This manual was written to assist technicians and service personnel with the repair and maintenance procedures for Briggs & Stratton Home Standby Generators. It assumes that persons using this manual have been properly trained in and are familiar with the servicing procedures for these products, including the proper use of required tools and safety equipment and the application of appropriate safety practices. Persons untrained or unfamiliar with these procedures or products should not attempt to perform such work.

Proper maintenance and repair is important to safe, reliable operation of all engines and engine-driven systems. The troubleshooting, testing, maintenance, and repair procedures described in this manual are appropriate for the Briggs & Stratton Home Standby Generators described herein. Alternative methods or procedures may pose risk to personal safety and the safety and/or reliability of the engine and are not endorsed or recommended by Briggs & Stratton.

All information, illustrations, and specifications contained in this manual were based on the data available at the time of publication. Briggs & Stratton Corporation reserves the right to change, alter, or otherwise improve the product or the product manuals at any time without prior notice.

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This generator is rated in accordance with UL (Underwriters Laboratories) 2200 (stationary generator assemblies) and CSA (Canadian Standards Association) standard C22.2 No. 100-04 (motors and generators).
SECTION 1 - Safety, Maintenance and Adjustments

SECTION 2 - Troubleshooting

SECTION 3 - Unit Disassembly

SECTION 4 - Generator Specifications
MODELS COVERED IN THIS MANUAL

- 040298
- 040298A
- 040301
- 040315
- 040320
SECTION 1 - SAFETY, MAINTENANCE AND ADJUSTMENTS

Equipment Description

This product is intended for use as an optional residential generator system which provides an alternate source of electric power. This product does not qualify for emergency standby as defined by NFPA 70 (NEC).

Every effort has been made to ensure that the information in this manual is accurate and current. However, we reserve the right to change, alter, or otherwise improve the product and this document at any time without prior notice.

This repair manual contains safety information that is designed to:

- Make you aware of hazards associated with generators.
- Inform you of the risk of injury associated with those hazards.
- Tell you how to avoid or reduce the risk of injury.

Safety Symbols and Meanings

The safety alert symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard.

- **DANGER** indicates a hazard which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazard, which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazard which, if not avoided, could result in minor or moderate injury.
- **NOTICE** address practices not related to personal injury.

**WARNING** Before attempting to service this equipment, read and understand this manual and the operating instructions of the generator. Failure to follow instructions could result in property damage, serious injury (including paralysis) or even death.

- Operate generator ONLY outdoors.
- Install a battery operated carbon monoxide alarm near the bedroom.
- Keep exhaust gas from entering a confined area through windows, doors, ventilation intakes, or other openings.

**WARNING** Running engines gives off carbon monoxide, an odorless, colorless, poison gas. Breathing carbon monoxide can cause headache, fatigue, dizziness, vomiting, confusion, seizures, nausea, fainting, or death.

- Operate generator ONLY outdoors.
- Install a battery operated carbon monoxide alarm near the bedroom.
- Keep exhaust gas from entering a confined area through windows, doors, ventilation intakes, or other openings.
**WARNING** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

**WARNING** The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

**WARNING** Certain components in this product and related accessories contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm. Wash hands after handling.

**WARNING** Storage batteries give off explosive hydrogen gas during recharging. Slightest spark will ignite hydrogen and cause explosion. Battery electrolyte fluid contains acid and is extremely caustic. Contact with battery contents will cause severe chemical burns. A battery presents a risk of electrical shock and high short circuit current.

- **DO NOT** dispose of a battery in a fire. Recycle the battery.
- **DO NOT** allow any open flame, spark, heat, or lit cigarette during and for several minutes after charging a battery.
- **DO NOT** open or mutilate the battery.
- Wear protective gloves, rubber apron, rubber boots, and rubber gloves.
- Remove watches, rings, or other metal objects.
- **Use tools having insulated handles.**

**WARNING** Generators produce hazardous voltage. Failure to properly ground generator can result in electrocution. Failure to isolate generator from utility power can result in death or injury to electric utility workers due to back feed of electrical energy.

- When using generator for backup power, notify utility.
- **DO NOT** touch bare wires or bare receptacles.
- **DO NOT** use generator with electrical cords which are worn, frayed, bare, or otherwise damaged.
- **DO NOT** handle generator or electrical cords while standing in water, while barefoot, or while hands and feet are wet.
- If you must work around a unit while it is operating, stand on an insulated dry surface to reduce the risk of a shock hazard.
- **DO NOT** allow unqualified persons or children to operate or service generator.
- In case of accident caused by electrical shock, immediately shut down the source of electrical power and contact the local authorities. **Avoid direct contact with the victim.**
- Despite the safe design of the residential generator, operating the equipment imprudently, neglecting its maintenance, or being careless can cause possible injury or death.
- **Remain alert at all times while working on this equipment. Never work on the equipment when you are physically or mentally fatigued.**
- Before performing any maintenance on the generator, disconnect the battery cable indicated by a **NEGATIVE, NEG** or (-) first. When finished, reconnect that cable last.
- After the system is installed, the generator may crank and start without warning any time there is a power failure. To prevent possible injury, always set the generator's system switch to **OFF**, remove the service disconnect from the disconnect box, AND remove the 15 Amp fuse BEFORE working on the equipment.
NOTICE: Exceeding generator’s wattage/amperage capacity can damage generator and/or electrical devices connected to it.

- See Essential Circuits in operator’s manual.
- Start generator and let engine stabilize before connecting electrical loads.

NOTICE: Improper treatment of generator can damage and shorten its life.

- Use generator only for intended uses.
- If you have questions about intended use, contact your authorized dealer.
- Operate generator only on level surfaces.
- Adequate, unobstructed flow of cooling and ventilating air is critical to correct generator operation.
- The access panels/doors must be installed whenever the unit is running.
• DO NOT expose generator to excessive moisture, dust, dirt, lint, or corrosive vapors.
• Remain alert at all times while working on this equipment. Never work on the equipment when you are physically or mentally fatigued.
• DO NOT start engine with air cleaner or air cleaner cover removed.
• DO NOT insert any objects through cooling slots.
• DO NOT use the generator or any of its parts as a step. Stepping on the unit can cause stress and break parts. This may result in dangerous operating conditions from leaking exhaust gases, fuel leakage, oil leakage, etc.
• If connected devices overheat, turn them off and disconnect them from generator.
• Shut off generator if electrical output is lost, if equipment sparks, smokes, or emits flames, or if unit vibrates excessively.

**Generator Clearances**

Install generator outdoors in an area which will not accumulate deadly exhaust gas. DO NOT install generator where exhaust gas could accumulate and enter inside or be drawn into a potentially occupied building. Ensure exhaust gas is kept away from any windows, doors, ventilation intakes, or other openings that can allow exhaust gas to collect in a confined area.

**WARNING** Running engines gives off carbon monoxide, an odorless, colorless, poison gas. Breathing carbon monoxide can cause headache, fatigue, dizziness, vomiting, confusion, seizures, nausea, fainting, or death.

- Operate generator ONLY outdoors.
- Install a battery operated carbon monoxide alarm near the bedroom.
- Keep exhaust gas from entering a confined area through windows, doors, ventilation intakes, or other openings.

**WARNING** Exhaust heat/gases can ignite combustibles or structures causing a fire.

- DO NOT install the generator closer than 5 feet (1.5m) from any combustibles or structures with combustible walls having a fire resistance rating of less than 1 hour.

**General Location Guidelines**

- Install the unit outdoors ONLY.
- Place the unit in a prepared location that is flat and has provisions for water drainage.
- Install the unit in a location where sump pump discharge, rain gutter down spouts, roof run-off, landscape irrigation, or water sprinklers will not flood the unit or spray the enclosure and enter any air inlet or outlet openings.
- Install the unit where it will not affect or obstruct any services (including covered, concealed, and underground), such as telephone, electric, fuel, irrigation, air conditioning, and so forth.
- Install the unit where air inlet and outlet openings will not become obstructed by leaves, grass, snow, etc. If prevailing winds will cause blowing or drifting, you may need to construct a windbreak to protect the unit.
- Install the generator as close as possible to the transfer switch and fuel supply to reduce the length of wiring, conduit, and piping.
**NOTICE:** Laws or local codes may regulate the distance to the fuel supply. The minimum (MIN) clearances from aerial view of generator (B) to combustible (D), and non-combustible (A) materials is shown below.

- These distances are provided to give generator clearances relative ONLY to combustibles, generator cooling, and maintenance.
- The minimum distances in the figure are as shown. All four sides of the generator cannot be enclosed or restricted, even if the minimum distances are maintained. DO NOT connect (A) and/or (D) to (E).
- Do NOT install a roof over the generator, or place the generator under an existing roof.
- Exhaust (C) must not be allowed to accumulate.

**Lifting the Generator**

The generator weighs more than 350 pounds (159 kg). Proper tools, equipment, and qualified personnel should be used in all phases of handling and moving the generator.

**WARNING** Hazardous Voltage - Contact with power lines can cause electric shock or burn. Lifting Hazard / Heavy Object - Can cause muscle strain or back injury.

- If lifting or hoisting equipment is used, DO NOT contact power lines.
- DO NOT lift or move generator without assistance.
- DO NOT lift unit by roof as damage to the generator will occur.

Lifting pockets are provided at each corner between the base of the generator and its mounting pad. See Generator Components for lifting pocket location. Retouch any chipped paint with supplied touch-up paint.

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**A**- Non-Combustible material with Fire Resistant Rating of 1 hour or greater.
**B**- Home Standby Generator
**C**- Engine Exhaust
**D**- Combustible Material or Structure with a Fire Resistance Rating of less than 1 hour.
**E**- Any structure or material. DO NOT connect (A) and/or (D) to (E).
Access To The Generator
The 7kW Home Standby Generator System is equipped with several access openings and a removable roof (Figure 1).
- Roof (A)
- Access Door (B)
- Side Panel (C)
- Access Panel (D)
- Access Cover for Oil Drain and Oil Filter (E)

Each generator is supplied with a set of identical keys. These keys fit the locks that secure the access door.

Figure 1
To remove roof:
Remove the four screws and lift off (A, Figure 2). Reinstall roof in the reverse order.

![Figure 2]

To remove access cover:
Remove two screws, tilt cover out, and lift cover off panel (A, Figure 3). Reinstall cover in the reverse order.

![Figure 3]

To remove side panels:
1. Remove roof.
2. Remove screws at base of enclosure and along the side of the control panel (A, Figure 4).

![Figure 4]

3. Pull panel outward (away) from unit while pulling panel upward and out of base.

To install side panel:
1. Guide bottom of panel into base.
2. Push panel until flush with sides.
3. Replace panel screw(s).
4. Replace roof and screws.

