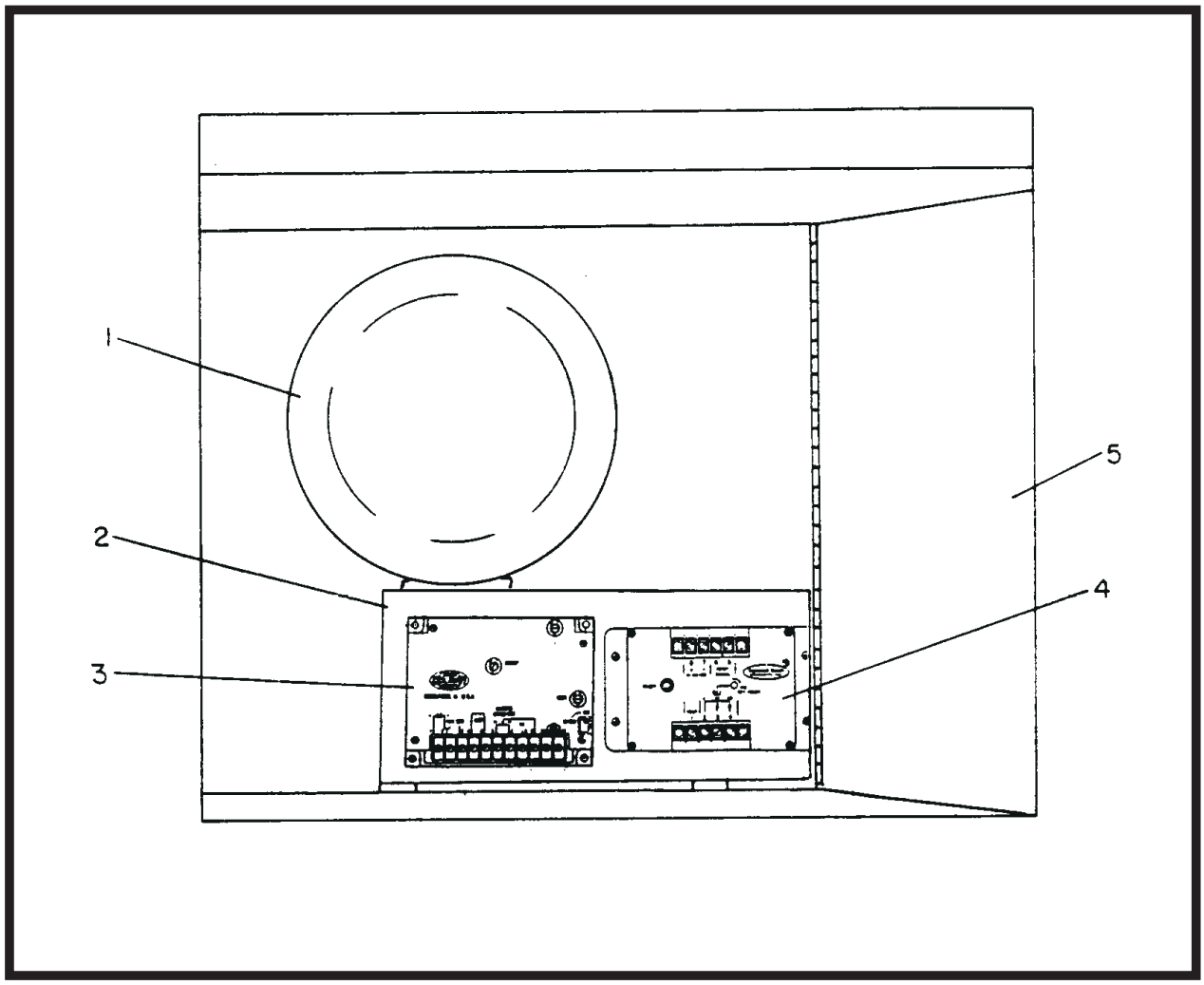
(a) Signal to actuator

Refer to Figure 9. With the generator set operating at governed speed *(2400 RPM, 400-Hz),* check actuator signal voltage, measuring this voltage between terminals 4 and 5 on the contrl box terminal board. Voltage measured should be approximately 5.2-VDC at no load, and 5.8-VDC at full load.

(b) Magnetic pickup signal

Connect a high impedance voltmeter to the magnetic pickup input terminals (10 and 11) on control box terminal board. The voltage value at governed speed, no load should be 4-VAC MINIMUM to 10-VAC MAXIMUM.

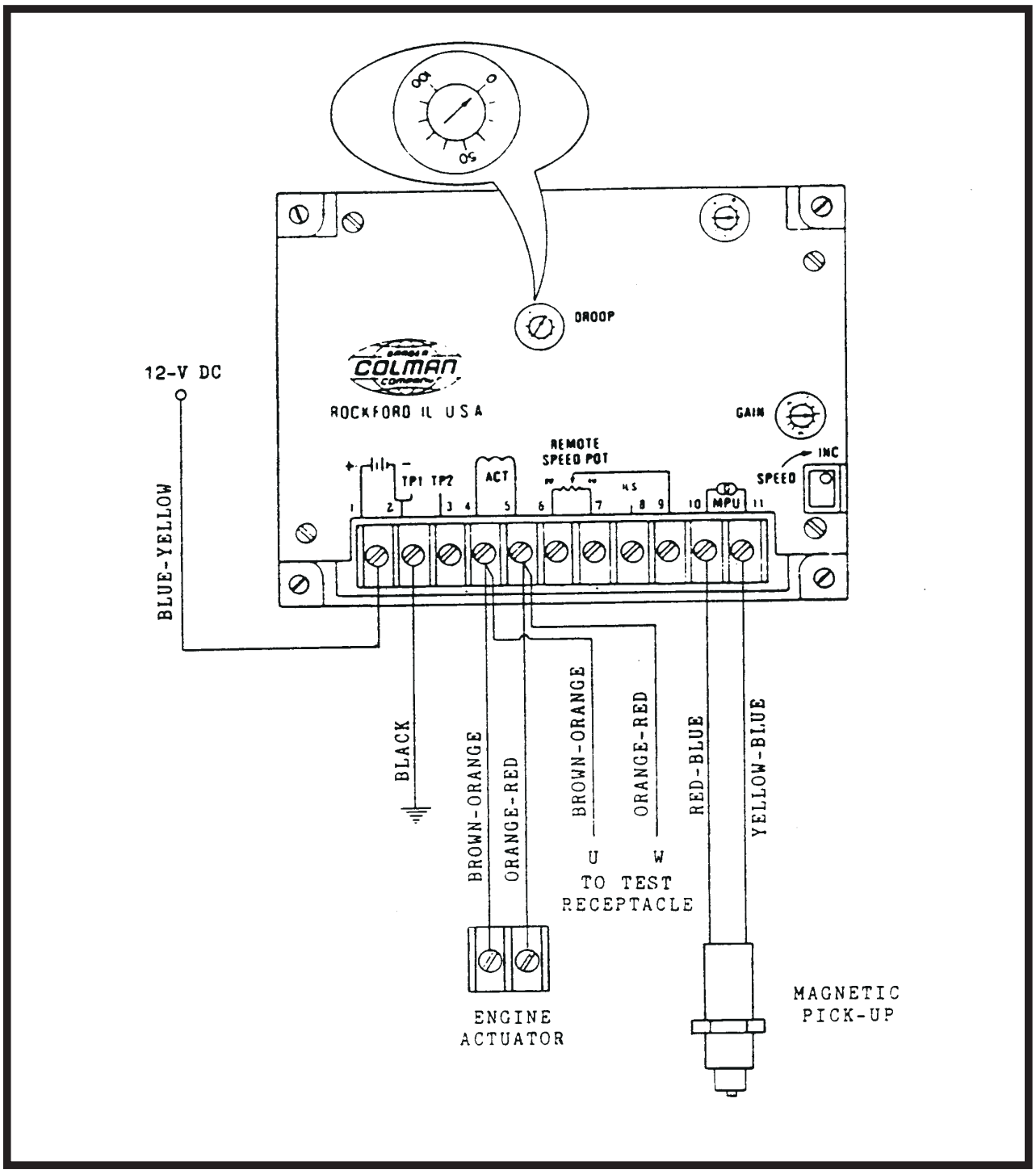
NOTE: A signal as low as 1-V is sufficient to operate the control unit satisfactorily. If a condition exists wherein no voltage at all is measured, this indicates either that the magnetic pickup is too far from the flywheel or that it is defective.



1. Air cleaner
2. Bracket, governor control box and overspeed switch
3. Governor control box
4. Overspeed switch
5. Left rear door of generator set

Electric Governor Control Box Location

Figure 8



Electric Governor Control Box

Figure 9

F. Accellerator Linkage Adjustment

The accellerator linkage, illustrated in Fig. 10, provides a means of manually controlling the engine speed for mobile operation of the self-propelled unit by mechanical operation of the governor actuator. Linkage coomponents are shown in the **IDLE** position.

The end *(not illustrated)* of the cable core *(7)* is attached to a lver actuated by the accellerator pedal. Depressing the pedal pulls the core *(7)* and attached finger *(2)* in a direction which moves the arm *(1)* to increase engine speed. The most important thing in the adjustment of this linkage is to locate the finger *(2)* on core *(7)* such that the arm *(1)* will operate freely to full **IDLE** position when the accellerator pedal is in the **RELEASED** position.

To adjust the accellerator linkage, proceed as follows, with the engine **STOPPED.**

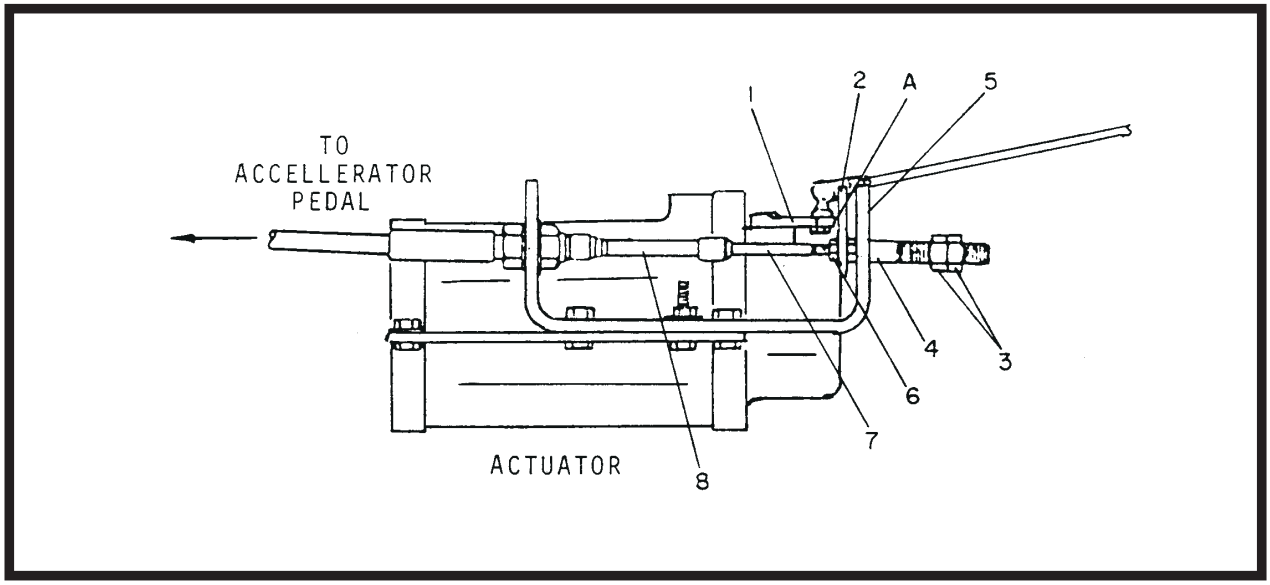
(1) Check operation of the accellerator pedal and make certain that it operates freely through its full travel and that the return spring is in good condition and returning the pedal to idle position properly.

(2) With the engine stopped, actuator lever *(1, Fig. 10)* will be in or near **IDLE** position. Push actuator lever **FORWARD** to be sure it is in **IDLE** position, and check clearance at “A”, Fig. 10, between arm *(1)* and finger *(2).* Clearance should be at least 1/16 inch when all components are in idle position.

(3) To adjust clearance, loosen locknut *(6)* and either thread extension rod *(4)* farther into the core *(7),* or back it off, as required to reposition finger *(2)* to obtain a clearance *(A)* of 1/16 inch to 1/8 inch between arm *(1)* and finger *(2).*

NOTE: Nut (6) must be tight against finger (2) when checking clearance.

(4) Operate arm *(1)* throughout its full travel to make certain it will not touch any component including finger *(2).*



1. Actuator arm
2. Finger
3. Locknuts
4. Extension
5. Guide yoke
6. Locknut
7. Cable core
8. Cable housing

Accellerator Linkage Adjustment

Figure 10

(5) Check security of all components.

G. Overspeed switch adjustment

Adjust electronic overspeed switch *(4, Fig. 8)* such that it limits engine speed to 2650 RPM +/- 25 RPM. Refer to Synchro-Start Instruction Manual in Chapter 6 for procedures in setting overspeed switch.

4. Chassis Components Adjustment

A. Clutch Pedal Adjustment

The clutch pedal adjustment should be checked at once when the clutch does not engage or disengage properly, or when transmission gears are difficult to engage. An improperly adjusted clutch linkage can cause slippage and complete clutch failure.

(1) Check the clutch pedal adjustment *(See Figure 11).*

(a) Use a ruler to measure the distance from the clutch pedal pad to the floorboard.

(b) Depress the pedal slowly *(against return spring pressure)* until the clutch release bearing contacts the clutch pressure plate fingers. *(A much stronger resistance will be felt).* Again measure the distance from the pedal pad to the floorboard. The difference between this reading and the first reading will be the pedal free-travel which should be approximately one inch.

(2) Adjust clutch pedal travel *(See Figure 11)*

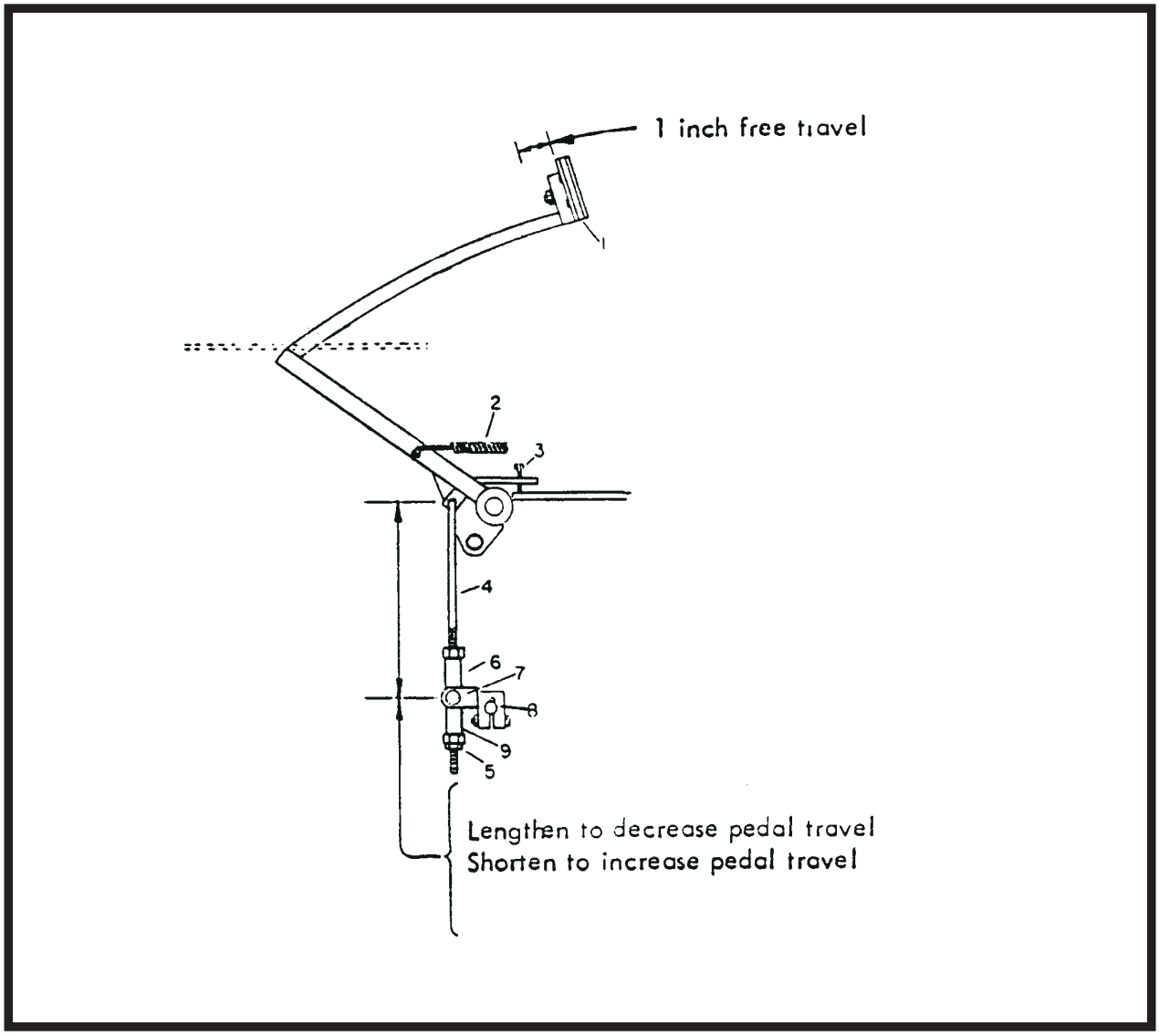
(a) Raise the vehicle so that the clutch linkage is accessible from the underside.

WARNING: HEAVY EQUIPMENT CAN CRUSH OR KILL ! ALWAYS USE FLOOR STANDS WHEN WORKING UNDER THE VEHICLE.

(b) Loosen nut *(5)* sufficiently to allow adjuster *(6)* to be threaded up or down on rod *(4)* as required for adjustment. Thread adjuster (6) upward **ONTO** the rod *(4)* to **INCREASE** pedal travel. Thread adjuster *(6)* down **OFF** of the rod to **DECREASE** pedal travel.

(c) Be certain adjusters *(6 and 9)* are seated on swivel *(7),* then tighten nut *(5).*

(d) Check the pedal travel. Repeat steps *(b and c),* if necessary, until a satisfactory adjustment has been completed.



1. Clutch pedal
2. Return spring
3. Pedal stop screw
4. Clutch rod
5. Nut
6. Top adjuster (threaded)
7. Swivel
8. Clutch throwout shaft
9.Bottom adjuster (not threaded)

Clutch Pedal Adjustment

Figure 11

B. Brake Pedal Adjustment (See Figure 12)

Brake pedal free-travel should be 1/4 to 7/16 inch. Free-travel is the distance the brake pedal travel is before the push rod (4) touches the master cylinder piston.

Check and adjust as follows:

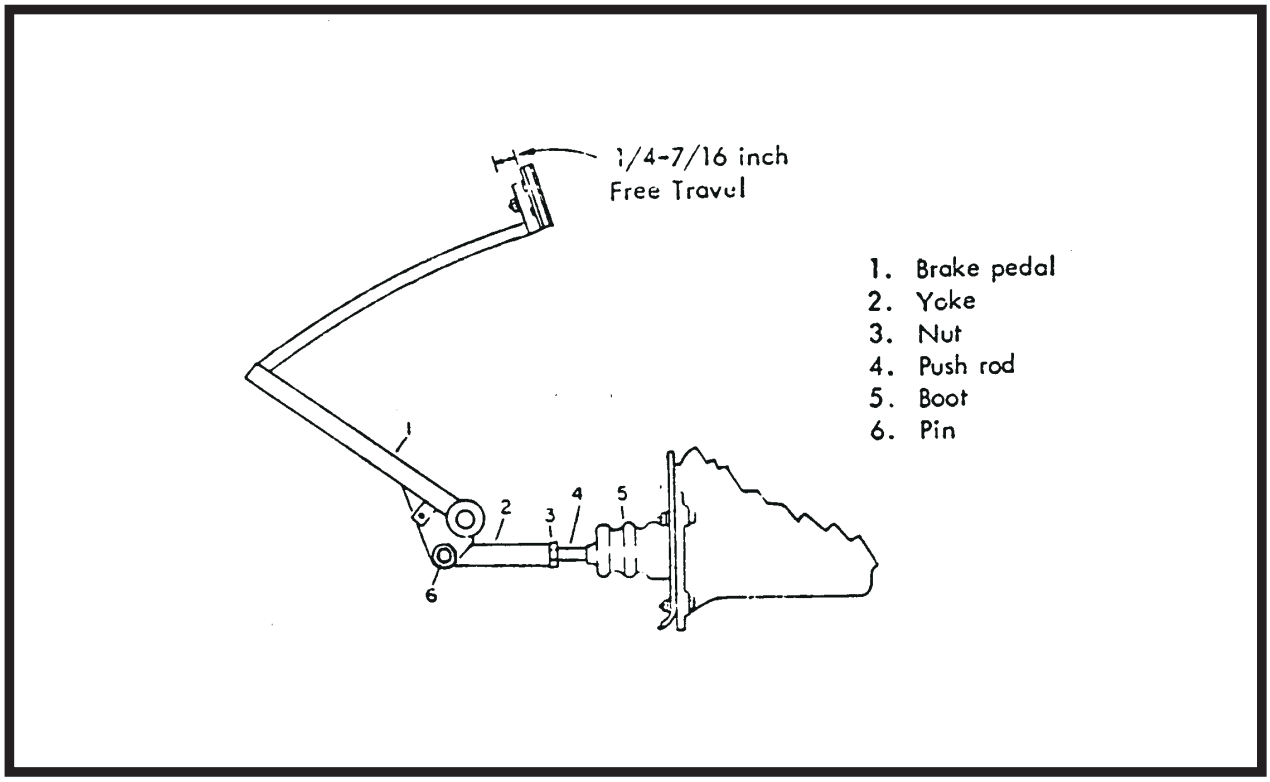
(1) Push the brake pedal down by hand until the rod *(4)* touches the master cylinder piston. If the pedal can be moved more than 7/16 inch or less than 1/4 inch before strong resistance is felt, adjust pedal linkage.

(2) Raise the vehicle and make adjustment from the underside.

(3) Loosen nut *(3)* and lengthen rod *(4)* to decrease free-travel. Shorten the rod to increase free-travel.

NOTE: If pliers are used to turn the rod, use the unthreaded portion of the rod for a gripping surface.

(4) When adjustment is completed, tighten nut *(3)* securely.



Brake Pedal Adjustment

Figure 12

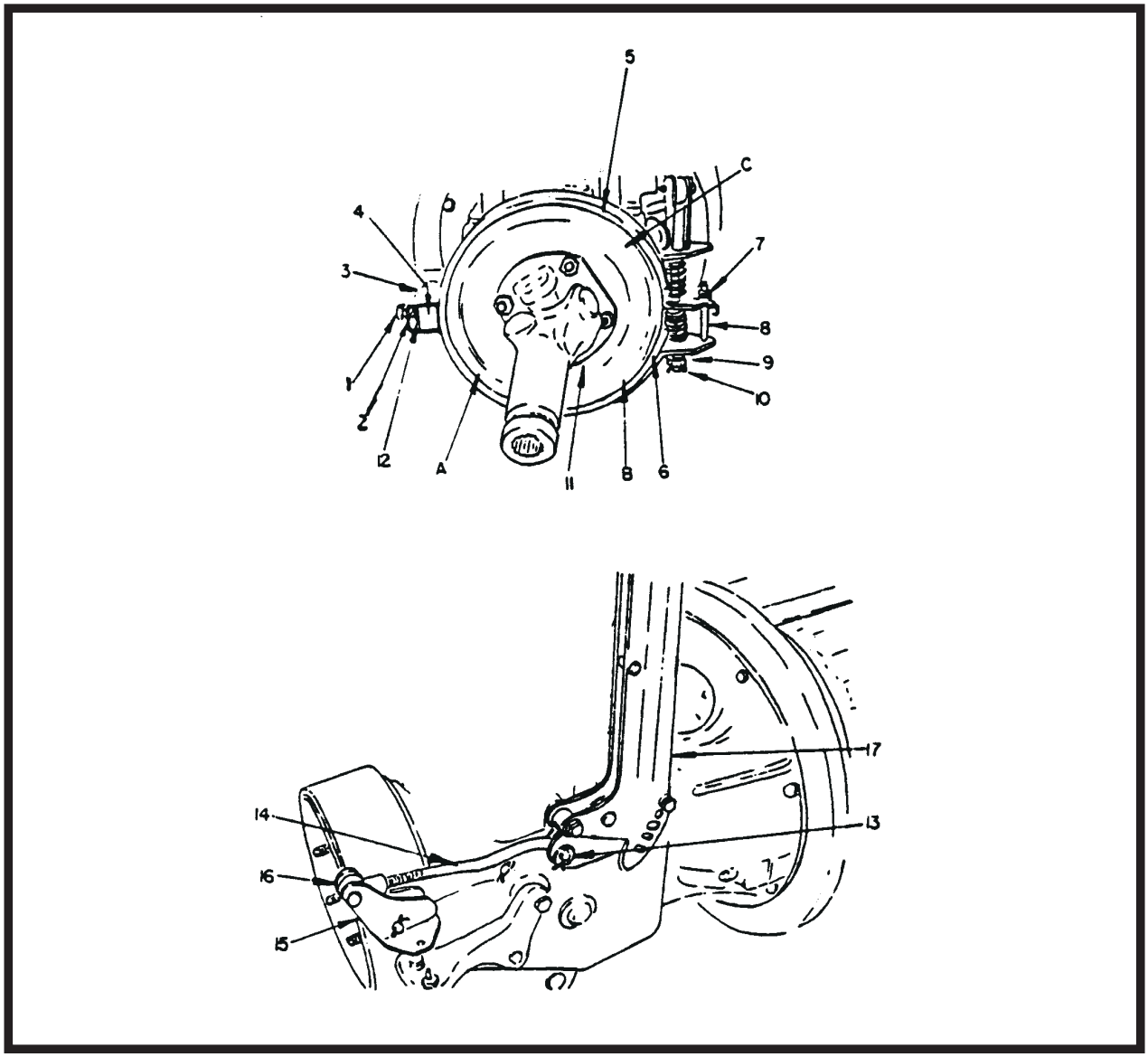
C. Parking Brake Adjustment

The parking brake should require little or no adjusting, since it is not subject to wear imposed by stopping the vehicle. Adjustment by use of the adjusting knob located on the end of the parking brake lever should be sufficient for a long period of time. If adjustment of the brake band is required, proceed as follows:

(1) Raise the rear of the vehicle and position safety stands.

(2) Make certain the parking brake lever is in **OFF** position.

(3) Inspect the brake lining *(6)* to drum *(10)* clearance around the complete brake band assembly *(5)* to determine the adjustments needed.



1. Anchor screw
2. Safety wire
3. Band mounting bracket
4. Mounting arm
5. Brake band
6. Brake lining
7. Nut
8. Screw
9. Adjusting nut
10. Cotter pin
11. Brake drum
12. Spring
13. Cotter pin
14. Brake rod
15. Cam lever
16. Rod attaching eye
17. Lever

Parking Brake Adjustment

Figure 13

(4) Remove the cotter pin *(13)* and disconnect rod *(14).*

(5) Cut and remove safety wire *(2).* Adjust anchor screw *(1)* to position band approximately 0.010 inch from the drum at "A". Be sure the band bracket *(3)* will move freely on mounting arm *(4)* and that the spring *(12)* will hold the band away from the drum. Use penetrating oil to free if required.

(6) Loosen nut *(7)* and adjust screw *(8)* so the lining surface at "B" is approximately 0.010 inch from the drum.

(7) Remove the cotter pin *(10)* and adjust nut *(9)* to position lining *(6)* approximately 0.010 inch from the drum (11) at point "C".

(8) Adjust rod *(14)* in eye *(16)* so that cam lever *(15)* is flat on the brake band hooked end when the rod *(14)* is connected to the brake lever *(17).* Install cotter pin *(13).*

(9) Be sure all linkage works freely. Use penetrating oil as required. Apply brake several times. Adjust the knob at the end of the brake lever to apply pressure as required in locked position.

(10) Release brake lever and recheck adjustment to make certain the band is fully released and lining is not touching the brake drum.

CAUTION: IF THE BRAKE DRUM RUBS THE LINING AT ANY POINT, THE LINING CAN BE DESTROYED BY FRICTION IN A SHORT TIME.

(11) Install new safety wire *(2).* tighten nut *(7).* Install new cotter pin *(10).*

D. Service Brake Adjustment

Service brakes should be adjusted anytime the brake pedal travels over halfway to the floorboard when the brakes are applied. Adjust as follows:

(1) Raise the vehicle to free all four wheels. **INSTALL FLOOR STANDS.**

(2) Place transmission in **NEUTRAL** and be sure the parking brake is released.

(3) Each brake is equipped with two eccentric cams *(one for each shoe)* for adjusting purposes. To adjust, use an open end, or box end wrench to turn the hex head adjusting bolts.

(4) With wrench positioned on the adjusting cam bolt in a horizontal position as shown in Figure 14, pull downward to tighten until the shoe contacts the drum and creates a drag when the wheel is turned. "Back-off" the adjustment by pushing the wrench handle upward until the wheel turns freely.

(5) Repeat step *(4)* until all shoes are adjusted.

E. Bleeding Hydraulic Brakes

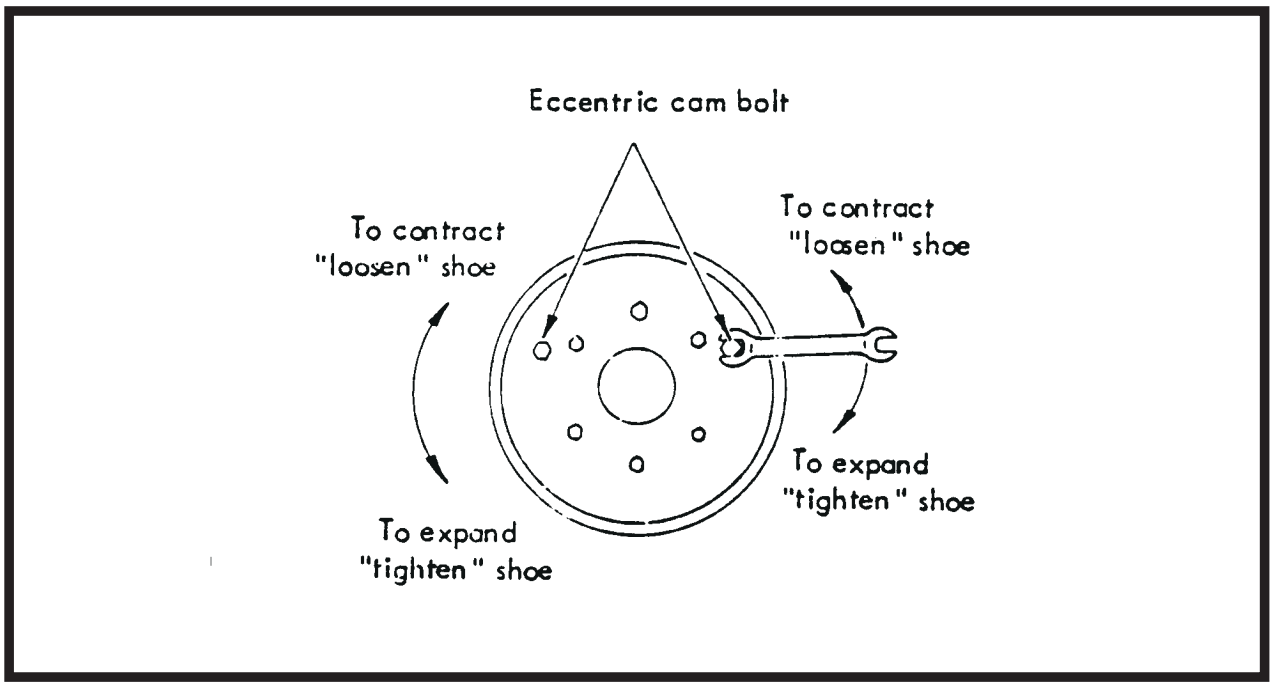
If air enters the hydraulic brake system, the brake pedal action will feel soft and "spongy" when the brakes are applied and braking may be erratic. Ait will enter the system if the master cylinder reservoir is allowed to become empty, or if the system is opened for any reason. A leaking condition may also allow air to enter. To remedy the condition the system must be "bled" to expel air. The system may be bled manually or with pressure bleeding equipment.

(1) Manual method

This bleeding method can best be accomplished by two mechanics; one to operate the bleeder valves, and one to operate the brake pedal and keep the master cylinder reservoir filled.

(a) Raise the vehicle so that the bleeder valves are easily accessible.

(b) Remove the master cylinder access cover from the floorboard.



Brake Shoe Adjustment

Figure 14

(c) Clean all dirt from the top of the master cylinder and from the filler cap. Remove cap and fill reservoir with new, clean, heavy duty brake fluid. *(See 2-2, Fig. 2).*

(d) Position a 3/8-inch box-end wrench on the bleeder valve *(See Fig. 15)* in the right, front wheel cylinder.

(e) Submerge the free end of the tube in a clear, glass container partially filled with clean brake fluid.

(f) Loosen *(open)* the bleeder valve 1/8 to 1/4 turn. Push the brake pedal down slowly through its full travel. Allow it to return slowly to its fully released position. Repeat this operation until air bubbles cease to appear at the submerged end of the bleeder tube.

NOTE: Be sure the reservoir ALWAYS contains fluid during the bleeding operation.

(g) Close the bleeder valve and remove the bleeder hose.

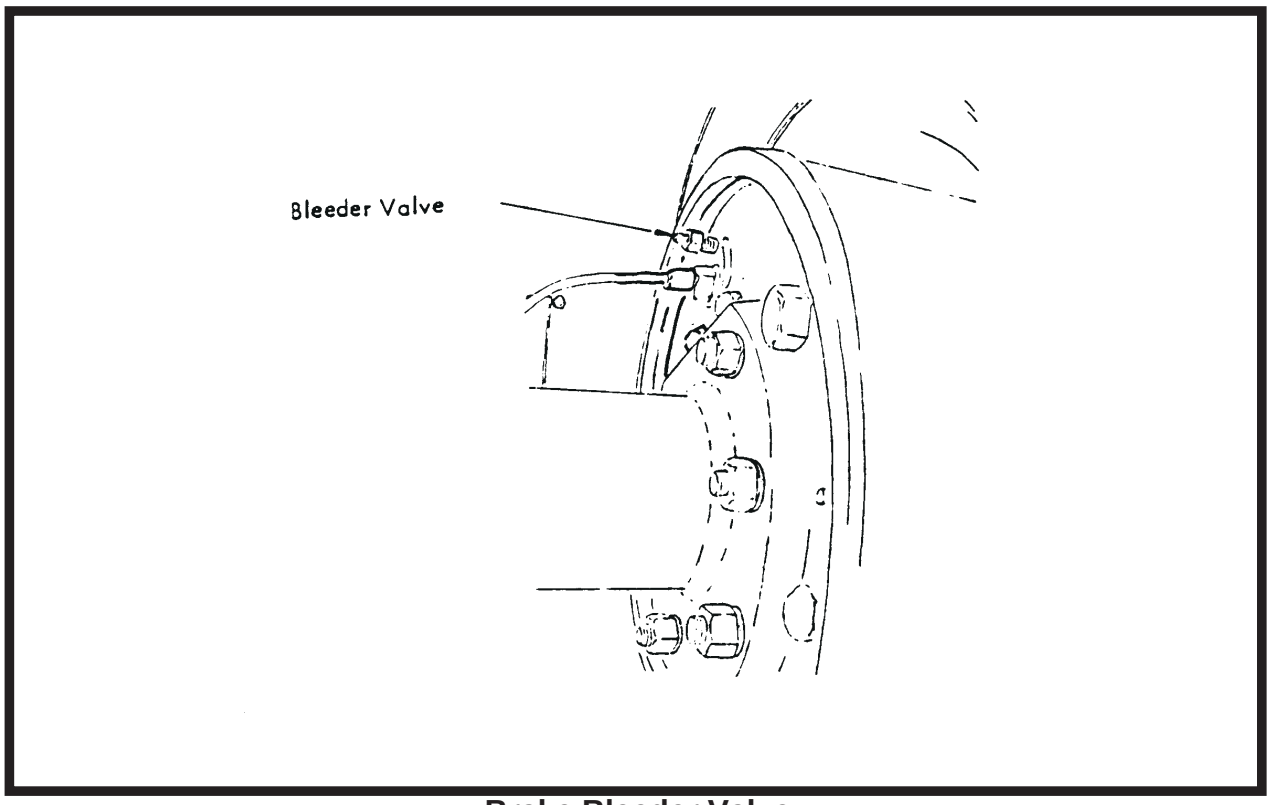
(h) Repeat the bleeding procedures at each wheel cylinder in the following sequence: left front, right rear, and left rear.

(i) Fill the master cylinder. Fluid level should be 3/8-inch below the bottom edge of the filler hole. Install the filler cap securely.

(j) Install the master cylinder access cover and lower the vehicle.

(2) Automatic pressure method

One mechanic can easily perform this operation because it is not necessary to use the brake pedal to force air from the system. Neither is it necessary to fill the master cylinder after bleeding each wheel cylinder. The bleeding equipment will automatically keep the master cylinder full at all times. The bleeder tank must contain enough new brake fluid to complete the bleeding job and it must be charged with 10 to 30 PSI of air pressure.



Brake Bleeder Valve

(Rear Wheel Illustrated)

Figure 15

CAUTION: PRESSURE MUST NOT EXCEED 50 PSI.

(a) Raise the vehicle and remove the master cylinder access cover and filler cap as in steps *(a)* through *(c)* under “Manual method” above.

(b) After removing the filler cap, select an adapter from the pressure bleeding accessaory equipment which will fit the master cylinder reservoir and install. Connect the bleeder tank output hose to the adapter.

NOTE: an adapter cap may be fabricated by drilling a hole through the center of a proper size cap and soldering a tube fitting in the hole.

(c) Position a 3/8-inch box end wrench on the right-front wheel cylinder valve. Attach a bleeder tube to the end of the bleeder valve, and submerge the free end of the tube in a clear, glass container partially filled with clean brake fluid.

(d) Open the valve on the bleeder tank *(or hose)* to admit pressurized brake fluid to the master cylinder.

