# Service

## RV/Mobile Generator Sets

Models:

**7CCKM**
**7CCFKM**
**7CCKMR**
**7CCFKMR**

ISO 9001
KOHLER GENERATORS
INTERNATIONALLY REGISTERED

KOHLER®
POWER SYSTEMS

TP-5570 4/92a

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# Safety Precautions and Instructions

A Generator Set, like any other electro–mechanical device can pose potential dangers to life and limb if improperly maintained or imprudently operated. The best safeguards against accident are to be ever mindful of the potential dangers and to always use good common sense. In the interest of safety, some general precautions relating to operating of a Generator set follow. Keep these in mind. This manual contains several types of safety precautions which are explained below.

### ⚠ DANGER

Danger is used to indicate the presence of a hazard which *will* cause *severe* personal injury, death, or substantial property damage if the warning is ignored.

### ⚠ WARNING

Warning is used to indicate the presence of a hazard which *can* cause *severe* personal injury, death, or substantial property damage if the warning is ignored.

### ⚠ CAUTION

Caution is used to indicate the presence of a hazard which *will* or *can* cause *minor* personal injury or property damage if the warning is ignored.

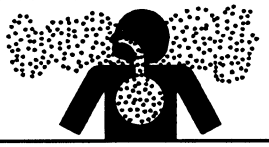
### NOTE

Note is used to notify people of installation, operation, or maintenance information which is important but not hazard–related.

Safety decals are affixed to the generator set in prominent places to advise the operator or service technician of potentially hazardous situations. The decals are reproduced here to improve operator recognition and thereby increase decal effectiveness. For a further explanation of decal information, reference the accompanying safety precautions. Before operating or servicing the generator set, be sure you understand the message of these decals. Replace decals if missing or damaged.

## EXHAUST SYSTEM

**⚠ WARNING**



**Carbon monoxide.**
**Can cause severe nausea, fainting, or death.**

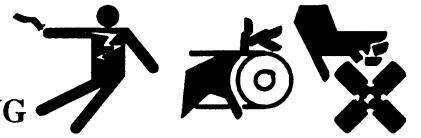
The exhaust system must be leakproof and routinely inspected.

**Carbon monoxide can cause severe nausea, fainting, or death.** Install exhaust system tail pipe so discharged exhaust gases will not be drawn into vehicle interior through windows, doors, air conditioners, etc. Do not use flexible tail piping since this type could crack and allow lethal exhaust fumes to enter the vehicle.

**Carbon monoxide can cause severe nausea, fainting, or death.** Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside an occupied building or vehicle. Be careful when parking your vehicle to avoid obstructing the exhaust outlet. The exhaust gases must discharge freely, otherwise carbon monoxide may deflect into the vehicle. Avoid breathing exhaust fumes when working on or near the generator set. Carbon monoxide is particularly dangerous because it is an odorless, colorless, tasteless, nonirritating gas which can cause death if inhaled for even a short period of time.

## ACCIDENTAL STARTING

**⚠ WARNING**



**Accidental starting.**
**Can cause severe injury or death.**
Disconnect battery cables before working on generator set (negative lead first and reconnect it last).

**Accidental starting can cause severe injury or death.** Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on any equipment connected to generator. The generator set can be started by remote start/stop switch unless this precaution is followed.

## MOVING PARTS

**⚠ WARNING**

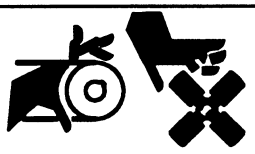
**Hazardous voltage.**

**Moving rotor.**

**Can cause severe injury or death.**

Do not operate generator set without all guards and electrical enclosures in place.

**⚠ WARNING**



**Rotating parts.**
**Can cause severe injury or death.**

Do not operate generator set without all guards, screens, or covers in place.

**Exposed moving parts can cause severe injury or death.** Keep hands, feet, hair, and clothing away from belts and pulleys when unit is running. Replace guards, covers, and screens before operating generator set.

**Flying projectiles can cause severe injury or death.** Retorque all crankshaft and rotor hardware after servicing. When making adjustments or servicing generator set, do not loosen crankshaft hardware or rotor thru–bolt. If rotating crankshaft manually, direction should be clockwise only. Turning crankshaft bolt or rotor thru–bolt counterclockwise can loosen hardware and result in serious personal injury from hardware or pulley flying off engine while unit is running.

## ENGINE BACKFIRE/FLASH FIRE

**⚠ WARNING**

**Fire.**
**Can cause severe injury or death.**

Do not smoke or permit flame or spark to occur near fuel or fuel system.

**A flash fire can cause severe injury or death.** Do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuel or fuel vapors. When removing fuel line or carburetor, use a proper container to catch all fuel.

**A sudden backfire can cause severe injury or death.** Do not operate with air cleaner removed.

## HAZARDOUS VOLTAGE/ ELECTRICAL SHOCK

**⚠ WARNING**

**Hazardous voltage.** **Moving rotor.**

**Can cause severe injury or death.**

Do not operate generator set without all guards and electrical enclosures in place.

**⚠ WARNING**

**Hazardous voltage.**
**Backfeed to utility system can cause severe injury, death, or property damage.**

Do not connect to any building electrical system without connecting through an approved device and after building main switch is open.

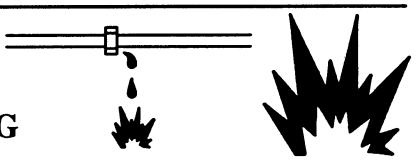
**Hazardous voltage can cause severe injury or death.** The heat sink of the voltage regulator contains high voltage. Do not touch voltage regulator heat sink when testing or electrical shock will occur.

**Hazardous voltage can cause severe injury or death.** Perform electrical service only as prescribed in equipment manual. Be sure that generator is properly grounded. Never touch electrical leads or appliances with wet hands, when standing in water, or on wet ground as the chance of electrocution is especially prevalent under such conditions. Wiring should be inspected at the interval recommended in the service schedule — replace leads that are frayed or in poor condition. The function of a generator set is to produce electricity and wherever electricity is present, there is the hazard of electrocution.

**Hazardous "backfeed" voltage can cause severe injury or death.** The generator must not be used to "backfeed" by connecting it to building/campground electrical circuits. Install a transfer switch in vehicle generator installations to prevent connection of vehicle and other sources of power. Electrical backfeed into a utility electrical system can cause serious injury or death to utility personnel working on transmission lines.

**Hazardous voltage can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while adjustments are made. Remove wristwatch, rings, and jewelry that can cause short circuits.

## FUEL SYSTEM



**⚠ WARNING**

**Explosive fuel vapors.**
**Can cause severe injury or death.**
Use extreme care when handling, storing, and using fuels.

**Explosive fuel vapors can cause severe injury or death.** All fuels are highly explosive in a vapor state. Use extreme care when handling, storing, and using fuels. Store fuel in a well–ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running since spilled fuel may ignite on contact with hot parts or from ignition spark. Do not smoke or permit flame or spark to occur near potential sources of spilled fuel or fuel vapors. Keep fuel lines and connections tight and in good condition—don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Additional precautions must be taken when using the following fuels:

**Gasoline** – Store gasoline only in approved red containers clearly marked GASOLINE. Do not store gasoline in any occupied building.

**Propane (LP)** – Adequate ventilation is mandatory. Propane is heavier than air; install gas detectors low in room. Inspect detectors often.

**Explosive fuel vapors can cause severe injury or death.** Spilled fuel can cause an explosion. Use a container to catch fuel when draining fuel system. Wipe up all spilled fuel after draining system.

**Explosive fuel vapors can cause severe injury or death.** Fuel leakage can cause an explosion. Check LP Vapor gas fuel system for leakage using a soap–water solution with fuel system test pressurized to 6–8 ounces per square inch (10–14 inches water column). Do not use test solutions that contain ammonia or chlorine, since the soap will not bubble for an accurate leakage test.

**Explosive fuel vapors can cause severe injury or death.** Fuel leakage can cause an explosion. Check LP Liquid Withdrawal gas fuel system for leakage using a soap–water solution with fuel system test pressurized not less than 90 psi (621 kPa). Do not use test solutions that contain ammonia or chlorine, since the soap will not bubble for an accurate leakage test.

## BATTERY

**⚠ WARNING**

**Sulfuric acid in batteries.**

**Can cause severe injury or death.**

Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

**Sulfuric acid in batteries can cause severe injury or death.** Sulfuric acid can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash–proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous spattering of electrolyte.

**Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (–) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. Do not mount battery in generator compartment. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

## HAZARDOUS NOISE

**⚠ CAUTION**

**Hazardous noise.**

**Can cause loss of hearing.**

Never operate generator without a muffler or with faulty exhaust system.

## HOT PARTS

**⚠ WARNING**

**Hot engine and exhaust system.**
**Can cause severe injury or death.**

Do not work on generator set until unit is allowed to cool.

**Fire can cause severe injury or death.** Hot exhaust system can ignite adjacent combustible materials. Do not locate electrical wiring, fuel lines, or combustible material above the exhaust muffler. Be careful when parking your vehicle to prevent grass fires started by exhaust system and hot exhaust gases.

**Fire can cause severe injury or death.** Hot generator can ignite debris in compartment. Keep the compartment and generator set clean and free of debris and combustible materials to minimize chances of fire. Do not block fuel/oil drain opening in generator mounting tray. If sub–flooring is used, cut a corresponding hole in the sub–flooring for drain opening.

**Hot parts can cause severe injury or death.** Do not touch hot engine parts. An engine gets hot while running and exhaust system components get extremely hot.

## NOTES

**NOTE**

**This generator set does not comply with United States Coast Guard (U.S.C.G.) requirements and must not be used for marine applications.** Use only generator sets specified for marine use in marine installations. U.S.C.G. Regulation 33CFR183 requires a generator set to be "ignition protected" when used in a gasoline–fueled environment.

**NOTE**

Do not "tee" into fuel injected fuel systems. Use a two dip tube arrangement for fuel supply. Consult an Authorized Kohler Service Dealer for further fuel system installation information.

**NOTE**

**HARDWARE DAMAGE!** Engine and generator may make use of both American Standard and metric hardware. Be sure to use the correct size tools to prevent rounding of bolt heads and nuts.

# INTRODUCTION

This manual covers the service of the 7CCKM–RV (60 Hz.), the 7CCFKM–RV (50 Hz.), the 7CCKMR–Mobile (60 Hz.), and the 7CCFKMR–Mobile (50 Hz.). Generator Sets.

Read through this manual and carefully follow all procedures and safety precautions to ensure proper generator operation and to avoid serious bodily injury.

# SERVICE ASSISTANCE

See the Yellow Pages of your Telephone Directory under Generator – Electric for your closest Kohler Generator Dealer.

KOHLER CO., Kohler, Wisconsin 53044
Phone 414–565–3381, Telex 26888,
Fax 414–565–3648
For Sales & Service in U.S.A. & Canada
Phone 1–800–544–2444

Provide MODEL, SPECIFICATION, SERIAL, and ENGINE numbers from the generator nameplate to receive current parts and information for your generator set.

# Section 1. Introduction

Your vehicle is equipped with a dependable Kohler Alternating Current Generator Set. Service requirements of the Generator Set are minimal but it is important that the required services be performed at the prescribed intervals.

Please take a few moments to read this manual, then carefully follow all service recommendations to keep your set in top condition. Keep this manual with your vehicle for future reference. See Figure 1–1 for identification and location of components. For complete specifications, see Section 10. Specifications Chart and Engine Service Manual.

## SPECIFICATIONS

### GENERATOR

The generator is direct mounted to the engine for permanent alignment. Static excited, rotating–field construction with a four–pole rotor is used.

Model 7CCKM–RV supplies 7 kW of 120 Volt (reconnectable to 120/240 Volt), single phase, 60 Hz. alternating current.

Model 7CCFKM–RV supplies 5.8 kW of 110 Volt (reconnectable to 110/220 Volt), single phase, 50 Hz. alternating current.

Model 7CCKMR–Mobile supplies 7 kW of 120 Volt (reconnectable to 120/240 Volt), single phase, 60 Hz. alternating current. Includes battery charging feature.

Model 7CCFKMR–Mobile supplies 5.8 kW of 110 Volt (reconnectable to 110/220 Volt), single phase, 50 Hz. alternating current. Includes battery charging feature.

#### Generator Features

- Static excited, rotating field design permits power to be obtained from stationary leads.
- Rotor and stator are coated with high bond epoxy varnish. Helps prevent corrosion in high humidity areas. (Vacuum impregnated).
- Rotors are dynamically balanced to minimize vibration.
- Copper windings ensure minimal heat build–up. Insulation meets NEMA standards for Class 155 insulation.
- Exclusive Kohler PowerBoost IIIE voltage regulator–exciter system uses separate AC windings isolated from the load for superior motor starting and smooth operating performance.
- Direct connected to the engine, the generator has sealed precision ball bearing with end bearing mounted in a cast metal sleeve to prevent shaft misalignment, and extend bearing life.

- Voltage Regulation (+/– 2% no load to full load transient) and Frequency Regulation (+/– 0.5% no load to full load transient) exceeds ANSI/EGS–1–1986 and CSA C22.2 standards for RV generator sets. Prevents prolonged operation at severe under–or–over voltage conditions which could damage appliances.
- Drip–proof construction.
- Four–lead reconnectable stator.
- Air Vac™ cooling system maintains exceptional generator and engine cooling even in high ambient temperatures. Compartment air enters over cylinder block, passes over engine cooling fins, and is discharged out bottom of compartment

**NOTE**

**DERATING:** The kilowatts of the generator set will decrease 3% for each 1000 ft. (305 meters) above sea level and 2% for each 10°F (5.5°C) increase in ambient temperature above 60°F (16°C), and 11.1% when converted to LP fuel.

## ENGINE

Kohler twin–cylinder, air–cooled, four–cycle gasoline engine. Models 7CCKM–RV/ CCKMR–Mobile and 7CCFKM–RV/ CCFKMR– Mobile use Kohler K–582 engine.

### Engine Features

- One side serviceability, air cleaner, carburetor, oil fill, dipstick, and oil drain.
- Internally–vented crankcase breathers reduce emissions of unburned hydrocarbons.
- Operates on leaded or unleaded fuel with octane rating of 86 or higher.
- Engine shutdown control prevents dieseling on shutdown.
- Combination oil fill and dipstick.
- Low oil pressure cutout.
- Electronic ignition.
- Electronic governor.
- Thermistor anti–icing.
- Overspeed shutdown.

## CONTROLLER

The generator set is equipped with a Relay Logic Controller. For a description of controller, see "Operation – Controller."

### Controller Features

- Generator set can be started by a switch at the set, or from an optional remote.
- LED's for easy diagnosis of controller circuit board.
- Starter interlock prevents re–engagement of starter whenever engine is running.
- Controller cover is removed by four screws making easy access for service.
- Connection to controller are by error proof gold plated plugs and receptacles which eliminate corrosion and the possibility of misconnection.

# ACCESSORIES

Several accessories are available to finalize the installation or to add convenience to operation and service. All the most current information can be obtained by contacting your local Kohler Distributor. Available accessories at the time of print of this publication are as follows.

## Remote Panels

Kohler offers optional remote panels for mounting wherever convenient inside the motorhome. Remote panel harness plug has the *four square* configuration. Remote panels require an extension wiring harness for hook–up to the generator set controller.

### Remote Start/Stop Panel

Allows starting/stopping from a location remote of the generator set. Overall mounting dimensions are 4–1/16 in. (103 mm) by 2–1/8 in. (54 mm) with a minimum mounting depth of 2–1/4 in. (57 mm).

### Remote Start/Stop Panel with Hourmeter

Allows starting/stopping from a location remote of the generator set. Overall mounting dimensions are 4 in. (102 mm) by 2 in. (51 mm) with a minimum mounting depth of 2–5/16 in. (59 mm).

## Wiring Harnesses

Kohler Co. supplies wiring harnesses of varying lengths to simplify electrical connections between the generator set, controller and the remote panel. Top quality gold–plated contacts are used for greatest corrosion resistance. Harnesses of 3 ft. (91 cm), 15 ft. (38 cm), 30 ft. (76 cm), and 40 ft. (102 cm) are offered with keyed (error–proof) plugs for the controller and the Kohler remote panel. One end has the *four square* plug for connection to remote panel. The other end has the *six in–line* plug configuration for connection to the generator set controller.

A one foot (0.3 m) wiring harness with a keyed plug for the controller and pigtails for connection to customer supplied start switch, generator "ON" light, hourmeter, etc. Pigtail harness plug has the *six in–line* configuration for hook–up to the generator set controller.

## Exhaust Systems

Aluminum–coated for durability, all Kohler Mufflers are designed for minimal back pressure to allow full rated power output. Kohler spark arrestors are approved by the U.S. Forestry Service. All required elbows, clamps, brackets, etc., are provided in kits.

Available kits include:

**Right side exhaust outlet** for generator set mounted above floor.

**Left side exhaust outlet** for generator set mounted above floor.

**Front exhaust outlet** for generator set mounted below floor.

**Rear exhaust outlet** for generator set mounted below floor.

**Side exhaust outlet** for generator set mounted below floor.

**Center tap bottom exhaust outlet** for generator set mounted below floor.

### LP Conversion Kits

An LP vapor withdrawal kit and an LP liquid withdrawal kit are available. These kits include all the necessary components for installation.

### Below Floor Mounting Trays

A below floor mounting kit for use with standard tray is available. Housing kit and hinge kit for use with below floor mounting kit are also available.

# SERVICE VIEWS

1. Low Oil Pressure Safety Shutdown Switch
2. Spark Plug/Spark Plug Wire
3. Lifting Eye
4. Spark Plug/Spark Plug Wire
5. Lifting Eye
6. Electric Choke
7. Carburetor
8. Anti–Dieseling Solenoid
9. Air Cleaner
10. Start/Stop Switch
11. Nameplate
12. Remote Start Connector
13. Voltage Regulator
14. AC Load Leads/Ground Lead
15. Fuel Filter (Fuel Inlet) – gasoline
16. AC Circuit Breaker(s)
17. Battery Negative (–) Connection
18. Electric Fuel Pump – gasoline
19. Electronic Governor Actuator
20. Oil Drain Petcock
21. Oil Fill/Oil Check
22. Starter Solenoid
23. Battery Positive (+) Connection
24. Exhaust Outlet (bottom of tray)
25. Electronic Governor Magnetic Pick–up
26. Oil Filter

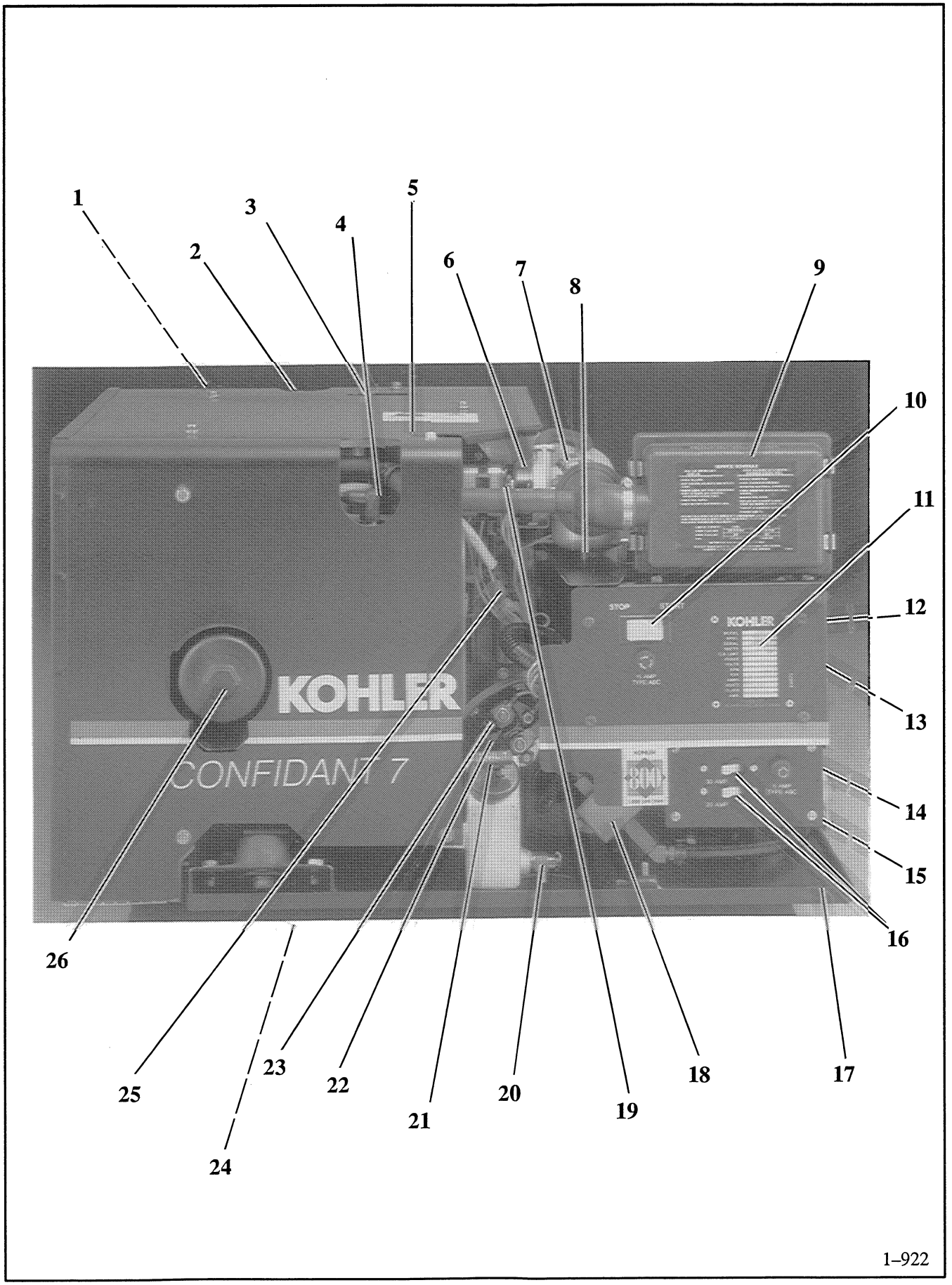



**Figure 1–1. Service Views – All Models (typical) – Gasoline**

# Section 2. Operation

## PRESTART CHECKS

To insure continued satisfactory operation, the following items should be checked before each startup.

**OIL LEVEL:** Should be at or near Full mark (not over).

**AIR INLETS:** Must be clear and unobstructed.

**COMPARTMENT:** Interior must be clean.

**AIR CLEANER:** Must be clean and properly installed.

**AIR SHROUDING:** Must be tight and in proper position.

**EXHAUST:** Tail pipe must be clear, muffler and piping tight and in good condition.

**ELECTRICAL:** All connections (including battery) must be tight.

## CONTROLLER

For identification of controller, see Figure 2–1.

1. **Start/Stop Switch** – used to start and stop generator set – refer to "Starting" and "Stopping" following.

2. **Input (Controller) Fuse** – the generator set will shutdown after a fault in the control circuitry. See "Circuit Protection" following.

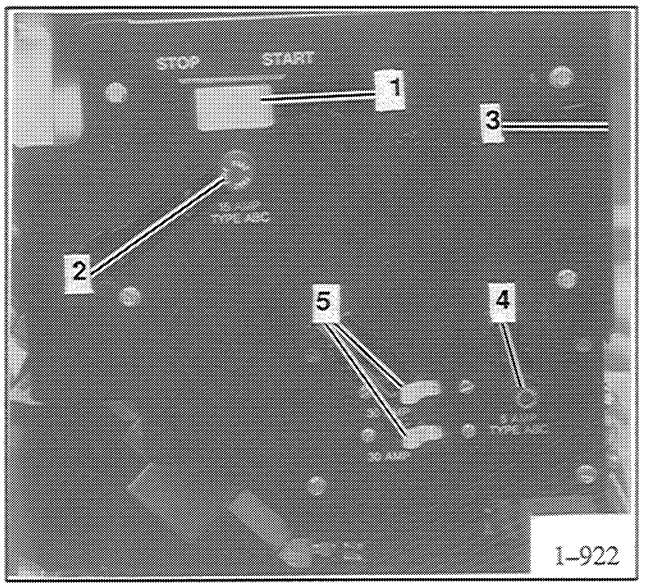



**Figure 2–1. Controller**

3. **Remote Start Connector** – 6–pin in–line connector on controller side panel allows connection of (optional) remote start kits.

4. **Voltage Regulator Fuse** – the generator set will shutdown should a malfunction develop in the voltage regulator circuit. See "Circuit Protection" following.

5. **AC Circuit Breaker(s)** – will trip when a fault is detected in the AC output circuit. It is used to disconnect generator set during maintenance of coach wiring. To close circuit breaker(s), place in "ON" position.

# STARTING–STOPPING

Move the START–STOP switch into the START position and hold in this position until the engine is running, then release. Do not crank engine continuously for more than 10 seconds at a time. A 60 second cool–down period must be allowed between cranking attempts if the engine does not start. If the unit fails to start after three attempts contact an Authorized Service Dealer for repair. Failure to follow these guidelines may result in burn–out of the starter motor. Wait for the engine to come to a complete halt before making a restart attempt. If the flywheel ring gear is still rotating when the starter pinion gear is engaged, the pinion gear and ring gear will clash which may damage the ring gear teeth. Whenever possible, allow a brief cooling period by running the set at low or no load for a few minutes just prior to shut–down.

To stop, move the switch to the STOP position and hold until the set comes to a complete halt. If the generator stops automatically, identify and correct the problem before attempting to restart.

# MANUAL ANTI–ICING (For Gasoline Models Only)

The manual anti–icing system functions by diverting heated manifold air to the carburetor intake. The system can be identified by the anti–icing adjustment lever found on the air cleaner. When operating the generator at temperatures below 40°F (4.4°C), move the anti–icing adjustment lever to the "Winter" position (lever up). At temperatures above 70°F (21°C), move the adjustment lever to the "Summer" position (lever down). Between 40°F (4.4°C) and 70°F (21°C), the adjustment lever may be left in either position.

**NOTE**

At temperatures above 70°F (21°C), operation of the generator set with the adjustment lever in the "Winter" position will cause decreased generator output.

# CIRCUIT PROTECTION

**AC Circuit Breaker(s)** – will trip when a fault is detected in the AC output circuit. See Section 4. Troubleshooting to determine cause of fault. After fault is corrected, reset AC circuit breaker by placing in "ON" position.

| **Model** | **Circuit Breaker** |
|---|---|
| 7CCKM/CCKMR (60 Amp. Breaker) | (2) 30 Amps. 1–pole |
| 7CCKM/CCKMR (50 Amp. Breaker) | (1) 30 Amp. 1–pole & (1) 20 Amp. 1–pole |
| 7CCFKM/CCFKMR | (2) 25 Amp. 1–pole and |

**Input (Controller) Fuse (15 Amp.)** – indicates a fault in the controller circuit. See Section 4 – Troubleshooting. After fault is corrected, replace fuse. Unit is now ready to be restarted.

**Voltage Regulator (5 Amp.)** – indicates a fault in the voltage regulator and/or generator circuit. After fault is corrected, replace fuse. Voltage regulator circuit is now functional.

**Battery Charging Circuit Breaker (25 Amp.)** (on sets equipped with battery charging) – indicates a fault in the battery charging circuit. See Section 4 – Troubleshooting to determine cause of fault. Breaker will automatically reset.

# ENGINE SAFETY SHUTDOWNS

The engine is protected by one shutdown switch and circuitry within the electronic governor circuit board, which automatically reset after the problem is corrected. The following conditions will cause the generator set to shutdown:

Low Oil Pressure (LOP)
Overspeed/Overfrequency

**Oil pressure** of 14 psi ± 2 psi (96.5 kPa) or less will cause the unit to shutdown. This circuit is not operational during starting. It becomes operational when unit comes up to speed and 5–10 seconds after AC voltage is available to energize K5 relay.

**NOTE**

The Low Oil Pressure switch does not act as a low oil level switch. The only way to protect against damage from low oil level is to check oil level regularly.

**Overspeed/Overfrequency** protection is part of the electronic governor circuit board. The unit will shutdown if the rated speed is exceeded. See Section 3. Governor for more information.

# REMOTE PANELS (OPTIONAL)

## REMOTE START PANEL

Remote start panel allows starting–stopping from a location remote of the generator set. Generator sets are equipped with a 6–pin connector on controller for connection of the kit. See Figure 2–2.

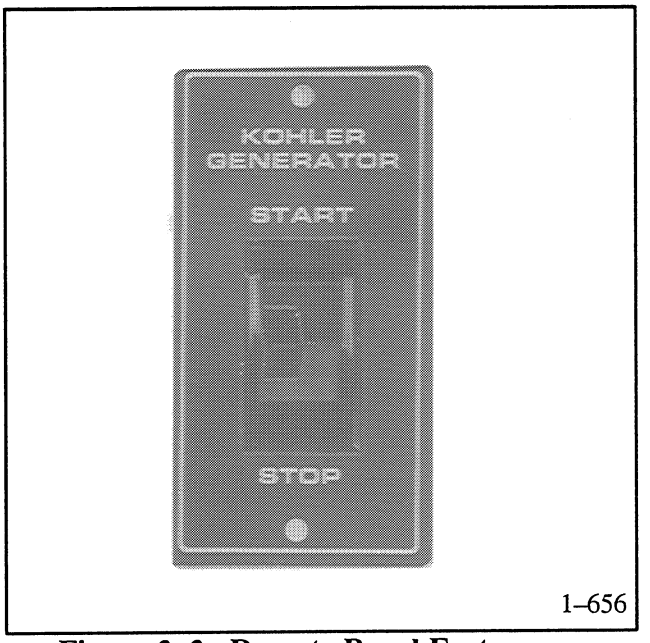



**Figure 2–2. Remote Panel Features**

## REMOTE START PANEL WITH HOURMETER

Remote start panel allows starting–stopping from a location remote of the generator set. Panel includes an hourmeter which records total generator set operating hours. Generator sets are equipped with a 6–pin connector on controller for connection of the kit. See Figure 2–3.

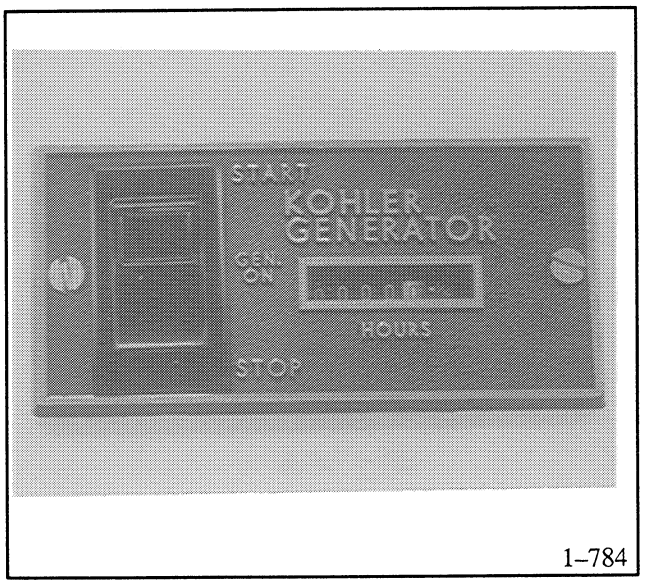
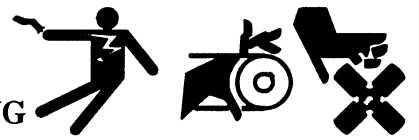



**Figure 2–3. Remote Panel Features**

# Section 3. Scheduled Maintenance

In addition to the routine services listed in this manual, there are other important steps that should be taken to keep a generator set in top condition. Usually, tools and instruments required for these additional steps are not available to the generator set owner. For this reason, the set should be returned periodically to an authorized Service Dealer for complete servicing and tune–up. The benefits of such service will be improved performance and continuous satisfactory operation during a long trouble free service life

**⚠ WARNING**



**Accidental starting.**
**Can cause severe injury or death.**
Disconnect battery cables before working on generator set (negative lead first and reconnect it last).

**Accidental starting can cause severe injury or death.** Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on any equipment connected to generator. The generator set can be started by remote start/stop switch unless this precaution is followed.

**NOTE**

Generator sets equipped with optional "swing down" tray should not be left in the tilted position for any extended period (one hour or more) otherwise, hydrostatic lock can occur. Always place unit in the normal mounting position when service is not actually being performed.

# SERVICE SCHEDULE

| Perform Service at Intervals Indicated (X) | Before Each Start–Up | Every 50 Hours or 6 Months | Every 100 Hours or 12 Months | Every 500 Hours or Two Years |
|---|---|---|---|---|
| Check exhaust outlet | X | | | |
| Check oil level | X | | | |
| Check fuel supply | X | | | |
| Keep cooling air inlets and outlets clean | X | | | |
| Remove loose dirt from compartment | X | | | |
| Check electrolyte level in battery | X | | | |
| Check air cleaner (replace if dirty) | | X | | |
| Replace lube oil filter | | | X | |
| Change lube oil (change oil initially after first five hours of operation) | | | X | |
| Regap or replace spark plugs | | | X | |
| Check battery specific gravity | | | X | |
| Check and tighten electrical connections | | | X | |
| Check and tighten mounting bolts and vibro–mounts | | | X | |
| Blow dust out of generator | | | X | |
| Clean spark arrestor | | | X | |
| Check for stepper motor/throttle shaft coupling wear | | | X (250 Hours) | |
| Check valve–tappet clearance | | | | X |
| Service cylinder heads | | | | X* |
| Check compression | | | | X |
| Replace fuel filter | | | | X |

***NOTE:** Unleaded gasoline is recommended. If leaded gasoline is used, service cylinder heads every 250 hours.

# LUBRICATION SYSTEM

## SPECIFICATIONS

Use high quality detergent oil of API (American Petroleum Institute) service class SC, SD, SE, or SF are recommended for use in the Kohler K–582 engine. This information can be found on most oil containers, see Figure 3–1. The symbol illustrated identifies the API service class in the upper portion. The center indicates the SAE (Society of Automotive Engineers) viscosity grade. The bottom portion (when used) signifies the oil is intended to improve fuel economy and displays the phrase "Energy Conserving."

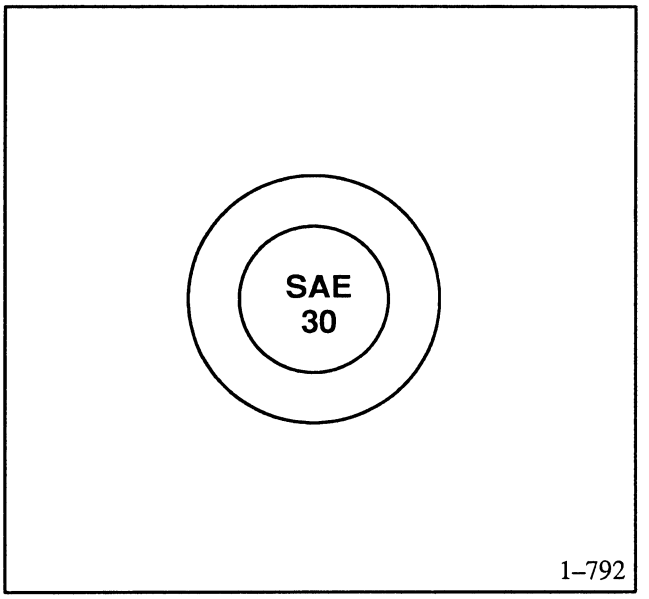



**Figure 3–1. Oil Service Class and SAE Viscosity Grade Symbol**

Straight weight 30 oil is preferred. If multi–viscosity oil is used, be aware of the resulting increase in oil consumption and combustion deposits when used in temperatures above 32° F (0° C).

Base oil weight selection on air temperature at time of operation. Consult the SAE Viscosity Grade chart (see Table 3–1).

It is best not to mix different brands of oils. Possible incompatibility could cause a breakdown of lubricating ingredients and reduce engine protection.

**RECOMMENDED SAE VISCOSITY GRADES**

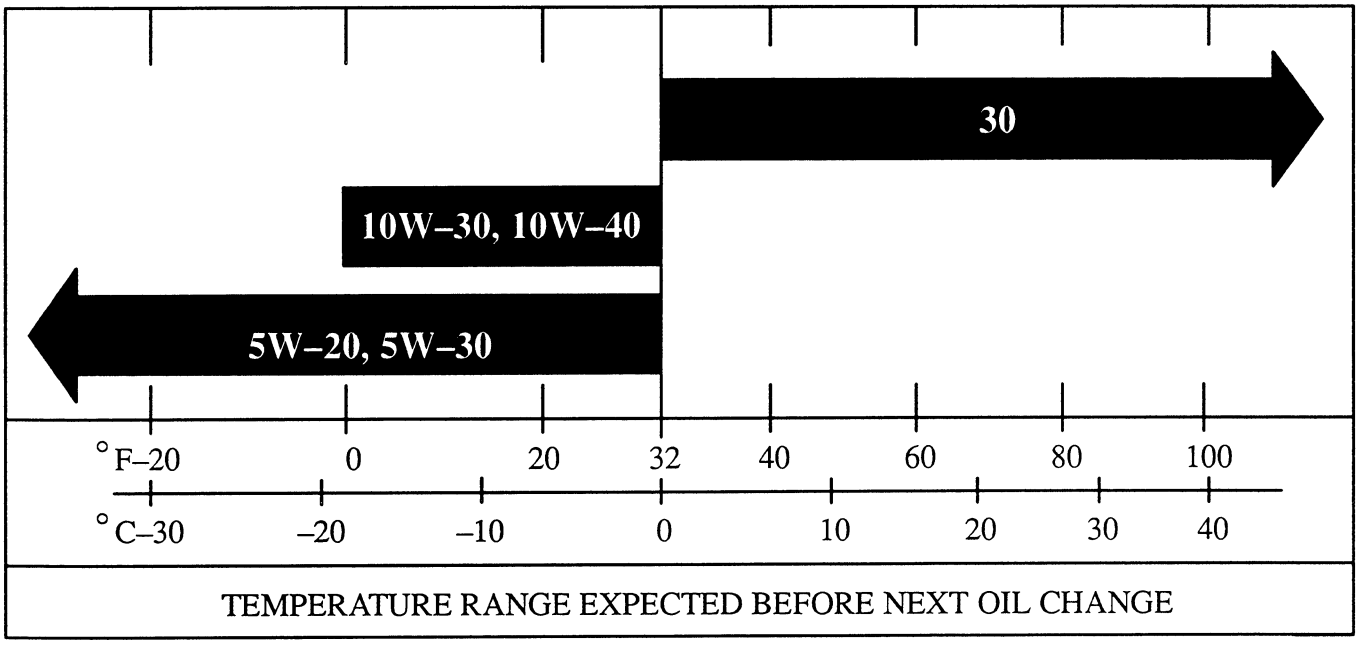



**Table 3–1. Oil Recommendations**

## OIL CHECK

Check crankcase oil level daily or before each start. To check oil level, remove oil cap/dipstick assembly and wipe dipstick clean (see Figure 3–2).

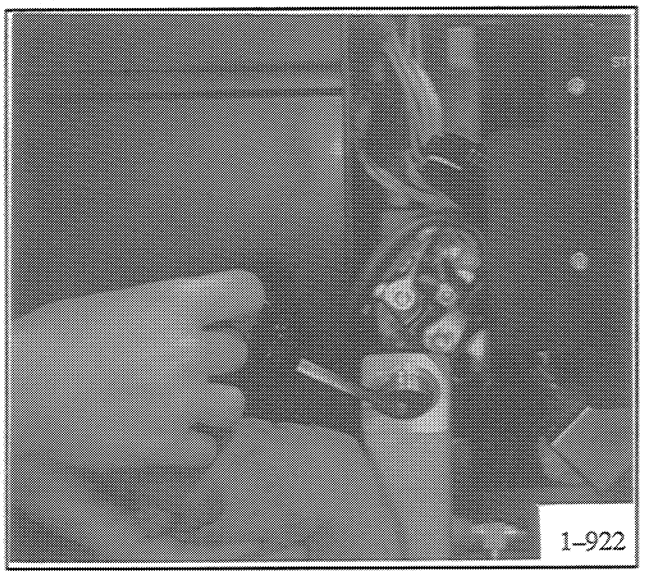



**Figure 3–2. Oil Fill/Dipstick**

Reposition dipstick in crankcase on top of hole (do not turn plug in) before removing for a reading Oil level should read between L and F on dipstick. Do not operate set if oil level exceeds "F" or registers below "L" on dipstick. See Figure 3–3.

