

FORWARD

This guide has been written and published by Briggs & Stratton Corporation to aid our dealers' mechanics and company service personnel when servicing the products described herein.

It is assumed that these personnel are familiar with the servicing procedures for these products, or like or similar products, manufactured by Briggs & Stratton Corporation. It is also assumed that they have been trained in the recommended servicing procedures for these products, which includes the use of mechanics hand tools and any special tools that might be required.

Proper service and repair is important to the safe, economical and reliable operation of all engine driven systems. The troubleshooting, testing, service and repair procedures described in this guide are effective methods of performing such operations.

We could not possibly know of and advise the service trade of all conceivable procedures or methods by which a service might be performed, nor of any possible hazards and/or results of each procedure or method. We have not undertaken any such wide evaluation. Therefore, anyone who uses a procedure or method not described by the manufacturer must first satisfy himself that neither his safety, nor the safety of the product, will be endangered by the service or operating procedure selected.

All information, illustrations, and specifications contained in this guide are based on the latest production information available at the time of publication. However, Briggs & Stratton Corporation reserves the right to change, alter, or otherwise improve the product at any time without prior notice.

Some components or assemblies of the product described in this guide may not be considered repairable. Disassembly, repair and reassembly of such components may not be included in this guide.

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MODEL 1938 (10KW)

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GENERAL INFORMATION

MODEL 1938 (10KW)

General Information

NOTES

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SAFETY RULES

In the Interest of Safety

This manual outlines the construction, function and servicing procedures of the Briggs & Stratton Power Products® Home Standby generator series. It is structured for use by trained technicians that are working in and from a properly equipped shop. Familiarity with the proper method of using tools, measuring equipment and workshop procedures are essential to performing successful maintenance and repair on this equipment.

Ensure that all specified tools and/or equipment are available before attempting to service this equipment.

For a detailed discussion of the fundamental principles involved with the physics of electrical power generation, refer to the Familiarization and Troubleshooting Guide (Publication #86262 Revision 3 or later). This manual is available through your Briggs & Stratton Central Distributor.

Safety Alert Symbols

The safety alert symbol (⚠) is used to identify safety information about hazards that can result in personal injury. A signal word (**DANGER**, **WARNING**, **CAUTION**) is used with the alert symbol to indicate 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 **might result in death or serious injury.**

CAUTION: When used without the alert symbol, indicates a situation that could result in damage to equipment.

NOTE: This notation is used to inform you of a method, reference or procedure that could assist with specific operations or decisions.

HAZARD SYMBOLS AND MEANINGS		
Toxic Fumes	Electrocution	Explosion
Hot Surface	Chemical Burns	Fire
Read	Explosive Pressure	Goggles
Kick Back	Disconnect Spark Plug	Entanglement

DANGER

Generator produces powerful voltage.

Failure to isolate generator from power utility can result in death or injury to electric utility workers due to backfeed of electrical energy.

- When using generator for backup power, notify utility company. Use approved transfer equipment to isolate generator from electric utility.
- Use a ground fault circuit interrupter (GFCI) in any damp or highly conductive area, such as metal decking or steel work.
- Do not touch bare wires or 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 or feet are wet.
- Do not allow unqualified persons or children to operate or service generator.

WARNING

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

DANGER

Failure to properly ground generator can result in electrocution, especially if the generator is equipped with a wheel kit.

- National electric code requires generator to be properly grounded to an approved earth ground. Call an electrician for local grounding requirements.

DANGER

Running engines produce heat. Temperature of muffler and nearby areas can reach or exceed 150°F (65°C). Severe burns can occur on contact.

- Do not touch hot surfaces.
- Allow equipment to cool before touching.

Safety Practices

DANGER



Storage batteries give off explosive hydrogen gas during recharging.



Hydrogen gas stays around battery for a long time after battery has been charged.



Slightest spark will ignite hydrogen and cause explosion.



You can be blinded or severely injured.



Battery electrolyte fluid contains acid and is extremely caustic.



Contact with battery fluid will cause severe chemical burns.

- Do not allow any open flame, spark, heat, or lit cigarette around battery during, and for several minutes after charging.
- Wear protective goggles, rubber apron, and rubber gloves.

WARNING

- This generator does not meet U.S. Coast Guard Regulation 33CFR-183 and should not be used on marine applications.
- Failure to use the appropriate U.S. Coast Guard approved generator could result in bodily injury and/or property damage.



- Do not attempt to modify the unit or use it for any application it was not designed for. If you have any questions about your generator's application, ask your dealer or consult the factory.



- Read these procedures carefully and become familiar with your generator set. Know its applications, its limitations and any hazards involved.



- Never handle any kind of electrical cord or device while standing in water, while barefoot, or while hands or feet are wet.



- Do not use worn, bare, frayed or otherwise damaged electrical cord sets with any generator set. Using a defective cord may result in an electrical shock or damage to the test equipment and/or the unit.



- These units require an adequate flow of cooling air for their continued proper operation. Never operate or service any unit while inside any enclosure where the free flow of cooling air into and out of the unit might be obstructed. Without sufficient cooling airflow, the units quickly overheat, damaging the generator and/or nearby property.



- Home Standby generators produce a high voltage that can cause an extremely dangerous electrical shock. Avoid contact with bare wires, terminals, etc. Never permit an untrained person to service or assist with the procedures discussed in this guide.



- Never start or stop a unit with electrical loads connected to receptacles and with the connected loads turned **ON**. Start the engine and let it stabilize before connecting any electrical loads. Turn **OFF** and disconnect all electrical loads before shutting down any generator.



- The manufacturer could not possibly anticipate every circumstance that might involve a hazard. For that reason, warnings in manuals and warnings on tags or decals affixed to the units are not all-inclusive. Do not handle, operate or service a unit with a procedure or method not specifically recommended by the manufacturer.



- This entire book is filled with important safety information - please read it carefully.

ACCESS TO THE GENERATOR

The Home Generator System is equipped with an enclosure that has four access doors (Figure 1). The doors are named for the significant component located behind them. Starting with the side that has the fuel connection and proceeding clockwise, the doors are named:

- OIL SERVICE DOOR
- AIR INTAKE DOOR
- CONTROL PANEL DOOR
- BATTERY DOOR

Each Home Generator System is equipped with three identical keys. These keys fit the locks that secure the oil service and control panel doors.

CAUTION: Do not operate the backup generator unless the OIL SERVICE and/or CONTROL PANEL doors are installed. Failure to do so will cause overheating.

To remove an access door:

- Insert a key into the lock of the access door you wish to remove and turn one quarter turn clockwise.



NOTE: The key is retained in the lock when the locks are open.

- Grasp the door's lift handle and pull the door upwards until the security pins are free of the lower base.
- With the security pins free, pull the lift handle outward (away) from the unit while pulling the door down and out of the upper door channel. The door will come free of the generator enclosure.

The AIR INTAKE DOOR does not have locks or lift handles. You must remove a locking screw found directly above the center of the door. They are removed in the same way the locking doors are removed. To secure these access doors, replace the locking screws.

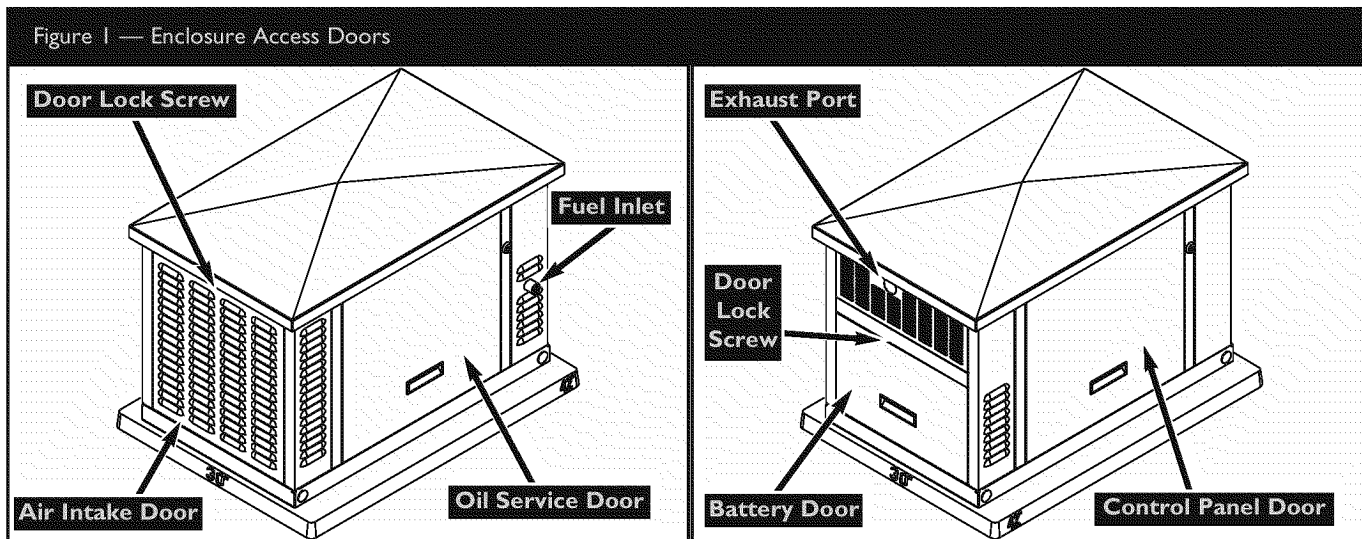
WARNING

The exhaust port can reach a temperature of 600°F and remains hot after shutdown.

- Carelessness could cause severe burns.

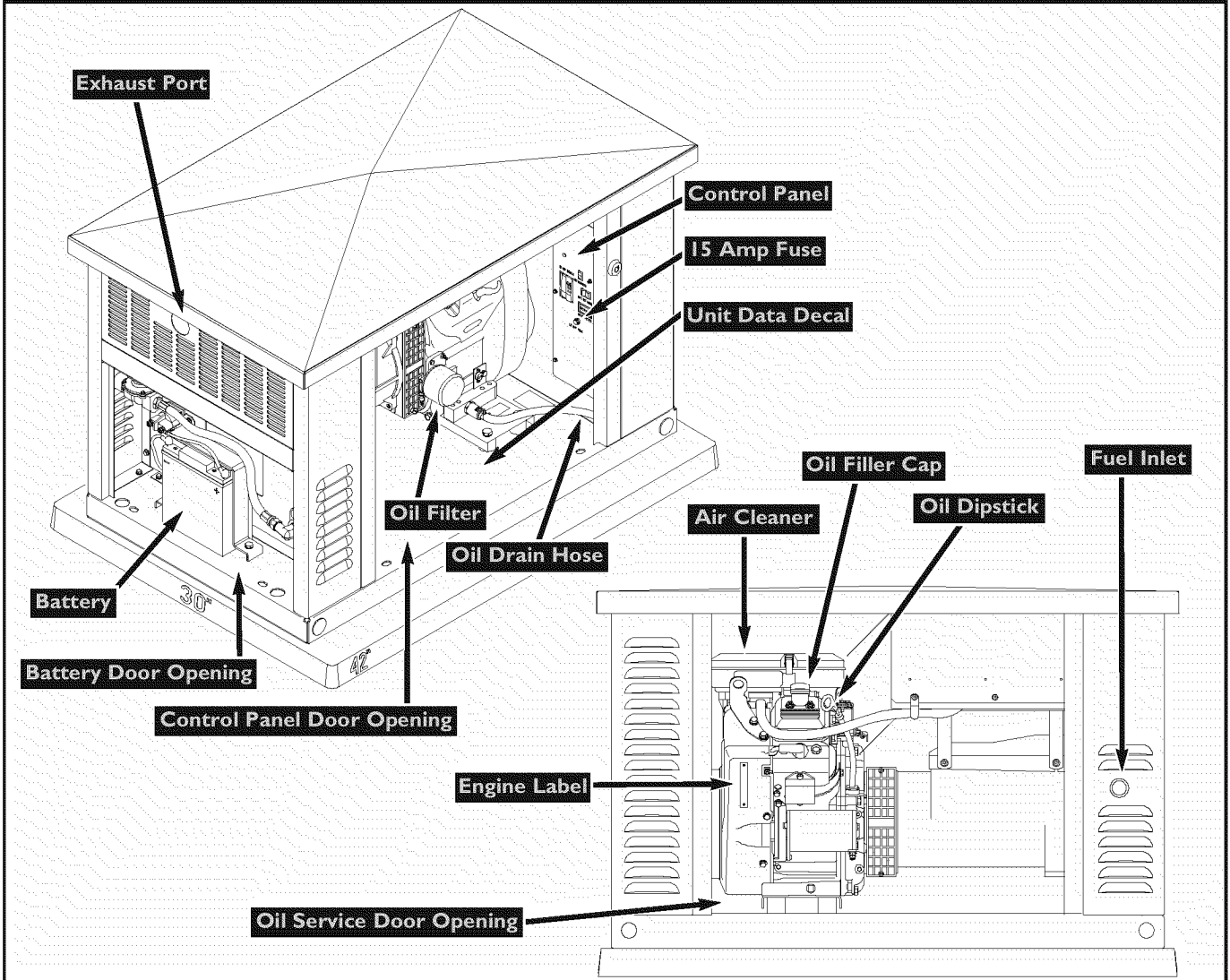
To install an access door:

- Support the door by grasping the lift handle or louver. Guide the top of the door into the generator enclosure.
- Lift the door up into its upper channel until the security pins clear the sill of the enclosure.
- Push the lower half of the door into the door recess until it is flush with the sides.
- Seat the door by pushing it down until the rubber coated security pins engage and the door rests on the mounting sill.
- When installing a lockable door, turn the key one quarter turn counterclockwise and remove the key.



GENERATOR COMPONENTS

Figure 2 — Generator Components



15 Amp Fuse — Protects the DC control circuits.

Air Cleaner — Uses a dry type filter element and foam precleaner to prevent dirt and dust from being drawn into the engine.

Battery — 12 VDC, 33 Amp-Hour sealed battery provides power to start the engine. Battery receives trickle charge whenever generator is not running.

Control Panel — Used for various test, operation and maintenance functions. See THE SYSTEM CONTROL PANEL on the next page.

Engine Label — Identifies engine model and type.

Exhaust Port — High-performance muffler lowers engine noise to comply with most residential codes.

Oil Dip Stick — Used to check the engine oil level.

Oil Drain Hose — Provided to facilitate changing oil.