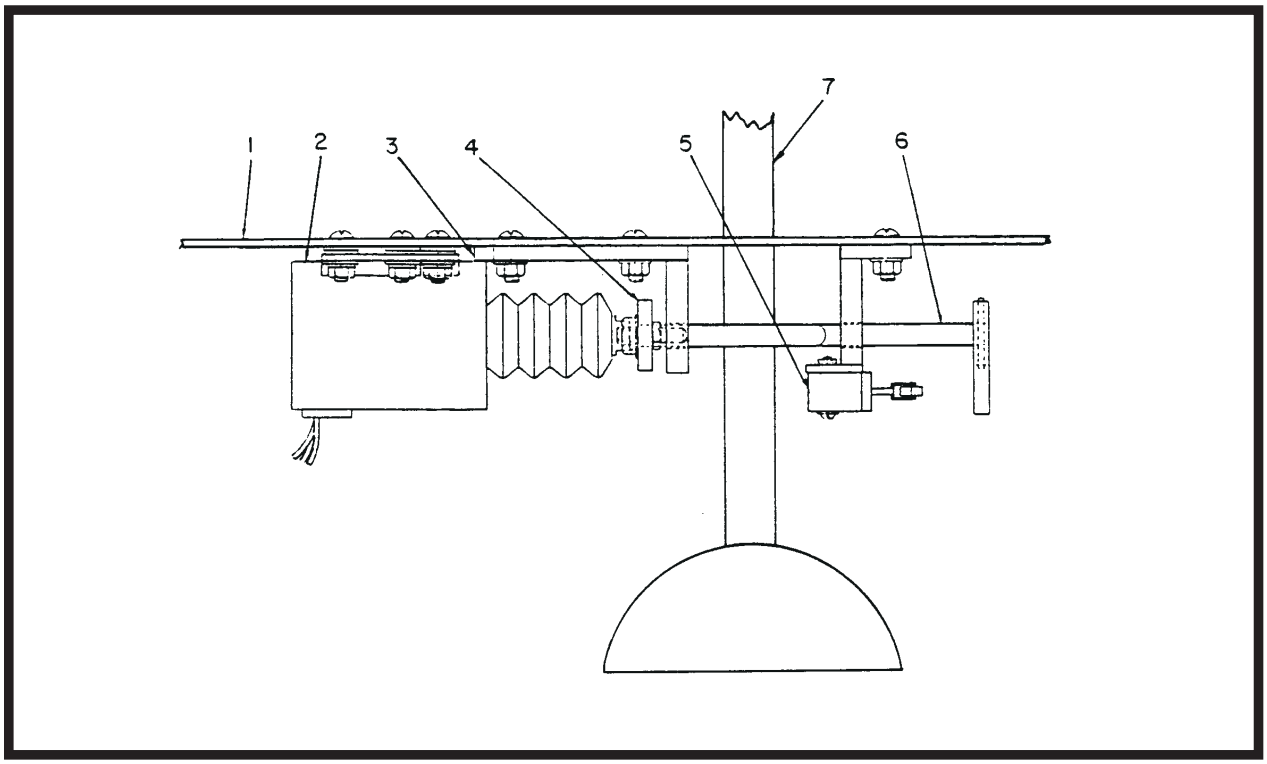
(e) Loosen *(open)* the wheel cylinder bleeder valve 1/8 to 1/4 turn.

(f) When air bubbles cease to appear at the submerged end of the bleeder tube, close the bleeder valve and remove the tube.

(g) Repeat the bleeding operation at the other wheel cylinders in the following order: left-front, right-rear, and left-rear.

(h) Close the bleeder tank valve and remove the brake bleeding equipment.

(i) Be sure the master cylinder is filled. Install the filler cap and access cover, and lower vehicle.



1. Floor plate, rear section
2. 12-VDC solenoid
3. Support plate
4. Actuator safety plate
5. Snap switch
6. Rod and plate assembly
7. Gearshift lever

Gearshift Lockout Device

Figure 16

F. Gearshift Lockout Device Adjustment

Under normal circumstances, no adjustment should ever be necessary on the gearshift lockout device. however, this assembly should be periodically checked to see that items in the assembly are properly and securely mounted, as shown in Figure 16. Make certain that no binding occurs that hampers the movement of the rod and plate assembly *(6, Figure 16)* when the solenoid *(2, Figure 16)* is activated.

G. Backup

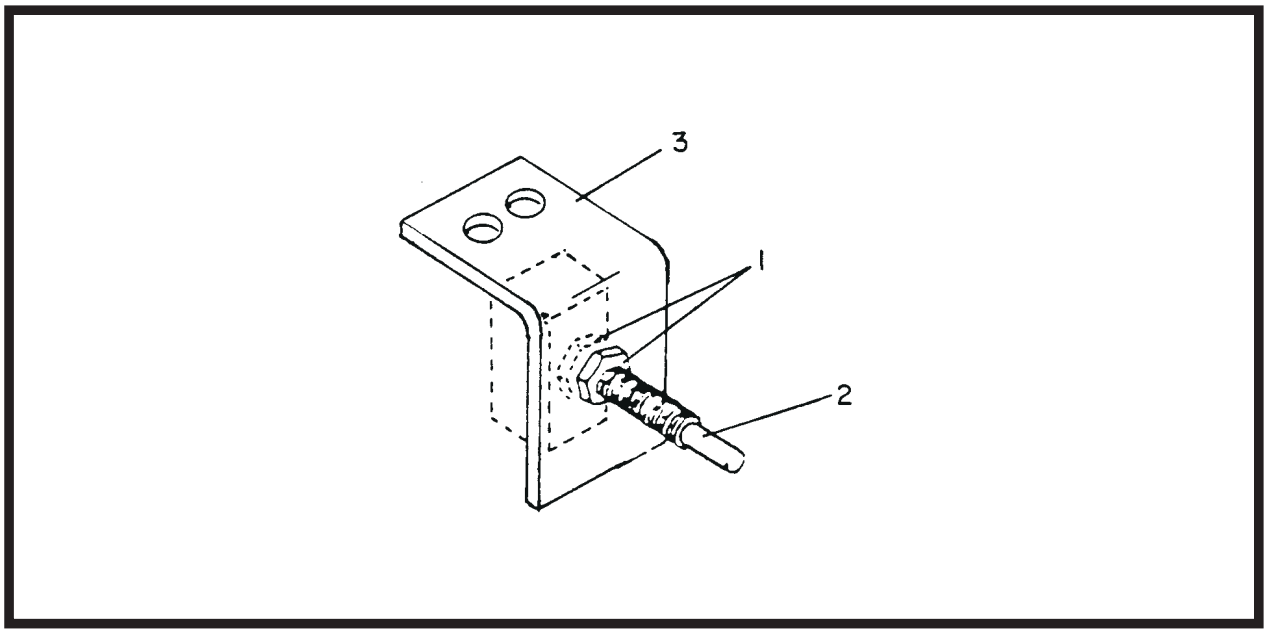
(1) Remove the floorboard.

(2) Place the gearshift lever in **REVERSE** position and check operation of the actuator *(2, Figure 17)* and Micro switch.

(3) To adjust the backup light switch, loosen the mounting nuts *(1, Fig. 17)* and readjust them to reposition the actuator *(2)* in bracket *(3)* so that when the gearshift lever is in reverse position, the actuator rod is moved sufficiently to turn **ON** the Micro switch.

(4) Tighten nuts (1) securely when a satisfactory adjustment has been made.

NOTE: The actuator rod is spring-loaded to prevent damage to the Micro switch in case it is adjusted too close to the gearshift lever.



1. Nuts
2. Actuator
3. Bracket

Backup Light Switch Adjustment

Figure 17

5. Generator and Exciter Test

The generator fields may be tested with a “Kelvin” bridge. This is a double bridge instrument required for the very low resistances encountered in this test. It is understood that 0 resistance indicates a **SHORT CIRCUITED** condition. An infinite resistance reading indicates an **OPEN CIRCUITED** condition. See Figure 18 for resistance values.

NOTE: The equipment should be COLD or at normal ambient temperature when tests are made.

A. Disconnect the generator stator leads at the power module panel.

B. Disconnect exciter leads from terminal board mounted on the rear of the engine control panel. Positive lead is **RED.** Negative lead is **YELLOW-BLACK.**

C. Check resistance and compare to values given in Figure 18.

TEST CONNECTION	NOMINAL RESISTANCE IN OHMS
GENERATOR STATOR	
Phase A to N	0.00827
Phase B to N	0.00835
Phase C to N	0.00840
NOTE: the two leads of a phase must be connected when the test is made.	
EXCITER A-B, B-C, A-C	0.1
L2 Field (RED to YELLOW-BLACK)	7.23
L1 Field	2.2 +/- 5%

Generator and Exciter Stator Test Values

(70 Deg. F Ambient Temp.)

Figure 18

6. Diode Test

Test values for diodes are not given here because they could be misleading.

Test values may vary even between diodes of the same part number, rating, and manufacturer. General instructions for testing diodes follow:

A. Disconnect diode leads.

B. Use a good quality ohmmeter. An instrument which indicates 50 ohms at the center of the scale is preferable.

NOTE: Make certain the battery is in good condition and the pointer is adjusted to zero when the test lead points are shorted together. Set the scale selector to RX1.

C. Hold one ohmmeter lead point on the threaded end of the diode. Hold the other lead point on the wire terminal end. Observe and note the indicated resistance. Now reverse the lead connections on the diode. Again observe and note the ohmmeter indicated resistance. Generally speaking, if an infinite or very high resistance was indicated with the leads connected one way and a low, readable resistance was indicated with the leads connected the opposite way, the diode may be considered good.

TEST BOX POINTER POSITION	TEST POINTS CONNECTOR TERMINALS	TEST DESCRIPTION	CONDITION	VOLTAGE
1	K-M	Phase “A” input for reg. and trays	Unit in “GEN” mode	115-VAC 400-Hz
2	K-P	Phase “B” input for reg. and trays	Unit in “GEN” mode & auto-man sw. in “AUTO”	115-VAC 400-Hz
3	K-S	Phase “C” input for reg. and trays	Unit in “GEN” mode & auto-man sw. in “AUTO”	115-VAC 400-Hz
4	K-A	Protective monitor	Battery voltage	12-VDC
5	K-B	Fuse interlock relay	Test bank sw. closed & contactor closed	12-VDC
6	H-S	Protective monitor contacts	Auto-man sw. in “AUTO” position	115-VAC
7	K-Z	Plug interlock relay	Plug in aircraft	28-VDC
8	D-F	Exciter input	Unit in “GEN” mode	8-12-VDC
9	V-X	Regulator output*	Unit in “GEN” mode & auto-man sw. in “AUTO”	50-70-VDC
10	K-b	ContactorTest bank operation	sw. closed & contactor closed	115-VAC
11	K-E	Overload contacts at less than 125% load	Test bank sw. closed & contactor closed	0-VDC
12	K-R	Contactor switch	Test bank sw. closed & contactor sw. in “ON” position	115-VAC
13	K-N	Battery voltage & engine circuit fuse	All conditions	12-VDC
14	K-J	Shut-down solenoid	Engine running	0-VDC
15	K-G	Governor & EDR	Unit in “GEN” mode	12-VDC
16	U-W	Governor actuator	Unit at idle speed Unit in “GEN” mode, no load	0-VDC 2-4-VDC

*** DO NOT GROUND. DAMAGE WOULD OCCUR TO THE REGULATOR CIRCUITRY**

CHAPTER 3. TROUBLESHOOTING

SECTION 1. TROUBLE SHOOTING PROCEDURES

1. General

A. 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.

B. This section provides information useful in diagnosing and correcting certain troubles which cause unsatisfactory operation or failure of the equipment.

C. Minor troubles may be remedied by the operator; however, major repairs must be undertaken by experienced mechanics and electricians only.

2. Trouble Shooting Chart (Figure 2)

A. Description

The troubleshooting chart lists information under three headings as follows:

(1) Trouble, Symptom, and Condition

(2) Probable Cause

(3) Test, Check, and/or Remedy

B. Use of the Trouble Shooting Chart

(1) A troubleshooting chart is furnished to provide maintenance and repair personnel with a time-saving guide for locating trouble. To use the chart, proceed as follows:

(a) Locate the symptom*(s)* of trouble in the “Trouble” column.

(b) Check the probable causes of trouble in the “Probable Cause” column.

(c) Test, check, repair, or correct the trouble as indicated in the “Remedy” column.

(2) If the cause of a trouble is an uncommon one and cannot be located by use of the chart, the only alternative is to start at the source of power or supply and check the affected circuit or system completely. Use schematic and connection diagrams which are supplied with this manual.

(3) Electrical components mentioned in the trouble shooting chart are identified by a noun name and corresponding symbol which allows the user to identify the item more easily on schematic diagrams.

(4) It is assumed that wiring and connections in defective circuits have been thoroughly checked before condemning any other components.

NOTE: Reference symbols (S9, etc.), used in the Trouble Shooting Chart, are identified on Schematic and Connection Diagrams.

3. Equipment for Troubleshooting

A good quality multi-scale voltohmmeter is the only instrument required for trouble shooting. At least two “jumper” leads with “alligator” clips and test prods will be required. The 12-V, engine electrical system may be used as a 12-V DC power source. If a test box, part number 388318-2, is available, tests may be made more quickly and accurately. However, the test receptacle connector (25, Fig. 1) may be used by inserting the test points of a voltohmmeter into proper terminals of the connector. Refer to 2-3, Fig. 19 for proper test values as should be measured at the test receptacle.

4. Safety - WARNING:

WARNING: EXERCISE EXTREME CARE TO AVOID CONTACT WITH HIGH VOLTAGE LEADS AND COMPONENTS WHICH COULD CAUSE SERIOUS SHOCK AND INJURY IF TOUCHED WHEN TROUBLE SHOOTING OR OPERATING THE EQUIPMENT.

5. Parts Replacement

To lessen end item “down” time and to get a faulty machine back “on-theline” as quickly as possible, the “black-box” concept of parts replacement is reflected in the trouble shooting chart. For example, if a component in the protective relay tray is defective, the quickest way to remedy the situation is to replace the complete tray assembly and send the old tray to stock.

Assemblies which lend themselves to this concept are:

- Generator control tray
- Protective relay tray
- Voltage regulator
- Overload module
- Protective monitor module
- Over-undervoltage module
- Over-underfrequency module
- Electric governor control “box”
- Governor actuator

The above items are in addition to normally replaced items such as fuel pump, injectors, relays, etc.

6. Test Values

Although test values are provided throughout the trouble shooting chart, where applicable, additional information and values are given here.

Generator output at maximum voltage regulator rheostat setting: 134 V or higher
Generator output at minimum voltage regulator rheostat setting: 108 V or lower
Overload relay trips at any value above 112 KVA in 5 minutes.
Overvoltage relay trips at 130 to 134 V AC, resets at 125 V AC.
Undervoltage relay trips at 93 to 102 V AC, resets at 110 V AC.
Undervoltage time delay circuit functions in 4 to 12 seconds.
Overfrequency relay trips at 415 to 425 Hz, resets at 410 Hz.
Underfrequency relay trips at 375 to 380 Hz, resets at 385 Hz.
Overload relay trips at 125% rated load in 5 minutes.

See 2-3, Fig. 13 for typical test values at test receptacle and test box.

7. Checking Connections and Leads

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

8. Electric Governor Trouble Shooting

The following facts concerning the operation of the electric governor may be helpful in understanding the system and in determining which unit in the system is faulty in case of troubles.

A. The system requires two sources of power to operate normally.

(1) 12-V DC input power *(from engine electrical system)*

(2) 4-V AC input power *(from magnetic pickup)*

B. Assuming other conditions are normal, the actuator will go to, or remain in, **IDLE** position under the following conditions.

(1) No 12-V DC power

(2) No voltage from control box to actuator

C. The actuator will “surge” under the following conditions:

(1) “Stability” or “gain” adjustment set too “high”

(2) Throttle linkage binding

9. Engine Trouble Shooting Procedures

The ability of the engine to start and operate properly depends primarily on three things:

- An adequate supply of 12-V DC power reaching a good starter and good starter switch.

- The presence of an adequate supply of air, compressed to a sufficiently high compression pressure.

- The injection of the proper amount of fuel at the right time.

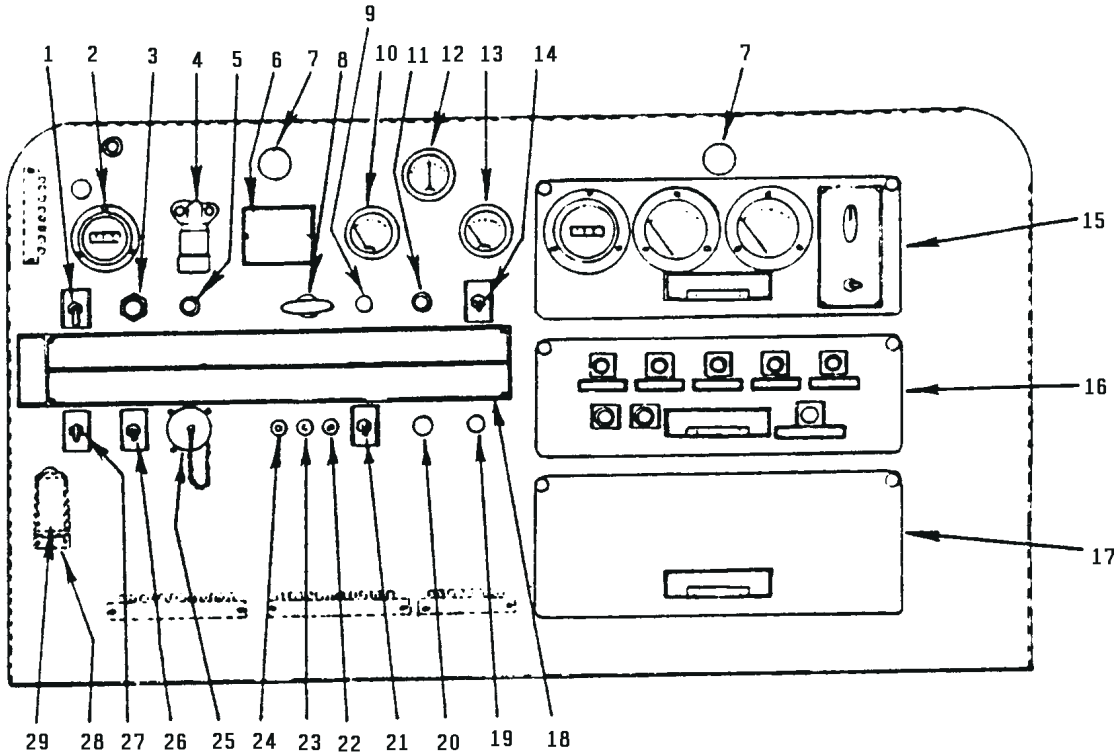
Lack of power, uneven running, excessive vibration, stalling, and hard starting may be caused by low compression, faulty injection in one or more cylinders, or lack of sufficient air. Refer to Detroit Handbook for trouble shooting and repair procedures.

10. Illustrations

Illustrations, Figures 1 through 5, are referred to throughout the Trouble Shooting Chart, Figure 6.

11. Connection and Schematic Diagrams

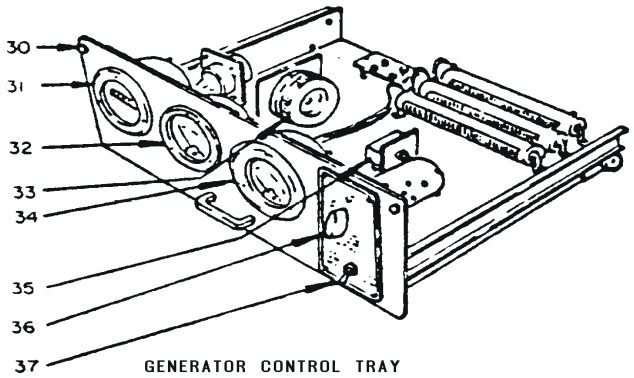
All connection and schematic diagrams for generator, engine, lights, and all controls are located in Chapter 6.



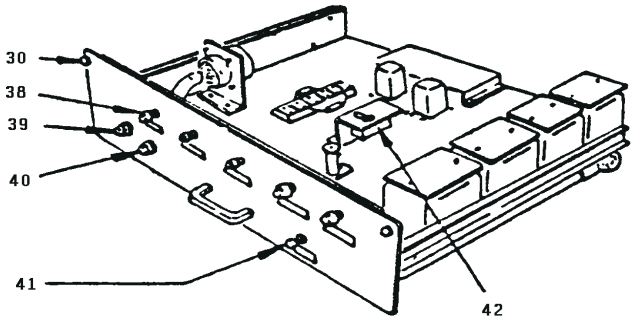
1. Engine control switch, start/stop
2. Hourmeter, engine
3. Pushbutton start switch
4. Air cleaner indicator, service
5. Engine"ON" indicating light
6. Identification plate
7. Instrument panel lights
8. Starting aid control
9. Hole plug button
10. Oil pressure gage
11. Contactor closed indicating light
12. DC ammeter, battery
13. Coolant temperature gage
14. Contactor control switch
15. Generator control tray
16. Protective relays tray
17. Voltage regulator tray
18. Identification & instruction plate
19. Hole plug button
20. Hole plug button
21. Operating mode control switch
22. Engine circuit fuse (20-A, slow-blow)
23. Panel light fuse (5-A)
24. Headlight fuse (20-A)
25. Test receptacle connector and cap
26. Panel light switch
27. Headlight switch
28. Capacitor, 6.8 mfd, 35-V
29. Excitation-deenergization relay
    (Items 28 and 29, on back of panel)

Operating Controls and Instruments (Sheet 1 of 2)

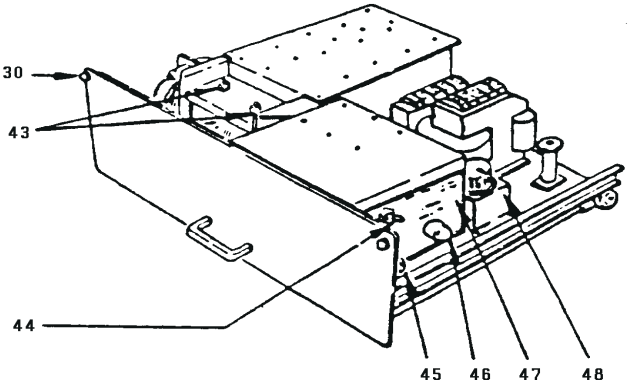
Figure 1



GENERATOR CONTROL TRAY



PROTECTIVE RELAY TRAY



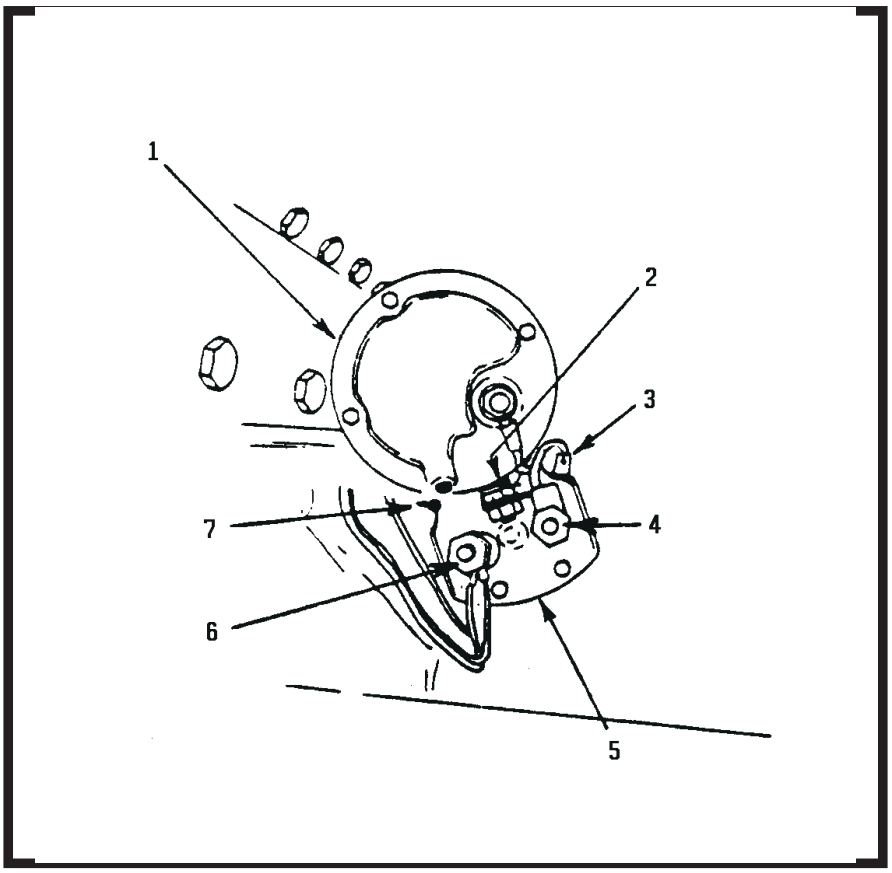
VOLTAGE REGULATOR TRAY

30. Tray fastener
31. Freauency meter
32. AC voltmeter
33. Manual control rheostat
34. AC ammeter
35. Automatic-manual switch
36. Meter switch
37. Line switch
38. Fault indicating light
39. Protective monitor system fuse
40. Load contactor circuit fuse
41. Protective monitor system reset switch
42. Test bank switch
43. Rate and gain adjustments
44. Line drop compensation switch
45. Cable size compensation adjustment
46. Cable length compensation adjustment
47. Instruction plate
48. Voltage adjusting rheostat

Operating Controls and Instruments

(Sheet 2 of 2)

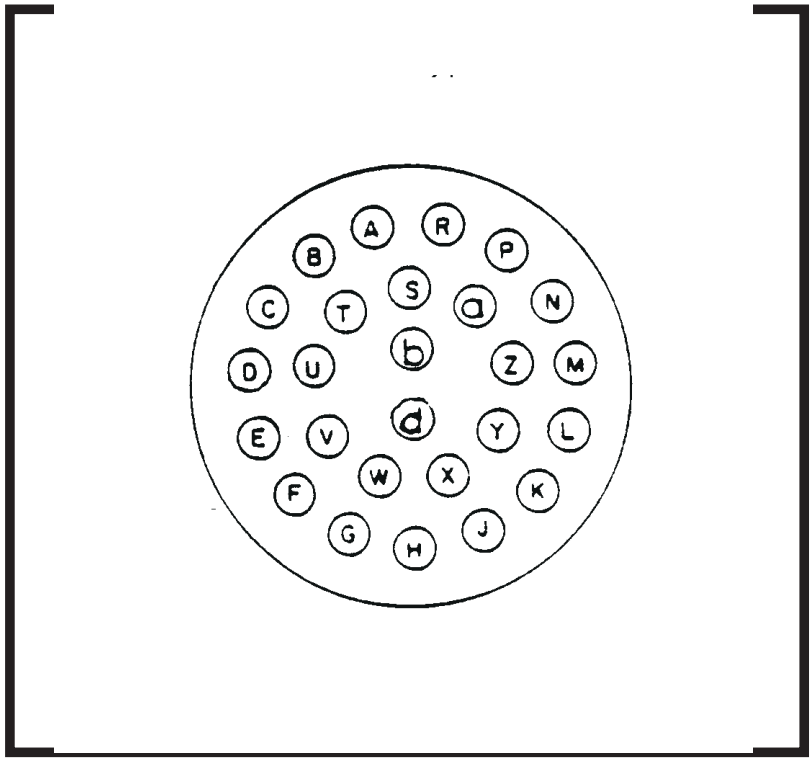
Figure 1



1. Starter
2. Starter Terminal
3. Solenoid ground terminal
4. Switch-to-starter terminal
5. Solenoid switch
6. Solenoid switch input terminal
7. Solenoid input signal terminal

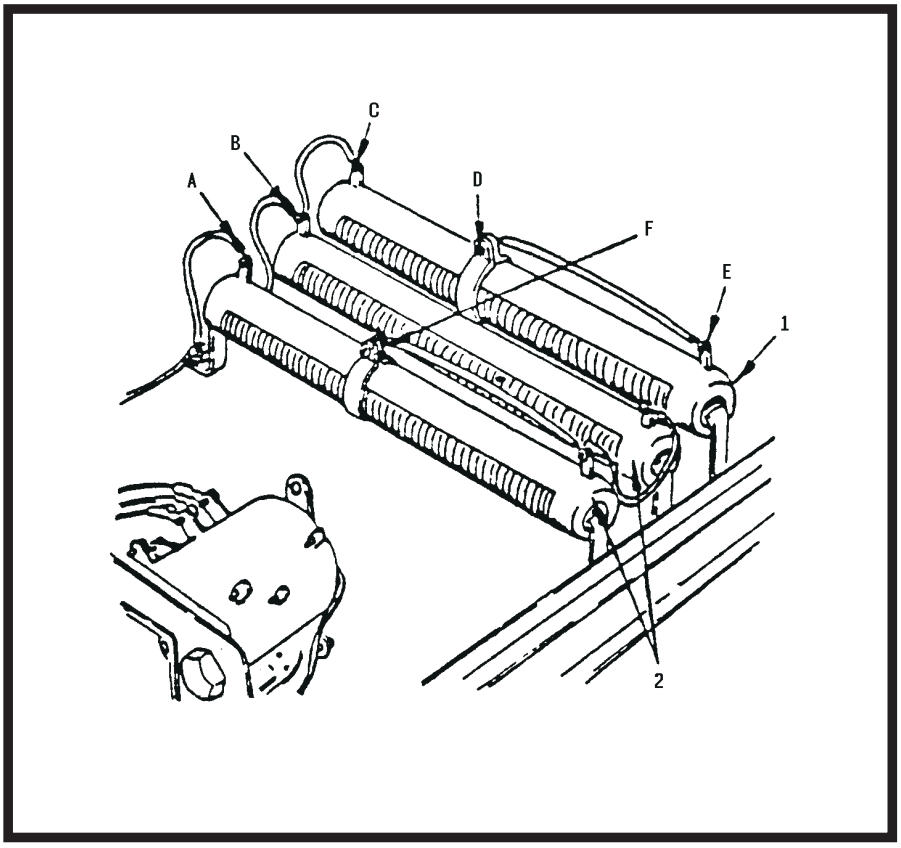
Starter and Solenoid Switch (Front View)

Figure 2



Test Receptacle Connector Terminals Identification

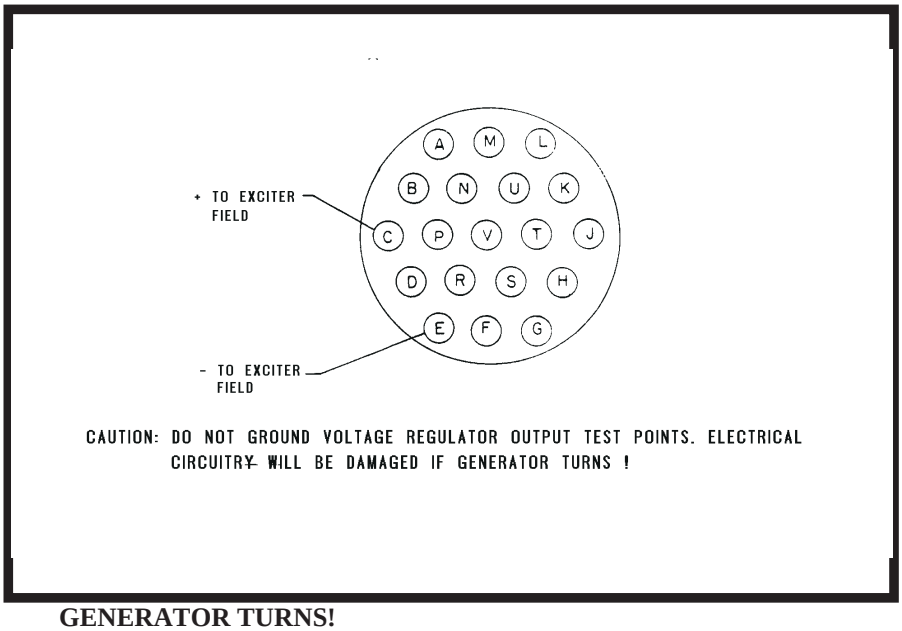
Figure 3



1. **Manual control voltage potential adjusting resistor**
2. **Exciter field ballast resistors**

Excitation Resistors

Figure 4



End View of Voltage Regulator Amphenol-Connector

Figure 5

CAUTION: DO NOT GROUND VOLTAGE REGULATOR OUTPUT TEST POINTS. ELECTRICAL CIRCUITRY WILL BE DAMAGED IF GENERATOR TURNS!

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TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS		
1. Engine will not start. Starter will NOT crank engine.	**A. Battery or batteries discharged or faulty**	**A. Check battery voltage and specific gravity. Recharge or replace.**
	B. 12-V DC power not reaching starter solenoid	**B. Check voltage at starter solenoid input terminal *(6, Fig. 2)*. Voltage should be approximately 13.5-V. If no voltage is indicated, check cables and connections between starter solenoid, batteries, and ground. Replace or repair cables and connectors as required.**
	C. Starter not properly grounded.	**C. Check cable and all connections.**
	D. Defective start switch *(S24) (3, Fig. 1)*	**D. Check voltage at terminal 7, Fig. 2, while pressing start switch button *(3, Fig. 1)*. If no voltage is indicated, replace switch.**
	E. Defective starter solenoid, or starter	**E. Momentarily connect a large capacity jumper cable between terminals 6 and 4, Fig. 2. If the starter cranks the engine, the solenoid *(5, Fig. 2)* is defective. If the starter does not crank the engine, the starter is defective. In either case, replace starter and solenoid as an assembly.**
	D. Internal seizure	**D. If all engine starting components are good and starter is unable to crank engine, internal seizure is indicated. Attempt to hand-crank engine, using a 3/4-inch square drive with long flex handle, in the crankshaft pulley. If engine cannot be turned, check starter for locked condition. If starter is free, internal seizure is indicated.**

Troubleshooting Chart *(Sheet 1 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
2. Engine will not start. Cranking speed low.	A. Low battery output	A. Check battery. Recharge or replace.
	B. Loose starting circuit connections or faulty cables.	B. Check all connections and cables. Tighten or replace as required.
	C. Improper lubricating oil viscosity	C. Check oil. See Sect. 2-2, Para. 2, D, (3).
	D. Ambient temperature too low for normal starting procedures	D. Use engine starting aid. See 1-3, Para. 3,C.
NOTE: Before proceeding to test and checks, make certain that the output cable plug connector(s) is/are properly stored in plug box(es), sufficient good-quality fuel is in the tank, and combustion air is not blocked.		
3. Engine will not start. Cranking speed normal. Indicating light ***(5, Fig. 1)*** does NOT glow when switch ***(1, Fig. 1)*** is in RUN position. Lamp is GOOD.	A. Defective fuse ***(22, Fig. 1)***	A. Remove fuse and visually inspect it. Replace if blown and check for cause of fuse blowing.
	B. Defective switch ***(1, Fig. 1)***	B. If fuse ***(22, Fig. 1)*** and lamp ***(5, Fig. 1)*** are good, the engine control switch ***(1, Fig. 1)*** is defective. Replace switch
4. Engine will not start. Cranking speed normal. Green indicating light GLOWS when engine control switch is in RUN position. Operating mode switch in DRIVE position	A. Defect in 12-V DC bypass circuit to fuel shut-off valve.	A. Check voltage at the fuel valve solenoid while holding engine control switch ***(1, Fig. 1)*** in START position. If approximately 12-V DC is observed, proceed to step 4, B, below. If no voltage is observed, continue checking circuit as follows:

Troubleshooting Chart *(Sheet 2 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
4. Engine will not start. Cranking speed normal Green indicating light GLOWS when engine control switch is in RUN position. Operating mode switch in DRIVE position	(1) Engine control switch ***(1, Fig. 1)*** defective in START position.	(1) Check voltage at control switch terminal 4, while holding switch ***(1, Fig.1)*** in START position. If no voltage is indicated, replace switch. If approximately 12-V DC is indicated, proceed to step (2).
	(2) Defective plug box micro-switch, or circuitry between control switch and fuel valve solenoid.	(2) Check circuitry and micro-switch. Repair or replace as required.
	B. Defective fuel valve solenoid or fuel injectors.	B. Operation of the fuel valve may be checked as follows: (1) Operation of the fuel valve is audible by holding a mechanic's stethoscope on the valve body while the engine control switch ***(1, Fig. 1)*** is operated repeatedly between STOP and START positions. If operation is not audible, replace valve. (2) If fuel valve solenoid operation checcks good, check for clogged or faulty injectors per the engine manual.
	C. No fuel being delivered to injectors.	C. If the bypass fuel valve circuit is proven to be good, and the fuel pump will NOT deliver fuel, prime the pump ***(See 2-2, Fig. 12)*** before attempting to find the cause of "no fuel". Fill the pump with clean fuel oil. If the engine will not start after priming, mechanical pump trouble is indicated. ***(continued)***

Troubleshooting Chart *(Sheet 3 of 20*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
4. Engine will not start. Cranking speed normal Green indicating light GLOWS when engine control switch is in RUN position. Operating mode switch in DRIVE position. (Continued)	C. No fuel being delivered to injectors. ***(Continued)***	C. ***(Continued)*** If the engine starts and then stops after a short time, trouble between the fuel source and the suction side of the pump is indicated. Check and/or remedy as follows:
	(1) Insufficient fuel in tank.	(1) The fuel tank should be filled above the level of the suction tube.
	(2) Fuel shut-off valve closed.	(2) Be CERTAIN fuel shut-off valve is OPEN.
	(3) Loose connections, damaged hoses, or fuel lines between tank and fuel pump.	(3) Tighten all fittings and connections. Replace any damaged hoses or fuel lines.
	(4) Plugged or defective fuel filter or lines.	(4) Do not overlook the possibility of restricted flow through the fuel filters. Also check gaskets for leaking or damaged condition.
	(5) Faulty installation	(5) Restricted fitting missing from return line.
	(6) Faulty fuel pump	(6) Check pump.
	(a) Relief valve not seating.	(a) An open relief valve will cause low output pressure
	(b) Worn pump gears or damaged pump drive.	(b) Check pump for normal operation. Replace if defective.