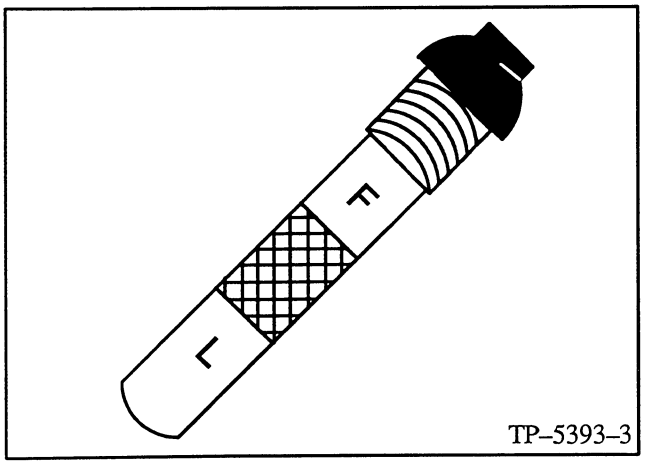



**Figure 3–3. Lube Oil Level**

**NOTE**

Do not operate the set if the level is below the 'L' mark or above the 'F' mark. Oil above the 'F' mark is wasted due to increased oil consumption.

**NOTE**

Do not check oil level when unit is running. Generator set must be stopped and level to get an accurate reading. Most accurate oil reading is obtained be shutting down the generator and waiting several minutes before checking oil.

## ADDING OIL

It is normal to add some oil between oil changes. The amount will vary with the usage. Open fill cap and pour a small amount of oil using a funnel or other suitable pouring device.

Wait a few minutes and check level. If necessary, add more oil and then check again. Each time be sure to add small quantities and check to prevent from overfilling.

## OIL CHANGE/OIL FILTER CHANGE

### Break–In Period Oil Recommendations

Generator set engines may be shipped "dry" due to the oil used in factory testing having been drained. Before operating a new set, the engine crankcase should be filled to specified capacity with a straight–weight oil having a viscosity appropriate for your particular climate. Do not use synthetic oils during the first five hours of operation or the rings may not seat properly. This oil should be changed immediately after the first five hours of operation. See "Lubrication System – Specifications."

On a new engine, change the oil after the first five hours of operation and thereafter at intervals specified in the service schedule.

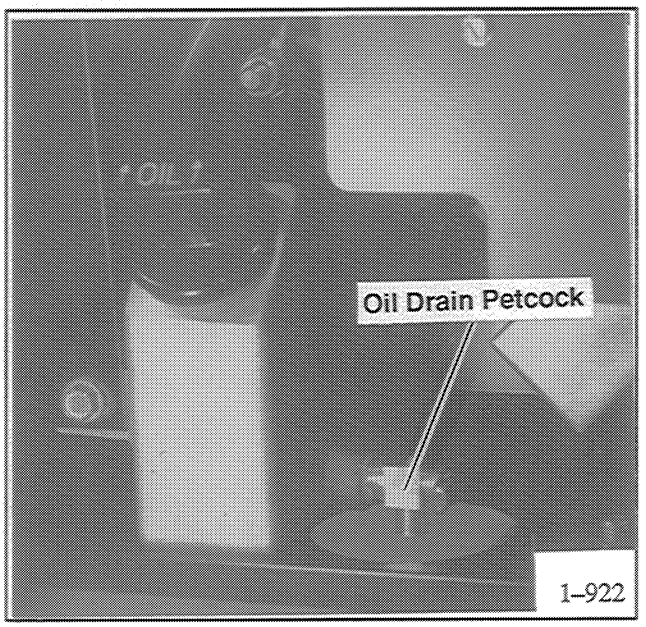



**Figure 3–4. Oil Drain Petcock**

Replace the oil filter (Kohler filter #277233) at every oil change. Whenever possible, drain the oil while it is still warm. To drain, place container below unit and open petcock (located to the right of the dipstick assembly). See Figure 3–4. Allow adequate time for generator to drain completely. After the oil has completely drained, close oil drain petcock.

Remove filter by rotating filter counter–clockwise with an oil filter wrench. Oil filter is 3 in. (76 mm) dia. and has 14 flutes (sides). Use rags to handle hot oil filter and clean up spilled oil. Remove filter and discard in a proper container. Clean contact surface of oil filter adapter.

Apply a light coating of fresh oil to the rubber seal at the base of the filter. Thread oil filter to adapter until gasket makes contact, hand–tighten an additional one–half turn. Wash hands after any contact with engine oil. Add new oil of proper weight and grade.

**Oil Refill Capacity: 4 U.S. Quarts (3.8 L)**
**(With Filter)**

Start generator set and check for leaks at oil drain petcock and oil filter. Tighten filter, if necessary.

STOP generator set. Wait a few minutes for oil to return to oil pan. Check oil level and add oil, as necessary.

Do NOT pollute the environment. Dispose of used engine oil and other contaminants in a safe and approved manner.

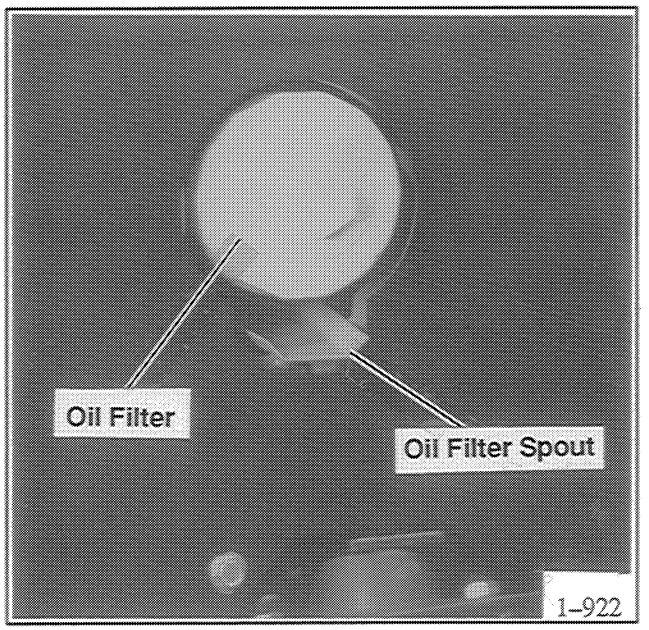



**Figure 3–5. Oil Filter Location**

## LOW OIL PRESSURE SHUTDOWN

The low oil pressure shutdown feature protects the engine against internal damage if the oil pressure drops below 14 psi ± 2 psi (96.5 kPa) due to oil pump fault or other malfunction. It does not protect against damage due to operating with the oil level below the safe range – **it is not a low oil level shutdown**. The only protection against running out of oil and possible engine damage is to check the level regularly and to add oil as needed. Location of the low oil pressure (LOP) switch is shown in Figure 3–6.

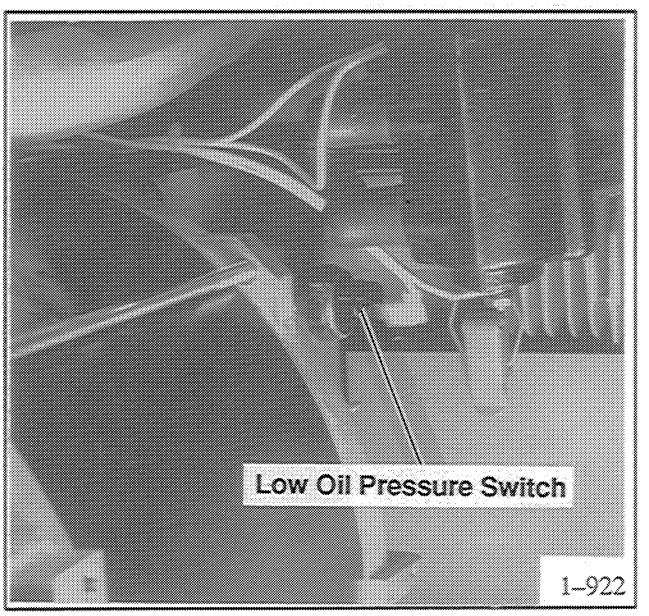



**Figure 3–6. Low Oil Pressure Switch**

# GASOLINE FUEL SYSTEM

## SPECIFICATIONS – GASOLINE

For best results, use only clean fresh, regular grade unleaded gasoline with a pump sticker octane rating of 86 or higher in the U.S.A. In countries using the research rating method, it should be 90 octane minimum.

Unleaded gasoline is recommended since it leaves fewer combustion chamber deposits. Regular grade leaded gasoline may also be used; however, be aware that the combustion chamber and cylinder head will require more frequent service. Gasohol containing no more than 10% ethanol can be used if unleaded gasoline is unavailable. Never use gasohol containing more than 10% ethanol or gasoline containing Methanol. Oil must not be mixed with the fuel.

Use fresh gasoline to ensure it is blended for the season, and to reduce the possibility of gum deposits forming which could clog the fuel system. Do not use gasoline left over from the previous season.

**⚠ WARNING**

**Explosive fuel vapors.**
**Can cause severe injury or death.**
Use extreme care when handling, storing, and using fuels.

**Explosive fuel vapors can cause severe injury or death.** All fuels are highly explosive in a vapor state. Use extreme care when handling, storing, and using fuels. Store fuel in a well–ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running since spilled fuel may ignite on contact with hot parts or from ignition spark. Do not smoke or permit flame or spark to occur near potential sources of spilled fuel or fuel vapors. Keep fuel lines and connections tight and in good condition—don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Additional precautions must be taken when using the following fuels:

**Gasoline** – Store gasoline only in approved red containers clearly marked GASOLINE. Do not store gasoline in any occupied building.

**Propane (LP)** – Adequate ventilation is mandatory. Propane is heavier than air; install gas detectors low in room. Inspect detectors often.

## FUEL FILTER – GASOLINE ONLY

The 7kW generator set utilizes an in–line (metal enclosed) type fuel filter connected to the electric (solid–state) fuel pump inlet. Replace the filter at intervals specified in the service schedule or when rough operation indicates an engine tune–up may be necessary. Be sure to use a genuine Kohler replacement part. Location of the fuel pump and fuel filter are shown in Figures 3–7 and 3–8 .

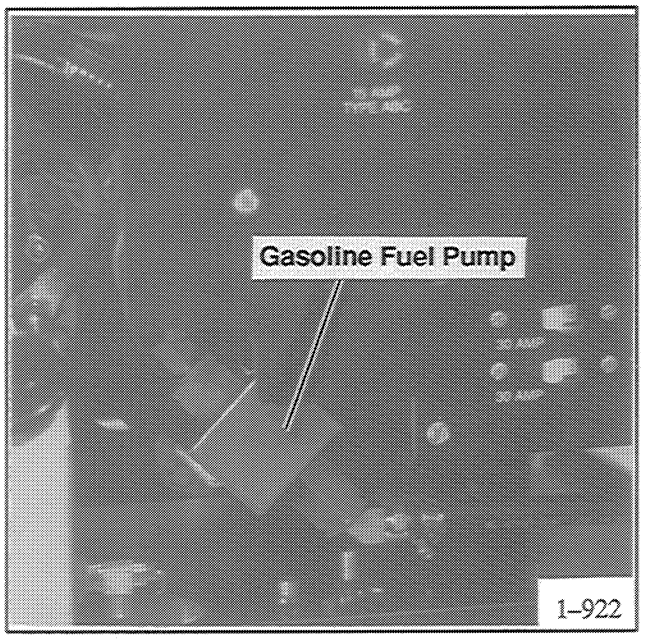



**Figure 3–7. Gasoline Fuel Pump**

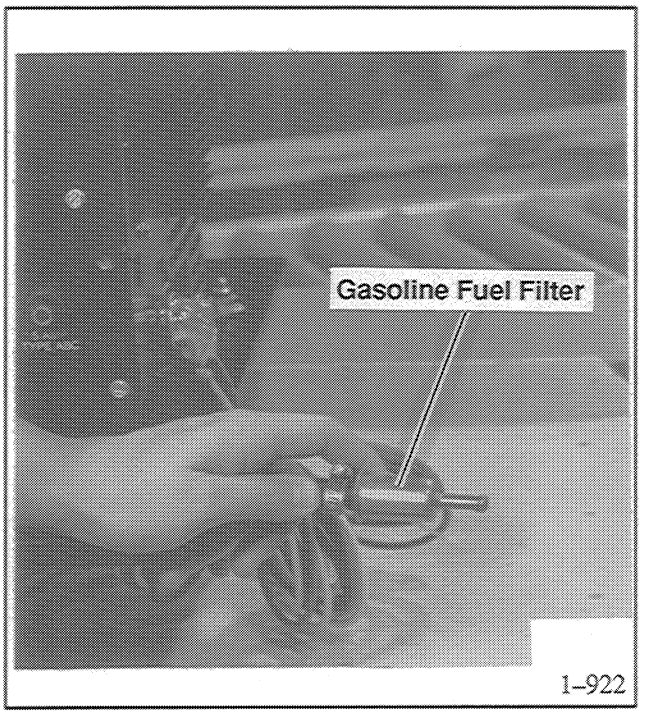



**Figure 3–8. Gasoline Fuel Filter**

## CARBURETOR ADJUSTMENTS – GASOLINE

A single venturi, sidedraft carburetor with anti–dieseling solenoid and electric choke is used on this generator set. The anti–dieseling solenoid provides a positive fuel shut–off when unit is shutdown. This helps prevent dieseling when shut down after running with a heavy load.

Lack of power and black sooty exhaust smoke usually indicate that the fuel mixture is too rich. An overrich mixture may be caused by a clogged air cleaner or improperly adjusted choke. Always check the air cleaner before readjusting the choke or carburetor. If the engine skips (misses) or backfires, the fuel mixture may be too lean. To locate adjustment needles, refer to Figure 3–9.

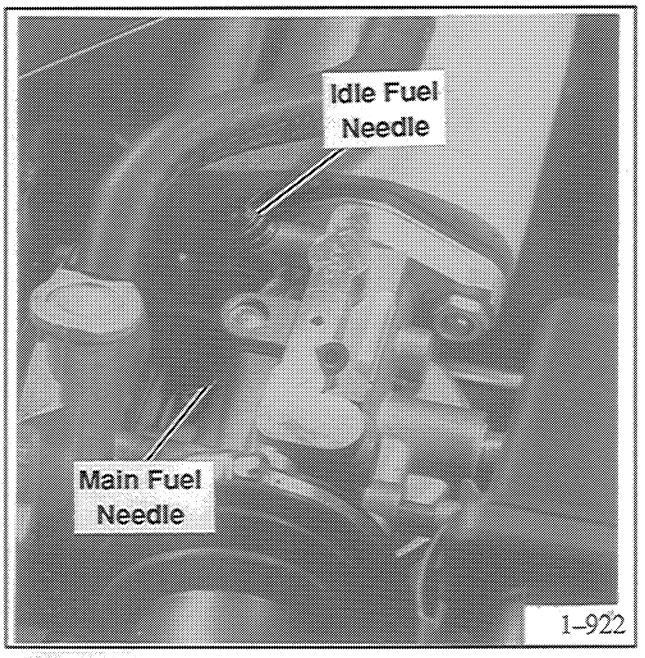



**Figure 3–9. Carburetor Adjustment Needles**

**NOTE**

Turning the adjusting needles in (clockwise) decreases the supply of fuel to the engine. This gives a leaner fuel/air mixture.

Turning the adjusting needles out (counterclockwise) increases the supply of fuel to the engine. This gives a richer fuel/air mixture.

### MAIN AND IDLE FUEL MIXTURE

1. Stop the engine. Turn the main fuel and idle fuel adjusting needles **in** (clockwise) until they bottom *lightly.* Do not force.

   **NOTE**

   The ends of the main fuel and idle fuel adjusting needles are tapered to critical dimensions. Damage to needles and seats will result if the needles are forced.

2. **Preliminary Settings:** Turn the main fuel and idle fuel adjusting needles **out** (counterclockwise) as follows:

   | | |
   |---|---|
   | **Main Fuel Needle** | **2–1/2 Turns** |
   | **Idle Fuel Needle** | **1–1/2 Turns** |

3. Start the engine and run at half–load for 5–10 minutes to warm up. The engine must be warm before making final settings.

**⚠ WARNING**

**Fire.**
**Can cause severe injury or death.**

Do not smoke or permit flame or spark to occur near fuel or fuel system.

**A flash fire can cause severe injury or death.** Do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuel or fuel vapors. When removing fuel line or carburetor, use a proper container to catch all fuel.

4. **Final Setting – Main Fuel:** Place engine 3/4 to full load. Turn main fuel adjusting needle **in** (clockwise) from preliminary setting until the engine does not operate smoothly. Note the position of the needle.

   Now turn the main fuel needle **out** (counterclockwise) 1/4 turn.

5. **Final Setting – Idle Fuel:** Set idle fuel adjusting needle using the same procedure as in Step 4.

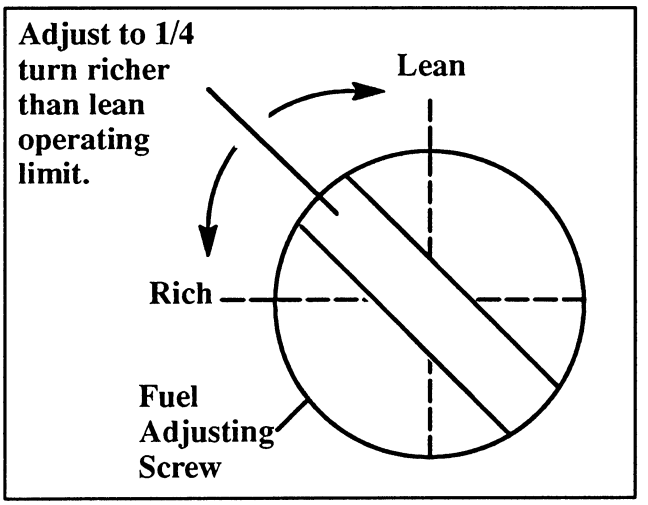



**Figure 3–10. Carburetor Adjustment**

# LP GAS FUEL SYSTEM

## SPECIFICATIONS – LP GAS (Vapor Withdrawal)

Most small engines, especially single–cylinder models, use vapor–withdrawal LPG systems. Fuel is drawn from the top of the LPG tank where it is already in a vapor state. Such a system uses a special pressure fuel tank. The components of the vapor withdrawal system are as follows:

- TANK: Adequate capacity to provide vaporization at lowest anticipated temperatures. The primary regulator, normally located at the fuel tank for vapor systems, reduces tank pressure to 4 to 6 ounces.
- PIPING: Adequate size to provide sufficient volume of gas.
- FUEL SHUT–OFF SOLENOID: Provides positive fuel shut–off when the engine is stopped.
- SECONDARY REGULATOR: Senses engine need for fuel and meters proper amount.
- CARBURETOR: Straight gas type with idle and main lines to the primary regulator.

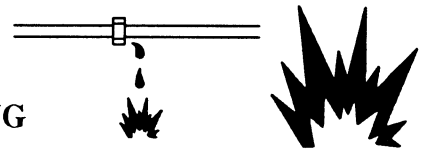
The LP Vapor gas system consists of a shut–off fuel solenoid, a secondary regulator, and carburetor that adjusts the mixture of fuel and air for proper combustion.

The gas and supply pressure should not exceed six ounces. To check inlet pressure, remove plug on fuel inlet of gas regulator. Insert ounce pressure gauge or manometer. Adjust pressure to 4–6 ounces or 7–11 inches water column. Inlet pressure is adjusted on primary regulator (pressure greater than 10 ounces will not allow electric fuel valve to open).

**NOTE**

If a removable fuel container is used as a fuel source, fuel leakage during a container change must be prevented by the use of a quick–close coupling on the fuel line or a check valve installed in the fuel line.

A hydrostatic relief valve is also required between the container shutoff valve and the automatic shut-off valve on the generator set.



**⚠ WARNING**

**Explosive fuel vapors.**
**Can cause severe injury or death.**
Use extreme care when handling, storing, and using fuels.

**Explosive fuel vapors can cause severe injury or death.** Fuel leakage can cause an explosion. Check LP Vapor gas fuel system for leakage using a soap–water solution with fuel system test pressurized to 6–8 ounces per square inch (10–14 inches water column). Do not use test solutions that contain ammonia or chlorine, since the soap will not bubble for an accurate leakage test.

## SPECIFICATIONS – LP Gas (Liquid Withdrawal)

Twin–cylinder and larger displacement multi–cylinder engines usually use liquid–withdrawal systems. The liquid–withdrawal system functions much the same as the vapor–withdrawal system – with one exception. The fuel drawn from the bottom of the LPG tank is in a liquid form. It needs to be converted to a vapor. The LPG in the tank usually cannot vaporize fast enough to satisfy the higher requirements of a larger engine. By drawing the liquidized fuel and converting it to vapor, a sufficient volume of fuel can be supplied to power an LPG engine. The 7kW uses the fuel line as a vaporizer by routing the fuel line in close proximity to the exhaust manifold to capture the radiated heat and thus cause vaporization of the liquid fuel. The components of the liquid withdrawal system are as follows:

- TANK: Adequate capacity to provide vaporization at lowest anticipated temperatures.
- PIPING: Adequate size to provide sufficient volume of gas.
- FUEL SHUT–OFF SOLENOID: Provides positive fuel shut–off when the engine is stopped.
- DRY GAS FILTER: Traps pipe scale and other impurities.
- PRIMARY REGULATOR: Reduces incoming pressure to 4 to 6 ounces.

**NOTE**

If generator set is experiencing poor starting, this may be an indication of a grease build–up in the primary regulator. To clean, remove two screws, remove cap and clean regulator with gasoline.

- FUEL SHUT–OFF SOLENOID (Secondary): Provides fuel shut–off when the engine is stopped. Eliminates back–fires.
- SECONDARY REGULATOR: Senses engine need for fuel and meters proper amount.
- CARBURETOR: Straight gas type with idle and main lines to the primary regulator.

The LP gas liquid withdrawal fuel system utilizes a vaporizer and regulator to convert LP gas from a liquid to a gaseous state. Vaporized fuel is combined with air in the carburetor to produce the correct air/fuel mixture for proper combustion. Be sure the LP gas is properly blended for the season and/or geographic location in which the generator is operated. To locate carburetor adjustments refer to Fig. 3–10a.

**⚠ WARNING**

**Explosive fuel vapors.**
**Can cause severe injury or death.**
Use extreme care when handling, storing, and using fuels.

**Explosive fuel vapors can cause severe injury or death.** Fuel leakage can cause an explosion. Check LP Liquid Withdrawal gas fuel system for leakage using a soap–water solution with fuel system test pressurized not less than 90 psi (621 kPa). Do not use test solutions that contain ammonia or chlorine, since the soap will not bubble for an accurate leakage test.

## CARBURETOR ADJUSTMENTS – LP GAS

### Main Fuel Mixture

For preliminary setting turn the MAIN FUEL valve in a clockwise direction until it bottoms lightly (do not force), then back out 1 turn. With the engine thoroughly warmed up and running at rated rpm under full load, turn MAIN FUEL valve in until the engine slows down (lean setting) then turn valve out until the engine regains full speed (about 1/8 turn). When properly adjusted, the engine will operate with steady governor action. Improper adjustment (rich setting) causes improper operation of the vaporizer and excess fuel consumption.

### Idle Fuel Mixture

The idle system functions only at part and no load conditions. For this reason, the idle setting has only a momentary effect. To adjust, stop the engine and then turn the IDLE FUEL screw all the way in (clockwise) then back out 1/4 turn. Adjust for proper no load operation.

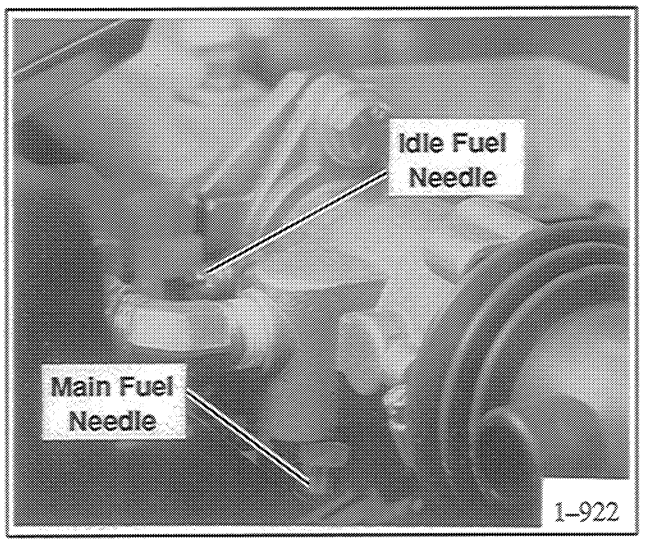



**Figure 3–10a. LP Carburetor Adjustments**

**NOTE**

If frost forms on primary regulator (LP–Liquid systems), this could mean that the carburetor main fuel valve is set too rich. Lean the carburetor 1/8 turn and repeat as often as necessary until frost is no longer present.

## PRIMARY REGULATOR LP GAS

The function of the primary regulator is to provide initial control of the fuel as it comes, under pressure, from the supply tank or vaporizer. The inlet pressure should never exceed 250 psi. In addition, the primary regulator is adjusted for an outlet pressure of approximately 6 ounces, or 11 inches of water.

## SECONDARY REGULATOR LP GAS

The secondary regulator operates in a similar fashion to the primary regulator, but is much more sensitive. When the engine is cranked, air flow through the carburetor creates a pressure drop (vacuum) in the secondary regulator. Atmospheric pressure pushes the diaphragm toward the lower pressure, and the diaphragm lever pulls the plunger away from the fuel inlet, allowing fuel to flow to the carburetor. A properly adjusted secondary regulator can react to a vacuum of only 0.25 to 0.35 inches of water column.

## FUEL VALVE & FILTER – LP LIQUID

The LP fuel valve contains a replaceable filter which should be inspected yearly or after every 100 hours of operation. Normally, the filter requires replacement only after accumulation of filtered debris restricts fuel flow to the regulator/vaporizer. Rough generator operation and/or the presence of frost on the fuel valve outer surface indicates filter replacement is necessary. Assembly of the LP gas fuel valve and location of the fuel filter is shown in Fig. 3–10b.

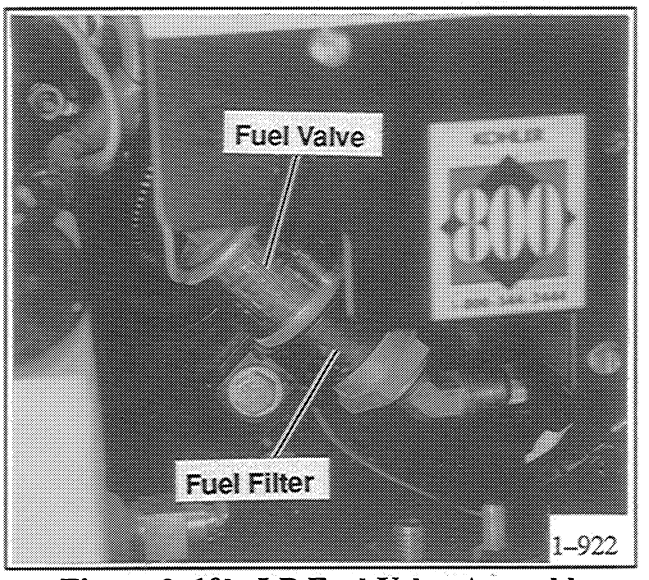
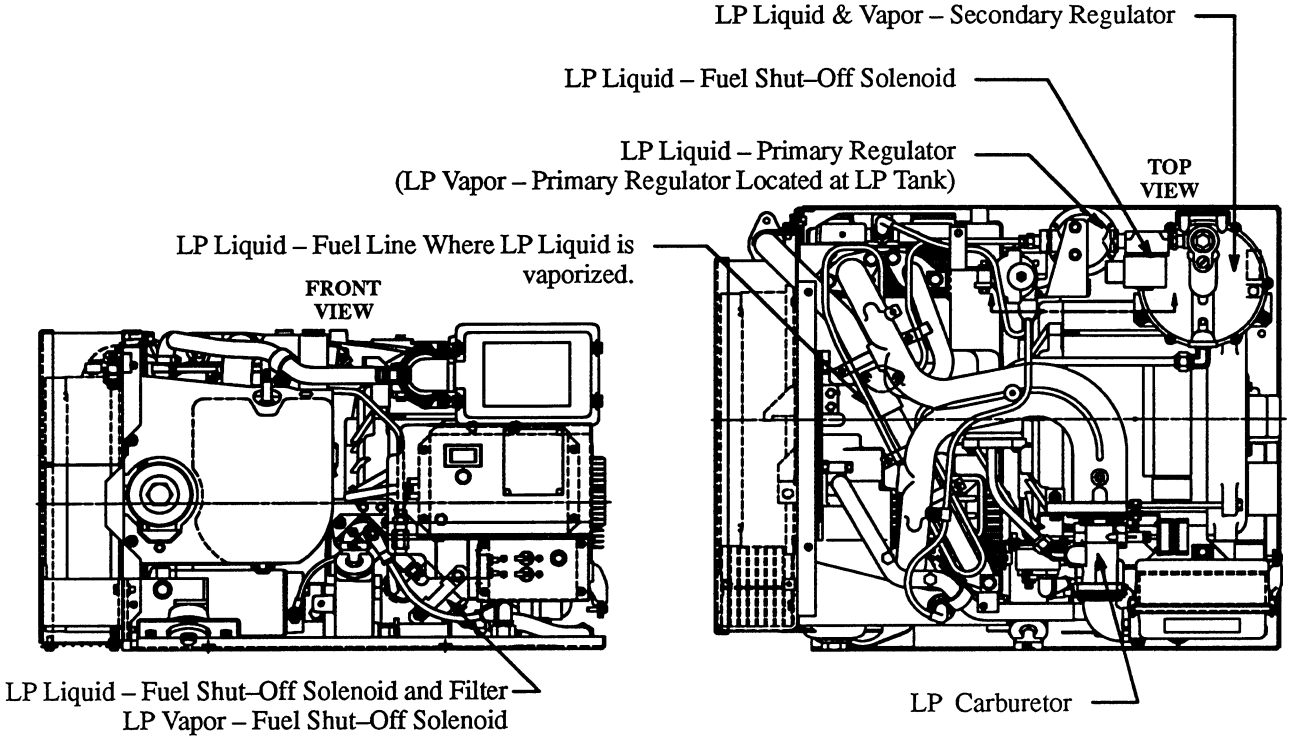
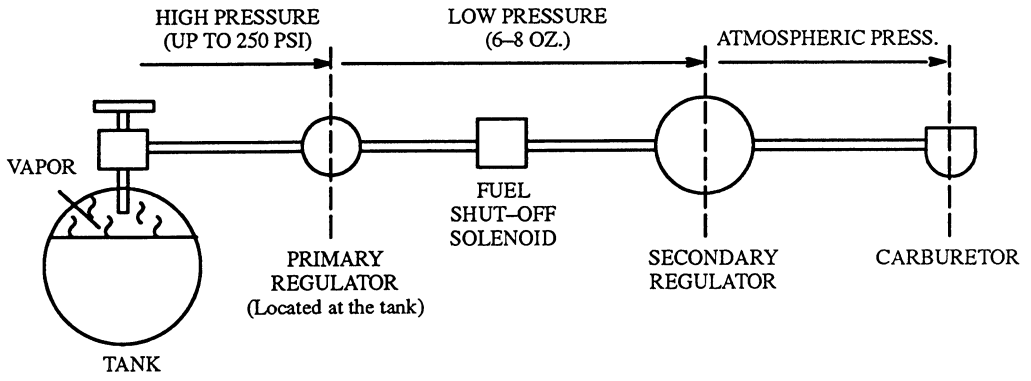


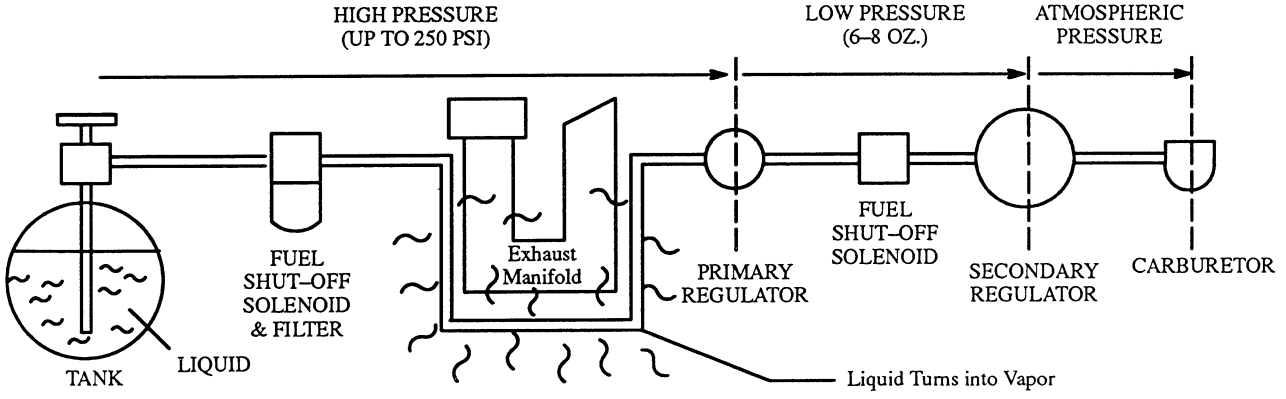

**Figure 3–10b. LP Fuel Valve Assembly**




## TYPICAL VAPOR WITHDRAWAL SYSTEM




## TYPICAL LIQUID WITHDRAWAL SYSTEM




**LP Gas System Components**

## ELECTRIC CHOKE ADJUSTMENT – GASOLINE

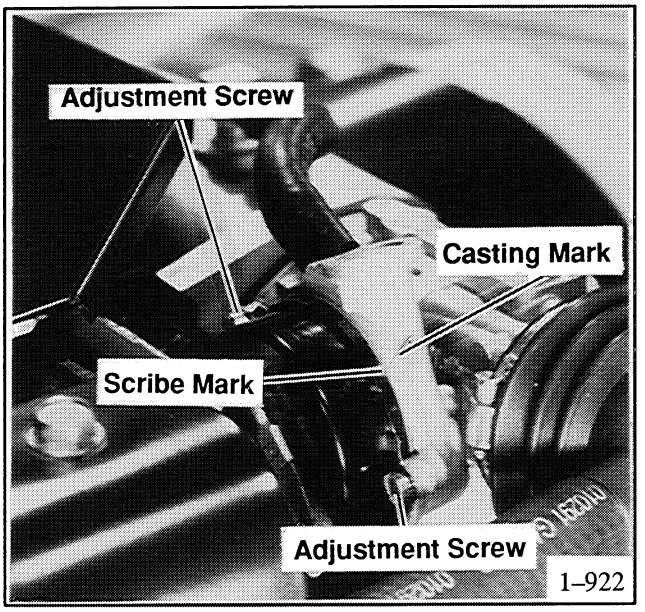



**Figure 3–11. Electric Choke Adjustment**

A Kohler Thermo–electric automatic choke is used to enrich the gasoline fuel mixture during starting. The choke automatically closes as the ambient temperature cools or as the engine temperature decreases. As the engine warms, the coils inside the choke allow the choke plate to open. If readjustment is needed, loosen the two screws securing the choke bracket to the carburetor and shift the position of the choke assembly (Figure 3–11). When properly set, the choke plate will be within 5 to 10 degrees of full open at approximately 70° F (21° C).

**Choke Adjustment Procedure**
**For Operation above 10°F (–12.2°C)**
(From original factory–set position)

1. Where the choke casting mark meets the black plastic cover of the choke, make a scribe mark on the choke's black cover. See Figure 3–11.

2. Loosen the two choke adjusting screws and rotate choke cover counter–clockwise towards leaner setting (follow direction of arrow on choke).

3. When the distance between the scribe mark on the black cover and the casting mark is 5/16 in. (8 mm) tighten the two choke adjusting screws.

**Choke Adjustment Procedure**
**For Operation below 10°F (–12.2°C)**

**NOTE**

If not previously adjusted, leave as factory set. Otherwise, follow procedure below.

1. If scribe mark has been made on the choke's black cover, loosen the two choke adjusting screws and rotate choke cover clockwise (opposite direction of arrow on choke).

2. When the scribe mark on the black plastic cover of the choke and the choke casting mark line up, tighten the two adjusting screws.

## SPARK PLUGS

At the recommended interval (shown in the service schedule) service spark plugs.

1. Remove spark plug wires by grasping boot and turning slightly while pulling. Do not pull on wire. See Figure 3–14.

   **NOTE**

   Pulling wire rather than boot may cause damage to wire or terminal.

2. Loosen spark plug with a ratchet and spark plug socket with a rubber insert to prevent damage to spark plug. Where possible, use compressed air to remove dirt from around each spark plug. This procedure will prevent dirt particles from falling into combustion chamber. Remove spark plugs and examine. See Table 3–2 for evaluating engine conditions by color/condition of spark plugs.

3. Clean spark plugs by wiping them clean with a rag and then file the center electrode so that it is parallel to the side electrode.

   Should replacement be necessary, see Section 10 – Specifications Chart for spark plug type.

   **NOTE**

   Do not sandblast, wire brush, scrape, or otherwise service spark plug in poor condition. Best results are obtained with a new plug.

4. Before installing any spark plug, check the gap. See Figure 3–15. The proper gap is attained when the feeler gauge (or wire) passes between the spark plug electrodes. It should pass easily, but with some resistance or drag; otherwise, adjust as necessary. The correct gap is 0.025 in. (0.64 mm) for gasoline models and 0.018 in. (0.46 mm) for LP gas models.

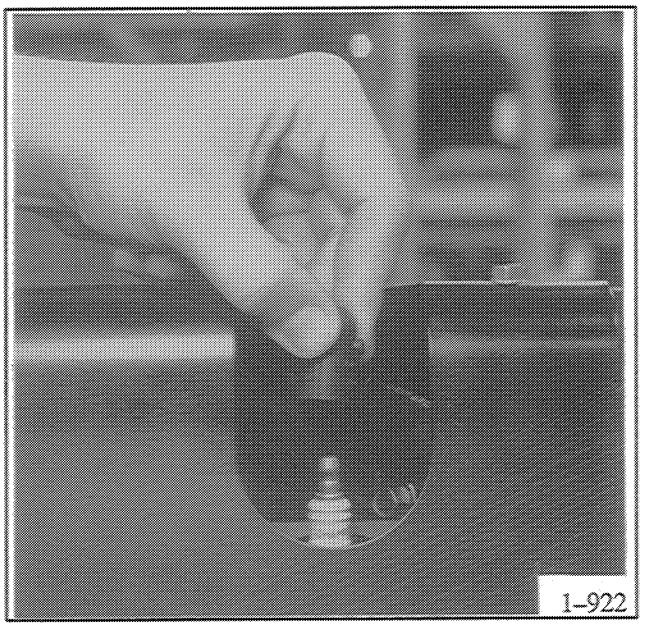



**Figure 3–14. Removing Spark Plug Boot**

5. Use gapping tool to gently bend the side electrode closer together or further apart to set the correct gap. See Figure 3–16. The side electrode must be directly over the area of the center electrode.

6. Reinstall spark plug being careful not to bump electrode against cylinder head. Rotate clockwise until resistance is felt.