To open access door:
1. Insert key into lock of access door handle and turn key one quarter turn clockwise (Figure 5).

![Figure 5]

2. Grasp door handle and turn one quarter turn counterclockwise to open. Remove key.

To close access door:
1. Close door and turn door handle one quarter turn clockwise.
2. Insert key into lock of door handle and turn key one quarter turn clockwise. Remove key.
Generator Components

Generator is shown with roof and access doors removed for clarity.

A - Lifting Pocket — Provided at each corner for lifting generator.
B - Exhaust Port — High-performance muffler lowers engine noise to comply with most residential codes.
C - Fuel Inlet — Attach appropriate fuel supply to generator here.
D - Oil Filter — Located inside access cover on side panel. Filters engine oil to prolong generator life.
E - Air Cleaner — Uses a dry type, UL approved filter element and foam pre-cleaner to protect engine by filtering dust and debris out of intake air.

F - Engine Label — Identifies engine model, type, and code numbers.
G - Oil Fill Cap/Dipstick — Check and fill engine with recommended oil here.
H - Control Panel — Used for various test, operation, and maintenance functions. See System Controls.
J - Oil Drain Hose — Located inside access cover on side panel. Provided to facilitate oil changing.
K - Unit Identification Label — Identifies unit by model and serial number.
L - Battery — (Installer-supplied) 12 Volt DC, sealed battery provides power to start the engine.
System Controls

A - Set Exercise — Used to set the exercise cycle start time and day-of-the-week. Exercise cycle only occurs in AUTO mode.

B - Circuit Breaker — Protects the generator from shorts and other over-current conditions. Must be ON to supply power to the automatic transfer switch.

C - 15 Amp Fuse — Protects the generator DC control circuits. If the fuse has ‘blown’ (melted open) or was removed, the engine cannot crank or start. Replace the fuse using only an identical ATO 15A fuse.

D - System Switch — This two-position switch is the most important control on the system and is used as follows:

  “AUTO” position is the normal operating position. If a utility power outage is sensed, the system will start the generator. When utility power is restored, AUTO lets the engine stabilize internal temperatures, shuts off the generator, and waits for the next utility power outage.

  “OFF” position turns off running generator, prevents unit from starting, and resets any detected faults.

E - Manual Over-Ride — This function allows the technician to manually start and stop the generator.

  With system switch in the AUTO position, push and hold the MANUAL OVER-RIDE for six seconds to start the generator.

  To turn off the generator, push and hold MANUAL OVER-RIDE until engine stops.

F - Digital Display — Displays the total number of hours the generator has been running and fault codes. It is used to schedule maintenance tasks and for troubleshooting operational problems with the residential generator. A constant number displayed indicates the total hours of operation. Fault conditions will flash “FC” followed by a fault code number.
**System Connections**

Except for the power output and grounding connectors, all signal wire connections are made to removable two- or ten-pin connector plugs. Compare this illustration with your generator to familiarize yourself with the location of these important connections. **Count down to the proper pin location on the control board since visual alignment with the decal can be misleading:**

**A - Fault Contacts** — Use NO, COM, and NC to hook up an optional phone dialer or a siren, light, etc. to alert you in case of a fault. Contacts reverse state (NO goes to NC and vice versa) upon a fault condition.

**B - Transfer Switch Communication** — Use TxRx and TxRx GND to connect to transfer switch control board for communication interface.

**C - Remote LED Output** — Use +LED and GND to connect the remote LED supplied with the generator. The remote LED will turn on and off in a series of blinks if certain faults are detected in the generator.

**D - +12 Volt DC, .5 Amp Output** — Auxiliary power supply. Use +12VDC and GND to connect installer-supplied accessories (siren, light, etc).

**E - 240 Volt Utility Connection** — Use to connect the 240V utility leads from the transfer switch fuses to the generator.

**F - Ten-pin Connector Plug**

**G - Two-pin Connector Plug**

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**NOTICE:**

- For power output connection, use #8 AWG minimum 300 volt 75°C-90°C copper wire, (ref. NEC Table 310.16, 100 ft. Use National Electric Code for correction factors and wire size calculations).
- For 240 Volt Utility Circuit Connection, use #14 AWG minimum 300 volts 75°C-90°C copper wire.
- For transfer switch communication use #18 AWG twisted pair conductors, no greater than 200 ft. in length, 300 volt 75°C-90°C copper wire.
- When connecting to the connector plugs, fasten only one wire to each connector screw.
- Torque connector plug screws to 7lb.-in. (8 Nm).
Fuel Factors

An important consideration affecting the performance of the generator is the type of fuel used. The system was factory tested and adjusted using either natural gas or liquid propane (LP). For proper engine function, important NG or LP factors are:

- Use clean, dry fuel, free of moisture or any particulate material. Using fuels outside the following recommended values may cause performance problems.
- In engines set up to run on propane (LP), commercial grade HD5 propane with a minimum fuel energy of 2500 BTUs/ft³ with maximum propylene content of 5% and butane heavier gas content of 2.5% and minimum propane content of 90%.

**WARNING** Propane and Natural Gas are extremely flammable and explosive. Fire or explosion can cause severe burns or death.
- The residential generator is equipped with an automatic safety fuel shut-off valve.
- DO NOT operate the equipment if the fuel shut-off valve is missing or inoperative.

Power Decrease at High Altitude or High Temperature

Air density is less at high altitudes, resulting in less available engine power. Specifically, engine power will decrease 3.5% for each 1,000 feet (300 meters) above sea level and 1% for each 10° F (5.6°C) above 77°F (25°C). Generators located in these conditions must have their transfer switch programmed appropriately for this power decrease.

Fuel Consumption

The generator has been factory set to run on natural gas. If you need to change from natural gas to LP gas, the unit will need to be reconfigured, as described in Reconfigure the Fuel System.

The table below provides approximate fuel supply requirements at half load and full load to ensure effective generator operation. To check fuel supply pressure, use #19495, Vacuum Tester.

- Natural gas fuel supply pressure at the generator fuel inlet port should be between 5 to 7 inches of water column (in. W.C.) at full load with all gas appliances turned on and operating.
- LP gas fuel supply pressure should be 11 to 14 inches of water column (in. W.C.) at full load with all gas appliances turned on and operating.

<table>
<thead>
<tr>
<th>Natural Gas</th>
<th>LP Vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ Load</td>
<td>½ Load</td>
</tr>
<tr>
<td>80 C</td>
<td>137 C</td>
</tr>
<tr>
<td>80,000 B</td>
<td>137,000 B</td>
</tr>
</tbody>
</table>

C = Cubic feet per hour
B = BTU’s per hour

Reconfigure the Fuel System

The engine of your generator is factory calibrated to run on natural gas (NG). It may also be operated on liquid propane (LP). There is no additional hardware/equipment required to switch between either fuel. However, LP fuel inlet pressure must be between 11 and 14 inches water column at full load with all gas appliances turned on and operating.

To reconfigure the fuel system for LP use:

1. Set control panel system switch to OFF.
2. Remove 15 Amp fuse.
3. Open oil fill access panel.
4. Remove four screws that secure roof to side panels and lift off roof.
5. Remove screw at base of enclosure front panel (A, Figure 6).

6. Remove two screws at front panel top corners from inside enclosure.
7. Lift front panel off base (B, Figure 7) and expose muffler and engine (C, Figure 8).
8. Locate the mixer (D).

9. Remove upper brass cover (E, Figure 9) and 3/4” cap (F).

10. Using a common screwdriver, install supplied plug into upper chamber (G, Figure 10).
11. Reinstall brass cover (E).
12. Using Insertion Tool #19570, remove existing jet from lower carburetor inlet (H).
13. Install new jet using Insertion Tool #19570.
14. Replace 3/4” brass cap (F).
15. Reinstall enclosure front panel and roof.
16. Reinstall 15Amp fuse.
17. Set generator circuit breaker to ON position.

The system is now ready to operate automatically using LP vapor fuel.
**Generator AC Connection System**

A single-phase, three-wire AC connection system is used in this generator. The stator assembly consists of a pair of stationary windings with two leads brought out of each winding. The junction of leads 22 and 33 forms the neutral lead, as shown schematically and as a wiring diagram. A complete schematic and wiring diagram can be found in Section 4 - Generator Specifications.

**NOTICE:** Neutral is not bonded to ground at generator.

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**Automatic Operation**

To select automatic operation, proceed as follows:

1. Confirm 15 Amp fuse is installed.
2. Turn on the main distribution panel circuit breaker that sends utility voltage to the transfer switch.
3. Turn on the generator circuit breaker.

![Schematic Diagram]

**CAUTION** With the system switch set to AUTO, the engine may crank and start at any time without warning.

- To prevent possible injury that may be caused by sudden starts, always set the system switch to OFF if performing maintenance on the system.
- Remove the 15 Amp fuse before working on or around the generator or transfer switch.

4. Set the control panel system switch to **AUTO**.

---

**Checking Automatic Operation**

To check the system for proper automatic operation, proceed as follows:

1. Turn **OFF** the circuit breaker that sends utility power to the automatic transfer switch.

**NOTICE:** When utility voltage is lost and the sensor has timed out, the engine will crank and start. Let the system go through its entire automatic operation sequence.

2. With the generator output supplying power, turn **ON** the circuit breaker that supplies utility power to the automatic transfer switch.
3. The automatic transfer switch will transfer loads back to utility power after a 5 minute minimum run time.
4. The generator will run for an additional one minute for engine cool down, then shut down.

If utility is restored and generator does not shut down after 10 minutes, set control panel system switch to **OFF** and proceed to Section 2 - Troubleshooting.

---

**NOTICE:** Neutral is not bonded to ground at generator.
Setting Exercise Timer
The generator is equipped with an exercise timer that will start and exercise the system once every seven days. During this exercise period, the unit runs for approximately 20 minutes and then shuts down. Electrical load transfer DOES NOT occur during the exercise cycle (unless a utility power outage occurs during the cycle).

A button on the control panel is labeled “Set Exercise” (see System Controls). The day and time at which this button is pressed is programmed into the control board memory. This day and time is then used to automatically initiate the system exercise cycle. The “SET EXERCISE” legend on the control panel will flash until the set exercise cycle is set.

To perform the Set Exercise procedure:
1. Choose the day and time you want the generator to exercise.
2. On that day and time, press and hold “SET EXERCISE” for three seconds. “SET EXERCISE” will flash until the button is held for three seconds, the “SET EXERCISE” will illuminate for five seconds, and finally turn off.