Troubleshooting Chart *(Sheet 4 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
4. Engine will not start. Cranking speed normal Green indicating light GLOWS when engine control switch is in RUN position. Operating mode switch in DRIVE position. ***(Continued)***	D. Low ambient temperature.	D. Check causes and remedies under ENGINE, Trouble 2, C and D above.
	E. Low compression, which may be caused by any one of the following:	E. Check compression.
	(1) Sticking or burned exhaust valves.	(1) Cylinder head must be removed and overhauled to correct this condition.
	(2) Compression rings worn or broken.	(2) Check compression
	(3) Improper valve clearance adjustment	(3) Check and adjust valve clearance according to instructions in the Detroit Diesel Maintenance Manual.
	(4) Faulty head or head gasket.	(4) Consult Detroit Diesel Maintenance Manual.
5. Engine starts. Stops after engine control switch ***(1, Fig.1)*** is released from START position.	A. Defective component in engine protective shut-down circuit. CAUTION: BE SURE ENGINE IS NOT OVERHEATED OR LOW ON LUBRICATING OIL; I.E., THAT THE PROTECTIVE CIRCUIT IS NOT FUNCTIONING PROPERLY.	Use a jumper lead to connect 12-V DC to the fuel valve solenoid ***(1-1; 15, Fig. 4)***. Start the engine. If it continues to run when the engine control switch is released, check each of the protective shut-down switches which are identified and located in 1-1, Fig. 4 as follows: High temperature switch (12), and oil pressure switch (26). Jumper each, one at a time, until the defective switch is found. NOTE: Do not overlook the possibility of a defective engine control switch ***(1, Fig. 1)***

Troubleshooting Chart *(Sheet 5 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
6. Engine will not come up to governed speed in GEN mode.	A. 12-V DC power not reaching governor control box for following reasons:	A. Apply 12-V DC directly to terminal "C" on governor control box. If engine comes up to speed, check following:
	(1) Defective operating mode switch (21, Fig. 1)	(1) Check switch. Replace if defective.
	(2) Gearshift safety switch defective or misadjusted.	(2) Check switch. Adjust or replace as required (See 2-3, Para. 4, F, for adjustment).
	(3) Defective excitation-deenergization relay ***(29, Fig. 1)***	(3) Check relay. Replace if defective.
	NOTE: 12-V DC power is supplied to the governor control box through a second set of contacts in the excitation-deenergization relay ***(29, Fig. 1)***.	
	B. Governor linkage binding or governor throttle sticking.	B. Check governor linkage and throttle shaft for binding and sticking.
	C. Defective or misadjusted magnetic pickup.	C. The control unit may not be receiving a signal from the magnetic pickup, and the "fail-safe" feature of the unit may be functioning to prevent any signal from reaching the actuator. To chack the magnetic pickup, disconnect pickup from control unit and connect a high impedence AC voaltmeter to the pickup output leads. Crank engine, but don't start. Voltage reading should be a minimum of one (1) volt. If no voltage or low voltage is indicated, check pickup adjustment ***[See 2-3; Para 3, E, (2)]***. If pickup is properly adjusted and voltage

Troubleshooting Chart *(Sheet 6 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
6. Engine will not come up to governed speed in GEN mode.	D. Defective actuator.	D. Apply 12-V DC to actuator input leads terminal "B" and "D" on control box terminals board ***(See 2-3; Fig. 13 and 14)***. Actuator lever should move immediately to full speed. If lever does not move, replace actuator.
	E. Defective control unit.	E. Connect an ammeter into control unit output circuit, terminals "B" and "D" on control box terminal board. ***(See 2-3, Fig. 13)***. With engine running, there should be a readable current in output circuit. See 2-3, Para. 3, E, (4). Turn speed adjusting screw several turns clockwise to be sure speed setting is not too low because of tampering. If current is still not readable, replace control unit. Refer to Barber-Colman Handbook for control unit bench tests and adjustments.
7. Engine goes to overspeed in GEN mode.	A. Governed speed control adjustment set too high.	A. Turn speed control adjusting screw 22 turns counterclockwise. Start engine and operate in GEN mode. If engine speed is now well below governed speed, turn adjusting screw clockwise until correct speed ***(2400 RPM, 400-Hz)*** is reached. If engine still goes to overspeed, proceed to step B.
	B. Defective linkage or actuator.	B. Check governor linkage and actuator for sticking or binding in full-speed position. Repair as required.

Troubleshooting Chart *(Sheet 7 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
7. Engine goes to overspeed in GEN mode. ***(Continued)***	C. Defective control unit	C. Replace control unit. Check old unit in accordance with Barber-Colman Handbook.
8. Engine is unsteady ***(surges)*** under load	A. Fault in engine.	A. Before condemning the governor system for surging, make certain the fault is not in the engine. Make certain that all cylinders are firing properly.
	B. Governor system faulty or mis-adjusted.	B. Check and adjust as follows:
	(1) Loose or binding gocernor linkage.	(1) Check linkage ball joints and all connections for looseness or binding. Be sure linkage will move from idle speed to full speed without lost motion or binding.
	(2) GAIN and STABILITY controls improperly adjusted.	(2) Adjust GAIN and STABILITY controls on control unit in accordance with 2-3, Para. 3, E, (3).
	(3) Magnetic pickup signal weak.	(3) Check and adjust pickup. See 2-3, Para. 3, E, (2).
9. Engine has show response time	A. Governor control unit improperly adjusted.	A. Adjust. See 2-3, Para. 3, E, (3).
	B. Speed control linkage binding.	B. Inspect and repair as required.
	C. Engine needs tune-up	C. Tune up as required. Refer to Detroit Diesel Maintenance Manual.
10. Engine “misses”. Runs unevenly.	A. Insufficient fuel.	A. Check fuel flow. See Detroit Diesel Maintenance Manual.

Troubleshooting Chart *(Sheet 8 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
ENGINE AND CONTROLS *(Continued)*		
10. Engine "misses". Runs unevenly. (Continued)	B. Faulty injector.	B. Check injectors. See Detroit Diesel Maintenance Manual.
	C. Low compression pressure.	Check compression. See Detroit Diesel Maintenance Manual.
11. Engine lacks power.	A. Improper engine adjustments timing	A. "Tune up" the engine in accordance with Detroit Diesel Maintenance Manual.
	B. Insufficient fuel	B. See ENGINE, Trouble 4.
GENERATOR AND EXCITATION CIRCUIT		
1. No *(or low)* generator output voltage in all phases. Generator operating at 400 Hz in AUTOMATIC mode.	**A. Defective generator or excitation circuit** **CAUTION: BE SURE THAT THE GENERATOR OUTPUT WILL NOT DAMAGE ANY GENERATOR OUTPUT LOAD. TO PREVENT DAMAGE TO THE REGULATOR CIRCUITRY, DO NOT GROUND THE VOLTAGE REGULATOR OUTPUT IF THE GENERATOR CAN TURN.**	**A. The first check is an easy one which will allow the mechanic to reach some definite conclusions about where the trouble is. Place the AUTO-MAN switch *(35, Fig. 1)* in MANUAL position. If a normal voltage (for the rheostat setting) is now produced, the generator is good, and the trouble is in the voltage regulator circuit. Proceed to step C. If switching to MANUAL control did not affect generator output, the trouble is likely in the generator, but to prove the generator is defective, proceed to step B.**
	B. Defective generator *** CAUTION: DO NOT USE ENGINE STARTING BATTERY FOR THIS TEST. THE GROUND ON THIS BATTERY WILL** CAUSE DAMAGE TO VOLTAGE REGULATOR CIRCUITRY.	**B. Use test receptacle *(25, Fig. 1)* to connect * ungrounded 12-V DC to the exciter field. Using leads with alligator clips and test prods, connect 12-V DC NEGATIVE lead to terminal "D". Terminal identifying letters are plainly visi-** ble on the face of the test receptacle. ***(Continued)***

Troubleshooting Chart *(Sheet 9 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
GENERATOR AND EXCITATION CIRCUIT *(Continued)*		
1. No (or low) generator output voltage in all phases. Generator operating at 400 Hz in AUTOMATIC mode. *(Continued)*	**B. Defective generator. *(continued)***	**B. *(Continued)*** **Connect POSITIVE lead to terminal "F". If no output voltage change is indicated when the exciter field is energized, the generator is defective. Stop operations and see 2-3, 2, E. for further generator testing. If the generator produces approximately 140-V AC when the exciter field is energized, the trouble is in the voltage regulator-excitation circuit.** Proceed to step C.
	C. Defect in VOLTAGE REG. excitation circuit.	**C. Check as follows:**
	(1) Defective AUTO-MANUAL switch *(35, Fig. 1)*	**(1) Check the switch thoroughly. A defective switch may prevent current reaching and/or leaving the voltage regulator. Replace switch if defective.**
	(2) Defective excitation-deenergization relay *(29, Fig. 1)*	**(2) Check EDR contacts. A faulty EDR can prevent power from reaching the voltage regulator. Replace relay if defective**
	(3) Defective ballast resistor(s) *(R1 and/ or R2) (See Fig. 4)*	**(3) If output voltage was produced when the generator set was operated in MANUAL mode, the resistors are good. If no voltage was produced in MANUAL mode, resistors could be defective. Refer to Fig. 4 and connect a jumper lead across the ballast resistors. If an output volage is now produced, replace resistors as required.**

Troubleshooting Chart *(Sheet 10 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
GENERATOR AND EXCITATION CIRCUIT *(Continued)*		
1. No (or low) generator output voltage in all phases. Generator operating at 400 Hz in AUTOMATIC mode. (Cont'd)	**(4) Defective Amphenol connector at voltage regulator, or defective wiring from regulator to exciter field.**	**(4) Disconnect voltage regulator Amphenol connector *(see 1-1; 14, Fig. 10)*. Using jumper leads with clip and prod terminals, connect 12-V DC to terminals "E" and "C" in loose plug. Connect NEGATIVE to terminal "E" Connect POSITIVE lead to "C" terminal *(see Fig. 5)*. If the generator will NOT produce a normal voltage, replace or repair Amphenol connector and wiring between voltage regulator and exciter field as required.**
	(5) Defective voltage regulator	**(5) All components in the excitation circuit except the voltage regulator have been tested in steps (1) through (4) above. This leaves only the regulator as a cause of trouble. Replace complete voltage regulator assembly if procedures in voltage regulator manual require that it be replaced.**
2. No (or low) output voltage when operating in MANUAL mode	**A. Defective generator manual control excitation circuit.**	**A. Place AUTO-MANUAL control switch *(35, Fig. 1)* in AUTO position. If a normal voltage is NOT produced, perform checks as instructed in GENERATOR AND EXCITATION CIRCUIT TROUBLE 1, above. If a** normal voltage is produced, proceed to step "B" below.

Troubleshooting Chart *(Sheet 11 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
GENERATOR AND EXCITATION CIRCUIT *(Continued)*		
2. No *(or low)* output voltage when operating in MANUAL mode *(Continued)*	**B. Defect in manual voltage control portion of excitation circuit**	**A. Check as follows:**
	(1) Defective AUTO-MANUAL switch *(35 Fig. 1)*	**(1) Check contacts and operation of AUTO-MANUAL switch. Replace if defective.**
	(2) Defective rectifier *(CR 3) (Sect 1-1; 15, Fig. 7)*	**(2) Check diodes *(See 2-3, Para. 2, D.)* Replace rectifier if defective.**
	(3) Defective resistor *(R11) (See, Fig. 4)*	**(3) Jumper resistor *(1, Fig. 4)*. If normal voltage *(depending on rheostat setting)* is produced, replace resistor.**
	(4) Defective rheostat *(R61) (33, Fig. 1)*	**(4) Connect a jumper across rheostat. If maximum *(manual control)* voltage is produced, replace rheostat.**
NO. 1 LOAD CONTACTOR OPERATING CIRCUIT		
2. Load contactor *(K1)* will not close when control switch *(20, Fig. 1)* is held in ON position. Generator running at normal voltage. No fault lights on.	**A. In addition to defective wiring and connections in the AC and DC load contactor actuating circuits, the load contactor may be prevented from closing for any one of the following reasons:**	**A. After checking fuse (F1) in step (1) below, check all wiring and connections in the load contactor circuits on the engine control panel, protective relay tray, and power module. Then check components as follows:**
	(1) Blown fuse *(F1) (40, Fig. 1)*	**(1) Remove and inspect fuse.** Replace if blown.

Troubleshooting Chart *(Sheet 12 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
NO. 1 LOAD CONTACTOR OPERATING CIRCUIT *(CONTINUED)*		
1. Load contactor *(K1)* will not close when control switch *(20, Fig. 1)* is held in ON position. Generator running at normal voltage. No fault lights on. *(Continued)*	**(2) Defective *(open)* relay in protective module *(K14) (1-1; 1, Fig. 8)***	**(2) Use a jumper with clip and prod terminals to GROUND terminal "H" in the test receptacle. If contactor will now close, replace module or complete protective relay tray *(16, Fig. 1)***
	(3) Defective load contactor control switch *(S5) (14, Fig. 1)*	**(3) Set AUTO/MANUAL switch *(S1)* to AUTO position. Connect a jumper with test prods between terminals "S" and "R" on the test receptacle. If the contactor closes, replace control switch.**
	(4) Defective rectifier *(CR6) (1-1; 5, Fig. 11)*	**(4) With test receptacle terminals "S" and "R" connected as above, check voltage at load contactor coil terminal X2. If voltage is not approximately 90-V DC, replace rectifier.**
	(5) Defective load contactor coil *(K1) (1-1; 6, Fig. 11)*	**(5) Disconnect leads at load contactor terminals X1 and X2. Check coil resistance between these terminals. Resistance should be approximately 600 ohms. If coil is defective, replace the** complete load contactor.

Troubleshooting Chart *(Sheet 13 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
NO. 1 LOAD CONTACTOR OPERATING CIRCUIT *(CONTINUED)*		
2. Load contactor (K1) will close when control switch (14, Fig. 1) is held in momentary ON position. Opens immediately when switch is released to center ON position.	**A. 28.5-V DC is not reaching plug interlock relay *(K2)* from aircraft for the following reasons:**	**A. Check voltage at terminal Z on test receptacle. Voltage should be 28.5-V DC. If not, voltage is not being supplied from aircraft. Check causes as follows:**
	(1) Generator to aircraft cable connector defective or not plugged into aircraft receptacle connector	**(1) Inspect cable connector plug thoroughly for damaged E and F terminals. Be sure the plug is fully mated with the aircraft receptacle connector and making good contact.**
	(2) Aircraft rejecting power	**(2) Check aircraft on board electrical equipment and controls**
	B. "Blown" fuse *(F2) (39, Fig. l)* in protective relay tray	**B. Press the lens housing of fault indicating lights. If lamps do not glow, replace fuse *(F2)*.**
	C. Defective plug-interlock relay *(K2)*	**C. Place test-bank switch *(S2) (42, Fig. 1)* in ON position. If load contactor will now remain closed, replace the plug-interlock relay *(K2) (Sect. 1-1; 18, Fig. 8)* or the complete protective relay tray.**
	D. Small contacts in load contactor *(K1)* defective	**D. Connect a jumper lead between small terminal no. 1 and no. 2 on the load contactor. If load contactor will now remain closed, replace the complete load contactor *(K1)*.**

Troubleshooting Chart *(Sheet 14 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
NO. 1 LOAD CONTACTOR OPERATING CIRCUIT *(CONTINUED)*		
2. Load contactor will close when control switch *(14, Fig. 1)* is held in momentary ON position. Opens immediately when switch is released to center ON position.	**E. Defective fuse-interlock relay *(K17)* or resistor *(R46)***	**E. Open protective relay tray and connect a jumper across the resistor *(R46) (Sect. 1-1; 8, Fig. 11)*. If the contactor will now remain closed, replace the resistor *(R46)*. If the contactor will not remain closed, replace fuse-interlock relay *(K17) (Sect. 1-1; 2, Fig. 8)* or replace the protective relay tray assembly.**
3. Load contactor opens during power delivery. NO fault indicating lights on.	**A. Fuse *(1F or 2F)* blown**	**A. Remove and inspect fuses *(39 and 40, Fig. 1)*. Replace as required.**
	B. A fault has developed in the load contactor holding circuit.	**B. If the load contactor cannot be closed by operation of the control switch *(S5) (14, Fig. 1)*, check the circuit in accordance with instructions in Trouble 1, above under LOAD CONTACTOR OPERATING CIRCUIT. If the load contactor can be closed, but opens as soon as control switch *(S5)* is released, check for trouble under Trouble 2, above.**
	C. Cable accidentally disconnected from aircraft.	**C. Reconnect cable.**

Troubleshooting Chart *(Sheet 15 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
PROTECTIVE CIRCUIT		
NOTE: The protective relays and protective monitor are not completely functional until the load con-tactor is CLOSED. Since it is not advisable to vary voltages for test purposes while delivering power to an aircraft, the generator should be connected to a load bank for trouble shooting the protective circuits.To avoid repetition, it will be assumed that the reset switch (41, Fig. 1) has been pushed and the load contactor has been closed before commencing each test.		
1. Load contactor opens during power delivery. Over-voltage indicating light ON	**A. The overvoltage condition may have been the result of a sudden drop in the load, or possible tampering with voltage regulator rheostat *(48, Fig. 1)*, and may have been a normal action.**	**A. Press reset switch *(41, Fig. 1)* and resume power delivery. Observe voltmeter *(32, Fig. 1)* to be certain voltage is normal 115 V AC. Adjust to normal if necessary. If the load contactor is opened again and an overvoltage condition is indicated by light *(DS 38)*, proceed to step B.**
	B. Defective overvoltage sensing relay *(K9)*.	**B. Use voltage adjusting rheostat *(48, Fig. 1)* to reduce voltage to 110 V AC. Press reset switch *(41, Fig. 1)* and resume power delivery. Observe voltmeter and gradually increase voltage with rheostat. If the overvoltage sensing relay *(K9)* functions to open the load contactor at any value less than 134 V AC, it is defective. Remove protective relay tray and replace.**
2. Load contactor opens during power delivery. Under-voltage indicating light ON.	**A. An undervoltage condition caused the over-undervoltage sensing module *(K26)* to function normally.**	**A. Observe generator voltage on voltmeter and adjust to normal 115 V AC with voltage regulator rheostat *(48, Fig. 1)*. Resume normal operation. If the load contactor opens again and an undervoltage condition is indicated by light *(DS38)*, proceed to step B.**

Troubleshooting Chart *(Sheet 16 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
PROTECTIVE CIRCUIT *(Continued)*		
2. Load contactor opens during power delivery. Under-voltage indicating light ON *(Cont'd)*	**B. Defective under-voltage sensing relay *(K10)***	**B. Use rheostat *(48, Fig. 1)* to reduce voltage to 104 V. The undervoltage indicating light should NOT come on during a time delay of 5 seconds or more. If the light comes on before a delay of 5 seconds, the under-voltage relay is defective. Replace the module *(K10)* or the protective relay tray.**
	C. Defective protective monitor *(K14)*	**C. With unit running normally, use rheostat *(48, Fig. 1)* to reduce voltage quickly to 90 V. If the undervoltage indicating light *(DS38)* is turned ON immediately, the protective monitor circuitry is defective. Replace pro tective monitor *(K14)* or re-place protective relay tray.**
3. Load contactor opens during power delivery. Over-frequency indi-cating light *(DS40)* ON	**A. Electric governor improperly adjusted, or malfunctioning**	**A. Proceed as follows:**
	(1) Governor improp-erly adjusted	**(1) Adjust in accordance with Sect. 2-3, Para. 3, E, (3).**
	(2) Electric governor system malfunc-tioning	**(2) Check and adjust or re-pair in accordance with ENGINE AND CONTROLS, Troubles No. 7.**
	B. Defective over-frequency sensing relay *(K12)*	**B. If overfrequency nuisance tripping continues after the governor system is proven to be good, and an overfre-quency condition does not exist, replace the over-frequency relay *(1-1; 3, Fig. 8)*,** or complete protective relay

Troubleshooting Chart *(Sheet 17 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
PROTECTIVE CIRCUIT *(Continued)*		
4. Load contactor opens during power delivery. Under-frequency light ON.	**A. Electric governor improperly adjusted, or malfunctioning**	**B. Proceed as follows:**
	(1) Governor improp-erly adjusted	**(1) Adjust in accordance with Sect. 2-3, Para. 3, E, (3).**
	(2) Electric governor system malfunc-tioning	**(2) Check and adjust or re-pair in accordance with ENGINE AND CONTROLS, Troubles No. 7.**
	B. Defective under-frequency sensing relay *(K11)*	**B. If overfrequency nuisance tripping continues after the governor system is proven to be good, and an underfre-quency condition does not exist, replace underfrequency relay, *(1-1; 4, Fig. 8)* or com-plete protective relay tray.**
5. Load contactor opens during power delivery. Over-frequency indi-cating light ON.	**A. There may have been an overload condition which caused the overload device *(K4)* to function normally.**	**A. Observe ammeter *(34, Fig. 1)*. Check for abnormal overload condition and correct. If overload device functions to open the load contactor when an overload does not exist, proceed to step B.**
	B. One of the resistors *(R26, R27, or R28)* across overload transformers is open circuited.	**B. An open resistor will cause a higher than normal volt-age. Check resistors *(Sect. 1-1; 1, Fig. 11)*. Replace if defective.**
	C. Overload device printed circuit board defective	**C. Check voltage at terminal E, Fig. 3. If 12-V DC, replace overload device *(K4) (Sect. 1-1; 7, Fig. 11)*.**

Troubleshooting Chart *(Sheet 18 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
GENERATOR		
1. No *(or low)* voltage output	A. Shorted diode in exciter rectifier *(CR2)*.	A. Check diodes in accordance with Sect. 2-3, para. 2, D. If diodes are good, proceed to step B.
	B. Open or shorted exciter rotor winding *(G2)*	B. Use ohmmeter to check for open or shorted condition. If exciter rotor windings are good, proceed to step C.
	C. Open or shorted exciter field windings *(L2)*	C. Check field resistance. See Sect. 2-3, Fig. 6 for normal values.
	D. Open or shorted generator rotor windings *(L1)*	D. Check resistance with ohmmeter to determine if open or short circuited.
2. Generator operates single phase	A. Open or short circuited winding in generator stator *(G1)*	A. Check stator winding resistances. See Sect. 2-3, Fig. 6 for normal values.
3. Generator overheats	A. Loose connection causing high resistance.	A. Check all output connections. Look for discoloration caused by heat. Tighten or replace as required.
	B. Improper or blocked ventilation.	B. Check for foreign material *(rags, etc.)* blocking air flow. Provide adequate ventilation.
	C. Generator stator windings short circuited	C. Check stator windings. See Sect. 2-3, Fig. 6.
5. Unbalanced output	A. Loose connection in output circuit.	A. Check all output connections. Discolored connectors indicate a loose connection. Tighten or replace as required.
	B. Open or short circuited phase	B. Check stator windings in accordance with 2-3, Para. 2, E. Repair or replace as required.

Troubleshooting Chart *(Sheet 19 of 20)*

Figure 6

TROUBLE, SYMPTOM AND CONDITION	PROBABLE CAUSE	TEST, CHECK, AND/OR REMEDY
GENERATOR *(Continued)*		
4. Unbalanced output *(Continued)*	**C. Defective connection in output circuit.**	**A. Check plug and receptacle connectors at aircraft. Tighten, repair, or replace as required.**
	D. Break or cut in output cable assembly.	**D. Inspect. Repair or replace as required.**
	E. Unbalanced load	**E. Check aircraft 400-Hz** components.

Troubleshooting Chart *(Sheet 20 of 20)*

Figure 6

CHAPTER 4. ILLUSTRATED PARTS LIST

SECTION 1. INTRODUCTION

1. General

The Illustrated Parts List identifies, describes, and illustrates main assemblies, subassemblies, and detail parts of an engine-driven generator set manufactured by Hobart Brothers Company, Power Systems Group, Troy, Ohio, 45373. This set is identified as Hobart Specification No. 7006-1

2. Purpose

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

3. Arrangement

Chapter 4 is arranged as follows:

Section 1 - Introduction

Section 2 - Manufacturer's Codes

Section 3 - Parts List

Section 4 - Numerical Index

4. Explanation of Parts List

A. Contents

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

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

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

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

B. Parts List Form

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

- **(1) FIGURE-ITEM NO. Column**

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

- **(2) HOBART PART NUMBER Column**

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

- **(4) REC. SPARES Column**

  When there is an entry in this column, it shows the quantity of that item recommended for spares to support **ONE** end item.

- **(5) "EFF" (Effective) Column**

  This column is used to indicate the applicability of parts to different models of equipment. When more than one model of equipment is covered by a parts list, there are some parts 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.

  Parts coded "A" are used on Spec 7006-1 units only.

  Parts coded "B" are used on Spec 7124-1 units only.

  Uncoded parts are used on all models.

- **(6) UNITS PER ASSEMBLY Column**

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

SECTION 2. MANUFACTURER'S CODES

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

The following list is a compilation of vendor codes with names and addresses for suppliers of purchased parts listed in this publication. The codes are in accordance with the Federal Supply Codes for Manufacturer's Cataloging Handbook H4-1, 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 full name of the manufacturer will be listed in the nomenclature column.

CODE	VENDOR'S NAME AND ADDRESS
00779	AMP Inc. P.O. Box 3608 Harrisburg, Pennsylvania 17105
01428	Superior Ball Joint Corporation 1202 South Quality Drive P.O. Box 227 New Haven, IN 46774
01843	American Bosch Marketing Div. of Ambac Industries Inc. 3664 Main Street Springfield, Mass. 01107
02231	Anchor Rubber Company 840 South Patterson Boulevard P.O. Box 832 Dayton, OH 45401
02660	Amphenol Division Bunker-Ramo Electra Corp. 2801 S. 25th Avenue Broadview, IL 60153
03613	Barber-Colman Co. 1354 Clifford Ave. Loves Park, IL 61132
03924	StratoFlex, Inc. 2nd and Piper Sts., Baer Field Box 9190, Waynedale Station Ft. Wayne, IN 46809
04009	Crouse-Hinds Arrow-Hart Corp., Arrow-Hart Division, 103 Hawthorne St., Hartford, CT 06105
04665	Barry Controls, Midwestern Operation, 1825 Webster Street, Dayton, Ohio 45402
04713	Motorola Inc. Semiconductor Products Div. Phoenix, Arizona 85008
05277	Westinghouse Electric Corp. Semi Conductor Div., Hill Street Youngwood, Pennsylvania 15697
07088	Kelvin Electric Company, 5907 Noble Avenue, Van Nuys, CA 91411
08108	Lamp Industries For Use With Industry Designations & Abbreviations for Lamps
08556	Bell Electric Company, 2600 W. 50th Street, Chicago, IL 60632
12204	Chrysler Corporation, 341 Massachusetts Avenue, Detroit, MI 48231

CODE	VENDOR'S NAME AND ADDRESS
13445	Cole-Hersee Company, 20 Old Colony Avenue, Boston, Massachusetts 02127
14101 See 56289	Sprague Electric Company
14831 See 07088	Magnetic Components, Inc.
14959	Crane Company, 4100 S. Kedzie Avenue, Chicago, Illinois 60632
16053	Pepka Spring Company, 810 S. Waugh, Kokomo, Indiana 46901
19816	Westinghouse Electric Corporation, Lamp Division, Hoult Rd., P. O. Box 1312 Fairmont, West Virginia 26555
21335	Fafnir Bearing Company, Division of Textron, 37 Booth Street, New Britain, Connecticut 06050
21585	Farr Company, Airport Station, P.O. Box 92187, Los Angeles, California 90009
21678	Uniroyal Inc., Plastic Products Div., 312 N. Hill St., Mishawaka, Indiana 46544
24248 See 94222	South Chester Corporation
24617	General Motors Corporation, General Motors Building, 3044 Grand Blvd. West, Detroit, Michigan 48202
26992	Hamilton Watch Company, 941 Wheatland Ave., Lancaster, Pennsylvania 17604
27191	Cutler-Hammer Inc., Power Distribution and Control Division, 4201 N. 27th Street, Milwaukee, Wisconsin 53216
27797	Wise Company, Inc., 1299 Farmville Road, Memphis, Tennessee 38122
30327	Imperial Clevite Inc., Fluid Components Division, 6300 W. Howard Street, Chicago, Illinois 60648
31007	International Harvester Company, 401 N. Michigan Avenue, Chicago, Illinois 60611
31356	J-B-T Instruments, Incorporated , 394 East Street, P.O. Box 1818, New Haven, Connecticut 06508
33525	Kidde, Walter & Company, Inc., Belleville, New Jersey 07109
35738	Charles Lentz & Sons 3330 N. Broad Philadelphia, Pennsylvania 19140
44655	Ohmite Manufacturing Company 3601 West Howard Street Skokie, Illinois 60076
49234	Protectoseal Company 225 W. Foster Avenue Bensenville, Illinois 60106
51589	Sarkes Tarzian Semicon Inc., Broadcast Equipment Division, 415 N. College Avenue, Bloomington, Indiana 47401

CODE	VENDOR'S NAME AND ADDRESS
56289	Sprague Electric Company, 87 Marshall St., North Adams, Massachusetts 01247
57448	Stephens & Adamson Mfg. Company, 275 Ridgeway Avenue, Aurora, Illinois 60507
57733	Stewart-Warner Corporation, 1826 Diversey Parkway, Chicago, Illinois 60614
58849	Syntron Company, 1938 Black Street, Homer City, Pennsylvania 15748
59730	The Thomas & Betts Company, Hwy 218, South Iowa City, Iowa 52240
60741	Triplett Electrical Instrument Company, Harmon Road, Bluffton, Ohio 45817
61112	Turner Corporation, 821 Park Avenue, Sycamore, Illinois 60178
63477	Wagner Electric Corporation, Wagner Division, 6400 Plymouth Avenue, St. Louis, Missouri 63133
66295	Wittek Microdot Fastening Systems, Special Components Div., 1421 Barnsdale Road LaGrange Park, Illinois 60525
70611	Ark-Les Switch Corporation 51 Water Watertown, Massachusetts 02172
70960	North American Rockwell Corporation, Universal Joint Plant, Allegan, Michigan 49010
71000	Borg and Beck/Long Division of Borg-Warner Corporation, 6558 S. Menard, Chicago, Illinois 60638
71400	Bussmann Manufacturing Division of McGraw-Edison Company, 114 Old State Road, P.O. Box 14460, St. Louis, Missouri 63178
71785	TRW Inc., Cinch Connector Division, 1501 Morse Avenue, Elk Grove Village, Illinois 60007
71956	Dodge Manufacturing Corporation, 500 S. Union Street, Mishawaka, Indiana 46544
72210	Columbus Auto Parts Company, P. O. Box 507, Columbus, Ohio 43216
72582	Detroit Diesel Allison Division , General Motors Corporation, 13400 W. Outer Drive, Detroit, Michigan 48228
72619	Amperex Electronics Corporation, Dialight Division, 203 Harrison Place, Brooklyn, New York 11237
73331	Guide Lamp Division of General Motors Corporation, 2915 Pendleton Avenue, Anderson, Indiana 46011
73559 See 74559	Carling Electric Inc.
73842	Goodyear Tire & Rubber Company, 1144 E. Market, Akron, Ohio 44316

CODE	VENDOR'S NAME AND ADDRESS
74063	Figgie International Inc., Hartman Electrical Manufacturing Div., P.O. Box 8, Mansfield, Ohio 44902
74400	Stewart Warner Corp., Hobbs Div.Ash Street & Yale Boulevard, Springfield, Illinois 62705
74559	Carlingswitch Inc., 505 New Park Avenue West, Hartford, Connecticut 06110
75175	The Duplan Corporation, KD Lamp Division, 1910 Elm Street Cincinnati, Ohio 45210
75358	Knape & Vogt Mfg. Company, 2700 Oak Industrial Drive, Grand Rapids, Michigan 49505
75418	Kysor Industrial Corporation, One Madison Avenue, Cadillac, Michigan 49601
75915	Littelfuse, Inc., 800 E. Northwest Highway, Des Plaines, Illinois 60016
76534	Rockwell-Standard Corporation, Spring Division, Logansport, Indiana
76700	Nelson Muffler Corporation, P. O. Box 189, Stoughton, Wisconsin 53589
77342	American Machine & Foundry Company, Potter & Brumfield Division, 200 Richland Creek Drive, P.O. Box 522, Princeton, Indiana 47670
77640	Ross Gear Division, TRW Inc., Lafayette Plant, Lafayette, Indiana 47902
77915	Sheller Manufacturing Corporation, Steering Wheel Division, South Bridge Street, Portland, Indiana 47371
78225	Stant Manufacturing Company Inc., 1620 Columbia Avenue, Connersville, Indiana 47331
78500	North American Rockwell Corporation, Transmission & Axle Division Rockwell Standard Bldg., Detroit, Michigan 48231
78992	Chrysler Corporation, Universal Products Division, 6455 Kingsley Avenue, Dearborn, Michigan 48126
79136	Waldes Kohinoor, Inc.,47-16 Austel Place, Long Island City, New York 11101
79410	Wagner Gear Division of Borg-Warner Corporation, 1106 Seymour Street, Muncie, Indiana 47305
79470	Dana Corporation, The Weatherhead Division, 767 Beta Drive, Cleveland, Ohio 44143
79497	Western Rubber Compan, 620 E. Douglas, Goshen, Indiana 46526
79620	Walker Manufacturing Company, 1201 Michigan Blvd., Racine, Wisconsin 53403
81074	ITT - Holub Industries, Inc., 413 Elm Street, Sycamore, Illinois 60178

CODE	VENDOR'S NAME AND ADDRESS
81082	Electric Auto Lite Company, Lebanon Road, Cincinnati, Ohio 45241
81091	Pass & Seymour Inc., Solvay Station Syracuse, New York 13209
81860	Barry Wright Corporation, Barry Controls Division, 700 Pleasant Street, Watertown, Massachusetts 02172
82268	Sparton Electronics Division of Sparton Corporation, 2400 E. Ganson, Jackson, Michigan 49202
84970 See 51589	Sarkes Tarzian Semicon Inc.
85925	Electro Mechanical Instrument Co., Inc.8th & Chestnut Streets, Perkasie, Pennsylvania 18944
87084	George J. Mayer Company, 540-60 E. Marker, Indianapolis, Indiana 46204
88223 See 71785	Jaymar Terminal Boards, Inc.
89110	AMP Inc., Capitron Div., 1595 South Mt. Joy Street, Elizabethtown, Pennsylvania 17022
89373	Uniroyal Inc., United States Rubber Company, 3920 Big Beaver Rd., Suite 200 P.O. Box 3939, Troy, Michigan 48084
89616 See 21678	Uniroyal Inc., United States Rubber Co.
90201	Emhart Industries Inc., Mallory Capacitor Co., 4760 Kentucky Ave.P.O. Box 372 Indianapolis, Indiana 46206
90763	TRW Inc., The United-Carr Division, 10544 West Lunt Ave., Rosemont, Illinois 60618
91637	Dale Electronics Incorporated, P.O. Box 609, Columbus, Nebraska 68601
91929	Honeywell, Inc., Building Controls & Components Group, Micro Switch Division, Freeport, Illinois 61032
94154	Wagner Electric Corporation, Tung-Sol Division, 1 Summer Avenue, Newark, New Jersey 07104
94222	Southco Inc., 210 North Brinton Lake Road, Concordville, Pennsylvania 19331
97576	The Lenz Company, 3301 Klepinger Road, P.O. Box 1044, Dayton, Ohio 45401
98410	E.T.C. Molex Inc., 5201 Richmond Road, Bedford Heights, Ohio 44146
No Number	Peterson Manufacturing Company, 700 West 143rd Street, Plainfield, Illinois 60544

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SECTION 3. PARTS LIST

1. Explanation of Parts List Arrangement

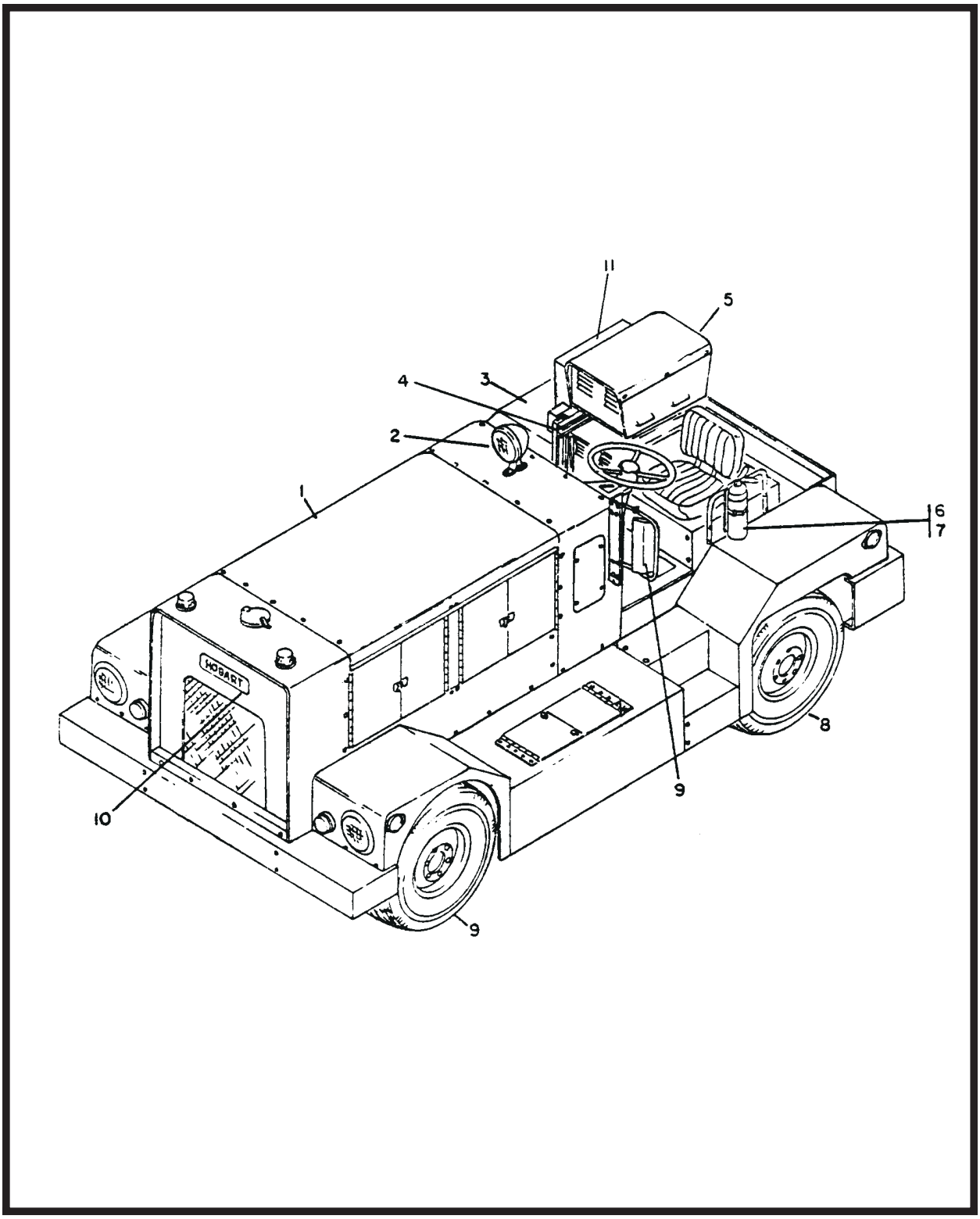
The parts list is arranged so that the illustration will appear on a lefthand page and the applicable parts list will appear on the opposite righthand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

2.Symbols and Abbreviations

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

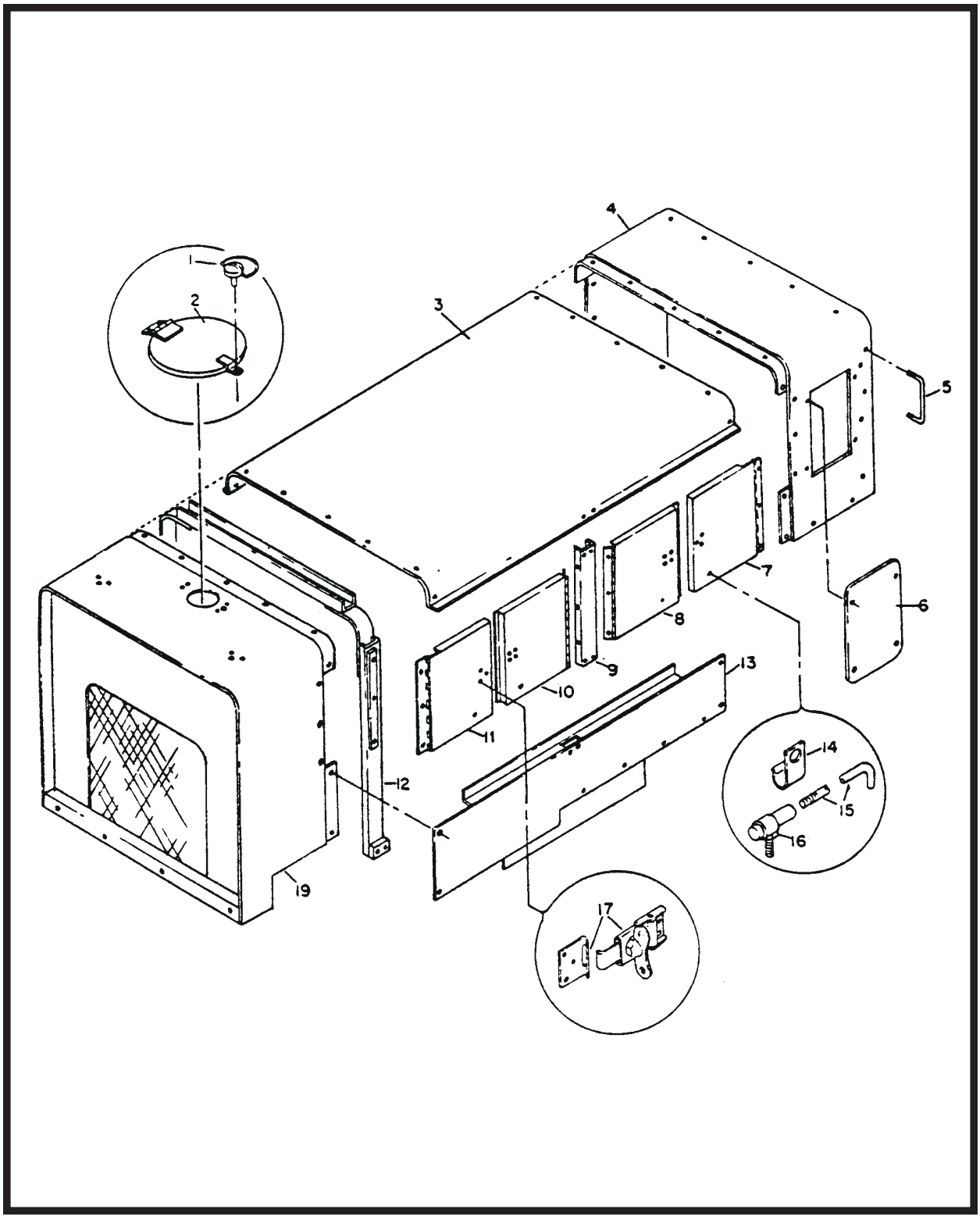
*****	- item not illustrated
A, or AMP	- ampere
AC	- alternating current
AR	- as required
DC	- direct current
Fig.	- Figure
hd.	- head
hex	- hexagon
Hz	- Hertz (cycles-per-second)
I.D.	- inside diameter
IN	- inch
kVA	- kilovolt-ampere
uF	- microfarad
No.	- number
NHA	- next higher assembly
OM	- Owners Manual
PRV	- peak reverse voltage
PSI	- pounds per square inch
Ref	- reference (the item has been listed previously)
T-R	- transformer-rectifier
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.