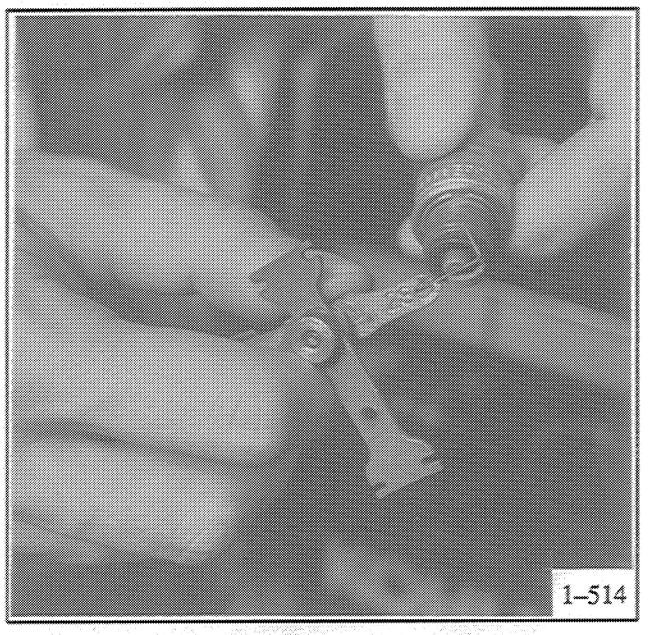



**Figure 3–15. Checking Spark Plug Gap**

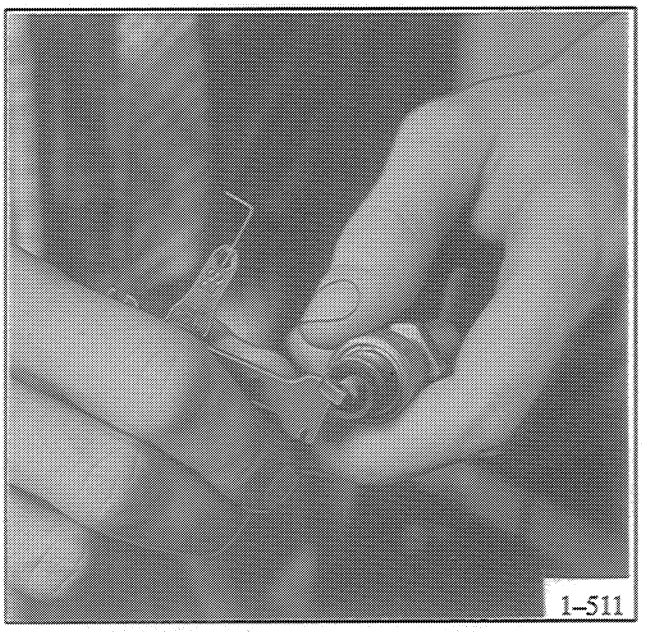



**Figure 3–16. Adjusting Spark Plug Gap**

7. Use a torque wrench and torque each spark plug to 18–22 ft. lbs. (24–30 Nm). Otherwise, hand–tighten spark plug until resistance is felt and then final tighten using ratchet wrench an additional 1/4 turn. Do NOT over–tighten as this may strip threads or alter electrode gap setting.

8. Check spark plug wire connector in boot for accumulated dirt, grease, etc. and clean as necessary. Firmly push spark plug boot onto spark plug.

## TIMING

The timing of the spark is automatically controlled by the ignition module. No ignition timing adjustments are necessary or possible with this system. If timing problems are encountered, check ignition module air gap. See Engine Service Manual for details.

| PROBLEM | MEANS OF IDENTIFICATION | POSSIBLE CAUSE |
|---|---|---|
| **Normal** | Light tan or gray deposit on the firing tip. | Good operating conditions and maintenance. |
| **Gap bridged** | Deposits built–up and closing gap between electrodes. | Oil or carbon fouling. Clean and regap, or replace |
| **Oil fouled** | Wet black deposits on the insulator shell bore electrode. | Excessive oil entering combustion chamber through worn rings and pistons, excessive clearance between valve guides and stems, or worn or loose bearings. Replace plug. |
| **Carbon fouled** | Black, dry fluffy carbon deposits on insulator tips, exposed shell surfaces and electrodes. | Using too cold range plug, weak ignition, clogged air intake or improper carburetor adjustments, defective fuel pump, overrich fuel mixture, or excessive no load operation. Clean and regap, or replace |
| **Lead fouled** | Dark gray, black, yellow, or tan deposits; or a glazed coating on the insulator tip. | Caused by highly leaded fuel. Replace plug. |
| **Pre–ignition** | Melted electrodes and possibly blistered insulator. Metallic deposits on insulator suggests internal engine damage. | Wrong type of fuel, incorrect timing or advance, too hot of a plug, burnt valves or engine overheating. Replace plug. |
| **Overheating** | White or light gray insulator with small black or gray/brown spots with bluish (burnt) appearance on electrodes. | Engine overheating, wrong type of fuel, loose spark plugs, too hot a plug, low fuel pump pressure or incorrect ignition timing. Replace plug. |
| **Worn** | Severely eroded or worn electrodes. | Caused by normal wear and failure to replace at proper interval. Replace plug. |

**Table 3–2. Spark Plug Condition**

# COOLING SYSTEM

To prevent damage to the generator set from overheating, keep the cooling air inlets and outlets to the compartment clean and unobstructed at all times.

A fan on the rotor of the generator draws cooling air into the compartment through the generator cooling slots and expels it at the engine–generator adapter. The engine of the generator set features an air–vac reverse flow cooling system. Fins on the engine flywheel pull cooling air past the fins of the cylinder heads and heated air is discharged downward and out of the compartment through the discharge duct. See Figure 3–17.

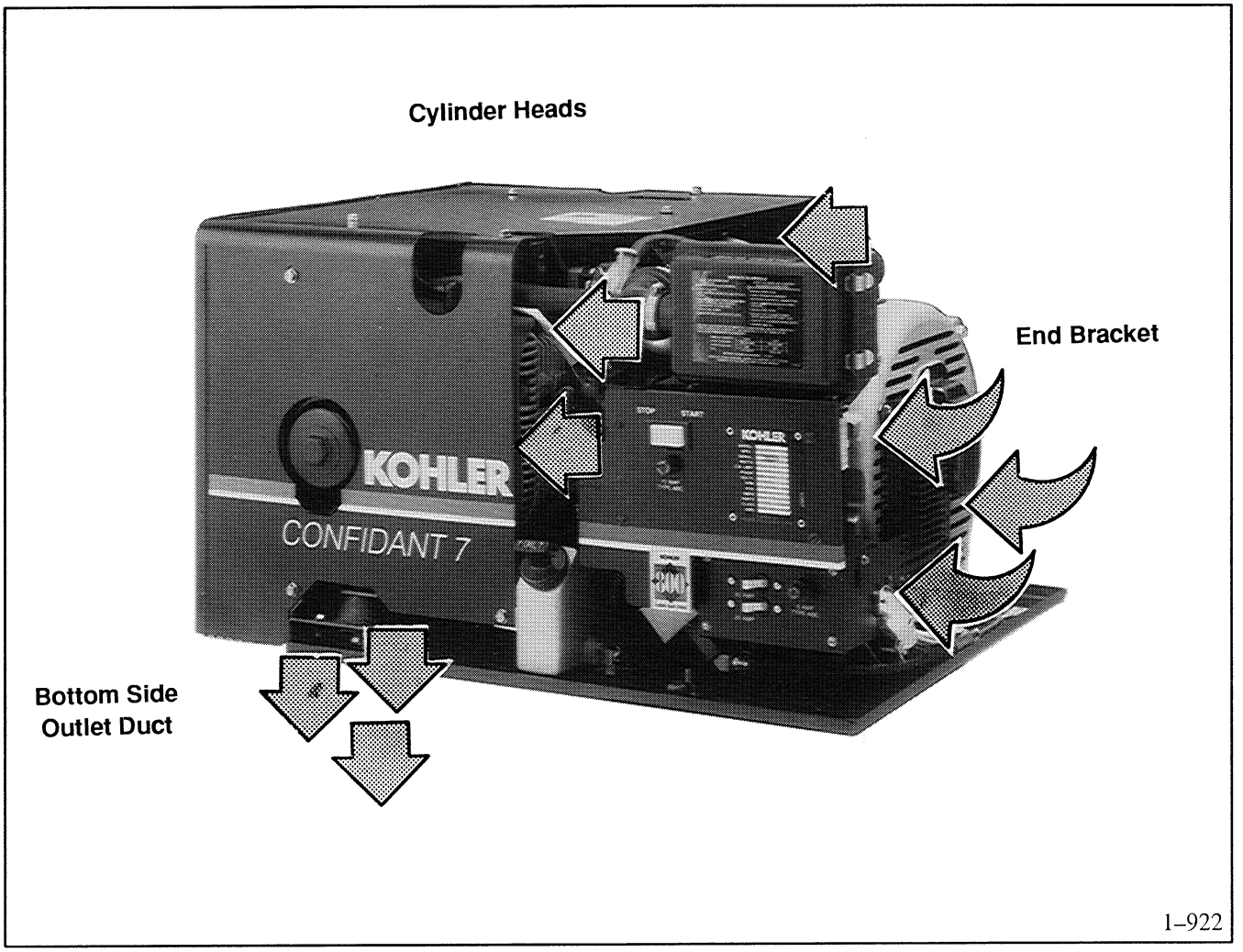



**Figure 3–17. Cooling Air Circulation**

# AIR CLEANER

The engine is equipped with a dry type (flame proof) air cleaner. At the recommended interval specified in the service schedule replace air cleaner (more often if operating under extremely dusty or dirty conditions). Remove element and service by tapping element lightly against flat surface to dislodge loose surface dirt. Do not clean in any liquid or blow out with compressed air as this will ruin filter material in element. If dirty, bent, or damaged replace element with a genuine Kohler replacement part. See Figure 3–18.

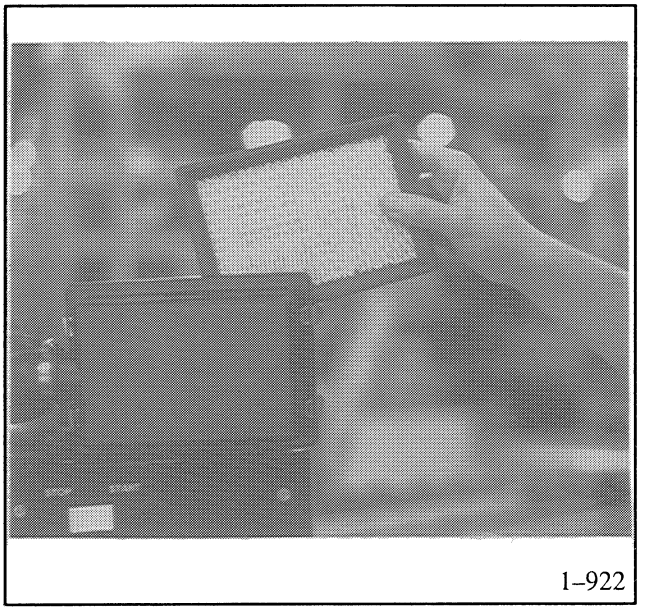



**Figure 3–18. Air Cleaner Service**

# CYLINDER HEAD SERVICE

At the specified interval, the cylinder heads should be taken off the engine and serviced. Remove carbon deposits from combustion chamber in head. Scrape and remove carbon with a sharp piece of wood or plastic. Wood or similar material is suggested to avoid scratching aluminum surfaces of the cylinder head. Always use a new cylinder head gasket. Make sure head bolts are tightened in the proper sequence and to the torque value specified. See Figure 3–19.

**NOTE**

If the engine is operated on leaded fuel or under certain conditions, such as continued light load or relatively constant speed, carbon may build up more rapidly. If there are early indications of this, such as heavy deposits of carbon on spark plug electrodes, service the heads more frequently. See Service Schedule NOTE concerning leaded fuel.

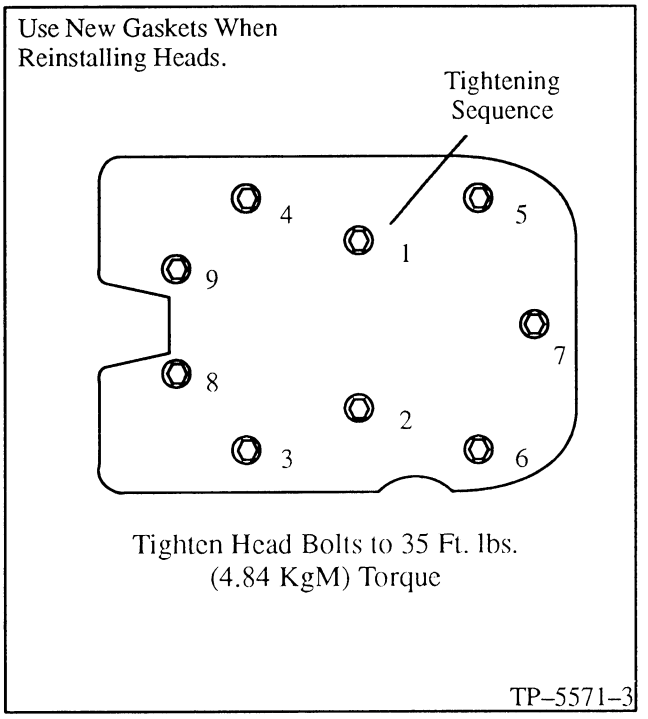



**Figure 3–19. Cylinder Head Fastener Tightening Sequence**

# BATTERY

The recommended starting battery is one 12 Volt with a minimum CCA (cold cranking Amps.) of 290 at 0° F (–18° C) or 55 Amp. Hr. When using a "Maintenance Free" battery it is not necessary to check the specific gravity or electrolyte level. Otherwise, these procedures should be done at the intervals specified in the "Service Schedule."

**⚠ WARNING**
**Sulfuric acid in batteries.**
**Can cause severe injury or death.**
Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

**Sulfuric acid in batteries can cause severe injury or death.** Sulfuric acid can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash–proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous spattering of electrolyte.

## CLEANING

Keep battery clean by wiping it with a damp cloth. Keep all electrical connections dry and tight. If corrosion is present, disconnect cables from battery and remove corrosion with a wire brush. Clean battery and cables with a solution of baking soda and water. Be careful that cleaning solution does not enter battery cells. When cleaning is complete, flush battery and cables with clean water and wipe with a dry cloth. After the battery cables are reconnected, coat terminals with petroleum jelly, silicon grease, or other nonconductive grease.

**Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (–) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. Do not mount battery in generator compartment. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

## CHECKING ELECTROLYTE LEVEL

Check the level of electrolyte before each start–up. Remove filler caps and check to see that electrolyte level is up to bottoms of filler holes, see Figure 3–20. Refill as necessary with distilled water or clean tap water. DO NOT add fresh electrolyte! Be sure filler caps are tight. If water is added during freezing temperatures, run generator set 20–30 minutes to allow mixing of added water and electrolyte. This will prevent damage to battery due to freezing.

**NOTE**

The generator set will not start if the battery connections are made in reverse.

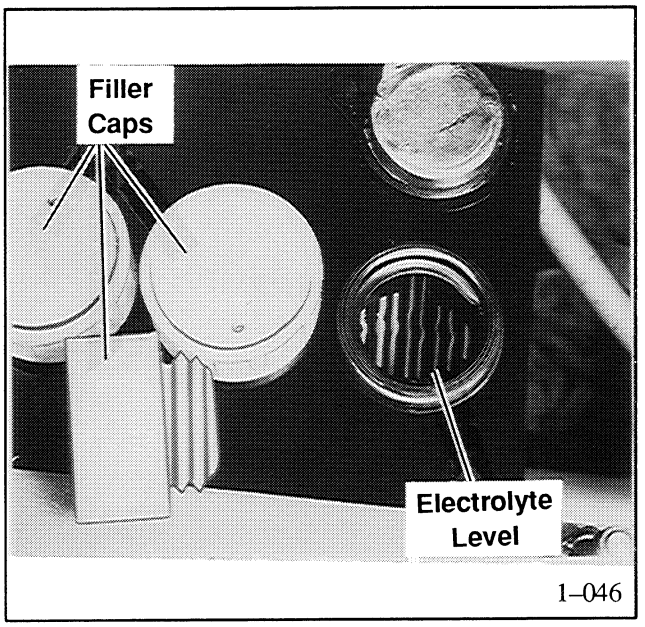



**Figure 3–20. Checking Electrolyte Level**

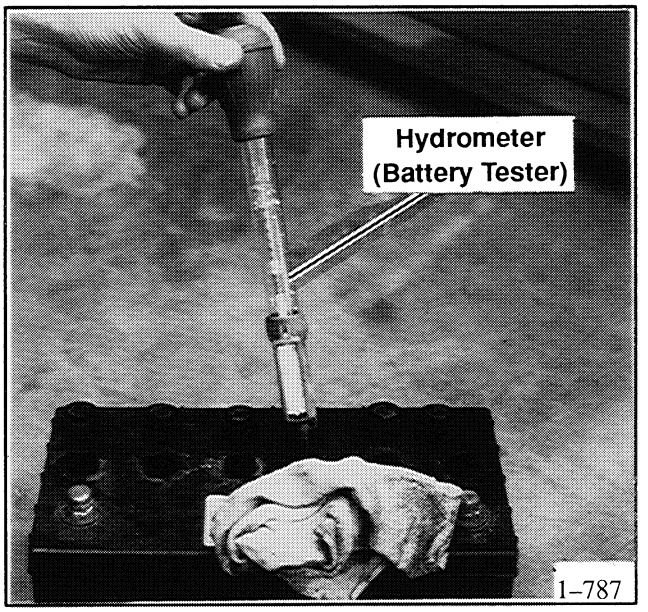



**Figure 3–21. Checking Specific Gravity**

## CHECKING SPECIFIC GRAVITY

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell. While holding the hydrometer vertical, read the number on the glass bulb at the top of the electrolyte level (or the number adjacent to the pointer), see Figure 3–21. If the hydrometer used does not have a correction table, use the one in Figure 3–22. Determine specific gravity and electrolyte temperature of battery cells. Locate temperature in Figure 3–22 and adjust gravity by amount shown. The battery is fully charged if the specific gravity is 1.260 at an electrolyte temperature of 80° F (26.7° C). The difference between specific gravities of each cell should not exceed +/–0.01. The battery should be charged if the specific gravity is below 1.215 at an electrolyte temperature of 80° F (26.7° C).

### NOTE

Some battery testers available simply have four or five beads in the tube. Draw electrolyte into the tube as done with the other type of hydrometer. Use instructions with tester.

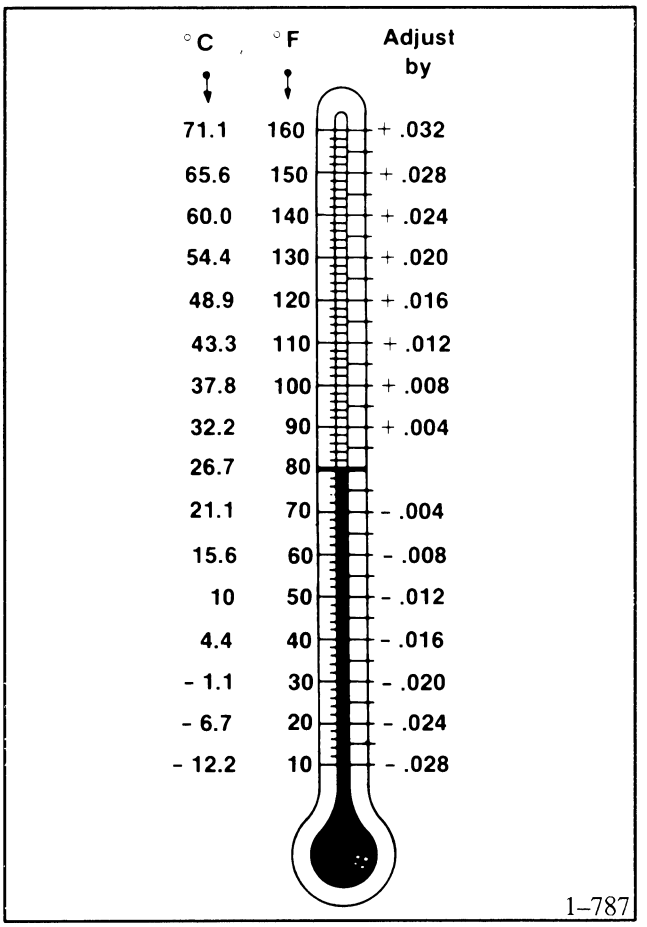
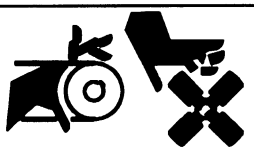



**Figure 3–22. Specific Gravity Temperature Correction**

# VALVE ADJUSTMENT

At the specified interval adjust valve lash (or sooner if excessive valve train noise is noticed), check clearance between the valve stems and tappets. The engine must be stopped and cooled to normal ambient temperatures to accurately gauge and adjust valve clearances. Use the following procedure to adjust. Reference the Engine Service Manual for more information.

**⚠ WARNING**



**Rotating parts.**
**Can cause severe injury or death.**

Do not operate generator set without all guards, screens, or covers in place.

**Flying projectiles can cause severe injury or death.** Retorque all crankshaft and rotor hardware after servicing. When making adjustments or servicing generator set, do not loosen crankshaft hardware or rotor thru–bolt. If rotating crankshaft manually, direction should be clockwise only. Turning crankshaft bolt or rotor thru–bolt counterclockwise can loosen hardware and result in serious personal injury from hardware or pulley flying off engine while unit is running.

**NOTE**

The piston must be at top dead center (TDC) of the compression stroke to measure valve–to–tappet clearance. By rotating the flywheel and observing the valves and tappets for movement, it can be determined if a cylinder is at TDC.

If, for example, the flywheel is rotated and movement is noticed in the No. 2 side valve box – the opposite cylinder (No. 1 side) will be at TDC and valve–to–tappet clearance can be measured. Rotating the flywheel one complete revolution (360°) will then cause movement in the No. 1 side valve box – the No. 2 side cylinder will be at TDC, enabling measurement of valve–to–tappet clearance for that side.

**NOTE**

The engine must be stopped and cooled to normal ambient temperatures to accurately gauge and adjust valve clearances.

## CLEARANCE SPECIFICATIONS

**INTAKE**

0.008–0.010 in. (0.20 mm – 0.25 mm)

**EXHAUST**

0.017–0.020 in. (0.43 mm – 0.51 mm)

1. Turn engine over until piston in #1 cylinder (closest to flywheel) is at Top Dead Center on compression – in this position, both valves will be closed and cam will have no affect on tappet.

2. Measure clearance between valve stem and tappet with a feeler gauge, see Figure 3–22a. To adjust, turn adjusting screw on tappet in or out until proper clearance is attained

3. After adjusting valve–tappet clearance on #1 cylinder, turn engine over until #2 cylinder is at T.D.C. on compression and repeat adjustment on this cylinder.

4. After valves are in proper adjustment, position new head gasket and reinstall cylinder heads. Make sure head bolts are tightened in the proper sequence and to the torque value specified on page 3–21.

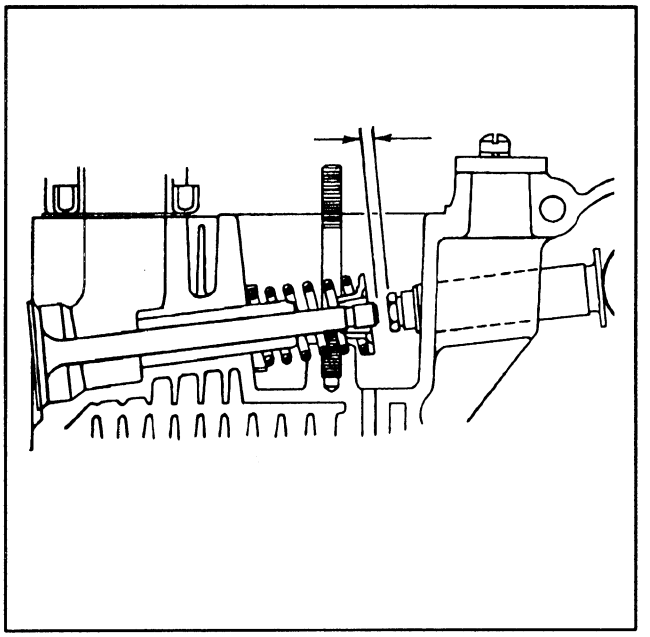


**Figure 3–22a. Valve–Tappet Clearance**

# ELECTRONIC GOVERNOR

The governor system consists of an electronic isochronous governor, an electro–mechanical stepper motor, and a magnetic pickup. Electrical pulses are supplied by the magnetic pickup to the isochronous governor (control unit) each time one of the ring gear teeth passes the pickup. The control unit then compares the frequency of these pulses to a pre–set reference and provides a signal to the stepper motor which, in turn, controls the carburetor throttle position and hence the engine speed. This is a closed loop system and typically provides steady state speed regulation of +/– 0.25%.

The electronic governor is set at the factory and under normal circumstances will not require further adjustment. If erratic operation is noted, check the following items BEFORE readjustment.

a. Check electrical connections – the stepper motor, controller box, and governor connector (inside the controller) should be checked for clean and tight connections.

b. Check magnetic pick–up connections – poor connections may cause the signal to be erratic. As long as this erratic signal is being sent, the unit will not shut down due to "loss of pick–up."

c. Check electrical ground connections – a good DC ground must be provided to the controller assembly and governor circuit.

d. Check for dirt build–up on magnetic pick–up – metal filings or caked–on dirt/grease may decrease the output signal of magnetic pick–up.

e. Check for stepper motor/throttle shaft coupling wear – if the roll pin has cause wear to the slot of the stepper motor coupling, loosen coupling screw and move coupling so that roll pin is positioned at a point in stepper motor coupling without wear. Tighten coupling screw.

If the governor is removed or tampered with, use the following adjustment procedure.

1. The first adjustment check is the governor actuator shaft to carburetor throttle shaft. In order for proper engagement, shafts must be concentric. Throttle plate position can be either open or closed during assembly. Carburetor throttle shaft pin must be in the slot of the stepper motor coupling with the pin in the middle of the depth of the slot. No other adjustment is necessary or possible with this arrangement.

   The governor stepper motor should function with steady and smooth movement during operation. If movement of stepper motor is erratic or large changes in movement occur, check shaft alignment, check for excessive coupling slot wear, and check for broken or loose wiring including plug connections.

   To test for proper operation of the stepper motor, disconnect magnetic pick–up leads. Manually move the throttle shaft/governor stepper motor fully counter–clockwise (closed throttle). Start generator set. Stepper motor should initially move clockwise (wide open throttle) and then go completely counter–clockwise. The stepper motor should remain in this position. STOP generator set. If stepper motor fails this test, replace stepper motor. Connect magnetic pick–up leads.

   **NOTE**

   Before replacing the stepper motor, make sure that the controller circuit board is functioning properly by verifying that 12 volts are entering the governor circuit board at pin 6.

2. The magnetic pick–up air gap is 0.040 in. (1.02 mm) +/– 0.005 in. (0.127 mm). See Figure 3–23.

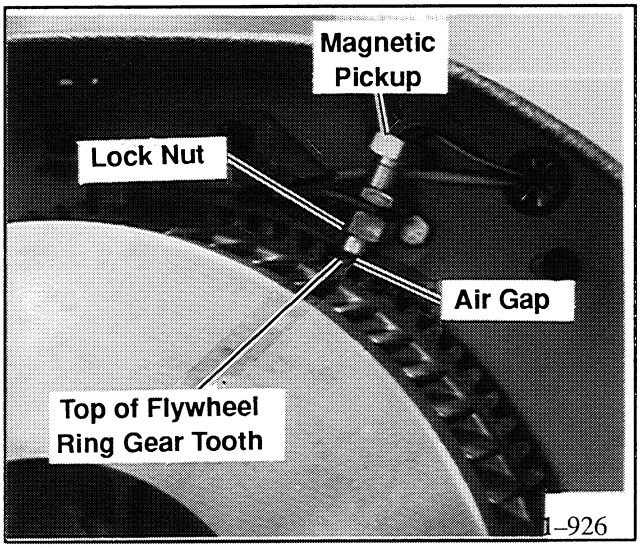



**Figure 3–23. Magnetic Pickup Air Gap**

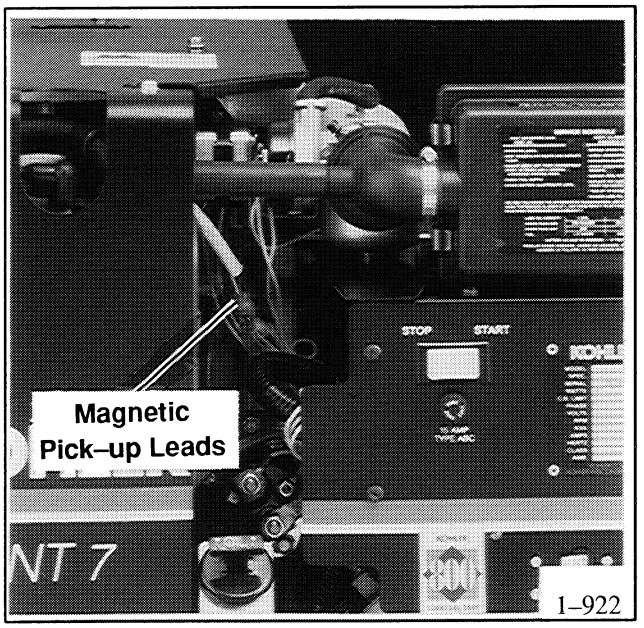



**Figure 3–24. Magnetic Pick–up Leads**

To verify operation of the magnetic pick–up, connect voltmeter to magnetic pick–up leads. See Figure 3–24.

During engine cranking, voltage should be 1.75 volts AC minimum. If the air gap has been checked and is correct, replace magnetic pick–up if proper voltage is not measured.

3. Adjust carburetor fuel mixture as stated in "Carburetor Adjustments."

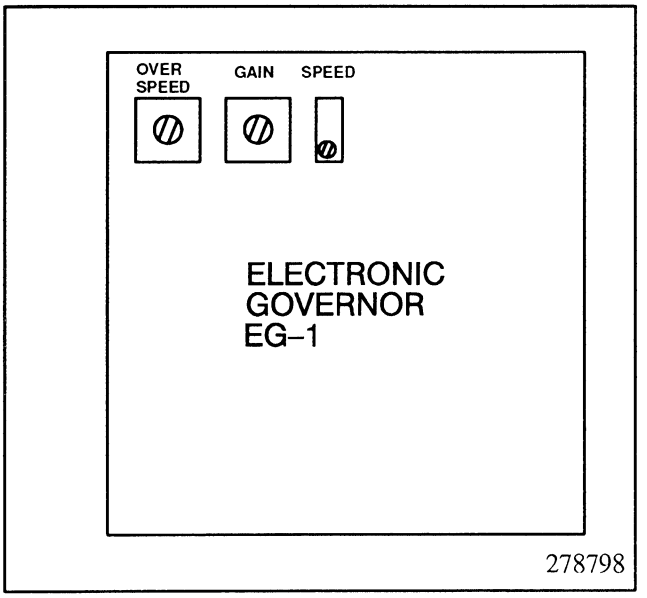



**Figure 3–25. Governor Adjustments**

**NOTE**

Often hunting/surging problems thought to be caused by the governor are actually linked to carburetor adjustment. Carburetor MUST be properly adjusted before continuing to next step.

4. Attach a frequency meter to AC output leads. Start and run the generator until normal operating temperature is obtained (about 5–10 minutes).

5. Adjust the electronic governor **speed** pot. to obtain a full load engine speed of 60 Hz. (1800 rpm) on 60 Hz. models and 50 Hz. (1500 rpm) on 50 Hz. models. See Figure 3–25. Turn clockwise to increase frequency and counter–clockwise to decrease frequency.

6. With generator set running and with no load applied, check stability. If generator set speed is unstable or hunting/surging is observed, turn **gain** pot. approximately 1/8 turn counter–clockwise or until the generator set becomes stable where there is no hunting/surging. Observe frequency reading. Repeat Step 5, as necessary.

7. Apply rated load to generator set and observe frequency reading. No load and full load frequency should be within 0.4 Hz. (120 rpm). If not within specs., check that carburetor throttle plate is opening fully and that it is not sticking; and check that carburetor is properly adjusted. If these procedures do not correct the problem, the circuit board is defective and should be replaced.
   Check for hunting/surging at full load. Turn **gain** pot. in 1/8 turn increments (as required) counter–clockwise until stability is observed.

8. Remove load and observe frequency. Frequency should return to value as stated in speed adjustment (Step 5). Gain adjustment *may* affect generator set speed/frequency. If speed has been changed, repeat Step 5.

   **NOTE**

   If speed adjustments were repeated, it is not necessary to repeat gain adjustments (Steps 6 and 7) as speed adjustments have no affect on gain adjustments.

9. With unit running check overspeed cutout point. Manually move the throttle shaft/governor stepper motor coupling clockwise (as viewed from the back of the governor stepper motor). See Figure 3–26. Do not use **speed** adjustment pot. to check the overspeed cutout point. Observe frequency meter and note frequency at which generator set shuts down. Factory setting is 72 Hz. for 60 Hz. models and 60 Hz. for 50 Hz. models (or 120% of rated speed/frequency).

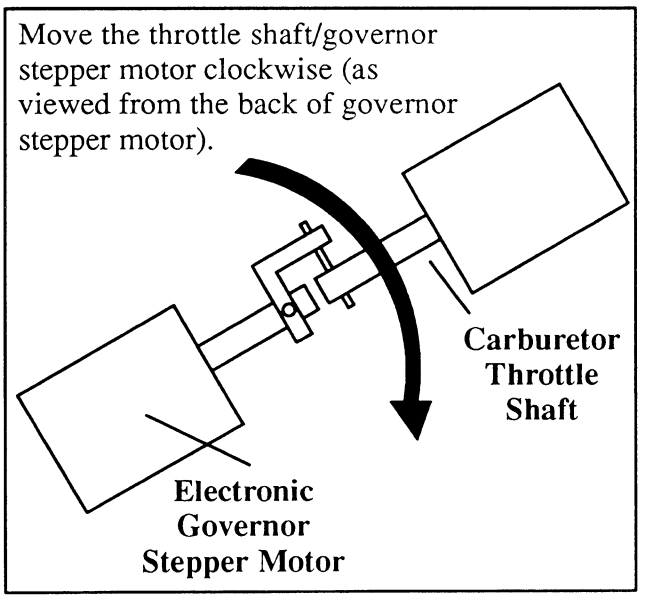



**Figure 3–26. Manually Moving Stepper Motor**

**NOTE**

Overspeed *must* be reset after any speed adjustments are made.

Turn **overspeed** pot. counter–clockwise to increase overspeed cutout point and clockwise to decrease overspeed cutout point. Readjust **overspeed** pot. and repeat procedure, as necessary, to obtain the desired overspeed cutout point.

STOP generator set.

If after performing governor adjustments and the generator set is not within the stated specifications, repeat Steps 5–9. If this fails to bring generator set to proper electronic governor specifications, replace governor controller circuit board.

See Figure 3–27 for electronic governor wiring.

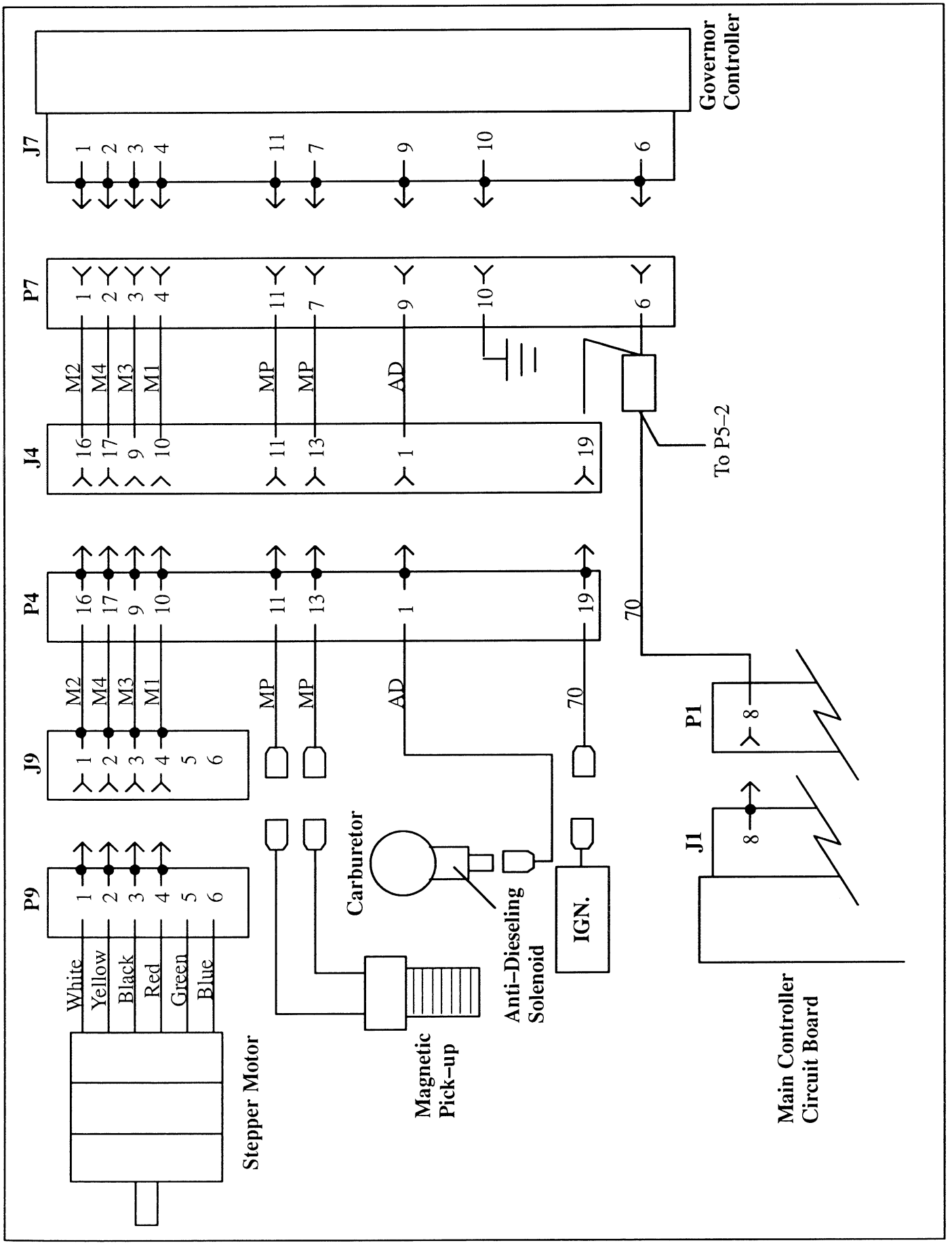



Figure 3–27. Electronic Governor Wiring

# GENERATOR SERVICE

## GENERAL

Under normal conditions generator service will not be required on a regular basis. If operating under extremely dusty and dirty conditions, use DRY compressed air to blow dust out of the generator at frequent intervals. Do this with the generator set operating and direct the stream of air in through the cooling slots at the end of the generator. Because of the generator set design, brush service should be practically nonexistent. The brushes operate at a very low amperage and should last indefinitely. Abrasive dust on the slip rings could, however, shorten the life of the brushes. If brush replacement becomes necessary due to poor or no AC output, contact an Authorized Service Dealer to have this done.

The end bracket bearing should be replaced every 10,000 hours of operation. Service more frequently if bearing inspection indicates excessive rotor end play or bearing damage from corrosion or heat build–up. The end bracket bearing is sealed and requires no additional lubrication. All generator service must be performed by an authorized service dealer.

# WATTAGE REQUIREMENTS

If the rated capacity of your generator set is exceeded, the circuit breaker(s) located in the controller will trip to protect the generator against damage. This could be caused by a short in the AC circuit in your RV or simply by having too many appliances on at the same time resulting in an overload condition. If the circuit breaker(s) trip, the set may continue running but there will be no AC output to the protected circuit. Before resetting the circuit breaker(s), turn off some of the appliances and lights inside the RV to bring the load down within the rated limits of the set. If this is done and the circuit breaker(s) trips again after being reset, a short circuit is indicated. In this event, turn off the set and have a qualified electrician locate and correct the cause of the short circuit.