For example, if you press “SET EXERCISE” on Sunday morning at 10:00 AM, the unit will run an exercise cycle every Sunday at 10:00 AM (+/- 1/2 hour).

“SET EXERCISE” will only work if the unit is in AUTO mode and this exact procedure is followed. The exerciser will need to be reset if the 15 Amp fuse is removed or changed, or if the starting battery is disconnected.

If you want to change the day and time the unit exercises, simply perform the “Set Exercise” procedure at the new day and time that you want it to take place.

Generator Maintenance
Before performing any generator maintenance, always perform the following steps:
1. Set generator’s circuit breaker to its OFF position.
2. Set control panel system switch to OFF.
3. Remove 15 Amp fuse from control panel.
4. Utility voltage is present at generator control panel. Disconnect utility power before servicing control panel.
5. Remove roof.
6. After all servicing has been completed, replace fuses in transfer switch, replace 15 Amp fuse in control panel, set system switch and circuit breaker ON turn ON utility power and reset exercise timer. See Setting Exercise Timer.

For detailed servicing information for the Briggs & Stratton engine, please refer to the Single Cylinder OHV Repair Manual (#276781), available from your Briggs & Stratton source of supply.

Cleaning the Generator
1. Set control panel system switch to OFF.
2. Remove 15 Amp fuse from control panel.

NOTICE: Improper treatment of generator can damage it or shorten its life.

• DO NOT expose generator to excessive moisture, dust, dirt, or corrosive vapors.
• DO NOT insert any objects through cooling slots.
3. Use a damp cloth to wipe exterior surfaces clean.
4. Use a soft, bristle brush to loosen caked on dirt, etc.
5. Use a vacuum cleaner to pick up loose dirt and debris.
6. Use low pressure air (not to exceed 25 psi) to blow away dirt. Inspect cooling air slots and openings in the generator. These openings must be kept clean and unobstructed.
7. Reinstall 15 Amp fuse in control panel.
8. Set generator’s system switch to AUTO.

Cooling Fins
Periodically check to make sure the engine cylinder fins, oil cooler, screens, and mixer ducting are free of leaves, grass, mulch, or other debris.
Adjusting the Valve Lash

The valve lash must be checked every 100 hours of operation. Measure valve clearance with the engine cold. To adjust the valve lash, proceed as follows:

1. Turn crankshaft counterclockwise until piston is at top dead center on the compression stroke. This prevents the compression release from holding the valves open.
2. Insert a narrow screwdriver or rod into the sparkplug hole as a gauge, then slowly turn crankshaft counterclockwise until the piston has moved down the bore by 1/4”.
3. Using a feeler gauge (A, Figure 9), adjust the rocker nut to obtain the correct clearance as listed below:
   - Intake - 0.003 - 0.005 in. (0.08 - 0.13 mm)
   - Exhaust - 0.005 - 0.007 in. (0.13 - 0.18 mm)
4. Hold rocker nut and tighten the rocker ball setscrew (B) to 45 lb-in. (5 Nm).
5. Check clearance again and readjust, if necessary.
6. Repeat for the other valve.

Replacing the Spark Plugs

Replace the spark plugs every year. Use only the recommended spark plugs and make sure they are gapped to 0.030 in. (0.76 mm).

1. Stop the engine and disconnect the wires from the spark plugs.
2. Clean around the spark plugs and remove them from the cylinder head.
3. Inspect the spark plugs for wear or damage - replace as necessary. DO NOT blast clean.
4. Set the gap as specified above and install the cleaned or new spark plugs into the cylinder heads. Torque to 180 lb-in. (20 Nm).

Oil Service

Checking the Oil Level

Check the engine oil level as follows:

1. Remove the roof to the unit to access the oil fill and dipstick locations.
2. Remove dipstick. Wipe with clean cloth.
3. Insert and rotate dipstick fully to locked position. Remove and check oil level.

If oil level is low, remove the oil fill cap and slowly add recommended oil to bring level to the FULL mark on the dipstick.

Changing the Oil and Oil Filter

Oil capacity is approximately 2-1/2 quarts (80 ounces or 2.3 liters) when changing both the oil and oil filter. Use only 5W-30 full-synthetic detergent oil rated for service SJ or higher. This allows for system operation in the widest range of temperature and climate conditions.

CAUTION Avoid prolonged or repeated contact with used motor oil.

- Used motor oil has been shown to cause cancer in certain laboratory animals.
- Thoroughly wash exposed areas with soap and water.

KEEP OUT OF REACH OF CHILDREN. DON’T POLLUTE. CONSERVE RESOURCES. TAKE USED OIL TO COLLECTION CENTERS.

Change oil and oil filter after every 100 hours of operation. If the unit is run under dirty or dusty conditions or in extremely hot weather, change the oil more often.

Use the following instructions to change the oil while the engine is still warm.

1. Set control panel system switch to OFF.
2. Remove the 15 Amp fuse.
3. Gain access to oil drain hose. It is located inside the access cover on the side panel (Figure 10).
4. Place oil drain hose (A) into an approved container.
5. Remove fitting (B) from end of drain hose.
6. When oil has drained, reinstall the fitting on the hose.
7. Gain access to the oil filter. It is located inside the access cover on the side panel.
8. Place the provided oil filter drain tray (A, Figure 11) beneath the oil filter (B) and remove the filter.

9. Coat the gasket of the new filter with clean engine oil. Turn the new filter clockwise by hand until the gasket contacts the filter adapter, then tighten 1/2 to 3/4 turn more.
10. Fill the engine with oil until the level is at the FULL mark on the dipstick.
11. Install and tighten the oil fill cap.
12. Reinstall the 15 Amp fuse.
13. Start and run the generator using the Manual Over-Ride button.
14. Run the engine for one minute and check for leaks. Recheck the oil level.
15. Turn control panel system switch to AUTO and reset the exercise timer. See Resetting the Exercise Timer.
16. Empty oil filter drain tray.

Servicing the Air Cleaner

The engine air cleaner is one of the most important areas to maintain. Use only genuine Briggs & Stratton parts which meet UL requirements for a generator. Clean the foam pre-cleaner (if equipped) every 25 hours and the filter cartridge every 100 hours of operation. Clean or replace more often in dusty or dirty conditions.

To service the air cleaner:
1. Unsnap and remove the air filter cover.
2. Remove the air filter cartridge and clean by tapping gently on a flat surface. Replace if very dirty or damaged.
3. If equipped, remove the foam pre-cleaner from filter cartridge and wash in soapy water. Rinse thoroughly and allow to air dry.
4. Remove the foam filter and clean.
5. Reinstall foam filter and clean air filter cartridge. Make sure that the rubber seals are in contact with the mounting all around the filter.
6. Engage the two clips of the air filter cover into their slots and close the air filter cover. Engage the locking latch of the filter cover and snap shut.

**NOTICE:** NEVER use petroleum solvents or pressurized air to clean the air filter cartridge. Solvents will cause the cartridge to deteriorate; pressurized air will perforate the paper media.

Battery

The installer must supply a valve-regulated, rechargeable 12 volt starting battery. See Battery in the installation manual.

**WARNING** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

The battery receives a trickle charge from the control board when:

- The generator is running and,
- When utility power is present and the control panel system switch is either in the AUTO or OFF position.

The trickle charge will not recharge a battery that is completely discharged.

Servicing the Battery

Battery service should be performed or supervised only by personnel who are knowledgeable of batteries and the required precautions.

If it is necessary to service the battery, proceed as follows:
1. Set control panel system switch to OFF.
2. Remove 15 Amp fuse from control panel.
3. Service or replace battery as required. See Battery in section under Final Installation Considerations in the installation manual for battery specifications.
4. Connect red battery cable to battery positive terminal, indicated by POS, or (+).
5. Connect black battery cable to negative battery terminal, indicated by NEG, or (-).
6. Ensure hardware on both positive and negative battery terminals is secure.
7. Reinstall 15 Amp fuse in control panel.
8. Set control panel system switch to AUTO.

DON'T POLLUTE. CONSERVE RESOURCES. TAKE USED BATTERY TO RECYCLING COLLECTION CENTERS.

Charging the Battery
If it is necessary to charge the battery, proceed as follows:
1. Set control panel system switch to OFF.
2. Remove 15 Amp fuse from control panel.
3. Disconnect negative (-) battery cable from negative (-) battery terminal.
   **NOTICE:** Failure to disconnect negative (-) battery cable will result in equipment failure.
   - DO NOT attempt to jump start the generator.
   - Damage to equipment resulting from failure to follow this instruction will void engine and generator warranty.
4. Charge battery with battery charger at 2 Amps until battery is fully charged. DO NOT exceed 13.7 volts when charging.
5. Connect negative (-) battery cable to negative (-) battery terminal.
6. Ensure hardware on both positive (+) and negative (-) terminals is secure.
7. Reinstall 15 Amp fuse in control panel.

**CAUTION** With the system switch set to AUTO, the engine may crank and start at any time without warning.
- To prevent possible injury that may be caused by sudden starts, always set the system switch to OFF if performing maintenance on the system.
- Remove the 15 Amp fuse before working on or around the generator or transfer switch.

8. Set control panel system switch to AUTO.

Engine Adjustment
There are regional variances in the composition of natural gas. Each generator leaves the factory set for NG operation. If the generator frequency is outside the ranges given below, the combustibility of the gas at the installation site may be different from the fuel used at the factory.
- Minimum generator frequency is 57 Hz at full load.
- Maximum generator frequency is 62.0 - 62.5 Hz at no-load.

To adjust the engine for this difference, proceed as follows:
1. Remove four screws and control panel from the enclosure to expose the main circuit breaker.
2. Connect an accurate frequency meter to line side of the main circuit breaker or connect tachometer on spark plug lead.
3. Ensure that the 15 Amp fuse is installed.
4. Set the main circuit breaker ON.
5. Set the control panel system switch to AUTO.
6. Push MANUAL OVER-RIDE on the control panel.
   When the engine starts, allow it to warm up for five minutes.
7. Normal no-load frequency is 62.0 to 62.5 Hz (3720 - 3750 RPM). If adjustment is needed at no-load, remove unit side panels. Using needle nose pliers or Tang Bender #19229 or #19480, bend spring anchor tang (A, Figure 12) slowly up or down until frequency is 62.0 to 62.5 Hz.

8. Turn off service disconnect to transfer switch. After a short time delay, transfer switch will connect to generator.

9. Load generator to full-load.

10. After load stabilizes, frequency should be above 57.0 Hz (3240 RPM).

11. If frequency is below 57.0 Hz (3240 RPM), use the Tang Bender or needle nose pliers to bend spring anchor tang until frequency is above 57.0 Hz (3240 RPM).