Self-Propelled Generator Set
Figure 1

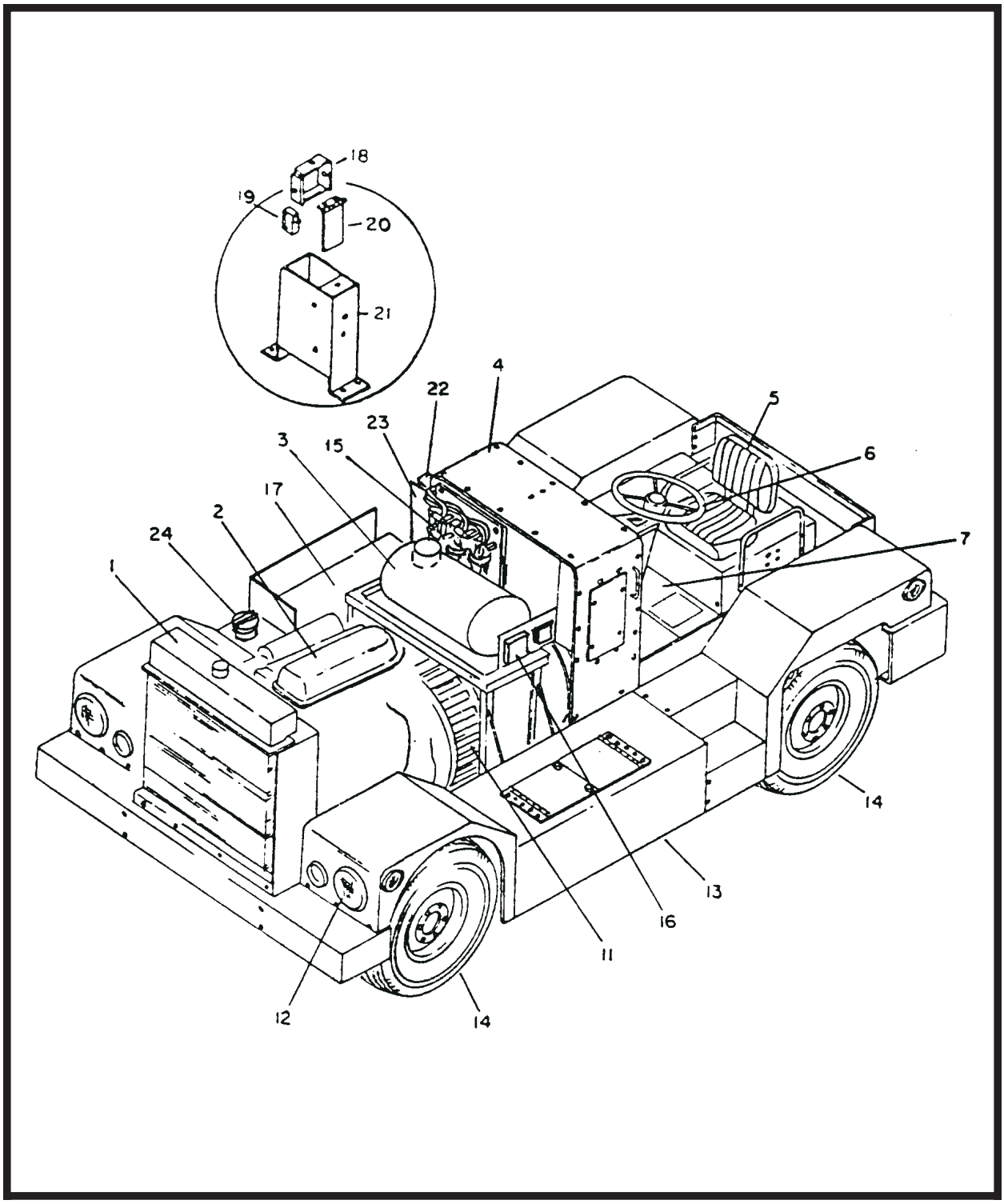
FIGURE & ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	EFF	UNITS PER ASSY
1-	**S-7006-1**	**GENERATOR SET, SELF-PROPELLED, 90 kVA, MODEL NO. 90GM24S WITH TRANSFORMER-RECTIFIERS**	**A**	**1**
	S-7124-1	**GENERATOR SET, SELF-PROPELLED, 90 kVA, MODEL NO. 90GM24S**	**B**	**1**
1	181475	. CANOPY ASSEMBLY (For Details See Fig. 2)		1
2	482381	. KIT, SPOTLIGHT	A	1
3	No Number	. GENERATOR SET W/O CANOPY (For Details See Fig. 3)		1
4	481387-4	. TRANSFORMER-RECTIFIER MOUNTING ASSEMBLY, OPTIONAL (For Details See Manual TO-105 in Chapter 6)	A	1
5	487750-1	. TRANSFORMER-RECTIFIER ASSEMBLY 28.5 V., 1500 A. (For Details See Manual OM-433 in Chapter 6)	A	2
6	181481	. EXTINGUISHER, FIRE V33525, No. 5DCPS-1	A	1
7	481996	. PLATE, MTG., FIRE EXTINGUISHER	A	1
8	No Number	. AXLE GROUP, FRONT & REAR		1
9	482382	. KIT, MIRROR		1
10	402987	. NAMEPLATE, HOBART		3
11	181532	. SWITCHING BOX (For Details See Hobart Diagrams 181532, 181567, and 181574 in Chapter 6)	A	1



Canopy Assembly
Figure 2

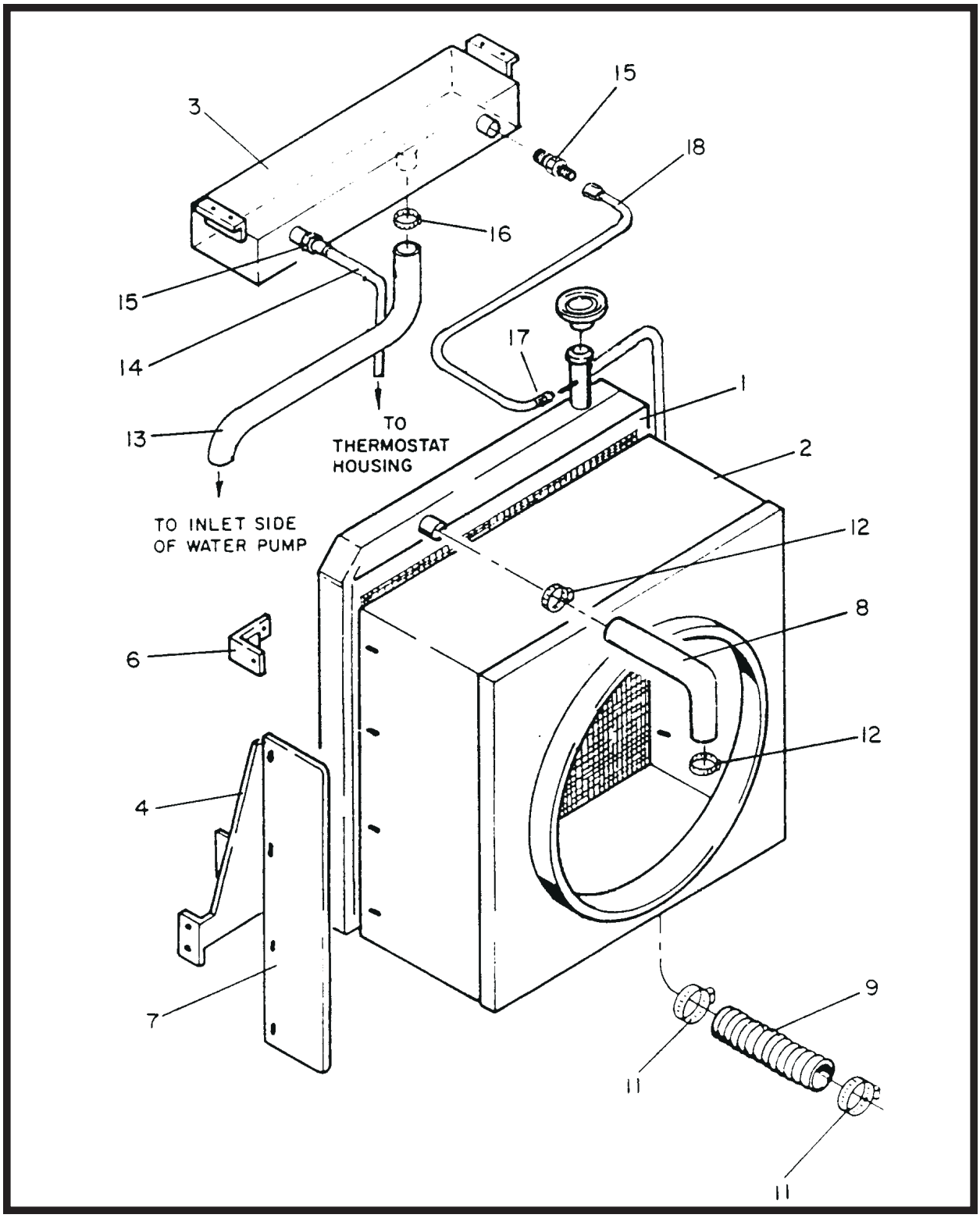
FIGURE & ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	EFF	UNITS PER ASSY
2-	**181475**	**CANOPY ASSEMBLY (For NHA See Fig. 1)**		**REF**
	352281	. COVER ASSEMBLY, RADIATOR HOLE		1
1	16DA-4133-1	. . FASTENER V94222, No. 5-RA-200		1
2	352275-0	. . COVER		1
	482656	. TOP ASSEMBLY, CANOPY		1
4	481669	. PANEL ASSEMBLY, REAR, CANOPY		1
5	384935-0	. HANDLE, CANOPY, REAR		2
6	485552	. PANEL, ACCESS, CONTROL BOX		1
7	481634	. DOOR ASSEMBLY, SIDE		2
8	481631	. DOOR ASSEMBLY, SIDE		2
9	481633	. BRACKET, CENTER		2
10	481626	. DOOR ASSEMBLY, SIDE		2
11	481644	. DOOR ASSEMBLY, SIDE		2
12	481619	. SUPPORT ASSEMBLY, CANOPY		2
13	481649	. PANEL ASSEMBLY, SIDE, LEFT		1
14	386751	. CLAMP, RETAINER, DOOR		8
15	387445	. ROD, HOOK, DOOR		8
16	HJ-129A	. JOINT, BALL V01428, No. SPS1002CP		8
17	30GHP-391	. LATCH, DOOR, CANOPY		4
* 18	481646	. PANEL ASSEMBLY, SIDE, RIGHT		1
19	181446	. FRONT ASSEMBLY, CANOPY		1
* 20	482376	. COVER, OPENING		2
* 21	352289	. SPACER, HINGE		1
* 22	481695	. SPACER, MOUNTING, DOOR		4
* 23	181449	. PANEL, TOP, RADIATOR		1
* 24	181450	. PANEL, LEFT SIDE, RADIATOR		1
* 25	181451	. PANEL, RIGHT SIDE, RADIATOR		1
* 26	181452	. PANEL, BOTTOM, RADIATOR		1
* 27	181644	. BRACKET, SUPPORT, FLOOR PLATE		1

*** NOT ILLUSTRATED**



Generator Set Without Canopy
(Shown without T-R Equipment)
Figure 3

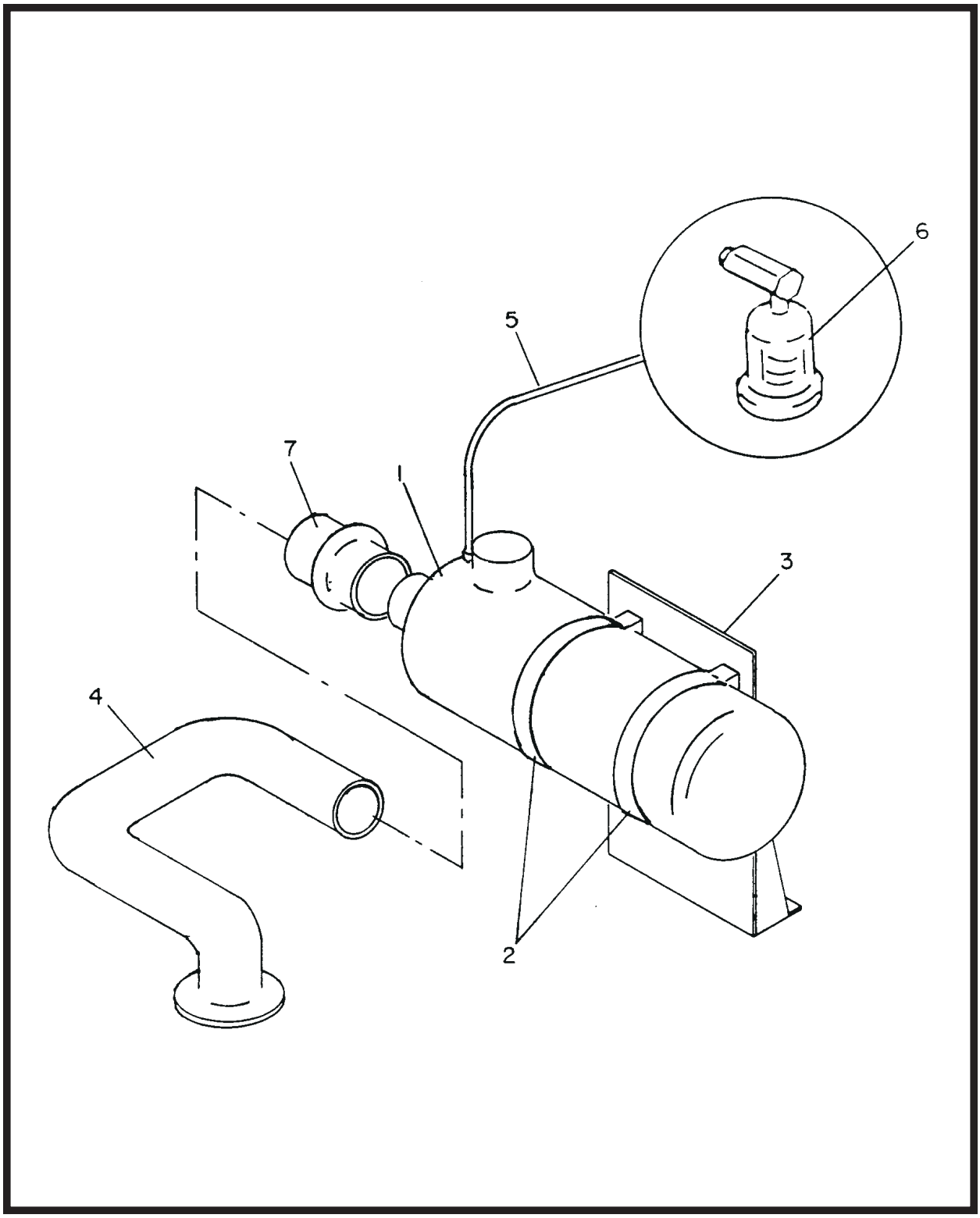
FIGURE & ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567		UNITS PER ASSY
3-	No Number	. GENERATOR SET WITHOUT CANOPY (For NHA See Fig. 1)		REF
1	No Number	. RADIATOR AND COOLING SYSTEM GROUP (For Details See Fig. 4)		1
2	280927	. ENGINE, V-8 DIESEL, V72582, Model 8.2 N		1
3	280810	. KIT, AIR CLEANER, ASSY. (For Details See Fig. 5)		1
4	482207-6	. BOX, CONTROL, ASSY. (For Details See Fig. 9)		1
5	No Number	. SEAT AND MOUNTING SUPPORT GROUP (For Details See Fig. 16)		1
6	No Number	. STEERING COLUMN GROUP (For Details See Fig. 19)		1
	No Number	. FLOORPLATES & PEDALS GROUP (For Details See Fig. 20)		1
8	No Number	. GEARSHIFT SAFETY DEVICE GROUP (For Details See Fig. 21)		1
9	404309	. TRANSMISSION ASSY., 4 SPD., V79410, No. 13-01-000-129 (For Details See Fig. 22)		1
10	No Number	. CLUTCH GROUP (For Details See Fig. 23)		1
11	489343	. GENERATOR ASSY (For Details See Fig. 24)	A	1
	489343A	. GENERATOR ASSY (For Details See Fig. 24)	B	1
12	No Number	. VEHICULAR LIGHTS GROUP (For Details See Fig. 25)		1
13	No Number	. BODY AND FRAME GROUP (For Details See Fig. 26)		1
14	No Number	. AXLE GROUP (For Details See Fig. 28)		1
15	482075-2	. PANEL ASSY, POWER MODULE (For Details See Fig. 10)		1
16	181538	. KIT, GOVERNOR, ELECTRIC (For Details See Fig. 7)		1
17	482561	. TANK, FUEL, ASSY.		1
	181515	. BOX, PLUG, ASSY.	A	1
18	485476	. . BRACKET, MICRO-SWITCH	A	1
19	83A-1069	. . SWITCH, MICRO	A	1
20	485475	. . ACTUATOR, SWITCH,	A	1
21	181516	. . WRAPPER, BOX, PLUG	A	1
22	181433	. FILTER, FUEL/WATER SEPARATOR	A	1
23	486855	. PLATE, MOUNTING, WATER SEPARATOR	A	1
24	76A-1152	. CAP, FILL, UNIT		1
25	488910	. KIT, COLD START		1
* 26	181548	. FILTER, FUEL, PRIMARY		1
* 27	488696	. PLATE, MOUNTING, FUEL FILTER		1
* 28	482509	. SUPPORT, FUEL PIPE		1
* 29	280928	. GOVERNOR, OVERSPEED		1
* 30	No Number	. MUFFLER AND EXHAUST GROUP		1
* 31	388975	. STATOR TERMINAL PANEL ASSEMBLY (For Details See Fig. 8)		1



Radiator and Cooling System Group
Figure 4

FIGURE & ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
4-	No Number	RADIATOR AND COOLING SYSTEM GROUP (For NHA See Fig. 3)	REF
1	181389	. RADIATOR ASSY.	1
2	181378	. SHROUD, FAN, ASSY.	1
3	181564	. TANK, SURGE, RADIATOR, ASSY.	1
4	181376	. SUPPORT, RADIATOR, LEFT, ASSY.	1
* 5	181371	. SUPPORT, RADIATOR, RIGHT, ASSY.	1
6	181512	. BRACKET, STIFFNER, RADIATOR	2
7	389909	. GUARD, FAN	2
8	181269	. HOSE, INLET, RADIATOR	1
9	56531	. HOSE, OUTLET, RADIATOR	34"
* 10	HF-2962	. CLAMP, RADIATOR, HOSE	1
11	W-10869-5	. CLAMP, HOSE, RADIATOR	2
12	W-10869-3	. CLAMP, HOSE, RADIATOR	2
13	56501	. HOSE, SURGE TANK TO WATER PUMP	1
14	56534	. HOSE, SURGE TANK TO THERMOSTAT HOUSING	21"
15	W-10886-2	. FITTING, HOSE	3
16	W-10869-2	. CLAMP, HOSE, RADIATOR	2
17	W-10869-14	. CLAMP, HOSE, RADIATOR	1
18	56534	. HOSE, SURGE TANK TO RADIATOR	27"
* 19	403782-2	. SWITCH, SHUT-DOWN (Located on top of front left side of engine)	1
* 20	351541	. LABEL, CAUTION, FAN	2
* 21	W-7814-4	. BUSHING	1
22	405743	. CAP, RADIATOR	1

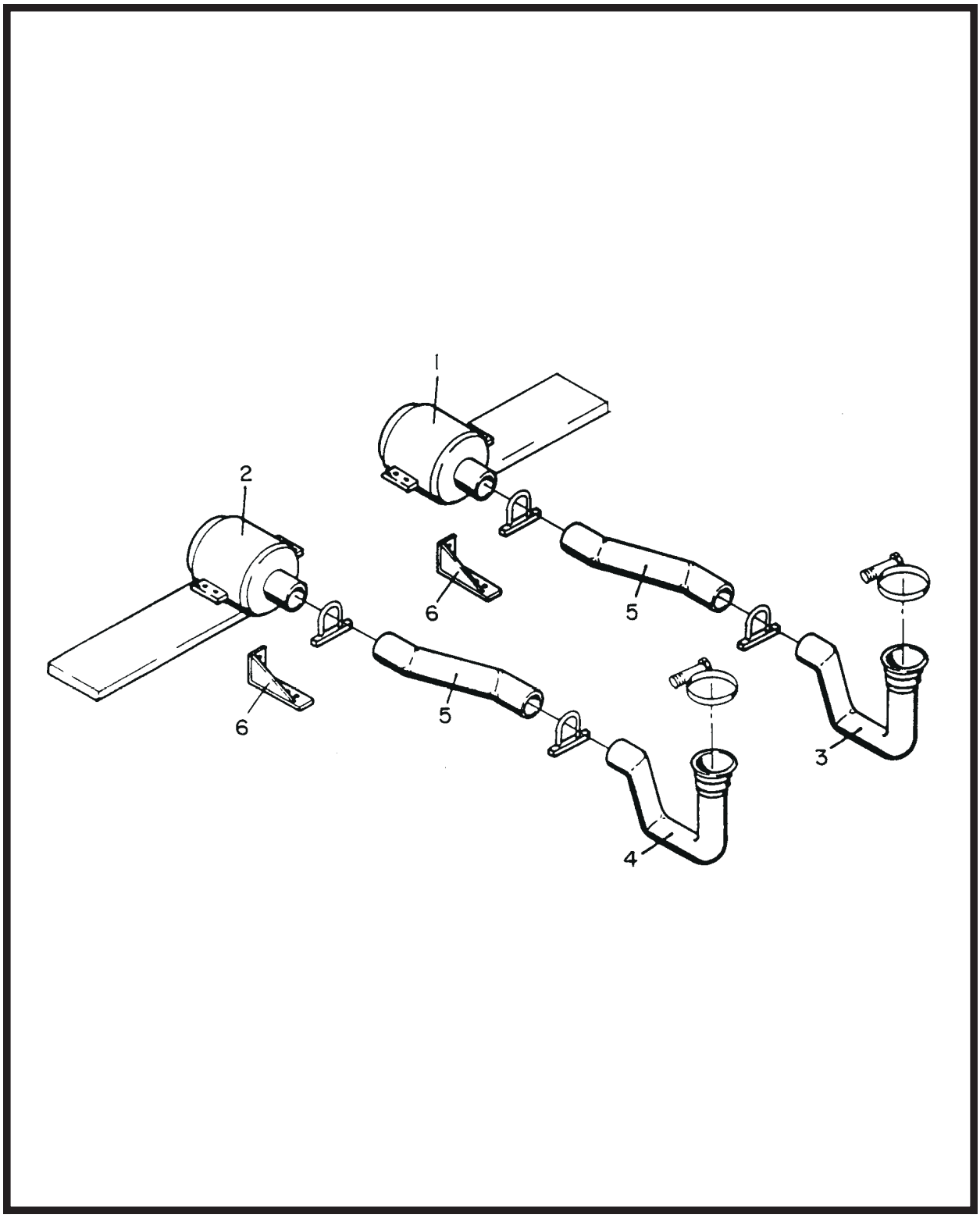
*** Not Illustrated**



Air Cleaner Assembly
Figure 5

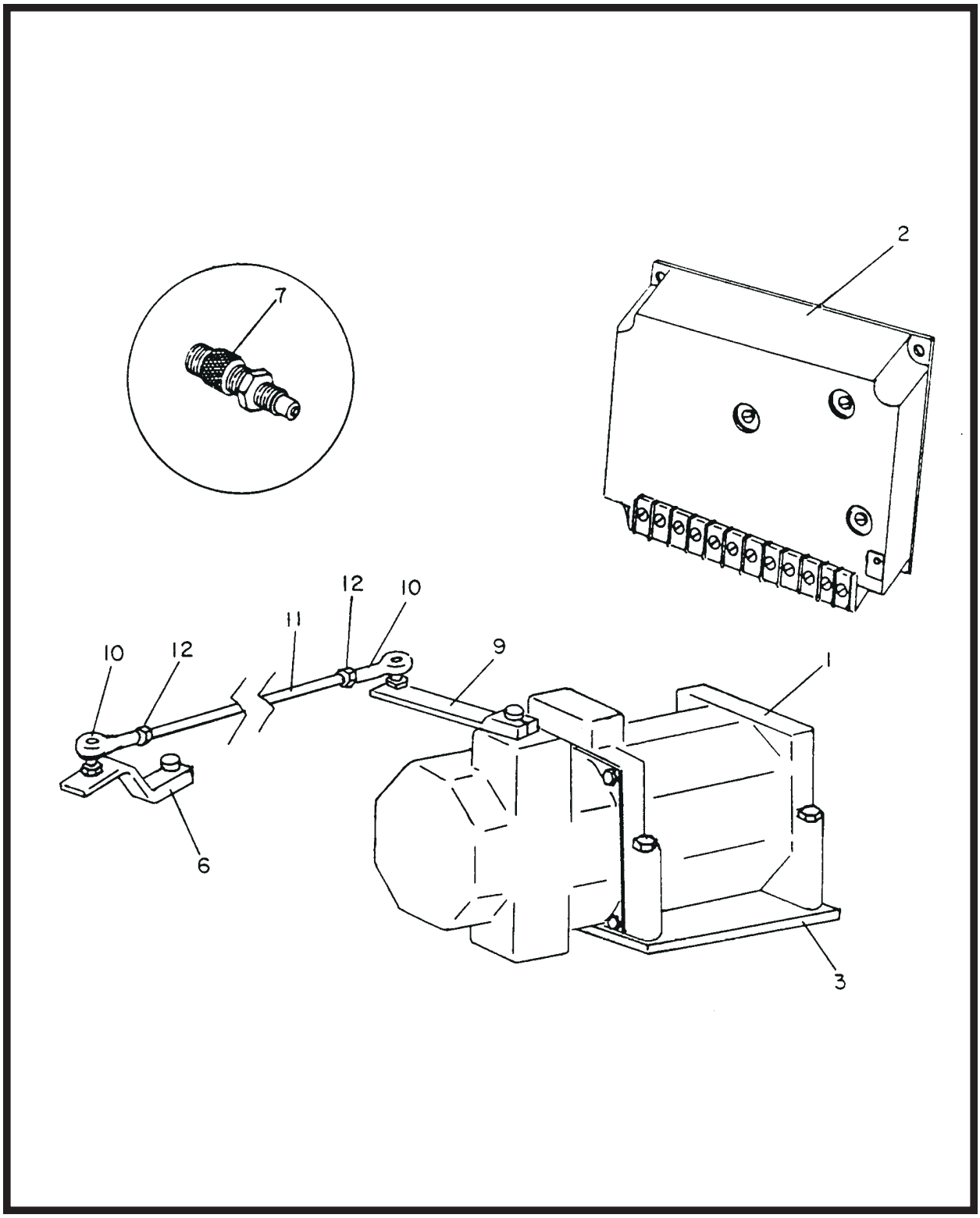
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
5-	280810	KIT, AIR CLEANER, ASSY. (For NHA See Fig. 5)	REF
1	84A-1011	. AIR CLEANER V18265, No. FHG09-0024	1
	85A-1002	. . FILTER, AIR CLEANER	1
2	84A-1010	. CLAMP, MOUNTING, AIR CLEANER V18265, No. POO-4073	2
3	280824	. BRACKET, SUPPORT, AIR CLEANER	1
4	280808	. PIPE, MANIFOLD TO AIR CLEANER, ASSY.	1
5	56534	. HOSE, LOW PRESSURE, 1/4 ID	36"
6	83A-1026	. INDICATOR, SERVICE, FILTER, AIR CLEANER, V21585, No 14440-001(Mounted on Engine Control Panel)	1
7	280829	. COUPLING, RUBBER	1
* 8	181509	. GASKET, PIPE	1
* 9	405061-8	. SCREW, MOUNTING, FLANGE	8
* 10	403483	. CLAMP, HOSE V21585, No. L-4690-6	2
* 11	400059-3	. CONNECTOR, FEMALE, SAE-45 V79470, No. 46 X 4	1
* 12	W-10893-2	. FITTING, HOSE, SWIVEL, FEMALE V30327, No. KA04-04NS	2
* 13	W-10750-3	. NIPPLE, PIPE, 1/8	1
* 14	83A-1029	. NUT, PIPE, 1/8-27 V79470, No C3059 X 2	1

*** NOT ILLUSTRATED**



Muffler and Exhaust Group
Figure 6

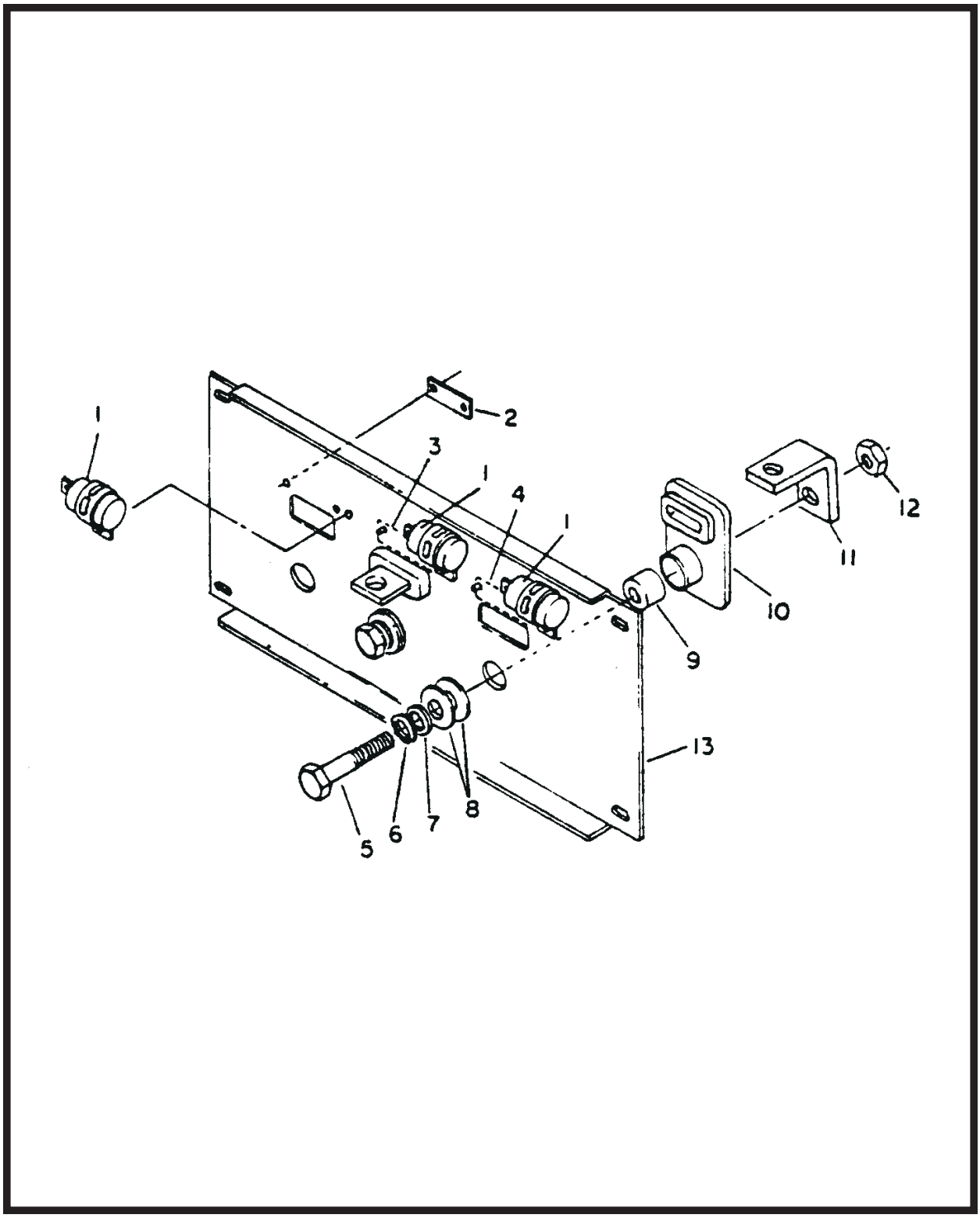
FIGURE & ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
6-	No Number	MUFFLER AND EXHAUST GROUP (For NHA , See Fig. 3)	REF
1	181392	. MUFFLER, RIGHT, ASSY.	1
2	181396	. MUFFLER, LEFT, ASSY.	1
3	280817	. PIPE, EXHAUST MANIFOLD, RIGHT, ASSY.	1
4	280819	. PIPE, EXHAUST MANIFOLD, LEFT, ASSY.	1
5	280818	. PIPE, EXHAUST, MUFFLER, ASSY.	2
6	181384	. SUPPORT, MUFFLER, ASSY.	4
7	404154-13	. CLAMP, PIPE, EXHAUST	4