The average wattage requirements of some common RV appliances and motor loads are listed in the following chart. Use these figures to calculate the total load on your set to avoid the inconvenience of having the circuit breaker trip due to overload. The lighting load is easily determined by adding the wattage rating of each bulb in the circuit. Check the nameplate rating on motors and appliances in your RV for exact wattage requirements. See Section 10 – Installation for wattage ratings of some typical appliances.

For more information regarding generator set capacity, see "Installation – Generator Selection and Wattage Requirements" in the Operation and Installation Manual.

# STORAGE PROCEDURE

If your generator set is to be out of service for a considerable length of time (2 months or more), the following steps should be taken to preserve the set before placing it in storage.

1. Change the oil and filter when the engine is still warm from operation. Refer to "Oil Change." Run the engine for a few minutes to distribute the clean oil.

2. Gasoline – fueled generators – Drain the carburetor bowl (or run unit until empty). This step is done to prevent the gasoline from becoming "stale" which causes formation of gum. The bowl can be removed by unscrewing retaining bolt on bottom of bowl. Replace the bowl after draining the fuel.

   Use of a gas stabilizer for gasoline–fueled generators is permitted in lieu of draining the carburetor bowl; add the correct amount of gas stabilizer to the fuel and follow all recommendations of the gas stabilizer manufacturer.

   LP gas–fueled generators – With the generator running, shut off LP gas fuel supply. Run the generator set until the set stops from lack of fuel.

3. Gasoline–fueled generators only– remove the fuel line at the pump outlet to drain fuel line to carburetor. Reconnect fuel line. The pump itself requires no additional maintenance.

4. Remove the spark plugs. Pour about 1 tablespoon of engine oil into each spark plug hole. Crank the engine two or three revolutions to lubricate the cylinders. Reinstall the spark plugs.

5. Clean the exterior surface of the generator set then spread a light film of oil or silicon spray over unpainted metallic surfaces which could rust or corrode.

# Section 4. General Troubleshooting

Use the following tables as a quick reference in troubleshooting individual problems. Generator set faults are listed by specific groups and include likely causes and remedies. The source of more detailed information needed to correct a problem is indicated. These sources include various sections of this manual, the Operation and Installation Manual (TP–5571) and the Engine Service Manual. Corrective action and testing in many cases requires knowledge of electrical and electronic circuits. It is recommended that service only be done by Authorized Service Dealers. Improper repair by unqualified personnel can lead to additional failures.

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **ENGINE** | | | |
| **Will not crank (dead)** | Controller voltage supply fuse blown | Replace fuse. | Section 7. Engine/ Generator Components<br>Section 8. Wiring Diagrams |
| | Battery disconnected or improperly connected | Check connections | Section 9. Wiring Diagrams<br>Section 3. Battery |
| | Dead battery | Check electrolyte level and specific gravity (batteries with filler caps only).<br>Perform load test | Section 3. Battery |
| | Corroded or loose battery connections | Clean or replace | Section 3. Battery |
| | Defective starter | Replace | Engine Service Manual |
| | Defective start/stop switch | Check continuity | Section 7. Component Testing<br>Section 9. Wiring Diagrams |
| | Open wiring, terminal, pin, foil, etc. | Check continuity | Section 7. Component Testing<br>Section 9. Wiring Diagrams |
| | Remote start/stop switch not operating properly. | Check wiring and connection to controller. If start/stop switch on controller functions, replace/ repair remote switch and/or wiring. | Section 9. Wiring Diagrams<br>Section 7. Component Testing |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Will not start (cranks okay)** | No fuel in tank | Replenish | |
| | Defective carburetor shutdown solenoid | Check operation | Section 7. Fuel System – Carb. Shutdown Solenoid<br>Section 7. Engine/ Generator Components |
| | Carburetor adjustment wrong | Adjust carburetor | Section 3. Carburetor Adjustment |
| | Defective/misadjusted spark plug(s) | Regap or replace | Section 3. Ignition System – Spark Plugs |
| | Loose spark plug wires | Reconnect wires | Section 3. Ignition System – Spark Plugs |
| | Defective ignition module | Test. If defective, replace | Engine Service Manual |
| | Air intake restriction | Check air intake | Section 3. Servicing Air Cleaner |
| | Engine malfunction | Troubleshoot engine | Engine Service Manual |
| | Defective electric fuel pump (gasoline fuel only) | Verify operation with 12 Volts DC applied. Check fuel pressure of 2–3.5 psi (14–24 kPa) | Section 7. Engine/ Generator Components |
| | Clogged fuel filter (gasoline fuel only) | Replace filter | Section 3. Fuel Filter Service |
| | K2 relay coil defective (If LED2 is lit, relay is receiving power but may not be energized) | Check continuity | Section 7. Controller Circuit Board<br>Section 9. Wiring Diagrams |
| | Open wiring, terminal, or pin (P2 connector) | Check continuity | Section 9. Wiring Diagrams |
| | K3 relay defective (K2 relay must be energized for K3 to function) | Check relay coil continuity | Section 7. Controller Circuit Board<br>Section 9. Wiring Diagrams |
| | Too low overspeed setting on electronic governor board | Readjust overspeed on governor board | Section 3. Electronic Governor |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Will not start (cranks okay) (cont'd.)** | Defective K4 relay contacts | Test circuit board | Section 7. Controller Circuit Board |
| | Weak or dead battery | Check electrolyte level and specific gravity (batteries with filler caps only). Perform load test | Section 3. Battery |
| | Defective gas valve (LP fuel only) | Test. If defective replace | Section 3. Fuel System |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Engine starts, but stops after start switch is released** | No generator output voltage | Check AC voltage. Separately excite unit. Check stator continuity | Section 9. Wiring Diagrams<br>Section 7. Component Testing–Separate Excitation<br>Section 9. Wiring Diagrams |
| | Open wiring (P1 or P2 connector) | Check continuity | Section 9. Wiring Diagrams |
| | K1 relay coil defective. | Check continuity | Section 7. Controller Circuit Board<br>Section 9. Wiring Diagrams |
| | If LED1 is not lit, K1 relay is not receiving power from stator B1/B2 winding | | Section 7. Stator<br>Section 7. Component Testing – Engine/ Generator Components |
| | Fuse blown on voltage regulator circuit | Replace fuse | Section 9. Wiring Diagrams |
| | No/low oil pressure (time delay of 5–10 seconds | Check oil pressure, oil pump, and low oil pressure shutdown switch | Engine Service Manual |
| | Defective low oil pressure (LOP) shutdown | Disconnect lead from LOP switch and isolate terminal. If engine continues to run, replace LOP switch. LOP switch contacts close at approx. 14 psi ± 2 psi (96.5 kPa). **NOTE:** Verify proper engine oil pressure of psi ( kPa) before replacing LOP shutdown switch. | |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Hard starting** | Stale or bad fuel | Replace | |
| | Fuel vapor lock (hot engine only) | Check fuel line routing | Operation and Installation Manual – Fuel Systems |
| | Air intake restriction | Check air intake | Section 3. Servicing Air Cleaner |
| | Carburetor adjustment wrong | Adjust carburetor | Section 3. Carburetor Adjustment |
| | Choke out of adjustment | Repair/replace | Section 7. Carburetor Choke<br>Section 7. Engine/ Generator Components |
| | Defective ignition module | Test and/or replace | Engine Service Manual |
| | Defective spark plug(s) | Replace spark plugs | Section 3. Ignition System |
| | Worn piston rings, valves, etc. | Check compression | Engine Service Manual |
| | Improper cooling (hot engine only) | Inspect cooling system | Section 3. Cooling System |
| | Defective anti–icing plate (thermistor) | Test and/or repair | Section 7. Component Testing |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Generator set shuts down by itself** | No fuel in tank | Replenish | |
| | Fuel line restriction | Inspect fuel lines and tank | |
| | Clogged fuel pump filter (gasoline fuel only) | Replace filter | Section 3. Fuel Filter Service |
| | Defective electric fuel pump (gasoline fuel only) | Verify operation with 12 Volts DC applied. Check fuel pressure of 2–3.5 psi (14–24 kPa) | Section 7. Engine/ Generator Components |
| | Engine overloaded (hot engine only) | Reduce electrical load | Section 3. Wattage Requirements |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Generator set shuts down by itself (cont'd.)** | Engine overheated (hot engine only) | Check air intake, carburetor adjustment, oil level, etc. | Section 3. Scheduled Maintenance<br>Engine Service Manual |
| | Loss of generator output voltage to K1 relay (LED1 not lit) | Check AC voltage at rectifier (BR1)<br>Check continuity of B1/B2 stator leads | Section 9. Wiring Diagrams<br>Section 7. Stator |
| | Fuel vapor lock (hot engine only) | Reroute fuel lines away from heat source (exhaust system) | Operation and Installation Manual – Fuel Systems |
| | Faulty carburetor shutdown solenoid | Replace solenoid | Section 7. Fuel System – Carb. Shutdown Solenoid |
| | Air intake clogged | Clean air intake | Section 3. Servicing Air Cleaner |
| | Faulty spark plug(s) | Replace spark plug(s) | Section 3. Ignition System – Spark Plugs |
| | Defective ignition module | Test and/or replace | Engine Service Manual |
| | No/low oil pressure | Check oil pressure, oil pump, and low oil pressure shutdown switch | Engine Service Manual |
| | Controller fuse blown | Replace fuse | Section 7. Engine/ Generator Components<br>Section 8. Wiring Diagrams |
| | Defective low oil pressure (LOP) shutdown | Disconnect lead from LOP switch and isolate terminal. If engine continues to run, replace LOP switch. LOP switch contacts close at approx. 14 psi ± 2 psi (96.5 kPa). **NOTE:** Verify proper engine oil pressure of psi ( kPa) before replacing LOP shutdown switch. | |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Will not carry load or runs rough** | Excessive load connected to generator | Reduce electrical load | Section 3. Wattage Requirements |
| | Improper cooling (hot engine only) | Inspect cooling system | Section 3. Cooling System |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Will not carry load or runs rough (cont'd.)** | Governor not properly adjusted or defective (Engine not operating at rated rpm) | Check speed using tachometer or frequency meter. **NOTE:** Hz x 120/ No. of rotor poles = rpm **(Example:** 60 x 120/4 = 1800) | Section 3. Governor |
| | Carburetor not properly adjusted or defective | Check and/or adjust | Section 3. Carburetor Adjustments |
| | Defective ignition module | Test and/or replace | Engine Service Manual |
| | Defective/misadjusted spark plug | Regap or replace | Section 3. Spark Plug Service |
| | Carburetor choke | Test and/or replace | Section 7. Carburetor Choke<br>Section 7. Engine/ Generator Components |
| | Fuel line restriction | Inspect fuel lines and tank. Check fuel pump pressure of 2–3.5 psi (14–24 kPa) | |
| | Dirty fuel filter (gasoline fuel only) | Replace fuel filter | Section 3. Fuel Filter Service |
| | Defective electric fuel pump (gasoline fuel only) | Check fuel pressure of 2–3.5 psi (14–24 kPa) | |
| | Excessive carbon build–up | Clean cylinder head | Engine Service Manual |
| | Valves not seating | Inspect valves and valve seats | Section 3. Valve Service<br>Engine Service Manual |
| | Air intake restriction | Check air intake | Section 3. Servicing Air Cleaner |
| | Improper type of fuel | Use proper type of fuel; consult fuel supplier | Section 3. Fuel System |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Will not carry load or runs rough (cont'd.)** | Fuel vapor lock (hot engine only) | Reroute fuel lines away from heat source (exhaust system) | Operation and Installation Manual – Fuel Systems |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Lacks power** | Governor not properly adjusted or defective (Engine not operating at rated RPM) | Check engine speed using frequency meter or tachometer. **NOTE:** Hz. x 120/No. of rotor poles = rpm **(Example:** 60 x 120/4 = 1800) | Section 3. Governor |
| | Air intake restriction | Check air intake | Section 3. Servicing Air Cleaner |
| | Carbon build–up | Clean carbon from cylinder heads | Engine Service Manual |
| | Improper cooling | Inspect cooling system | Section 3. Cooling System |
| | Engine overloaded | Reduce electrical load | Section 3. Wattage Requirements |
| | Stale or bad fuel | Replace | |
| | Carburetor adjustment wrong | Adjust carburetor | Section 3. Carburetor Adjustment |
| | Choke misadjusted or defective | Check and/or adjust | Section 7. Carburetor Choke<br>Section 7. Engine/ Generator Components |
| | Fuel line restriction | Check fuel lines and tank | |
| | Dirty fuel filter (gasoline fuel only) | Replace fuel filter | Section 3. Fuel Filter Service |
| | Faulty spark plug(s) | Replace spark plug(s) | Section 3. Spark Plug Service |
| | Defective ignition module | Test and/or replace coil | Engine Service Manual |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Lacks Power (cont'd)** | LP liquid fuel filter clogged | Replace | Section 3. LP Fuel System |
| | LP liquid shut–off solenoid clogged | Clean | Section 3. LP Fuel System |
| | Grease build–up in LP liquid primary regulator | Clean | Section 3. LP Fuel System |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Operates erratically** | Air intake restriction | Check air intake | Section 3. Servicing Air Cleaner |
| | Stale or bad fuel | Replace | |
| | Faulty spark plug(s) | Replace spark plug(s) | Section 3. Ignition System Spark Plugs |
| | Carburetor adjustment wrong | Adjust carburetor | Section 3. Carburetor Adjustment |
| | Governor not properly adjusted or defective (Engine not operating at rated RPM) | Check engine speed using frequency meter or tachometer. **NOTE:** Hz. x 120/No. of rotor poles = rpm **(Example:** 60 x 120/4 = 1800) | Section 3. Governor |
| | Fuel line restriction | Inspect fuel lines and tank. Check fuel pump pressure of 2–3.5 psi (14–24 kPa) | |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Overheats** | Improper cooling | Check cooling system | Section 3. Cooling System |
| | Air intake restriction | Check air intake | Section 3. Servicing Air Cleaner |
| | Carburetor adjustment too lean | Adjust carburetor mixture | Section 3. Carburetor Adjustments |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Unit is noisy** | Exhaust system leak | Check and replace as necessary | Operation and Installation Manual – Exhaust Systems |
| | Broken or damaged vibro mounts | Check and replace as necessary | Section 8. Disassembly/ Reassembly |
| | Loose or vibrating sheet metal/housing | Retighten screws | |
| | Inadequate compartment clearances | Check clearances | Section 10. Specifications Chart – Generator Operation and Installation Manual – Compartment Size |
| | Exhaust piping or air inlets/outlets not securely installed | Inspect for loose parts | Operation and Installation Manual – Exhaust Systems |
| | No compartment sound insulation | Install fireproof insulation | Operation and Installation Manual – Compartment Size |
| | Excessive vibration – engine/generator | Check rotor, crankshaft, bearing, etc. (Disassembly of engine and/or generator may be required | Section 8. Disassembly/ Reassembly Engine Service Manual |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **ELECTRICAL SYSTEM** | | | |
| **Battery will not charge** | Loose or corroded connections | Clean and tighten connections | Section 3. Battery |
| | Sulfated or worn–out battery | Check electrolyte level and specific gravity (batteries with filler caps only) | Section 3. Battery |
| | Defective battery charging circuit | Check coach battery charging system | Coach Operation/ Service Manual |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Starter does not work properly** | Loose or corroded connections | Clean and tighten loose connections | Section 3. Battery |
| | Low battery output | Check electrolyte level and specific gravity (batteries with filler caps only) | Section 3. Battery |
| | Defective starter solenoid | Check starter solenoid | Section 7. Engine/ Generator Components |
| | Defective start/stop switch | Replace switch | Section 7. Engine/ Generator Components |
| | Defective wiring | Check wiring | Section 8. Wiring Diagrams |
| | Defective starter | Replace starter | Engine Service Manual |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Starter cranks slowly** | Low battery output | Check electrolyte level and specific gravity (batteries with filler caps only) | Section 3. Battery |
| | Too heavy viscosity lube oil | Use proper viscosity oil | Section 3. Lubrication System |
| | Loose or corroded wiring | Clean and tighten loose connections | Section 3. Battery |
| | High starter current draw | Replace starter | |
| | Battery cable undersize | Select proper size cable | Section 10. Specifications Chart – Installation Operation and Installation Manual – Electrical Systems |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **GENERATOR** | | | |
| **No generator output voltage** | AC output circuit breaker open or defective | Check position of circuit breaker<br>Check AC voltage on generator side of circuit breakers | Section 2. Circuit Protection<br>Section 9. Wiring Diagrams |
| | AC circuit breaker tripping due to overload on unit | Reduce load<br>Reset and attempt startup | Section 3. Wattage Requirement |
| | Transfer switch in OFF or *other* power source position | Turn handle to proper position | Section 9. Wiring Diagrams<br>Operation and Installation Manual – Electrical Connections |
| | No battery voltage to terminal (+) and (–) of voltage regulator during cranking | Check for 12 VDC at voltage regulator (+) and (–) | Section 9. Wiring Diagrams |
| | Fuse blown in voltage regulator circuit (lead 55) | Replace fuse. If fuse blows again, check voltage regulator and stator aux. windings | Section 7. Voltage Regulator<br>Section 9. Wiring Diagrams |
| | Short circuit in coach wiring causing circuit breaker to trip | Reset circuit breaker. If breaker trips again, check coach wiring. | Section 9. Wiring Diagrams<br>Coach Wiring Diagram |
| | Open wiring, terminals or pin in aux. winding circuit (field flashing) | Check continuity | Section 9. Wiring Diagrams |
| | Defective rotor (open, grounded, or shorted windings) | Test and/or replace | Section 7. Rotor |
| | Defective stator (open, grounded, or shorted windings) | Test and/or replace | Section 7. Stator |
| | Open D5 or D8 diode | Check for open or shorted diode (a good diode has high resistance one way and low resistance the other way, when tested with ohmmeter) | Section 9. Wiring Diagrams<br>Section 7. Circuit Board |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **No generator output voltage (cont'd.)** | K1 relay (N.C.) contacts open | Check continuity | Section 9. Wiring Diagrams<br>Section 7. Circuit Board |
| | Brushes sticking in holder | Check alignment | Section 7. Brushes |
| | Rotor slip rings dirty or corroded | Check and/or service | Section 7. Brushes |
| | Broken, weak, or missing brush spring | Check condition | Section 7. Brushes |
| | Defective or misadjusted voltage regulator | Excite (rotor) separately | Section 7. Separate Excitation<br>Section 7. Voltage Regulator Test |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **Low generator output voltage** | Low engine rpm | Check engine speed using frequency meter or tachometer.<br>**NOTE:** Hz. x 120/No. of rotor poles = rpm.<br>**(Example:**<br>60 x 120/4 = 1800) | Section 3. Governor Adjustments |
| | Set overloaded | Make sure capacity is not being exceeded | Section 3. Wattage Requirements |
| | Defective rotor | Test and/or replace | Section 7. Rotor |
| | Defective stator | Test and/or replace | Section 7. Stator |
| | Defective voltage regulator | Test and/or replace | Section 7. Voltage Regulator |
| | Improperly adjusted voltage regulator | Readjust | Section 7. Voltage Regulator |

| Problem | Possible Cause | Corrective Action | Reference |
|---|---|---|---|
| **High generator output voltage** | Defective voltage regulator | Test and/or replace | Section 7. Voltage Regulator |
| | Voltage regulator misadjusted | Readjust | Section 7. Voltage Regulator |
| | Open or poor splice connection at terminals 33–3 or 44–4 on stator (regulator sensing); or poor pin connection at voltage regulator | Check continuity | Section 7. Stator |

# Section 5. Controller Troubleshooting

The following test is the controller sequence of operation when starting, running, stopping, or during fault shutdown of the set. Use this section as a starting point for controller fault identification. Refer to Figure 5–1 for the accompanying wiring schematic. See Legend for symbol descriptions.

## STARTING

- Close the start/stop switch between N and 47 (local or remote starting).
- K2 relay is energized (LED2 lights) and (–) rotor slip ring (field flashing) is energized. Normally open K2 contacts close to energize K3 relay (LED3 lights), anti–icing plate, anti–dieseling solenoid, governor system, ignition system, (+) rotor slip ring (field flashing), fuel pump (or gas valve), electric choke and electronic governor control.
- K3 relay normally–open contacts close to energize S relay (starter solenoid). S relay normally–open contacts close to engage starter motor.

## RUNNING

- When proper output is obtained from B1/B2 winding, K1 relay is energized (LED1 lights). After a 5–10 second time delay, K5 relay is energized (LED 5 lights). **NOTE:** Voltage to the K1 relay is rectified and regulated at 12 Volts DC by BR1 and VR1.
- Winding 33–44 provides voltage sensing source to voltage regulator.
- One set of normally–open K1 (A) contacts close to maintain voltage to K2 relay (LED2 remains lit). Normally–open K2 contacts remain closed to maintain voltage to engine components.
- A second set of normally–open K1 (B) contacts close to energize the (optional) remote generator 'ON' light and hourmeter.

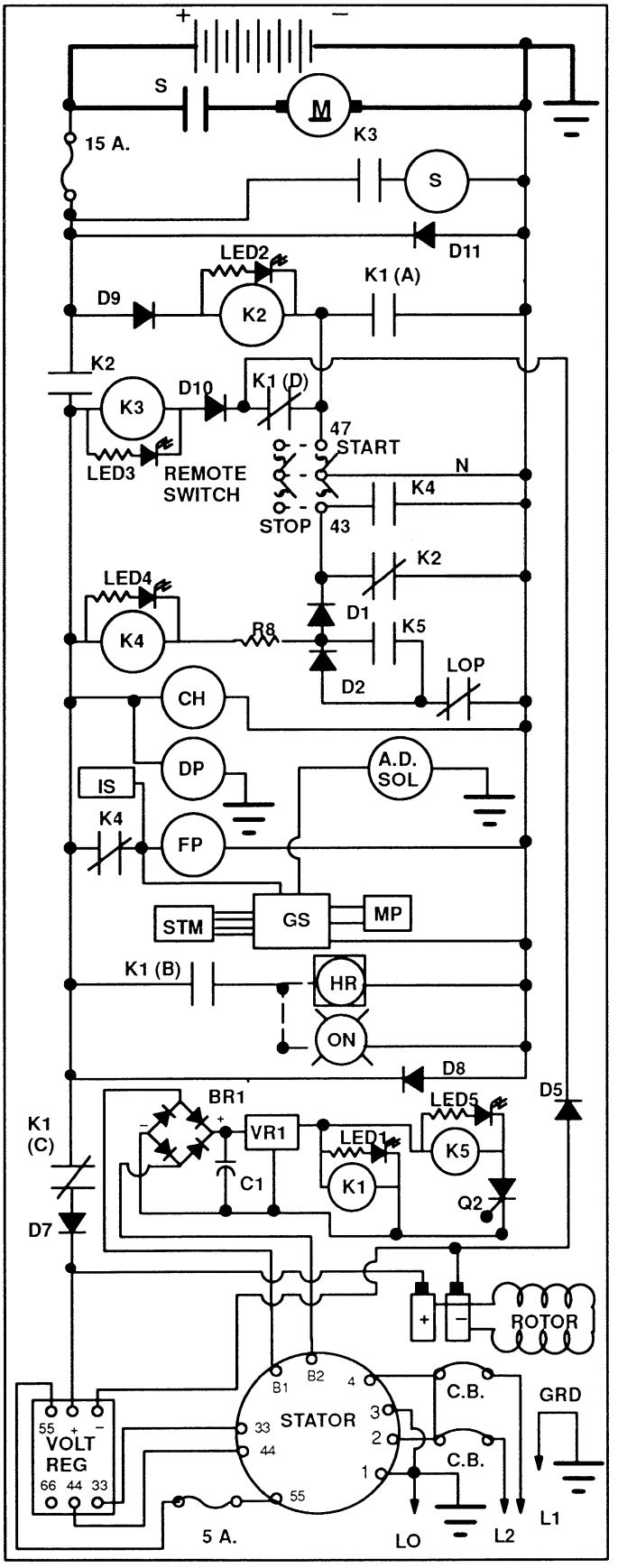



**Figure 5–1. Sequence of Operation**

- A set of normally–open K5 contacts close to permit engine low oil pressure (LOP) switch to function.
- One set of normally–closed K1 (C) contacts open to disconnect circuit to (+) rotor slip ring (field flashing).
- A second set of normally–closed K1 (D) contacts open to disconnect circuit to (–) rotor slip ring (field flashing) and de–energize K3 relay (LED 3 goes out). K3 contacts open to de–energize S relay (starter solenoid) and prevent accidental re–energizing of starter motor. (S relay contacts open to de–energize starter motor.)
- When the unit is running, start switch contacts N and 47 are opened by releasing start/stop rocker switch.

## STOPPING

- Close stop switch between N and 43 (local or remote).
- K4 relay is energized (LED4 lights).
- Normally–closed K4 contacts open to de–energize fuel pump (or gas valve), governor system, anti–dieseling solenoid, and ignition system.
- As unit is shutting down, K1 relay is de–energized. Normally–open K1 (A) contacts open to de–energize K2 relay. Normally– closed K2 contacts close to ground K4 relay until unit comes to a complete stop.

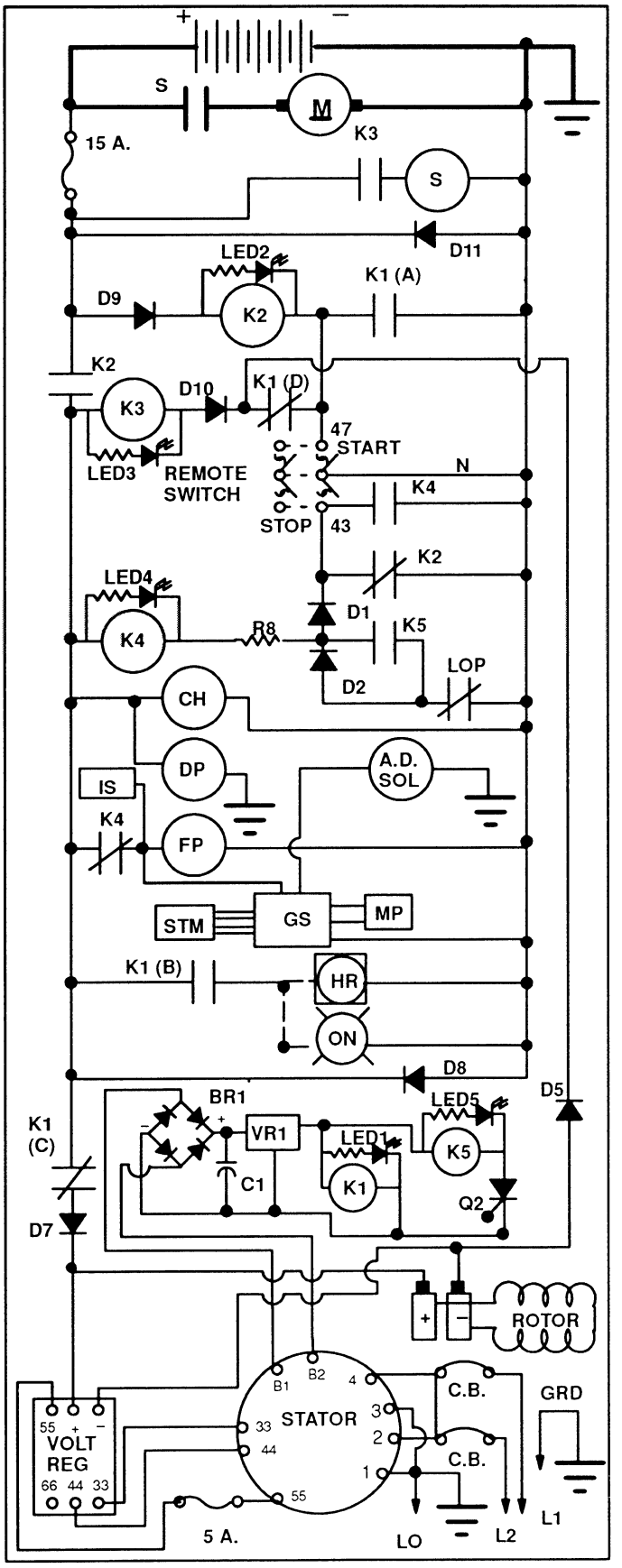



**Figure 5–1. Sequence of Operation (Cont'd)**

## ENGINE SAFETY SHUTDOWN SWITCH

Low oil pressure (LOP) shutdown switch:

- When low oil pressure is encountered, safety shutdown switch contacts close and energize K4 relay (LED4 lights).
  **NOTE:** During cranking low oil pressure shutdown switch is deactivated until K5 relay is energized. This is to allow engine to reach normal operating oil pressure. Normally–closed LOP contacts open when unit develops adequate oil pressure.
- Normally–closed K4 contacts open to de–energize fuel pump (or gas valve), governor system, anti–dieseling solenoid, and ignition system.
- As unit is shutting down, K1 relay is de–energized. K5 relay is de–energized and normally–open K5 contacts open. Normally–open K1 (A) contacts open to de–energize K2 relay. Normally– closed K2 contacts close to ground K4 relay until unit comes to a complete stop.

## LEGEND

| | |
|---|---|
| AD | Anti–Diesel Solenoid |
| BR1 | Bridge Rectifier (Supply Voltage) |
| C | Capacitor |
| CH | Choke Heater |
| D | Diode |
| DP | Anti–Icing Plate |
| FP | Fuel Pump (or Gas Valve) |
| GRD | Ground |
| GS | Governor System |
| HR | Hourmeter |
| IS | Ignition System |
| K1 | AC Crank Disconnect Relay |
| K2 | Engine Run Relay |
| K3 | Engine Crank Relay |
| K4 | Fault Shutdown Relay |
| K5 | Low Oil Pressure Delay Relay |
| L0 | Neutral Lead |
| LED | Light Emitting Diode |
| LOP | Low Oil Pressure Shutdown |
| M | Starter Motor |
| MP | Magnetic Pick–up (Governor) |
| Q2 | SCR (Silicon Controller Rectifier) |
| R | Resistor |
| S | Starter Relay |
| STM | Step Motor (Actuator) (Governor) |
| VR1 | Voltage Regulator |

# Section 6. Generator/Controller Troubleshooting

The flow chart is a guide to troubleshoot the generator set including the controller circuit board. Before beginning the troubleshooting procedures, read all safety precautions at the beginning of this manual. Additional safety precautions are included with the tests; DO NOT NEGLECT THESE PRECAUTIONS.

## CONTROLLER CIRCUIT BOARD

The controller circuit board is equipped with LED's (light emitting diodes) to indicate the presence of relay coil power and aid in circuit board and generator fault detection. See Figure 6–1. When K1, K2, K3, K4, or K5 relays are receiving power, the corresponding LED will light. The LED does not indicate whether the relay coil is energized. This conclusion can only be reached through deductive analysis of generator faults and by performing a continuity test on the relay coil (see Section 7. Controller Circuit Board). Use the following flow chart as an aid in troubleshooting the generator set. If the prescribed remedy does not correct the problem, the circuit board may have to be replaced.

Where a check or test is referenced, go to that appropriate part of Section 7. Generator Testing and Adjustment for detailed instructions.

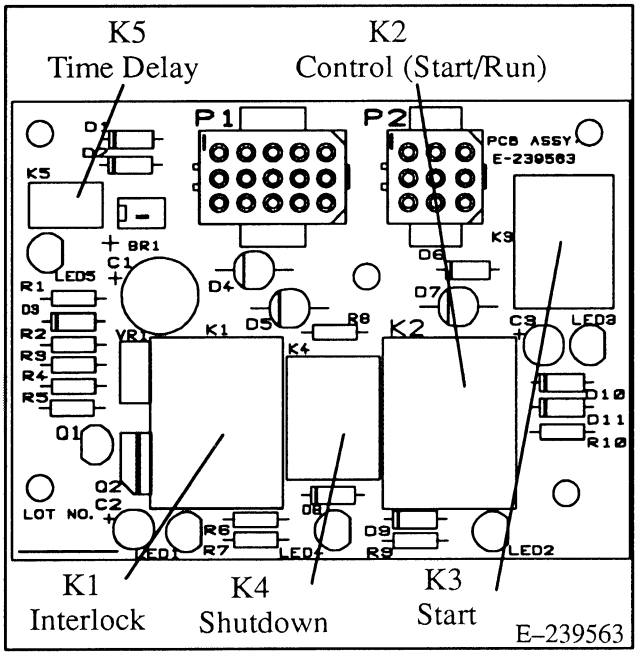
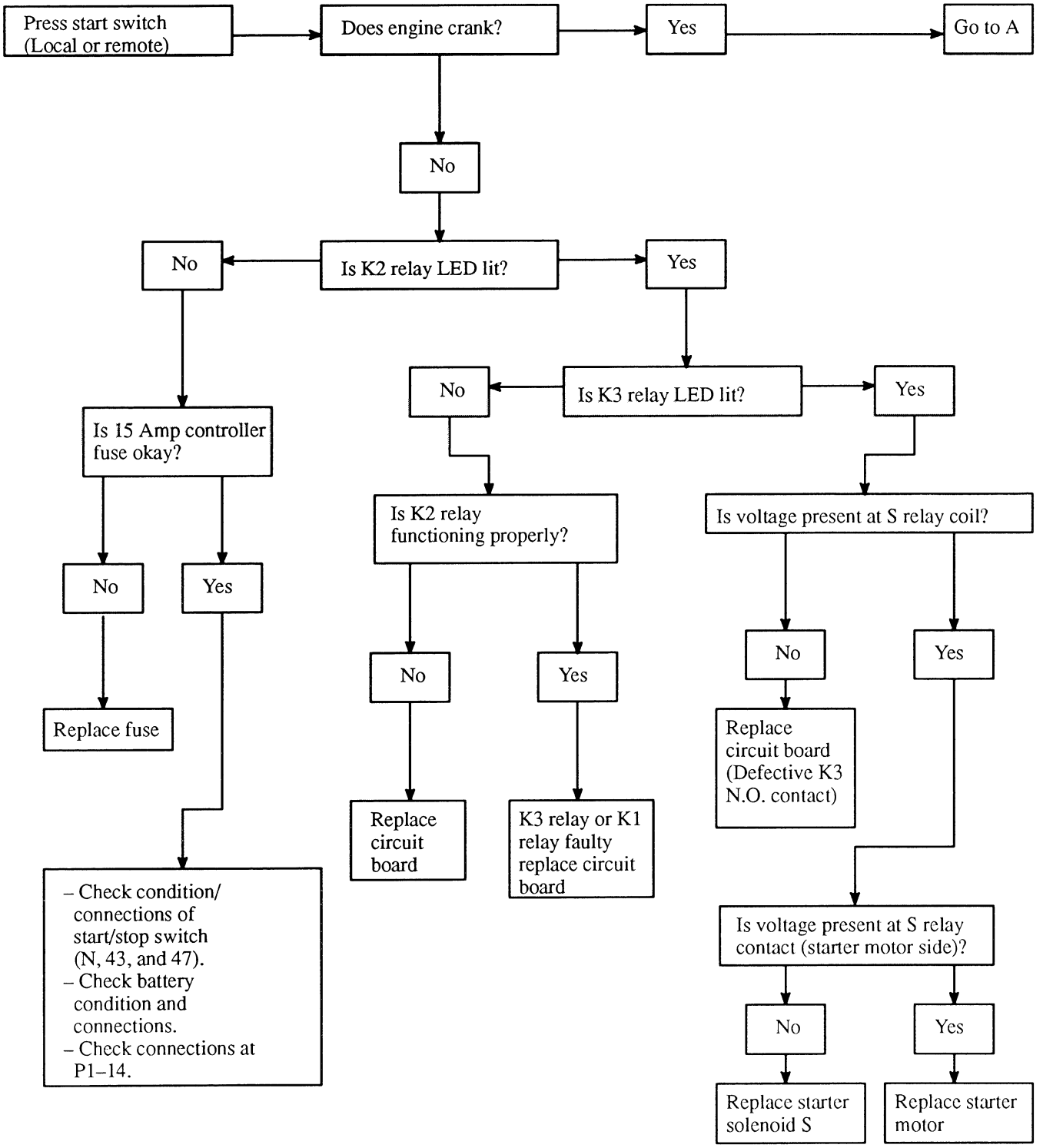
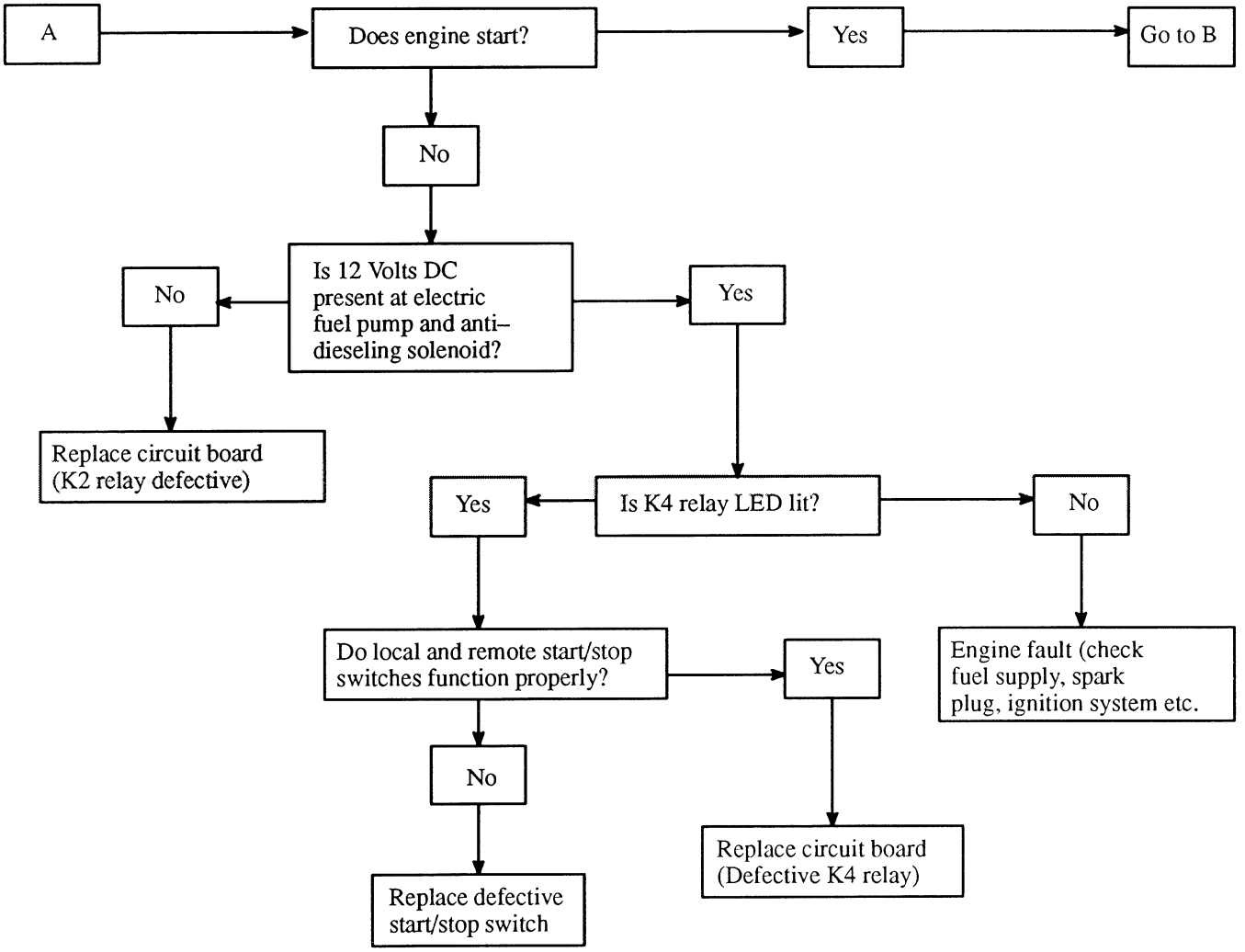