12. Turn on service disconnect to transfer switch. Transfer switch will connect to utility power after five minutes.

13. Push and hold **MANUAL OVER-RIDE** button on control panel until engine stops.

14. After engine has stopped:

   • If an adjustment was made in Step 11, repeat Steps 2 through 7 to verify correct frequency.
   • If an adjustment was not made in Step 11, proceed to Step 15.

15. Reinstall system control panel into enclosure.
Control Panel
The control panel contains all the logic circuits, operator controls, and system displays necessary to operate, program, and protect the generator. The control panel interprets and monitors electrical inputs from all related circuits throughout the standby operation.

Before replacing the control panel, all other circuits must be tested to ensure proper operation. When a failure has been traced to the control panel, it must be replaced as a complete assembly.

240VAC utility power is delivered from the fuses in the transfer switch to the 2-pin connector mounted directly to the control panel. The control panel uses internal circuits to rectify the utility voltage to 12VDC. This is then delivered to the positive (+) battery post through the 15 Amp fuse via Pin #1, Wire #13. The 240VAC utility power is also used to power the optional battery warmer and optional oil warmer.

Functions of the Control Panel:
• Battery Trickle Charge
• Set Exercise Timer (SET EXERCISE)
• Manual Start (MANUAL OVER-RIDE)
• Sensing Utility Voltage
• Automatic Start, in the event of utility failure
• Automatic Engine Cool-Down Timer
• Fault Code (FC) Detection with Automatic Shutdown
• Fault Indication Display (LED)
• Hour Meter

Power During Control Panel Fault Conditions
When the Home Generator System experiences a fault condition, the Automatic Transfer Switch automatically defaults to utility power when present. This ensures that all circuits in the home will have power until the fault is corrected.

If the unit fails to exercise at its prescribed time, check for a fault code on the digital display. If no fault code is shown, perform the SET EXERCISE procedure. See Setting the Exercise Timer.

How to Access the control panel
The control panel circuit board is mounted behind the control panel face (A, Figure 1).

1. Open and/or remove the system control panel door.
2. Set control panel system switch to OFF.
3. Remove the 15 Amp fuse.
4. Disconnect the negative (-) battery cable.
5. Remove the four mounting screws (B, Figure 2), then carefully remove and tilt down the panel to expose the control board.

WARNING Equipment contains high voltage that can cause injury or death. DO NOT touch bare wires.

WARNING Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.
The control panel is connected to its various circuits through connectors that are mounted directly to the board (Figure 3), shown tilted down.

The 8-pin connector (A, Figure 3) is wired to the internal systems of the unit and is the primary point of measurement for troubleshooting. The 2-pin connector (B) is connected to fuses in the transfer switch, and it supplies 240 VAC from UTILITY power. The 10-pin connector (C) is used for optional generator features. In addition, the control panel also has connections for E1 and E2 (D), which sense 240VAC from the generator, and four terminals (E), which are used for optional battery and engine warmers.

The functions of the 8-pin connector are shown below (Figure 4).

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery Trickle Charge (Wire #13)</td>
</tr>
<tr>
<td>2</td>
<td>Ground (Wire #0)</td>
</tr>
<tr>
<td>3</td>
<td>Start Circuit (Wire #56)</td>
</tr>
<tr>
<td>4</td>
<td>Fuel Solenoid (Wire #14)</td>
</tr>
<tr>
<td>5</td>
<td>Oil Temperature (Wire #95)</td>
</tr>
<tr>
<td>6</td>
<td>Oil Pressure (Wire #85)</td>
</tr>
<tr>
<td>7</td>
<td>Vacant</td>
</tr>
<tr>
<td>8</td>
<td>Vacant</td>
</tr>
</tbody>
</table>

Figure 4
Accessing the Automatic Voltage Regulator

The Automatic Voltage Regulator (AVR) (A, Figure 5) is mounted inside the alternator air intake plenum (B).

Figure 5

The voltage regulator acts to increase or decrease current flow to the rotor windings based on the demands of the load connected to the generator. The increase or decrease in current flow through the rotor results in a proportional increase or decrease in the rotor’s magnetic field strength, which is what induces (AC) current in the power windings of the stator.

The operating sequence for this type of voltage regulator is as follows:

- The rotor turns at a pre-determined speed.
- Voltage is induced into the stator windings by residual magnetism in the rotor.
- Voltage from the 120VAC stator power windings are available through wires 11, 12, 33, and 44 to the circuit breaker. Any electrical load connected to generator will complete the circuit.
- 120VAC and frequency signals are delivered from the stator winding via wires 11A and 22A, to the voltage regulator at sensing terminals 11(A, Figure 6) and 22 (B). If for any reason sensing or frequency is lost, the voltage regulator will turn off, and it will only turn back on when the generator is shut down and restarted.
- Excitation winding output is delivered through wires 2 and 6 to the voltage regulator at excitation terminals 2 (C) and 6 (D). If the excitation wire connections are reversed, the voltage regulator will shut off.
- The voltage regulator converts the (AC) excitation winding output to (DC) and delivers the (DC) output to the rotor via the red wire (+) (E), brush, and slip ring. Then it moves throughout the rotor winding, the (-) brush, and slip ring through the black wire (F). The (DC) output from the voltage regulator to the rotor is based on the voltage and frequency signals received from sensing wires 11A and 22A.

Figure 6
The control panel is equipped with sensing circuits that automatically shut down the generator in the event of potentially damaging conditions.
When the control panel senses a condition that prevents the generator from functioning properly, it shuts down the generator and displays the fault code on the control panel. This will be displayed as a flashing FC_ (fault code), followed by the appropriate number. At the same time, it signals the remote LED to flash in a sequence that corresponds to the fault code.
For example, “FC_1” on the control panel indicates Low Battery Voltage and the remote LED would repeatedly flash once with a pause until it’s reset or the condition is corrected.
When no faults exist, the digital display functions as an hour meter and shows the total elapsed running time of the generator.

Following is a list of possible fault codes:

(FC_1) Low Battery Voltage
(FC_2) Low Oil Pressure
(FC_3) Low Voltage
(FC_4) Engine Fails to Start
(FC_5) Low Frequency
(FC_6) Engine Overspeed
(FC_7) High Temperature
(FC_8) Transfer Switch

Resetting the Fault Code Detection System
After correcting the fault indicated by the fault code, the operator or technician must reset the fault code detection system before the Home Generator System will operate.

1. Place the control panel system switch in the OFF position for 5 seconds or more.
2. Place the control panel system switch in AUTO position.

If the fault is not corrected, the unit will return to Auto Shutdown and the same fault code indication (s) will be displayed.
If more than one fault exists, the control panel will only indicate one fault condition. Once that fault is corrected, the next fault will be indicated on the digital display.
FC_1
Low Battery Voltage

Test #1
Check Battery

OK? YES

Test #2
Measure Trickle Charge Voltage at Battery

NO

Charge / Replace Battery

Test #3
Check Utility Voltage Input

NO

Voltage OK? YES

END

240VAC?

YES

Test #4
Measure Trickle Charge Voltage at control panel

NO

Replace control panel

NO

Check and Repair Fuses, Wiring, and Connections in the ATS

YES

12VDC?

Repair Wiring and/or Connections between control panel and Battery
(FC_1) LOW BATTERY VOLTAGE

If the generator cannot start because the battery output power is below that needed to crank the engine, the digital display will show FC_1 and the remote LED will repeatedly flash once with a pause.

A completely discharged battery will not be capable of powering the digital display. The causes for a low or discharged battery may be:

- Blown fuse in the transfer switch
- Blown fuse in the generator control panel
- Failed battery
- Parasitic drain on the battery
- Failed trickle charger

The circuit functions and test/repair procedures for these conditions are outlined below.

**WARNING** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

The trickle charge circuit is a float-type charger. When utility voltage is present and the unit is switched to the AUTO or OFF position, the trickle charge circuit in the control panel will maintain the voltage of a fully charged battery.

**TEST 1 - Check Battery**

1. Set control panel system switch to OFF.
2. Remove the 15 Amp fuse.
3. Disconnect the negative (-) battery cable.
4. Disconnect the positive (+) battery cable.
5. Using the approved procedure for your battery tester, check the battery state-of-charge.
   - If the battery is discharged, connect to an appropriate battery charger. Set the charger at 2 Amps until a full charge is indicated. DO NOT exceed the 2 Amp charge rate.
   - If battery replacement is required, the replacement must be a 12VDC, AGM type battery. Refer to the Installation Manual for complete battery information.
   - Once battery state of charge is satisfactory, proceed to **TEST 2 - Check Trickle Charge Voltage at Battery**.

**NOTICE:** DO NOT replace with a liquid electrolyte (lead-acid) type battery.

**TEST 2 - Check Trickle Charge Voltage at Battery**

1. Set control panel system switch to OFF.
2. Remove the 15 Amp fuse.
3. Inspect the fuse to see if blown.
   - If fuse is good, proceed to **Step 4**.
   - A blown fuse indicates a short in the circuit. Repair any short and replace fuse before proceeding to **Step 4**.
4. Disconnect the negative (-) battery cable. Leave positive (+) battery cable connected to the battery.
5. Set the meter to measure DC voltage. Connect positive (+) meter test lead to positive (+) battery terminal.
6. Connect negative (-) meter test lead to negative (-) battery terminal.
   - If approximately 12.5 VDC is measured, proceed to **Step 7**.
   - If battery voltage is low, recharge or replace battery as necessary, than proceed to **Step 7**.
7. Disconnect negative (-) meter test lead from negative (-) battery terminal and connect to negative (-) battery cable.
8. Reinstall 15 Amp fuse.
9. Ensure utility voltage is turned ON.
10. Set control panel system switch to ON.

**NOTICE:** The control panel must be connected to a 12 volt battery to turn on internal circuits. Once the trickle charge circuit is turned on, the battery can be disconnected and battery charge output will remain.

11. While observing the meter and keeping the negative (-) meter test lead connected to the negative (-) battery cable, momentarily touch the battery cable and meter test lead to the negative (-) battery terminal (A, Figure 7) for 30 seconds, then remove (B, Figure 8). This will turn on the trickle charger long enough to read the trickle charge output voltage on the meter. Approximately 13.5 VDC should be measured.
If approximately 13.5 VDC is not measured, proceed to TEST 3 - Check Utility Voltage Input. If approximately 13.5 VDC is measured, proceed to Step 12.

12. Disconnect meter test leads.
13. Set control panel system switch to OFF.
14. Remove the 15 Amp fuse.
15. Connect the negative (-) battery cable.
16. Reinstall the 15 Amp fuse.
17. Set control panel system switch to ON.
18. Reset the exercise timer. See Resetting the Exercise Timer.