Electric Governor Assembly
Figure 7

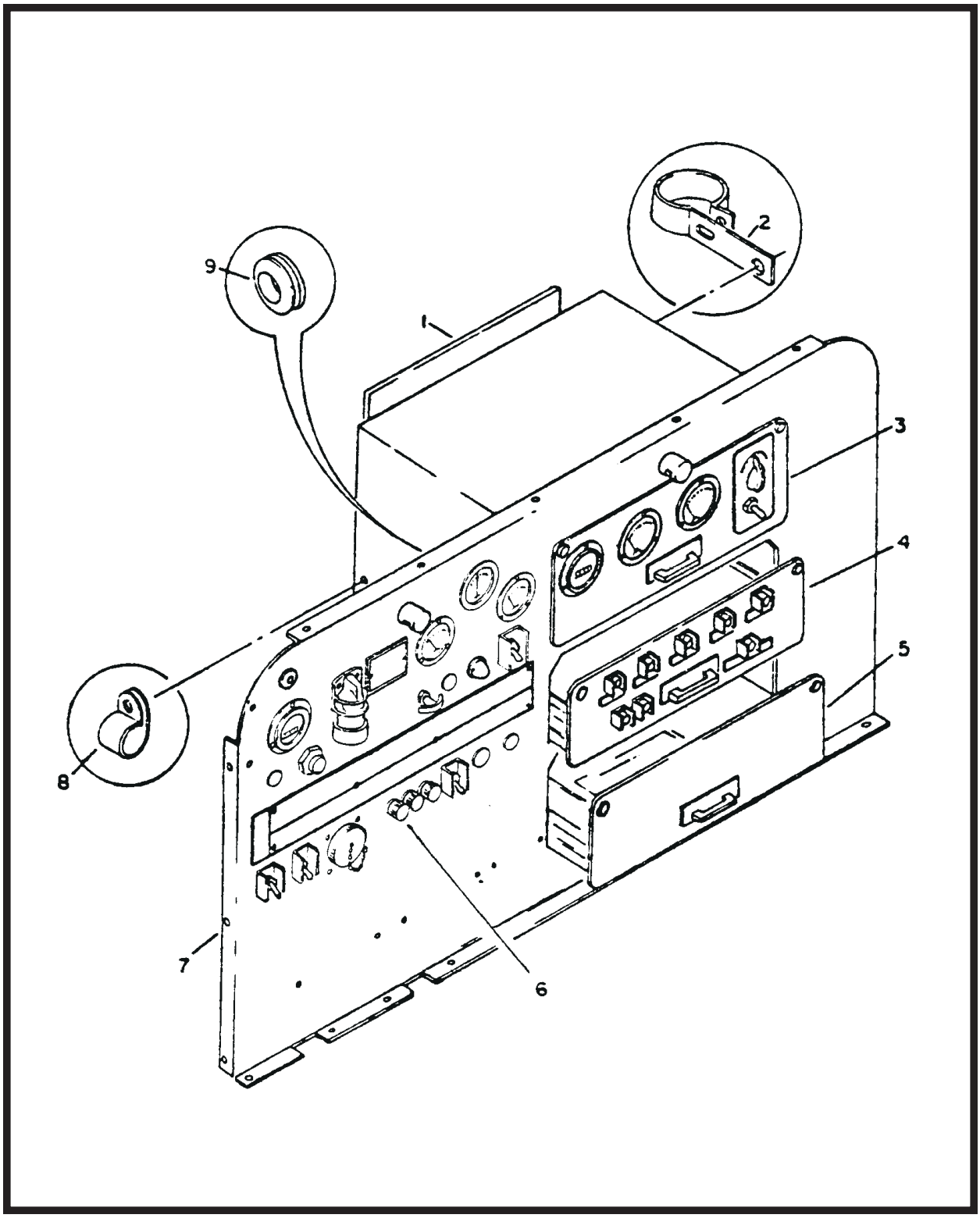
FIGURE & ITEM NO.	NOMENCLATURE HOBART PART NO.	1234567	UNITS PER ASSY
7-	**181538**	**KIT, GOVERNOR, ELECTRIC (For NHA, See Fig. 3)**	**REF**
1	181539	. ACTUATOR, ELECTRIC GOVERNOR	1
2	181540	. CONTROLLER, ELECTRIC GOVERNOR	1
3	181541	. BRACKET, MOUNTING, ACTUATOR	1
* 4	181542	. SCREW, MOUNTING, BRACKET, M10 X 30	2
* 5	181543	. SCREW, MOUNTING, BRACKET, M8 X 25	1
6	181544	. LEVER, GOVERNOR CONTROL	1
7	281774-2	. SENSOR, MAGNETIC, GOVERNOR	1
* 8	281751-1	. ADAPTER, MAGNETIC PICK-UP	1
9	85A-1047	. LEVER, ACTUATOR	1
10	402908	. JOINT, BALL, GOVERNOR LINKAGE V57448, No. TF-4Y	2
11	W-9476-31	. ROD, THREADED, 1/4-28 X 10"	1
12	W-11280-3	. NUT, 1/4-28	4
* 13	400829-5	. TERMINAL, SPADE	3

*** Not Illustrated**



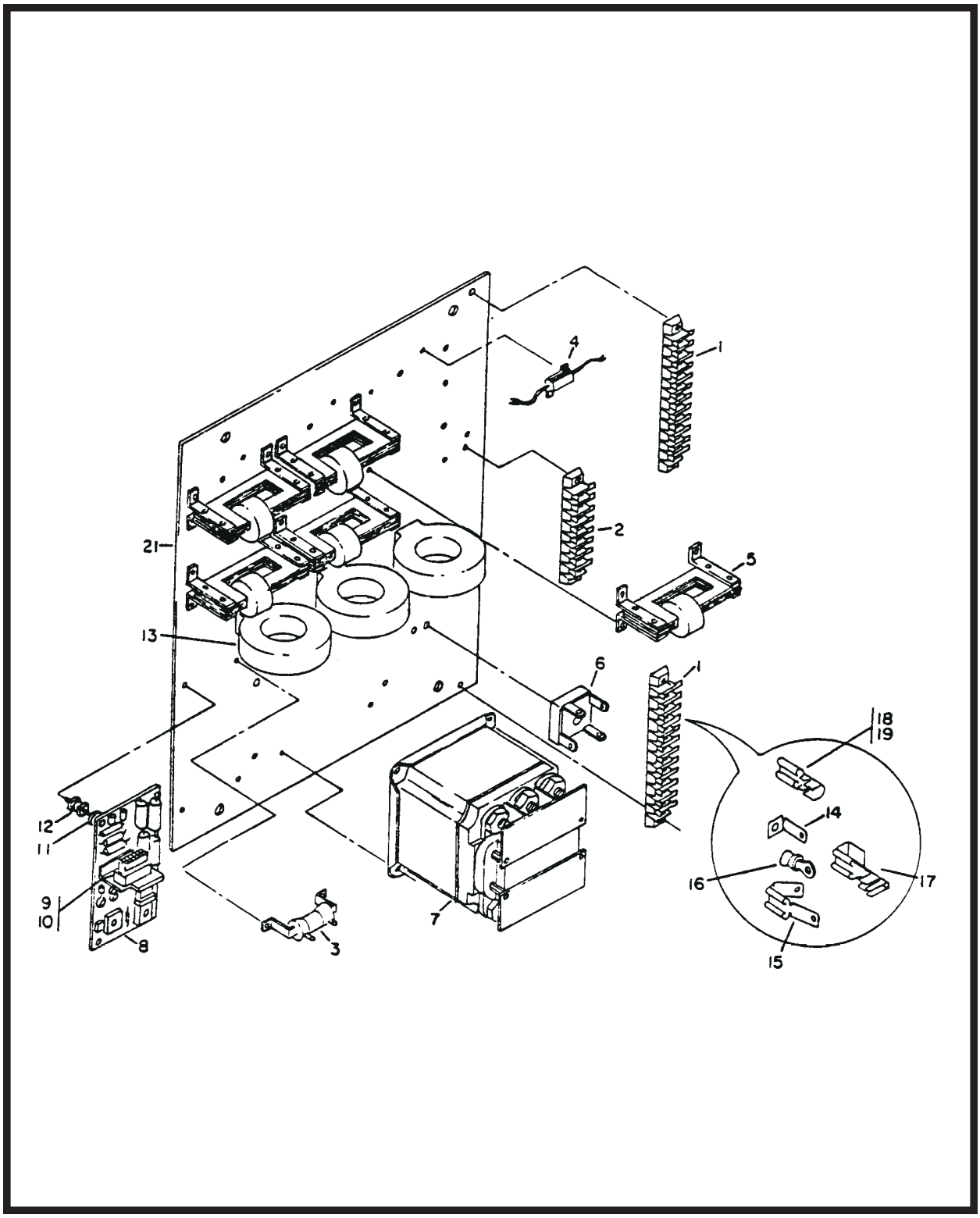
Stator Terminal Panel Assembly
Figure 8

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
8 -	**388975**	**STATOR TERMINAL PANEL ASSEMBLY (For NHA See Fig. 3)**	**REF**
1	W-10854-4	. CAPACITOR, 0.1 MFD, 500-V, V90201, No. B-206143	3
2	75GH-48	. NAMEPLATE, “C”	1
3	75GH-47	. NAMEPLATE, “B”	1
4	75GH-46	. NAMEPLATE, “A”	1
5	W-11097-8	. SCREW, 3/8-16 X 2", HHC, STEEL	3
6	W-11254-6	. WASHER, LOCK, 3/8", STEEL	3
7	W-11242-10	. WASHER, FLAT, 3/8", STEEL	3
8	5CW-976A	. WASHER	6
9	5CW-2127	. BUSHING	3
10	5CW-975	. BUSHING, INSULATOR	3
11	100GH-112	. TERMINAL, OUTPUT	3
12	W-11278-5	. NUT, HEX, STEEL, 3/8-16	3
13	388982	. PANEL, TERMINAL, STATOR	1



Control Box Assembly
Figure 9

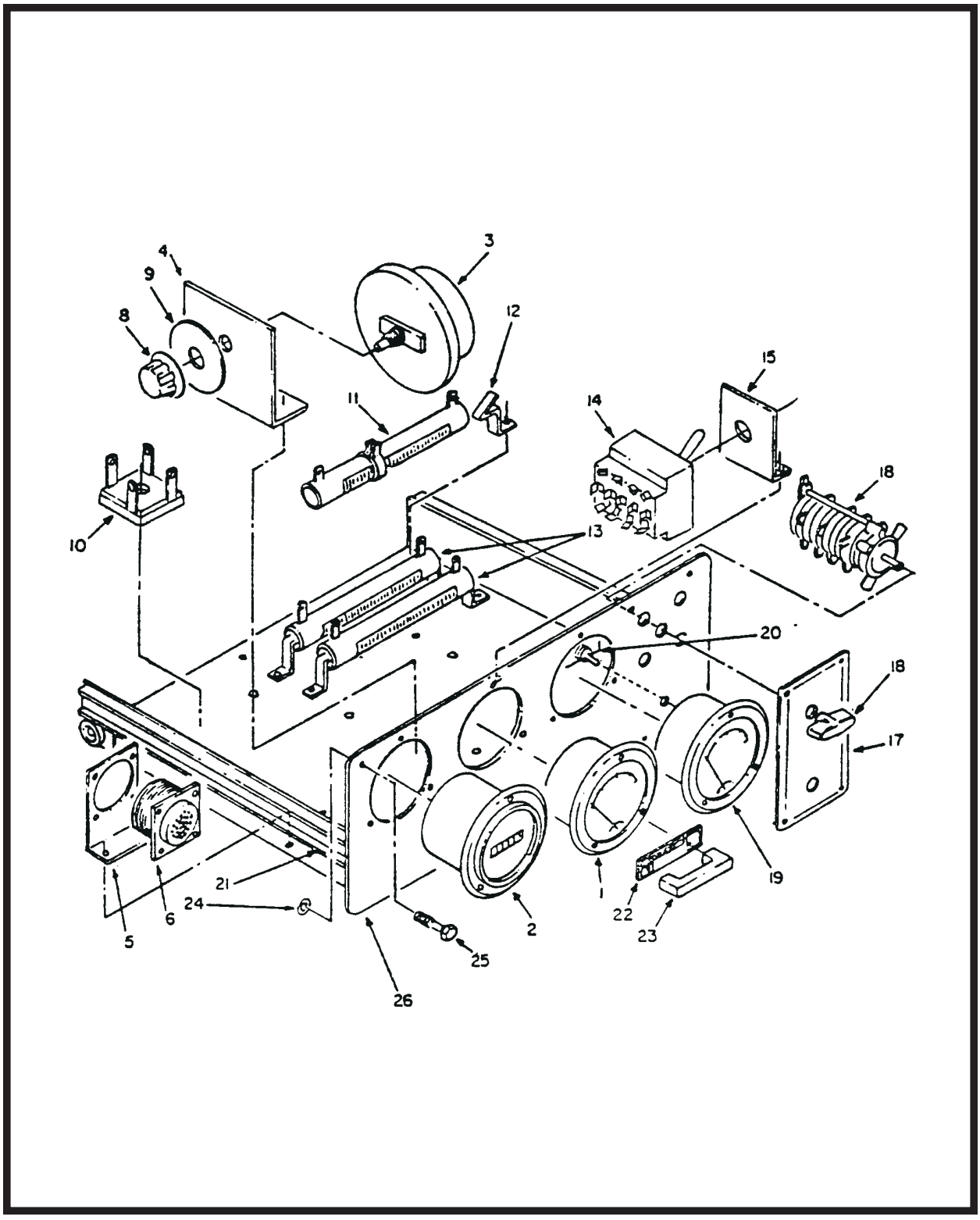
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
9-	482207-6	BOX ASSEMBLY, CONTROL (For NHA See Fig. 3)	REF
1	482075-2	. PANEL ASSEMBLY, POWER MODULE (For Details See Fig. 10)	1
2	HF-2962	. CLAMP, CABLE	2
3	388327A-5	. TRAY ASSEMBLY, GENERATOR CONTROLS (For Details See Fig. 11)	1
4	387769B-12	. TRAY ASSEMBLY, PROTECTIVE RELAYS (For Details See Fig. 12)	1 1
5	386829A-1	. TRAY ASSEMBLY, VOLTAGE REGULATOR (For Details See Fig. 13)	1
6	No Number	. CONTROL BOX FRONT PANEL INSTRUMENTS AND CONTROLS (For Details See Fig. 14)	1
7	No Number	. CONTROL BOX AND INTERNAL COMPONENTS GROUP (For Details See Fig. 15)	1
8	W-10051-13	. CLAMP, WIRE, PLASTIC, 7/8	1
9	402037-9	. GROMMET, RUBBER, V02231, NO. AGW-4211	3



Module Panel Assembly
Figure 10

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
10 -	**482075-2**	**PANEL ASSEMBLY, POWER MODULE (For NHA See Fig. 10)**	**REF**
1	401937-3	. STRIP, TERMINAL V98410, No. 35012-3526	2
2	401937-2	. STRIP, TERMINAL V98410, No. 35008-3526	1
3	W-9746-1	. RESISTOR, LINE DROP BURDEN, 50 OHM, 25 WATT, V44655, No. 0200D	3
4	404402-1	. RESISTOR, OVERLOAD BURDEN, 16.6 OHM, 25-WATT V91637, No. RH-25	3
5	1CZ-148	. TRANSFORMER, CURRENT, LINE DROP & OVERLOAD V50508, No. E-6170	6
6	404065-1	. RECTIFIER, SILICON V04713, No. SDA10270-1	1
7	404518	. CONTACTOR, LOAD V50603, No. HB200BB	1
8	387738A	. BOARD ASSEMBLY, PC OVERLOAD	1
9	401564-4	. HOUSING, SOCKET, CONNECTOR V89110, No. 1-480287-0	1
10	401566-11	. TERMINAL, SOCKET V89110, No. 60619-1	10
11	403763-1	. WASHER, FIBER, SHOULDER	4
12	401556	. MOUNT, SHOCK, RUBBER V81860 No. SS-01	4
13	363136-5	. TRANSFORMER, CURRENT, AMMETER	3
14	400701	. CONNECTOR, RIGHT ANGLE V59730, No. TA-250-8	5
15	401939	. ADAPTER, TERMINAL V98410, No. VWA-0	1
16	400830-15	. TERMINAL, RING TONGUE V89110, No. 31159	3
17	402197-1	. TERMINAL, QUICK CONNECT, PIGGYBACK V89110, No. 61944-2	1
18	400480-2	. TERMINAL, QUICK CONNECT V00779, No. 41274	5
19	400480-3	. TERMINAL, QUICK CONNECT V00779, No. 42640-2	2
* 20	1CZ-93B	. DIODE, SILICON V05277, No. IN4820	1
21	482076	. PANEL, POWER MODULE	1

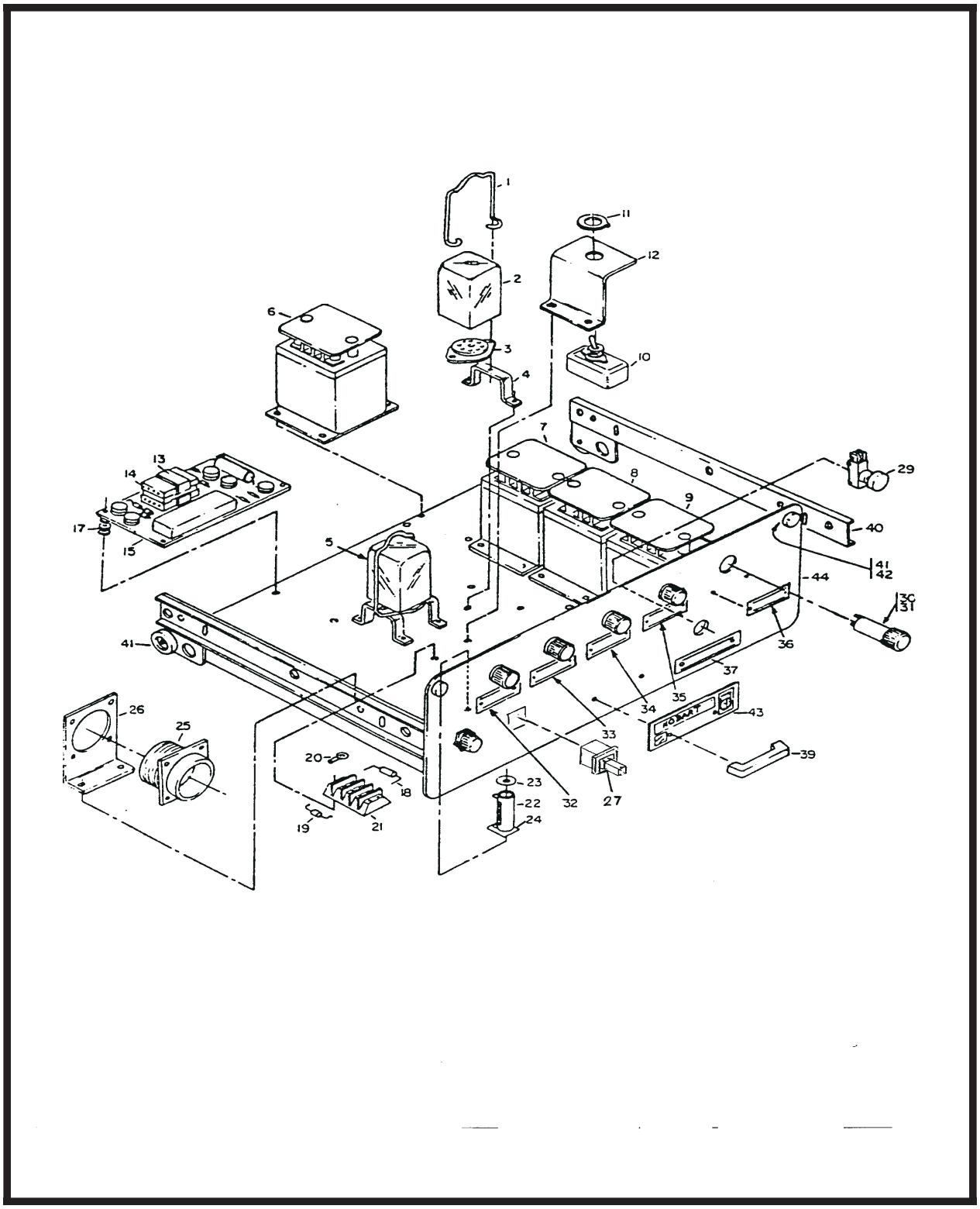
*** Not Illustrated**



Generator Control Tray Assembly
Figure 11

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
11 -	**388327-5**	**TRAY ASSY., GENERATOR CONTROLS (For NHA See Fig. 13)**	**REF**
1	W-8105A-4	. VOLTMETER, 0-300-V, V60741, NO. 331LH	1
2	W-9916-10	. METER, FREQUENCY, V31356, NO. 36-FX	1
3	402218	. RHEOSTAT, MANUAL, 100-OHM, 150-WATT, V44655, MODEL L	1
4	381439	. BRACKET, MOUNTING, RHEOSTAT	1
5	384918	. BRACKET, MOUNTING, RECEPTACLE	1
6	402378	. RECEPTACLE, BOX, 20-CONTACT, V02660, NO. MS-3102A-28-16P	1
7	363771-5	. SLEEVING, PLASTIC, 1/8-IN. I.D.	15
8	16DA-2162	. KNOB, RHEOSTAT, 44655, NO. 5150	1
9	10J-178	. NAMEPLATE, FIELD, RHEOSTAT	1
10	404065-2	. RECTIFIER, SILICON, V04713, NO. SDA10270-2	1
11	W-2974-L	. RESISTOR, MANUAL, 100-WATT, V44655, NO. 0959	1
12	400078	. BRACKET, MOUNTING, RESISTOR	6
13	W-2974-N	. RESISTOR, BALLAST, V44655, 20-OHMS, 100-WATTS	2
14	402826	. SWITCH, AUTOMATIC, MANUAL, 4PDT, V15605, NO. 8926K425	1
15	480639	. BRACKET, MOUNTING, SWITCH, AUTO-MANUAL	1
16	388328-22	. NAMEPLATE, IDEDNTIFICATION	1
17	15GH-433	. NAMEPLATE, METER SELECTOR	1
18	HF-1459	. SWITCH, METER SELECTOR, V04009, NO. 81579-FT	1
19	W-8095A-9	. AMMETER, AC, 0-500-A, V60741, NO. 331LH	1
20	400400	. SWITCH, LIINE, DPDT, V73559, NO. 26L61TABS	1
	385784	. TRAY, ASSEMBLY	1
21	402383	. . SLIDE, TRAY, LEFT AND RIGHT	1PR
22	404028	. . NAMEPLATE, HOBART	1
23	370382A	. . HANDLE, TRAY	1
24	W-11250	. . WASHER, RETAINER	2
25	382818	. . SCREW, FASTENING	2
26	385785	. . TRAY	1
* 27	481865	HARNESS ASSEMBLY, WIRE, GENERATOR CONTROLS TRAY	1

*** Not Illustrated**



Protective Relay Tray Assembly
Figure 12

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
12 -	**387769B-12**	**TRAY ASSEMBLY, PROTECTIVE RELAYS (For NHA See Fig. 13)**	**REF**
1	16DA-4253-1	. RETAINER, SPRING, RELAY V77342, No. *(KUP)* 20C206	2
2	16DA-4004A-10	. RELAY, FUSE, INTERLOCK & K23 V77342, No. KAP-14DG-12	1
3	16DA-4052-0	. SOCKET, RELAY	2
4	387725	. BRACKET, RELAY-MOUNTING	3
5	16DA-4004A-3	. RELAY, PLUG, INTERLOCK 24 V. DC V77342, No. K10-14DG-24	1
6	383766	. RELAY, OVERVOLTAGE	1
7	10DH-845-0	. RELAY, UNDERVOLTAGE	1
8	10DH-847-4	. RELAY,UNDERFREQUENCY	1
9	10DH-846-4	. RELAY, OVERFREQUENCY	
10	402662	. SWITCH, TEST BANK V73559, No. 2GK71-73	1
11	403336	. RING, LOCKING, SWITCH V91929, No. TS10397	1
12	100GH-142	. BRACKET, MOUNTING, SWITCH	1
13	401566-11	. TERMINAL, SOCKET V89110, No. 60619-135	13
14	401564-5	. HOUSING, SOCKET, CONNECTOR V89110, No. 1-480438-0	1
15	387736C	. BOARD ASSY, MEMORY AND TIME DELAY	1
16		DELETED	
17	401556	. MOUNT, SHOCK, RUBBER V81860, No. SS-01	4
18	400030-1	. CAPACITOR, 6.8 mfd, 35-V, V14101, NO. 150D685X9035B2	1
19	1CZ-93B	. DIODE, SILICONE, 400 PRV, 1.5-A, V19816, NO. 1N4820	3
20	400176-1	. TERMINAL, LUG, V89110, NO. 34105	4
21	401911-3	. TERMINAL BOARD, V88223, NO. 441-3	1
22	W-9746-3	. RESISTOR, 100-OHM, 25-WATT, V44655, NO 0200F	1
23	1CZ-74	. WASHER, INSULATOR, TOP	1
24	430476	. WASHER, INSULATOR, BOTTOM	1
25	402380	. CONNECTOR, RECEPTACLE, V02660, NO. MS-3102A-28-12P	1
26	384918	. BRACKET, MOUNTING, CONNECTOR	1
27	408544-1	. CIRCUIT BREAKER, FUSE-HOLDER TYPE	2

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FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
12 -			
* 28	482340	. RECEPTACLE, BOX, 26-CONTACT	1
29	402759-2	. SWITCH, PUSH, RESET, V04009, NO. 3391	1
30	75NH-35-2	. LIGHT, INDICATING, V72619, NO. VM911	5
31	No Number	. . LAMP, INCANDESCENT, V08108, NO. 1815	1
32	30GH-720	. PLATE, IDENTIFICATION, OVERVOLTAGE	1
33	30GH-721	. . PLATE, IDENTIFICATION, UNDERVOLTAGE	1
34	30GH-718	. . PLATE, IDENTIFICATION, OVERFREQUENCY	1
35	30GH-719	. . PLATE, IDENTIFICATION, UNDERFREQUENCY	1
36	30GH-722	. . PLATE, IDENTIFICATION, OVERLOAD	1
37	30GH-723	. . PLATE, INSTRUCTION, (PRESS-TO-RESET)	1
* 38	388328-30	. PLATE, IDENTIFICATION, TRAY	1
	387770A	. TRAY ASSEMBLY	1
39	370382A	. . HANDLE, TRAY	
40	402383	. . SLIDE, TRAY, LEFT AND RIGHT	1PR
41	382818	. . SCREW, FASTENING	2
42	W-11250	. . WASHER, RETAINER	2
43	404028	. . NAMEPLATE, HOBART	1
44	387771A	. . TRAY	
* 45	402900	. TERMINAL, QUICK-DISCONNECT, V70611, NO. 3000M402A	1
46	481866	HARNESS ASSEMBLY, WIRE, PROTECTIVE RELAYS TRAY	1

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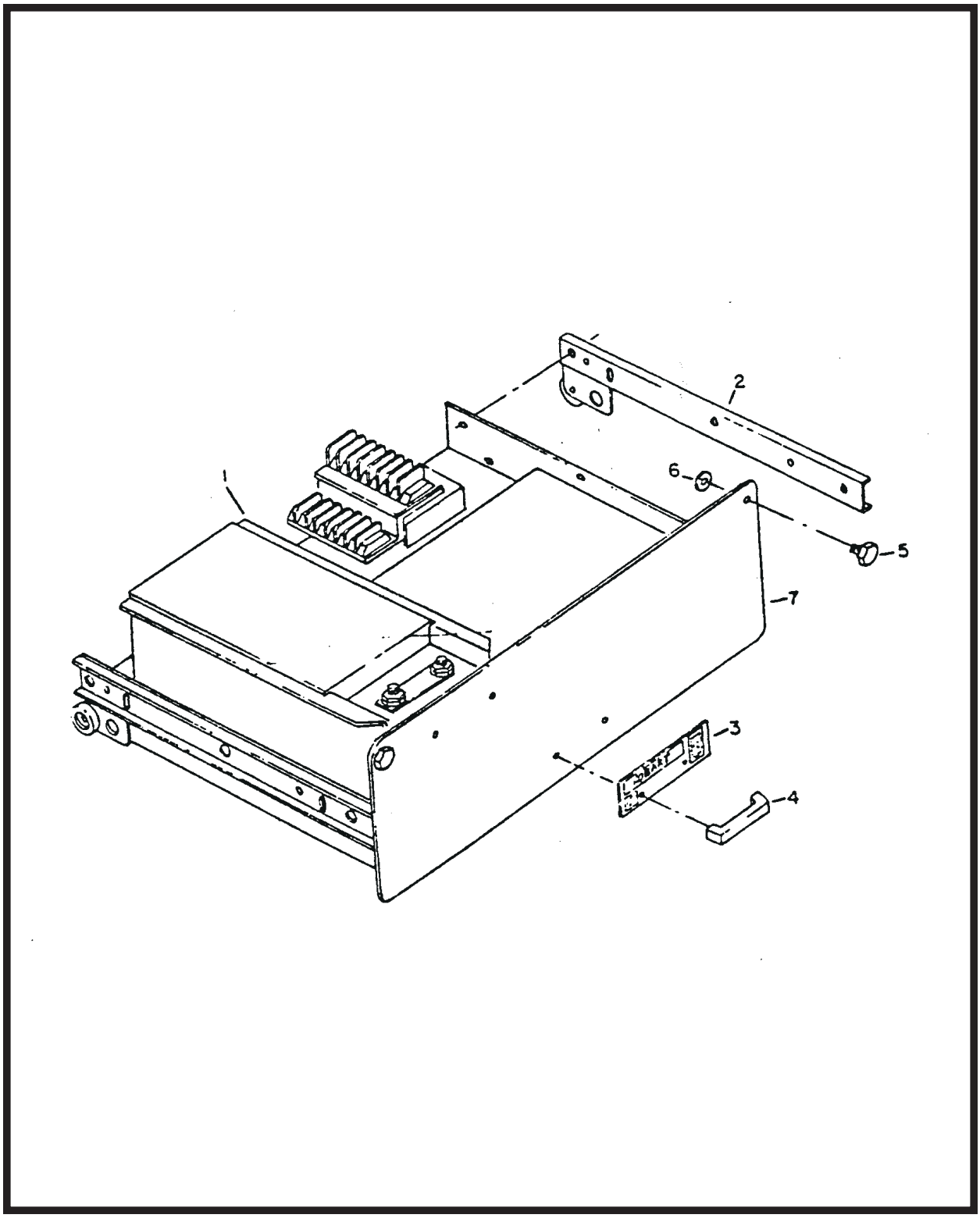
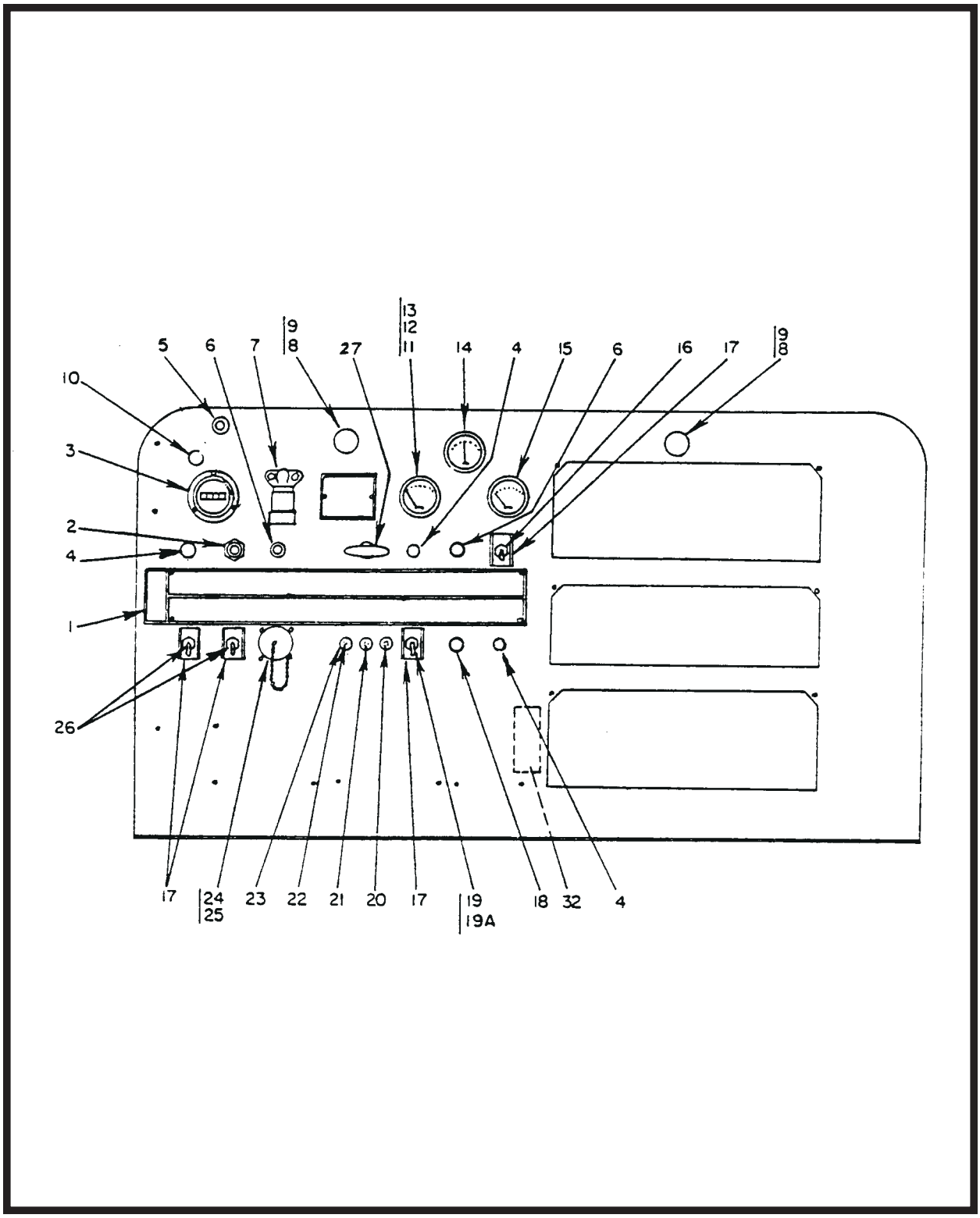


Voltage Regulator Tray Assembly
Figure 13

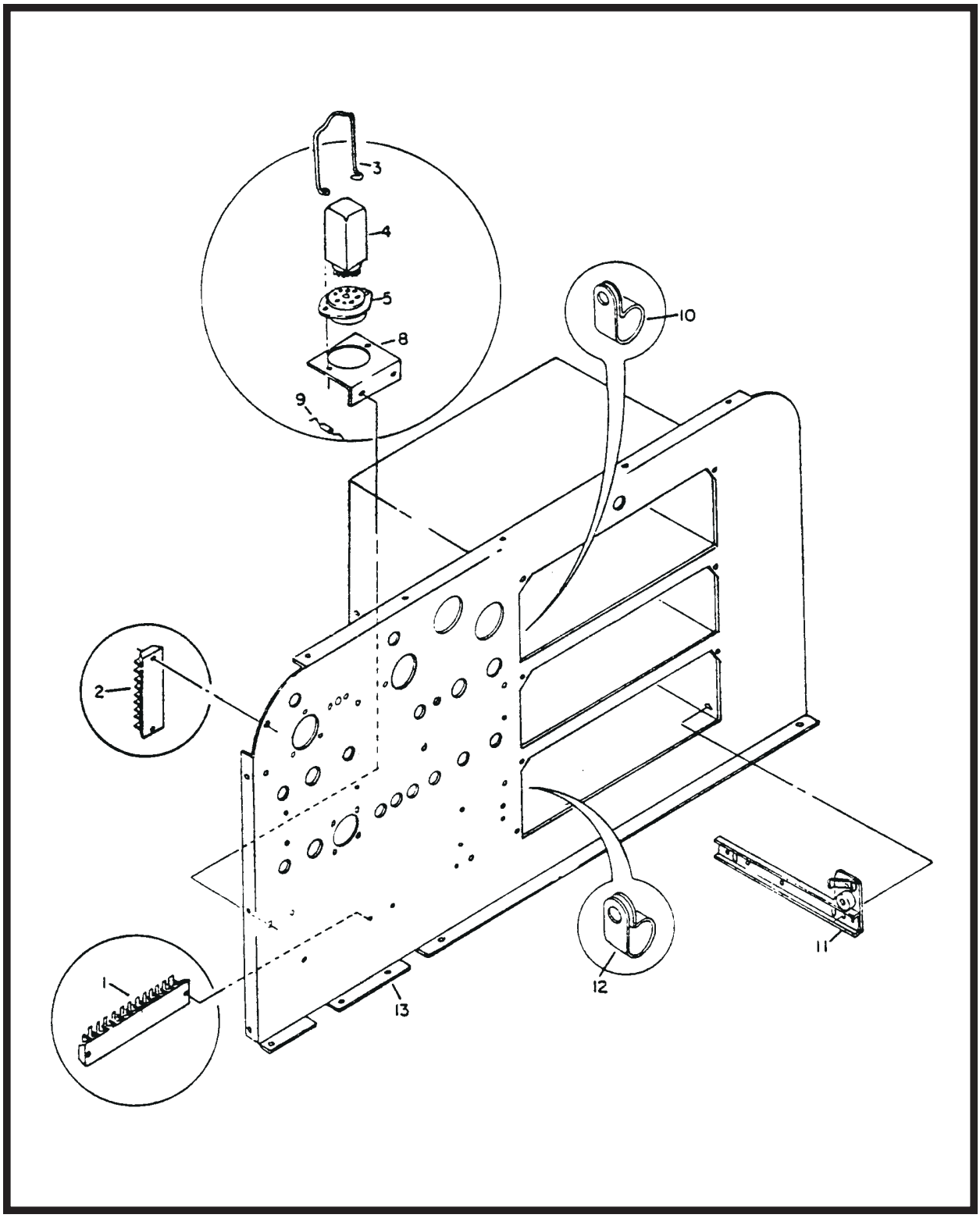
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
13 -	**386929A-1**	**TRAY ASSEMBLY, REGULATOR, VOLTAGE (For NHA See Fig. 9)**	**REF**
1	430391C	. REGULATOR ASSEMBLY, VOLTAGE	1
	386884	. TRAY ASSEMBLY	
2	402383	. . SLIDE ASSEMBLY, TRAY (Consists of four parts marked CR, CL, DR, & DL) V75358, No. 1335-12	1 set
3	404028	. . NAMEPLATE, HOBART	1
4	370382A	. . HANDLE, TRAY	1
5	382818	. . SCREW, FASTENING	2
6	W-11250	. . WASHER, RETAINING	2
7	386890	. . TRAY	1
* 8	481867	. . HARNESS ASSEMBLY, WIRE, VOLTAGE REGULATOR	1