**Figure 6–1. Controller Circuit Board**

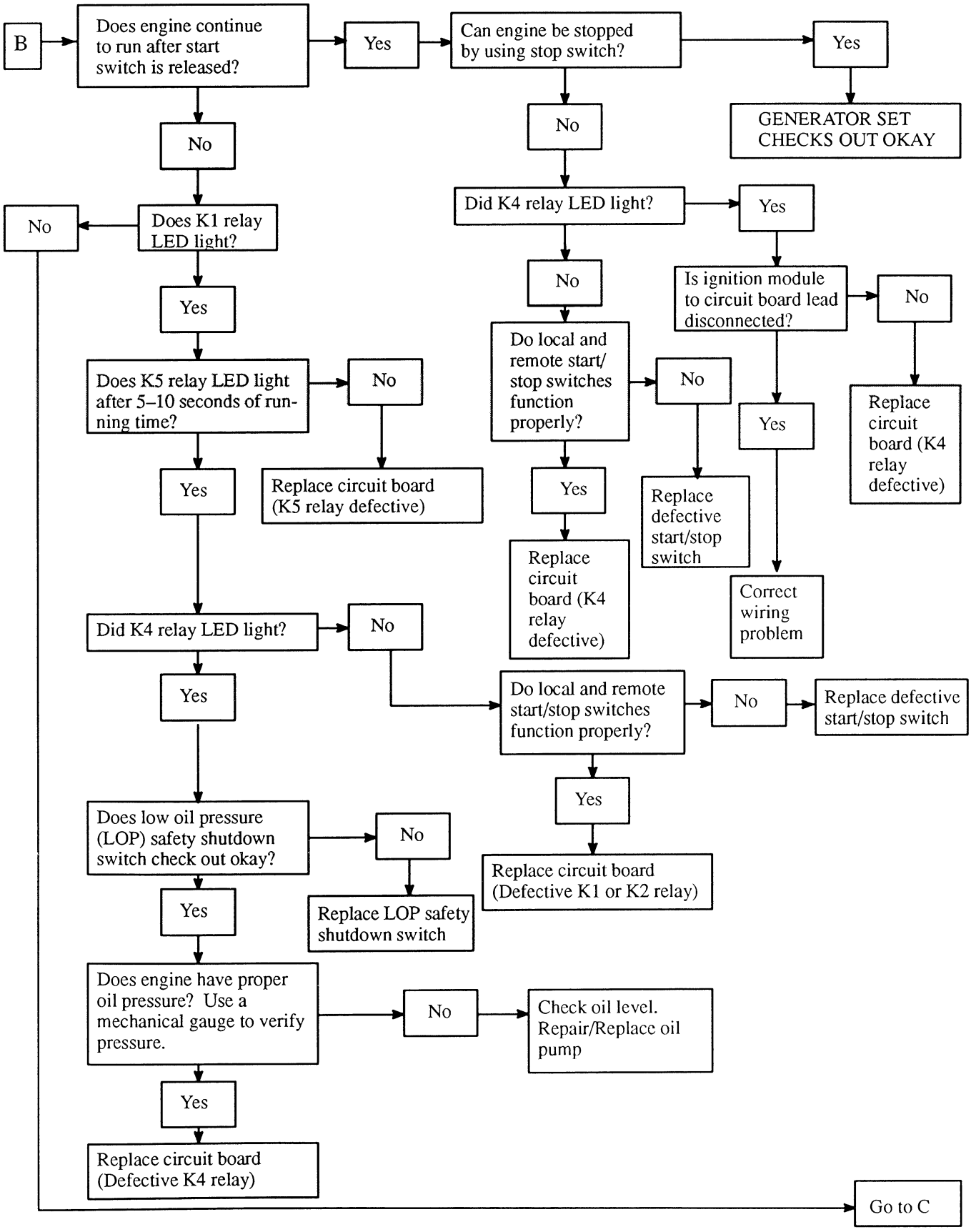
# GENERATOR/CONTROLLER TROUBLESHOOTING



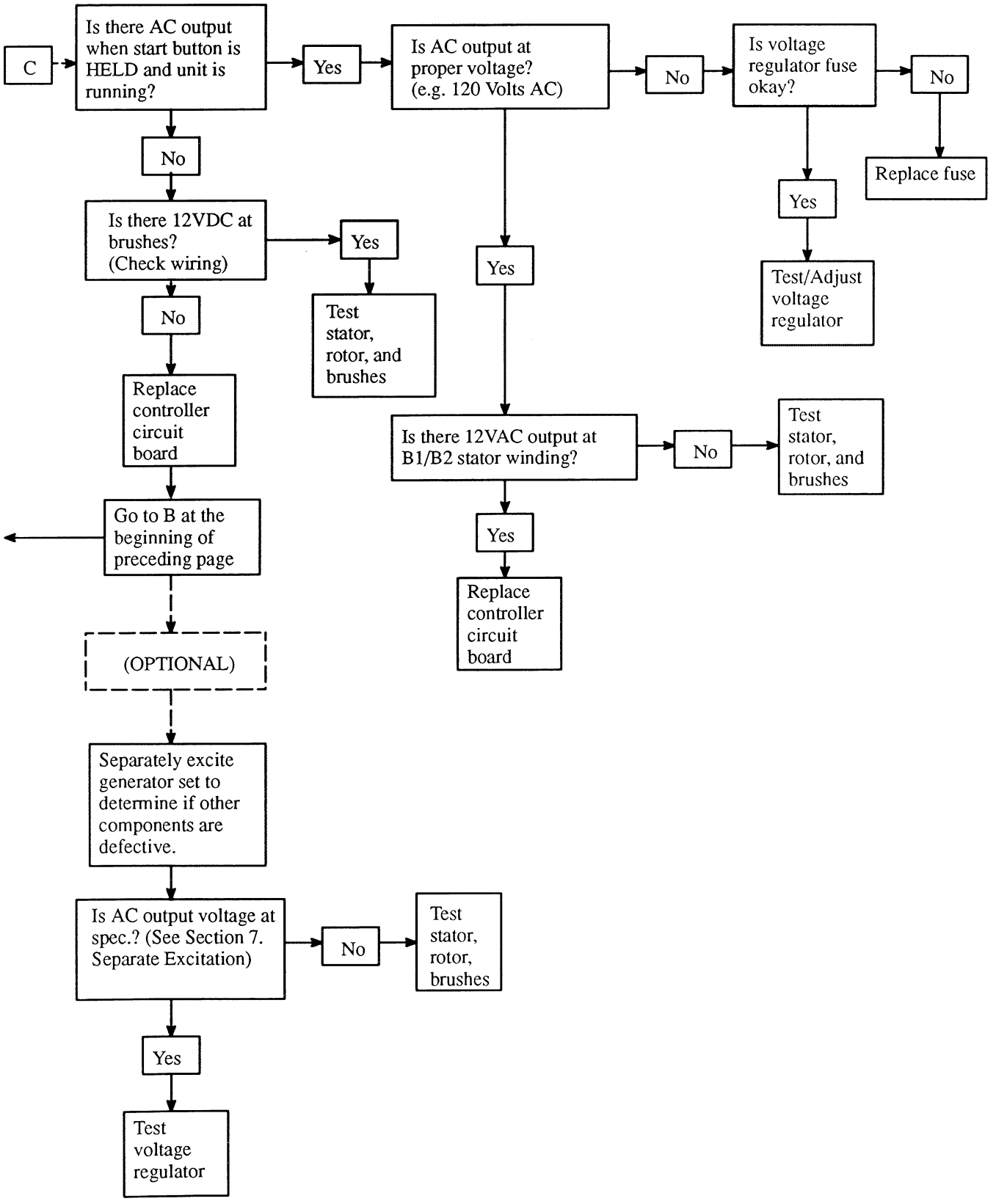
# GENERATOR/CONTROLLER TROUBLESHOOTING (Cont'd.)



# GENERATOR/CONTROLLER TROUBLESHOOTING (Cont'd.)



# GENERATOR TROUBLESHOOTING



# Section 7. Component Testing & Adjustment

This section is a guide for checking generator, controller, and some engine components for improper operation. Follow the safety precautions at the beginning of this manual during all test procedures. Additional safety precautions are included with the tests; OBSERVE THESE PRECAUTIONS!

## SEPARATE EXCITATION

To determine the cause of no or low AC output, separately excite the generator. The generator field (rotor) may be excited (magnetized) using an outside DC power source (12 Volt automotive battery) and the following procedures. While separately exciting the generator to determine the presence of a faulty voltage regulator, it is possible to determine if a running fault exists in the rotor and/or stator. A generator component that appears good while static (stationary) may exhibit a running open or short while dynamic (moving). This fault can be caused by centrifugal forces acting on the windings while rotating or insulation breakdown as temperatures increase.

**⚠ WARNING**

**Hazardous voltage.** **Moving rotor.**

**Can cause severe injury or death.**

Do not operate generator set without all guards and electrical enclosures in place.

**Hazardous voltage can cause severe injury or death.** Perform electrical service only as prescribed in equipment manual. Be sure that generator is properly grounded. Never touch electrical leads or appliances with wet hands, when standing in water, or on wet ground as the chance of electrocution is especially prevalent under such conditions. Wiring should be inspected at the interval recommended in the service schedule — replace leads that are frayed or in poor condition. The function of a generator set is to produce electricity and wherever electricity is present, there is the hazard of electrocution.

**Hazardous voltage can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while adjustments are made. Remove wristwatch, rings, and jewelry that can cause short circuits.

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**⚠ WARNING**

**Sulfuric acid in batteries.**

**Can cause severe injury or death.**

Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

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**Sulfuric acid in batteries can cause severe injury or death.** Sulfuric acid can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash–proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous spattering of electrolyte.

**Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (–) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. Do not mount battery in generator compartment. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

1. Disconnect all leads from voltage regulator. See Figure 7–1.

2. Connect an ammeter and a 12–Volt automotive battery to the positive (+) and negative (–) brush leads. Include a 10 Amp. fuse to protect the circuit in case of a shorted rotor refer to Figure 7–2. Note and record the ammeter reading.

3. The approximate ammeter reading should be battery voltage divided by specified rotor resistance. For rotor resistance, see Section 10. Specifications – Generator.

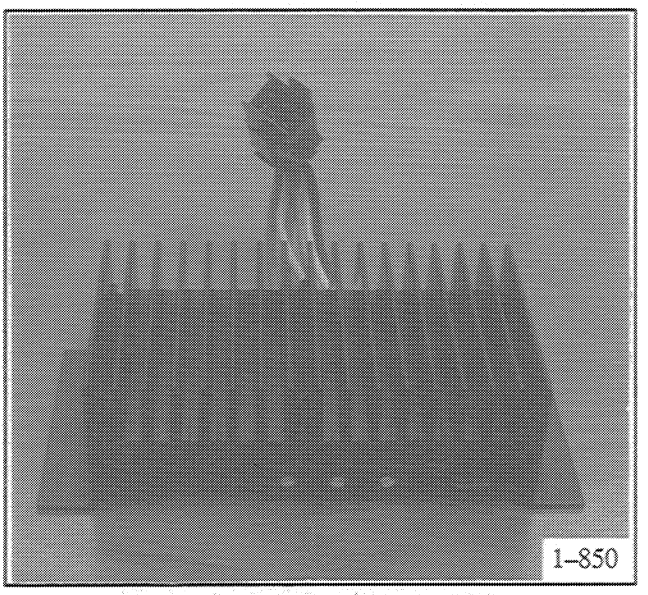


**Figure 7–1. PowerBoost IIIE Voltage Regulator**

**Example:**

$$\frac{\text{12 Volts (Battery Voltage)}}{\text{4.7 Ohms (Rotor Resistance)}} = \text{2.6 Amps. (Rotor Current)}$$

4. Start engine and check that ammeter remains stable. An increasing meter reading indicates a shorted rotor. A decreasing meter reading to zero or unstable reading suggests a running open (see Section 7. Rotor). If ammeter is stable proceed to Step 5.

5. Check for AC output across stator leads (see Section 7. Stator) and compare to readings in Table 7–1. If readings vary considerably from those in Table 7–1, a faulty stator is likely. Refer to Section 7. Component Testing for further information.

6. If rotor and stator test good in prior steps, the voltage regulator is probably defective. Refer to Section 7. Component Testing.

| Leads | 7CCKM–RV |
|---|---|
| 1–2, 3–4, 33–44 | 65 |
| 33–55 | 75 |
| B1–B2 | 10 |

| Leads | 7CCFKM–RV |
|---|---|
| 1–2, 3–4, 33–44 | 80 |
| 33–55 | 100 |
| B1–B2 | 12 |

**Table 7–1. Stator Output Voltages with Separately Excited Rotor (12 Volt Battery)**

**NOTE**

Values in Table 7–1 are based on a battery voltage of 12 Volts. Should actual battery voltage vary (11–14 Volts), resulting values will also vary.

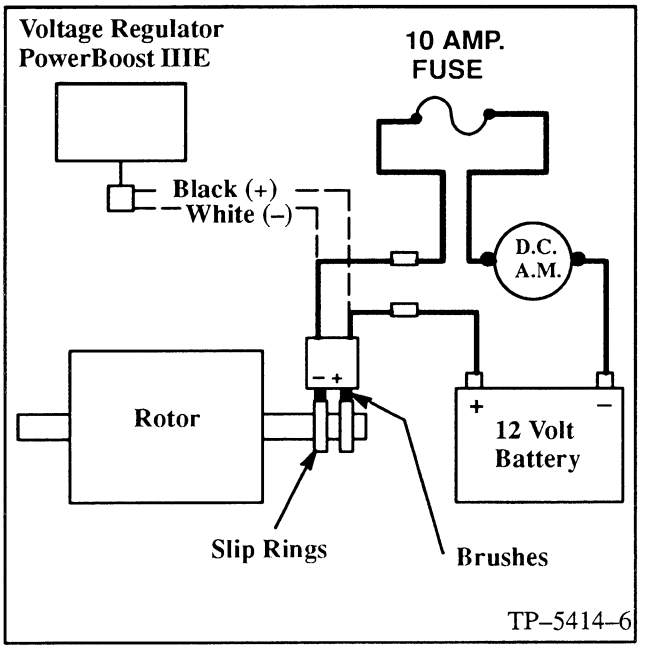


**Figure 7–2. Separate Excitation Connections (PowerBoost IIIE)**

## POWERBOOST IIIE VOLTAGE REGULATOR TEST

The voltage regulator monitors output voltage magnitude and frequency to supply current to the generator exciter field. To determine if the voltage regulator is functioning properly, reduce engine speed (Hz.) and watch for a corresponding drop in AC voltage. AC voltage should remain constant until engine speed drops below 56.3 Hz. on 60 Hz. models or 46.3 Hz. on 50 Hz. models (approximately). When frequency drops below 56.3 Hz. on 60 Hz. models or 46.3 Hz. on 50 Hz. models, AC voltage should decline. If this test proves inconclusive, perform the following test to check regulator output. To test the voltage regulator the following components will be needed:

- Variable Transformer, 0–140 Volts (.5 Amp. Minimum)
- 120 Volt AC Plug
- 120 Volt, 100 Watt Lamp
- AC Voltmeter
- #14 AWG Copper Wire (minimum)

1. Connect components as shown in Figure 7–3.

2. Turn variable transformer setting to zero. Plug in variable transformer.

3. Turn variable transformer on. Slowly increase variable transformer voltage to 100 Volts. The lamp should go on. If the lamp does not light, turn the voltage adjustment pot. clockwise. If the light still does not go on, the voltage regulator is defective and should be replaced. This would correspond to a low or no voltage output condition.

4. Slowly increase voltage to 120 Volts. The lamp should go out and stay out as voltage is further increased. If the lamp does not go out, turn the voltage adjustment pot. counterclockwise. If the light still does not go out, the voltage regulator is defective and should be replaced. This would correspond to a high voltage output condition.

5. Turn variable transformer to zero and unplug AC cord.

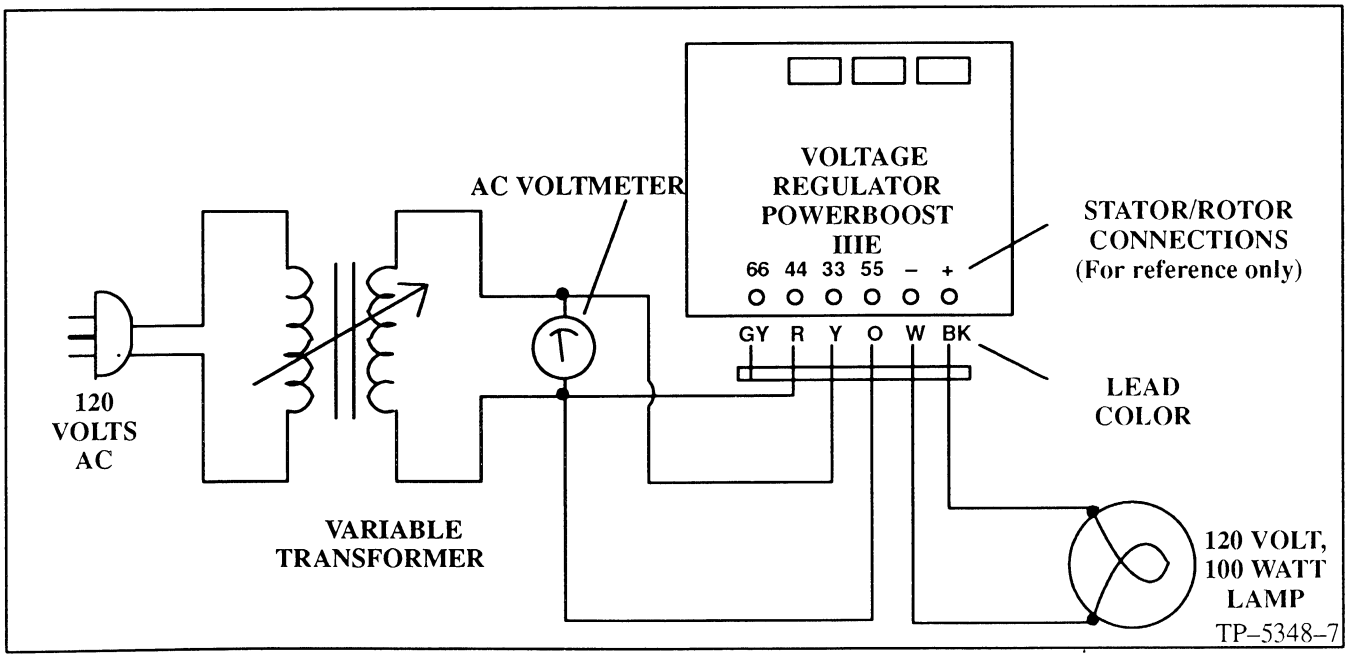


**Figure 7–3. PowerBoost IIIE Voltage Regulator Test**

**NOTE**

Terminal 66 on voltage regulator (PowerBoost IIIE) is intended for connection of a remote rheostat in applications where fine voltage adjustment is required. This terminal is NOT intended for connection of stator lead 66 as was done with non–PowerBoost IIIE models.

## VOLTAGE REGULATOR ADJUSTMENT

The PowerBoost IIIE voltage regulator monitors generator output to control current flow to the generator field. However, unlike earlier PowerBoost regulators, PowerBoost IIIE maintains generator output at 120 Volts under load until the generator engine speed drops to a pre–set level (factory setting 56.3 Hz. on 60 Hz. models or 46.3 Hz. on 50 Hz. models). At this point the regulator allows generator voltage and output power to drop. This drop will allow the engine to pick up the load. When the generator speed returns to normal (60 Hz) as load is accepted, generator output also returns to normal. The voltage regulator is factory set for proper generator operation under a variety of load conditions. Under normal circumstances, no further adjustment is necessary. However, if the regulator is replaced or has been tampered with, readjust according to the following procedure. Voltage regulator components are identified in Figure 7–4 and described in the following paragraphs.

**NOTE**

The voltage regulator is located on the generator end bracket and is serviceable by removing four screws. Adjustments are possible without removing the regulator from the controller bracket. See Figure 7–5.

**Voltage Adjustment Pot.** – Adjusts generator output within range of approx. 100–130 Volts.

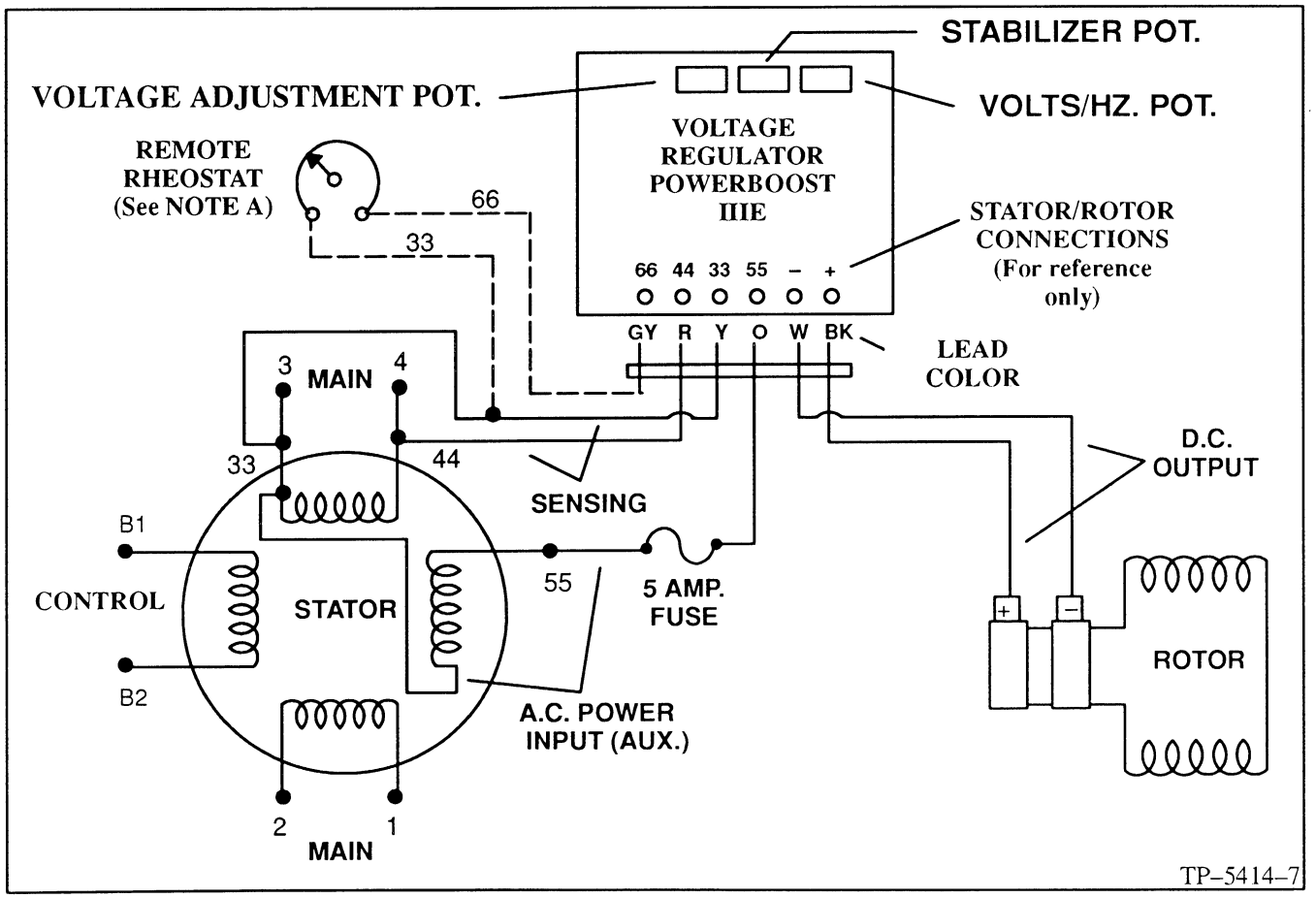


**Figure 7–4. PowerBoost IIIE Voltage Regulator**

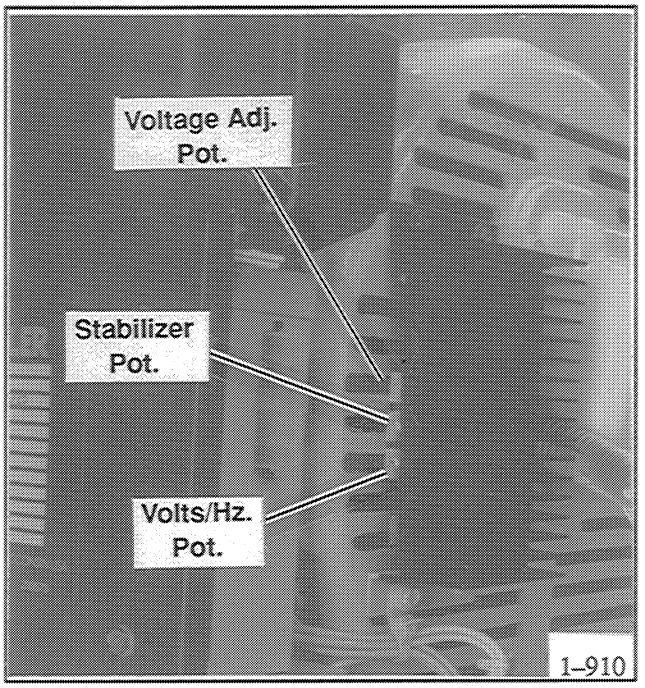


**Figure 7–5. PowerBoost IIIE Voltage Regulator Installed**

**NOTE A**

A customer–provided rheostat may be connected across regulator leads/terminals 33 and 66 to adjust generator output voltage from a location remote from the set. The rheostat (10k ohms, 1/2 watt minimum) will provide a 5 Volt adjustment range.

**Stabilizer Pot.** – "Fine–tunes" regulator circuitry to reduce light flicker.

**Volts/Hz Pot.** – Adjustment determines engine speed (Hz) at which generator output voltage will begin to drop.

**NOTE**

For optimum results, full load should be applied when adjusting voltage regulator.

1. With generator set off, turn remote rheostat (if equipped) to mid–point. Turn **Voltage, Volts./Hz., and Stability pots.** fully counterclockwise. Connect voltmeter and frequency meter to AC circuit or an electrical outlet.

2. Start generator set. Rotate **voltage adjustment pot.** clockwise to increase voltage (counterclockwise to decrease voltage) until desired output voltage is achieved.

3. Rotate **stability pot.** clockwise until minimum light flicker is obtained.

4. Readjust **voltage adjustment pot.** (if necessary) and add 1/2 load.

5. Adjust engine speed to desired cut–in frequency (factory setting 56.3 Hz. for 60 Hz. models or 46.3 Hz. for 50 Hz. models) as measured on frequency meter.

6. Rotate **Volts/Hz adjustment pot.** clockwise until voltage level begins to drop (as measured on voltmeter). When set to these specifications, the generator will attempt to maintain normal output until engine speed drops below the frequency set in step 5 (as load is applied).

7. Readjust engine speed to normal (1800 rpm for 60 Hz. or 1500 rpm for 50 Hz.).

8. Readjust **voltage adjustment pot.** (if necessary).

9. Readjust **stability pot.** (if necessary).

10. Use remote rheostat (if equipped) to make final voltage adjustments. STOP GENERATOR SET.

## ROTOR

The four–pole rotor creates the magnetic field needed to raise alternating current in the stator windings. Prior to testing, inspect the rotor for visible damage to pole shoes, insulation, exposed coil windings, and slip ring surfaces. Check rotor bearing for noisy operation, excessive wear, and heat discoloration. Replace or repair these components if any of the above conditions exist.

Slip rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright, newly–machined appearance. Ordinary cleaning with a dry, lint–free cloth is usually sufficient. Very fine sandpaper (#00) may be used to remove roughness. Use light pressure on the sandpaper. Do not use emery or carborundum paper or cloth. Clean out all carbon dust from the generator. If the rings are black or pitted, remove the rotor and remove some of the surface material using a lathe.

Check the rotor for continuity and resistance. Measure the rotor resistance (ohms) between the two slip rings (Figure 7–6). See Table 7–2 for typical readings.

| Model | Resistance |
|---|---|
| 7CCKM–RV | 4.6 – 5.7 Ohms |
| 7CCFKM–RV | 4.6 – 5.7 Ohms |

**Table 7–2. Rotor Resistance (Cold)**

**NOTE**

Since ohmmeters do vary in their accuracy, use Table 7–2 as a reference for approximate readings. Readings must be at room temperature or about 70° F (21° C).

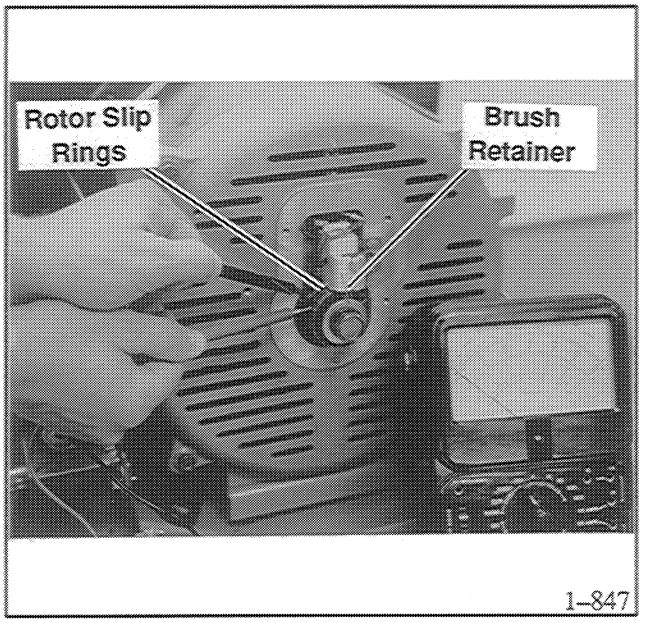


**Figure 7–6. Rotor Resistance Check**

To check for rotor shorted to ground, adjust ohmmeter to zero ohms. Touch one ohmmeter led to either slip ring and other lead to rotor poles or shaft. Meter should register no continuity.

**NOTE**

Rotor resistance will vary directly with increase in temperature.

**NOTE**

When checking rotor resistance with rotor installed, brushes must not be in contact with rotor slip rings. Use brush retainer on brushes for accurate resistance readings.

The rotor must be repaired or replaced if any faults are detected in the previous tests.

## STATOR

The stator consists of a series of coils of wire laid in a laminated steel frame. The stator leads supply voltage to the AC load and exciter regulator.

Prior to testing, inspect the stator for heat discoloration and visible damage to housing lead wires, exposed coil windings, and exposed and varnished areas of frame laminations. Be sure the stator is securely riveted in the stator housing.

### CHECKING STATOR CONTINUITY AND RESISTANCE

1. To check stator continuity, set ohmmeter on R x 1 scale. Contact the red and black meter leads; adjust ohmmeter to zero ohms. Check stator continuity by connecting meter leads to stator leads as shown in Figure 7–7.

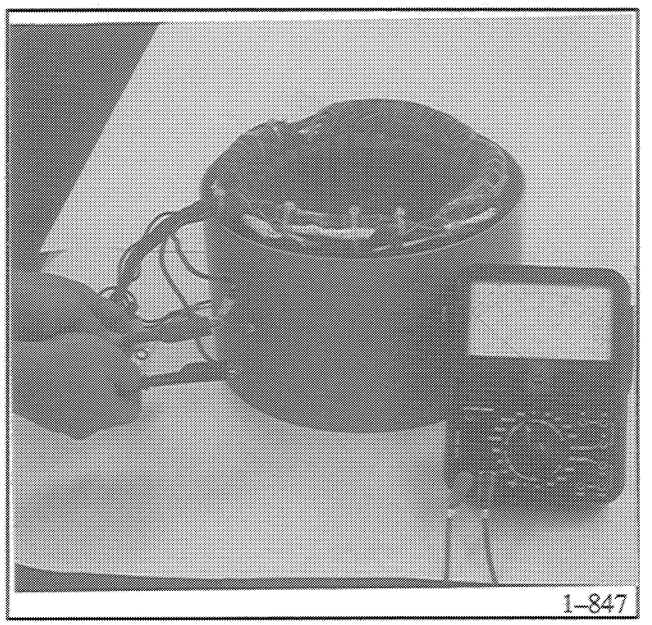


**Figure 7–7. Stator Resistance Check**

**NOTE**

Disconnect all stator leads prior to performing stator continuity tests.

Leads 1, 2, 3, and 4 are the generator output leads. Leads 33, 44, and 55 are the voltage regulator supply and sensing leads. The output of leads B1 and B2 are rectified by (BR1) to supply control voltage. BR1 is located on the controller circuit board. Refer to the schematic in Figure 7–8 when performing the following tests.

- There must be continuity between leads 1 and 2.
- There must be continuity between leads 3 and 4.
- There must be continuity between leads 33 and 44.
- There must be continuity between leads 33 and 55.
- There must be continuity between leads B1 and B2.
- There must be NO continuity between lead 1 and leads 3, 4, 33, 44, and 55.
- There must be NO continuity between lead 1 and leads B1 and B2.
- There must be NO continuity between lead 4 and leads B1 and B2.
- There must be NO continuity between any stator lead and ground on stator housing or frame laminations.

2. Contact ohmmeter leads and readjust ohmmeter to zero ohms. Check cold resistance of stator windings by connecting meter leads to stator leads 1 and 2, 3 and 4, 33 and 44, 33 and 55, and B1 and B2. Typical stator winding resistance readings are listed in Table 7–3.

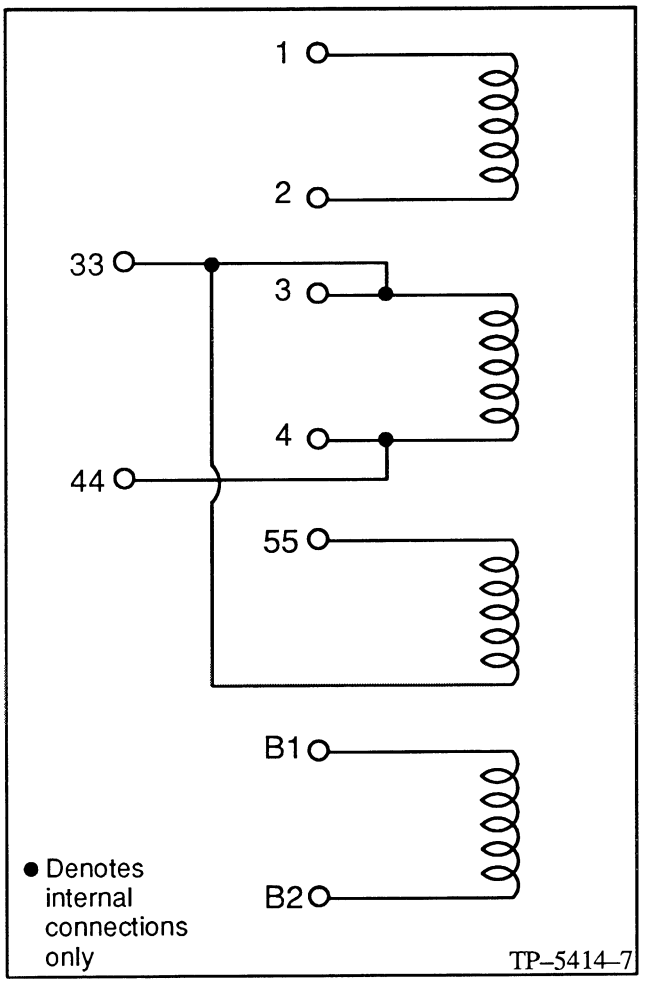


**Figure 7–8. Generator Stator Leads**

| Leads | 7CCKM–RV Readings +/–10% (in Ohms) |
|---|---|
| 1–2, 3–4, 33–44 | 0.28 |
| 33–55 | 1.26 |
| B1–B2 | 0.08 |

| Leads | 7CCFKM–RV Readings +/–10% (in Ohms) |
|---|---|
| 1–2, 3–4, 33–44 | 0.59 |
| 33–55 | 1.7 |
| B1–B2 | 0.14 |

**Table 7–3. Stator Winding Resistance (Cold)**

**NOTE**

Since ohmmeters do vary in their accuracy, use Table 7–3 as a reference for approximate readings. Ohmmeter readings must be taken at room temperature or about 70° F (21° C).

**NOTE**

Most ohmmeters will not provide accurate readings when measuring less than 1 ohm. The stator can be considered good if a low resistance reading (continuity) is obtained and there is no evidence of shorted windings (heat discoloration).

**NOTE**

When taking an ohmmeter reading using lead 55, make connection prior to in–line fuse.

**NOTE**

Stator resistance will vary directly with increase temperature.

Should any of the stator readings vary considerably during the previous checks, the stator must be repaired or replaced.

## BRUSHES

The brushes transfer current from the voltage regulator to the slip rings. Since the brushes carry a very low current (approximately 2 Amps.), they should last the life of the generator. Abrasive dust on the slip rings could, however, shorten the life of the brushes. Excessive arcing at the brushes could damage the voltage regulator. Arcing could be caused by weak springs, damaged slip rings, sticking brushes, loose holder, or poor brush contact.

The brushes must be free to move within the holder and be held in proper contact by the springs. When properly positioned, spring pressure on the brush surface will cause the brush to wear evenly. Brushes must ride 100% on the rings or arcing will occur and cause burned rings or failure of the voltage regulator. Figure 7–9 shows the correct positioning of the brushes. Add or remove shims as necessary to center brushes on slip rings.

Replace brushes if they show excessive or uneven wear.

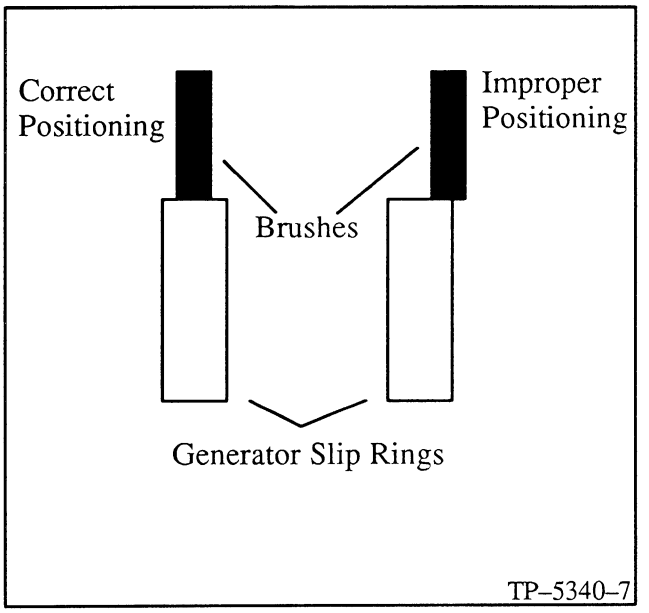


**Figure 7–9. Brush Positioning**

## CONTROLLER CIRCUIT BOARD

It is possible to check some controller circuit board components (relays) without removing the component from the board. These checks should be made prior to installing a new board and attempting start–up. Most of the tests are referenced in Section 4. General Troubleshooting.