TEST 3 - Check Utility Voltage Input

**WARNING** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

1. Set control panel system switch to OFF.
2. Remove the 15 Amp fuse.
3. Remove screws to gain access to the control panel board.
4. Ensure utility power is turned ON to the automatic transfer switch.
5. Set the meter to measure AC Voltage. Measure the AC voltage at the 2-pin connector. 240VAC should be measured (A, Figure 9).
   • If voltage is present, proceed to TEST 4 - Measure Trickle Charge Output Voltage at control panel.
   • If no voltage is present, repair or replace the wiring and fuses between utility power and the control panel.

TEST 4 - Measure Trickle Charge Output Voltage at control panel

1. Set control panel system switch to OFF.
2. Remove the 15 Amp fuse.
3. Remove screws to gain access to the control panel board.
4. Ensure utility power is turned ON to the automatic transfer switch.
5. Set the meter to measure DC voltage.
6. Connect the positive (+) test lead to Pin #1, Wire #13 and the negative (-) test lead to Pin #2, Wire #0 at the control panel (A, Figure 10).
7. While observing the meter, momentarily touch Wire #13 (previously disconnected in TEST 2) to the positive (+) battery cable. This will turn on the trickle charge long enough to read the trickle charge output on the meter.
8. About 13.5VDC should be measured when the wire is removed from the post. The trickle charge voltage will diminish quickly.
• If no voltage is measured, replace the control panel.
• If voltage is measure at the control panel, but not on Wire #13 at the battery connection, repair or replace the wiring between the control panel and the battery.
FC_2
Low Oil Pressure

Test #1
Measure for Short-to-Ground on Wire #85

Shorted?
YES → Repair / Replace Wire #85
NO → Test #2
Check Oil Pressure Switch

Switch OK?
YES → Replace System Control Board
NO → Test #3
Measure Engine Oil Pressure

Within Spec?
YES → Replace Oil Pressure Switch
NO → Repair / Replace Engine as Required

Fault Detected?
YES → END
NO → Reset Fault Code Start Unit

END

2
The Home Generator System is equipped with a Low Oil Pressure (LOP) switch. The contacts of the switch are normally closed, but are held open by oil pressure during engine operation. Should the engine oil pressure drop below a preset level, the contacts will close. This completes a circuit to ground on Wire #85 and the control panel shuts the engine down.

The digital display will show **FC_2** and the remote LED will repeatedly flash twice with a pause.

During cranking and immediately after engine start, the following sequence will occur:

- The control panel bypasses the LOP switch for several seconds during initial cranking.
- The LOP switch opens when the engine produces sufficient oil pressure.
- The control panel senses that the engine is running by monitoring voltage on Wires #E1 and #E2.
- After the control panel senses that the engine is running, it looks for a ground on Wire #85.

If Wire #85 is grounded, the control panel shuts down the engine and displays **FC_2** at the control panel.

### Correcting Low Oil Pressure
1. Fix any obvious leaks and, if necessary, add the recommended oil to the FULL mark on the dipstick.
2. Reset the fault code detection system. See **Resetting the Fault Code Detection System**.
3. Set control panel system switch to **AUTO** and push **MANUAL OVER-RIDE** to start the unit. Listen for any abnormal sounds that might indicate engine damage from low oil.

If a low oil pressure condition still exists, the engine will shut down after approximately 10 seconds and the control panel will display **FC_2**. Proceed to **TEST 1 - Measure for Short-to-Ground**.

### TEST 1 - Measure for Short-to-Ground
1. Set control panel system switch to **OFF**.
2. Remove the 15 Amp fuse.
3. Turn OFF utility power to the transfer switch.
4. Remove screws to gain access to the control panel board.
5. Disconnect the 8-pin connector from the control panel.
6. Disconnect Wire #85 from the LOP switch.
7. Measure for short-to-ground between Wire #85 (A, Figure 11) and engine block (B).

- If no short is detected, proceed to **TEST 2 - Check Engine Oil Pressure**.
- If a short is detected, proceed with **Steps 8-14**.

8. Repair or replace wiring, as necessary, then retest.
9. Reconnect Wire #85 to the LOP switch.
10. Reconnect the 8-pin connector to the control panel.
11. Reinstall the system control panel cover.
12. Reinstall the 15 Amp fuse.
13. Reset the fault code detection system. See **Resetting the Fault Code Detection System**.
14. Set control panel system switch to **AUTO**.
15. Reset the exercise timer. See **Resetting the Exercise Timer**.

### TEST 2 - Check Oil Pressure Switch
1. Reconnect the 8-pin connector to the control panel.
2. Reinstall the system control panel cover.
3. Reinstall the 15 Amp fuse.
4. With the LOP switch installed and wire #85 removed, set control panel system switch to **AUTO**, then push and hold **MANUAL OVER-RIDE** to start the unit.
5. Check the switch with a continuity tester. The switch contacts should be open (no continuity).
   - If the switch contacts open when the engine is running, wire #85 is not shorted to ground, and unit shuts down on **FC_2**, replace the control panel.
   - If the switch contacts remain closed, proceed to **TEST 3 - Check Engine Oil Pressure**.
TEST 3 - Check Engine Oil Pressure

1. Remove the oil pressure switch and install a technician supplied oil pressure gauge.
2. Set control panel system switch to AUTO, then push and hold the MANUAL OVER-RIDE to start the unit.
3. Pressure reading on gauge should be **10-50 PSI (0.7-3.5 Bar)**.
   • If oil pressure is normal and oil switch did not open in Test 2, replace the oil switch and repeat Test 2.
   • If oil pressure is low, see Single Cylinder OHV Repair Manual (#276781) to troubleshoot the source of problem.
FC_3
Low Voltage

Test #1
Measure Circuit Breaker (CB) Load-Side Voltage

240VAC? YES

Test #2
Measure Voltage at control panel

240VAC? YES

Replace control panel

NO

Test #3
Measure Circuit Breaker Line-Side Voltage

240VAC? NO

Cycle CB Measure CB Input

Output OK? YES

END

NO

Repair/Replace Open Wires E1 & E2 Between CB Output and control panel

Output OK? NO

Replace Circuit Breaker

NO

Output OK? YES

END

YES

Replace Voltage Regulator

NO

Test #4
Check Alternator

OK? YES
The low voltage shutdown feature is designed to protect the generator and its loads from an output voltage that is too low. When the generator has stabilized, the control panel senses output voltage on Wires #E1 and #E2. If the control panel does not sense the proper generator voltage, it will shut down the unit.

The digital display will show FC_3 and the remote LED will flash repeatedly three times with a pause. Low output voltage may be caused by:

- An open control panel circuit breaker
- A generator that is overloaded
- A restriction in the fuel flow
- A broken or disconnected signal lead (#E1 or #E2)
- Diminished engine power
- A failed alternator winding
- Open wiring

TEST 1 - Measure Circuit Breaker Load-Side Voltage

1. Reset the fault code detection system. See Resetting the Fault Code Detection System.
2. Remove the system control panel cover to gain access to the circuit breaker.
3. Ensure that the generator circuit breaker is ON and the 15 Amp fuse is installed.
4. Set control panel system switch to AUTO, then push and hold MANUAL OVER-RIDE to start the unit.
5. Check for 240VAC at the load-side of the circuit breaker (Figure 12). The acceptable range is 239-262VAC.

TEST 2 - Measure Generator Voltage at control panel

**NOTICE:** Use care when obtaining measurements on wires. It is possible to short terminals to control panel electrical components.

1. With the unit running, measure for 240VAC at control panel on Pins #E1 and #E2 (Figure 13).

   - If 240VAC is present, replace the control panel board.
   - If no voltage is present, ensure the circuit breaker is ON and retest.
2. Repair or replace the wires between the circuit breaker and #E1 and #E2.
3. Retest for 240VAC.

TEST 3 - Measure Circuit Breaker Line-Side Voltage

1. Ensure the circuit breaker is ON.
2. Start the generator and measure for 240VAC on the line-side of the circuit breaker.

   - If there is no voltage on the line-side of the breaker, proceed to TEST 4 - Bypass the AVR.
   - If there is voltage on the line-side of the breaker, but none on the load-side, manually cycle the circuit breaker and retest. If there is still no voltage on the load-side, replace the circuit breaker.

- If the specified voltage is present, proceed to TEST 2 - Measure Generator Voltage at control panel.
- If specified voltage is not present, proceed to TEST 3 - Measure Circuit Breaker Line-Side Voltage.
TEST 4 - Check Alternator

There are two methods of testing the alternator windings:
1. Measuring the winding resistance and comparing them to the specifications.
2. Bypassing the Automatic Voltage Regulator (AVR).

Either one can be used, or they can be used in conjunction with each other to confirm a diagnosis.

**Measure Winding Resistance**
Prior to measuring resistance, perform the following steps:
1. Set control panel system switch to **OFF**.
2. Remove the 15 Amp fuse.
3. Remove screws to gain access to the circuit breaker and neutral connection
4. Disconnect the power wires 11 and 44 from the circuit breaker.
5. Disconnect wires 22 and 33 from the (installer supplied) neutral wire. Then separate wires 22 and 33.
6. Disconnect all the wires from the voltage regulator

**Test Stator AC Power Windings**
1. Set meter to measure Ohms.
2. Connect the test leads to stator wires #11 and #22 (Figure 14).
3. Measure the resistance and compare it to the nominal resistance from the specifications listed Section 4.
4. Connect the test leads to stator wires #33 and #44 (Figure 15).
5. Measure the resistance and compare it to the nominal resistance listed in Section 4.
   - A reading within the specifications listed is acceptable.
   - A reading of infinity or high resistance indicates an opening in the power winding. Replace the stator.
   - A low reading indicates a shorted stator winding. Replace the stator.
6. Connect one meter test lead to a proper ground on the engine or alternator. Connect the other test lead to the stator power winding.
   - A reading of infinity should be measured.
   - A reading other than infinity indicates a stator winding shorted to ground. Replace the stator.

**Check Stator Excitation Windings**
The excitation wires may be colored (red and blue) or numbered (#2 and #6). Colored excitation wires must not be confused with the colored power wires. The excitation wires were disconnected from the voltage regulator earlier in *Measuring Winding Resistance*.
1. Set meter to measure Ohms.
2. Connect the test leads to the stator excitation wires #2 and #6 (Figure 16).
3. Measure the resistance and compare it to the specifications listed in Section 4.
   • A reading within the specifications listed is acceptable.
   • A reading of infinity or high resistance indicates an opening in the excitation winding. Replace the stator.
   • A low reading indicates a shorted stator winding. Replace the stator.