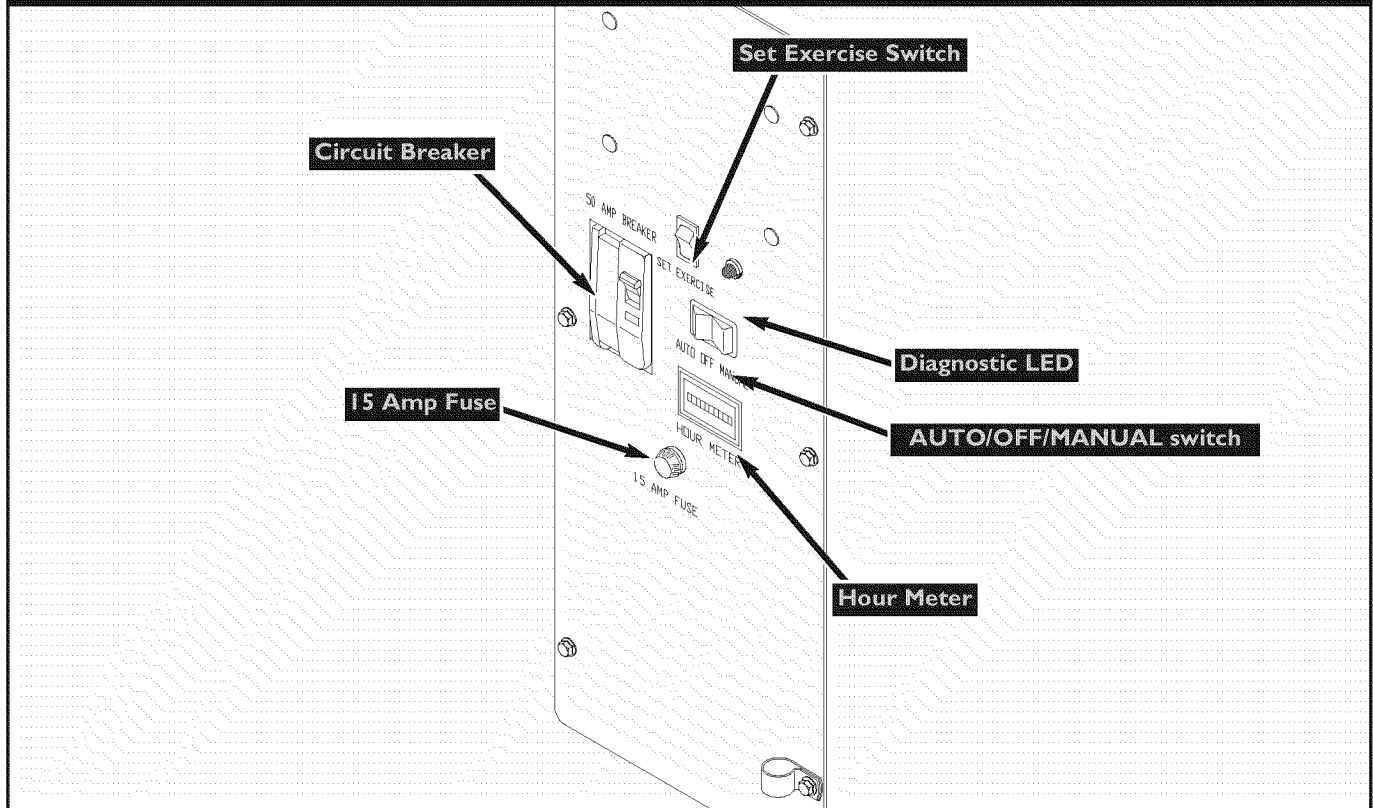
Oil Fill Cap — Remove to service the engine with recommended oil.

Oil Filter — Filters engine oil to prolong engine life.

Unit Data Decal — Identifies unit by serial number.

SYSTEM CONTROLS

Figure 3 — System Control Panel



15 Amp Fuse — Protects the Home Generator System 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 BUSS AGC 15A fuse.

AUTO/OFF/MANUAL Switch — This three-position device 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 and the internal engine temperatures stabilize, it shuts off the generator, and waits for the next utility power outage. While waiting, it maintains the battery with a trickle charge.

- **OFF** position turns off running generator, takes system out of Automatic mode and resets any detected faults.
- **MANUAL** position starts the engine but does not disconnect from utility power. It is used for maintenance or diagnostic functions.

Circuit Breaker — Protects the system from shorts and other over-current conditions. Must be **ON** to supply power to the Automatic Transfer Switch.

Diagnostic LED — Used for troubleshooting operational problems with the Home Generator System. All fault conditions are described in the section LED Fault Light Conditions.

Hour Meter — The hour meter records the total number of hours the generator has been running and is used to schedule maintenance tasks.

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

Generator Clearances

The generator enclosure should be a minimum of 3 ft. (.9 meter) from combustible material. At least 3 ft. (.9 meter) of access room all around the enclosure should be available.

The unit's exhaust port should be at least 5 ft. (1.5 meter) from any building opening (window, door, vent etc.), and the exhaust gases should not be able to accumulate in any occupied area (Figure 4).

Fuel Factors

For proper engine function, the following fuel guidelines are recommended:

- Clean, dry fuel, which is free of moisture or any particulate material should be used.

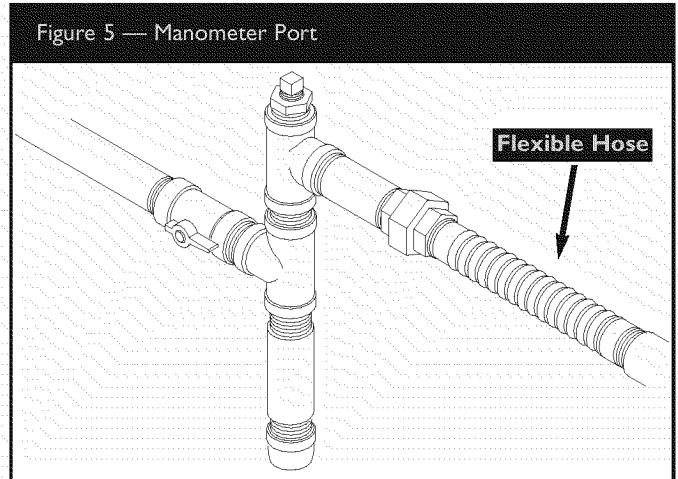
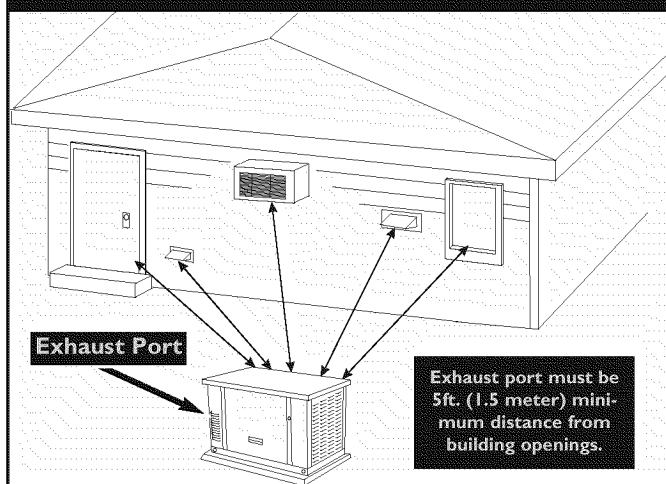


Figure 4 — Home Generator System Clearances



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). Make sure these factors have been considered when determining total generator load output.

Starting The Generator (No Load)

Begin testing the system without any electrical loads connected, as follows:

- Set the AUTO/OFF/MANUAL switch to **OFF**.
- Set the generator's main circuit breaker to its **OFF** (open) position.
- Install the 15 Amp fuse in the control panel.
- Set the AUTO/OFF/MANUAL switch to **MANUAL**.

CAUTION

This equipment is equipped with an automatic safety gas fuel shut-off valve.

• Do not operate the equipment if the fuel shut-off valve is missing or inoperative.

NOTE: If the Home Generator System has been idle for an extended period, it may require that air in the gaseous fuel lines be purged. This may take a few minutes.

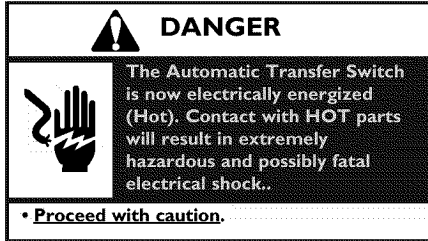
- A manometer port should have been provided (Figure 5).

- The unit will go through its starting cycle.
- If unit failed to start, reset fault light and make sure the fuel is **ON**.
- Listen for unusual noises, vibration or other indications of abnormal operation. Check for oil leaks, evidence of overheating etc. while the unit runs.

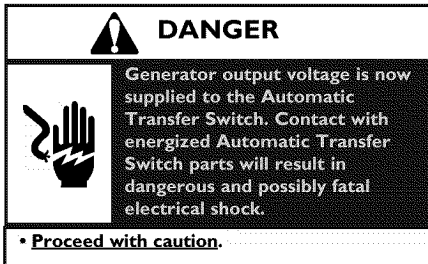
Electrical Checks

With the AUTO/OFF/MANUAL switch set to **OFF**:

- Turn **ON** the main distribution panel circuit breaker that supplies utility power to the Automatic Transfer Switch.



- Use a true RMS AC voltmeter to check utility power voltage across UTILITY CONNECTION lugs in the Automatic Transfer Switch. Nominal line-to-line voltage should be about 240VAC.
- Check utility power between one of the UTILITY CONNECTION lugs and the neutral lug, then between the other UTILITY CONNECTION lug and the neutral lug. Nominal line-to-neutral voltage should be 120VAC.
- Set the generator's main circuit breaker to the **OFF** position. Initial tests will be conducted at no-load condition.
- Set the AUTO/OFF/MANUAL switch to **MANUAL**. The engine should crank and start.
- Let the engine warm up for about five minutes to allow internal temperatures to stabilize. Then, set the generator's main circuit breaker to its **ON** (closed) position.



- Connect a true RMS AC voltmeter and a frequency meter to check generator output across GENERATOR CONNECTION lugs in the Automatic Transfer Switch. Voltage should be about 240VAC, frequency should be 62.0 - 62.5 Hz.



NOTE: If either parameter is outside these ranges, perform the Engine Adjustments described on page 40.

- Check generator output between one of the GENERATOR CONNECTION lugs and the neutral lug, then between the other GENERATOR CONNECTION lug and the neutral lug. In both cases, voltage reading should be about 120VAC.
- Set the generator's main circuit breaker to **OFF**.
- Set the AUTO/OFF/MANUAL switch to **OFF**. Engine should shut down.



IMPORTANT: Do not proceed until you are certain that generator AC voltage and frequency are correct and within the stated limits. To obtain the proper generator frequency, see Engine Adjustments on page 40.

Automatic Operation

To select automatic transfer operation, do the following:

- Set the main distribution panel circuit breaker that sends utility voltage to the transfer switch to **ON**.
- Set the AUTO/OFF/MANUAL switch to **AUTO**.
- Set the generator's main circuit breaker to its **ON** position.

Sequence Of Automatic Events

The generator's control panel houses a logic control circuit board. This control board constantly monitors utility power source voltage. Should that voltage drop below 70%, control board action will signal the engine to crank and start. After the engine starts, the control board signals the transfer switch to activate and connect the protected house circuits to the Home Generator System.

When utility source voltage is restored above the 80% voltage level, the control board signals the transfer switch to transfer loads back to the utility source. After retransfer, the engine is signaled to shut down after about 1 minute for cool-down.

The actual system operation is not adjustable and is sequenced by sensors and timers on the control board, as follows:

Utility Fail

- Utility voltage sensor senses when utility voltage is below 70% of nominal. Engine start sequence is initiated after 6 second delay.

Engine Warm-up Time Delay

- Time delay to allow engine warm-up before transfer fixed at 20 seconds or 50 seconds with optional cold weather package.

Utility Voltage Pickup Sensor

- Voltage pickup level is 80% of nominal voltage.

Retransfer Time Delay

- Retransfer from standby to utility supply 10 seconds after utility voltage is above pickup level.

Engine Cool-down Timer

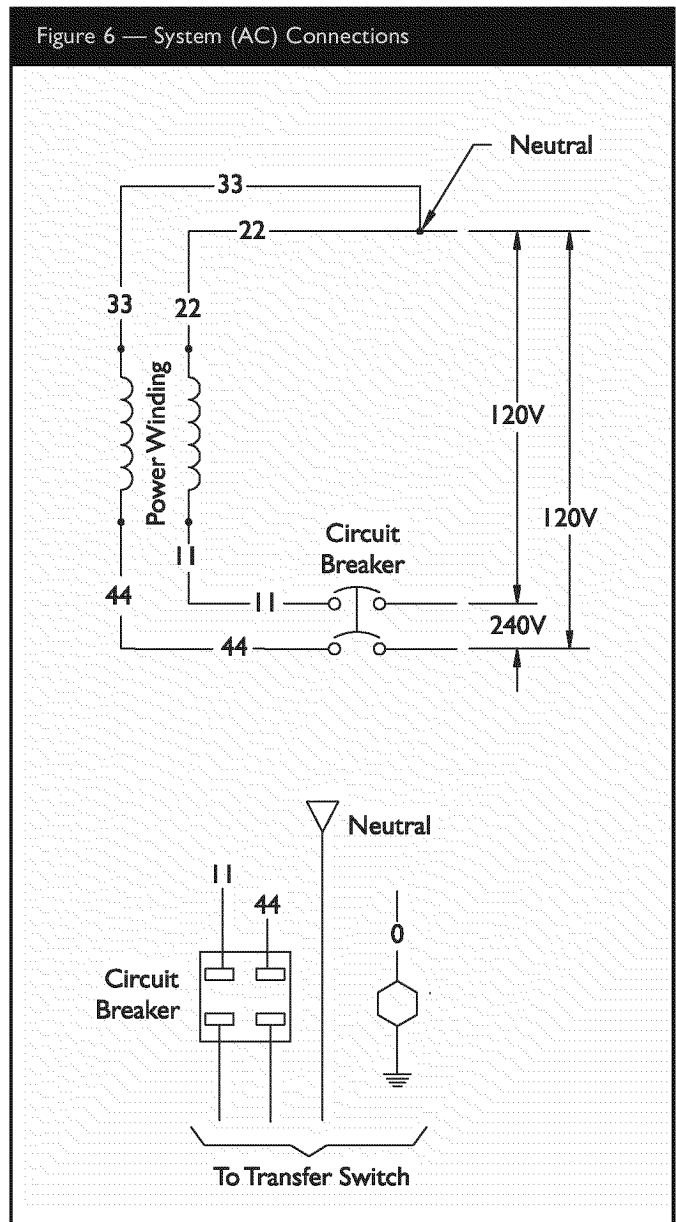
- Engine will run for 60 seconds after retransfer.

Testing of The Automatic Transfer Switch

- Turn the main service disconnect to the **OFF** position. The automatic sequence will follow. To go back to utility power, turn the main service disconnect to the **ON** position.

Generator AC Connection System

A single-phase, three-wire AC connection system is used in the Home Generator System. The stator assembly consists of a pair of stationary windings with two leads brought out of each winding. The two windings are connected together in series, resulting in a fixed 240VAC, 60Hz output. Stator output leads #11 and #44 are the two hot leads. The junction of leads #22 and #33 form the neutral lead (Figure 6).





Checking Automatic Operation

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

- Check that AUTO/OFF/MANUAL is set to **OFF**.
- Apply utility power to the UTILITY CONNECTION lugs of the Automatic Transfer Switch by turning **ON** the main distribution panel circuit breaker.
- Set the AUTO/OFF/MANUAL switch to **AUTO**. The Automatic Power System is now ready for automatic operation.
- Turn **OFF** the main distribution panel circuit breaker that sends utility power to the automatic transfer switch.

The engine will crank and start once the utility voltage drops out and the sensor has timed out. After starting, the transfer switch will transfer the circuit loads to the generator. Let the system go through its entire automatic operation sequence.

- With the generator output supplying its loads, turn **ON** the main distribution panel circuit breaker that supplies utility power to the transfer switch.
- After about 5 minutes of run-time, the automatic transfer switch will transfer loads back to the utility power.
- About one minute after re-transfer, the engine will shut down.

This completes the test procedures for automatic operation. The Home Generator System will now start automatically when utility power is lost and will supply power to the protected circuits in the home.

Stopping the System

To disable the power transfer system for maintenance:

- Ensure that utility power is **ON** and is supplied to the UTILITY CONNECTION lugs of the transfer switch.
- Set the AUTO/OFF/MANUAL switch to **OFF**.
- Set the generator's main circuit breaker to its **OFF** position.

Generator Load Tests

To test the generator with electrical loads applied, proceed as follows:

- Set the generator's main circuit breaker to **OFF**.
- Set the AUTO/OFF/MANUAL switch to **OFF**.
- Turn **OFF** the main circuit breaker, which supplies utility power to the UTILITY CONNECTION lugs of the Automatic Transfer Switch.
- Set AUTO/OFF/MANUAL switch to **AUTO**.

Engine should crank and start immediately.

- Let the engine stabilize and warm up for a few minutes.
- Set the generator's main circuit breaker to **ON**. (Generator power is now supplied to the GENERATOR CONNECTION lugs of the transfer switch).
- Turn **ON** electrical loads. Apply the full rated output of the selected circuits to the generator system.
- Use an accurate AC voltmeter to check generator output voltage across the primary load lugs that supply power to the protected circuits. Voltage should be equal to or greater than 216VAC.
- Connect an accurate AC frequency meter across the primary load lugs of the protected circuits. Frequency should be 57-62.5 Hz.
- Let the Home Generator System run loaded for 20-30 minutes. Listen for unusual noises, check for excessive vibration or other indications of abnormal operation. Check for oil leaks, evidence of overheating etc.
- Turn the Main Distribution Circuit Breaker **ON** (This supplies utility power to the UTILITY CONNECTION lugs of the transfer switch).