Use a high quality multimeter and follow the manufacturer's instructions. To obtain accurate readings when testing, remove all circuit board connectors and conformal coating (transparent insulation) from component terminals. Use the following chart and see the controller circuit board schematic (Figure 7–10).

| Component | Ohmmeter Connections | Remarks | Results |
|---|---|---|---|
| K1 Relay Coil | K1 coil terminals (See relay schematic) | Ohmmeter on R x 10 scale | If good – approx. 160 ohms. Low resistance (continuity) – shorted coil. High resistance – open coil. |
| K2 Relay Coil | K2 coil terminals (See relay schematic) | Ohmmeter on R x 10 scale | If good – approx. 160 ohms. Low resistance (continuity) – shorted coil. High resistance – open coil. |
| K3 Relay Coil | K3 coil terminals (See relay schematic) | Ohmmeter on R x 10 scale | If good – approx. 400 ohms. Low resistance (continuity) – shorted coil. High resistance – open coil. |
| K4 Relay Coil | K4 coil terminals (See relay schematic) | Ohmmeter on R x 10 scale | If good – approx. 125 ohms. Low resistance (continuity) – shorted coil. High resistance – open coil. |
| K5 Relay Coil | K5 coil terminals (See relay schematic) | Ohmmeter on R x 10 scale | If good – approx 510 ohms. Low resistance (continuity) – shorted coil. High resistance – open coil. |

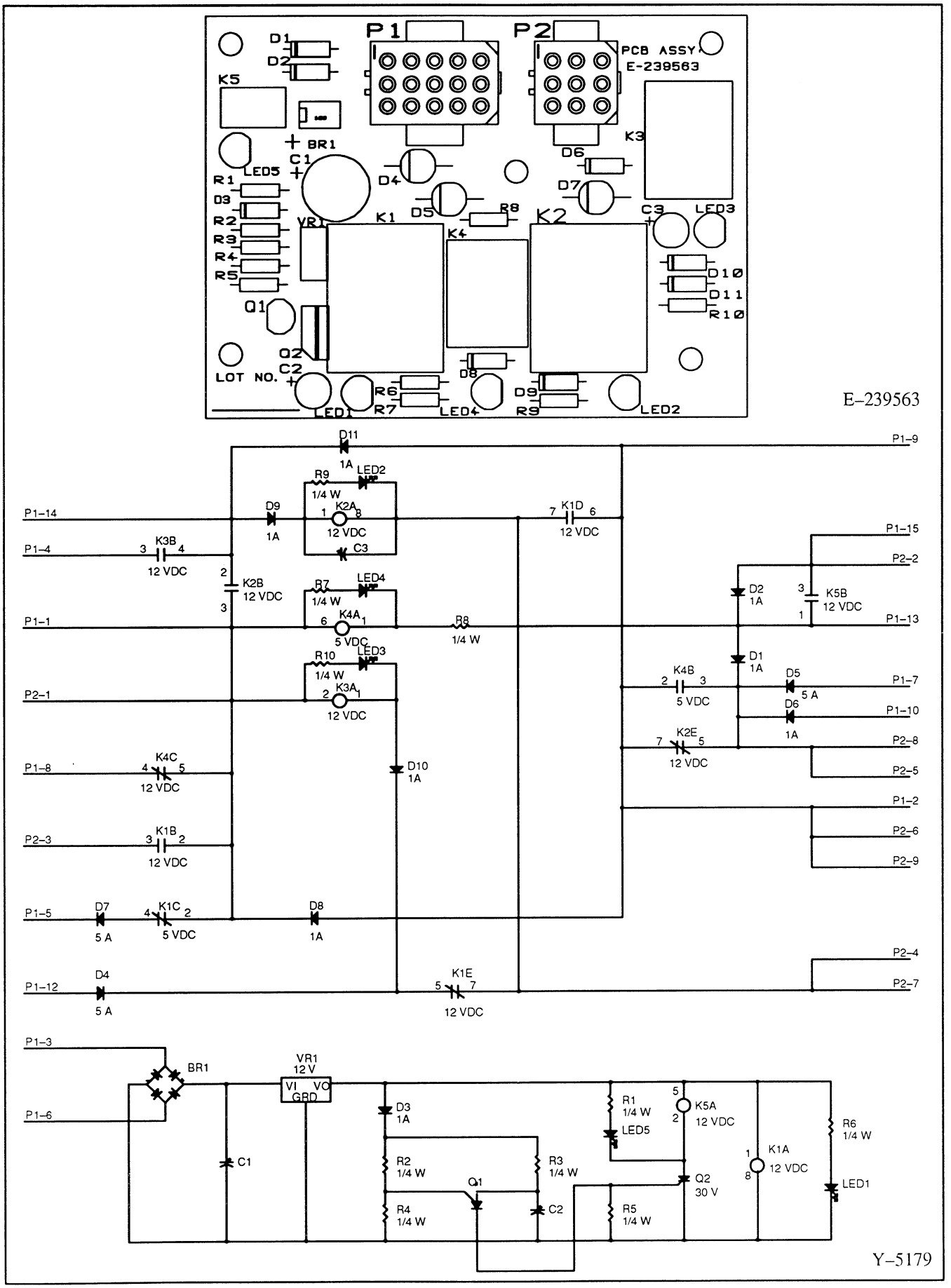


**Figure 7–10. Controller Circuit Board Testing**

## ENGINE/GENERATOR COMPONENTS

With the generator set battery connected, the wiring harness and some engine/generator components can be checked. Place the controller or remote start/stop switch in the prescribed position and check for 12 Volts DC at each component using a DC voltmeter. This will verify that the switches function and 12 Volts DC is present at each component.

| Component | Voltmeter Connections | Remarks | Results |
|---|---|---|---|
| B1 and B2 stator auxiliary winding | Disconnect B1/B2 leads. Connect AC voltmeter to leads. **NOTE:** Voltage can only be measured momentarily since unit will not continue to run after start switch is released. STOP generator. | Voltmeter setting 20 Volts AC or greater. Start generator set and allow to reach proper speed. | Reading of 12–15 Volts indicates B1/B2 winding is good. |
| Carburetor electric choke, anti–diesel solenoid, fuel pump (or gas valve), 'S' relay, anti–icing plate, and governor system wiring harness | Red test clip to each component positive (+) terminal. Black test clip to engine block (ground) | Place controller or remote switch to START position. Voltmeter setting 12 Volts DC or greater. | 12 Volts DC reading indicates wiring harness is okay. To check electric choke, anti–dieseling solenoid, 'S' relay, and de–icing plate, see ohmmeter tests following. To determine if fuel pump (or gas valve) is good, proceed to next step. To check/adjust governor, see Section 3. Governor. |
| Fuel pump (or gas valve) | None | Disconnect fuel pump (or gas valve) leads at in–line connector. Apply 12 Volts DC to fuel pump (or gas valve) leads. Maintain proper polarity (red lead to (+) and black lead to (–). **WARNING:** See Safety Precautions before proceeding. | If good – fuel pump (or gas valve) will operate. |

To further check generator set components, disconnect the battery and remove wiring harness plugs from the controller circuit board. Use an ohmmeter to check continuity and to isolate defective components. Use the following charts and see Figure 7–11.

**NOTE**

Before performing ohmmeter checks, disconnect generator set battery to prevent damage to the ohmmeter.

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**⚠ WARNING**

**Sulfuric acid in batteries.**

**Can cause severe injury or death.**

Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

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**Explosion can cause severe injury or death.** Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (–) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. Do not mount battery in generator compartment. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

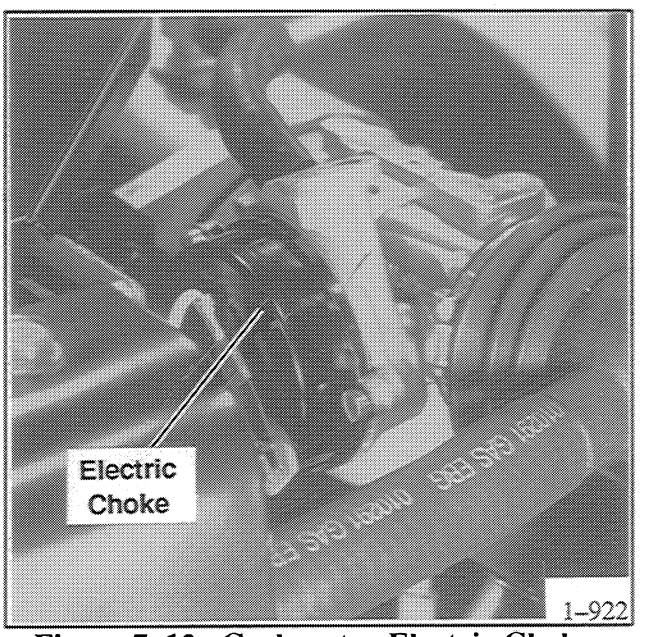



**Figure 7–12. Carburetor Electric Choke**

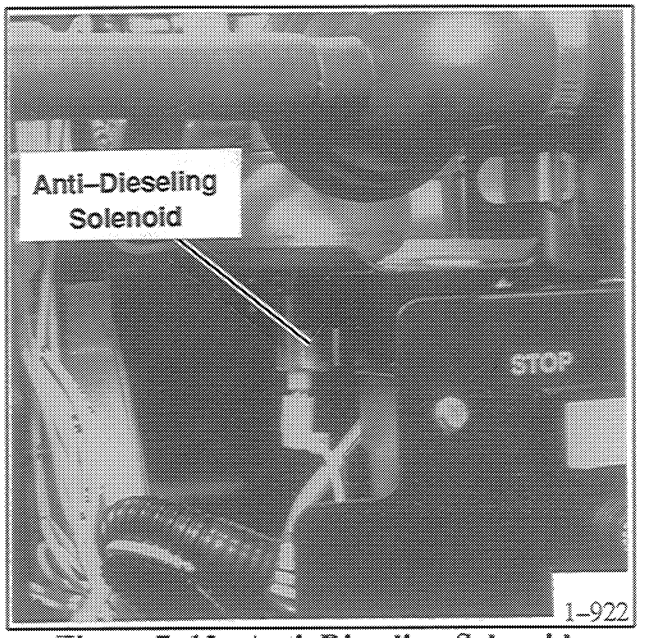



**Figure 7–13. Anti–Dieseling Solenoid**

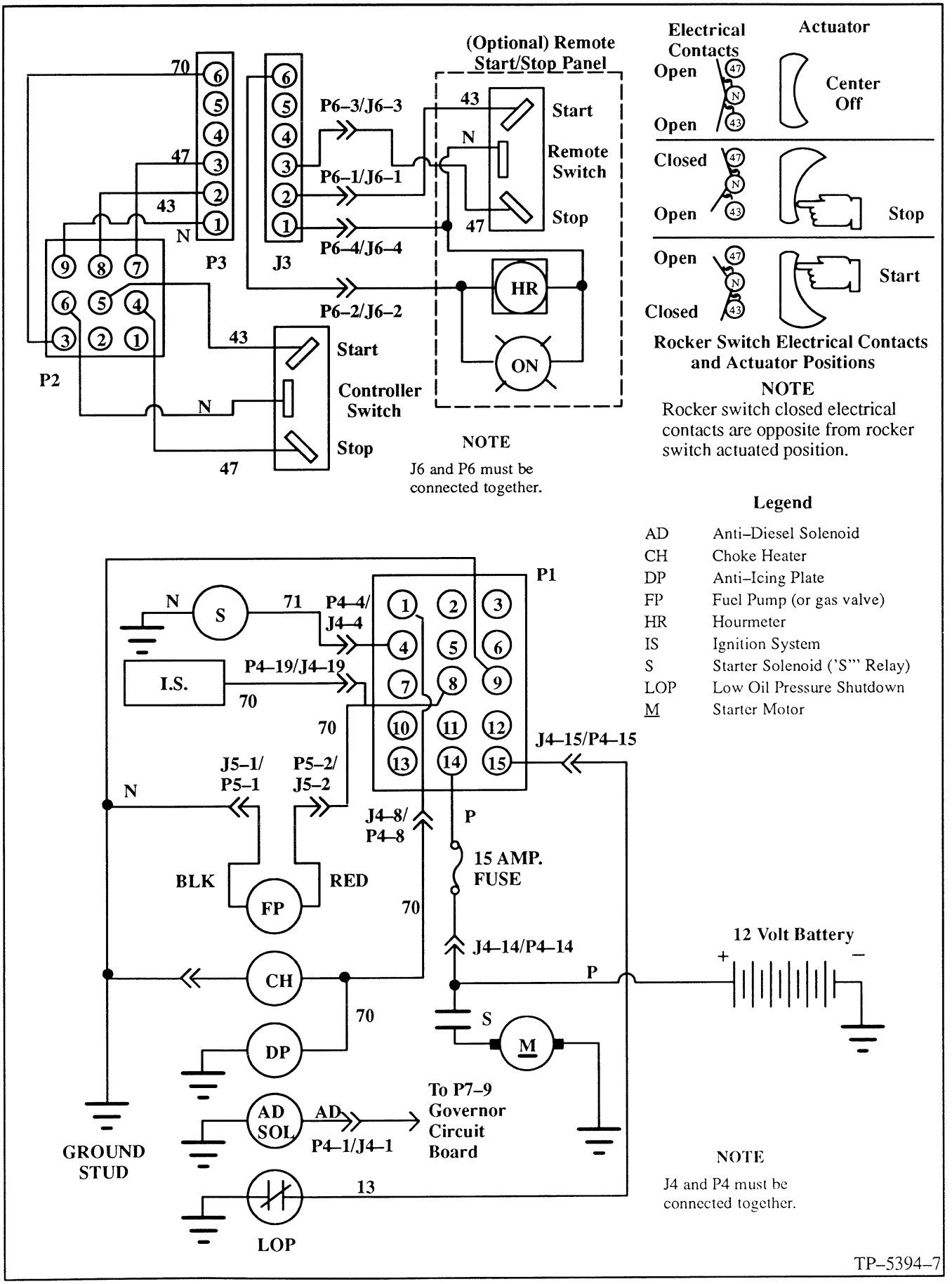



**Figure 7–11. Wiring Harness Connections**

| Component | Ohmmeter Connections | Remarks | Results |
|---|---|---|---|
| Controller switch | P2–6 and P2–4 | Ohmmeter on R x 1000 scale. Place rocker switch in START position. | If good – zero ohms (continuity). Any resistance other than zero or very low ohms – replace switch. |
| | P2–6 and P2–5 | Ohmmeter on R x 1000 scale. Place rocker switch in STOP position. | If good – zero ohms (continuity). Any resistance other than zero or very low ohms – replace switch. |
| Carburetor choke (see Figure 7–12) | Disconnect leads at choke and connect to choke terminals. | Ohmmeter on R x 1 scale. | If good – approx. 18 ohms at 75° F (24° C). |
| Anti–dieseling solenoid (see Figure 7–13) | Disconnect lead at solenoid. Solenoid terminal and engine block (ground). | Ohmmeter on R x 1 scale. | If good – approx. 22 ohms at 75° F (24° C). |
| Starter solenoid ('S' relay) (see Figure 7–14) | P1–4 and P1–9 | Ohmmeter on R x 1 scale. | If good – approx. 3.5–4 ohms at 80° F (27° C). |
| Anti–icing plate (thermistor) (see Figure 7–15) | Disconnect lead at thermistor. Connect to thermistor terminal and engine block (ground). | Ohmmeter on R x 1 scale. | If good – approx. 10 ohms. |
| Controller 15 Amp. circuit breaker (or fuse) and wiring | Battery positive (+) cable and P1–14 | Ohmmeter on R x 1000 scale. | If good – zero or very low ohms. No reading (infinity) – open circuit or circuit breaker tripped. |
| Low oil pressure (LOP) safety shutdown switch | P1–15 and engine block (ground) | Ohmmeter on R x 1000 scale. | If good – zero ohms (continuity). Then, disconnect LOP switch lead and isolate terminal. Meter reading reading show an open circuit. |

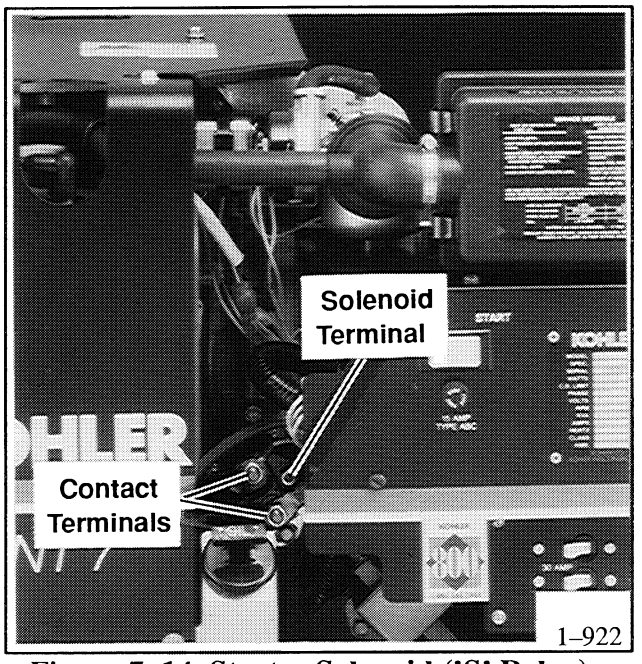



Figure 7–14. Starter Solenoid ('S' Relay)

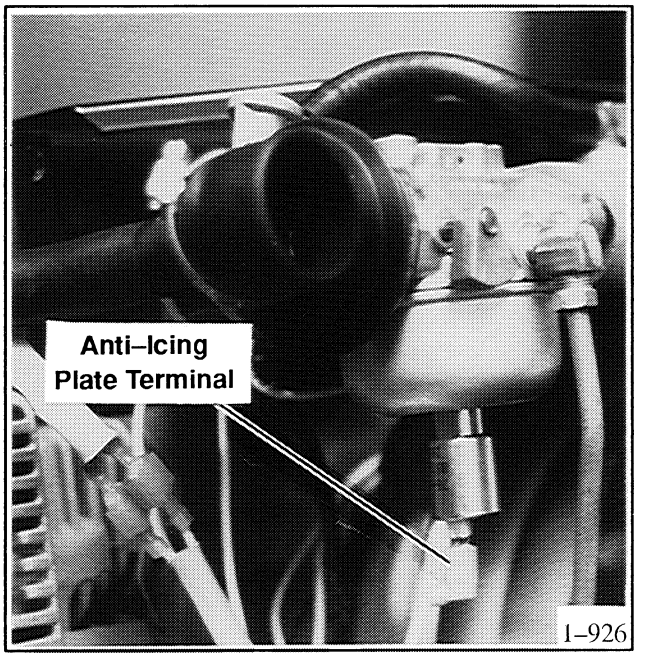



Figure 7–15. Anti–Icing Plate Terminal

| Component | Ohmmeter Connections | Remarks | Results |
|---|---|---|---|
| Remote switch (optional) | J3–1 and J3–3 (plug side) | Ohmmeter on R x 1000 scale. Place rocker switch in START position. | If good – zero ohms (continuity). Any resistance other than zero or very low ohms – replace switch. |
| | J3–1 and J3–2 (plug side) | Ohmmeter on R x 1000 scale. Place rocker switch in STOP position. | If good – zero ohms (continuity). Any resistance other than zero or very low ohms – replace switch. |
| Remote panel hourmeter (optional) | J3–1 and J3–6 Disconnect 'ON' light leads. | Ohmmeter on R x 1000 scale. | If good – zero ohms. (continuity). |
| Remote panel Generator 'ON' Light (optional) | J3–1 and J3–6 Disconnect hourmeter leads. | Ohmmeter on R x 1000 scale. | If good – zero ohms. (continuity). |

# Section 8. Disassembly/Reassembly

Prior to disassembly, the generator set must be unbolted from the coach. Disconnect all external connections – battery cables at battery (negative lead first), AC output leads at coach junction box, remote start panel at controller P3 connector, fuel line at filter inlet, and exhaust system. Observe all safety precautions listed at the beginning of this manual during the disassembly/reassembly procedure.

**NOTE**

**HARDWARE DAMAGE!** Engine and generator make use of both SAE and metric hardware. Be sure to use the correct size tools to prevent rounding of bolt heads and nuts.

## DISASSEMBLY

1. Remove four screws using a 1/4 in. nutdriver or socket wrench from start/stop control panel. See Figure 8–1.

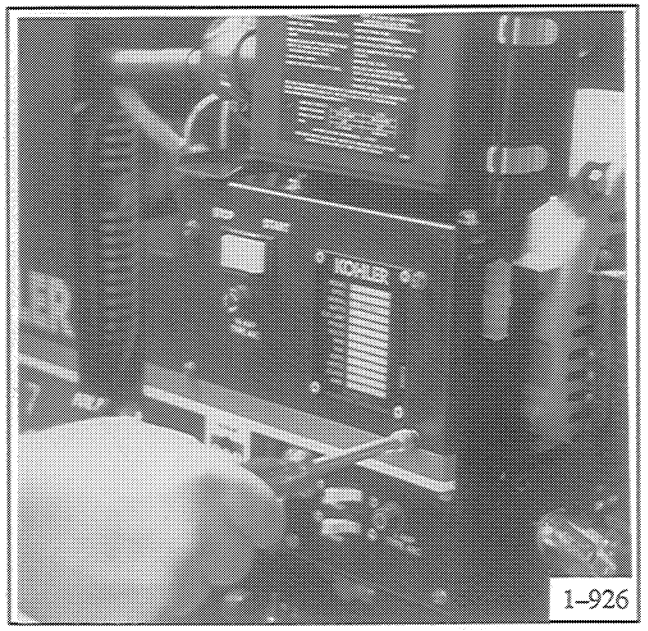



**Figure 8–1. Removing Controller Cover**

2. If main circuit board or electronic governor circuit board require replacement, follow Steps 2a–2d. If circuit board replacement is not required, go to Step 3.

**NOTE**

If adjustment to electronic governor circuit board is required, pot. adjustment can be made without removing circuit boards.

2a. Remove P1 (15 pin) and P2 (9 pin) connectors from main circuit board.

2b. Remove four nuts using 1/4 in. nutdriver and one nut (upper right–hand corner securing the circuit board bracket) using a 5/16 in. nutdriver. Remove five white insulator washers and black (long) spacers from studs. Remove main circuit board. See Figure 8–2.

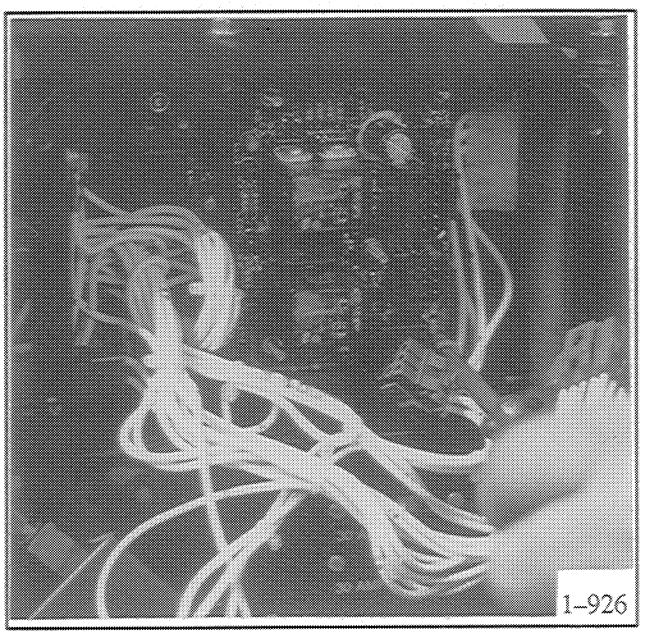



**Figure 8–2. Removing Main Circuit Board**

2c. Remove four nuts and lock washers using 5/16 in. nutdriver and remove main circuit board bracket. See Figure 8–3.

2d. Remove P2 (9 pin) connector from electronic governor circuit board and then remove electronic governor circuit board.

For reassembly, reverse Steps 2a – 2d. Electronic governor circuit board is installed with pots. to the LH side.

If electronic governor circuit board was replaced or pots. altered, see Section 2. Maintenance – Governor for adjustment.

3. Loosen hose clamp between air cleaner assembly and carburetor at carburetor side.

4. Remove breather hose at air cleaner assembly by removing adapter from air cleaner assembly. Hose clamp does not need to be loosen.

5. Release four latches and remove air cleaner cover. See Figure 8–4. Carefully remove air cleaner element from base. Protect element from dirt/dust contamination until installation.

6. Remove three air cleaner base screws (two screws are in front, mounted to the controller box, and one screw is in back, mounted to the stator assembly) using 3/8 in. socket wrench.. See Figure 8–5.

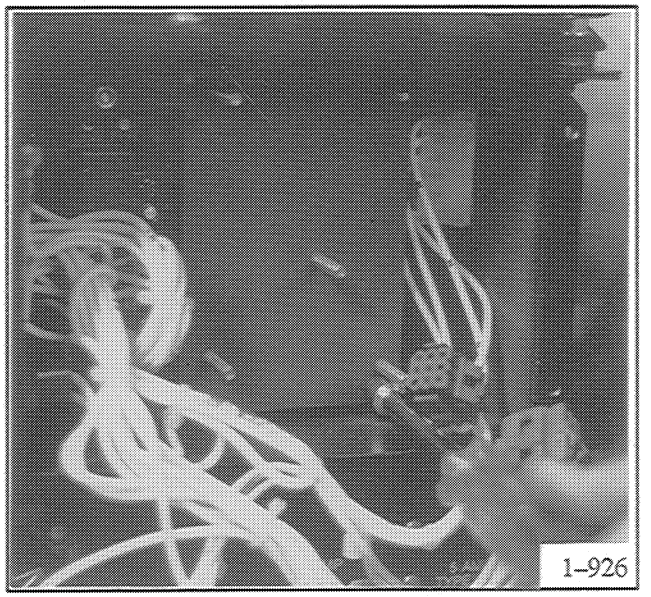



**Figure 8–3. Removing Circuit Board Bracket**

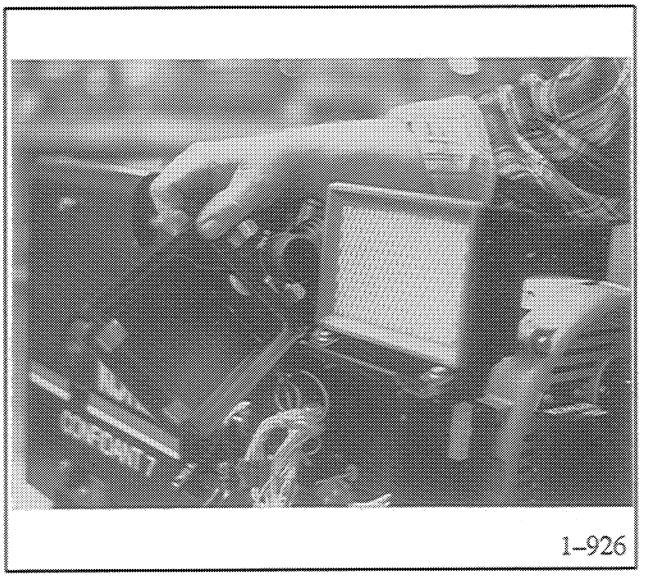



**Figure 8–4. Removing Air Cleaner Cover**

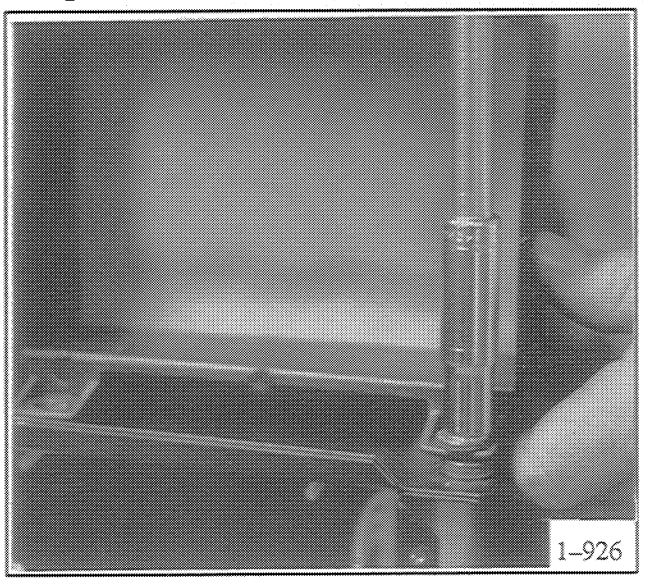



**Figure 8–5. Removing Air Cleaner Base**

7. Remove three screws (two are on top of the controller box, and one inside the controller box), using 3/8 in. socket wrench to remove controller box. See Figure 8–6.

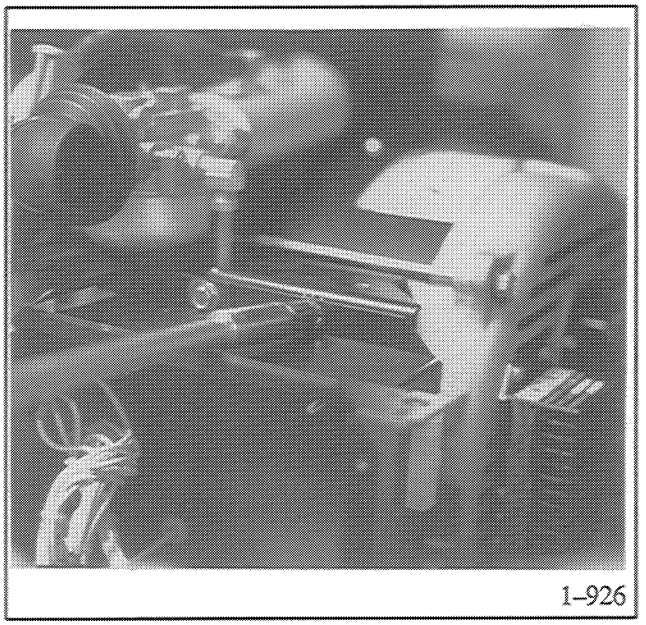



**Figure 8–6. Removing Controller Box**

8. Remove small tray drip located underneath carburetor.

9. Disconnect fuel pump (2 pin) P5 connector and (20 pin) P4 connector from controller box.

10. Remove four screws from AC circuit breaker panel using 1/4 in. nutdriver or socket wrench. See Figure 8–7.

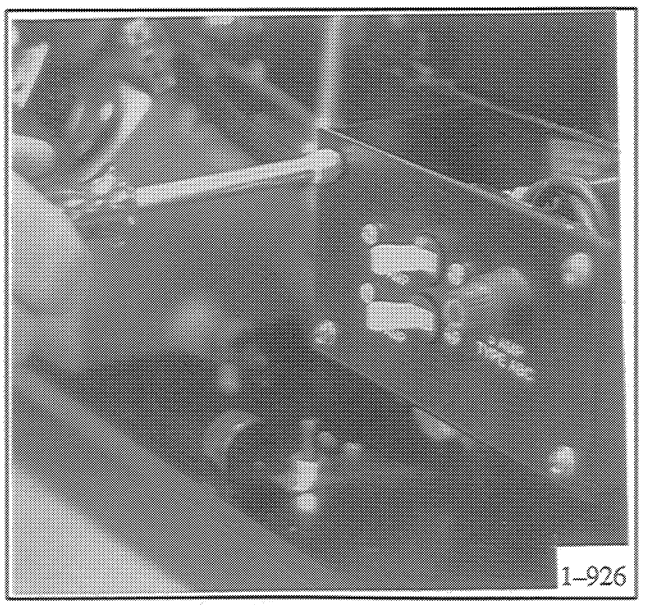



**Figure 8–7. Removing AC Circuit Breaker Panel**

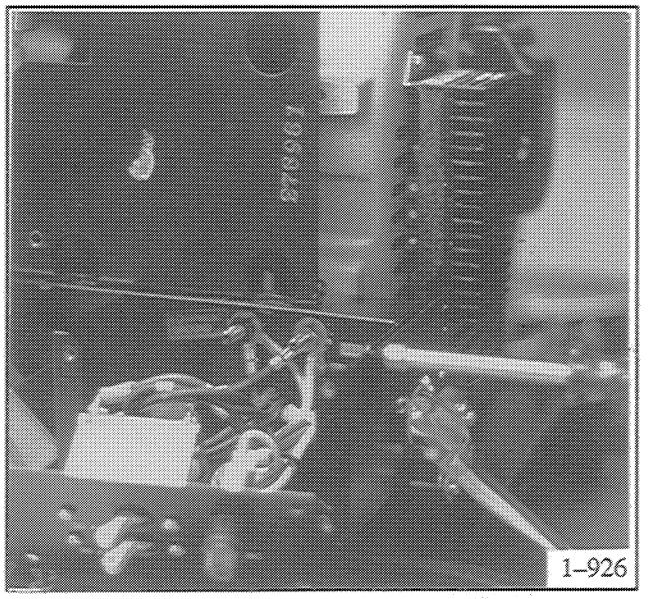



**Figure 8–8. Removing Voltage Regulator Guard (Left Screw)**

11. Remove one screw on side of controller box using 1/4 in. nutdriver. This will release one end of the voltage regulator guard. See Figure 8–8.

12. Remove two screws on the other end of the voltage regulator guard using 1/4 in. nutdriver to free guard. See Figure 8–9.

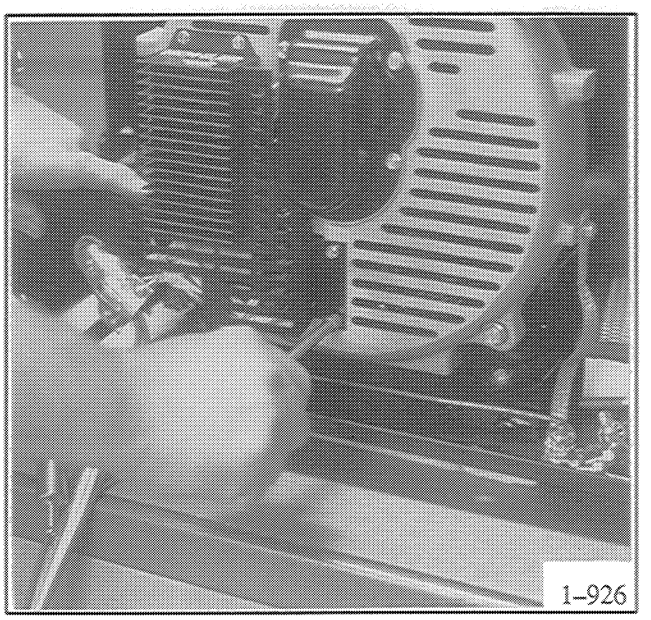



**Figure 8–9. Removing Voltage Regulator Guard**

13. Disconnect 6–pin (voltage regulator) connector and 4–pin (B1, B2, 33, 44 lead) connector.

14. Remove four screws and remove voltage regulator using 1/4 in. nutdriver or socket wrench. See Figure 8–10.

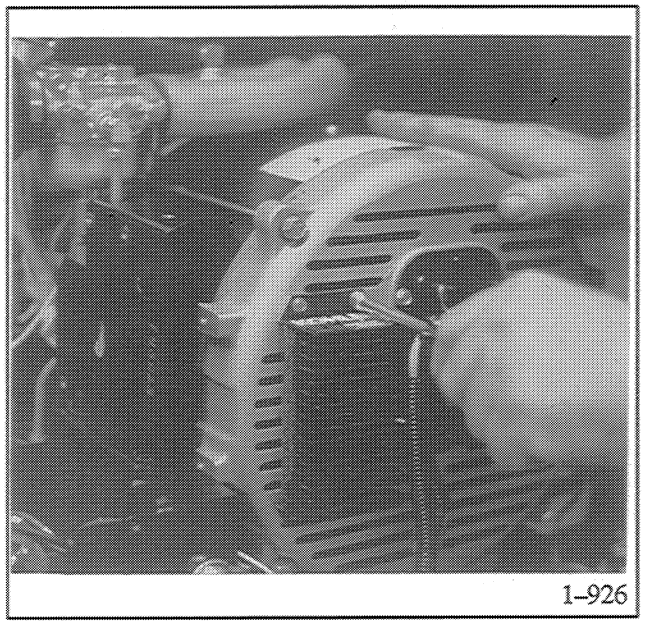



**Figure 8–10. Removing Voltage Regulator**

15. Remove four screws and brush cover using 5/16 in. socket wrench. See Figure 8–11.

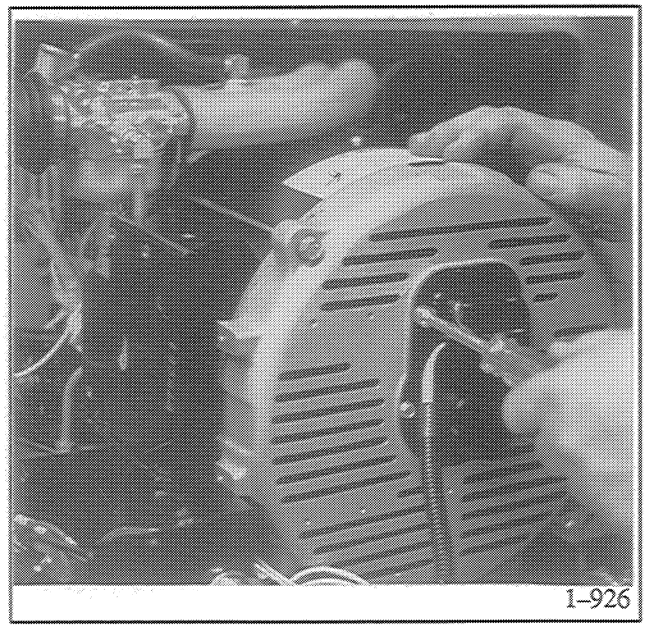



**Figure 8–11. Removing Brush Cover**

16. Raise brushes in holder by pulling leads outward and install brush retainer (length of stiff wire or paper clip will also work). See Figure 8–12.