4. Connect one test lead to a stator power wire. Connect the other test lead to one of the stator excitation wires.
   • A reading of infinity should be measured.
   • A reading other than infinity indicates a power winding shorted to an excitation winding. Replace the stator.

5. Connect one test lead to an excitation wire. Connect the other test lead to a proper metal ground.
   • A reading of infinity should be measured.
   • A reading other than infinity indicates a winding shorted to ground. Replace the stator.

Check Rotor Resistance Through the Brush Wires

In an effort to eliminate the need to disassemble the engine/alternator assembly, the rotor resistance can be measured through the brush wires. This may, or may not provide conclusive results. Resistance measured through the brush wires will likely result in a slightly higher reading than the specifications listed in Section 4. If a measurement is not within 10% of specifications listed in Section 4, a rotor amperage test must be performed. To check the rotor resistance:

1. Set meter to measure Ohms.
2. Connect the test leads to the brush wires, red (#4) and black (#1) (Figure 17) Previously disconnect from voltage regulator.

3. Measure the rotor resistance. Compare it to the nominal resistance from the specifications listed in Section 4.
   • A reading of infinity or a very high resistance indicates an open circuit or a partially open condition in the rotor windings. Before replacing the rotor, proceed to Bypass the Automatic Voltage Regulator.
   • A very low resistance indicates a shorted rotor. Replace the rotor.
   • If resistance is within specifications, proceed to Step 4.

4. Connect one test lead to a proper metal ground on the engine or alternator and the other test lead to either brush wire.
   • A reading of infinity should be measured. If a reading of infinity is measured rotor resistance is within specifications, the rotor is functioning properly.
   • A reading other than infinity indicates a rotor winding shorted to the rotor shaft. Replace the rotor.
Bypass the AVR
Bypassing the AVR will test all wiring and windings within the alternator without disassembly of the generator. There are two AC Voltage checks and one DC Amperage test to be performed. The exact readings may vary depending on ambient temperature, battery voltage, meter calibration, etc. This test requires a fully charged 12V battery. Using a battery that is not fully charged will give inaccurate readings.

**WARNING** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

**WARNING** Generators produce hazardous voltage. Failure to properly ground generator can result in electrocution. Failure to isolate generator from power utility can result in death or injury to electric utility workers due to back feed of electrical energy.

- DO NOT touch bare wires or bare receptacles.
- DO NOT use generator with electrical cords which are worn, frayed, bare, or otherwise damaged.
- DO NOT handle generator or electrical cords while standing in water, while barefoot, or while hands and feet are wet.
- If you must work around a unit while it is operating, stand on an insulated dry surface to reduce the risk of a shock hazard.
- DO NOT allow unqualified persons or children to operate or service generator.
- In case of accident caused by electrical shock, immediately shut down the source of electrical power and contact the local authorities. **Avoid direct contact with the victim.**
- Despite the safe design of the residential generator, operating the equipment imprudently, neglecting its maintenance, or being careless can cause possible injury or death.
- Remain alert at all times while working on this equipment. Never work on the equipment when you are physically or mentally fatigued.
- Before performing any maintenance on the generator, disconnect the battery cable indicated by a **NEGATIVE, NEG** or (-) first. When finished, reconnect that cable last.
- After the system is installed, the generator may crank and start without warning any time there is a power failure. To prevent possible injury, always set the control panel system switch to **OFF**, remove the service disconnect from the disconnect box, AND remove the 15 Amp fuse BEFORE working on the equipment.

An open in the rotor could cause lowered voltage readings during these tests. Check and record all the voltage readings first, then check and record the amperage draw on the rotor. These tests require a fully charged 12V battery. Using a battery that is not fully charged will give inaccurate readings.

1. Set the control panel system switch to **OFF**.
2. Remove the 15 Amp fuse.
3. Switch the generator circuit breaker **OFF**.

4. Disconnect Wires #1, #4, #11A, #22A, #2, and #6 from the AVR.
5. Set meter to measure AC Voltage. Connect one test lead to Wire #2 and the other lead to Wire #6 (Figure 18).

6. Connect a jumper wire from battery positive (+) to Wire #4 (positive brush wire). Then connect another jumper wire from battery negative (-) to Wire #1 (negative brush wire) (Figure 19).

7. Reinstall the 15 Amp fuse.
8. Manually start the unit and measure AC voltage across Wire #2 and Wire #6. A minimum of 60VAC should be measured.
9. Set control panel system switch to **OFF**.
10. Connect one test lead to Wire #11A and the other lead to Wire #22A (Figure 20).
11. Manually start the unit and measure AC voltage across Wire #11A and Wire #22A. A minimum of 60VAC should be measured.

The AC voltage measured across Wire #2 and Wire #6 should be higher than the AC Voltage measured across Wire #11A and Wire #22A.

Refer to Figure 21 when performing the following test. There is one DC Amperage test to perform. The exact amperage readings may vary depending on ambient temperature, battery voltage, meter calibration, etc.

1. Set meter to measure DC Amperage.
2. Connect the meter in series between battery positive (+) and wire #4. Refer to the operation/instruction manual for the meter you are using for correct test lead locations and meter settings.
3. Connect the meter in series between the 12V battery negative (-) and Wire #1.
4. Manually start the unit and measure DC Amperage. Reading should be **1.0 - 1.5 Amps**.

5. Disconnect the battery from Wire #1 and Wire #4.
6. Restore wiring connections to the circuit breaker and the AVR.
7. Analyze test results as follows:
   - If all readings are within the spec, the alternator is good and the voltage regulator is suspect.
   - If amperage reading is within the range, and one or more of the voltage readings are low, the stator is suspect.
   - High amperage indicates a short. Verify battery voltage, wiring, and connections. Repair as necessary, then retest. If the reading is still high, replace the rotor.
   - Low on no amperage indicates an open. Verify the meter’s fuse is good and check the battery voltage, wiring, and connections. Repair as necessary, then retest. If reading is still low, replace the rotor.
FC_4
Engine Does Not Start

The engine will either crank and it will not start, or it may not crank at all.
Use this flowchart if engine does not start.

Test #1
Visually Inspect Generator

OK? YES Test #2 Check Spark

OK? YES Test #3 Check Fuel Delivery System

NO Repair / Correct Repair / Correct

Start? NO YES END

YES END

Test #4
Check Fuel Supply Pressure

OK? YES Test #5 Check Fuel Solenoid

OK? YES Test #6 Check Fuel Regulator

NO Repair / Correct Repair / Correct

Start? NO YES END

YES END
Whenever the unit is directed to start (MANUAL or AUTO), the control panel delivers 12VDC from Pin #3, Wire #56 to the starter contactor for 15 seconds. If there is a no-start condition, it pauses for 15 seconds and repeats the attempt until 2 minutes of start time have accumulated.

During the starting attempt, the control panel also delivers 12 VDC from Pin #4, Wire #14 to the fuel solenoid and monitors Wires #E1 and #E2 for a minimum voltage signal. This signal indicates that the engine has started and delivery of voltage to the starter contactor is discontinued. However, if the minimum frequency signal has not been sensed after approximately 2 minutes of accumulative start time, the control panel terminates the engine cranking cycle.

The digital display will show FC_4 and the remote LED will repeatedly flash four times with a pause.

A no-start condition may be caused by:

- Open generator circuit breaker
- No or low alternator output voltage
- Inadequate fuel supply
- Fuel solenoid not opening
- Fuel supply discrepancies
- Starter motor damaged
- Starter motor connections loose
- Engine component damage
- Clogged engine air filter
- Worn or fouled spark plugs
- Damaged wiring or loose connections
- Clogged atmospheric vent on regulator

Troubleshooting Engine No-Start Conditions
1. Reset the fault code detection system. See Resetting the Fault Code Detection System.
2. Set control panel system switch to AUTO and push MANUAL OVER-RIDE to start unit.

The engine will either crank with no start, or it may not crank at all. Use TESTS 1-6 for starting problems and TESTS 7-10 for cranking problems.

Starting Problems
If the engine starts but shuts down and FC_4 is shown in the display, the condition is caused by no voltage or frequency on Wires #E1 and #E2 and the control panel. An open main breaker could be the cause. Use FC_3 troubleshooting for this condition.

TEST 1 - Visually Inspect Generator
1. Remove all access doors to the unit.
2. Remove the 15 Amp fuse, then inspect for any obvious broken or corroded electrical connections.
3. Remove the screws to gain access to the control panel board. See How to Access the control panel Board.
4. Visually inspect the condition of all wiring, connectors, and terminals associated with the following components:
   - Oil Pressure and Oil Temperature
   - #1 Sparkplug Lead (Remove the lead and ensure the plug is tight)
   - Starter Contactor
   - Fuel Solenoid
   - Generator and Engine Grounds
   - Starter Motor
   - #2 Sparkplug lead (Remove the lead and ensure the plug is tight)
   - All component connections
   - The control panel connections and each of their wires
5. Repair or replace any damaged wiring or terminal connections.
6. Reset the fault code detection system. See Resetting the Fault Code Detection System.
7. Set control panel system switch to AUTO and push MANUAL OVER-RIDE to start unit.
8. If there are no obvious electrical faults, and the problem persists, proceed to TEST 2 - Check Spark.

TEST 2 - Check Spark
1. Turn off the manual fuel valve to the unit.
2. With the sparkplug installed, attach a Briggs & Stratton Ignition Tester #19368 to a sparkplug lead and ground the end of the tester (Figure 22).

NOTE: Engine may appear different than shown in figure.
3. Set control panel system switch to AUTO and push MANUAL OVER-RIDE to start unit.
   • If spark jumps the tester gap, the ignition system is functioning properly. The color of the spark is not important.
   • If there is no spark during this test, but there was spark during Step 2, replace the spark plug and test again. If still no spark, see Single Cylinder OHV Repair Manual #276781 for further troubleshooting.

TEST 3 - Check Fuel Delivery System
1. Ensure that adequate fuel supply is available to operate the system.
2. Verify that the main fuel supply valve and any in-line fuel valves are open. Ensure that all gas appliances are hooked up and operational.
3. Correct any fuel supply problems.
4. Reset the fault code detection system. See Resetting the Fault Code Detection System.
5. Set control panel system switch to AUTO and push MANUAL OVER-RIDE to start unit.
6. If the unit still does not start, proceed to TEST 4-Check Fuel Supply Pressure.