*** Not Illustrated**



Control Box Front Panel Instruments and Controls
Figure 14

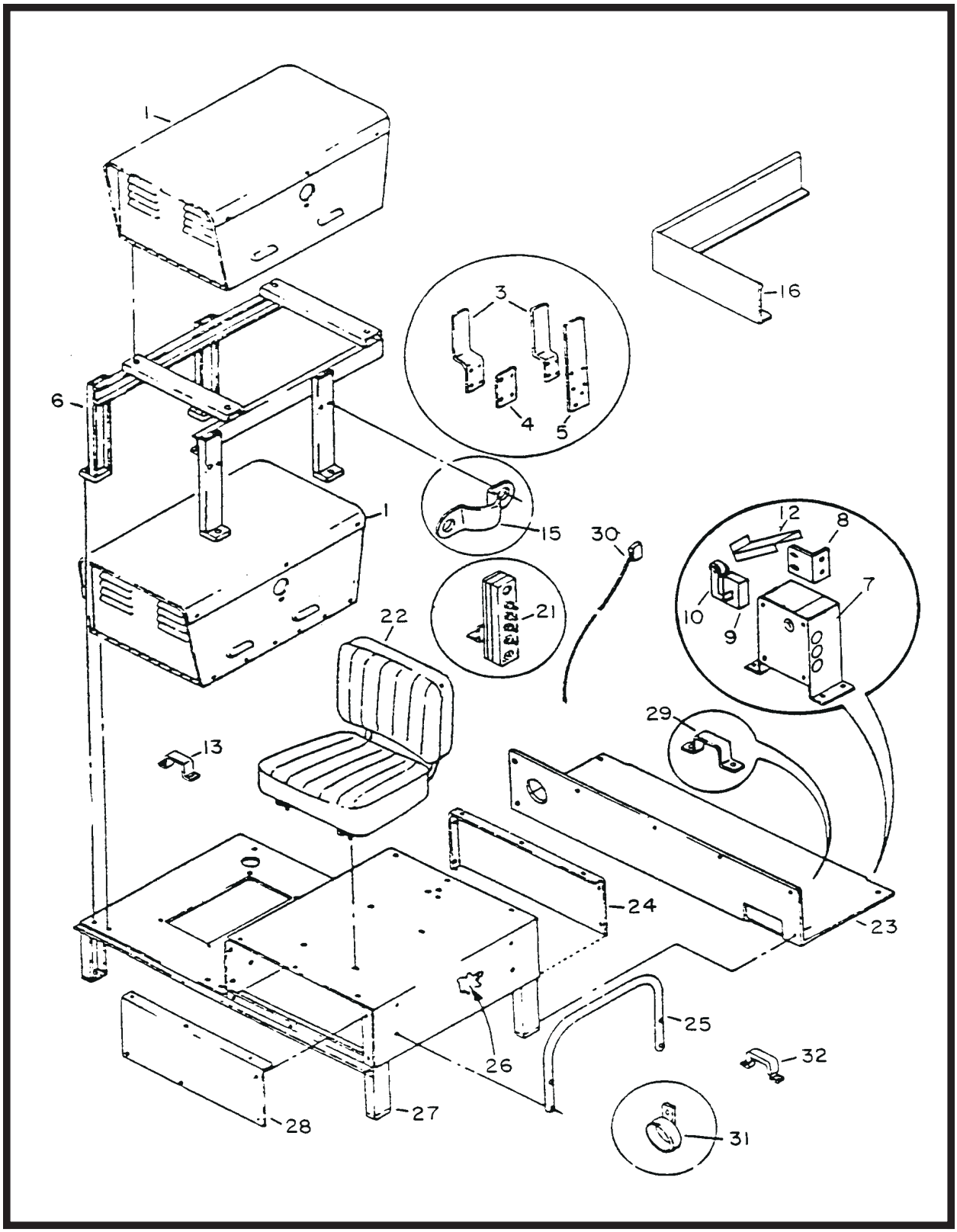
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
14 -	**No Number**	**CONTROL BOX FRONT PANEL INSTRUMENTS & CONTROLS (For NHA See Fig. 9)**	**REF**
1	482210	. NAMEPLATE, CONTROLS	1
2	404100	. SWITCH, PUSHBUTTON, STARTER, V70040, No. 1996027	1
3	W-9917-18	. METER, ENGINE, HOUR, V26992, No. 771-4/50	1
4	403091-2	. BUTTON, HOLE, PLUG, V28520, No. DP-437	3
5	402037-6	. GROMMET, RUBBER, V79497, No. G-1068	1
6	HF-2518-8	. LIGHT, PILOT, ENGINE & GENERATOR, GREEN, V72619, No. 261310-119	2
7	402435	. INDICATOR, SERVICE, FILTER, AIR CLEANER, V21585, No. L-1444025	1
8	82B-1047	. LIGHT, PANEL, V75175, No. 261-3306	2
9	53GHP-206	. . LAMP, TRADE NO. 67 FOR 12-V	1
10	385765	. CONTROL, ENGINE, STOP OR CHOKE V77910, No. 3A-548	1
11	DW-6080	. GAGE, OIL PRESSURE, V81082, No. 75	1
12	W-10910-0	. TEE, 1/8-IN. PIPE, BRASS, V79470, No. 3700 X 2	1
13	402130	. SWITCH, OIL PRESSURE, V74400, No. M-4006	1
14	402889-2	. AMMETER, BATTERY V85925, No. 730-D-5	1
15	DW-4304	. GAGE, WATER TEMPERATURE, V81082, No. 8585A	1
16	403189	. SWITCH, TOGGLE, V91929, No. 312TS1-59	1
17	481545	. GUARD, SWITCH	4
18	16DA-1997-6	. BUTTON, HOLE, PLUG, V90763, No. SS-51026	1
19	400400	. SWITCH, TOGGLE, V73559, No. 2GL-61 TABS	1
19A	1CZ-93B	. . DIODE, SILICON, V19816, No. IN-4820	1
20	406910-9	. FUSE, ENGINE, V71400, Type MDA-20	1
21	W-11166-2	. FUSE, PANEL LIGHTS, V71400, Type AGC 5	1
22	W-11166-5	. FUSE, HEADLIGHTS, V71400, Type AGC 20	1
23	402658	. HOLDER, FUSE, V71400, No. HKP-HH	3
	482230	. HARNESS, WIRE, RECEPTACLE, TEST, ASSY.	1
24	403380	. . CAP & CHAIN ASSY., V02660, No. 9760-28	1
26	403379	. . RECEPTACLE, V02660, No. MS-3102A-28-12S	1
26	FW-1312	. SWITCH, TOGGLE, VO4009, No. 80600-BJ	2
27	No Number	. CABLE, CONTROL, ASSY, QUICK-START	1



Control Box and Internal Components Group
Figure 15

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
15 -	**No Number**	**CONTROL BOX AND INTERNAL COMPONENTS GROUP (For NHA See Fig. 13)**	**REF**
1	401937-3	. STRIP, TERMINAL, V98410, NO. 35012-3526	3
2	401937-2	. STRIP, TERMINAL, V98410, NO. 35008-3526	2
3	16DA-4253-1	. RETAINER, SPRING, RELAY V77342, No. *(KUP)* 20C206	2
4	16DA-4004A-10	. RELAY, FUSE, INTERLOCK & K23 V77342, No. KAP-14DG-12	2
5	16DA-4052-0	. SOCKET, RELAY	2
6	363771-5	. SLEEVING, PLASTIC, 1/8-IN I.D.	10
7	363770-1	. . SLEEVING, PLASTIC, 3/16-IN I.D.	4
8	370891	. BRACKET, MOUNTING, SOCKET, RELAY	1
9	400030-1	. CAPACITOR, 6.8 MFD, 35-V, V14101, 150D685X9035B2	1
10	W-10051-7	. CLAMP, WIRE, PLASTIC, 1/2-INCH, V81074, NO. EC-8	1
11	402383	. SLIDE, CABINET, RIGHT & LEFT, (Part of 4-piece kit 402383)	3pr
12	W-10051-6	. CLAMP, WIRE, PLASTIC, 7/16-INCH, V81074, NO. EC-7	2
13	482208	. BOX, CONTROL	1
		.	

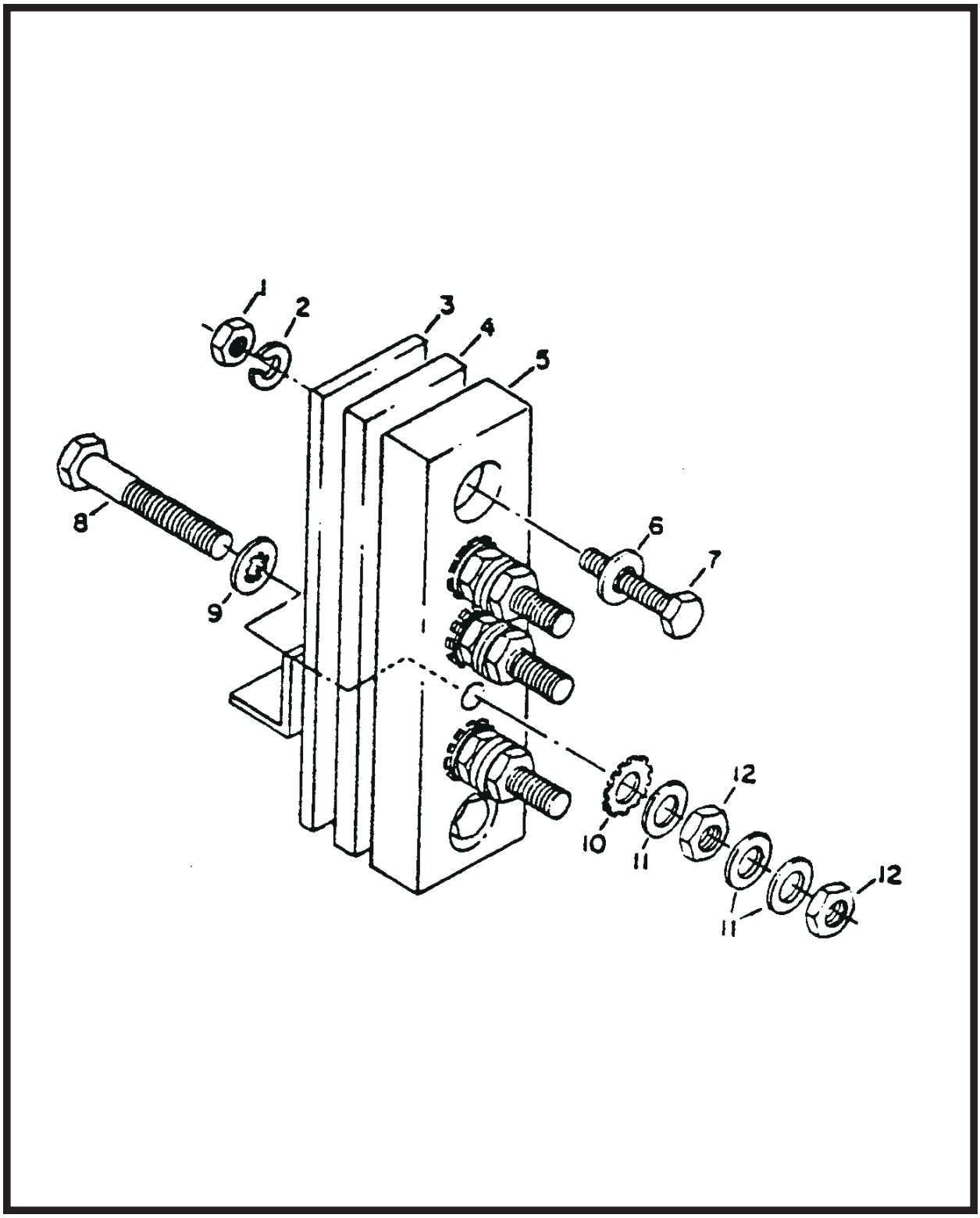
*** Not Illustrated**



Seat and Mounting Support Group
Figure 16

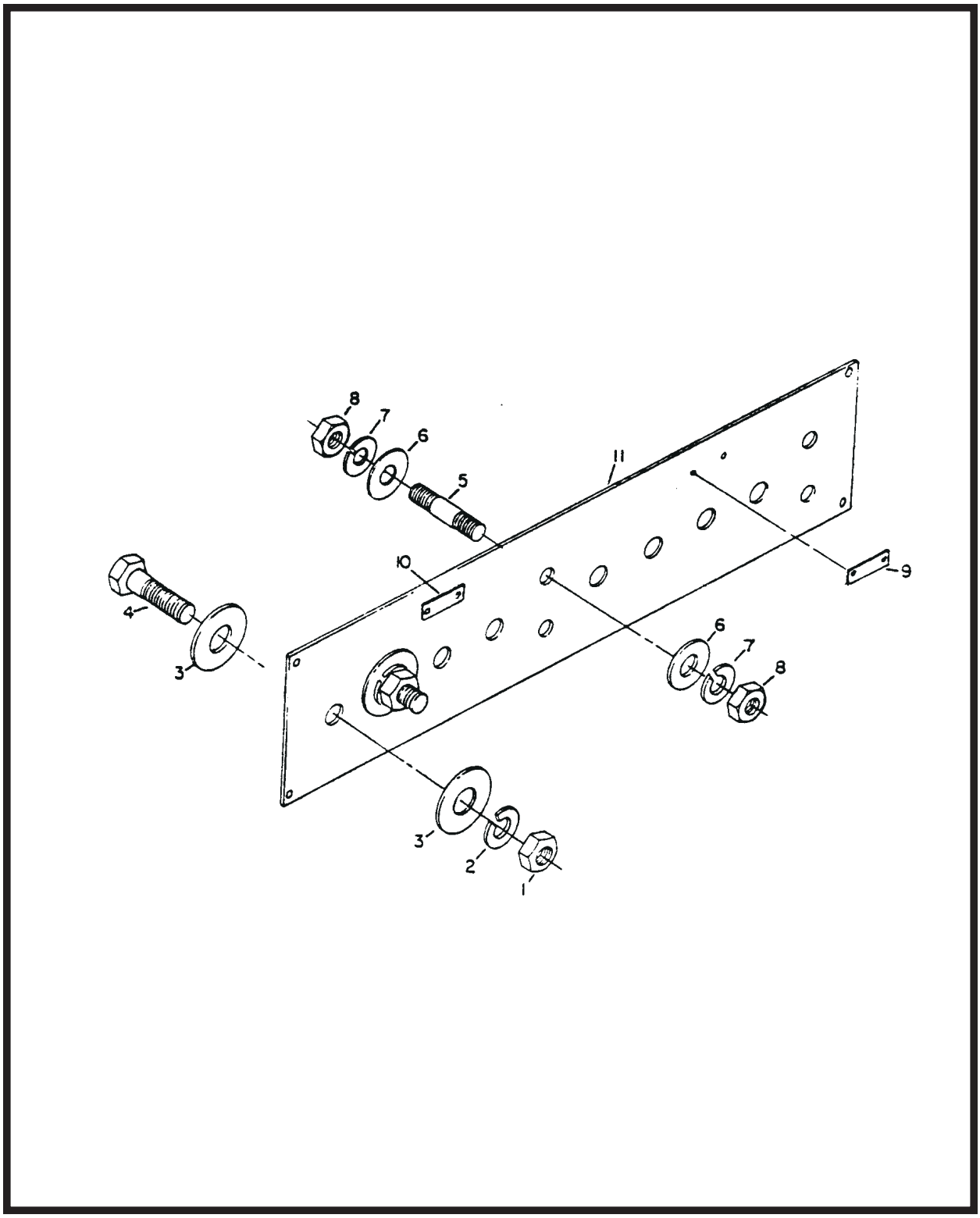
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
16 -	**No Number**	**SEAT AND MOUNTING SUPPORT GROUP (For NHA See Fig. 3)**	**REF**
1	487750-1	. TRANSFORMER-RECTIFIER UNIT, 28.5-V DC	REF
* 2	481387-4	. MOUNTING ASSY, TRANSFORMER-RECTIFIER, (See Manual TO-105 in Chapter 6)	1
3	DWP-982	. . HANGER, CABLE	2
4	50NH-622	. . PLATE, REINFORCING, HANGER	1
5	389827	. . SUPPORT, HANGER, CABLE	1
6	389431	. . SUPPORT, TRANSFORMER-RECTIFIER	1
	181515	. . BOX, PLUG, OUTPUT CABLE ASSEMBLY	2
7	181516	. . . WRAPPER, PLUG, BOX	1
	485473	. . . . PLATE, END	2
8	485476	. . . BRACKET, MICRO-SWITCH	1
9	83A-1069	. . . SWITCH, MICRO	1
10	83A-1067	. . . ACTUATOR, MICRO-SWITCH	1
* 11	400562-39	. . . SPRING, TORSION	1
12	485475	. . . ACTUATOR, SWITCH	1
13	60GHP-424	. . CLAMP, CABLE, OUTPUT	1
* 14	483092	. . HARNESS ASSEMBLY, WIRE	1
15	481968	. . CLAMP, SUPPORT, T-R	1
16	389809	. . BOX ASSEMBLY, CABLE (Mounted on right side of unit)	1
* 17	W-9407-198	. . CABLES (Terminal block to T-R)	3
* 18	W-9407-199	. . CABLES (Terminal block to T-R)	3
* 19	389826	. . CONDUIT, CABLE	1
* 20	402037-24	. . GROMMET, RUBBER	1
21	389823	. BLOCK ASSEMBLY, TERMINAL, T-R (For details see Fig. 17)	1
22	404257	. SEAT ASSEMBLY, V27797, No. WM-113	1
23	481663	. PANEL, BOTTOM, CABLE BOX	1
24	481661	. PANEL, COVER, REAR	1
25	481813	. ARM, SEAT	2
26	482070	. PANEL ASSEMBLY, TERMINAL, OUTPUT (For details see Fig. 18)	1
27	481664	. SUPPORT, MOUNTING, SEAT	1
28	481660	. PANEL, COVER, FRONT	1
29	60GHP-424	. CLAMP, CABLE	2
30	389824	. HARNESS WIRE, T-R	1
31	384575	. SUPPORT, STATOR LEADS	3
32	60GHP-1040	. CLAMP, OUTPUT CABLE	2

*** Not Illustrated**



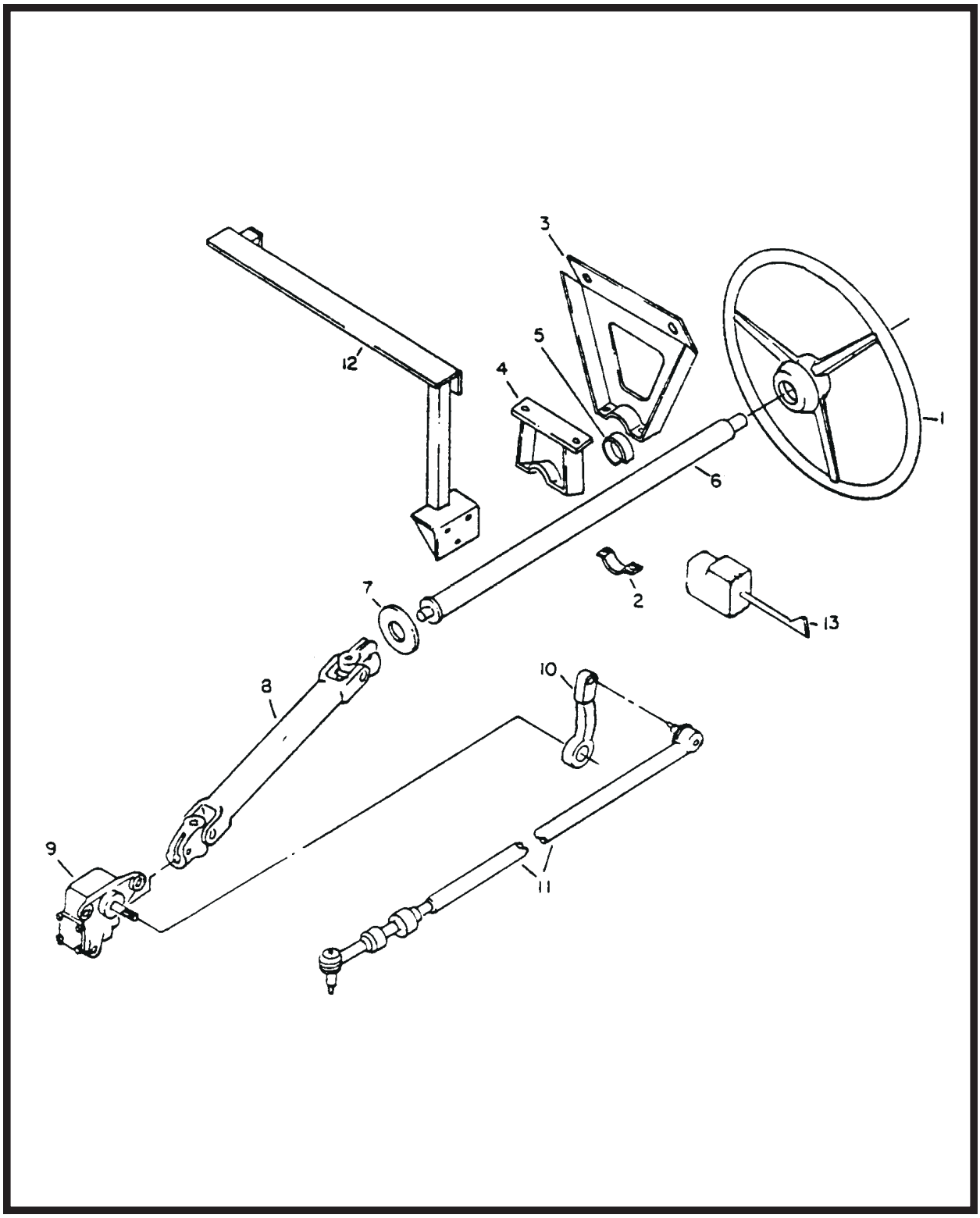
Transformer-Rectifier Terminal Block Assembly
Figure 17

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
17 -	**389823**	**BLOCK ASSEMBLY, TERMINAL, T-R (For NHA See Fig. 16)**	**REF**
1	W-11280-2	. NUT, 1/4 - 20, STEEL	2
2	W-11254-4	. WASHER, LOCK, 1/4, STEEL	2
3	389830	. BRACKET, MOUNTING	1
4	10DH-239	. STRIP, INSULATING	1
5	10DH-244	. BOARD, TERMINAL, OUTPUT	1
6	W-11242-5	. WASHER, FLAT,1/4, STEEL	2
7	402119-8	. SCREW, 1/4 - 20 X 1-1/2, STEEL	2
8	W-11097-8	. SCREW, 3/8 -16 X 2,STEEL	4
9	W-11160-3	. WASHER, 3/8, LOCK, STEEL	4
10	W-11263-6	. WASHER, 3/8, LOCK, STEEL	4
11	W-11242-10	. WASHER, 3/8, FLAT,STEEL	12
12	W-11278-5	. NUT, 3/8 - 16, STEEL	8



Output Terminal Board Assembly
Figure 18

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
18 -	**482070**	**BOARD ASSEMBLY, OUTPUT TERMINAL (For NHA See Fig. 16)**	**REF**
1	W-11278-5	. NUT, 3/8 - 16, STEEL	8
2	W-11254-6	. WASHER, 3/8, LOCK, STEEL	8
3	W-11242-18	. WASHER, 3/8, FLAT,STEEL	16
4	W-11097-8	. SCREW, 3/8 -16 X 2,STEEL	8
5	W-9549-19	. STUD, 1/4- 20, STEEL	4
6	W-11242-5	. WASHER, FLAT,1/4, STEEL	8
7	W-11254-4	. WASHER, LOCK, 1/4, STEEL	8
8	W-11280-2	. NUT, 1/4 - 20, STEEL	8
9	75NH-307	. NAMEPLATE, NO. 2 OUTPUT	1
10	75NH-306	. NAMEPLATE, NO. 1 OUTPUT	1
11	482071	. BOARD, TERMINAL	1



Steering Group
Figure 19

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
19 -	**No Number**	**STEERING COLUMN GROUP (For NHA See Fig. 3)**	**REF**
1	402837	. WHEEL, STEERING, V77915, NO. 586	1
2	481374-2	. CLAMP, STEERING COLUMN	2
3	481561	. SUPPORT, UPPER STEERRING COLUMN	1
4	481413	. SUPPORT, LOWER STEERING COLUMN	1
5	386374	. COLLAR, STEERING COLUMN	2
6	484712	. COLUMN, STEERING	1
7	386375	. COVER, FLOOR, RUBBER	1
8	402836	. JOINT ASSEMBLY, UNIVERSAL, SLIP, V70960, NO. L6S	1
9	402835	. GEAR ASSEMBLY, STEERING, V77640, 24J	1
10	386655	. ARM, PITMAN, STEERING GEAR	1
11	402907	. LINK ASSEMBLY, DRAG, V72210, NO. HXL-9708	1
12	388831	. SUPPORT ASSEMBLY, GEAR, STEERING, LOWER	1
13	400309	. SWITCH, SIGNAL, TURN	1
* 14	404614	. FLASHER, SWITCH, TURN SIGNAL, V94154, NO. 552	1

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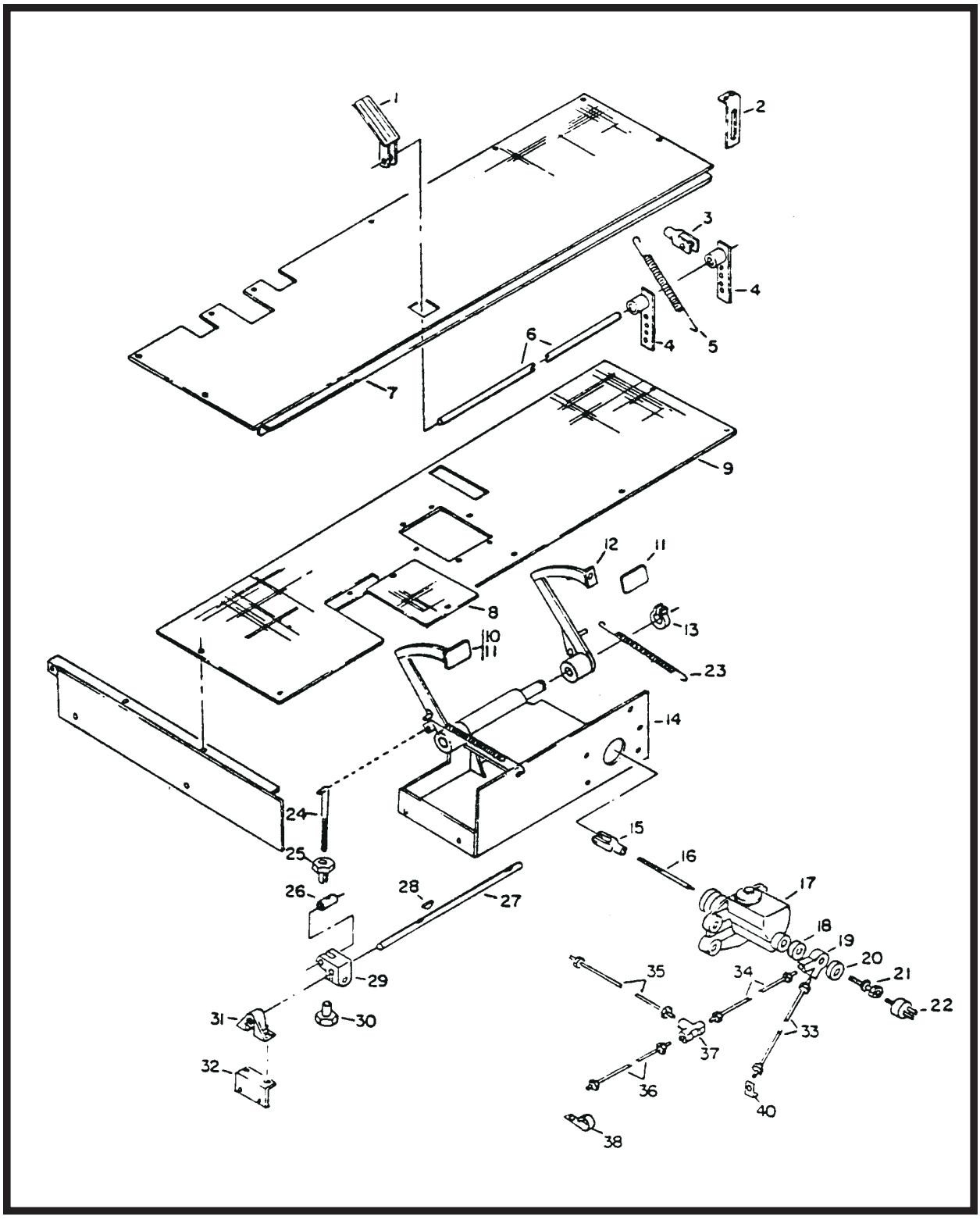

Floorplate, Pedals, and Brake Group
Figure 20

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
20 -	No Number	FLOORPLATE & PEDALS GROUP (For NHA See Fig. 3)	REF
	481548	. PLATE, FLOOR, FRONT SECTION	1
1	386718	. . ACCELLERATOR	1
2	388964	. . BRACKET, MOUNTING, THROTTLE, CONTROL	1
3	403714	. . CLEVIS, THROTTLE, CONTROL	1
4	388965	. . ARM ASSEMBLY, CROSSOVER, THROTTLE	2
5	W-799F-136	. . SPRING, V16053, NO. 136	1
6	388963	. ROD, CROSSOVER	1
7	481525	. PLATE, ASSEMBLY, FLOOR	1
8	481652	. PLATE, INSPECTION, MASTER CYLINDER	1
9	482402	. PLATE, FLOOR, REAR SECTION	1
	384817	. CYLINDER ASSEMBLY, BRAKE,MASTER (Including Pedals)	1
10	384974	. . BRACKET ASSEMBLY, PEDAL, CLUTCH	1
11	384977	. . PEDAL, FOOT	2
12	384960	. . BRACKET ASSEMBLY, PEDAL, BRAKE	1
13	400017-1	. . RING, RETAINING	2
14	384968	. . BRACKET ASSEMBLY, BRAKE AND CLUTCH	1
15	400954	. . YOKE, V31007, NO. 144256	1
16	385171	. . ROD, PUSH, CYLINDER, BRAKE	1
17	402394	. . CYLINDER , BRAKE,MASTER (Including Boot and Cap)	1
18	404174	. . GASKET, COPPER, V63477, NO. FC602	1
19	402396	. . FITTING SWIVEL, V63477, NO. FC5727	1
20	402410	. . GASKET, COPPER, V63477, NO. FC603	1
21	402397	. . FITTING, BOLT, SWIVEL, V63477, NO. FC3474	1
22	400197	. . SWITCH, LIGHT, STOP, V13445, NO. 8626HD	1
23	W-799J-204	. SPRING, RETURN, PEDAL, V12204, NO. 856339	2
24	384818	. ROD, LINK, CLUTCH	1
25	60GHP-649	. NUT, ADJUSTING, TOP (Not Threaded)	1
26	DWP-560	. PIN, SWIVEL, ROD, CLUTCH	1
27	384819	. SHAFT, THROWOUT, CLUTCH	1
28	W-10863-6	. KEY, WOODRUFF, NO. 9	1
29	50GHP-341	. LINK, CONNECTION, CLUTCH	1
30	400127	. NUT, ADJUSTING, BOTTOM (Threaded)	1

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FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
20 -			
31	401467	. BEARING, BLOCK, PILLOW, V71956, Size 3/4-INCH	1
32	384950	. BRACKET, MOUNTING, BLOCK, PILLOW	1
	387129-1	. LINE ASSEMBLY, BRAKE	1
33	30FP-975-2	. . LINE ASSEMBLY, COPPER, (Master Cylinder-to-Rear Axle)	1
34	30FP-975-7	. . LINE ASSEMBLY, COPPER, (Master Cylinder-to-Tee-Front Brakes)	1
35	30FP-975-10	. . LINE ASSEMBLY, COPPER, (Tee-to-Left Front Brake)	1
36	30FP-975-5	. . LINE ASSEMBLY, COPPER, (Tee-to-Right Front Brake)	1
37	402454	. . TEE, UNION, V79470, NO. 702 X 3	1
38	J-366	. . CLAMP, LINE, BRAKE	10
* 39	401662	. . LOCK, LINE, BRAKE, V12204, NO. 392911	3
40	30FP-1113	. . BRACKET, REAR, LINE, BRAKE	1
41	481658	. PANEL, SUPPORT, SIDE, LEFT	1
	481657	. PANEL, SUPPORT, SIDE, RIGHT	1

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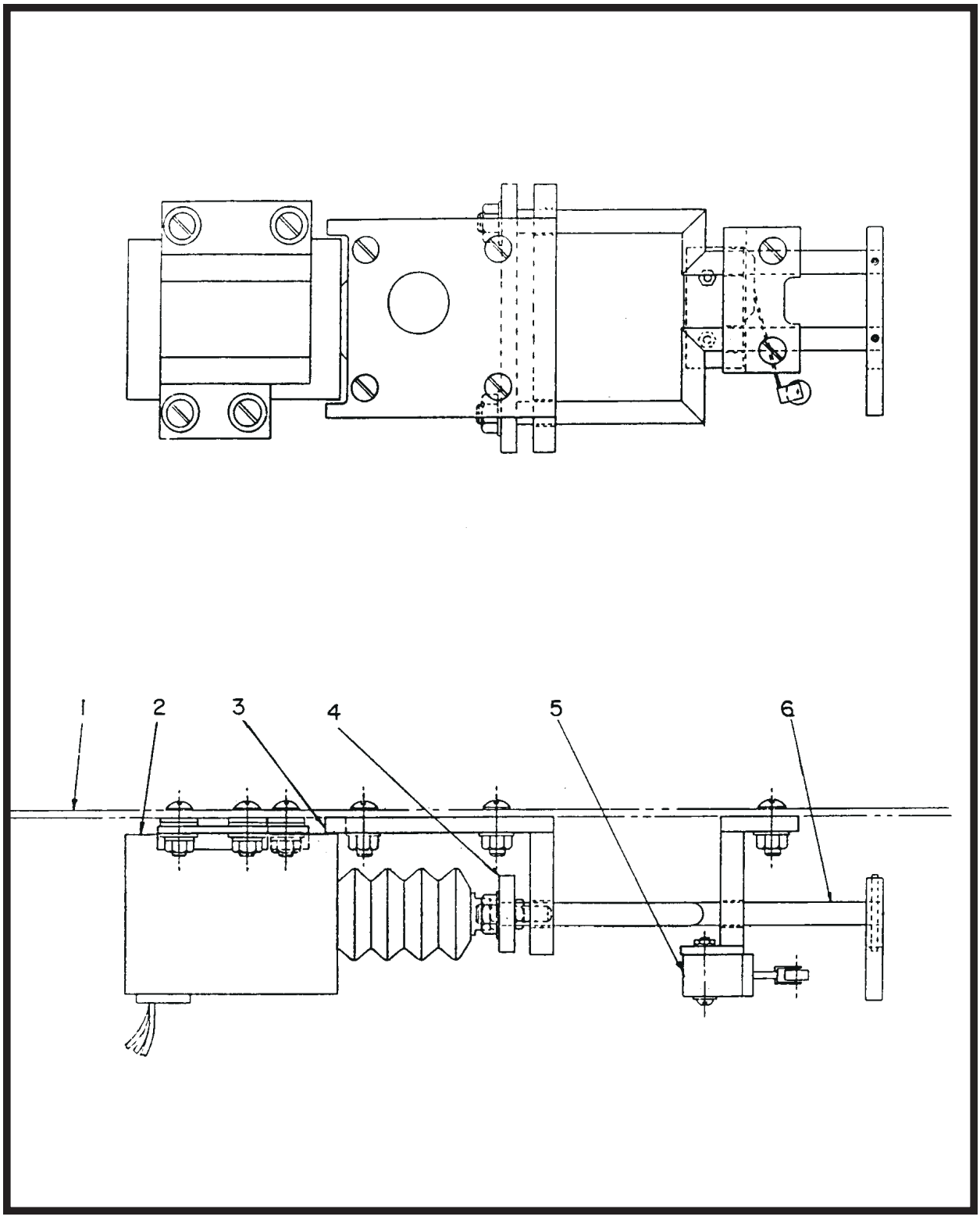

Gearshift Safety Device Group
Figure 21

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
-	**181471**	**ACTUATOR, SAFETY, GEARSHIFT, ASSY. (For NHA See Fig.)**	**REF**
1	181465	. PLATE, FLOOR, REAR SECTION, ASSY.	1
2	181456	. SOLENOID, 12-V DC	1
3	280883	. PLATE, SUPPORT, ASSY.	1
4	280877	. PLATE, ACTUATOR, SAFETY	1
5	181457	. SWITCH, SNAP	1
6	181454	. ROD AND PLATE ASSEMBLY	1
* 7	W-799F-136	. SPRING, SOLENOID	1