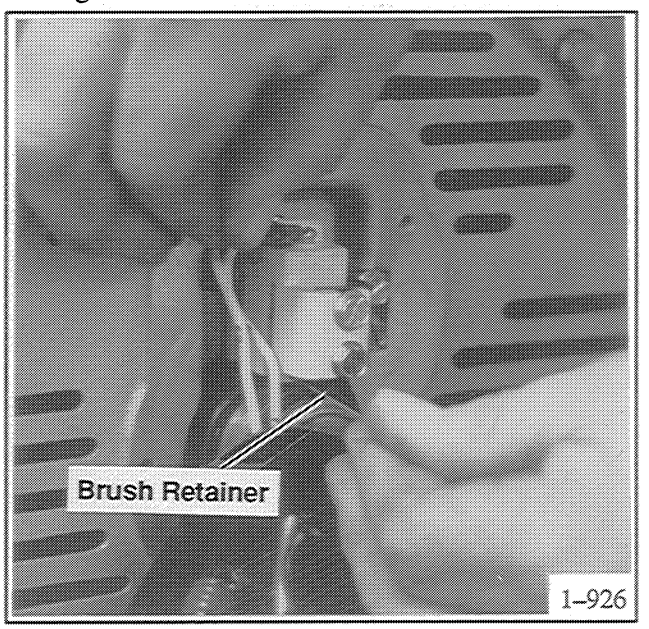



**Figure 8–12. Installing Brush Retainer**

17. Remove two screw securing brush holder bracket using 5/16 in. nutdriver or socket wrench. See Figure 8–13.

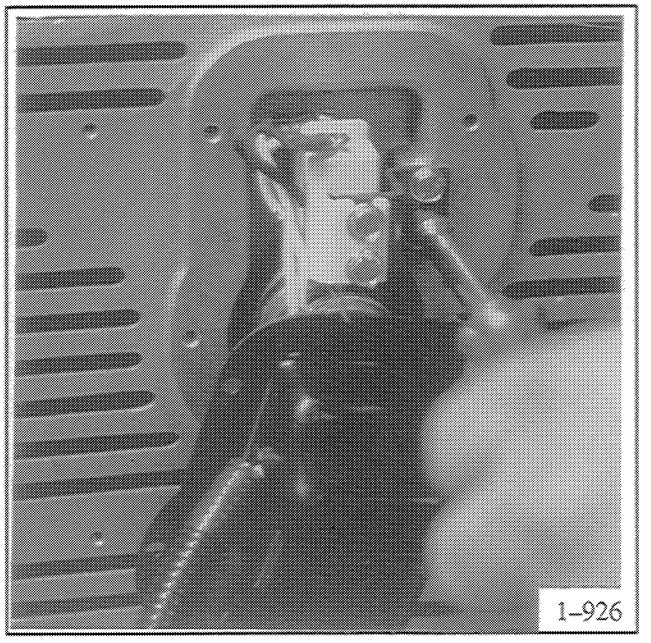



**Figure 8–13. Removing Brush Holder Bracket**

18. Remove two screws securing A.C. circuit breaker box to stator bracket using 3/8 in. ratchet. See Figure 8–14.

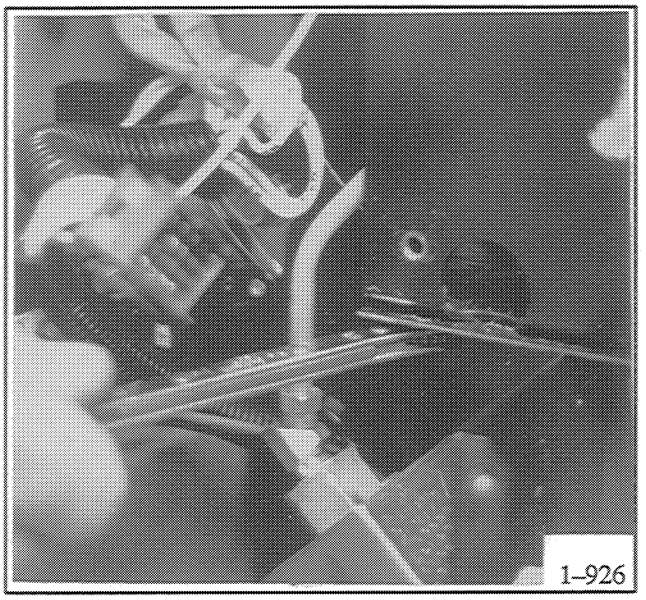



**Figure 8–14. Removing Circuit Breaker Box**

19. Remove one screw securing ground strap using 3/8 in. socket wrench. See Figure 8–15.

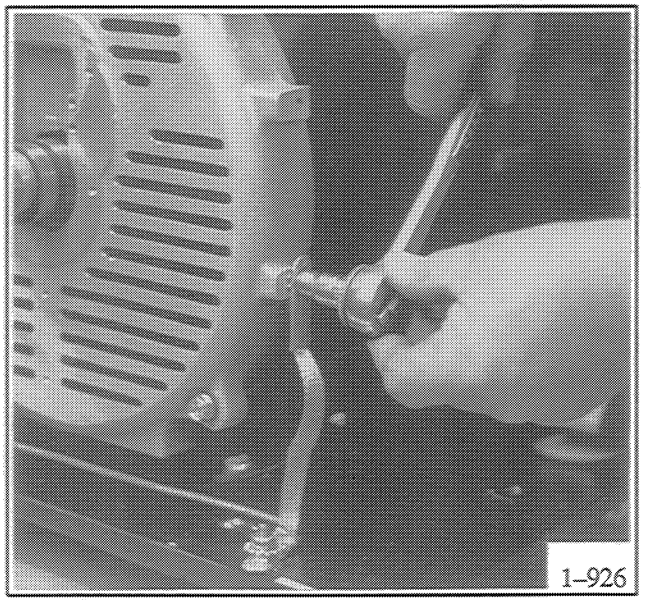



**Figure 8–15. Removing Ground Strap**

20. Remove two bolts on vibromounts at stator assembly using 9/16 in. socket wrench. See Figure 8–16.

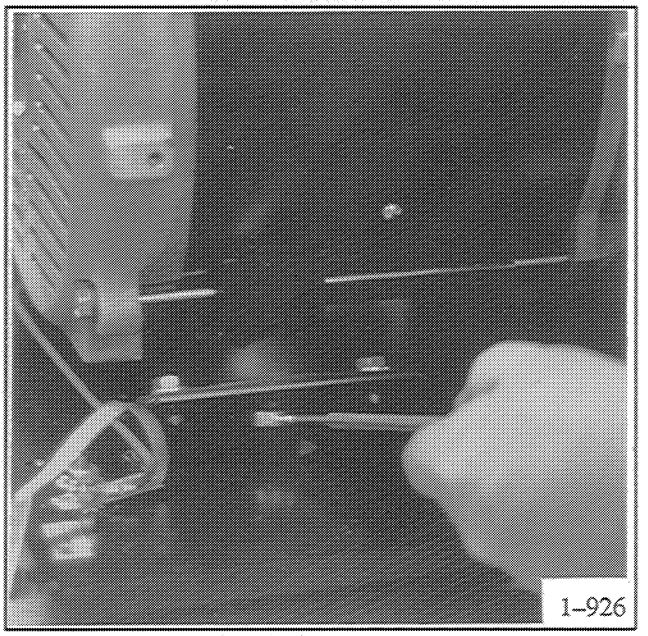



**Figure 8–16. Removing Vibromount Bolts**

21. Raise generator end of unit (use hoist if necessary) and support unit on adapter or on oil pan using wood block(s).

22. Use 7/16 in. socket wrench to remove leads 1 and 3 from ground in A.C. circuit breaker box.

23. Disconnect leads 2 and 4 from circuit breaker, and two leads marked 55 from fuse.

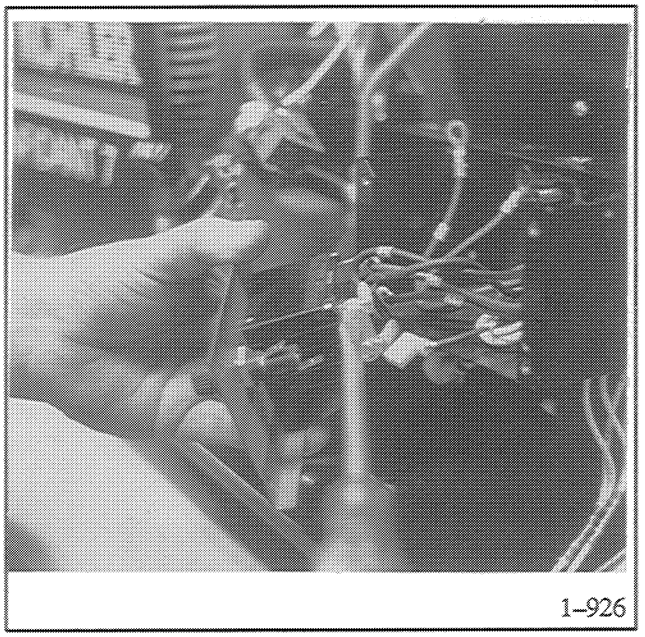



**Figure 8–19. Disconnecting Circuit Breaker Leads.**

24. Use a 7/16 in. wrench (use a flare nut wrench if available) to loosen fuel line fitting at fuel pump. See Figure 8–20. Lift and bend fuel line slightly to clear fuel pump adapter.

25. Remove two screws located above starter solenoid using 5/16 in. ratchet to free panel. See Figure 8–21.

26. Carefully pull stator leads through hole in back of breaker box so stator can later be removed.

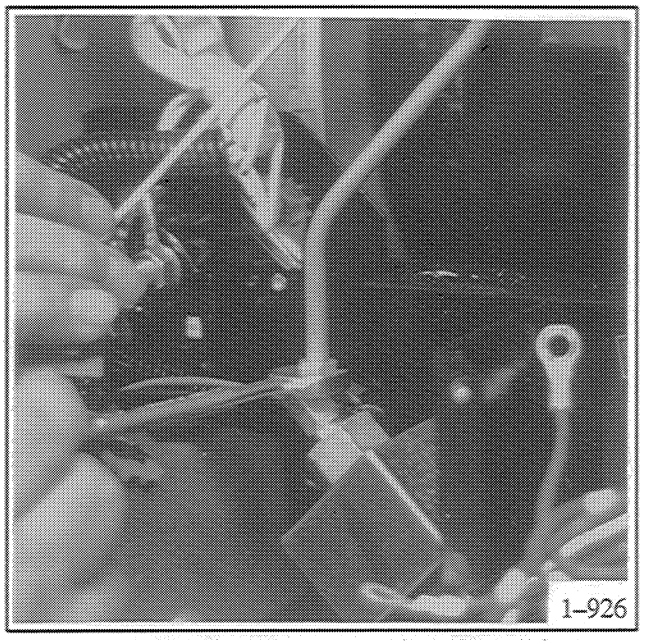



**Figure 8–20. Disconnecting Fuel Line**

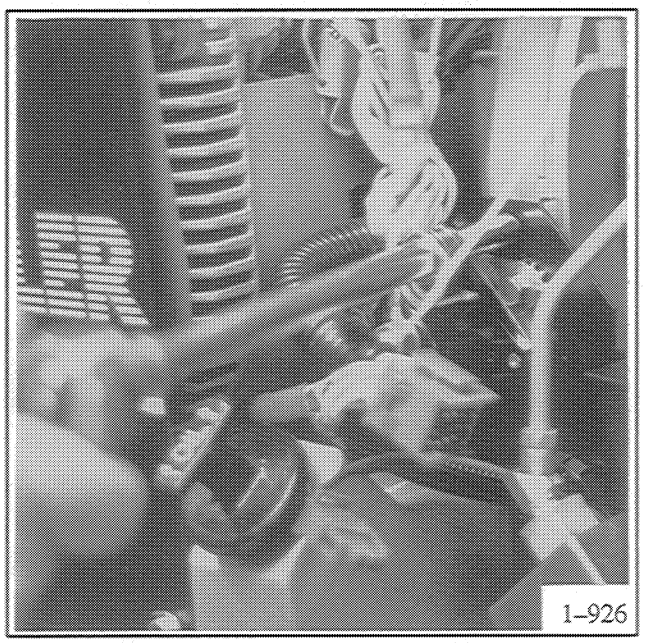



**Figure 8–21. Removing Panel**

27. Remove four overbolts from end bracket using 7/16 in. socket wrench. See Figure 8–22.


**Figure 8–22. Removing Overbolts**

28. Use a rubber (soft faced) hammer to carefully remove end bracket from stator assembly. See Figure 8–23.

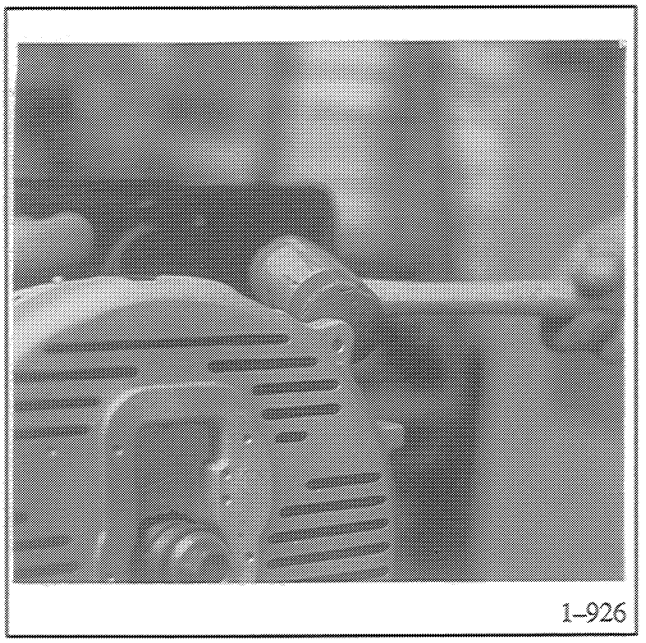



**Figure 8–23. Removing End Bracket**

29. Remove stator assembly by sliding off adapter lip. Use a screwdriver between stator assembly shell edge and generator adapter to loosen stator, if necessary. Be careful not to damage mating surfaces. See Figure 8–24.

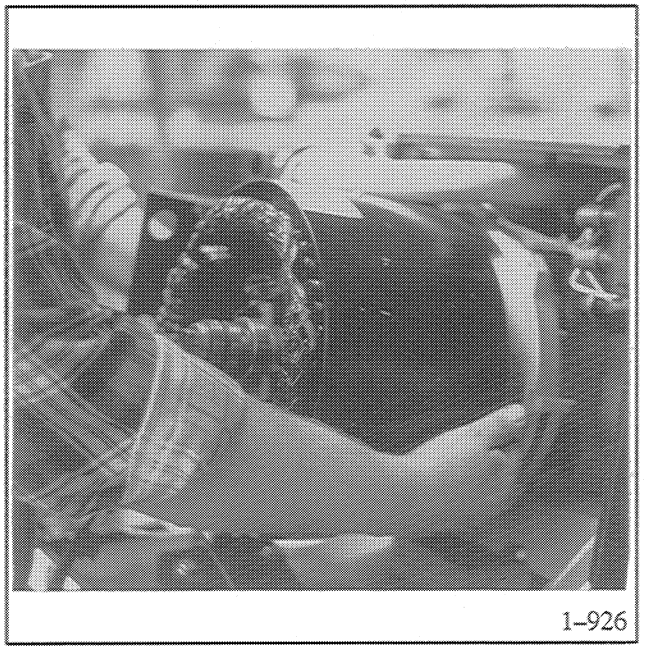



**Figure 8–24. Removing Stator Assembly**

30. Loosen thru–bolt 2–3 turns leaving an 1/8 in. (3 mm) gap between bolt and rotor using a 3/4 in. socket wrench. Use a strap wrench on rotor windings and socket wrench on thru–bolt *(or* place wrench on thru–bolt and strike wrench with lead hammer using a medium force blow) to loosen thru–bolt. See Figure 8–25.

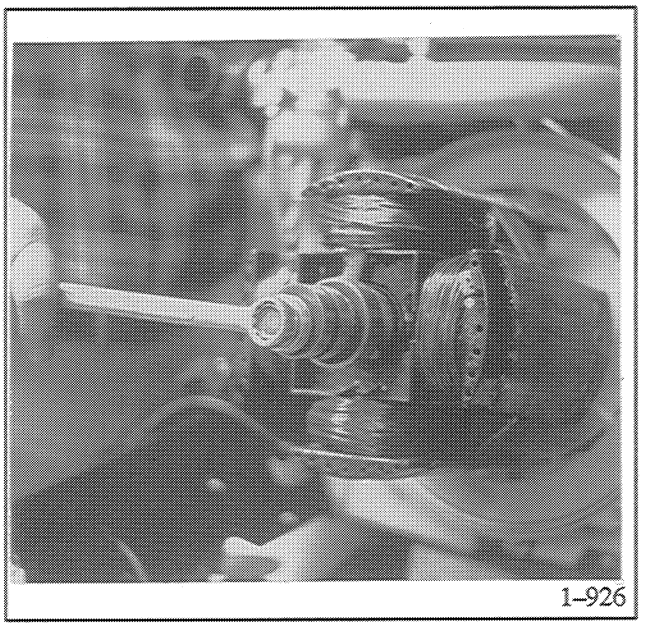



**Figure 8–25. Loosening Rotor Thru–Bolt**

31. Strike thru–bolt head with lead hammer using a medium force blow to loosen rotor. If necessary, use prybar or large screwdriver to pry rotor at laminations. See Figure 8–26. Do NOT allow pry tool to contact windings.

**NOTE**

Do not attempt to loosen rotor thru–bolt by blocking rotor cooling fan and turning rotor with any kind of wrench. Damage to fan blades and rotor may result.

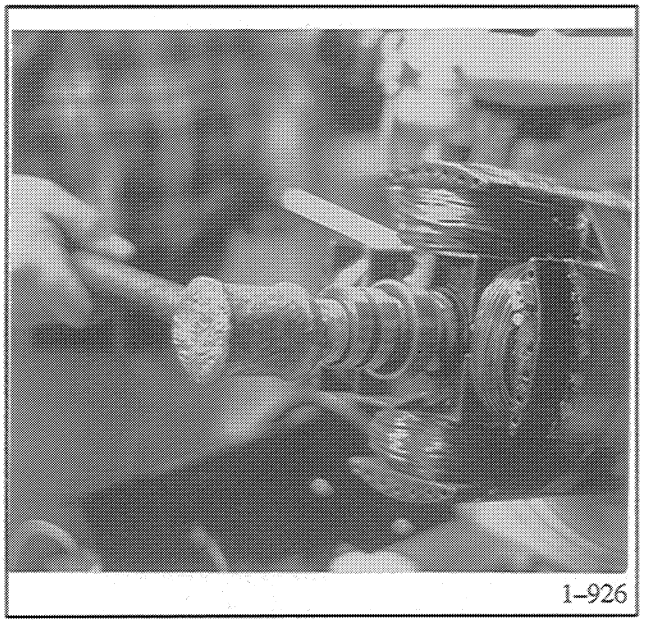



**Figure 8–26. Striking Thru–Bolt**

32. When rotor has been loosen, remove thru–bolt and then slide rotor from tapered crankshaft. See Figure 8–27.

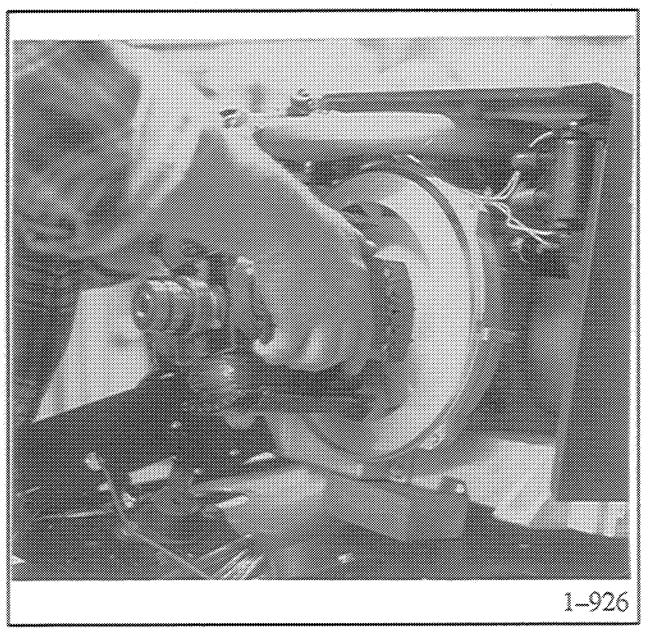



**Figure 8–27. Removing Rotor**

## REASSEMBLY

1. Coat crankshaft tapered shaft with anti–seize compound. See Figure 8–28.

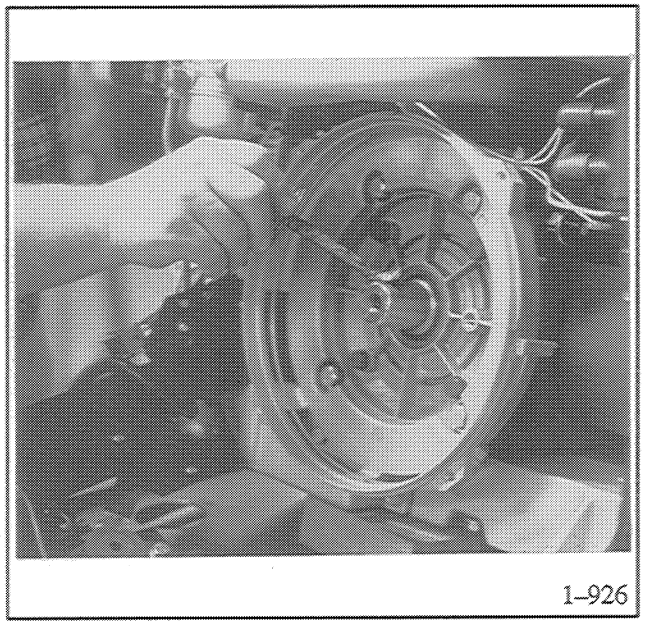



**Figure 8–28. Applying Ant–Seize Compound**

2. Place rotor onto tapered shaft of crankshaft and hand–tighten thru–bolt. Attach a strap wrench to rotor and torque thru–bolt to 40–55 ft. lbs. (54–75 Nm). See Figure 8–27. Do not allow flywheel to rotate when assembling rotor to crankshaft.

3. Place stator assembly over rotor and onto adapter lip. Be careful not to damage rotor.

4. Attach stator leads 1, 2, 3, 4, and 55 to AC circuit breaker box. See Section 9. Wiring Diagrams for proper connection.

5. Attach AC circuit breaker box to stator assembly bracket using two screws. Secure bracket by attaching two screws above starter solenoid.

6. Align end bracket on stator assembly and rotor bearing.

**NOTE**

Do NOT attempt to install end bracket to rotor by tightening overbolts. Damage to end bracket and/or generator adapter may result.

**NOTE**

No lubricant should be used during assembly.

Using a hard rubber or dead blow hammer alternately strike end bracket using medium force blows. Use the rotating sequence shown in Figure 8–29 to install end bracket.

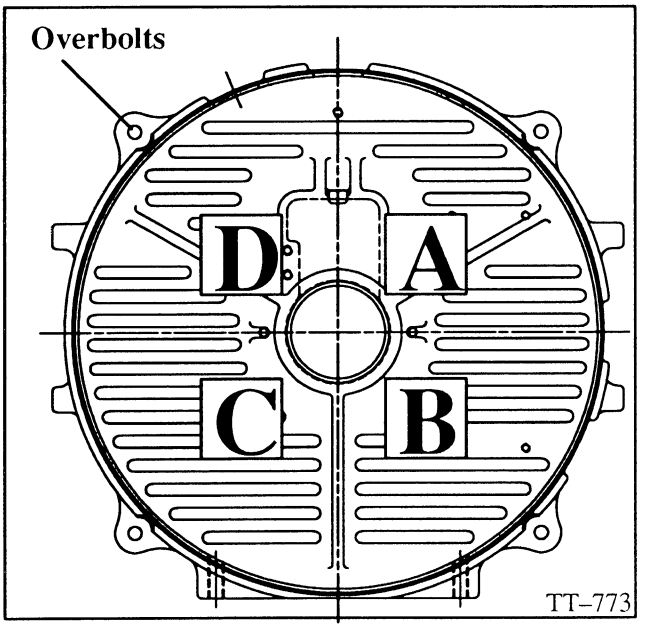



**Figure 8–29. Installing End Bracket**

When end bracket is completely installed in stator assembly, install and torque overbolts to 60 in. lbs. (7 Nm).

7. Carefully bend fuel line so that fitting is properly aligned with fuel pump adapter. Tighten fitting with 7/16 in. wrench.

8. Secure screw to ground strap using 3/8 in. socket wrench.

9. Lift unit (use hoist if necessary) and remove wood block(s) supporting generator set.

10. Attach stator assembly to vibromounts using two bolts.

11. Remove brush retainer from brush holder. Install brush holder bracket with two screws and brush cover with four screws.

12. Replace voltage regulator using four screws. Mount with adjustment pots. toward the start/stop panel.

    If the voltage regulator is replaced or has been tampered with, use readjustment procedure found in Section 7. Component Testing and Adjustment, Voltage Regulator Adjustment.

13. Install 6–pin (voltage regulator) connector and 4–pin (B1, B2, 33, and 44 lead) connector.

14. Attach voltage regulator guard by using three screws.

15. Install front cover to A.C. circuit breaker box by using four screws.

16. Reconnect fuel pump P5 (2 pin) connector and P4 (20 pin) connector to controller box.

17. Reposition small drip tray underneath carburetor.

18. Replace controller box using three screws.

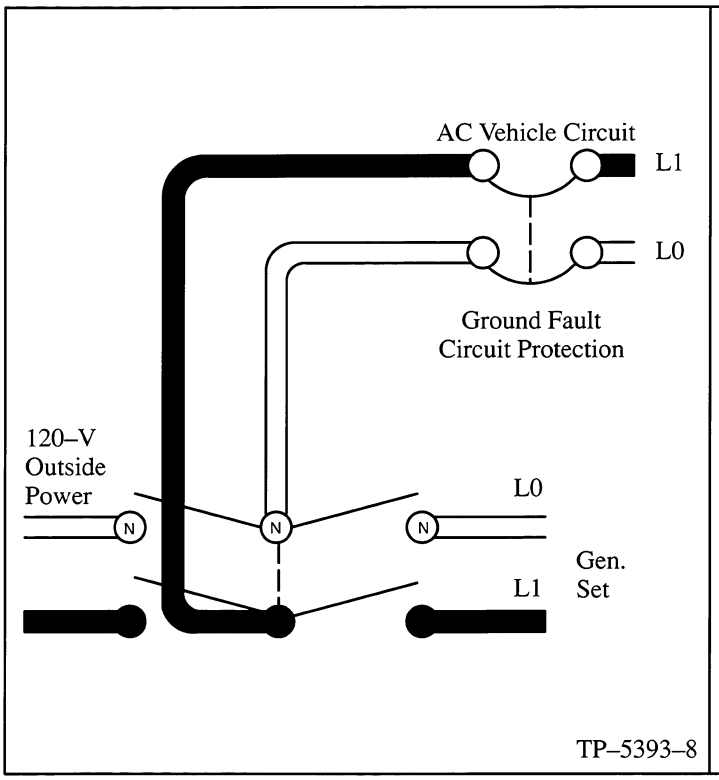
19. Replace air cleaner base using three screws. Replace air cleaner element and attach cover using four latches.

20. Replace breather hose adapter to air cleaner assembly.

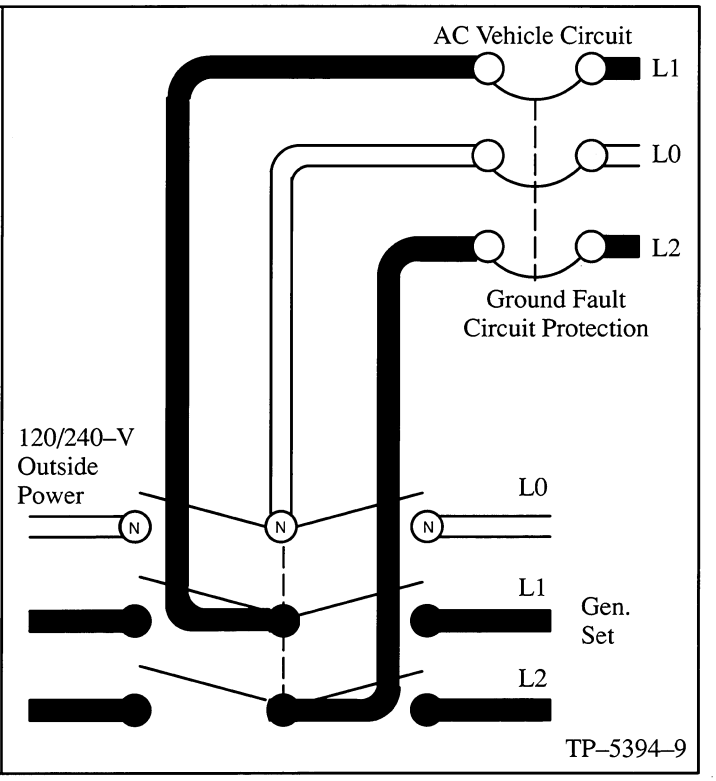
21. Replace main circuit board and/or electronic governor board if removed.

22. Carefully replace start/stop panel and wiring. Install four screws to mount panel.

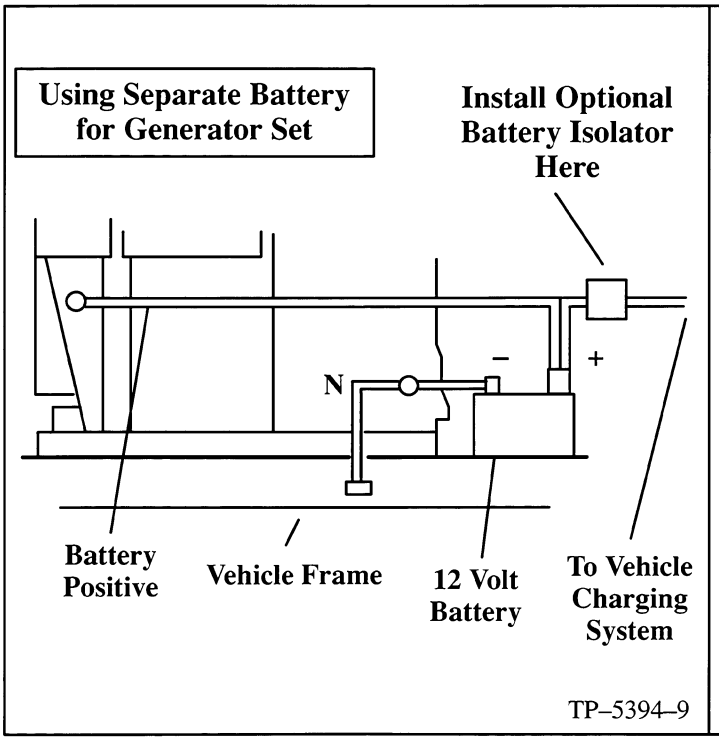
# Section 9. Wiring Diagrams

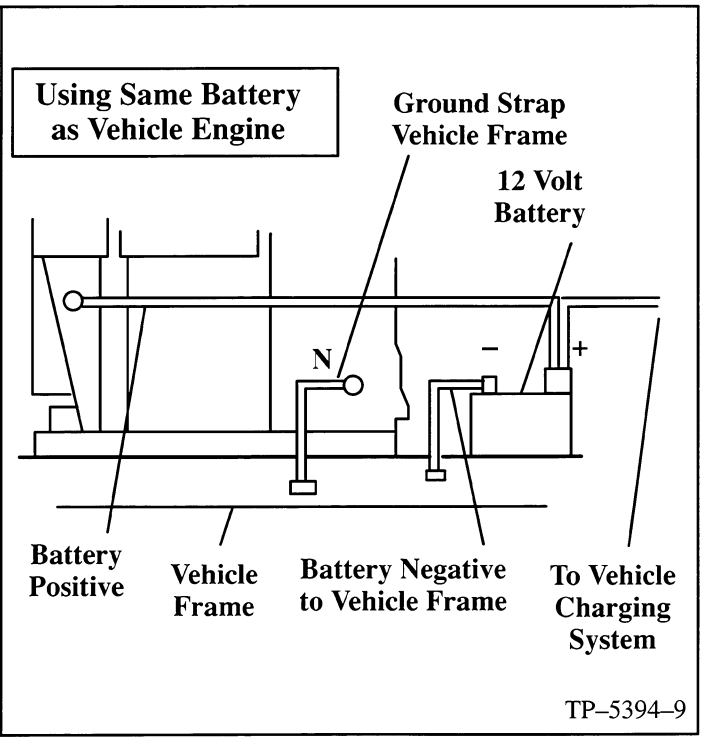



Transfer Switch Connections, 2–Wire AC Circuit

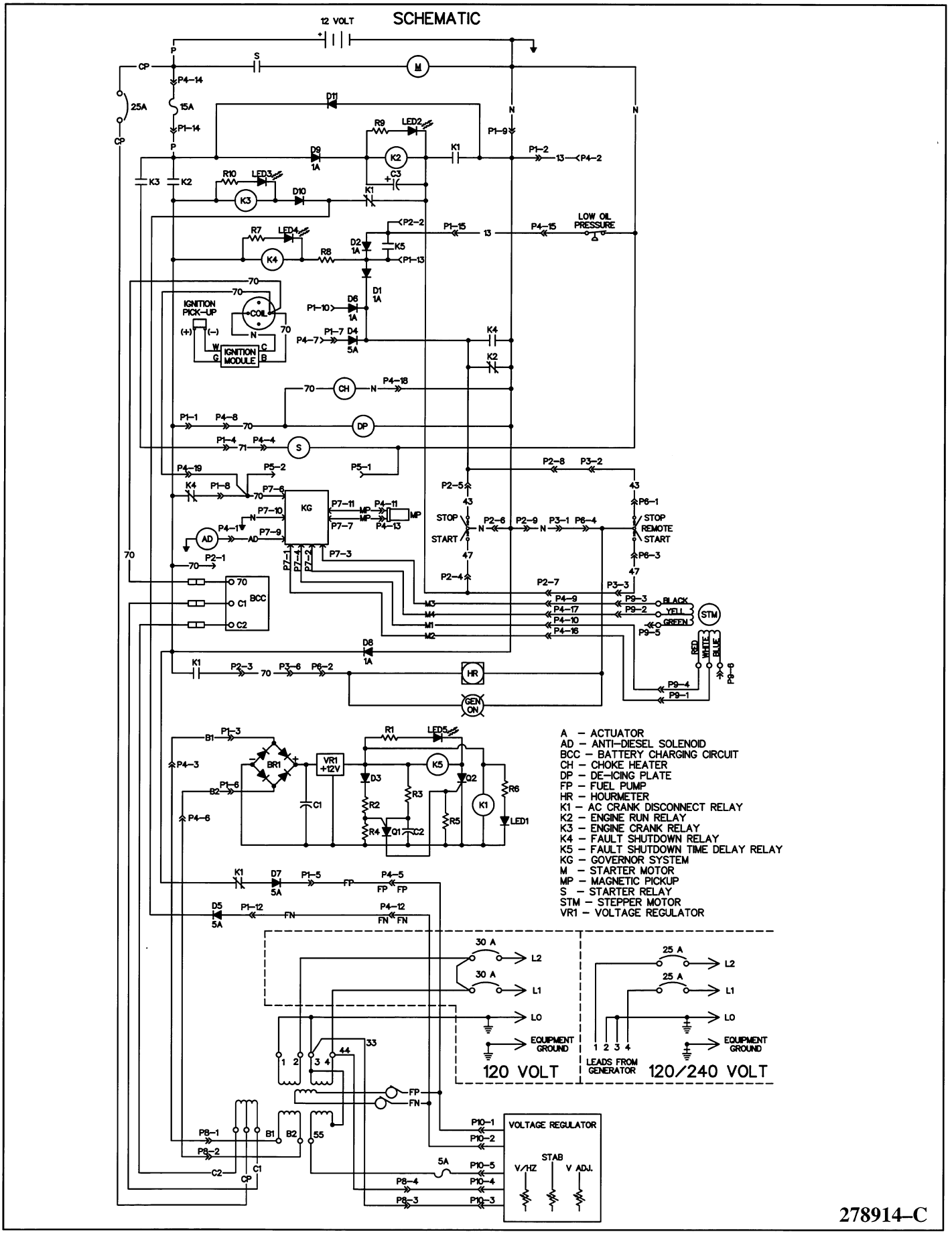



Transfer Switch Connections, 3–Wire AC Circuit

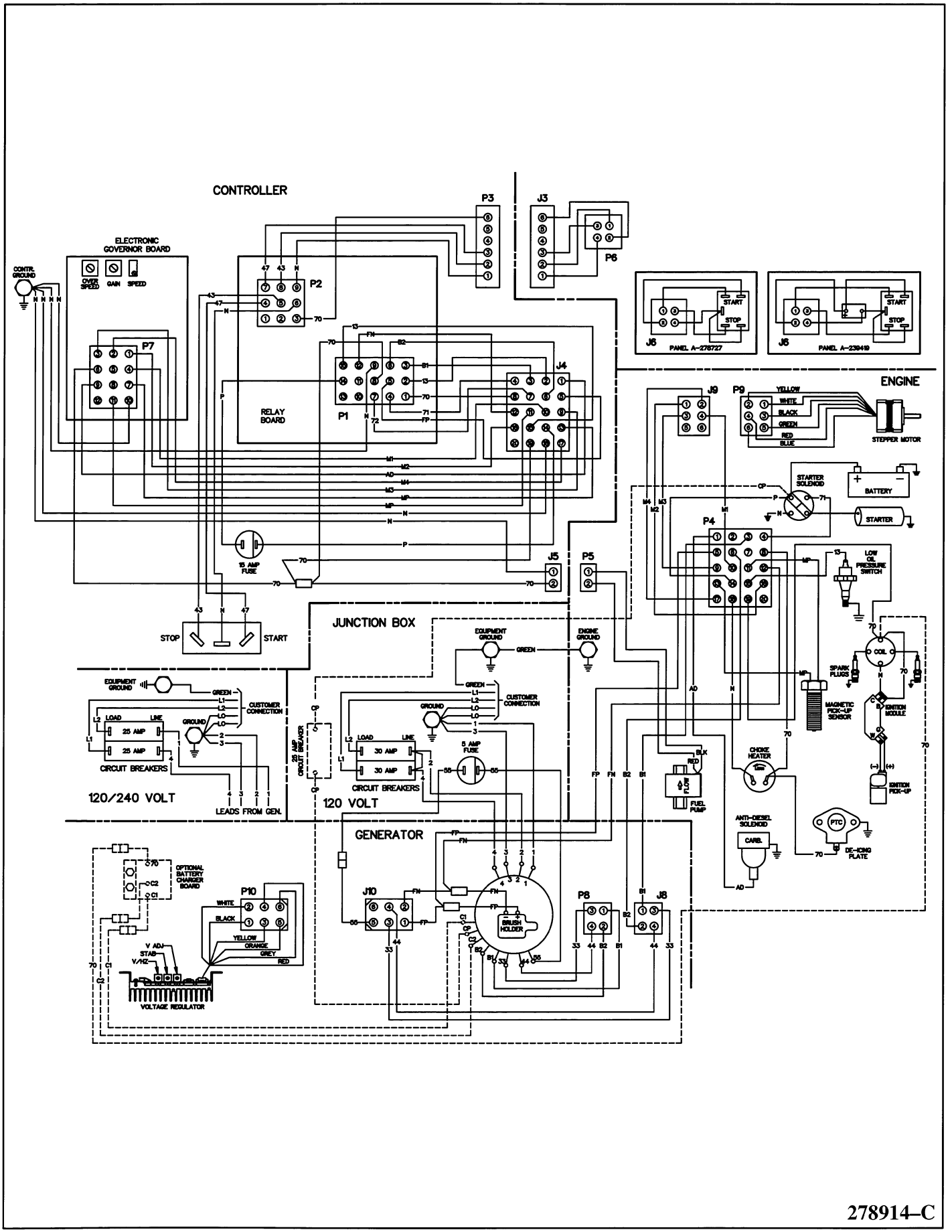



Battery Connections




**Wiring Diagram – 7CCKM, 60 Hz. (Schematic)**

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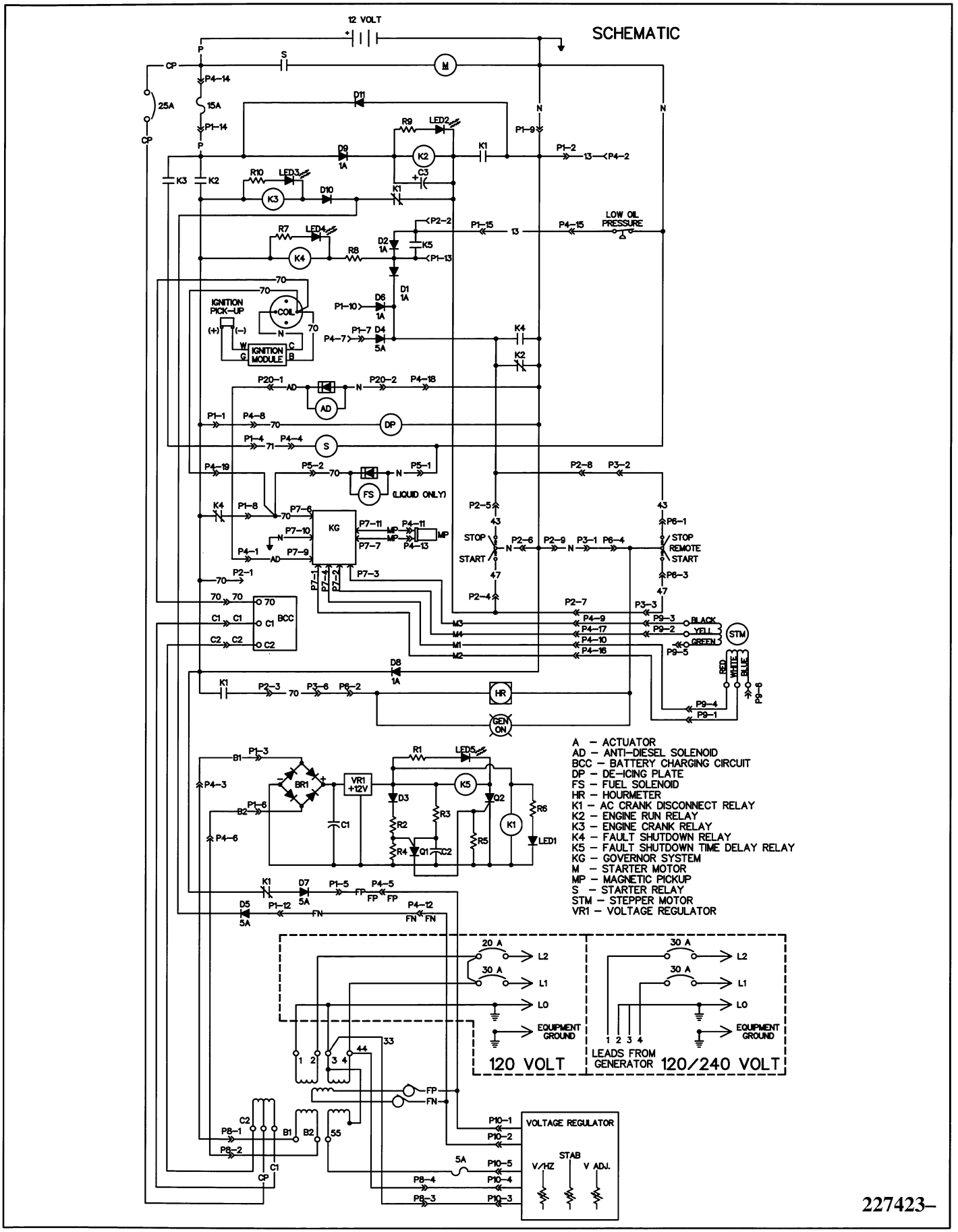
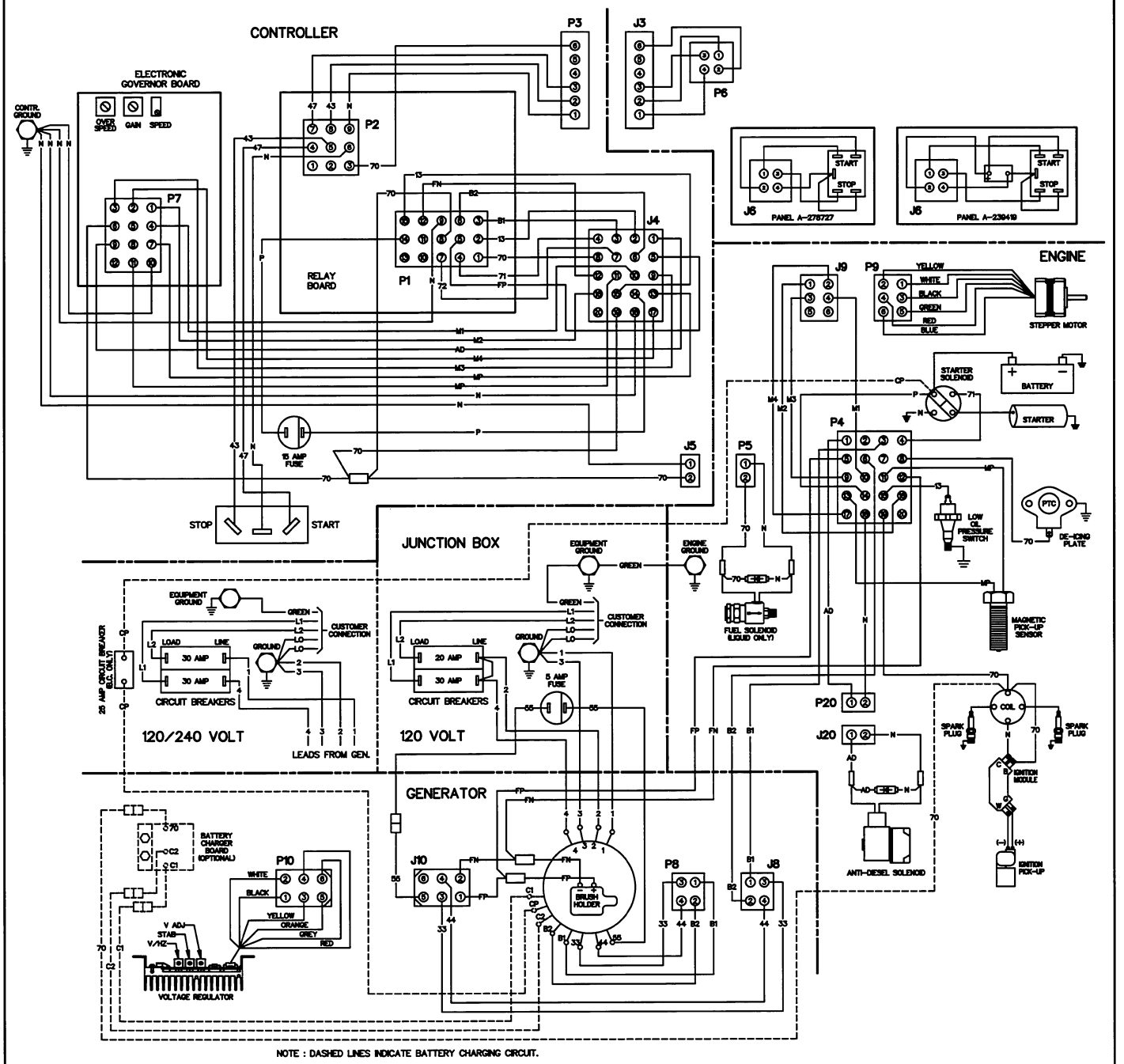
**Wiring Diagram – 7CCKM, 60 Hz. (Point–to–Point Wiring)**