The transfer switch should transfer back to utility, the generator will cool down for 1 minute and then shut down.

Reconfiguring The Fuel System

The engine of your Home Generator System is factory calibrated to run on natural gas (NG). It may also be operated on liquefied petroleum (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.

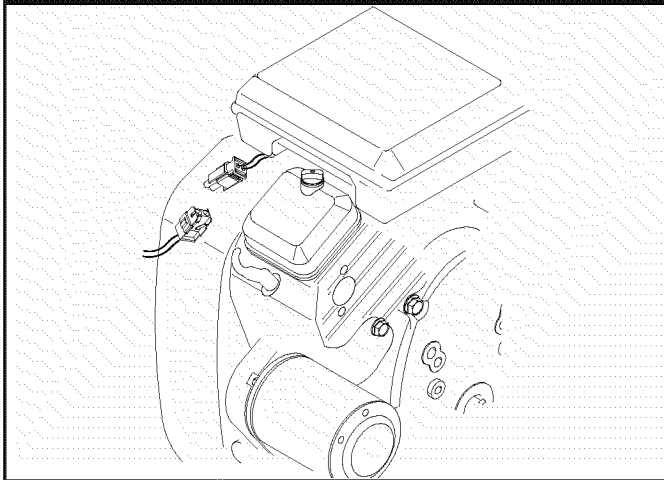
To reconfigure the fuel system for LP use:

- Set the AUTO/OFF/MANUAL switch to **OFF**.
- Set the generator's main circuit breaker **OFF**.
- Remove the 15 Amp fuse.

Activate the fuel transfer solenoid as follows:

- Remove the Oil Service access panel.
- Connect the two-pin electrical connector shown in figure 7. Use the short adapter cable, if supplied.

Figure 7 — Fuel Transfer Solenoid Connection



- Reinstall the Oil Service access panel.
- Reinstall the 15 Amp fuse.
- Set the generator's main circuit breaker **ON**.
- Set the AUTO/OFF/MANUAL switch to **AUTO**.

The system is now ready to operate automatically using LP fuel. With a fixed main jet for LP gas, there is no need to perform any engine adjustments for LP operation.

Setting Exercise Timer

The Home Generator System 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).

A switch on the control panel is labeled Set Exercise (depicted on page 9). The specific day and the specific time of day this switch is pressed is programmed into the control board memory. This date and time is then used to automatically initiate the system exercise cycle.

To perform the SET EXERCISE procedure:

- Choose the day and time you want your Home Generator System to exercise.
- On that day and time, set the AUTO/OFF/MANUAL switch to **OFF**.
- Press and hold down the SET EXERCISE switch. The Diagnostic LED will turn on.
- Release the SET EXERCISE switch.
- Set the AUTO/OFF/MANUAL switch to **AUTO**. Set Exercise is complete.

For example, if you press the SET EXERCISE switch on Sunday morning at 10:00 AM, the unit will run an exercise cycle the following Sunday at 10:00 AM.

NOTE: SET EXERCISE will only work if the unit is in the Automatic mode and this exact procedure is followed. The exerciser does not need to be re-set if the 15 Amp fuse is removed or changed. The exerciser will need to be re-set if the 12 VDC battery is disconnected.

If you want to change the day and time the unit exercises, simply perform the SET EXERCISE procedure on the exact day and time you want it to take place.

CIRCUIT INFORMATION

Power During Fault Conditions

Whenever the Home Generator System is in an uncorrected fault condition, the automatic transfer switch resets to UTILITY POWER. This means that when utility power is restored, it will automatically be applied to all the circuits in the home.

Control Module Assembly (CMA)

The Control Module Assembly (CMA) is a printed circuit board containing all the logic circuits that operate and protect the generator. It is located inside the generator enclosure behind the AIR INTAKE DOOR. It is the control center of the generator. Its functions depend on the input from various circuits throughout the standby installation. Before replacing the CMA, all other circuits must be tested to ensure proper operation. When a failure in the CMA has been determined, the CMA must be replaced as a complete assembly because its individual parts are not serviceable.

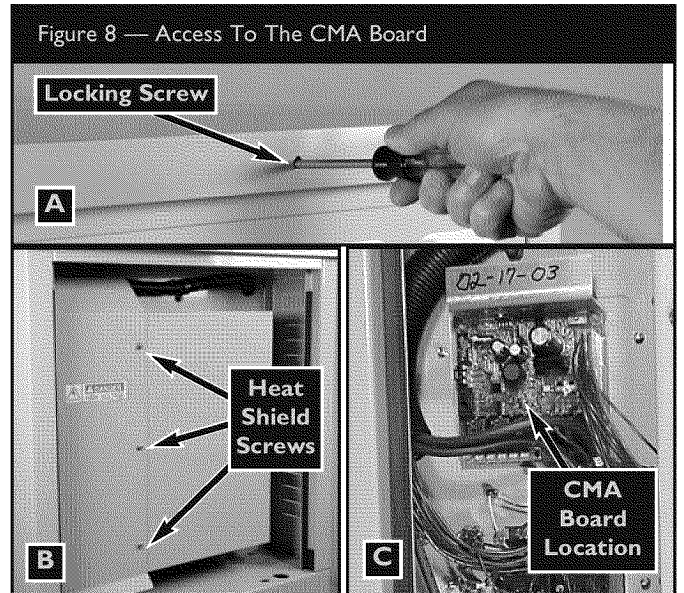
The functions of the CMA include:

- Battery Trickle Charge
- Set Exercise Timer
- Manual Start
- Sensing Utility Voltage
- Automatic Start, in event of utility failure
- Automatic generator power transfer.
- Automatic Engine Cool-Down Timer
- Fault Detection and Automatic Shutdown
- Fault Light Indication (Diagnostic LED)

To gain access to the CMA, refer to figure 8, views A, B & C.

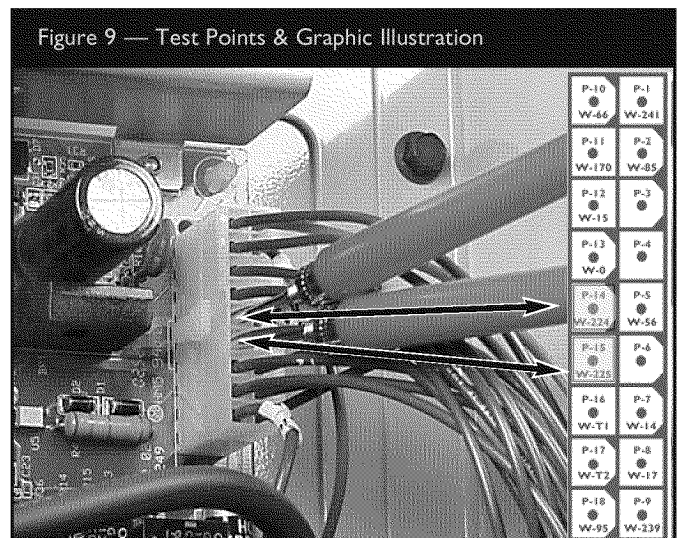
1. Remove the locking screw and the AIR INTAKE DOOR (View A).
2. Remove the three screws holding the shield marked **Danger High Voltage** (View B).

The location of the Control Module Assembly (CMA) is shown in view C.



The CMA is connected to its various circuits through an 18-pin connector that is mounted to the board itself.

When directed to measure an electrical value, the location of the measurement is shown in the form of a picture and the corresponding pin of the connector is shaded in a graphic illustration that is specific to each test being performed (Figure 9).

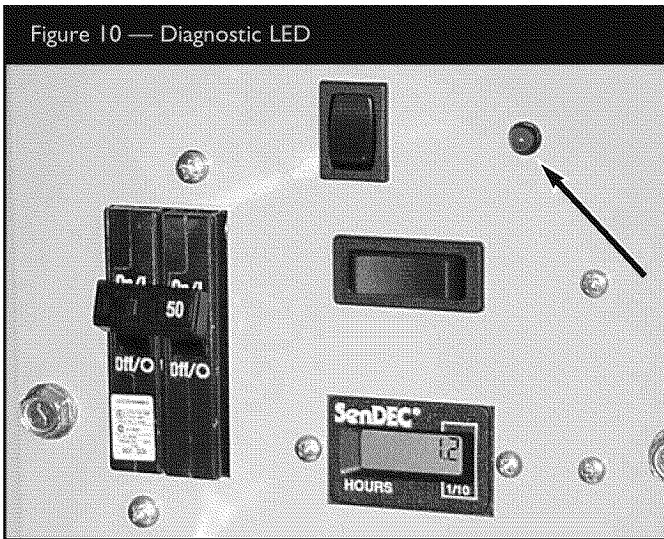


A detailed illustration of the entire connector, as well as the functions of each individual pin, is given on page 17.

LED Fault Light Conditions

The generator may have to run for long periods of time with no operator present. For that reason, the CMA is equipped with sensing circuits that automatically shut down the generator in the event of potentially damaging conditions such as low oil pressure, high oil temperature, over speed, and other conditions.

A light on the control panel (Figure 10), called the Diagnostic LED will flash on and off in a series of blinks. The blink pattern is repeated with a brief pause between each set.



The number of blinks in the series indicates the detected fault. These conditions are listed on the control panel and below:

Number of LED Flashes	Fault Description
1	Low Battery Voltage
2	Low Oil Pressure
3	Low Voltage
4	Engine Fail to Start
5	Low Frequency
6	Engine Overspeed
7	Oil Temperature High

Resetting The Fault Detection System

An operator or technician must reset the fault detection system each time it activates.

To do so:

- Place the AUTO/OFF/MANUAL switch in the **OFF** position for 30 seconds or more.
- Place the AUTO/OFF/MANUAL switch in the **AUTO** position.

If the fault is not corrected, it will be detected again and the unit will again go into Auto Shutdown with the same fault light indication.

Trickle Charge Operation

The trickle charge circuit is a Float Charger Type and is designed to maintain the voltage of the battery. When utility voltage is present and the unit is switched to the **AUTO** or **OFF** position, the trickle charger will maintain the voltage of a fully charged battery. It will not recharge a dead battery. With the engine running, the trickle charge system is shut down by the CMA and battery voltage is maintained by the generator battery charge winding.

Refer to the Control System Schematic on pages 56-57. Utility voltage is delivered from the fuses in the transfer switch through the terminal strip to the step-down transformer with wires N1 and N2. From the transformer, 24VAC is delivered to the CMA through Wires #224 and #225. The CMA rectifies this 24VAC to 12VDC. This is delivered to the battery via **Pin #12, Wire #15**, through the 15 Amp fuse, and on to the battery with Wire #13.

Fuel Supply

The following fuel supplies are necessary to ensure effective generator operation (Figure 11).

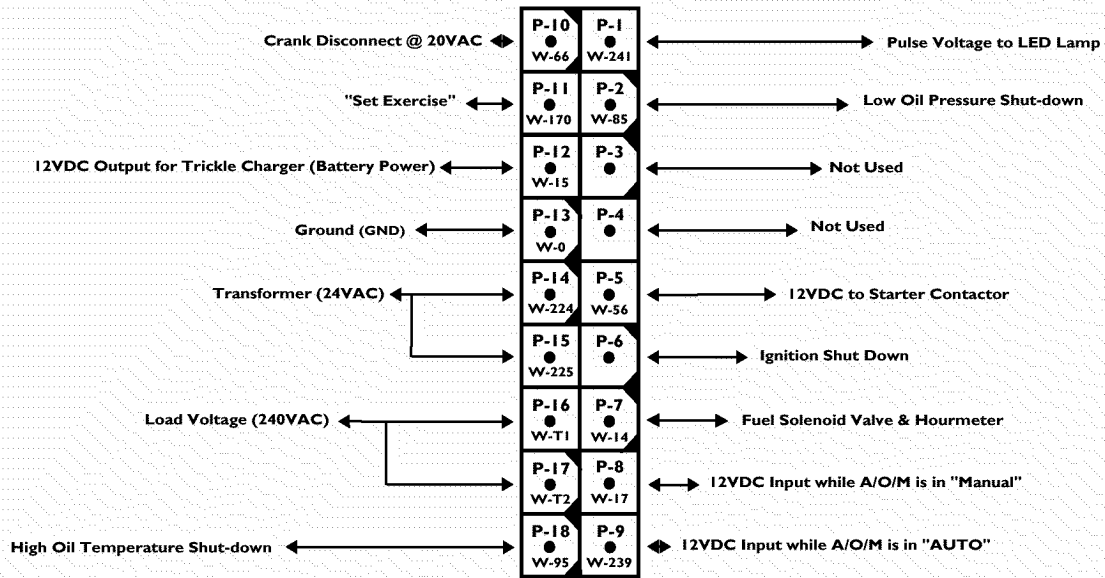
Figure 11 — Fuel Consumption Table

Model	Natural Gas*		LP Vapor**	
	1/2 Load	Full Load	1/2 Load	Full Load
1938(10kW)	84	162	34.19	65.81

* = Natural Gas in cubic feet per hour
** = LP Vapor in gallons per hour/cubic feet per hour

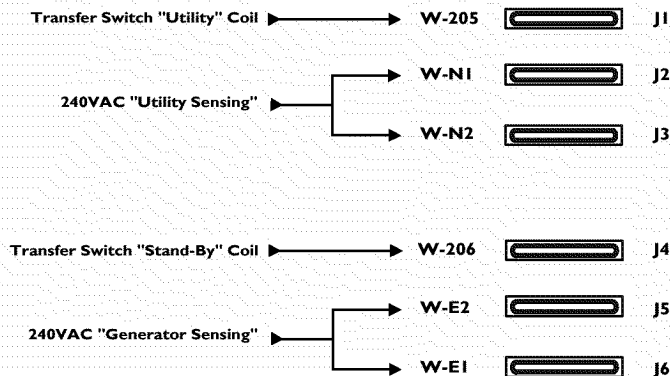
Figure 12 — Control Module & Switch Module Assemblies — Connector Pins, Functions & Wire Numbers for Model 1938

**Control Module Assembly (CMA)
Connector Pins, Functions & Wire Numbers
(As seen from wire side of connector in the generator)**

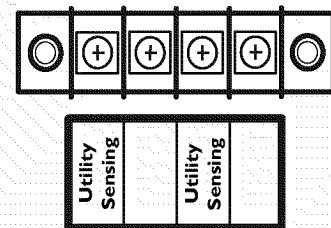


P - Pin Number W - Wire Number A/O/M - AUTO/OFF/MANUAL GND - Ground

**Transfer Switch Module Assembly (TSMA)
Connector Pins, Functions & Wire Numbers
(As seen from inside to 100/200 AMP transfer switch only)**



**Terminal Board
(As seen from inside the generator)**



NOTES

A large grid of dotted lines for taking notes, covering most of the page below the 'NOTES' header.



TROUBLESHOOTING INFORMATION

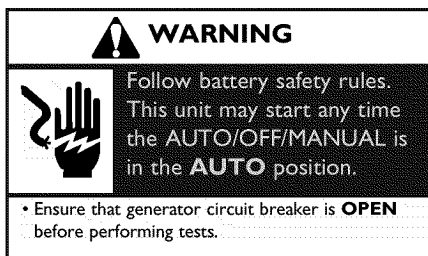
MODEL 1938 (10KW)

Troubleshooting

TROUBLESHOOTING LED FAULTS

Dead Unit / Low Battery Voltage: (No Blink [] / One Blink [•])

A unit with a completely depleted starting battery will not be capable of powering the Diagnostic LED (no blink). When the generator cannot start because the battery output power is below that needed to crank the engine, the Diagnostic LED will have an indication (one blink). The causes for either of these problems may be a failed battery, a parasitic drain on the battery or a failed trickle charger. The test and repair procedures for these three conditions are outlined below.



Check Battery:

- Switch AUTO/OFF/MANUAL to **OFF**.
- Remove 15 Amp fuse.
- Disconnect battery cables.