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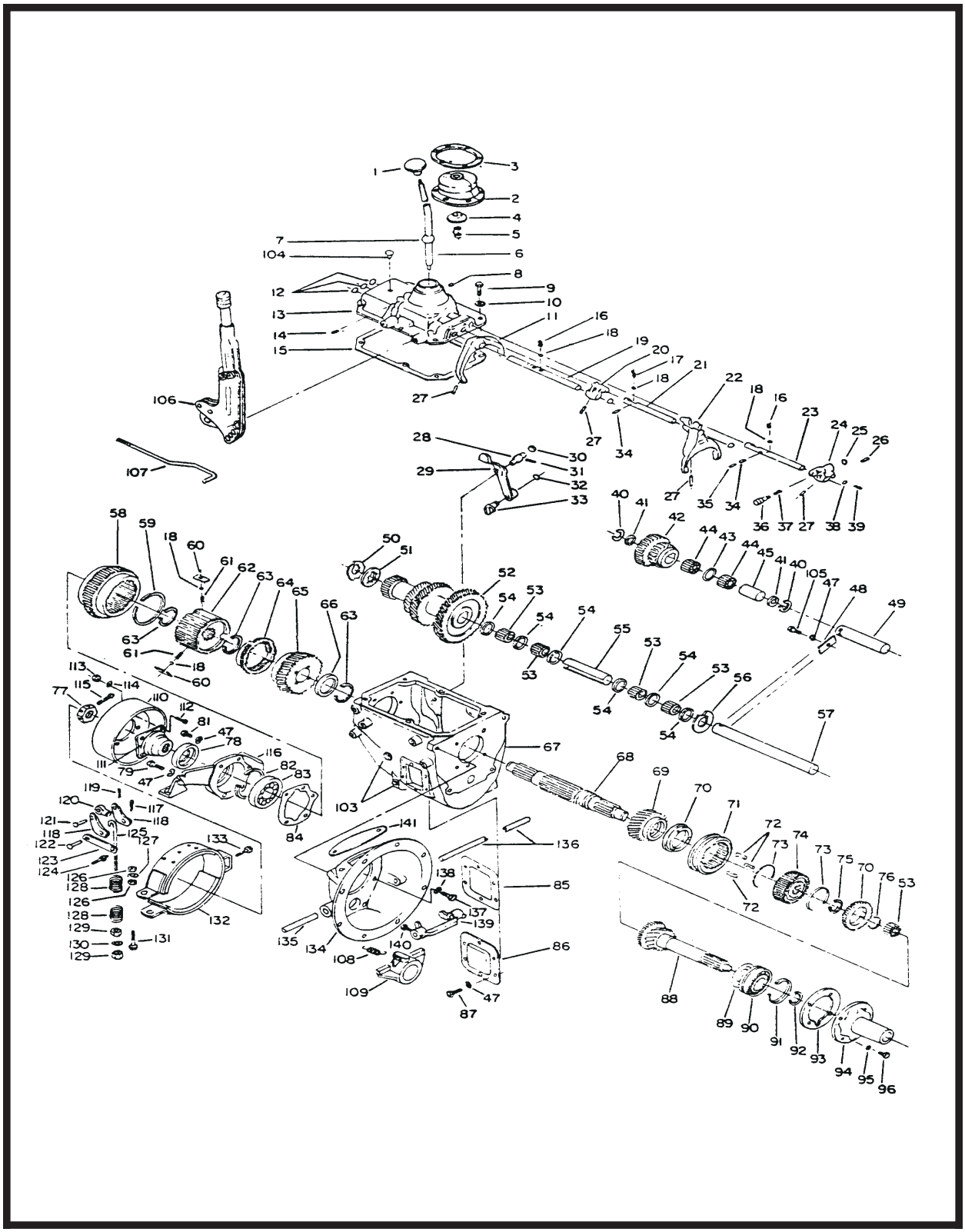


Transmission Assembly
Figure 22

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
22 -	**404309**	**TRANSMISSION ASSEMBLY, V79410, NO. 13-01-000-129 (For NHA See Fig.)**	**REF**
1	401514	. HANDBALL, LEVER, CONTROL, V79410, No. C37J-50A	1
2	76A-1119	. BOOT, GEARSHIFT, V24617, No. 3904784	1
3	76C-1120	. RETAINER, BOOT, GEARSHIFT	1
4	76A-1000	. WASHER, SPRING, LEVER, CONTROL, V79410, No. 4497H	1
5	401513	. SPRING, LEVER, CONTROL, V79410, No. 4498B	1
6	482090	. LEVER, CONTROL	1
7	76A-1001	. BALL, FULCRUM, V79410, No. C8-2-1/2C	1
8	401502	. PLUG, TAPER, V79410, No. 4572D	1
9	401507	. BOLT, HEX-HEAD, 3/8 - 16 X 7/8-INCH, V79410, No.1000-183-040	6
10	76A-1002	. LOCKWASHER, 3/8-INCH, V79410, No. 0000103321	11
11	76A-1003	. FORK, SHIFT (FIRST & SECOND) V79410, No. T-98A-24	1
12	401495	. PLUG, EXPANSION, V79410, No. 0000103892	6
13	76A-1004	. HOUSING, CONTROL, V79410, No.T98-148	1
14	76A-1005	. PIN, HOUSING, CONTROL, V79410, No. 4499B	1
15	76A-1006	. GASKET, HOUSING, CONTROL, V79410, No. T98-115	1
16	401504	. SPRING, POPPET, V79410, No. T8B-42	2
17	76A-1007	. SPRING, POPPET, (THIRD & DIRECT) V79410, No. T98A-42	1
18	401505	. BALL, STEEL, 3/8-INCH, V79410, No.0000453593	4
19	76A-1008	. RAIL, SHIFT, (FIRST & SECOND) V79410, No. 1301-100-007	1
20	76A-1009	. END, RAIL, SHIFT, (FIRST & SECOND) V79410, No. 1301-196-001	1
21	76A-1010	. RAIL, SHIFT, (THIRD & DIRECT), V79410, No. T10-20	1
22	76A-1011	. FORK, SHIFT, (THIRD & DIRECT), V79410, No. T98A-23	1
23	76A-1012	. RAIL, SHIFT, (REVERSE) V79410, No. T-98A-99A	1
24	76A-1013	. END, RAIL, SHIFT, (REVERSE), V79410, No. T18-37	1
25	76A-1014	. WASHER, “C”, PLUNGER, REVERSE, V79410, No. 4747B	1
26	76A-1015	. PIN, COTTER, 1/8-INCH X 7/8-INCH V79410, No. 0000108630	1
27	76A-1016	. PIN, SPRING, 3/8-INCH X 1-1/8-INCH V79410, No. 0000273503	4

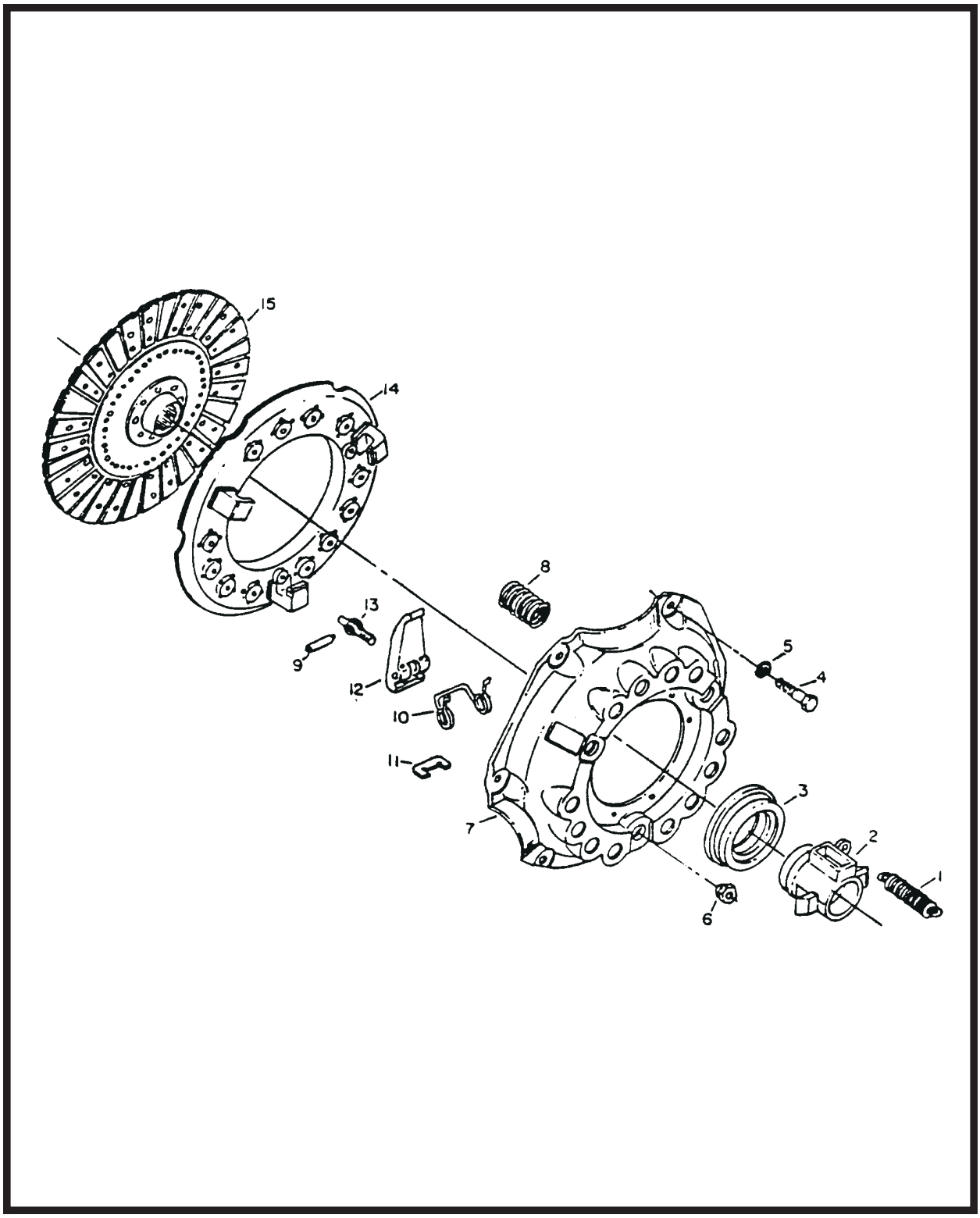
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
22 -			
28	76A-1017	. PIVOT, ARM, SHIFTING, V79410, No. T98-55N	4
29	76A-1018	. ARM, SHIFTING, REVERSE, V79410, No. T98-54N	1
30	76A-1019	. SEAL, OIL, V79410, No. T89B-108	1
31	76A-1020	. PIN, TAPER, V79410, No. 0000103565	1
32	76A-1021	. WASHER, “C”, SHOE, SHIFTING, V79410, No. 4747A	1
33	76A-1022	. SHOE, SHIFTING, REVERSE, V79410, No. T19-51	1
34	76A-1023	. PLUNGER, INTERLOCK, V79410, No. T8-86	2
35	76A-1024	. PIN, INTERLOCK, V79410, No. T97-86	1
36	76A-1025	. PLUNGER, REVERSE, V79410, No. 1309-156-003	1
37	76A-1026	. SPRING, PLUNGER, REVERSE, V79410, No. 1309-1-56-003	1
38	76A-1027	. BALL, STEEL, V79410, No. 1000-109-001	1
39	76A-1028	. SPRING, POPPET, V79410, No. 4750	1
40	76A-1029	. RING, SNAP, REVERSE IDLER GEAR, V79410, No. 4828F	2
41	76A-1030	. WASHER, THRUST, REVERSE IDLER V79410, No. T98-84A	2
42	76A-1031	. GEAR, IDLER, REVERSE, V79410, No. 1AT18-10	1
43	76A-1032	. SPACER, ROLLER , IDLER, REVERSE, V79410, No. T98-87A	1
44	76A-1033	. BEARING, ROLLER, V79410, No. F1-42	74
45	76A-1034	. SLEEVE, SHAFT, IDLER, REVERSE, V79410, No. T98-85A	1
* 46	76A-1035	. BUSHING, GEAR, IDLER, REVERSE, V79410, No. 13-01-127-001	1
47	76A-1036	. LOCKWASHER, 3/8-IN., V79410, No. 0000114606	6
48	76A-1037	. PLATE, LOCK, IDLER & COUNTERSHAFT V79410, No. T97-48	1
49	76A-1038	. SHAFT, IDLER, REVERSE, V79410, No. T9-35	1
50	76A-1039	. WASHER, THRUST, REAR COUNTERSHAFT, V79410, No. T98-33	1
51	76A-1040	. WASHER, THRUST, COUNTERSHAFT, V79410, No. T18-32	1
52	76A-1041	. GEARS, COUNTERSHAFT, V79410, No. T18-8	1
53	76A-1042	. BEARING, ROLLER, V79410, No. T97-166	88
54	76A-1043	. SPACER, BEARING, GEAR, COUNTERSHAFT V79410, No. T97-29	1
55	76A-1044	. SPACER, BEARING, COUNTERSHAFT, V79410, No. T98-28A	1
56	76A-1045	. WASHER, THRUST, FRONT COUNTERSHAFT V79410, No. T98-30	1
57	76A-1046	. COUNTERSHAFT, V79410, No. T18-3	1
58	76A-1047	. GEAR, LOW & SECOND SPEED, V79410, No.T8-12 (1301-070-003)	1

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
22 -			
59	76A-1048	. RING, RETAINING, PLATE, SHIFT, V79410, No. 4773 (1301-070-003)	1
60	76A-1049	. PLATE, SHIFTING, V79410, No. T98-82	1
61	76A-1050	. SPRING, V79410, No. T87D-42A (1301-090-001)	3
62	76A-1051	. HUB, CLUTCH, LOW & SECOND SPEED, V79410, No. T98-80	1
63	76A-1052	. RING, SNAP, SHAFT, MAIN, V79410, No. 4/45D	3
64	76A-1053	. RING, BLOCKING, SYNCHRONIZER, V79410, No. T98-83	2
65	76A-1054	. GEAR, SECOND SPEED, MAIN SHAFT, V79410, No. 1301-080-010	1
66	76A-1055	. WASHER, THRUST, SECOND SPEED GEAR, V79410, No. T98-63	1
67	76A-1056	. CASE, TRANSMISSION, V79410, No. T98-IN	1
68	76A-1057	. SHAFT, MAIN, V79410, No. 1301-171-008	1
69	76A-1058	. GEAR, THIRD SPEED, MAIN SHAFT, V79410, No. T18-11	1
70	401476	. RING, BLOCKING, SYNCHRONIZER, V79410, No. T87D-14	2
71	No Number	. SLEEVE, CLUTCH, DIRECT & THIRD, (Part of Item 74)(Order Assembly)	1
72	401472	. PLATE, SHIFTING, V79410, No. T95-13	3
73	76A-1059	. SPRING, SYNCHRONIZER, V79410, No. 4682AN	2
74	401470	. SYNCHRONIZER ASSEMBLY, THIRD & HIGH V79410, No. 1AT87D-2-1/2C	1
75	401477	. RING, SNAP, HUB, CLUTCH, V79410, No. 4746	1
76	76A-1060	. SPACER, BEARING, V79410, No. T97-29	1
77	76A-1061	. NUT, MAIN SHAFT, V79410, No. 4775W	1
78	401579	. SEAL, OIL, V79410, No. T9-110	1
79	76A-1062	. BOLT, HEX-HEAD, 3/8 - 16 X 1-7/8-INCH, V79410, No. 0000179846	1
80	76A-1063	. BOLT, HEX-HEAD, 1/2 - 13 X 1-3/8-INCH V79410, No. 0000179884	1
81	76A-1064	. BOLT, HEX-HEAD, 3/8 - 16 X 1	4
82	76A-1065	. RING, SNAP, BEARING, V79410, No. 4745E	1
83	76A-1066	. BEARING, ANNULAR, V79410, No. B308AG	1
84	76A-1067	. GASKET, RETAINER, BEARING, MAIN SHAFT, V79410, No. T98-145-1/2C	1
85	76A-1068	. GASKET, COVER, OPENING, POWER V79410, No. T9-150	1
86	76A-1069	. COVER, OPENING, POWER, V79410, No. T53-160B	1 1
87	76A-1070	. BOLT, HEX-HEAD, 3/8 - 16	

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
22 -			
88	76A-1071	. GEAR, MAIN DRIVE, V79410, No. T18-16C	1
89	76A-1072	. BAFFLE, OIL MAIN DRIVE GEAR, V79410, No. T90A-136A	1
90	76A-1073	. BEARING, ANNULAR, V79410, No. B308AMGS	1
91	76A-1074	. RING, SNAP, BEARING, V79410, No. 4745E	1
92	76A-1075-1	. RING,SNAP, MAIN DRIVE GEAR (SELECTIVE) V79410, No. 4816	1
	76A-1075-2	. RING,SNAP, MAIN DRIVE GEAR (SELECTIVE) V79410, No. 4816A	1
	76A-1075-3	. RING,SNAP, MAIN DRIVE GEAR (SELECTIVE) V79410, No. 4816B	1
	76A-1075-4	. RING,SNAP, MAIN DRIVE GEAR (SELECTIVE) V79410, No. 4816C	1
93	76A-1076	. GASKET, RETAINER, BEARING, MAIN DRIVE GEAR, V79410, No. T98-145C	1
94	76A-1077	. RETAINER, BEARING, MAIN DRIVE GEAR V79410, No. T98-6N	1
95	401508	. LOCKWASHER, 5/16-INCH, V79410, No. 000114605	4
96	76A-1078	. BOLT, OIL SEAL, HEX-HEAD, 5/16 - 18 X 3/4-IN. V79410, No. 4776A	4
* 97	76A-1079	. BOLT, HEX-HEAD, 5/16 - 18 X 7/8-IN. V79410, No. 0000179817	4
* 98	76A-1080	. LOCKWASHER, 1/2-INCH, V79410, No. 0000103323	5
* 99	76A-1081	. LOCKWASHER, 1/2-INCH, (Used with studs) V79410, No. 0000135629	4
* 100	76A-1082	. NUT,1/2 - 20, (Used with studs) V79410, No. 0000120371	4
* 101	76A-1083	. TUBE, OIL, V79410, No. T18-27	1
* 102	76A-1084	. BOLT, HEAD, HEX, 3/8 - 16 X 3/4 V79410, No. 0000179387	1
103	76A-1085	. PLUG, 3/4-INCH, V79410, No. 0000444592	2
104	76A-1086	. BREATHER, V79410, No. T9495	1
105	76A-1087	. MAGNET, V79410, No. 4915	1
106	380471	. LEVER, HANDBRAKE	1
107	481839	. ROD, CONNECTING, HANDBRAKE	1
108	W-799G-165	. SPRING (See Clutch Group)	REF
109	50GHP-464	. SLEEVE ASSEMBLY, RELEASE (See Clutch Group)	REF
	76A-1114	. BRAKE, DRUM & FLANGE ASSY., V79410, No. A6001	1
110	76A-1088	. . DRUM, BRAKE, V79410, No. 4508RR	1

*** Not Illustrated**

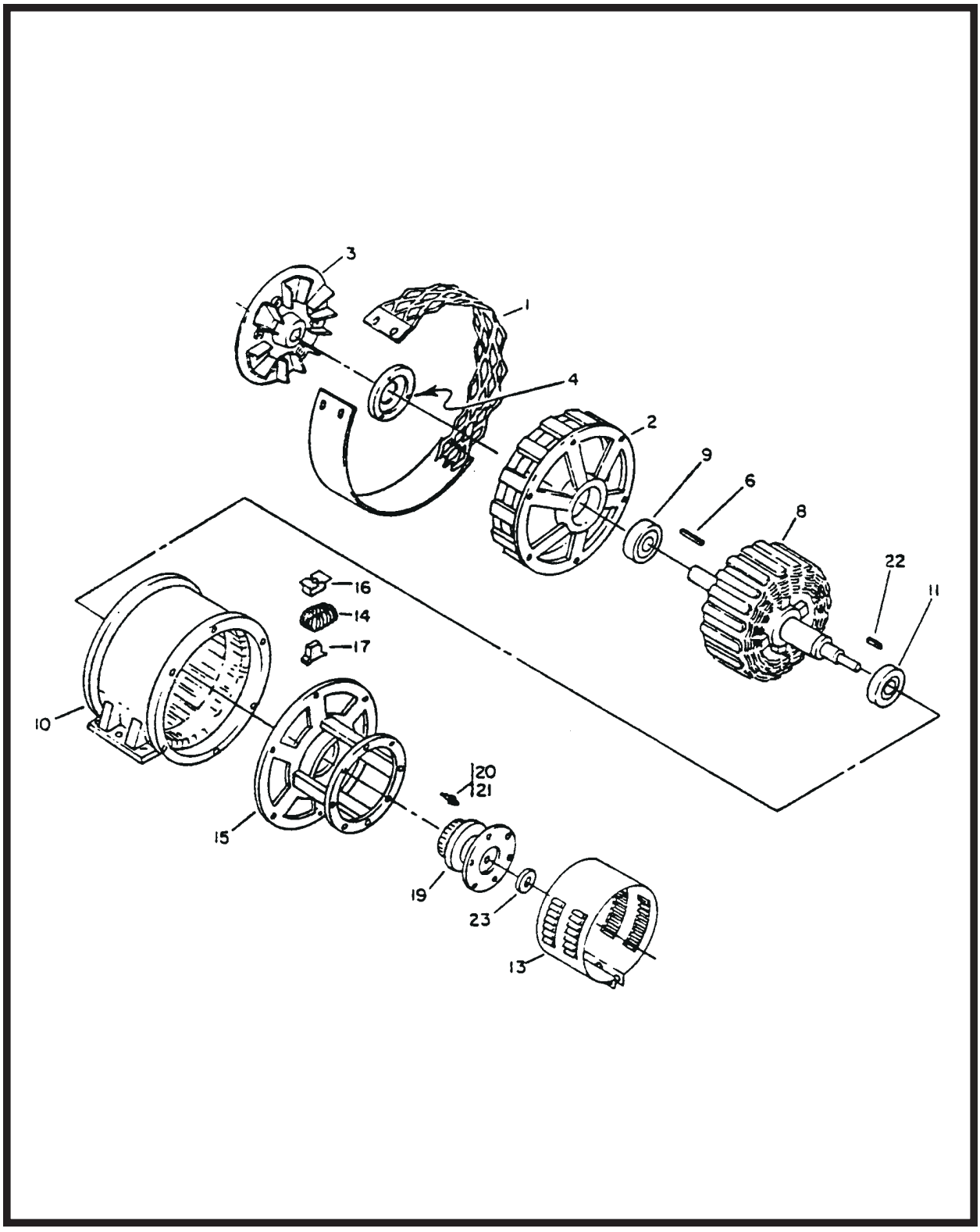
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
22 -			
111	76A-1089	. . FLANGE, V79410, No. 6001	1
112	76A-1090	. . BOLT, DRUM, BRAKE, V79410, No. 4620Y	4
113	76A-1091	. . NUT, DRUM, BRAKE, V79410, No. 4775AA	4
114	76A-1092	. . WASHER, LOCK, V79410, No. 114607	4
	76A-1093	. KIT, ASSEMBLY, BRAKE AND RETAINER, V79410, No. 13-33-420-001	1
115	76A-1094	. . PIN, COTTER, 1/8-IN. X 1-3/4-IN. V79410, No. 0000103388	1
	76A-1095	. . BRAKE ASSEMBLY, PARK & BEARING RETAINER, V79410, No. 13-33-557-006	1
116	76A-1096	. . . RETAINER, MAIN SHAFT, BEARING V79410, No. T98-7H	1
117	76A-1097	. . . PIN, COTTER, V79410, No. 0000108630	1
118	401585	. . . CAM, BRAKE LEVER, V79410, No. A22-2D	2
119	76A-1098	. . . PIN, COTTER, V79410, No. 0000103373	1
120	401589	. . . END, BRAKE, ROD ADJUSTMENT, V79410, No. A22-16-1/2C	1
121	76A-1099	. . . PIN, ROD END, V79410, No. X1288	1
122	76A-1100	. . . PIN, CAM, LEVER, V79410, No. X1290F	1
123	76A-1101	. . . LINK, BRAKE, SPACER, V79410, No. A23-20H	1
124	76A-1102	. . . STUD, LINK, V79410, No. 4429E	1
125	76A-1103	. . . BOLT, BRAKE ADJUSTING, V79410, No. A22-7A	1
126	76A-1104	. . . NUT, V79410, No. 0000120375	2
127	76A-1105	. . . WASHER, LOCK, V79410, No. 0000120380	1
128	402298	. . . SPRING, BRAKE RELEASE V79410, No. A26-9	2
129	76A-1106	. . . NUT, V79410, No. 0000272122	2
130	76A-1107	. . . WASHER, LOCK, V79410, No. 0000120383	1
131	76A-1108	. . . BOLT , V79410, No. 4667	1
132	401591	. . . BAND, BRAKE, V79410, No. 4AA24-12	1
133	76A-1109	. . . BOLT, ANCHOR CLIP, V79410, No. X821K	1
134	76A-1110	. HOUSING, CLUTCH, V79410, No. T18-1-1/2B	1
135	401573	. SHAFT, SHORT, THROWOUT V79410, No. T64-310	1
136	401574	. SHAFT, LONG, THROWOUT V79410, No. T9-311M	1
137	76A-1111	. BOLT, HEX-HEAD, 1/2-13 X 1-1/4, V79410, No. 0000179883	6
138	76A-1112	. WASHER, LOCK, 1/2-INCH, V79410, No. 0000103323	6
139	401569	. YOKE, THROWOUT, V79410, No. T64J-360D	1
140	401575	. SCREW, LOCK, V79410, No. 5573	2
141	76A-1113	. COVER, HARD HOLE V79410, No. T64J74D	1



Clutch Group
Figure 23

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
23	**No Number**	**CLUTCH GROUP (For NHA See Fig 3)**	**REF**
1	W-799G-165	. SPRING	1
**	50GHP-464	. SLEEVE ASSEMBLY, RELEASE	1
2	No Number	. . SLEEVE, RELEASE, V71000, No. CL-2394	1
3	No Number	. . BEARING, BALL, V71000, No. A2256-14	1
4	No Number	. BOLT, HEX-HEAD, 3/8-INCH - 16 X3/4-INCH	6
5	No Number	. WASHER, LOCK, 3/8-INCH	6
	384255	. COVER ASSEMBLY, CLUTCH	1
6	No Number	. . NUT, HEX, V71000, No. 4905	3
7	30GHP-346	. . COVER, CLUTCH, V71000, No. 7418	1
8	No Number	. . SPRING, PRESSURE, CLUTCH, V71000, No. 5955	12
9	No Number	. . PIN, RELEASE, LEVER, V71000, No. 3696	3
10	No Number	. . SPRING, ANTI-RATTLE, V71000, No. 3721	3
11	No Number	. . STRUT, LEVER, RELEASE, V71000, No. 6762	3
12	No Number	. . LEVER, RELEASE, V71000, No. 4079	3
13	No Number	. . EYEBOLT, V71000, No. 6761	3
14	No Number	. . PLATE, PRESSURE, V71000, No. 6964	1
15	50GHP-465-0	. PLATE ASSEMBLY, DRIVEN	1

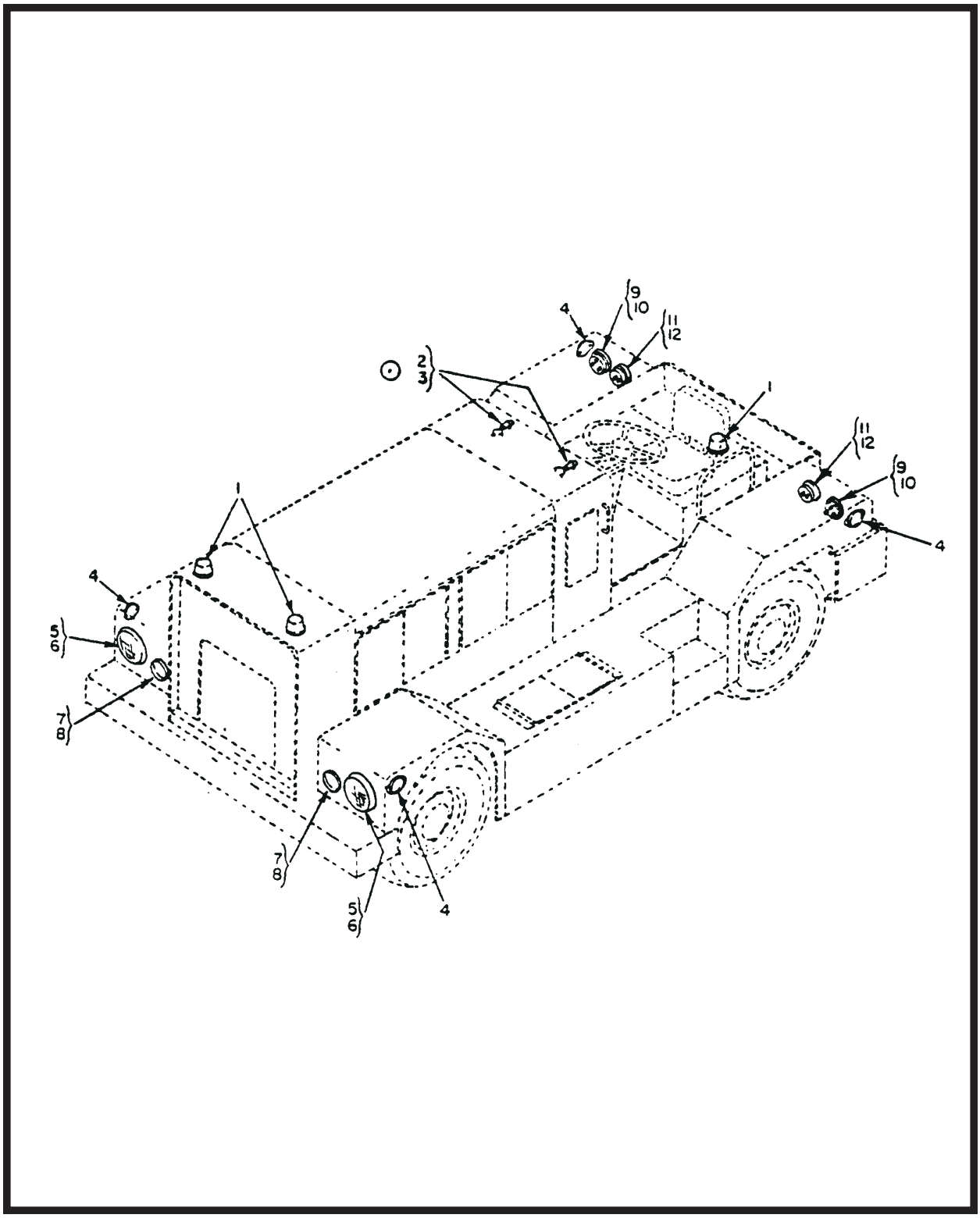
*** Serviced only as a complete assembly**



Generator Group
Figure 24

FIGURE ITEM NO	HOBART PART NO.	NOMENCLATURE 1234567		UNITS PER ASSY
24 -	**489343**	**. GENERATOR ASSY (For NHA See Fig. 3)**	**A**	**REF**
	489343A	**. GENERATOR ASSY (For NHA See Fig. 3)**	**B**	**REF**
1	387256A	. COVER, FAN, HOUSING		1
2	387249-1	. HOUSING, FAN, ASSEMBLY		1
3	480235A	. FAN & COUPLING ASSEMBLY		1
4	481940	. BRACKET, RETAINING, BEARING		1
* 5	481379	. KEY, EXCITER		1
6	480646	. KEY, FLEXIBLE, COUPLING		1
* 7	16DA-4249-11	. RING, RETAINER		1
8	386772	. ARMATURE, AC/DC	A	1
	181788	. ARMATURE, AC/DC	B	1
9	281536	. BEARING, FRONT	A	1
	W-10072-68	. BEARING, FRONT	B	1
10	380520-6	. HOUSING & STATOR ASSEMBLY		1
11	W-10072-1	. BEARING, REAR		1
* 12	50GHP-19	. BUSHING, ARMATURE		1
13	384204	. COVER, EXCITER HOUSING		1
14	Data 3190	. COIL, FIELD, EXCITER		1
15	384183A-2	. HOUSING, EXCITER		1
16	100NH-3	. INSULATION, EXCITER		4
17	100NH-2	. POLEPIECE		4
* 18	385950	. INSULATION, TOE		16
19	384178-2	. CORE, ARMATURE ASSEMBLY		1
20	W-10875-1	. . DIODE, SILICON, 35 AMP, NEGATIVE BASE V51589 #ST46ON		3
21	W-10874-1	. . DIODE, SILICON, 35AMP, POSITIVE BASE V51589 #ST460P		3
* 22	386612	. RING, SPACER, COUPLING		1

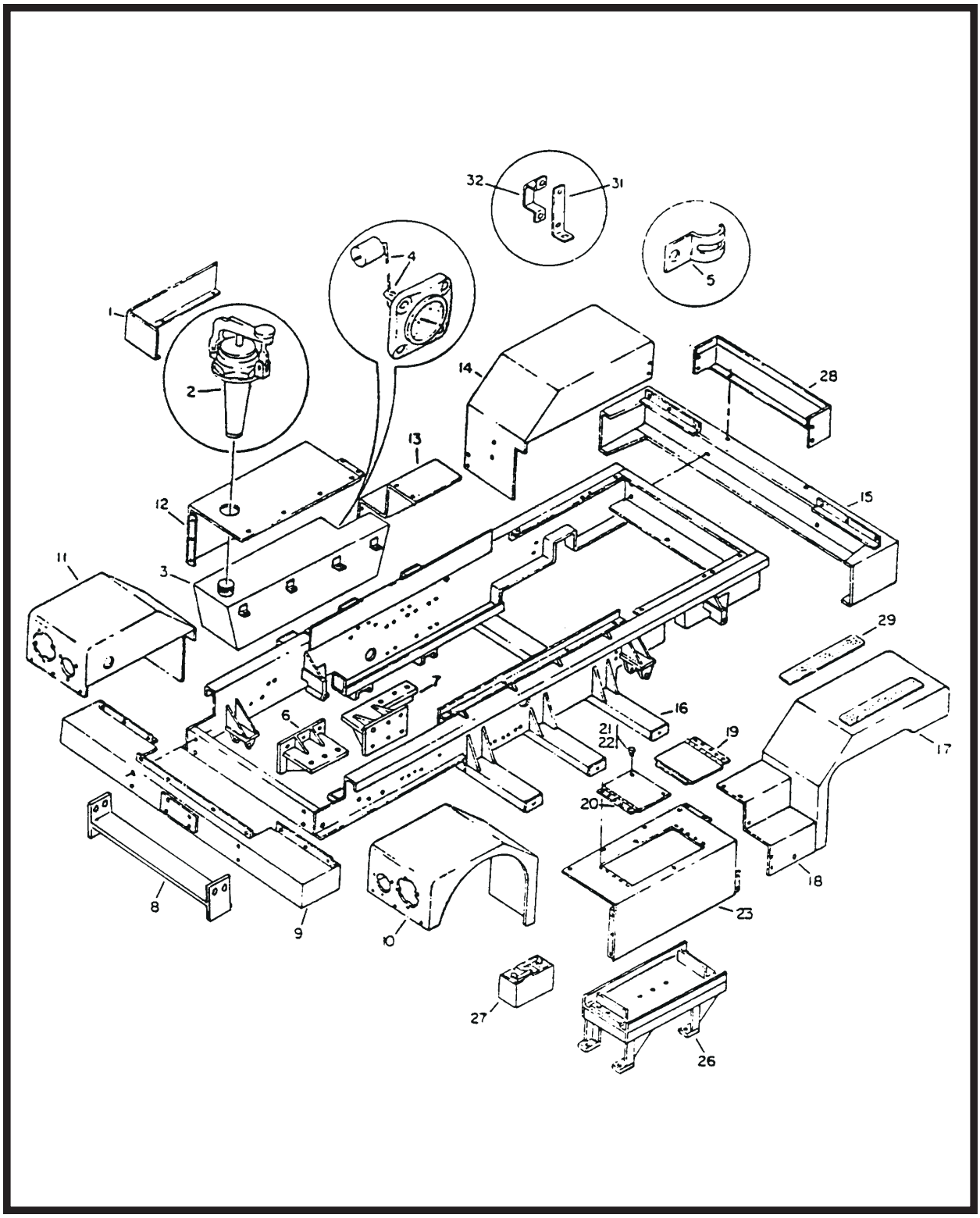
*** Not Illustrated**



Vehicular Lights Group
Figure 25

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
25	**No Number**	**VEHICULAR LIGHTS GROUP (For NHA See Fig 3)**	**REF**
1	404101-1	. LIGHT, CLEARANCE, V75175, No. 514-0168	3
2	82B-1047	. LIGHT, PANEL, V75175, No. 261-3306	REF
3	53GHP-206	. . LAMP, INCANDESCENT, 12-V, V08108, No. 67	REF
4	DWP-1804-1	. REFLECTOR, INDICATING, CLEARANCE, V75175, No. KD-333, RED	4
5	30GHP-355	. HEADLIGHT, V73331, No. 898305	2
6	No Number	. . LAMP, SEALED-BEAM, V73331, No. 5947212	1
7	401950	. DIRECTIONAL LIGHT, VEHICULAR, V75175, No. KD766A-12	2
8	No Number	. . LAMP, INCANDESCENT, V08108, No. 1073	1
9	401949	. STOPLIGHT-TAIL LIGHT, VEHICULAR, V75175, No. KD766ST-12	2
10	No Number	. . LAMP, INCANDESCENT, V08108, No. 1034	1
11	402350	. LIGHT, BACK-UP, V75175, No. KD766-2338-12	2
12	No Number	. . LAMP, INCANDESCENT, V08108, No. 1073	1
* 13	481989A	. HARNESS, WIRE, HEADLIGHTS	1
* 14	481990A	. HARNESS, WIRE, TAIL LIGHTS	1
* 15	481992A	. HARNESS, WIRE, SWITCHES	1
* 16	482091A	. HARNESS, WIRE, PLUG BOXES	1
* 17	DWP-1800-4	. LIGHT, SPOT, V75175, No. 894-3301	REF