TEST 4 - Check Fuel Supply Pressure
1. Turn OFF fuel valve supplying fuel to generator.
2. Remove test port plug (A, Figure 23). The installer supplied test port should have been installed with the fuel supply system during the original installation process.
3. Install Briggs & Stratton Vacuum Tester #19495 (B), in fuel supply line, as close to the generator as possible, to verify that the fuel pressure is available to the fuel solenoid.
4. Turn ON manual fuel valve.
5. Measure generator inlet fuel pressure. Fuel pressure should measure 7-11 in. wc (LP) or 5-7 in. wc (NG) with all gas appliances turned on and operating.
   • If the proper fuel pressure is not present, repair or replace the fuel delivery system, then retest the fuel pressure as described above.
   • If fuel pressure is acceptable, proceed to TEST 5-Check Fuel Solenoid.

TEST 5 - Check Fuel Solenoid
1. Set meter to read DC Volts.
2. Connect positive (+) test lead to wire #14, at fuel solenoid (A, Figure 24).
3. Connect negative (-) test lead to ground.
4. Measure DC Volts at fuel solenoid while the engine is cranking. No voltage will be present when the system pauses between cranks.
   • If no voltage is present, proceed to Step 8.
   • If voltage is present at the fuel solenoid, proceed to Step 5.
5. Remove the pipe plug in the regulator test port (A) and install Briggs & Stratton Vacuum Tester #19495 (Figure 25).

6. Ensure the fuel supply valves are ON.

7. Using a jumper wire, connect 12VDC to Wire #14 at the fuel solenoid. Fuel pressure should measure 11-14 in. wc (LPG) or 5-7 in. wc (NG).

Voltage can be supplied to the solenoid by cranking the engine. However, if this method is used, fuel pressure readings will be lower than the fuel inlet specification, resulting in an inaccurate reading.

- If no fuel pressure is measured, replace the fuel solenoid.
- If fuel pressure is measured within specifications, the solenoid is good. Proceed to TEST 6 - Check Fuel Regulator.

8. Set meter to read DC Volts.

9. Remove the screws to gain access to the control panel.

10. Connect positive (+) meter lead to Pin #4, Wire #14. Connect negative (-) meter lead to Pin #2, Wire #0 (A, Figure 26).

11. Measure DC volts while cranking.
   - If no voltage is measured at the control panel, replace the control panel.
   - If voltage is measured at the control panel, but not at the solenoid, repair or replace the wiring between the control panel board and the fuel solenoid (Wire #14).

**TEST 6 - Check Fuel Regulator**

The fuel regulator has two atmospheric vent holes (A, Figure 27) that balance diaphragm pressures.

1. Install a 1/8 NPT barbed fitting into one hole. Attach a 2 ft. length of hose to the fitting.
2. Plug the other vent hole, then gently blow into the hose.

When the fuel solenoid is energized (open) with battery voltage, this gentle pressure will allow fuel to pass through the regulator and will be indicated on the manometer as a decrease in pressure.

- If no fuel flow is detected, replace the fuel regulator.
- If fuel flow is detected, proceed to TEST 6 - Check Ignition Spark.
FC_4
Engine Does Not Crank

The engine will either crank and it will not start, or it may not crank at all.
Use this flowchart if engine does not crank.
Cranking Problems

TEST 7 - Check Battery Components

1. Check the condition and electrical integrity of the battery and all wires, connectors, and cables throughout the unit. Some areas for particular focus are:
   - Battery state of charge
   - Battery connections
   - Generator grounds, wiring, and connections
   - Starter contactor
2. Inspect the 15 Amp fuse. Replace if necessary. If the fuse is replaced, reset the fault code detection system. See Resetting the Fault Code Detection System.
3. Remove the screws to gain access to the control panel board. See How to Access control panel Board.
4. Make sure all the wires and connections are securely attached to the back of the control panel board (Figure 28).

Figure 28

5. Check the unit grounding cable and connections.
6. If electrical components are OK, proceed to TEST 8 - Check Starter Contactor Signal.

Figure 29

TEST 8 - Check Starter Contactor Signal

1. Set control panel system switch to OFF.
2. Reset the fault code detection system. See Resetting the Fault Code Detection System.
3. Gain access to the starter contactor located near the battery.
4. Connect the positive (+) test lead of the meter to Wire #56 at the contactor terminal (A, Figure 29). Connect the negative (-) test lead of the meter to ground.

Figure 30

- If no voltage is measured at the control panel board, replace the control panel.
- Reset the exercise timer. See Resetting the Exercise Timer.

TEST 9 - Check Control Panel Board Output

1. During the crank cycle, measure the DC voltage between Pin #3, Wire #56, and ground at Pin #2, Wire #0 (A, Figure 30).

Figure 30

- If voltage is present, but the starter won't engage, proceed to TEST 10 - Check Starter.
- If no voltage is present, proceed to TEST 9 - Check control panel Board Output.
• If voltage is measured, repair or replace wiring between the control panel and the starter contactor.

2. Measure the voltage at the starter motor (B, Figure 31). The reading should be above 9.6VDC between the starter terminal and ground while cranking (the control panel will deliver 12VDC to the terminals of the starter contactor).

![Figure 31](image)

**TEST 10 - Check Starter Motor**

Refer to Single Cylinder OHV Repair Manual #276781 for procedure to check the condition of the engine starter motor.
FC_5 Low Frequency & FC_6 Engine Overspeed

Test #1
Measure No-Load and Full-Load Output Frequency at Circuit Breaker (CB)

Within Specs?

YES
Test #2
Measure Frequency on E1 & E2 at control panel

Within Specs?

YES
Replace control panel

NO
Repair / Replace Open Wires E1 & E2 Between CB Output and control panel

Within Specs?

YES
END

NO
Perform Static Governor Adjustment

Not for Reproduction

Not for Reproduction

Not for Reproduction

Not for Reproduction

Not for Reproduction

Not for Reproduction
(FC_5) UNDER FREQUENCY

The troubleshooting steps for under- and over-frequency faults are identical.
The low frequency shutdown feature is designed to protect the generator and its loads from an output frequency that is too low. The control panel senses frequency at Wires #E1 and #E2. If output frequency drops below 55 Hz for three seconds, the control panel will shut down the generator.
The digital display will show FC_5 and the remote LED will repeatedly flash five times with a pause.
Under frequency may be caused by:

- A restricted air filter
- A problem in the generator sense wiring (#E1 or #E2)
- Incorrect engine governor adjustment
- Problems with the fuel delivery system
- Excessive loads
- Engine that is producing insufficient power
- A problem in the control panel

TEST 1 - Check No-Load & Full-Load Frequency

For the following procedures, we recommend the use of Briggs & Stratton Digital Tach and Hour Meter #19389.

![Figure 32](image)

**WARNING** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

Perform the following test under full electrical loads with all gaseous fuel appliances turned ON and operating.

No-Load RPM specification is **62.0-62.5 Hz** / 3750 ± 100 RPM
Full-Load RPM specification is **57.0-62.5 Hz** / 3420 ± 100 RPM

Check No-Load Frequency

1. Remove the four screws to gain access to the main circuit breaker.
2. Reset the fault code detection system. See Resetting the Fault Code Detection System.
3. Ensure the generator circuit breaker is ON.
4. Set control panel system switch to AUTO, then push and hold MANUAL OVER-RIDE to start the unit.
5. Measure frequency at the line side of the circuit breaker (Figure 32).

![Figure 33](image)

- If frequency at no-load is correct, proceed to Check Full-Load Frequency.
6. If the no-load frequency is not correct, use needle nose pliers or Tang Bender #19229 or #19480, bend spring anchor tang (A, Figure 33) slowly up or down until frequency is 62.0 to 62.5 Hz.
Check Full-Load Frequency
1. Turn OFF utility power to the transfer switch. The unit should start and transfer to generator power.
2. Gradually add electrical loads to the generator until it is running at full rated capacity.
3. Measure frequency at the load side of the circuit breaker (Figure 34).

TEST 2 - Measure Frequency at #E1 & #E2
1. With the unit running at full rated capacity, as described in Check Full-Load Frequency, measure the frequency at #E1 and #E2 at the control panel pins (A, Figure 35).

- If the frequency is correct, restore utility power then proceed to TEST 2 - Measure Frequency at #E1 and #E2.
- If the frequency is not correct, slowly rotate the governor adjustment nut until the frequency is above 57.0 Hz - 62.5 Hz. Then reapply utility power.
- If a full-load frequency adjustment was performed, recheck at no-load to verify frequency.

- If the frequency is not correct, repair or replace the wiring between the circuit breaker and #E1 and #E2 at the control panel. Then re-test the frequency at #E1 & #E2.
- If the frequency is correct but the generator continues to shut down for low frequency, replace the control panel board. Remember to reset the exercise timer.
The control panel monitors generator output frequency at Wires #E1 and #E2. If the generator output frequency increases to 65Hz-70Hz, the control panel waits three seconds before shutting the unit down. Should the frequency exceed 70Hz, the control panel will shut down the generator immediately. If the governor top speed is adjusted too high, the generator will shut down immediately after starting.

The reason for the 5Hz latitude in frequency sensing is that the engine governor will hunt somewhat before it finds the desired setting. This causes variable frequency outputs that are not harmful until they reach the 65Hz-70Hz range.

If the control panel senses an over-frequency condition, the digital display will show FC_6 and the remote LED will repeatedly flash six times with a pause.

The troubleshooting steps for under- and over-frequency faults are identical.

Note that over-frequency is a symptom of a governor related issue. Refer to Single Cylinder OHV Repair Manual (#276781) for procedures to check the adjustment and/or repair of the engine governor.
FC_7
High Temperature

Test #1
Check Oil Temperature Switch (OTS)

OK?

Shorted?

YES

Replace OTS
Reset Fault Detection Start Unit

NO

Test #2
Check Wire #95

Shorted?

YES

Repair / Replace Wire #95

NO

Replace control panel

Shorted?

YES

Reset Fault Detection Start Unit

NO

OK?

YES

END

NO

END

2
The contacts of the Over-Temperature Switch (OTS) are normally open. If the engine oil reaches a critical temperature, the switch contacts will close and complete a circuit to ground through Wire #95. If the control panel senses this ground, it will shut down the generator. The digital display will show FC_7 and the remote LED will repeatedly flash seven times with a pause.

Common causes from high oil temperature include:
- Low oil level
- Running the unit with the side doors removed.
- Obstructed air inlet or exhaust port
- Debris in the engine cylinder cooling fins

Inspect for and correct these conditions before checking the OTS. Once the problem is corrected, reset the fault code detection system. See Resetting the Fault Code Detection System.

**TEST 1 - Check Over-Temperature Switch**

1. Set control panel system switch to OFF.
2. Remove the 15 Amp fuse.
3. Locate the Over-Temperature Switch (OTS) located by the oil drain hose (A, Figure 36) near the starter motor.
4. Remove both wires from the OTS (B).
5. With the engine cold, check for continuity between switch terminals.
   - No continuity should be measured with the engine cold or at normal operating temperature.
   - If continuity is measured, replace the OTS.