Using the approved procedure for your battery tester, check the state of charge.

- Recharge battery, if required, and retest.

If battery replacement is required, use current BRIGGS & STRATTON recommended replacement part.

- Connect the battery cables.
- Reinstall the 15 Amp fuse.

Check Trickle Charging System:

NOTE: Depending on the state of charge of a battery, a slight (+) current flow indicates that the charging system is working. (.033 Amp for a fully charged battery to .612 Amp for a depleted battery)

Follow the recommendations of your meter's instruction manual.

- Install DC Amp meter between Negative (-) battery terminal and Negative (-) battery cable.

• If a (+) current flow is detected:

The trickle charge system is functioning.

- Connect Negative (-) battery cable.
- Reset the Fault Detection system
- Start unit.

• If a zero or negative (-) Amp draw is detected:

Troubleshoot The Trickle Charging System:

NOTE: If the diode in the battery charge rectifier shorts, it will drain the battery to ground.

Symptom: The battery charge resistor is warm, even when the unit isn't or hasn't been running.

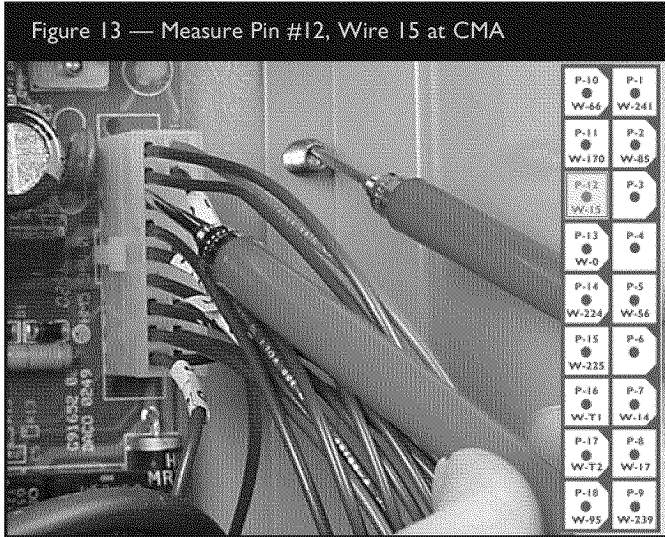
- Repair and/or replace defective wiring or components.

CAUTION: Do not allow disconnected cables to come in contact with ground during these tests.

- Remove 15 Amp fuse.
- Remove the (-) battery cable.
- Replace 15 Amp fuse.

With (+) battery cable removed, select **AUTO** at the AUTO/OFF/MANUAL switch.

- Measure for DC voltage at **Pin #12, Wire #15**, at the CMA and Ground (Figure 13).

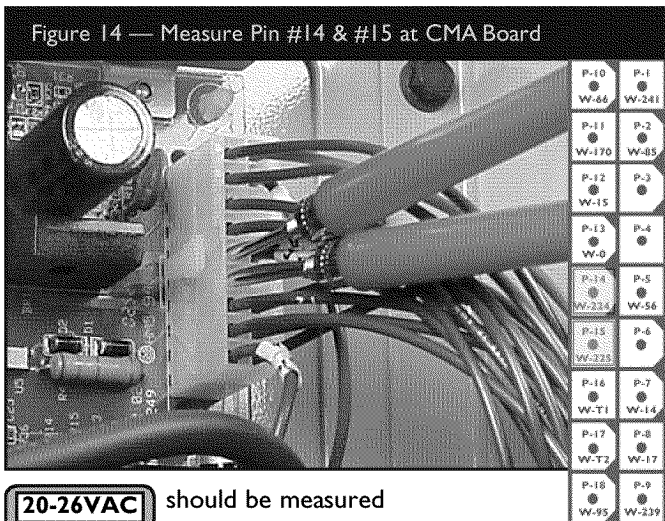


12-14VDC should be measured.

- If charging voltage at the CMA board is OK:
 - Repair fuse, wiring and/or connections between **Pin #12, Wire #15** between the CMA and (+) battery cable.
 - Recheck for charging voltage at (+) battery cable.
- If trickle charge voltage (14VDC) is not at the CMA board:
 - Proceed with Stepdown Transformer Inspection.

Check The Step-down Transformer

- Measure for AC voltage across **Pin #14, Wire #224 & Pin #15, Wire #225** at CMA (Figure 14).



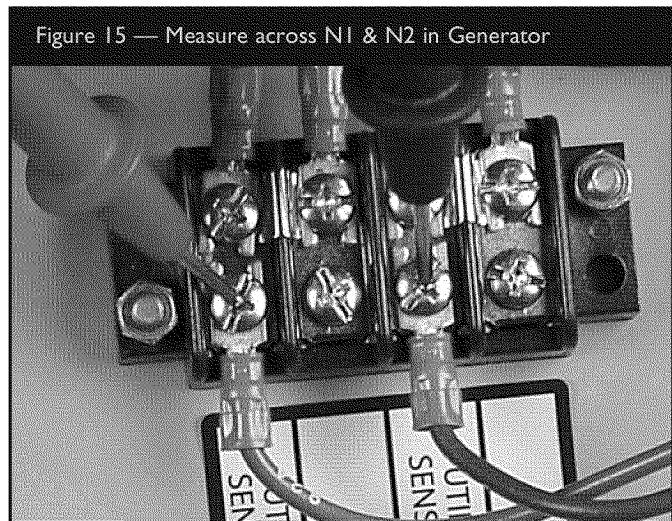
20-26VAC should be measured

- If 20-26VAC is present (going in) on **Pins #14 & Pin #15**, but 12VDC was not measured (coming out) at **Pin #12, Wire #15**, with the AUTO/OFF/MANUAL switch set to **OFF**:

Verify Ground connection on CMA circuit board.
(See Figure 27)

Verify that there are no other faults BEFORE replacing the CMA circuit board.

- Replace The CMA board.
- If 20-26VAC is not at present at **Pin #14 & #15**:
 - Measure AC voltage across **N1 & N2** at the generator terminal strip (Figure 15).



Approx. 240VAC should be measured.

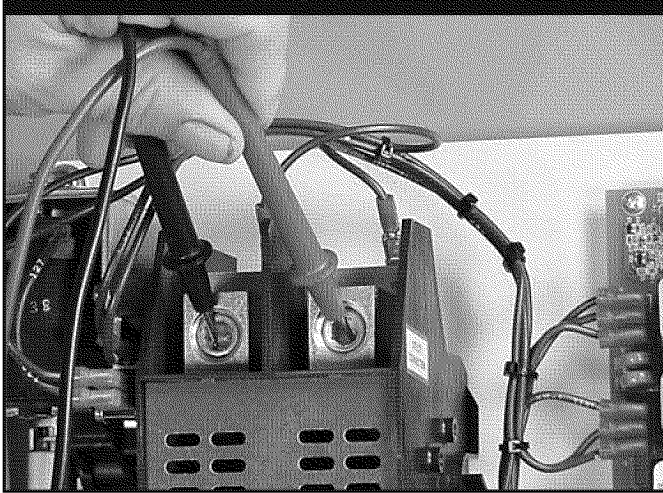
- If 240VAC is present at N1 & N2 but 20-26VAC is not present at CMA:
 - Repair and/or replace wiring, connectors or step-down transformer.

NOTE: Make sure to check the fuses in the transfer switch.

Troubleshooting

- If 240VAC is not present at wires **N1** & **N2** in generator:
 - Measure for 240VAC at **UTILITY CONNECTION lugs** in transfer switch (Figure 16).

Figure 16 — Measure across N1 & N2 in Transfer Switch



240VAC

should be measured.

- If voltage is present at the transfer switch terminal strip:
 - Repair wiring between generator and transfer switch terminal strips.
- If no voltage is present at transfer switch terminal strip:
 - Check fuses/wiring in transfer switch and repair or replace as necessary.
 - Reset the Fault Detection system by:
 - Placing the AUTO/OFF/MANUAL switch in the **OFF** position for 30 seconds or more.
 - Close the generator circuit breaker.
 - Set AUTO/OFF/MANUAL switch to **AUTO**.
 - Remove utility voltage and verify system operation.
 - Reinstall all enclosure panels and return system to standby configuration.

Low Oil Pressure: (Two Blinks [• •])

The generator unit is equipped with an oil pressure switch. The contacts of the switch are normally closed (NC) and are held open by engine oil pressure during operation. Should the engine oil pressure drop below 8 psi, the switch contacts will close, creating a connection to ground and the engine will be shut down.

The following sequence of events takes place during the first 10 second interval after engine startup:

- Oil PSI switch is normally closed (NC).
- CMA bypasses oil PSI switch during initial crank.
- Switch opens after engine has started and produces oil pressure.
- CMA senses engine is running by sensing frequency on **Pin #10, Wire #66**.
- Once CMA senses engine is running, the CMA looks for a ground on **Wire #85**.
- If ground is present on **Wire #85**, CMA will shut engine down and the LED will flash in a set of two blinks.

To remedy a low oil pressure condition, fix any obvious oil leak and/or add the recommended oil to the **FULL** mark on the dipstick.

- Reset the Fault Detection system as described earlier.
- Start the generator (No Load, as described on page 10).

If a low oil pressure condition still exists, the engine will start and shut down after about 10 seconds and the Diagnostic LED will flash in a set of two blinks.

Low Oil Pressure Troubleshooting Procedure:

- Select **OFF** at the AUTO/OFF/MANUAL switch.
- Remove the 15 Amp fuse.
- Remove utility voltage.
- Remove 18-pin connector from CMA
- Remove **Wire #85** from oil PSI switch (Figure 17).

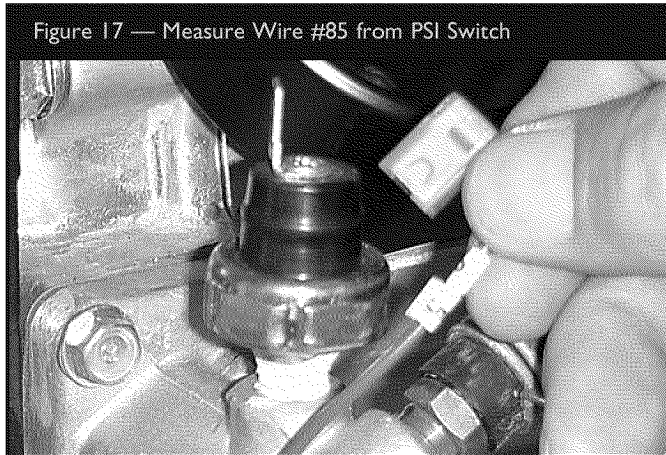


Figure 17 — Measure Wire #85 from PSI Switch

- Measure for short-to-ground on **Wire #85**.
- If a short is detected:
 - Repair and/or replace wiring, as necessary.
- If no short is detected:
 - Remove oil pressure switch and install oil pressure gauge.
 - Re-install connector at CMA board.
 - Re-install 15 Amp fuse.
 - Turn utility **ON**.
 - At the AUTO/OFF/MANUAL switch, select **MANUAL**.

The engine should start and run.

N **NOTE:** Oil Pressure @ 70° F (21° C):
10 ~ 50 PSI
(0.7 ~ 3.5 Bar)

- If oil pressure is low:
 Refer to engine service manual for repair procedures.
- If problem persists:
 - Replace oil pressure switch.
- If oil pressure is normal:

Verify Ground connection on CMA circuit board.
 (See Figure 27)

Verify that there are no other faults
BEFORE
replacing the CMA circuit board.

- Replace CMA.

- Replace the 15 Amp fuse.
- Close the generator circuit breaker.
- Set AUTO/OFF/MANUAL switch to **AUTO**.
- Remove utility power and verify system operation.
- Re-install all enclosure panels and return system to Automatic standby configuration.

Low Voltage: (Three Blinks [• • •])

The Low Voltage shutdown is designed to protect the generator and its loads from an output voltage that is too low. When utility power fails, the engine on the Home Generator System has started and the transfer switch has transferred the loads to the generator, the CMA senses output voltage at **Pins #16 and #17** on wires **T1** and **T2** (Refer to the schematic on pages 56-57). If the CMA does not sense generator voltage, it will shut down the generator and the Diagnostic LED will blink in a set of three.

This condition may be caused by:

- A restriction in the fuel flow
- A broken or disconnected signal lead
- A failed alternator winding
- An open control panel circuit breaker
- An open in the neutral circuit.

Low Voltage Troubleshooting Procedure:

Gain access to the generator unit by removing the air intake and control panel doors and remove the cover to the back of the CMA board (See Page 15, Figure 8).

- Reset the fault indication LED by selecting **OFF** at the AUTO/OFF/MANUAL switch for 30+ seconds.

Ensure that the generator circuit breaker is in the **CLOSED** position and the 15 Amp fuse is installed and functional.

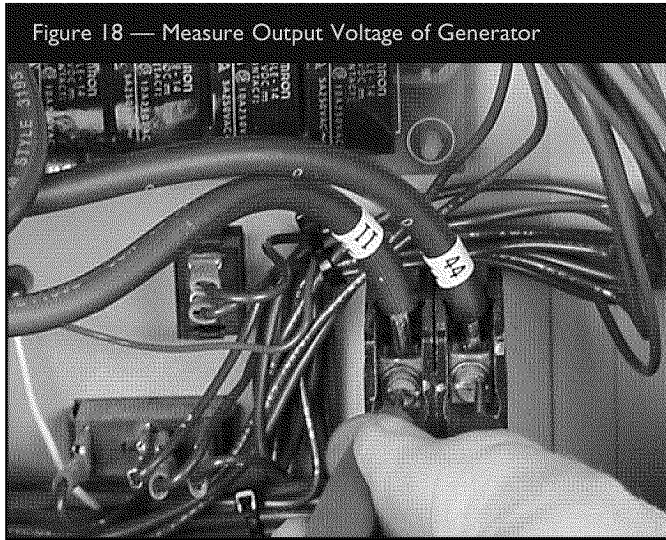
- Perform a manual start.

When the unit has stabilized, check the generator output:

- Measure the voltage at the input and output screws on the back of the circuit breaker (Figure 18).

Troubleshooting

Figure 18 — Measure Output Voltage of Generator



About 240VAC

should be measured.

Engine Fails To Start: (Four Blinks [••••])

This is a feature of the control module assembly (CMA) that prevents the standby unit from damaging itself by continually attempting to start, in spite of a problem that is beyond the CMA's ability to monitor. Whenever the unit is directed to start (MANUAL or AUTO), the CMA delivers 12VDC from **Pin #5, Wire #56** to the starter contactor for 15 seconds. It then pauses for 15 seconds and repeats the attempt until 90 seconds of start time have accumulated.

During the 15 second starting attempt, the CMA simultaneously delivers 12VDC from **Pin #7, Wire #14** to the hour meter and fuel solenoid(s) while monitoring **Pin #10, Wire #66** for a minimum frequency signal. This frequency terminates the delivery of start voltage to the starter contactor. If the minimum frequency signal has not been sensed after 90 accumulative seconds of start time, the CMA terminates the engine cranking cycle and triggers the LED to flash in a set of four blinks.

This directs the service technician to examine supporting systems that could prevent the standby system from operating.

For example:

- No Fuel
- Fuel Solenoid Failure
- Fuel Supply Discrepancies
- Failed Starter Motor
- Failed Starter Motor Connections
- Engine Component Failures
- Clogged Engine Air Filter
- Loose Spark Plugs
- Failed and/or Damaged Wiring
- Clogged atmospheric vent.

Troubleshooting Procedure:

- Reset the fault indication LED by selecting **OFF** at the AUTO/OFF/MANUAL switch for 30+ seconds.
- Select **MANUAL** at the AUTO/OFF/MANUAL switch and observe system operation.

Two possible conditions will exist;

Engine cranks but fails to start: (Page 25).

Engine fails to crank: (Go to page 28).

Engine Cranks But Fails To Start:

Ensure that adequate fuel is available to operate the standby system.