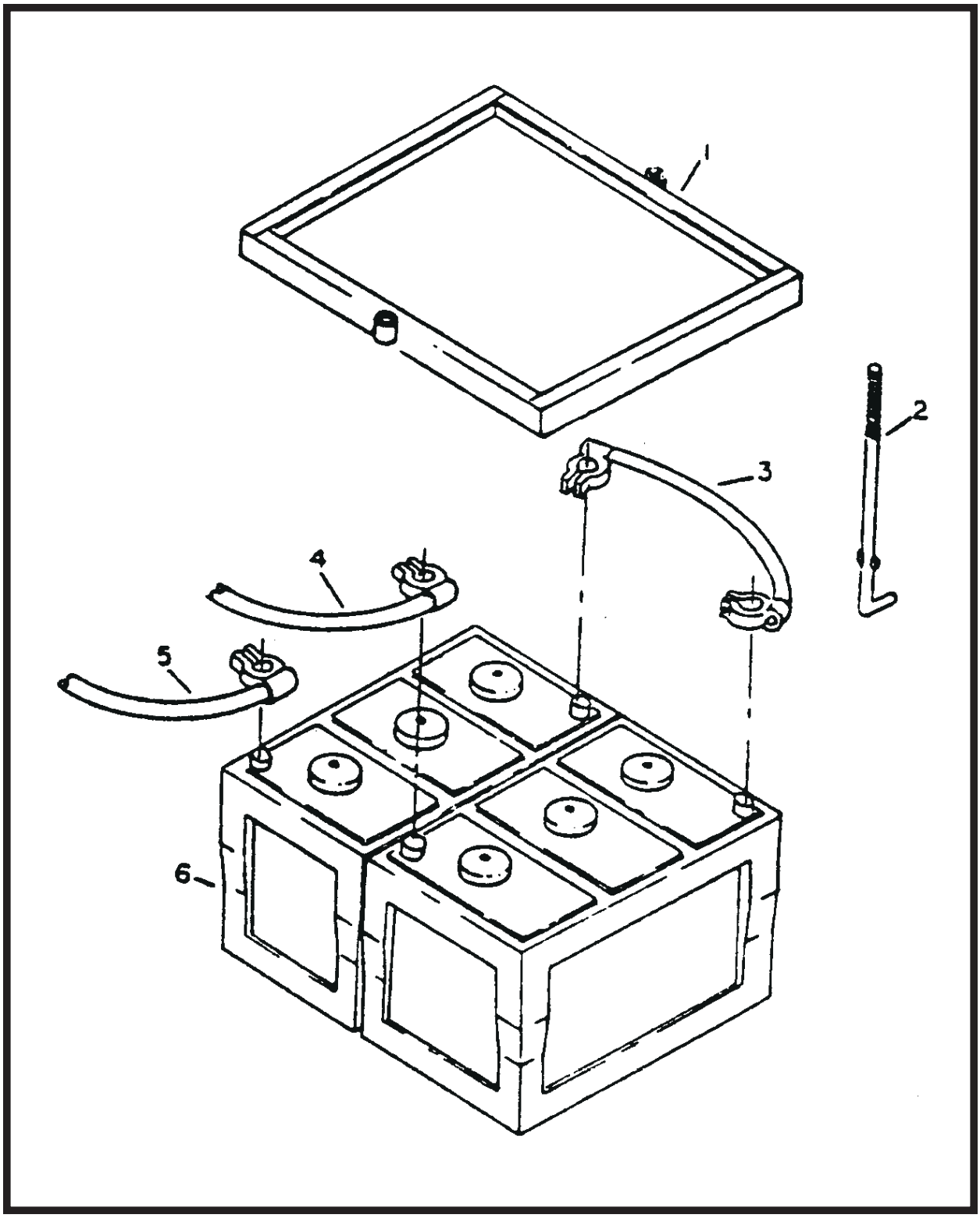
*** Not Illustrated**



Body and Frame Group
Figure 26

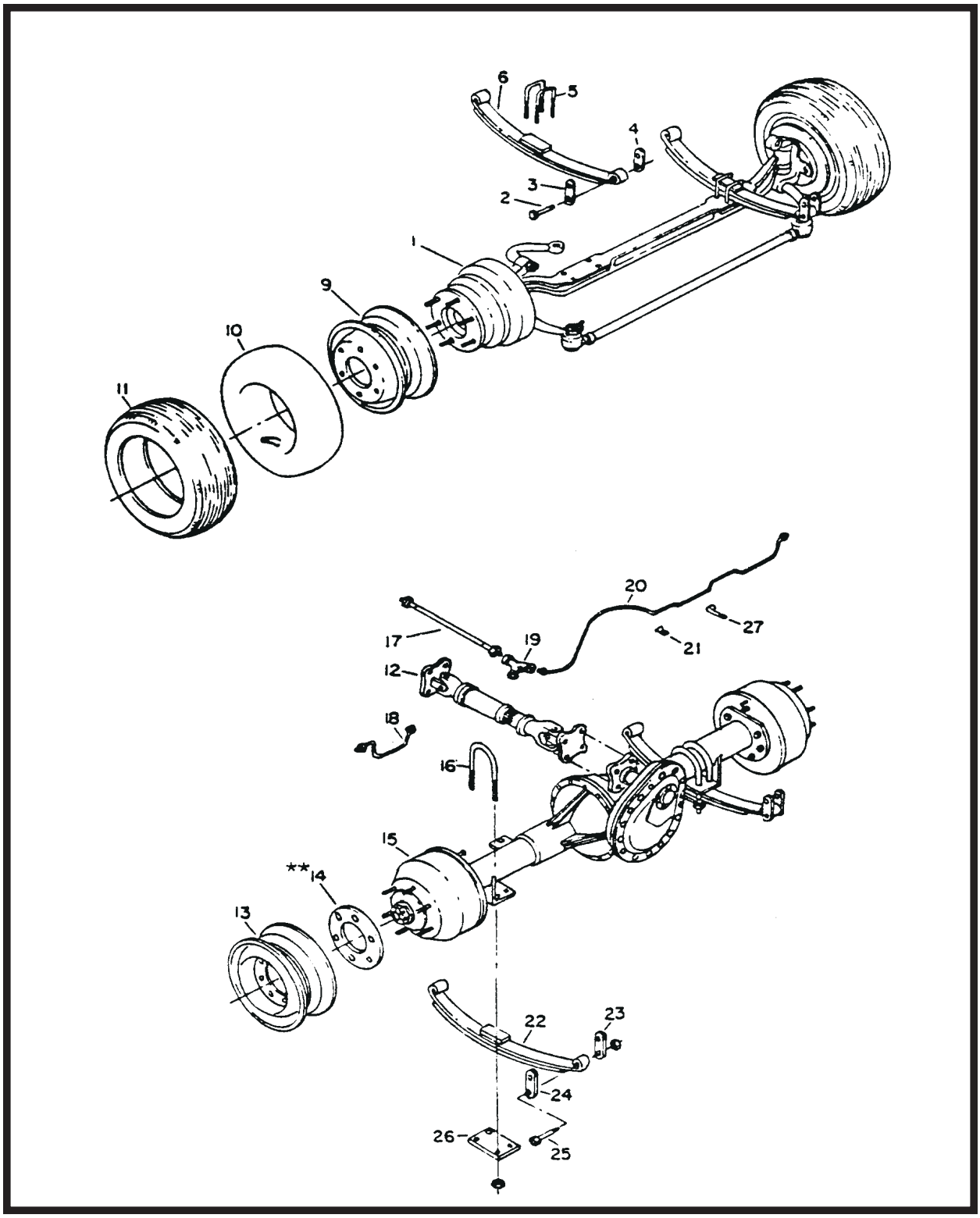
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567		UNITS PER ASSY
26	**No Number**	**BODY AND FRAME GROUP (For NHA See Fig 3)**		**REF**
1	389809	. BOX, CABLE		REF
2	76A-1152	. CAP, STRAINER, FUEL, V49234, No. 1275B		1
3	482561	. TANK, ASSEMBLY, FUEL		1
4	481690	. . GAGE, FUEL (Gasket furnished with gage)		1
5	W-11330	. CLAMP, HARNESS, WIRE		12
6	388848	. SUPPORT ASSEMBLY, GENERATOR, RIGHT		1
7	388808	. SUPPORT ASSEMBLY, GENERATOR, LEFT		1
8	280801	. SUPPORT, ENGINE, FRONT		1
9	181400	. . BUMPER ASSEMBLY, FRONT		1
10	481697	. . FENDER ASSEMBLY, LEFT, FRONT		1
11	481698	. . FENDER ASSEMBLY, RIGHT, FRONT		1
12	481699	. . SIDE ASSEMBLY, RIGHT		1
13	481702	. . STEP ASSEMBLY, SIDE, RIGHT		1
14	482049	. . FENDER ASSEMBLY, RIGHT, REAR		1
15	482051	. . BUMPER ASSEMBLY, REAR		1
16	181403	. . FRAME ASSEMBLY, MOUNTING		1
17	482050	. . FENDER ASSEMBLY, LEFT, REAR		1
18	481703	. . STEP ASSEMBLY, SIDE, LEFT		1
	481701	. . SIDE ASSEMBLY, LEFT		1
19	481720	. . . DOOR ASSEMBLY, ACCESS, REAR		1
20	481723	. . . DOOR ASSEMBLY, ACCESS, FRONT		1
21	HF-530	. . . KNOB, FASTENING, DOOR		2
22	W-11250	. . . WASHER, RETAINING		1
23	481722	. . . SIDE ASSEMBLY, BODY		1
* 24	402037-15	. . GROMMET, RUBBER, V02231, No. AN931-B14-26		2
* 25	384851	. . ANGLE, MOUNTING, TANK, FUEL		4
26	388771A	. SUPPORT ASSEMBLY, BATTERY		1
27	No Number	. BATTERY GROUP (For Details See Fig. 27)		1
28	481662	. PANEL, EXTENSION, CABLE STORAGE		1
29	481709	. KIT, INSTALLATION, TREAD, SAFETY		1
* 30	402037-4	. GROMMET, RUBBER, V02231, No. AGW-5001		1
31	60GHP-416	. BRACKET, CLAMP, CABLE		2
32	60GHP-1040	. CLAMP, CABLE		REF
* 33	430278	. GROMMET, RUBBER, V89616, No. TPR-1812		2
* 34	381441	. HITCH, TOWING, FRONT, ASSEMBLY	A	1
* 35	76A-1361	. HITCH, TOWING, REAR, ASSEMBLY	A	1

*** Not Illustrated**



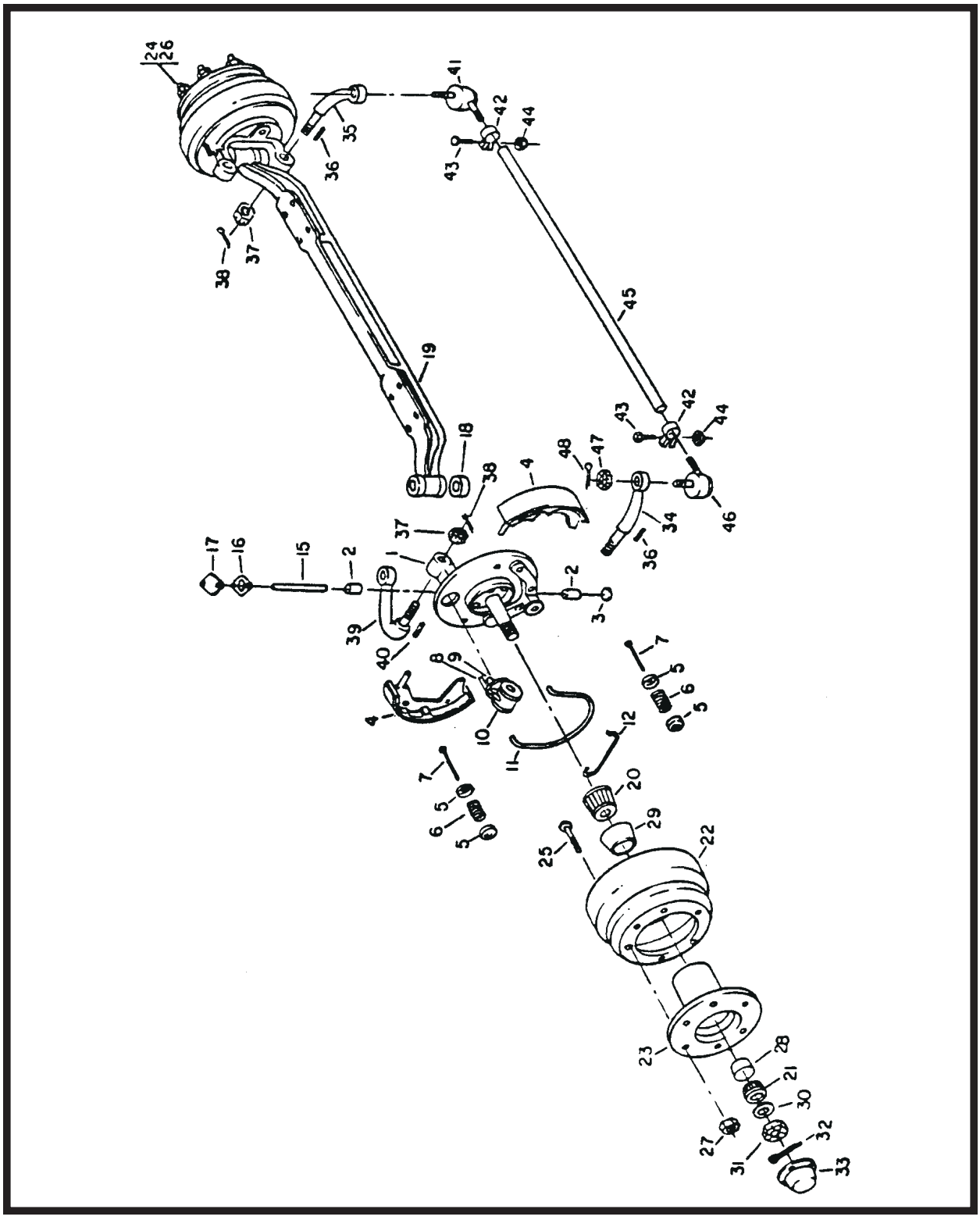
Battery Group
Figure 27

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
27	**No Number**	**BATTERY GROUP (For NHA See Fig 30)**	**REF**
1	480351	. CLAMP, HOLD-DOWN, BATTERY	1
2	5CW-2048	. RODS, CLAMP, BATTERY	2
3	388830	. CABLE, CONNECTION, BATTERY	1
4	388828-3	. CABLE, GROUND, BATTERY	1
5	388827-6	. CABLE, POSITIVE, BATTERY	1
6	403492-2	. BATTERY, STORAGE, 6-VOLT,	1
		AABM Group 7d, Type hdd-70	2



Front and Rear Axle Group
Figure 28

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
28	**No Number**	**AXLE GROUP, FRONT & REAR (For NHA, See Fig 1)**	**REF**
	389758	. AXLE ASSEMBLY, FRONT, COMPLETE (Includes leaf springs and brake line hoses)	1
1	402208	. . AXLE ASSEMLY, FRONT,V78500, No. FC-903-FSHX-1 (For details see Fig.33)	1
2	402279	. . BOLT, HANGER, SPRING, V78500, No. C52-56	6
3	384840	. . HANGER, SPRING	2
4	384841	. . HANGER, SPRING	2
5	384839	. . U-BOLT, MOUNTING, SPRING	4
6	402210	. . SPRING, 2-LEAF, V76534, No. 6MC-08	2
* 7	401660	. . HOSE, BRAKE LINE, V79470, No. 012201-004600-01528	2
* 8	403895	. . FITTING, HOSE ADAPTER, V63477, No. FC-3963	2
9	384836	. WHEEL. FRONT, 5.50 X 16	2
10	400753	. TUBE, INNER, PNEUMATIC, FRONT & REAR 7:00 X 16	4
11	402522	. TIRE, RUNBBER, FRONT & REAR, 6-PLY, 7:00 X 16	4
12	402222	. SHAFT ASSEMBLY, DRIVE, V78992, No. 7260-116	1
** 13	82C-1020	. WHEEL, REAR, 5.50 X 16	2
** 14		DELETED	
	384233	. AXLE ASSEMBLY, REAR, COMPLETE (Includes leaf springs and brake line hoses)	1
15	402209	. . AXLE ASSEMLY, REAR,V78500, No.TA-267-FHX-26 (For details see Fig.34)	1
16	384844	. . U-BOLT, MOUNTING, SPRING	4
17	401660	. . HOSE, BRAKE LINE, V79470, No. 012201-004600-01528	1
18	481607-1	. . LINE, BRAKE	1
19	404240	. . FITTING, TEE, V63477,No. FC-3048	1
20	481607-2	. . LINE, BRAKE	1
21	J-366	. . CLAMP, LINE, BRAKE	1
22	402210	. . SPRING, 2-LEAF, V76534, No. 6MC-08	2
23	384841	. . HANGER, SPRING	2
24	384840	. . HANGER, SPRING	2
25	402279	. . BOLT, HANGER, SPRING, V78500, No. C52-56	6
26	384847	. . PLATE, MOUNTING, SPRING	2
27	12CW-908	. . CLAMP	2
28	W-11097-35	. BOLT, DRIVE-SHAFT	4



Front Axle Assembly
Figure 29

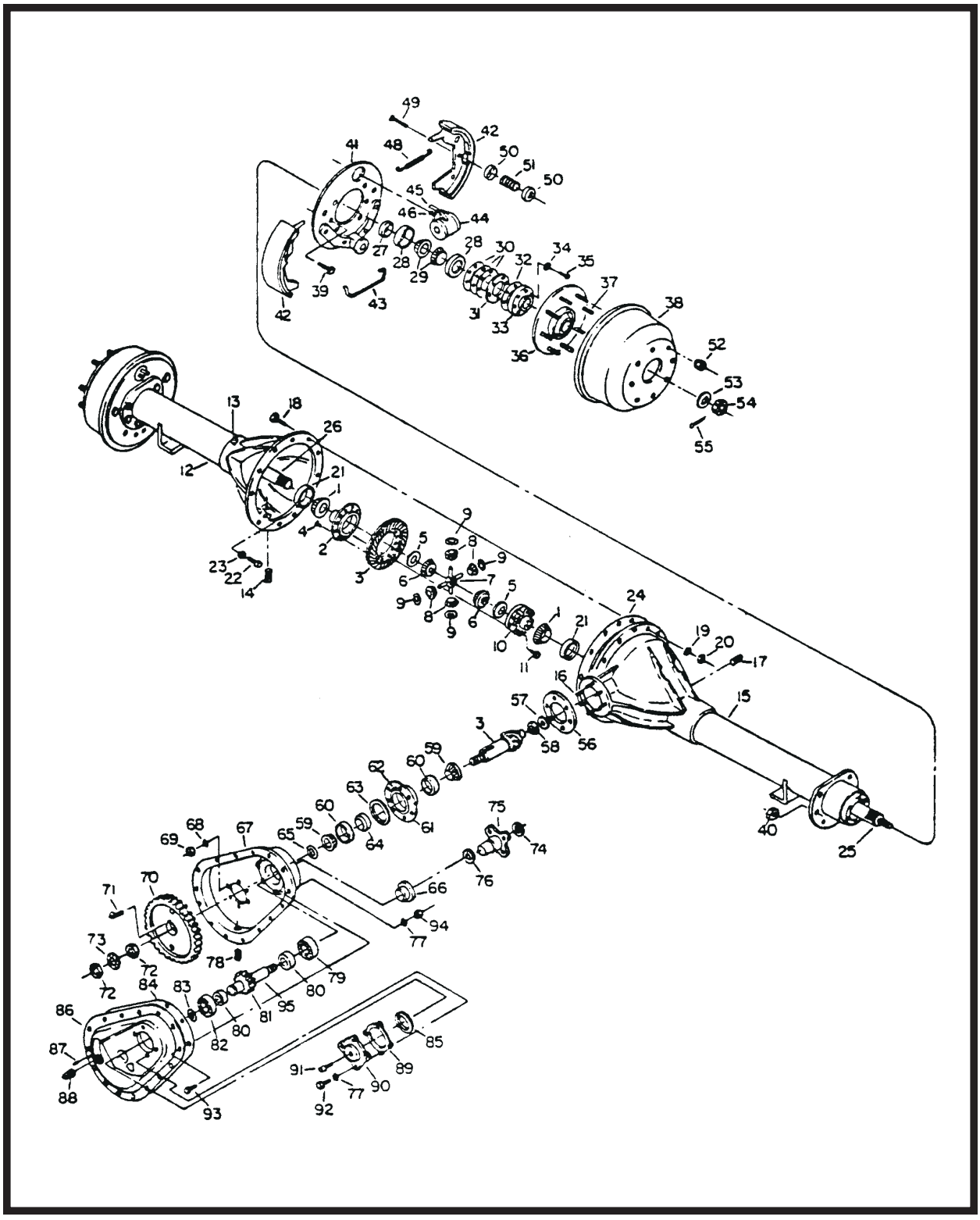
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
29	**482208**	**AXLE ASSEMBLY, FRONT, No. FC-903-FSHX-1 (For NHA See Fig 28)**	**REF**
	404616	. STEERING KNUCKLE & COMPLETE BRAKE ASSEMBLY, RIGHT SIDE V78500, No. A8-3111-Z-936	1
	404617	. STEERING KNUCKLE & COMPLETE BRAKE ASSEMBLY, RIGHT SIDE V78500, No. A8-3111-0-849	1
1	No Number	. . RIGHT & LEFT STEERING KNUCKLE, BACKING PLATE, & WHEEL BEARING OIL SLINGER ASSEMBLY (Serviceable in complete assembly only)	2
2	404619	. . BUSHING, KNUCKLE, V78500, No. 1225-Z-234	4
3	404620	. . PLUG, KNUCKLE, V78500, No. 1250-P-172	2
	404621	. . BRAKE ASSY, RIGHT & LEFT, V78500, No. FSH-12-199	2
4	404498	. . . SHOE & LINING ASSY, V78500, No. A1-3722-300	2
5	404622	. . . RETAINER, SPRING, V78500, No. 1807-1	4
6	404491	. . . SPRING, HOLD-DOWN, V78500, No. 2858-91	4
7	404623	. . . ROD, ANTI-RATTLE, V78500, No. 1779-49	4
8	404624	. . . INLET, CYLINDER WHEEL, V78500, No. 1199-758	1
9	404625	. . . BLEEDER, CYLINDER WHEEL, V78500, No. 1199-1338	1
10	404626	. . . CYLINDER ASSY, WHEEL, V78500, No. A46-3261-17	1
11	404492	. . . SPRING, “U”, RETURN, V78500, No. 1718-121	1
12	404490	. . . SPRING, RETAINER, CLIP,V78500, No. 1718-108	1
* 13	404627	. . . GASKET, V78500, No. 2208-206	1
* 14	404670	. OIL, SEAL, WIPER, V78500, No. 1199-S-3633	2
15	404628	. PIN, KNUCKLE, STEERING, V78500, No. 3101-N-92	2
16	404629	. GASKET, V78500, No. 2208-F-370	2
17	404630	. CAP, STEERING KNUCKLE,V78500, No. 1199-W-1687	2
18	404631	. BEARING, THRUST, V78500, No. T-126	2
19	404632	. AXLE, V78500, No. 3100-R-5738	1
20	404633	. BEARING, WHEEL, INNER, V78500, No. 54284	2
21	404634	. BEARING, WHEEL, OUTER, V78500, No. 25880	2
	404635	. HUB & DRUM ASSEMBLY, RIGHT SIDE, V78500, No. A12-333-G-1801	1

Not Illustrated

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
29 -			
	404636	. HUB & DRUM ASSEMBLY, RIGHT SIDE, V78500, No. A11-333-G-1801	1
	404637	. . HUB & CUP ASSEMBLY, RIGHT SIDE, V78500, No. A2-333-G-1801 (With Studs)	1
	404638	. . HUB & CUP ASSEMBLY, RIGHT SIDE, V78500, No. A1-333-G-1801 (With Studs)	1
22	404639	. . . DRUM, BRAKE, V78500, No. 3219-J-3832	1
23	404640	. . . HUB, V78500, No. 333-G-1801	1
24	404641	. . . STUD, RIGHT, V78500, No. 20 X 1394	6
25	404642	. . . STUD, LEFT, V78500, No. 20 X 1393	6
26	404643	. . . NUT, STUD, RIGHT, V78500, No. 1199-H-112	6
27	404644	. . . NUT, STUD, LEFT, V78500, No. 1199-H-111	6
28	404645	. . . CUP, BEARING, OUTER, V78500, No. 25820	1
29	404646	. . . CUP, BEARING, INNER V78500, No. 45220	1
30	404647	. WASHER, V78500, No. 1229-Y-1325	2
31	404648	. NUT, V78500, No. X-1421	2
32	404649	. PIN, COTTER, V78500, No. K-2412	2
33	404650	. CAP, HUB, V78500, No. 3262-K-89	2
34	404651	. ARM, STEERING - LEFT SIDE V78500, No. 3133-Y-1299	1
35	404652	. ARM, STEERING - RIGHT SIDE V78500, No. 3133-A-1301	1
36	404653	. KEY,V78500, No. 16-X-202	2
37	404654	. NUT, V78500, No. 14-X-3	3
38	404655	. PIN, COTTER, V78500, No. K-2614	3
39	482250	. ARM, STEERING, UPPER	1
40	404657	. KEY, V78500, No. 16X-202	1
	404660	. TUBE, CROSS & END ASSEMBLY WITH CLAMPS, V78500, No. A1-3102-K-3573	1
41	404661	. . END, CROSSTUBE - RIGHT SIDE . . V78500, No. A-3144-V-386	1
42	404662	. . CLAMP, END, V78500, No. 2257-P-16	2
43	404663	. . BOLT, CLAMP, V78500, No. S-1818	2
44	404664	. . NUT, CLAMP, V78500, No. N-18	2

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
29 -			
45	404665	. . TUBE, CROSS, V78500, No. 3102-K-3573	1
46	404666	. . END, CROSSTUBE - LEFT SIDE V78500, No. A-3144-U-385	1
47	404667	. . NUT, V78500, No. N-512	2
48	404713	. . PIN, COTTER, V78500, No. K-2410	2
* 49	404669	. SEAL, OIL, FELT, V78500, No. A-2105-C-1381	2

*** Not Illustrated**



Rear Axle Assembly
Figure 30

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
30 -	**402209**	**AXLE ASSEMBLY, REAR, V78500 TA-267-FHX-26 (For NHA See Fig. 28)**	**REF**
	No Number	. DIFFERENTIAL AND GEAR GROUP	1
1	404673	. . BEARING, DIFFERENTIAL, V78500, No. 3984	2
2	404701	. . CASE, DIFFERENTIAL, FLANGE HALF, V78500, No. B52-3235-D-212	1
3	404705	. . GEAR AND PINION SET, V78500, No. A35142-3	1
4	404706	. . RIVET, BEVEL GEAR, V78500, No. RV-7712	12
5	404714	. . WASHER, THRUST, V78500, No. 1229-V-412	2
6	404718	. . GEAR, SIDE, V78500, No. 2234-K-427	2
7	404719	. . SPIDER, V78500, No. 3278-T-72	1
8	404720	. . PINION, V78500, No. 2233-M-429	4
9	404721	. . WASHER, THRUST, PINION, V78500, No. 1229-U-1061	4
10	404722	. . CASE, DIFFERENTIAL, TONGUE HALF, V78500, No. A-3235-F-214	1
11	404723	. . SCREW, CAP, V78500, No. S-2822-1	8
12	404724	. HOUSING ASSEMBLY, DIFFERENTIAL & AXLE, L.H., V78500, No. A53-3800-X-570	1
13	404725	. . BREATHER, V78500, No. A1199-J-166	1
14	404726	. . PLUG, LUBRICANT, DRAIN, V78500, No. 1250-S-123	1
15	404727	. HOUSING ASSEMBLY, DIFFERENTIAL & AXLE, L.H., V78500, No. A23-3800-D-654	1
16	404728	. . STUD, REDUCTION GEAR CASE TO AXLE, V78500, No. 4-X-834	6
17	404729	. . PLUG, LUBRICANT, FILL, V78500, No. P-112	1
18	404730	. BOLT, HOUSING ASSEMBLY, V78500, No. 1714-1	11
19	404731	. WASHER, HOUSING ASSEMBLY, V78500, No. 1229-E-1513	11
20	404732	. NUT, HOUSING ASSEMBLY, V78500, No. NL-17-1	11
21	404733	. CUP, DIFFERENTIAL BEARING, V78500, No. 3920	2
22	404734	. PIN, BEVEL GEAR THRUST BLOCK, V78500, No. 1246-D-134	1
23	404735	. THRUST BLOCK, BEVEL GEAR, V78500, No. 2297-S-175	1
24	404736	. GASKET, DIFFERENTIAL HOUSING ASSEMBLY, V78500, No. 2208-H-112	1
25	404737	. SHAFT, LONG AXLE, V78500, No. A-3802-Z-1612	1

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
30 -			
26	404738	. SHAFT, SHORT AXLE, V78500, No. A-3802-Y-1611	1
27	404739	. COLLAR, BEARING SPACER V78500, No. 1874-E-187	2
28	404740	. CUP, BEARING, V78500, No. 18720	4
29	404741	. BEARING, AXLE, V78500, No. 18790	4
30	404742	. SHIM SET, AXLE, V78500, No. 2803-S-2099, No. 2803-T-2100, and No. 2803-U-2101	AR
31	404743	. RETAINER, BEARING, V78500, No. 1244-A-261	2
32	404744	. GASKET, OIL SEAL RETAINER, V78500, No. 2808-V-672	2
33	404745	. RETAINER, OIL SEAL, V78500, No. A-1805-N-560	2
34	404746	. LOCKWASHER, BEARING RETAINER CAP SCREW, V78500, No. WA-16	12
35	404747	. CAPSCREW, BEARING, RETAINER, V78500, No. S-2610-1	12
36	404507	. HUB, WHEEL, V78500, No. 311-D-264	2
37	404748	. STUD, WHEEL, V78500, No. 20-X-283	12
38	404749	. DRUM, BRAKE, V78500, No. 3819-W-439	2
39	404750	. BOLT, BRAKE-TO-AXLE, V78500, No. S-1812-1	12
40	404751	. NUT, V78500, No. NL-18-1	12
	404618	. BRAKE ASSEMBLY, V78500, No. FSH-12-145	2
41	404752	. . BACKING PLATE ASSEMBLY V78500, No. A8-3736-H-112	1
42	404506	. . SHOE & LINING ASSEMBLY V78500, No. A3-3722-134	2
43	404490	. . SPRING, RETAINING, V78500, No. 1718-D-108	1
44	404753	. . CYLINDER, WHEEL, V78500, No. A16-3261-N-40	1
45	404754	. . INLET, CONNECTION, V78500, No. 1799-D-56	1
46	404755	. . BLEEDER, V78500, No. 1199-H-1334	1
* 47	404756	. . GASKET, CYLINDER, WHEEL, V78500, No. 2208-V-204	1
48	404502	. . SPRING, RETURN, V78500, No. 2758-R-18	1
49	404757	. . ROD, ANTI-RATTLE, V78500, No. 1779-W-49	2
50	404758	. . RETAINER, V78500, No. 1807-A-1	4
51	404491	. . SPRING, V78500, No. 2858-M-91	2
52	404759	. NUT, WHEEL STUD, V78500, No. 1199-X-1142	12
53	404760	. WASHER, AXLE, V78500, No. 1829-U-775	2
54	404761	. NUT, AXLE, V78500, No. 1227-B-496	2

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
30 -			
55	404762	. PIN, COTTER, V78500, No. K-2418	2
	No Number	. PINION BEARING CAGE GROUP	1
56	404763	. . GASKET, BEVEL PINION CAGE, V78500, No. 2808-F-942	1
57	404764	. . LOCK RING, V78500, No. 1229-Y-1299	1
58	404765	. . BEARING, BEVEL PINION PILOT, V78500, No. 1228-E-83	1
59	404766	. . BEARING, PINION, V78500, No. HM-903247	2
60	404767	. . CUP, PINION,BEARING, V78500, No. HM-903210	2
61	404768	. . CAGE, PINION, BEARING, V78500, No. 3226-P-666	1
62	404769	. . DOWEL, V78500, No. 1246-C-211	1
63	404770	. . GASKET, OIL SEAL, V78500, No. 5X-424	1
64	404771	. . SPACER, BEARING, V78500, No. 2203-T-1831 thru 2203-T-1857	1
65	404772	. . WASHER, KEYWAY, V78500, No. 1229-G-813	1
	No Number	. REDUCTION GEAR CASE GROUP	1
66	404773	. . OIL SEAL, REDUCTION GEAR CASE, V78500, No. A1-1805-V-204	1
67	404774	. . CASE, REDUCTION GEAR, V78500, No. A3-3875-A-651	1
68	404775	. . WASHER, GEAR CASE-TO-AXLE, V78500, No. 1229-Y-1507	6
69	404776	. . NUT, GEAR CASE-TO-AXLE, V78500, No. NL-19-1	6
70	404777	. . GEAR, V78500, No. 3892-T-3426	1
71	404778	. . KEY, GEAR, V78500, No. 16X-71	1
72	404779	. . NUT, BEVEL PINION BEARING, V78500, No. 1227-M-117	2
73	404780	. . LOCK, BEVEL PINION BEARING NUT, V78500, No. 1229-H-528	1
74	404781	. . WASHER, INPUT SHAFT, V78500, No. 1829-T-592	1
75	404782	. . FLANGE, INPUT SHAFT, V78500, No. 3897-Z-1430	1
76	404783	. . OIL SEAL, INPUT SHAFT, V78500 No. A-1805-R-96	1
77	404784	. . LOCKWASHER, GEAR CASE CAP & COVER V78500, No. WA-16	19

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE 1234567	UNITS PER ASSY
30 -			
78	404785	. . PLUG, DRAIN, GEAR CASE (MAGNETIC), V78500, No. 1250-U-125	1
79	404786	. . BEARING, INPUT SHAFT FRONT, V78500, No. 1228-K-375	1
80	404787	. . SPACER, INPUT SHAFT BEARINGS, V78500, No. 1844-P-666	2
81	404788	. . GEAR, INPUT, V78500, No. 3892-U-3427	1
82	404789	. . BEARING, INPUT SHAFT REAR, V78500, No. 1228-V-308	1
83	404790	. . RING, SNAP, INPUT SHAFT BEARING, V78500, No. 1854-M-169	1
84	404791	. . GASKET, REDUCTION GEAR CASE, V78500, No. 2808-X-622	1
85	No Number	. . RING, SNAP, INPUT SHAFT BEARING RETAINER, (Part of Item No. 82)	1
86	404793	. . COVER, REDUCTION GEAR CASE, V78500, No. 3876-Z-416	1
87	404794	. . DOWEL, GEAR CASE COVER, V78500, No. 1846-C-159	2
88	404795	. . PLUG, GEAR CASE OIL FILLER, V78500, No. P-18	1
89	404796	. . GASKET, INPUT SHAFT REAR, V78500, No. 2808-C-913	1
90	404797	. . CAP, INPUT SHAFT REAR, V78500, No. 3866-A-989	1
91	404798	. . BREATHER, OIL, GEAR CASE, V78500, No. A-1199-J-166	1
92	404799	. . CAPSCREW, INPUT SHAFT COVER, V78500, No. S-268-1	4
93	404800	. . CAPSCREW, REDUCTION CASE-TO-COVER, V78500, No. S-1612-1	15
94	404801	. . NUT, GEAR CASE & COVER BOLT, V78500, No. N-16-1	15
95	404802	. . SHAFT, INPUT, V78500, No. 3880-C-965	1

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 alpha-numerical sequence. Thus, any part number beginning with the letter A would be located at or near the top of the index list. Likewise a part number 9 would be listed near the end of the list and far below a part number 1000. The figure number and item number location of the part is directly opposite the part. If the part is used in more than one place, each location is listed commencing with the first location the part is listed.

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10DH-847-4	12-8
10J-178	11-9
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100GH-142	12-12
100NH-2	24-17
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404725	30-13
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481649	2-13
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481698	26-11
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76A-1005	22-14
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76A-1013	22-24
76A-1014	22-25
76A-1015	22-26
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76A-1062	22-79
76A-1063	22-80
76A-1064	22-81
76A-1065	22-82
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76A-1067	22-84
76A-1068	22-85
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76A-1072	22-89
76A-1073	22-90
76A-1074	22-91
76A-1075-1	22-92
76A-1075-2	22-0
76A-1075-3	22-0
76A-1075-4	22-0
76A-1076	22-93
76A-1077	22-9
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76A-1079	22-9
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76A-1091	22-113
76A-1092	22-114
76A-1093	22-0
76A-1094	22-115
76A-1095	22-0
76A-1096	22-116
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76A-1111	22-137
76A-1112	22-138
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CHAPTER 5. OPTIONAL EQUIPMENT

This chapter provides documentation to cover any optional equipment furnished with your generator. Available options are listed below:

OPTION NAME	HOBART No.	MANUAL
Kit, Water Heater, Assembly	181641	TO-201

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CHAPTER 6. MANUFACTURER'S LITERATURE

Voltage Regulator	**Hobart Brothers Company** **Operation and Maintenance Manual TM-759**
Electric Governor	**Barber-Colman Governor Company** **Electric Governor Service Manual**
Electronic Speed Switch	**Synchro-Start Instruction Manual** **for Electronic Speed Switch ESSE-1**
Engine	**Detroit Diesel Corporation** **8.2 Liter Service Manual**
Flexible Coupling	**Hobart Brothers Company** **Coupling Manual OM-2019**
Exciter Rotor	**Hobart Brothers Company** **Rotor Manual TM-360**

Hobart Diagrams

482107	**- Schematic, Generator**
181547	**- Connection, Engine and Generator**
181482	**- Schematic, Engine**
482099	**- Connection Power Module**
181536	**- Connection, Control Box**
481899	**- Connection, Protective Relay Tray**
482224	**- Connection, Generator Control Tray**
280927	**- Engine, Detroit Diesel, Model 8.2 N**
181532	**- Box, Switch, T-R, Kit** ***(Specification No. 7006-1 Units)***
181567	**- Schematic and Connection, Box, Switch, T-R** ***(Specification No. 7006-1 Units)***
181522	**- Lines, Fuel and Oil Assembly (3 Sheets)**

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UNUSUAL SERVICE CONDITIONS

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

Among such conditions are :

1. Exposure to:

A. Combustible, explosive, abrasive or conducting dusts.

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

C. Chemical fumes, flammable or explosive gases.

D. Nuclear radiation.

E. Steam, salt-laden air, or oil vapor.

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

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

H. Abnormal axial or side thrust imposed on rotating equipment shafts.

I. Low and/or high ambient temperatures.

2. Operation at:

A. Voltages above or below rated voltage.

B. Speeds other than rated speed.

C. Frequency other than rated frequency.

D. Standstill with rotating equipment windings energized.

E. Unbalanced voltages.

F. Operation at loads greater than rated.

3. Operation where low acoustical noise levels are required.

4. Operation with:

A. Improper fuel, lubricants or coolant.

B. Parts or elements unauthorized by the manufacturer.

C. Unauthorized modifications.

5. Operation in poorly ventilated areas.

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