**TEST 2 - Check Wire #95**

1. Gain access to the control panel. See How to Access the control panel Board.
2. Disconnect the 8-pin connector from the control panel board and disconnect Wire #95 from the OTS.
3. Measure for short-to-ground between Wire #95 (A, Figure 37) and the engine block.

   - If a short-to-ground is present, repair or replace the wiring as necessary.
   - If no short-to-ground is present, replace the control panel. Remember to reset the exercise timer.
Transfer switch fault monitoring is an optional feature of the Home Generator System. A transfer switch with a compatible Air Conditioning Control Module (ACCM II or later) is required for this feature. This module monitors the transfer switch circuits during normal utility power and during standby power. Not all transfer switches will have ACCM II.

A transfer switch fault indicates an open circuit within the switch, which can occur:

- at the fuse(s)
- in the contactor coils
- in the limit switches
- in the factory wiring

Because an open circuit can occur in variable places, generator symptoms may vary. A visual inspection is generally sufficient to determine the source. Further troubleshooting can be done with a continuity tester and wiring diagram specific to the model of transfer switch installed.

The most common cause of transfer switch problems is a blown transfer switch fuse.

When a transfer switch fault occurs, the digital display will show FC_8 and the remote LED will repeatedly flash eight times with a pause.

- The fault code will display if a fault occurs while the unit is stopped and set in AUTO mode.
- The FC_8 fault code will not display if a fault occurs while the unit is running in EXERCISE, MANUAL, or UTILITY mode.
- The fault code will display if a fault occurs while the unit is stopped and set in AUTO mode.
- The unit will not shut down if a fault occurs while the unit is delivering standby power. But the fault code will display when power transfers back to the utility and the generator has stopped running.
SECTION 3 - UNIT DISASSEMBLY

Remove Access Door
1. Insert key into lock of access door handle and turn key one quarter-turn clockwise (Figure 1).
2. Grasp door handle and turn one quarter-turn counterclockwise to open. Remove key.
3. Open door enough to clear its jambs and lift the door from its hinges.

Remove Power and Fuel Source
1. Turn OFF the unit and remove the 15 Amp fuse.
2. Turn OFF and disconnect UTILITY power from generator.
3. Turn OFF and disconnect the fuel supply. Plug both openings to prevent contamination from entering the fuel inlet or the fuel line.

Remove Roof
Remove the four screws and lift off (A, Figure 2).

Remove Battery

WARNING Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

1. Disconnect the negative (−) battery cable.
2. Disconnect the positive (+) battery cable.
3. Remove the battery and set aside.

Remove Side Panels
1. Remove screws (A, Figure 3), attaching control side panel (B), access door (C), and exhaust panel (D). One panel (E) will not be removed.
2. Tilt panels out (away) from unit while pulling panels up and out of base.
Remove the Exhaust Flex Tube
1. Remove the two bolts that hold the exhaust tube to the engine (A, Figure 4).

2. Slip the flexible exhaust manifold up and out of the muffler assembly (B, Figure 5).

3. Remove the two bolts that secure the muffler heat shield assembly and set the heat shield aside.

Disconnect Control Panel Wiring
1. Remove the four mounting screws (A, Figure 6) that secure the face of the control panel, then carefully tilt down the panel to expose the control panel board.

2. Disconnect the line-side wiring (Figure 7) from the circuit breaker.

3. Using pliers, squeeze the barbs together to remove the plastic wire retainer (B, Figure 8).

4. Remove wire nut (C) from wire connection. Disconnect wire harness, then gather wires and push them through the grommet (D).
Disconnect Engine Wiring and Fuel Hose

1. Disconnect battery ground cable from engine block (A, Figure 9).

2. Disconnect the wire (B, Figure 10) from the oil pressure switch.

3. Disconnect the wires (C, Figure 11) from the temperature sensor.

4. Disconnect the wire from the oil warmer (if equipped) and from the harness connector (A, Figure 12).

5. Disconnect fuel supply hose at mixer, hose clamp (D, Figure 13), plug hose, and mixer inlet.

6. Remove the two mounting screws (E, Figure 14) from the voltage regulator (F).

7. Carefully note the location of the wires connected to the voltage regulator then disconnect the wires from the regulator.

8. Push the regulator wire harness through the air duct and into the center of the air plenum.
Engine / Alternator Removal

**WARNING** Lifting Hazard / Heavy Object - Can cause muscle strain or back injury.

- DO NOT lift or move generator without assistance.
- DO NOT lift unit by roof as damage to the generator will occur.

Depending on the type of lifting mechanism that you have available, it may be necessary to fabricate a pair of lifting eyes to remove the engine/alternator assembly from the mounting cradle.

If this is the case, fabricate two lifting eyes according to the following specifications (Figure 15):

![Figure 15](image1.png)

1. Remove the nut from the upper portion of the engine mount that is located forward of the engine starter (Figure 16).

![Figure 16](image2.png)

2. Install fabricated mounting brackets.
3. Repeat this process for the engine mount that is located behind the oil filter.
4. Using a technician-supplied chain and the lifting hooks bolted to the engine block, carefully lift the engine/alternator assembly until it is clear of the cradle (Figure 17).

![Figure 17](image3.png)

**NOTICE:** To prevent scratches to the engine shroud, place cardboard between the chain and engine shroud.

Remove the Stator

Ensure the engine/alternator assembly is set on a sturdy work surface. **Do not** set the engine/alternator assembly on the plastic end cover.

1. Remove the plastic end cover (A, Figure 18).
2. Remove the two mounting screws that secure the brush holder (B) to the rear bearing carrier.

![Figure 18](image4.png)

3. Remove the four stator bolts (C, Figure 19) that secure the rear bearing carrier to the alternator.
4. Remove the stator assembly. You may need to tap lightly on the stator assembly with a plastic, dead-blow hammer to loosen it from the alternator adapter.

5. Slide the stator out of the alternator adapter and off the rotor.

**NOTICE:** Use care not to damage the windings. Set the stator on the laminations, not on the coils of the wire.

**Remove the Rotor**

1. Remove the four screws that secure the alternator adapter to the engine adapter (A, Figure 20).

2. Loosen, but do not remove, the rotor through-bolt (A, Figure 21). The rotor through-bolt will prevent the rotor from falling during disassembly.

**WARNING** Lifting Hazard / Heavy Object - Can cause muscle strain or back injury.

- DO NOT lift or move generator without assistance.
- DO NOT lift unit by roof as damage to the generator will occur.

3. While supporting and pulling the rotor with one hand, strike the rotor assembly, on the steel laminations (B) with a plastic, dead blow hammer until it separates from the engine shaft.

4. Unscrew the through-bolt and carefully slide rotor off the engine crankshaft.

Except for certain engine repairs, there is no need to remove the engine adapter (Figure 22) from the engine.

**WARNING** Lifting Hazard / Heavy Object - Can cause muscle strain or back injury.

- DO NOT lift or move generator without assistance.
- DO NOT lift unit by roof as damage to the generator will occur.

**Reassemble the Alternator**

1. Install the rotor and torque to values listed in Section 4 - Specifications.

2. With stator harness and lead wires facing away from the engine, place stator (A, Figure 23) over rotor and into adapter casting (B, Figure 24). Verify roll pin slot (C), in stator, lines up with the roll pin (D) in adapter.
Assemble the Alternator

1. Pull wires up through rear bearing carrier (A, Figure 25). Set rear bearing carrier on rotor bearing and stator. Verify second roll pin slot (B, Figure 26) in stator lines up with roll pin (C) in rear bearing carrier.

3. Use a plastic, dead blow hammer to evenly seat stator into the adapter casting.

NOTICE: Do not use stator bolts to draw assembly together.

2. Using a plastic, dead blow hammer, tap rear bearing carrier evenly over rotor bearing and stator until it seats.

3. Insert stator bolts into each hole around the rear bearing carrier. Tighten bolts in a criss-cross pattern until snug, then torque to 40 lb-in. (5 Nm).

4. Rotate engine flywheel by hand slowly to ensure that the alternator is not binding.

Continue Engine/Alternator assembly in reverse order of removal.
## SECTION 4 - GENERATOR SPECIFICATIONS

### Models
040298, 040298A, 040301, 040315, 040320

### Rated Maximum Power and Load Current (LP)
- at 240 Volts: 29.1 Amps

### Rated AC Voltage
240 Volts

### Rated Frequency
60Hz

### Phase
Single Phase

### Rated Temperature
77°F (25°C)

### Normal Operating Range
-20°F to 104°F (-28.8°C to 40°C)

### LP Fuel Supply Pressure
11 - 14 in. W.C.

### LP Fuel Supply Consumption
- at 1/2 Load: 33c / 82,500b
- at Full Load: 56c / 140,000b

### NG Fuel Supply Pressure
5 - 7 in. W.C.

### NG Fuel Consumption
- at 1/2 Load: 80c / 80,000b
- at Full Load: 137c / 137,000b

- **c** = Cubic Feet Per Hour
- **b** = BTU Per Hour

### RESISTANCE VALUES

<table>
<thead>
<tr>
<th>Component</th>
<th>Resistance Range</th>
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<tbody>
<tr>
<td>Rotor</td>
<td>7.5 - 9.3 OHM</td>
</tr>
<tr>
<td>Power Winding</td>
<td>0.20 - 0.26/0.20 - 0.26 OHM</td>
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<tr>
<td>Excitation Winding</td>
<td>2.06 - 2.50 OHM</td>
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### FASTENER TORQUE VALUES

<table>
<thead>
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<th>Component</th>
<th>Torque Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Adapter to Engine</td>
<td>200 LB-IN (23 Nm)</td>
</tr>
<tr>
<td>Alternator Adapter to Engine Adapter</td>
<td>200 LB-IN (23 Nm)</td>
</tr>
<tr>
<td>Rotor Bolt to Crankshaft</td>
<td>200 LB-IN (23 Nm)</td>
</tr>
<tr>
<td>Brushes to Rear Bearing Carrier</td>
<td>50 LB-IN (7 Nm)</td>
</tr>
<tr>
<td>Stator Bolt</td>
<td>80 LB-IN (9 Nm)</td>
</tr>
<tr>
<td>Negative Battery Cable to Engine</td>
<td>80 LB-IN (9 Nm)</td>
</tr>
<tr>
<td>Muffler to Cylinder Head</td>
<td>220 LB-IN (25 Nm)</td>
</tr>
</tbody>
</table>