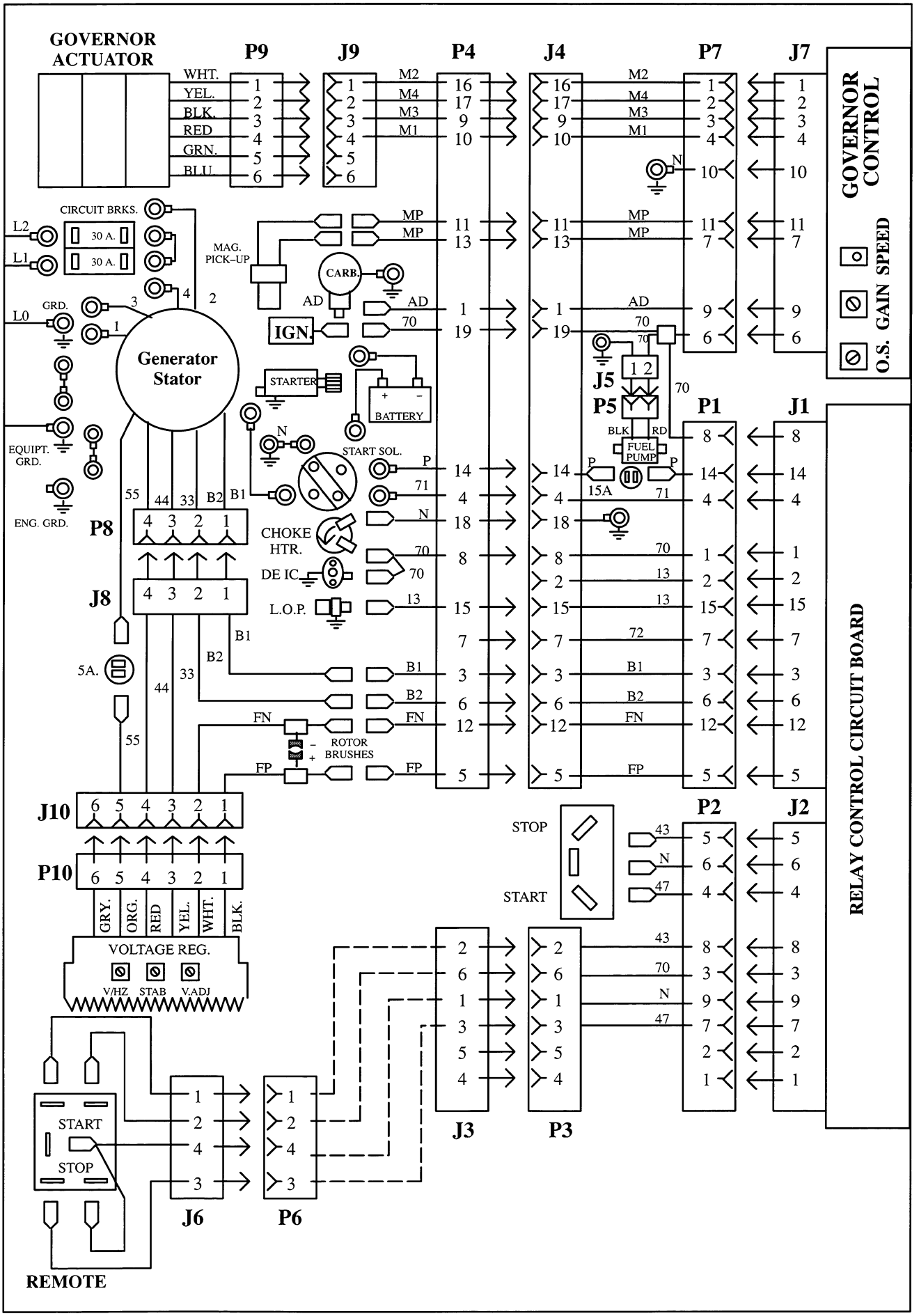

**Wiring Diagram – 7CCKM, 60 Hz. LP (Schematic)**



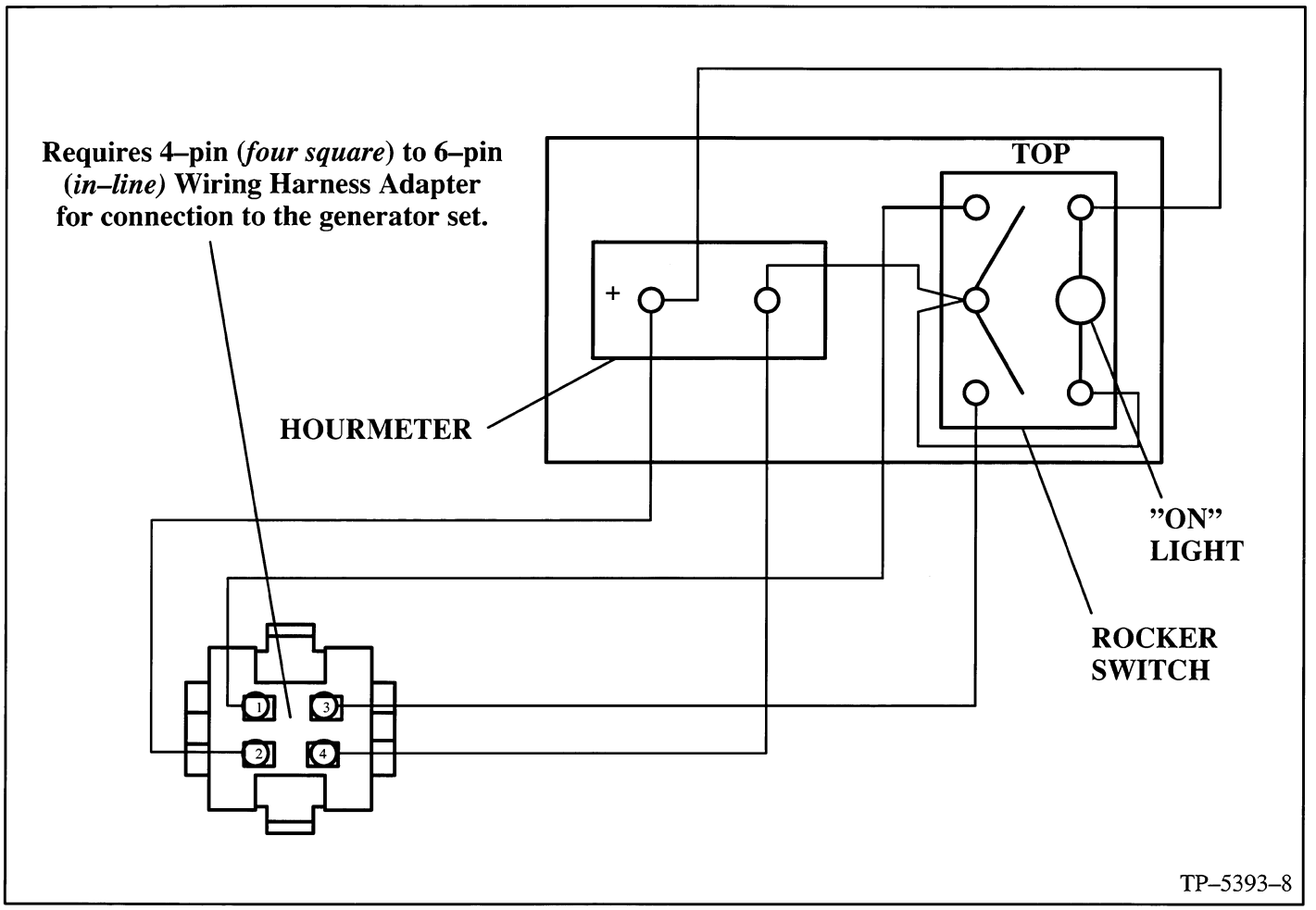

NOTE : DASHED LINES INDICATE BATTERY CHARGING CIRCUIT.

227423–

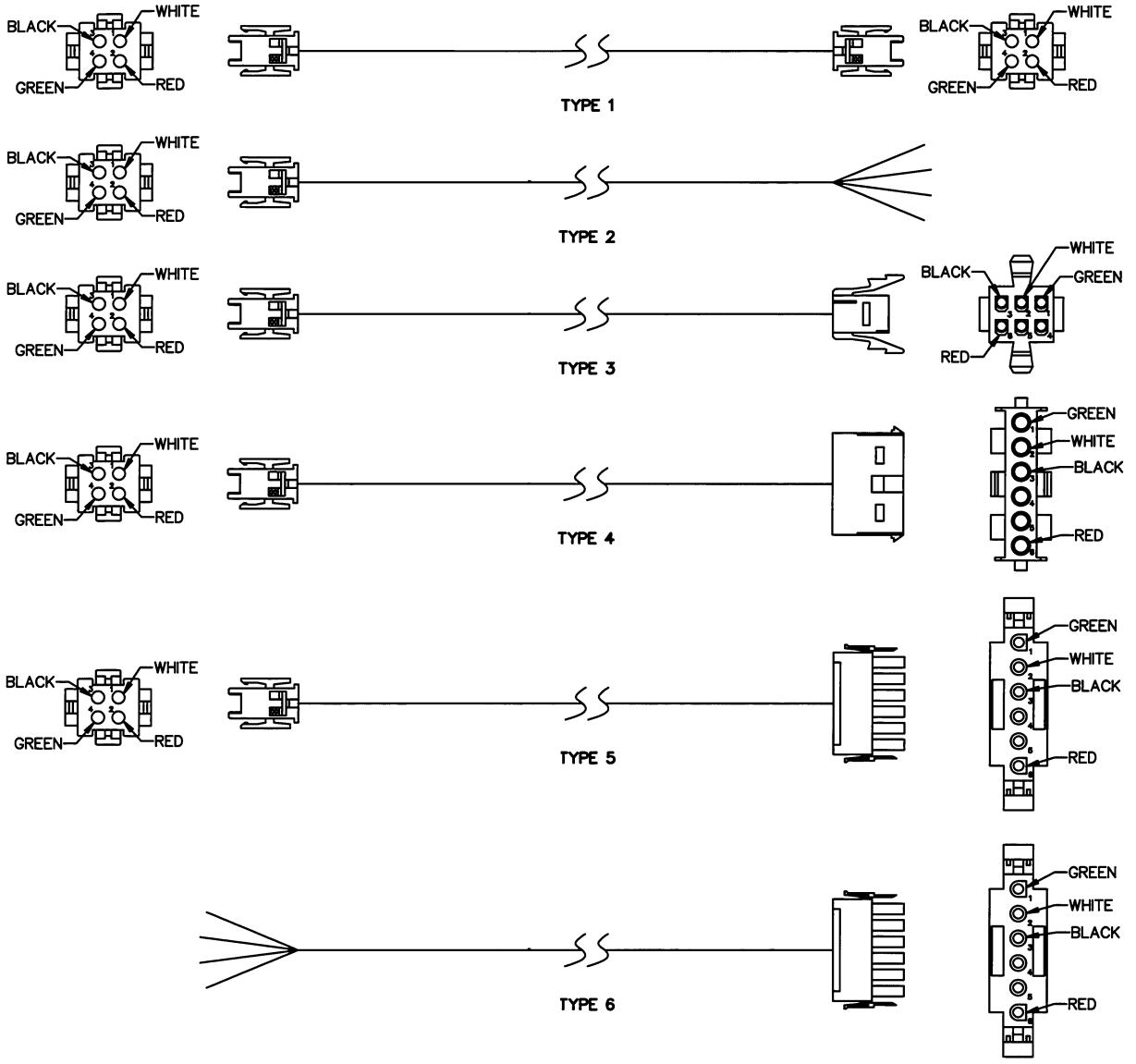
**Wiring Diagram – 7CCKM, 60 Hz. LP (Point–to–Point Wiring)**




**Wiring Diagram. 7kW 120 & 120/240 Volt (60 Hz.)**




**Remote Start/Stop Panel and Hourmeter**




| Part No. | Type | Cable Length |
|---|---|---|
| PA–239412 | 1 | 30 ft. (914 cm) |
| PA–239413 | 1 | 40 ft. (1219 cm) |
| PA–239414 | 1 | 15 ft. (457 cm) |
| PA–239430 | 2 | 1 ft. (30.5 cm) |
| PA–239433 | 3 | 3 ft. (91 cm) |
| PA–239436 | 2 | 3 ft. (91 cm) |
| PA–239439 | 2 | 5 ft. (152 cm) |
| PA–278371 | 4 | 1 ft. (30.5 cm) |
| PA–278372 | 4 | 3 ft. (91 cm) |
| PA–278681 | 6 | 1 ft. (30.5 cm) |
| PA–278682 | 5 | 3 ft. (91 cm) |
| PA–278728 | 5 | 30 ft. (914 cm) |
| PA–278729 | 5 | 40 ft. (1219 cm) |
| PA–278730 | 5 | 15 ft. (457 cm) |

Red ---- Hot
Green -- Ground
Black--- Start
White -- Stop

**NOTE**

Part numbers of wiring harnesses are subject to change.

TT–798

**Available Wiring Harnesses**

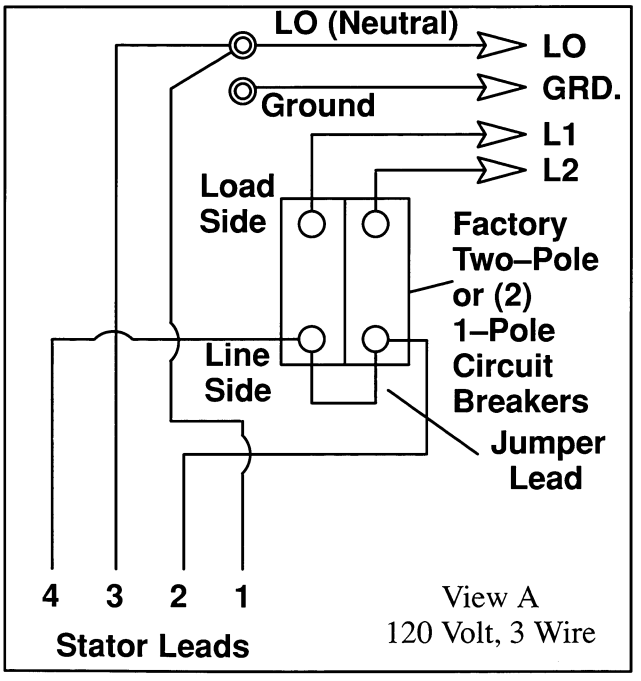
## Four–Lead Reconnectable (Single–Phase) Generator Sets Where Generator Output Can Be Reconnected For 120–Volt or 120/240–Volt, 60 Hz.; or 110–Volt or 110/220–Volt, 50 Hz.

To illustrate the proper reconnection of 4–lead generator sets, the following information is provided. In all cases, the National Electrical Code (NEC) should be followed.

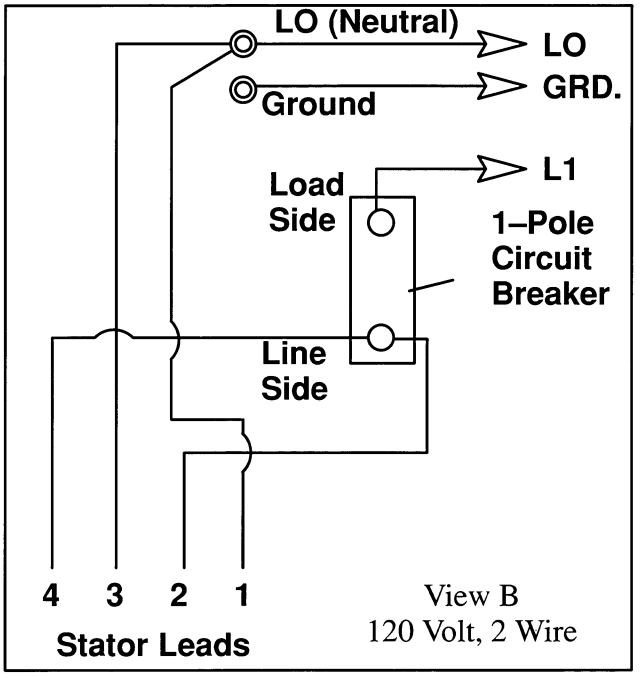
**NOTE:** When a generator set is reconnected to a voltage different than nameplate voltage, notice should be placed on the unit indicating this change. A decal (part no. 246242) is available for this purpose from Authorized Kohler Dealers.

### 120–Volt (or 110–Volt) Configurations – Figure 1 (Views A and B)

The load side terminals of the circuit breaker are not to be connected together when a factory two–pole circuit breaker is used, see View A. If the installation requires a 120 Volt, 2 wire system, a single pole circuit breaker must be used. See View B. When connecting stator phase leads together, the output lead (L1) must be sized accordingly. It is recommended that a jumper lead be used on the *line* side of the circuit breaker. This allows for balancing of the load of the generator set.




View A
120 Volt, 3 Wire

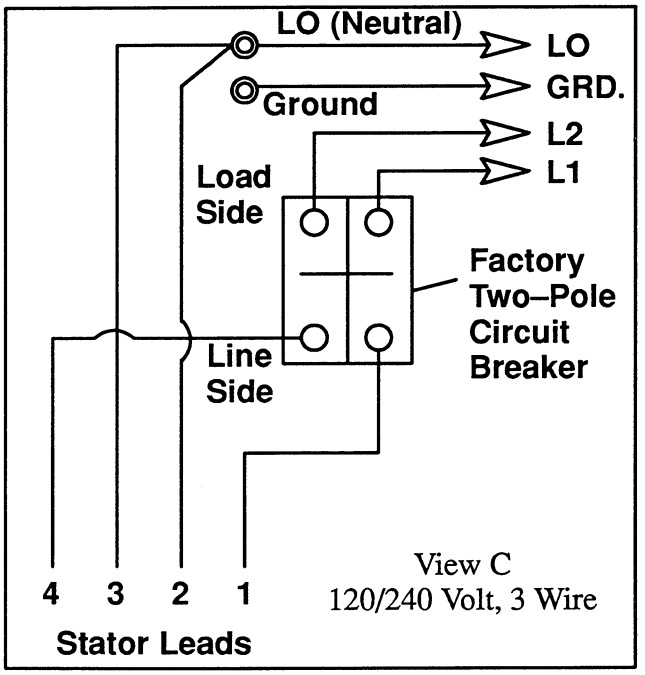



View B
120 Volt, 2 Wire

| | 60 Hz. | 50 Hz. |
|---|---|---|
| **L0 – L1** | 120 Volt | 110 Volt |
| **L0 – L2** | 120 Volt | 110 Volt |

## 120/240–Volt (or 110/220–Volt) Configurations – Figure 2 (View C)

Jumper lead not used. If unit was originally wired for straight 120–Volt (or 110–Volt), 3 wire, be sure jumper lead is removed (see Figure 1 for location). Circuit breaker MUST be a circuit breaker manufacturer two–pole circuit breaker. Two single–pole circuit breakers do not conform to NEC requirements when supplying a 240–Volt (or 220–Volt) load. This is true even if they are mechanically attached together. Leads L1 and L2 are different phases and must never be connected together.




| | 60 Hz. | 50 Hz. |
|---|---|---|
| **L0 – L1** | 120 Volt | 110 Volt |
| **L0 – L2** | 120 Volt | 110 Volt |
| **L1 – L2** | 240 Volt | 220 Volt |

# Section 10. Specifications Chart

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

| | 7CCKM/CCKMR |
|---|---|
| Dimensions – L x W x H —in. (mm) | 26.2 x 22.3 x 15.3 (665 x 566 x 389) |
| Weight – (dry), lbs. | 335 (152) |
| Air Requirements – Combustion CFM (L/min.) | 25 |
| – Cooling CFM (L/min.) | 540 |
| Free Air Opening | 85 sq. in. (548 sq. cm) |

| | 7CCFKM/CCFKMR |
|---|---|
| Dimensions – L x W x H —in. (mm) | 26.2 x 22.3 x 15.3 (665 x 566 x 389) |
| Weight – (dry), lbs. | 335 (152) |
| Air Requirements – Combustion CFM (L/min.) | 25 |
| – Cooling CFM (L/min.) | 540 |
| Free Air Opening | 85 sq. in. (548 sq. cm) |

| Fuel Consumption U.S. gal./hr. (L/hr.) | GASOLINE | | | |
|---|---|---|---|---|
| Load (Gasoline) | **25%** | **50%** | **75%** | **100%** |
| **7CCKM/CCKMR** | 0.57 (2.2) | 0.72 (2.7) | 0.97 (3.7) | 1.27 (4.8) |
| **7CCFKM/CCFKMR** | 0.53 (2.0) | 0.81 (3.07) | 1.01 (3.82) | 1.27 (4.8) |

| Fuel Consumption U.S. gal./hr. (L/hr.) | LP VAPOR | | | |
|---|---|---|---|---|
| Load (LP Gas) | **25%** | **50%** | **75%** | **100%** |
| **7CCKM/CCKMR** | 0.70 (2.6) | 0.79 (3.0) | 0.96 (3.6) | 1.1 (4.2) |
| **7CCFKM/CCFKMR** | 0.75 (2.84) | 0.75 (2.84) | 0.95 (3.6) | 1.15 (4.35) |

| Fuel Consumption U.S. gal./hr. (L/hr.) | LP LIQUID | | | |
|---|---|---|---|---|
| Load (LP Gas) | **25%** | **50%** | **75%** | **100%** |
| **7CCKM/CCKMR** | 0.59 (2.23) | 0.66 (2.50) | 0.80 (3.0) | 0.96 (3.6) |
| **7CCFKM/CCFKMR** | 0.56 (2.12) | 0.73 (2.76) | 0.77 (2.9) | 0.96 (3.6) |

**DERATING:** The kilowatts of the generator set will decrease 3% for each 1000 feet (305 meters) above sea level and 2% for each 10°F (5.5°C) increase in temperature above 60°F (16°C), and 11.1% when converted to LP fuel.

* If (floor or end) free air opening is used, reference Operation and Installation Manual for correct clearances.

** Most ohmmeters will not give accurate readings when measuring less than 1 ohm. The stator can be considered good if a low resistance reading (continuity) is obtained and there is no evidence of shorted windings (discoloration). Do not confuse a low resistance reading with a reading indicating a shorted winding.

# GENERATOR

| | 7CCKM/CCKMR | 7CCFKM/CCFKMR |
|---|---|---|
| Rated kW | 7.0 | 5.8 |
| Frequency – Hz | 60 | 50 |
| Rated Voltage | 120 Volt, 2–wire, single–phase | 110 Volt, 2–wire, single–phase |
| | 120/240 Volt, 3–wire, single–phase | 110/220 Volt, 3–wire, single–phase |
| Rated Amps. | 58.3 (120 Volt) | 52.7 (110 Volt) |
| Rated Amps. | 29.2 (240 Volt) | 26.4 (220 Volt) |
| Generator Type | 4–Pole, Rotating Field | |
| Shaft RPM | 1800 | 1500 |
| Voltage Regulation | +/– 2% | |
| Frequency Regulation | +/– 0.5% | |
| Minimum Recommended Clearances for Vibration and Cooling – (front, side, top, rear) | 0.6 in. (15.2 mm) | |
| Excitation Type | Static, Brush–Type | |
| Coupling Type | Tapered Shaft, Thru Bolt | |
| Rotor Resistance (cold) (ohms) | 4.6–5.7 | |
| Stator Resistance (cold) (ohms)* | | |
| Leads: ** | | |
| 1–2, 3–4, 33–44 | 0.28 | 0.59 |
| 33–55 | 1.26 | 1.7 |
| B1–B2 | 0.08 | 0.14 |
| Voltage Regulator Type | PowerBoost IIIE | |
| Number of Output Leads | 4, Reconnectable | |
| Insulation (Rotor and Stator) | Class 155, Epoxy Varnish, Vacuum Impregnated | |
| Winding Material | Copper | |
| Bearing, Number and Type | 1, Replaceable Ball | |
| Circuit Protection | | |
| Controller Fuse | 15 Amp. | |
| AC Output Circuit Breakers (manual reset) | (2) 30 Amp. (1–pole) or (1) 20 Amp. (1–pole) and (1) 30 Amp (1–pole) | (2) 25 Amp. (1–pole) |
| Voltage Regulator Fuse | 5 Amp. | |
| Battery Charging (if equipped) | 15 Amp. Self–Resetting Circuit Breaker | |
| Rotor Field Voltage/Current Readings at Rated Voltage (Hot) (240 V) | | |
| No Load | 26 V/3.9A | 19 V/2.7 A |
| Full Load | 38 V/5.6 A | 33 V/4.7 A |
| Stator Output Voltages with Separately Excited Rotor Using 12 Volt Battery | | |
| 1–2, 3–4, 33–44 | 65 | 80 |
| 33–55 | 75 | 100 |
| B1–B2 | 10 | 12 |

# ENGINE

Some general engine specifications are listed below. Refer to the appropriate service section and the engine service manual for specific service details.

| | 7CCKM/CCKMR | 7CCFKM/CCFKMR |
|---|---|---|
| Manufacturer | Kohler | |
| Model | K–582 | |
| Cycle | 4 | |
| Number of Cylinders (In–line) | 2 | |
| Compression Ratio | 7:1 | |
| Displacement – cu.in. (L) | 57.7 (945.7) | |
| Rated Horsepower . | 12.9 | 10.6 |
| RPM. | 1800 | 1500 |
| Bore – in. (mm) | 3.50 (88.9) | |
| Stroke – in. (mm) | 3.0 (76.2) | |
| Valve Material | Stellite® (with rotator) | |
| Valve Clearance – intake, in. (mm) | 0.008–0.010 (0.20–0.25) | |
| – exhaust, in. (mm) | 0.017–0.020 (0.43–0.51) | |
| Cylinder Block Material | cast iron | |
| Cylinder Head Material | aluminum alloy | |
| Piston Rings | 2 Compression/1 Oil | |
| Connecting Rod Material | tin plated aluminum alloy | |
| Crankshaft Material | ductile iron | |
| Bearings (main) (replaceable sleeve) | 2 | |
| Governor Type | electronic, Kohler | |
| Governor Magnetic Pick–up Air Gap in. (mm) | 0.040 (1.02) +/–0.005 (0.127) | |
| Lubrication System | full pressure | |
| Oil Capacity (with filter) – U.S. qts. (L) | 4 (3.78) | |
| Oil Type (API) | SC, SD, SE, or SF | |
| Oil Pressure – psi (kPa) (Normal) | 40–65 (276–448) | |
| Fuel Type – Gasoline | 86 octane unleaded | |
| – LP Gas (inlet pressure) | 7–11 water column, 4–6 oz. per sq. in. | |
| Fuel System | single venturi, sidedraft carburetor | |
| Carburetor Choke | automatic, electric | |
| Fuel Pump (gasoline models only) | electronic, electric | |
| Fuel Pump Pressure Rating (gasoline models only) | 2–3.5 psi (14–24 kPa) | |
| Battery Voltage | 12 | |
| Battery Ground | Negative | |
| Battery Recommendation | 290 Cold Cranking Amps. @ 0° F (–18° C)<br>55 Amp. Hr. | |
| Spark Plug Type | resistor type, radio suppression<br>Champion RH10 | |
| Spark Plug Gap – Gasoline in. (mm) | 0.025 (0.64) | |
| – LP Gas in. (mm) | 0.018 (0.46) | |
| Ignition System | Electronic module | |
| Starter Motor | Bendix automotive type | |
| Cooling System | Air cooled | |
| Engine Firing Order | 1–2–1 | |

| Motor Requirements | 1/4 HP | 1/3HP | 1/2 HP | 3/4 HP | 1 HP | 2 HP | 3 HP |
|---|---|---|---|---|---|---|---|
| Starting (in–rush) | 750 | 1000 | 1500 | 2000 | 3300 | 4000 | 5000 |
| Running Watts | 330 | 400 | 600 | 750 | 1100 | 2000 | 3000 |

**Motor Requirements**

| Electrical Appliance | Motor Starting Watts | Running Watts | Electrical Appliance | Motor Starting Watts | Running Watts |
|---|---|---|---|---|---|
| Blanket, Electric | – | 50–250 | Light Bulbs | – | as |
| Blender | 800 | 600 | | | indicated |
| Broiler | – | 1350 | Pan, Frying | – | 1200 |
| Drill, 3/8 in. | 600 | 350 | Percolator, Coffee | – | 650 |
| Dryer, Hair | – | 850–1200 | Radio | – | 50–100 |
| Fan, Air Circulating | 50–200 | 25–100 | Range, Electric (per | – | 100–1500 |
| Fan, Furnace | 400–500 | 270 | element) | | |
| Food Mixer | 400 | 235 | Soldering Gun | – | 250 |
| Heater, Space | – | 750–1500 | Television | – | 750–1200 |
| Heater, Water | – | 1500 | Toaster | – | 750–1200 |
| Iron | – | 900–1200 | Water System | 500–1500 | 300–1250 |

**Appliance Average Wattage Ratings (60 Hz.)**

| Model | Wattage | Will Operate Air Conditioner of of Size Indicated | "Power to Spare" for Lighting, Appliance, Tools, etc. |
|---|---|---|---|
| 7CCKM | 7000 | Two 13,500 Btu | 3000 |

**Air Conditioner Requirements (60 Hz.)**
**"Easy Start"**

| Distance Between Generator Set and Battery | Cable Size (AWG) At 0° F (–18° C) | At 32° F (0° C) | At 75°F (24° C) |
|---|---|---|---|
| 40 Feet (12.2 m) | 00 | 0 | 1 |
| 30 Feet (9.1 m) | 0 | 1 | 2 |
| 25 Feet (7.6 m) | 1 | 2 | 4 |
| 20 Feet (6.1 m) | 2 | 2 | 6 |
| 15 Feet (4.6 m) | 2 | 4 | 6 |
| 10 Feet (3 m) | 4 | 6 | 8 |
| 5 Feet (1.5 m) | 6 | 6 | 8 |
| 2.5 Feet (.8 m) | 8 | 8 | 8 |

**Battery Cable Size**

| Model | Fuel Inlet Hose Size I.D. in. (mm) | Exhaust Outlet Size O.D. in. (mm) |
|---|---|---|
| 7CCKM | 1/4 (6) | 1–3/8 in. (35 mm) |
| 7CCFKM | 1/4 (6) | 1–3/8 in. (35 mm) |

**Fuel Inlet and Exhaust Outlet Sizes**

# TORQUE SPECIFICATIONS

## GENERATOR

| | |
|---|---|
| Overbolt torque – in. lbs. (Nm) | 60 (7) |
| Thru bolt torque ft. lbs. (Nm) | 40–55 (54–75) |

## ENGINE

| | |
|---|---|
| Cylinder Head Torque – ft. lbs. (Nm) | 35 (47) |
| Spark Plug Torque – ft. lbs (Nm) | 18–22 (24–30) |

# GENERAL TORQUE SPECIFICATIONS

Use the following specifications for SAE fasteners when no torque values are given elsewhere in this manual for a specified bolt. The values given are for clean, dry threads.

| | | Assembled in Cast Iron or Steel | | | Assembled in Aluminum |
|---|---|---|---|---|---|
| Size | Measurement | Grade 2 | Grade 5 | Grade 8 | Grade 2 or 5 |
| 8–32 | in. lbs. (Nm) | 20 (2.3) | 25 (2.8) | – | 20 (2.3) |
| 10–24 | in. lbs. (Nm) | 32 (3.6) | 40 (4.5) | – | 32 (3.6) |
| 10–32 | in. lbs. (Nm) | 32 (3.6) | 40 (4.5) | – | – |
| 1/4–20 | in. lbs. (Nm) | 70 (7.9) | 115 (13) | 165 (18.6) | 70 (7.9) |
| 1/4–28 | in. lbs. (Nm) | 85 (9.6) | 140 (15.8) | 200 (22.6) | – |
| 5/16–18 | in. lbs. (Nm) | 150 (17) | 250 (28.2) | 350 (40) | 150 (17) |
| 5/16–24 | in. lbs. (Nm) | 165 (18.6) | 270 (30.5) | 360 (41) | – |
| 3/8–16 | ft. lbs. (Nm) | 22 (30) | 35 (45) | 50 (65) | |
| 3/8–24 | ft. lbs. (Nm) | 25 (35) | 40 (54) | 60 (80) | |
| 7/16–14 | ft. lbs. (Nm) | 35 (45) | 55 (75) | 80 (108) | |
| 7/16–20 | ft. lbs. (Nm) | 45 (54) | 75 (105) | 105 (142) | |
| 1/2–13 | ft. lbs. (Nm) | 50 (65) | 80 (110) | 115 (155) | |
| 1/2–20 | ft. lbs. (Nm) | 70 (95) | 105 (140) | 165 (224) | |
| 9/16–12 | ft. lbs. (Nm) | 75 (105) | 125 (165) | 175 (237) | |
| 9/16–18 | ft. lbs. (Nm) | 100 (136) | 165 (224) | 230 (312) | |
| 5/8–11 | ft. lbs. (Nm) | 110(149) | 180 (244) | 260 (353) | |
| 5/8–18 | ft. lbs. (Nm) | 140 (190) | 230 (312) | 330 (447) | |
| 3/4–10 | ft. lbs. (Nm) | 150 (203) | 245 (322) | 350 (475) | |
| 3/4–16 | ft. lbs. (Nm) | 200 (271) | 325 (440) | 470 (637) | |

Use the following specifications for metric fasteners when no torque values are given elsewhere in this manual for a specified bolt. These values on based on clean, dry threads. Reduce the value by 20% if new plated screws are used. Screws threaded into aluminum must have two diameters of threads engaged and may require 30% or more reduction in the torque.

| Size | Measurement | 5.8 | 6.9 | 8.8 | 10.9 | 12.9 |
|---|---|---|---|---|---|---|
| 6 | ft. lbs. (Nm) | 3 (5) | 5 (10) | 5 (10) | 10 (15) | 10 (15) |
| 7 | ft. lbs. (Nm) | 5 (10) | 5 (10) | 10 (15) | 15 (20) | 20 (25) |
| 8 | ft. lbs. (Nm) | 10 (15) | 15 (20) | 20 (25) | 25 (35) | 30 (40) |
| 10 | ft. lbs. (Nm) | 20 (25) | 30 (40) | 35 (45) | 50 (65) | 55 (75) |
| 12 | ft. lbs. (Nm) | 35 (45) | 50 (65) | 60 (80) | 85 (115) | 105 (140) |
| 14 | ft. lbs. (Nm) | 55 (75) | 75 (105) | 95 (130) | 135 (180) | 160 (215) |
| 16 | ft. lbs. (Nm) | 80 (110) | 125 (165) | 145 (195) | 195 (265) | 235 (320) |
| 18 | ft. lbs. (Nm) | 115 (155) | 170 (230) | 190 (260) | 265 (360) | 325 (440) |

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