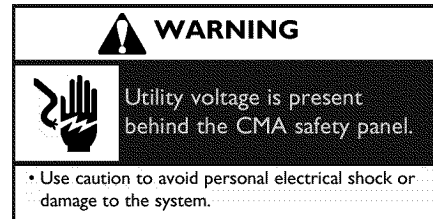
- Inspect the fuel supply tank to verify that the main supply valve is open.
- Inspect fuel supply plumbing for any shut-off valves that may be closed.

N **NOTE:** Fuel shut-off valves are often installed as a discretionary convenience to the owner. Therefore, the number of shut-off valves may vary with the circumstances of each installation. Be sure to trace the entire fuel supply system.

- Correct any fuel supply problems.
- Reset the fault indication LED by selecting **OFF** at the AUTO/OFF/MANUAL switch for 30+ seconds.
- Select **MANUAL** at the AUTO/OFF/MANUAL switch and observe system operation.
- If no fuel supply discrepancies are present, and engine cranks but fails to start:
- Remove the four access panels to the generator unit.

Inspect the standby unit for any obvious broken or corroded electrical connections. Starting at the control panel, visually inspect wiring and terminals associated with the following components:

- Oil Pressure and Oil Temperature _____
- # 1 Spark Plug Lead _____
- Remove the plug lead and check that the plug is tight in the engine. _____
- Starter Contactor _____
- Fuel Solenoid _____
- Generator and Engine Grounds _____
- Starter Motor _____
- # 2 Spark Plug Lead _____
- Remove the plug lead and check that the plug is tight in the engine. _____



Gain access to the control module assembly by removing the CMA safety panel (Figure 8 on page 15).

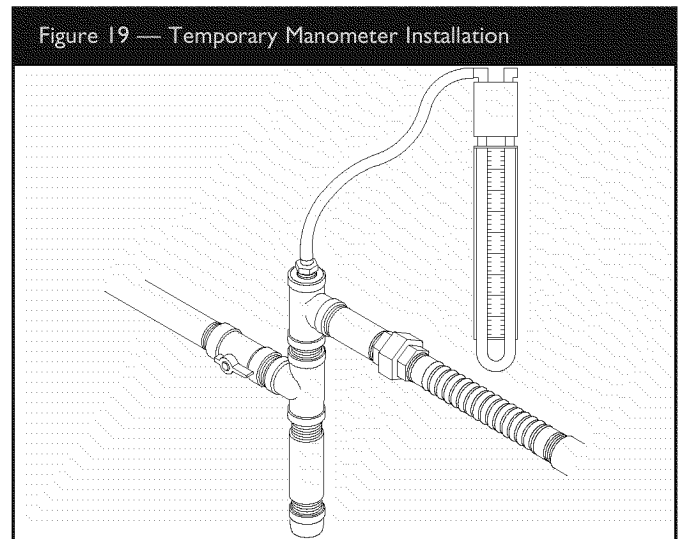
- Terminal board _____
- All component connections _____
- 18-Pin connector on the CMA board. _____

Repair and/or replace any damaged wiring or terminal connections.

- Reset LED, attempt **MANUAL** start and observe system operation.
- If there are no obvious electrical faults, and the problem persists:

Verify that fuel pressure is available to the fuel solenoid.

- Install a manometer, as illustrated in figure 19.



11 to 14 inches of water (in. W.C.) - LP
5 to 7 inches of water (in. W.C.) - NG

should be measured.

Troubleshooting

- If the proper fuel pressure is not present:
 - Repair and/or replace fuel delivery system.
 - Re-test fuel pressure as described above.

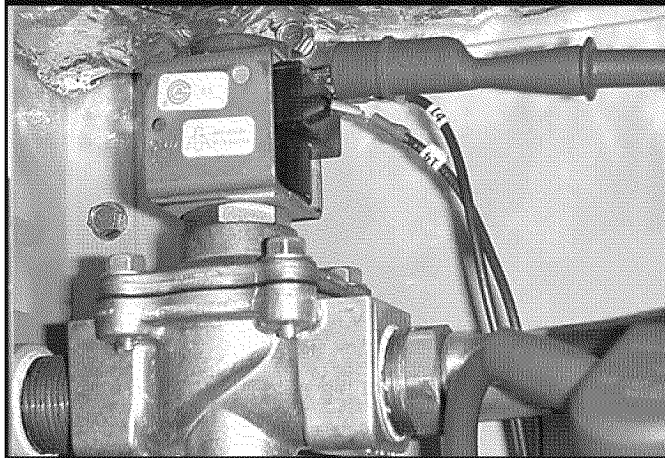
- If fuel pressure is acceptable:

Check the Fuel Solenoid.

While the engine is cranking:

- Check for DC voltage at the fuel solenoid (Figure 20).

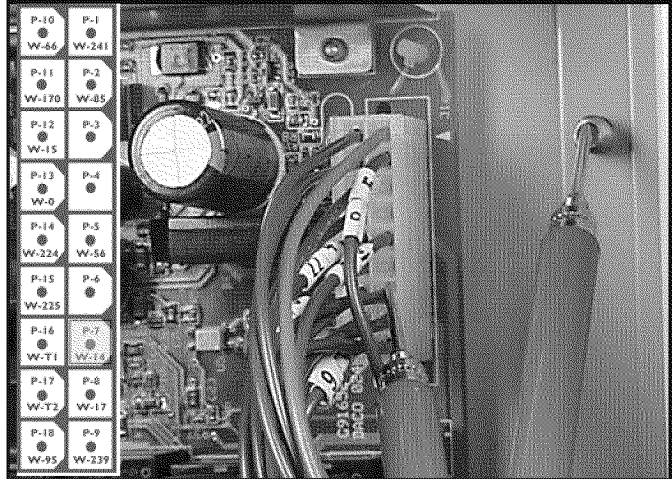
Figure 20 — Check Fuel Solenoid for DC Voltage



7-12VDC should be measured.

- If no voltage is present at the fuel solenoid:
- Check for voltage at **Pin #7, Wire #14** at the CMA harness connector (Figure 21).

Figure 21 — Check Pin #7, Wire #14 at CMA Connector



7-14VDC should be measured.

- If no voltage is present:

Verify Ground connection on CMA circuit board.
(See Figure 27)

Verify that there are no other faults BEFORE replacing the CMA circuit board.

- Replace the CMA Circuit Board.
- If voltage is present at the solenoid:

The fuel solenoid delivers fuel pressure to the fuel regulator. The regulator delivers fuel to the carburetor when a negative pressure is created by the intake stroke of the engine pistons. If fuel and fuel flow are present without ignition, the gas must be expelled through the exhaust pipe.

Gas Regulator

The gas regulator is an atmospheric zero governor which acts like the float and needle valve in a gasoline carburetor. Air flow through the venturi in the carburetor creates a vacuum which acts through an internal outlet on the diaphragm.

Atmospheric pressure then forces the diaphragm toward the vacuum, depressing the lever and pulling the valve seat away from the orifice which allows fuel to flow, as long as the demand persists. When the vacuum ceases, a spring force pushes on the lever and forces the valve seat against the orifice -shutting off the fuel flow.

NOTE: Fuel should not flow through the gas regulator when the engine is not running.

The easiest way to check the mechanical operation of the fuel solenoid and the fuel regulator is to smell the exhaust during the starting sequence.

⚠ DANGER

Extinguish all sources of fire and do not smoke while performing this inspection.

- If fuel is detected, proceed to Check Ignition Spark on page 28.
- If no indication of fuel is detected at the exhaust pipe during the starting sequence:

Check the fuel solenoid and/or fuel regulator for evidence of mechanical failure.

- Remove the pipe plug that caps the regulator test port and install a manometer (Figure 22).

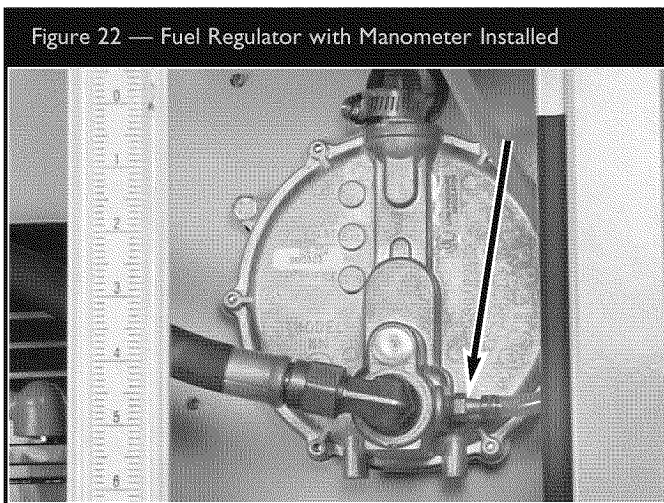


Figure 22 — Fuel Regulator with Manometer Installed

NG = 5 to 7 (in. W.C.)
LP = 11 to 14 (in. W.C.)

should be measured while the fuel solenoid is activated.

- If no fuel pressure is measured:
 - Replace the fuel solenoid.
- If fuel pressure is measured:

Refer to figure 23 for the following procedure.

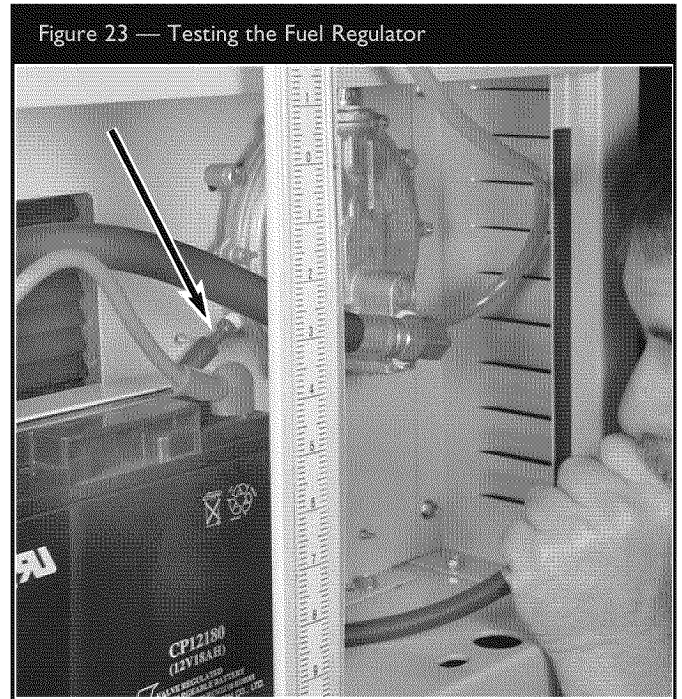


Figure 23 — Testing the Fuel Regulator

The fuel regulator has one atmospheric vent that balances diaphragm pressures.

- Install a 1/8 NPT barb fitting that has a 2 ft. length of hose attached to it.
- Plug the other vent hole.
- Gently blow into the hose.

CAUTION: Do not use compressed air. The regulator diaphragm is easily ruptured.

While the fuel solenoid is energized, this pressure will allow fuel to pass through the regulator. This fuel flow 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:
 - Refer to the BRIGGS & STRATTON Engine Service Manual to determine the condition of the gaseous fuel carburetor.

Check Ignition Spark:

- Turn off the manual fuel valve that is located on the outside of the building.
- Refer to the Briggs & Stratton Engine Service Manual to determine the proper method for checking the engine for ignition spark.

Engine Fails to Crank:

Check the 15 Amp fuse.

- Remove the control panel door
- Inspect 15 Amp fuse, reinstall or replace.

•• If fuse was replaced, reset LED:

- Place the AUTO/OFF/MANUAL switch in the **OFF** position for 30 seconds or more.
- Attempt **MANUAL** start and observe system operation.

•• If the fuse is OK:

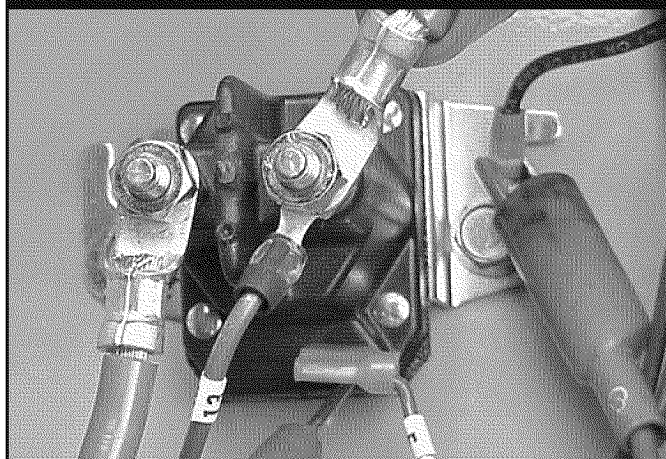
Check the starter contactor.

- **OPEN** the generator circuit breaker.
- Reset LED.
- Gain access to the starter contactor by removing the battery door.

Select the **MANUAL** position of the AUTO/OFF/MANUAL switch and while the engine start cycle is in progress:

- Measure for a voltage at the coil terminals of the starter contactor, as shown in figure 24.

Figure 24 — Measuring Coil Terminals of Starter Contactor



7-14VDC should be measured.

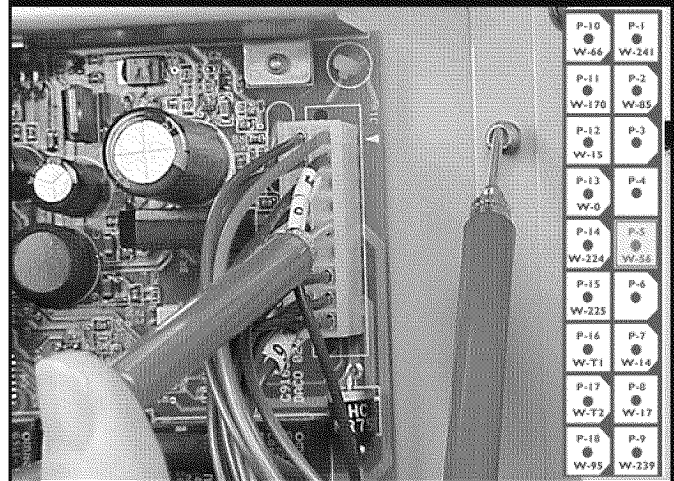
NOTE: Remember that the CMA only delivers 12VDC to the starter contactor for 15 seconds and then rests for 15 seconds.

- If no voltage is present at the coil terminals of the starter contactor:

Gain access to the CMA circuit board by removing the air intake door and the CMA safety panel (Page 15, Figure 8).

- Measure the voltage at **Pin #5, Wire #56** to ground, as shown in figure 25.

Figure 25 — Measure Pin #5, Wire #56 at the CMA



9-14VDC

should be measured while cranking.

Verify Ground connection on CMA circuit board.
(See Figure 27)

Verify that there are no other faults
BEFORE
replacing the **CMA** circuit board.

- If no voltage is measured:
 - Replace the CMA circuit board.
- If 9-14VDC is present at the starter contactor:
 - Measure the voltage at the starter, as shown in figure 26.

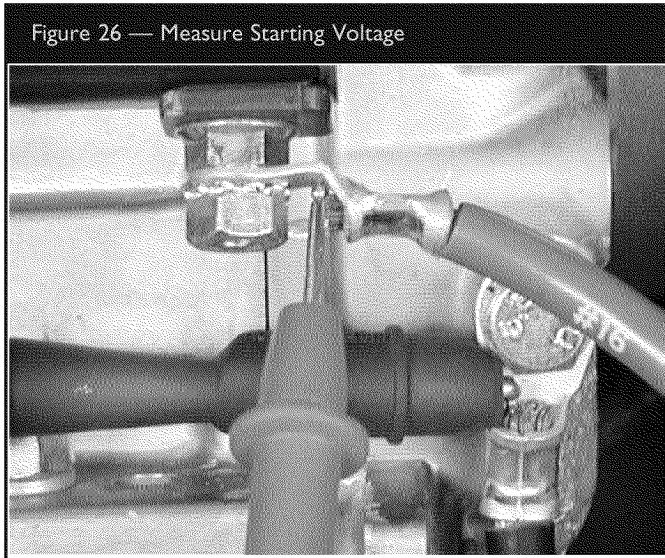


Figure 26 — Measure Starting Voltage

7-14VDC should be measured at the starter terminal and ground during the period that the CMA delivers 12VDC to the terminals of the starter contactor.

- If voltage is present but the starter won't engage:
 - Check the engine grounding cable for good contact.
 Repair or replace any defects with the grounding cable.
- If no voltage is present at the starter terminal:
 - Replace the starter contactor.
- If starting voltage is present at the starter terminal:
 - Refer to the BRIGGS & STRATTON Service Manual for procedures to check the engine starter.

Low Frequency: (Five Blinks [•••••])

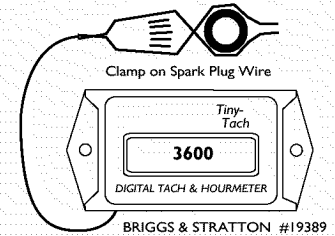
The low frequency shutdown feature is designed to protect the generator and the devices connected to the protected circuits from an output frequency that is too low. The CMA senses a frequency of 60 Hz at **Pin #10, Wire #66**. If output frequency drops below a minimum for more than a few seconds, the CMA will shut down the generator and trigger the diagnostic LED to blink in a set of five blinks.

This condition may be caused by a failed engine governor or by excessive loads on the protected circuits of the house.

Low Frequency Troubleshooting Procedure:

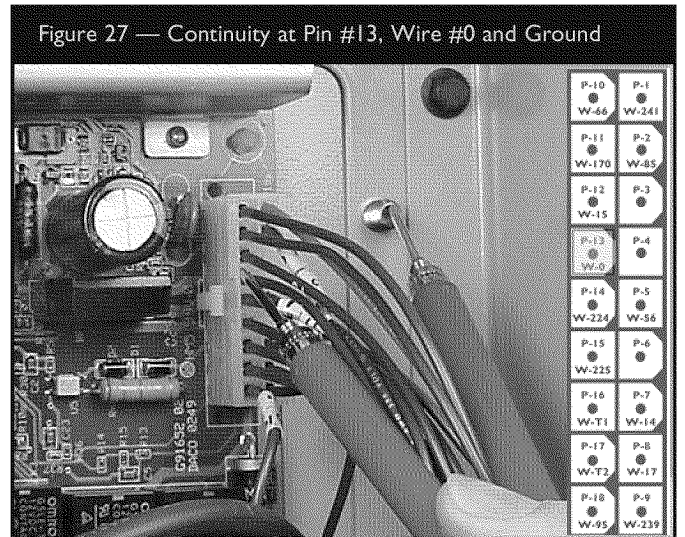
Check engine RPM.

- Set engine RPM to 3600, as specified in the BRIGGS & STRATTON engine service manual.



Verify that the Control Module Assembly (CMA) is grounded.

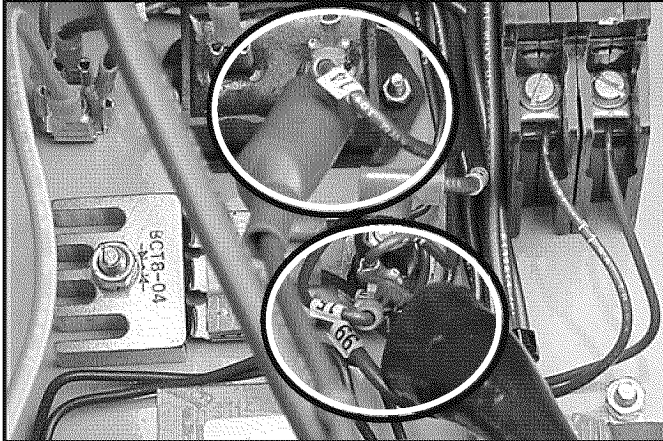
- Check for continuity between **Pin #13, Wire #0** and **Ground** as shown in figure 27.




- If no continuity is measured:
 - Repair and/or replace any defective wiring or terminals.
 - Retest continuity between **Pin #13, Wire #0** and **Ground** as shown in figure 27.
- If continuity is measured:
 - Install a jumper wire between **Wire #15** at the fuse holder and **Wire #14** at the hour meter as illustrated in figure 28.

Troubleshooting

Figure 28 — Jump Wire #15 at Fuse & #14 at Hourmeter



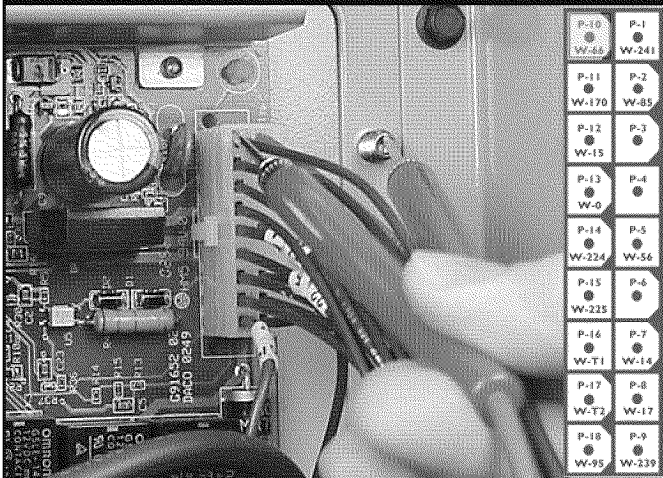
⚠ DANGER

 This jumper will energize the fuel solenoid and allow the engine to run for testing purposes.

- The only way to stop the engine is to remove the jumper wire.

- Select **MANUAL** at the AUTO/OFF/MANUAL switch and allow engine to start and stabilize.
- Measure voltage and frequency at **Pin #10, Wire #66** and Ground as shown in figure 29.

Figure 29 — Voltage & Frequency at Pin #10, Wire 66 & Ground



18-22VAC @ 60-62Hz should be measured.

N NOTE: Follow the Frequency Measurement instructions that apply to the type of meter you are using.

- If frequency and voltage are correct:

Verify Ground connection on CMA circuit board.
(See Figure 32)

Verify that there are no other faults BEFORE replacing the CMA circuit board.

- Replace CMA Circuit Board.
- If frequency is not correct:
Check engine RPM.

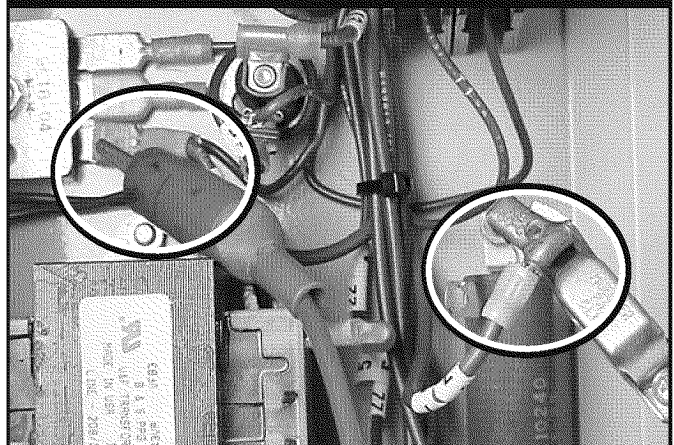
- Set engine RPM to 3600, as specified in the BRIGGS & STRATTON engine service manual.

- If voltage is not correct:

While the engine is running;

- Measure voltage and frequency at **Wire #66** and **Wire #77** as shown in figure 30.

Figure 30 — Voltage & Frequency at Wire #66 & Wire #77



18-22VAC & 60-62 Hz should be measured.

- If no output voltage is measured:

- Check for open Battery Charge Winding (BCW) (Refer to Checking The Battery Charge Winding on page 45.
- Repair or replace as necessary.

- If 18VAC is measured while the engine is running:
 - Measure the output from the battery charge rectifier between **Wires #66** and **Wire #0** as shown in figure 31.

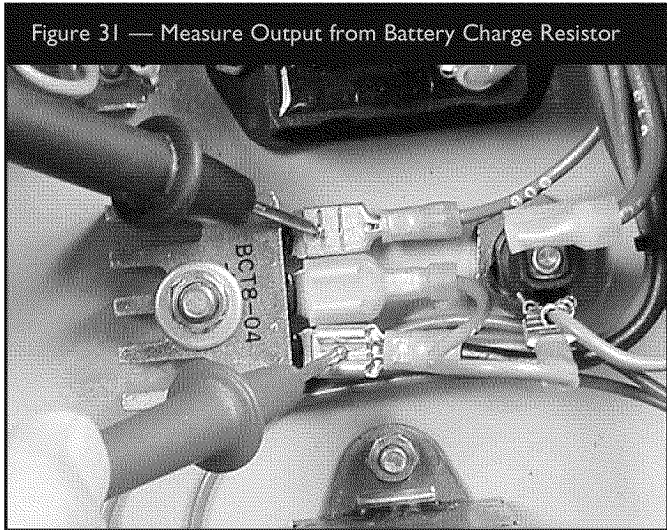


Figure 31 — Measure Output from Battery Charge Resistor

18-22VAC & 60-62 Hz should be measured.

- If 18-22VAC is not measured:
 - Check/test for open resistor.
 - If Resistor is OK:
 - Check for open/faulty wiring.
- Repair as necessary and retest.

Over Speed: (Six Blinks [••••••])

This feature of the Home Generator System protects devices that are wired into the protected circuits by shutting down the generator if it runs faster than the governed RPM limit (3600 RPM).

The control module assembly (CMA) senses frequency output at **Pin #10, Wire #66**.

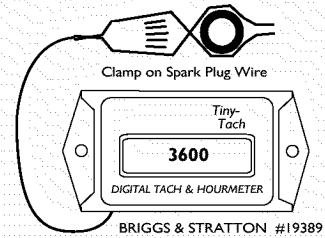
If the generator output frequency (directly proportional to engine RPM) gradually increases from 60 Hz and exceeds 72 Hz for five seconds, the CMA shuts the generator down and directs the fault indication LED to flash in a set of six blinks.

If the generator output frequency exceeds 75 Hz, the CMA shuts the generator down instantly and initiates the fault indication LED to flash in a set of six blinks.

The reason for this latitude in sensing output frequency is that often a governor will hunt for the desired setting. This causes variable frequency outputs that are not harmful until they reach the 72 Hz limit. Should the governor fail completely, the RPM will increase uncontrolled. In this case, the generator will appear to stall immediately after starting. In reality, it is shut down when the output frequency reaches 75 Hz.

Check engine RPM.

- Set engine RPM to 3600, as specified in the BRIGGS & STRATTON engine service manual.



Over Frequency Troubleshooting Procedure:

Verify that the Control Module Assembly (CMA) is grounded.

- Check for continuity between **Pin #13, Wire #0** and **ground** as shown in figure 32.

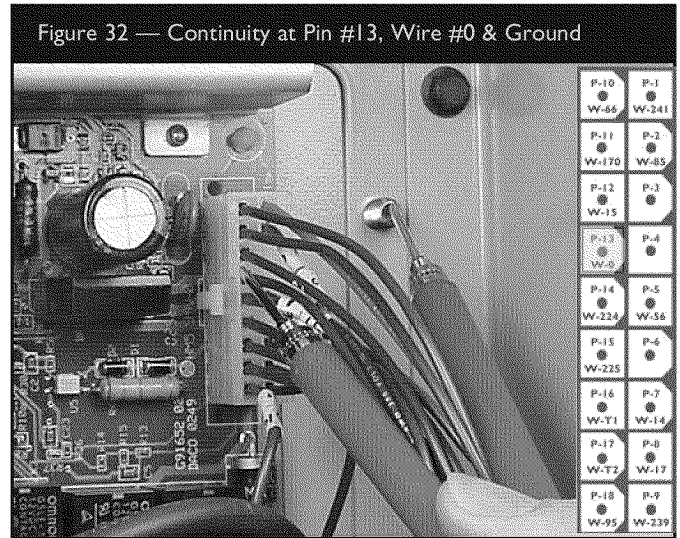


Figure 32 — Continuity at Pin #13, Wire #0 & Ground

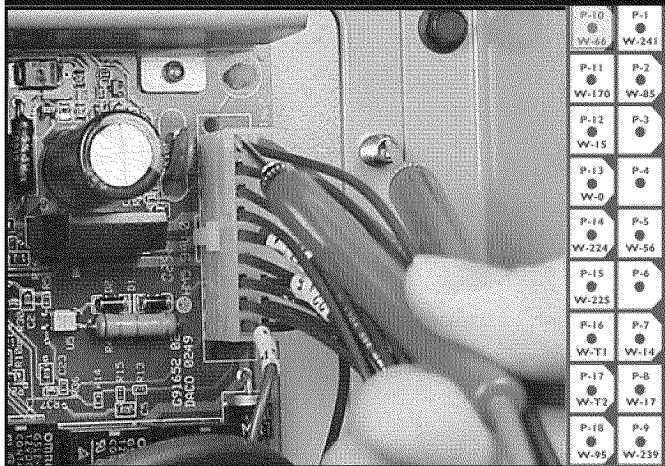
- If no continuity is measured:
 - Repair and/or replace any defective wiring or terminals.
 - Retest continuity between **Pin #13, Wire #0** and **ground** as shown in figure 32.

Troubleshooting

•• If continuity is measured:

- Select **MANUAL** at the AUTO/OFF/MANUAL switch and allow engine to stabilize.
- Measure voltage and frequency at **Pin #10, Wire #66 and Ground** as shown in figure 33.

Figure 33 — VAC & Hz at Pin #10, Wire #66 & Ground



18-22VAC & 60-62 Hz

should be measured.

NOTE: Follow the Frequency Measurement instructions that apply to the type of meter you are using.

•• If frequency and voltage are correct:

- Verify that CMA is not picking up a signal elsewhere.

Verify Ground connection on CMA circuit board.

(See Figure 32)

Verify that there are no other faults

BEFORE

replacing the CMA circuit board.

- Replace CMA Circuit Board.

•• If frequency is not correct:

Check engine RPM.

- Set engine RPM to 3600, as specified in the BRIGGS & STRATTON engine service manual.

High Oil Temperature: (Seven Blinks [••••••••])

The contacts of the temperature switch are normally open (NO). If the engine oil temperature exceeds approximately 140°C (284°F), the switch contacts close and the engine shuts down.

Common causes for this condition include:

- Running the unit with all access doors removed
- Obstructed air inlet or exhaust port
- Debris in the engine cylinder cooling fins

When the problem is corrected, reset the fault detection system:

- Place the AUTO/OFF/MANUAL switch in the **OFF** position for 30 seconds or more.

High Oil Temperature Troubleshooting Procedure:

- Remove **Wire #95** from the Oil Temperature Sensor as shown in figure 34.

Figure 34 — Remove Wire #95 from Temp. Sensor



- Start engine.
- If engine starts and runs:
 - Verify engine is not overheating.

This can be accomplished by checking the following:

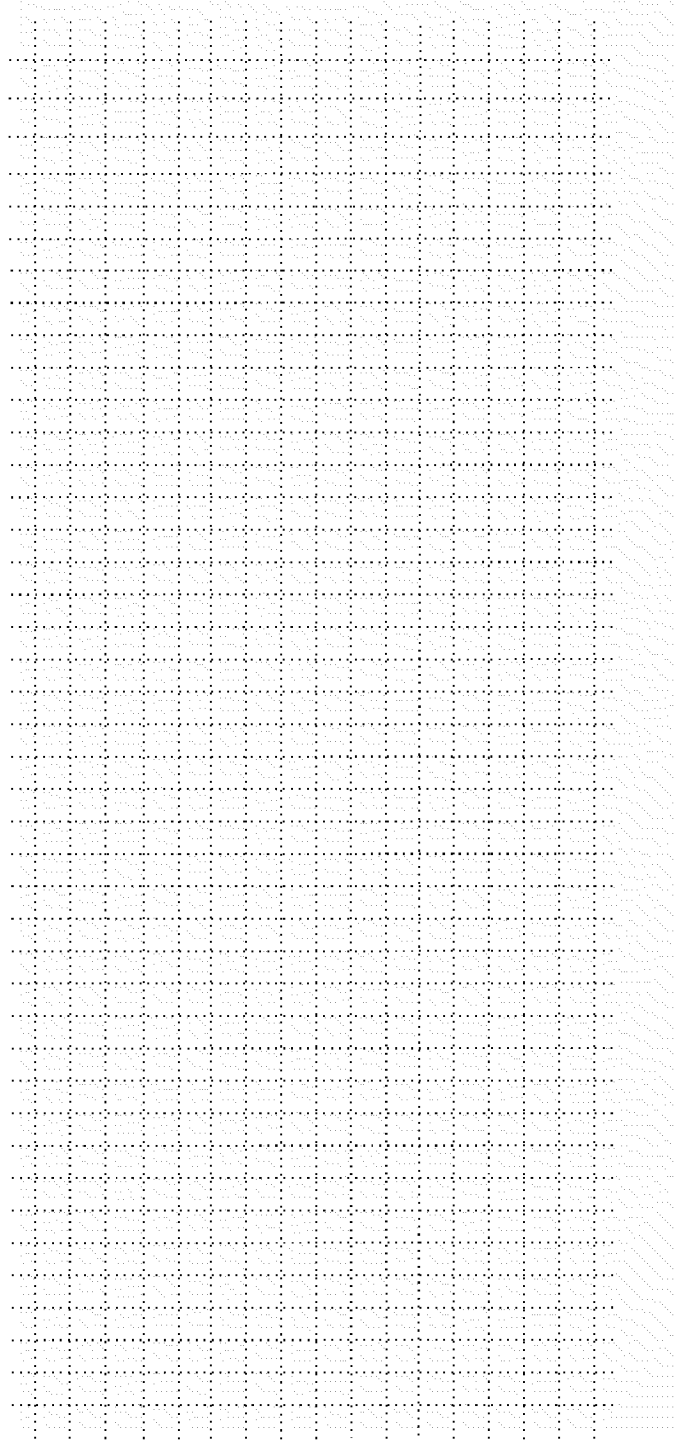
- Verify that the cooling intake is clear of obstructions.
- Check that the engine has the proper amount and type of oil.
- See that the engine cooling fins are not clogged.

- Check that all ducting, gaskets, shrouding and enclosure panels are in place.

NOTE: With more than two access doors removed, the engine will run hotter than designed.

- Replace defective oil temperature switch.
- If engine starts but won't run:
 - Select **OFF** at the AUTO/OFF/MANUAL switch.
 - Remove the 15 Amp fuse.
 - Remove utility power
 - Remove 18-pin connector from CMA
 - Measure for short-to-ground on **Wire #95**, as shown in figure 35.

NOTES



Troubleshooting



- If a short-to-ground is measured:
 - Repair and/or replace wiring as necessary.
- If no short-to-ground is measured:

Verify Ground connection on CMA circuit board.
(See Figure 32)

**Verify that there are no other faults
BEFORE
replacing the CMA circuit board.**

- Replace CMA circuit board.

NOTES



GENERATOR ASSEMBLY

MODEL 1938 (10kW)

SPECIFICATIONS: Model 1938

Generator

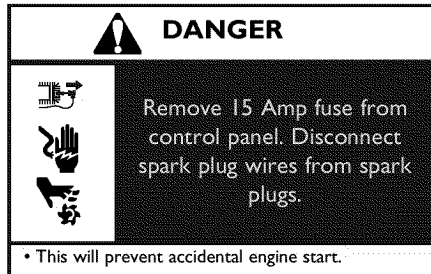
Rated Maximum Power (LP*).....	10 kW
Rated Maximum Load Current:	
at 240 Volts.....	41.6 Amps
at 120 Volts.....	83.4 Amps
Rated AC Voltage.....	120/240 Volts
Rated Frequency.....	60 Hz at 3600 RPM 50 Hz at 3000 RPM
Phase.....	Single Phase
Power Factor.....	1.0
NG Fuel Supply Pressure.....	5-7 in. W.C. (127-356mm)
LP Fuel Supply Pressure.....	11-14 in. W.C. (279-356mm)
Normal Operating Range.....	-20°F (-28.8°C)-104°F (40°C)
Output Sound Level.....	70dBa@23ft. (7m) at full load

* Natural gas rating will depend on specific fuel but typical derates are between 10% to 20% off the LP gas rating.

Engine

Type.....	Air Cooled, 4 Stroke, V-Twin, Horizontal Shaft, OHV Dual Fuel Engine
Bore x Stroke.....	2.83 (72mm) x 2.75 (70mm)
Displacement.....	570cc
Spark Plug.....	BRIGGS & STRATTON # 496018
Oil Type.....	Synthetic ILSAC GF-2 API "SJ/CF ENERGY CONSERVING
Oil Capacity (w/filter).....	56 fl. oz. (1.66L)
Spark Plug gap.....	0.030 in (.76mm)

Engine Maintenance



Check fuel lines and fittings frequently for cracks or leaks. Replace if necessary.

Checking Oil Level

Before placing the standby generator in service and at the recommended maintenance interval, check the engine oil level, as follows:

- Remove Oil Service door. Clean area around oil fill and dipstick locations.
- Remove dipstick. Wipe with clean cloth.
- Insert dipstick fully. Remove and check oil level.
- If oil level is low, remove oil fill cap and slowly add recommended oil to bring level to "Full" mark on dipstick.
- A reusable oil spout that fits most oil bottles is supplied to make it easier to pour oil into the engine.

Changing the Oil and Oil Filter

Oil capacity is approximately 1-1/2 quarts (48 ounces or 1.6 liters) when changing oil and filter. Use only 5W-30 API Service Grade SJ or greater synthetic oil.

Change oil after every 50 operating hours

Replace oil filter every 100 operating hours

If you are using this engine 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:

- Unclip and wipe the oil drain hose clean with a rag. Place the oil drain hose into a suitable container. Grasp the oil drain fitting and push it in towards the engine. Rotate it counterclockwise to its stop and pull the fitting outwards. Oil should begin to flow out of the oil drain hose.

- After the oil is drained, grasp the oil drain fitting and rotate it clockwise until it locks in place. Position the oil drain hose in its storage clip.
- Place a suitable container beneath the oil filter and remove the filter.
- Coat the o-ring of the new filter with fresh 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.
- Fill engine with oil as described above.
- Install and tighten the oil fill cap.
- Run the engine for a minute, stop the engine and check for oil leakage around the oil filter. Recheck oil level.

Replacing the Spark Plugs

Replace the plugs every year. Use the recommended spark plugs gapped for 0.030 in. (0.76 mm).

- Stop the engine and pull the spark plug wires off of the spark plugs.
- Clean around the spark plugs and remove them from the cylinder head.
- Clean off carbon deposits on the spark plug electrode using a wire brush or commercial solvent. Do not blast clean.
- Set the plug gap as recommended. Install the correctly gapped spark plugs into the cylinder heads. Torque to **15 lb. ft.**

Service Air Cleaner

The engine's air cleaner is one of the most important areas to maintain. The engine will not run properly and will be damaged if it is run with a dirty air cleaner system.

Use only genuine BRIGGS & STRATTON parts or their equivalent. The use of replacement parts which are not of equivalent quality may damage the engine.

Clean the foam precleaner every 25 hours and the cartridge every 100 hours of operation.

Clean or replace more often in dusty or dirty conditions.

CAUTION: Never run this equipment without the complete air cleaner system installed on the engine. Failure to do so will result in premature engine wear and significantly reduced engine life.

To service the air cleaner components:

- Unhook clips on both sides of air cleaner cover and remove.
- Carefully slide foam precleaner off cartridge.
- To service precleaner, wash in liquid detergent and water. Squeeze dry in a clean cloth. Never twist! Saturate in clean, fresh engine oil. Squeeze in clean, absorbent cloth to remove excess oil. Replace if very dirty or damaged.
- Remove knob and plate. Carefully remove cartridge to prevent debris from entering carburetor.
- To service cartridge, clean by tapping gently on a flat surface. Do not oil cartridge. Replace if very dirty or damaged.

NOTE: Do not use petroleum solvents, e.g. kerosene, which will cause the cartridge to deteriorate. Do not use pressurized air to clean cartridge. Pressurized air can damage the cartridge.

- Reinstall cartridge, plate and knob.
- Reassemble precleaner on cartridge.
- Replace cover and attach clips to body.

Inspect Spark Arrester Screen

The engine exhaust muffler has a spark arrester screen. Inspect the screen every 50 hours of operation or once each year, whichever comes first. The spark arrester must be maintained in good condition by the owner/operator.

Inspect the spark arrester as follows:

- Using a powerful flashlight, examine the circular screen installed in the end of the exhaust port. There should be no rips or tears in the screen. There should be little or no accumulated soot on the screen.
- Replace the screen if torn, perforated or otherwise damaged. Do not use a defective screen. Consult BRIGGS & STRATTON Technical Services for assistance in changing the screen.
- If screen is not damaged:
 - It may be cleaned in place with a gentle brushing using a wire brush or bottle brush.

Engine Governed Speed

CAUTION: The engine speed was properly adjusted at the factory and should require no additional adjustment. Do not attempt to change engine speed. If you believe the engine is running too fast or too slow, contact the factory for assistance.

CHANGING THE ENGINE GOVERNED SPEED WILL VOID THE ENGINE WARRANTY AND WILL ADVERSELY AFFECT SYSTEM OPERATION.

To assure smooth operation, keep governor linkage, springs and controls free of debris.

Valve Lash

Valve lash must be checked while engine is cold after every 100 hours of operation. Adjust if necessary. Valve lash is:
Intake and Exhaust 0.004 - 0.006 in. (0.10 - 0.15 mm)

Carburetor Adjustments

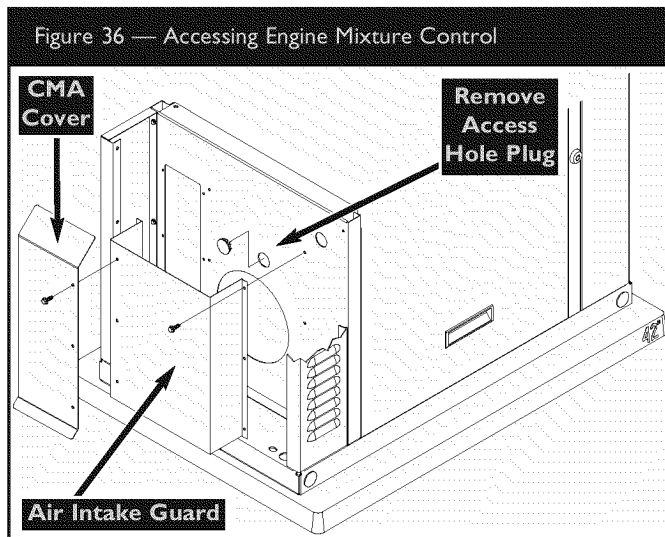
The engine carburetor is preset at the factory. The carburetor should not be tampered with because doing so will void the emission control system warranty. If you experience problems or your engine is used at an altitude higher than 5,000 feet, contact your installer or the factory.

Engine Adjustment

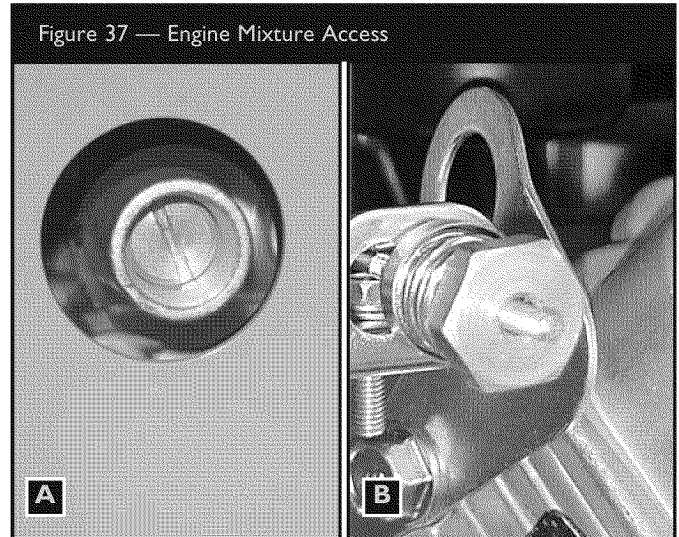
It is commonly known that there are regional variances in the combustibility of natural gas. Each standby unit is adjusted at the factory for correct NG operation. If the generator output voltage or frequency measured during initial Electrical Check (Page 11) is outside the listed ranges, the combustibility of the gas supplied at the installation site may be substantially different.

To adjust the engine for these regional variances, proceed as follows;

- Remove the Air Intake and Control Panel access door.
- Remove the three M5 sheet metal screws that hold the CMA cover to the air intake guard (Figure 37).



- The mixture adjustment screw is shown in figure 38A.
- Connect an accurate frequency meter to the load side of the main circuit breaker (on the back side of the control panel).
- Ensure that the 15 Amp fuse is installed.
- Set the generator's main circuit breaker to **ON**.
- Set the AUTO/OFF/MANUAL switch to **MANUAL**. When the engine starts, allow it warm up for two minutes.
- Normal no-load frequency is 62.0 to 62.5 Hz. If adjustment is needed at no-load, slowly rotate the governor adjustment nut (Figure 38B) clockwise and/or counterclockwise until frequency is 62.0 to 62.5 Hz.



- Turn the service disconnect to the transfer switch **OFF**. The transfer switch will connect to the generator after a short time delay.
- Load generator to rated Natural Gas rating.
- Connect an accurate frequency meter to the load side of the main circuit breaker (on the back of the control panel). Frequency should be above 57.0 Hz.
- If frequency is below 57.0 Hz, slowly rotate the governor adjustment nut (Figure 38) clockwise and/or counterclockwise until frequency is above 57.0 Hz.
- Reinstall the access hole plug.
- Turn the service disconnect to the transfer switch to **ON**. The transfer switch will connect to utility power after a short time delay.
- Set the AUTO/OFF/MANUAL switch to **OFF**.
- After the engine has stopped, reinstall the air intake guard.
- Reinstall the CMA cover to the air intake guard.
- Reinstall the air intake access panel.
- Set the AUTO/OFF/MANUAL switch to **AUTO**.

N **NOTE:** The mixture adjustment screw is the brass slotted screw in the center of the aluminum boss directly visible in the access hole.

10kW Rotor & Stator Resistance Values

Rotor Resistance $\pm 5\%$			
Model	Unit	Part No.	Ohms
1938-0	10kW	192971GS	4.67/4.67

Stator Resistance $\pm 5\%$			
Part No.	Power	DPE	BCW
192969GS	.109/.109	1.30	0.027

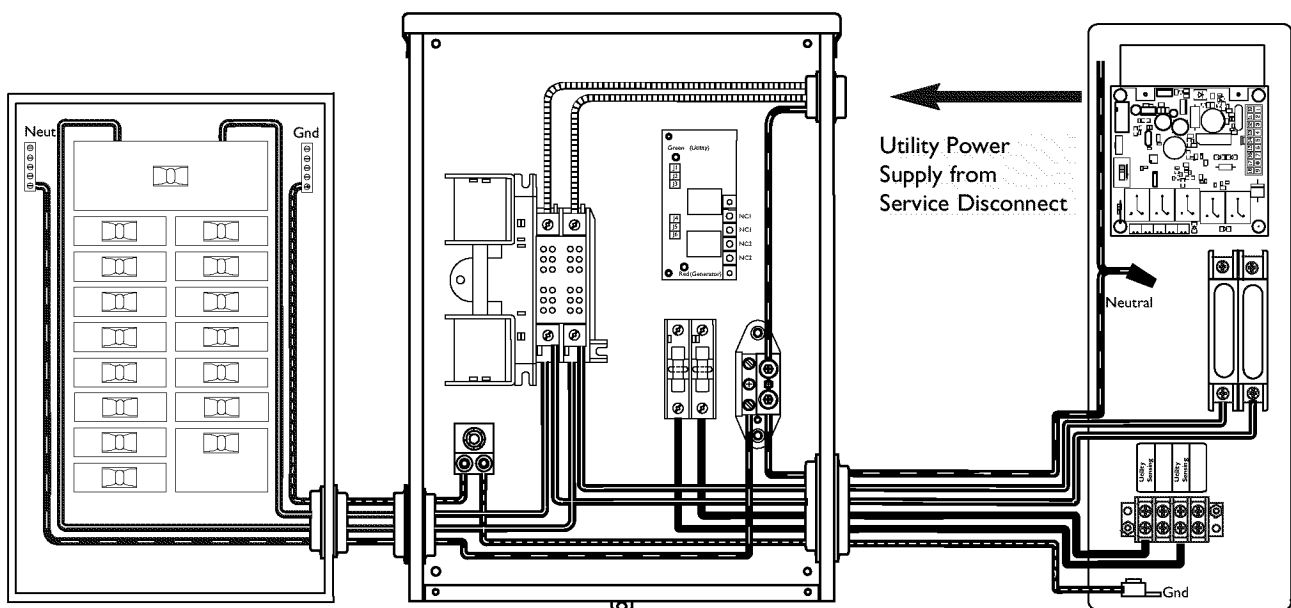
System Interconnections

The Home Stand-by System circuit interconnections consist of "Utility Supply" from the service disconnect to the transfer switch, "Generator" supply leads to the transfer switch, service panel leads to the transfer switch and "Utility 240VAC" from the transfer switch. All leads must be routed in conduit.

- The "Utility 240VAC" leads deliver utility power to generator circuit board.

The wiring diagram shown in figure 38 depicts the 200 Amp transfer switch. The same wiring procedure is used with the 100 Amp transfer switch with the exception of the large grounding terminal for the neutral wire. In all other respects the wiring of the 100 Amp and 200 Amp transfer switches is identical. Additional wiring diagrams are given in the appendix starting on page 55.

Figure 38 — Typical Wiring Diagram for Model 1938 Home Generator System with a 200 Amp Transfer Switch (CHGEN200ATSR)





10kW Circuit Test Introduction

The troubleshooting section of this service manual contains page references to inspection procedures of specific generator components. These components are related to the various LED fault light indications. To gain access to some of these components, it is necessary to disassemble sections of the generator enclosure.

This section is organized for the 10kW generator by "ease of access" to the various components with the easiest operations given first and the more complex operations following.

In order of complexity, they include the following:

Operation:	Page:	Access Requirements:	Page:
• Checking The Stator Power Winding Through The Harness	42	Access To CMA Board	15
• Checking The Battery Charge Winding (BCW) Through The Harness	42	Access To CMA Board	15
• Checking The Excitation Circuit	43	Roof Removal	46
		Muffler Box Removal	46
		Fuel Line from Regulator Removal	47
• Checking the Stator Power Winding	43	Roof Removal	46
		Muffler Box Removal	46
		Fuel Line from Regulator Removal	47
• Checking The Battery Charge Winding (BCW)	44	Roof removal	46
		Muffler Box Removal	46
		Fuel Line from Regulator Removal	47
• Checking The Rotor Winding	44	Roof Removal	46
		Muffler Box Removal	46
		Fuel Line from Regulator Removal	47
		Alternator Bulkhead Removal	48
• Removing The Meccalte-Generator	46	Roof Removal	46
		Muffler Box Removal	46
		Fuel Line From Regulator Removal	47
		Alternator Bulkhead Removal	48

Generator Assembly

Checking The Stator Power Winding Through The Harness

Access Requirements:

- Access to CMA Board (Page 15)

Related Fault Indications:

- Low Voltage ([. . .]) Three Blinks

Checking the power winding resistance through the harness (as shown in figure 39A & B) ensures the integrity of the winding and the associated wiring.

- Turn the generator circuit breaker "OFF".
- Check between **Wire #11** and **Wire #22** or **NEUTRAL**.
- Check between **Wire #44** and **Wire #22** or **NEUTRAL**.

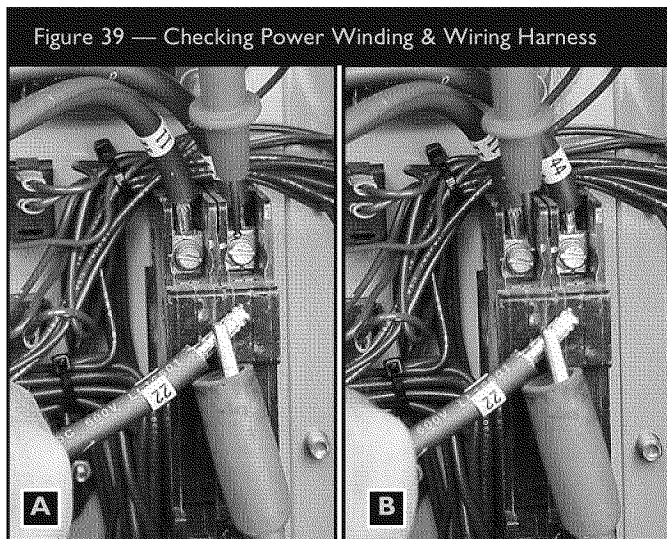


Figure 39 — Checking Power Winding & Wiring Harness

.109 / .109 Ohms +- 5% should be measured.

NOTE: Measuring through the harness will not verify a defective power winding but it will validate a winding/wiring combination that is serviceable.

To isolate the power winding:

See "Checking The Stator Power Winding" (Page 43).

Checking The Battery Charge Winding (BCW) Through The Harness

Access Requirements:

- Access to CMA Board (Page 15)

Related Fault Indication:

- Low Battery Voltage ([.]) One Blink

Checking the battery charge winding resistance (BCW) through the harness (as shown in figure 40) ensures the integrity of the winding and the associated wiring.

- Disconnect **Wire #77** from the resistor and check to **Wire #66**.

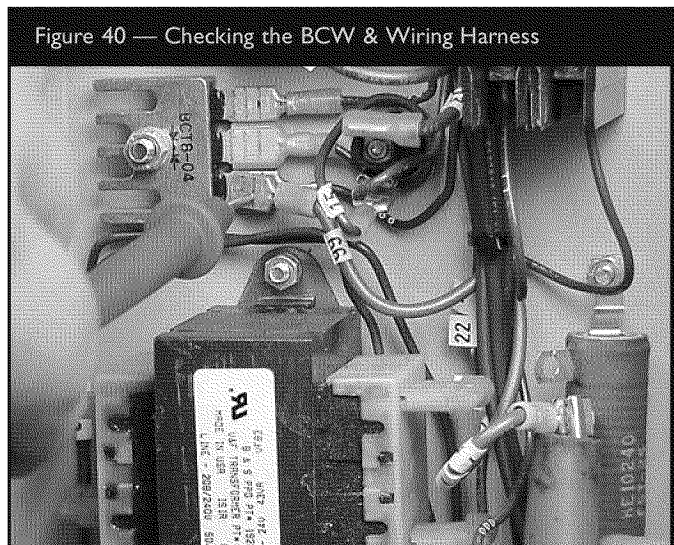


Figure 40 — Checking the BCW & Wiring Harness

0.027 Ohms +- 5% should be measured

NOTE: Measuring through the harness will not verify a defective battery charge winding (BCW) but it will validate a winding/wiring combination that is serviceable.

To isolate the battery charge winding:

See "Checking The Battery Charge Winding (BCW)" (Page 44).

Checking The Excitation Circuit

Access Requirements:

- Roof Removal Page 46
- Muffler Box Removal Page 46
- Fuel Line From Regulator Removal Page 47

Related Fault Indications:

- Low Voltage ([• • •]) Three Blinks

Gain access to the capacitors as mentioned above.

- Isolate The Capacitors

N **NOTE:** Use the manufacturer's instructions that apply to the type of meter you are using. The rated capacity is printed on the capacitors.

- If a value discrepancy is found:
 - Replace Capacitor

Check Excitation Winding (DPE) Resistance between wires that were disconnected from capacitors and lead into the stator, as shown in figure 41.

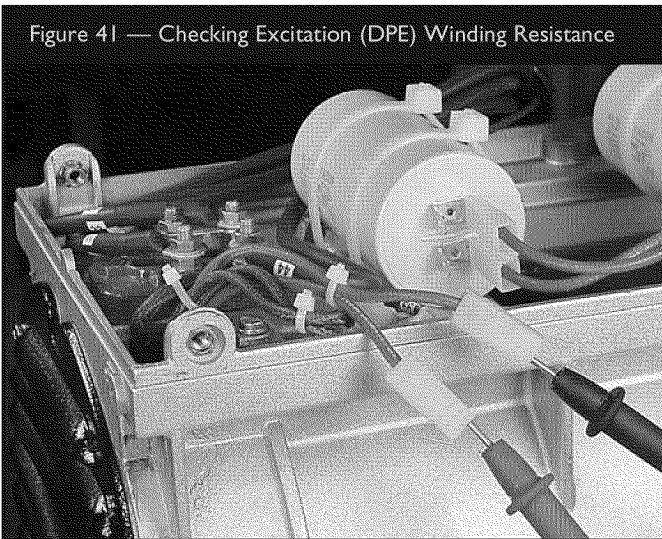


Figure 41 — Checking Excitation (DPE) Winding Resistance

1.30 Ohms +- 5% should be measured.

- If not:
 - Check for short-to-ground.

• If none: **Replace Stator**

See "Removing The Meccalte-Generator" (Page 46).

- If resistance reading is OK:

- Re-install/replace the capacitors
- Re-assemble the standby generator enclosure.

Checking The Stator Power Winding

Access Requirements:

- Roof Removal Page 46
- Muffler Box Removal Page 46
- Fuel Line From Regulator Removal Page 47

Related Fault Indications:

- Low Voltage ([• • •]) Three Blinks

Gain access to the stator power winding leads as mentioned above.

- Isolate the colored wires from the terminal block.
- Measure the resistance value of the stator power winding as shown in figure 42.

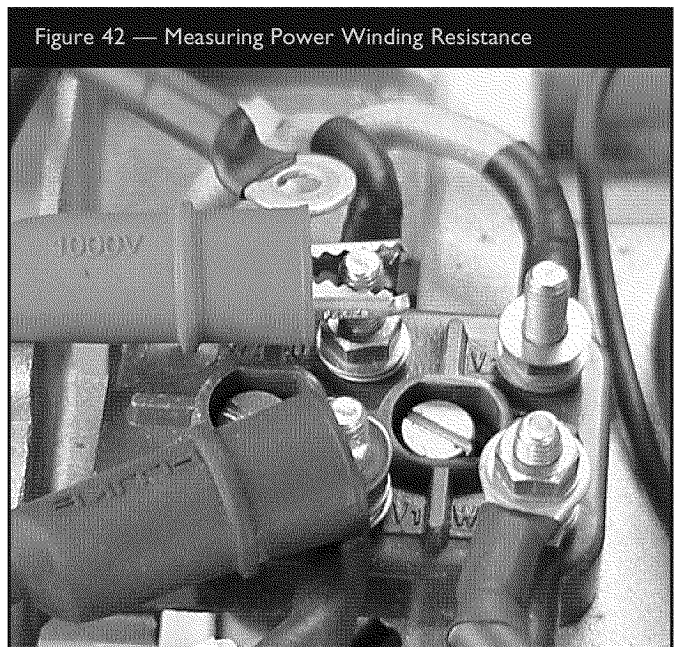


Figure 42 — Measuring Power Winding Resistance

.109 / .109 Ohms +- 5% should be measured.

- If not:
 - Check for short-to-ground.

• If none: **Replace Stator**

See "Removing The Meccalte-Generator" (Page 46).

- If resistance reading is OK:
 - Check for defective lead wire between terminal block and circuit breaker.
 - Re-assemble the standby generator enclosure.

Checking The Battery Charge Winding (BCW)

Access Requirements:

- | | |
|------------------------------------|---------|
| • Roof Removal | Page 46 |
| • Muffler Box Removal | Page 46 |
| • Fuel Line From Regulator Removal | Page 47 |

Related Fault Indications:

- Dead Unit ([]) No Blink
- Low Battery Voltage ([•]) One Blink

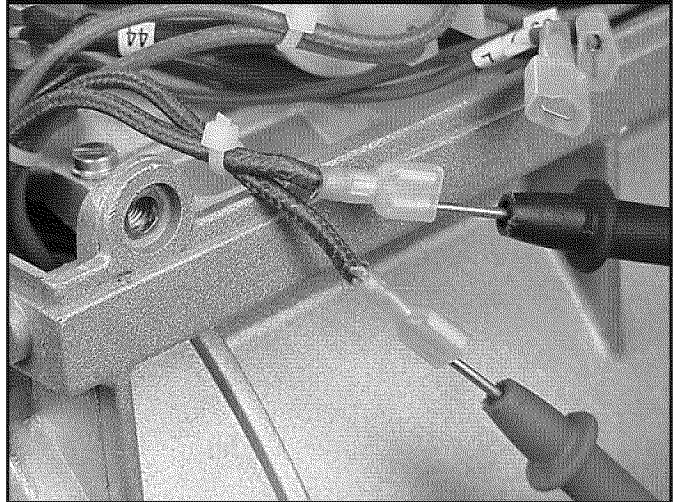
Gain access to the battery charge winding leads as mentioned above.

- Disconnect **Wire #66** and **Wire #77** from the Brown wires, on the terminal block.

NOTE: Always check individual windings to ground.

- Measure the resistance value of the battery charge winding as shown in figure 43.

Figure 43 — Checking Battery Charge (BCW) Winding



0.027 Ohms +- 5%

should be measured.

- If not:
 - Check for short-to-ground.

• If none:  **Replace Stator**

See "Removing The Meccalte-Generator" (Page 46).

- If resistance reading is OK:
 - Check for a defective lead wire in the harness.
 - Re-assemble the standby generator enclosure.

Checking The Rotor Winding

Access Requirements:

- | | |
|------------------------------------|---------|
| • Roof Removal | Page 46 |
| • Muffler Box Removal | Page 46 |
| • Fuel Line From Regulator Removal | Page 47 |
| • Alternator Bulkhead Removal | Page 48 |

Related Fault Indications:


- Low Voltage ([• • •]) Three Blinks

Gain access to the rotor winding leads as mentioned above.

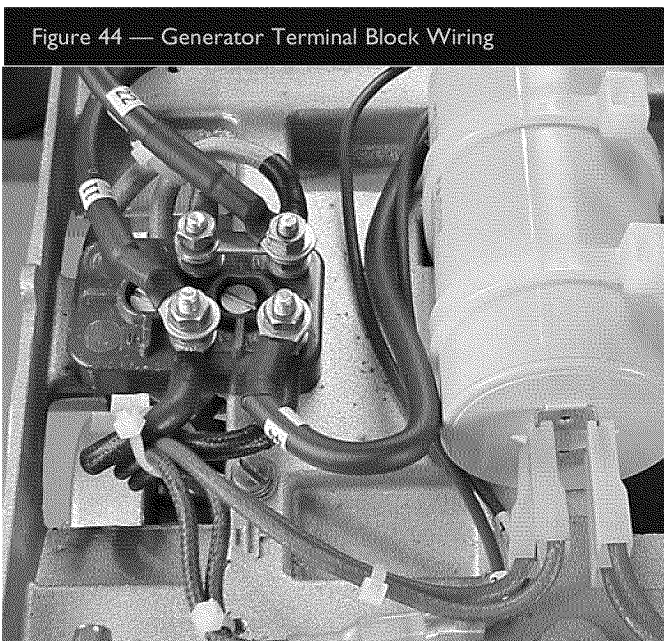
N **NOTE:** The rotor cannot be thoroughly inspected without removing it from the generator assembly. In addition, detailed components of the rotor must be de-soldered in order to determine its servicability. Specific instructions as well as general information about this procedure is given at the end of "Removing The Meccalte-Generator" on page 46.

- Measure the resistance value of the rotor windings and compare values to chart on page 40.

4.67 / 4.67 Ohms +/- 5% should be measured.

- If not:
 - Check for short-to-ground.
- If none:  **Replace Rotor**
- If resistance reading is OK:
 - Re-assemble the standby generator enclosure.

In order to assist you in performing electrical checks, unit reassembly and general troubleshooting, a reference of the generator terminal block is provided in figure 44.



NOTES

A large grid area for taking notes, consisting of a grid of small squares.

Removing The Meccalte-Generator

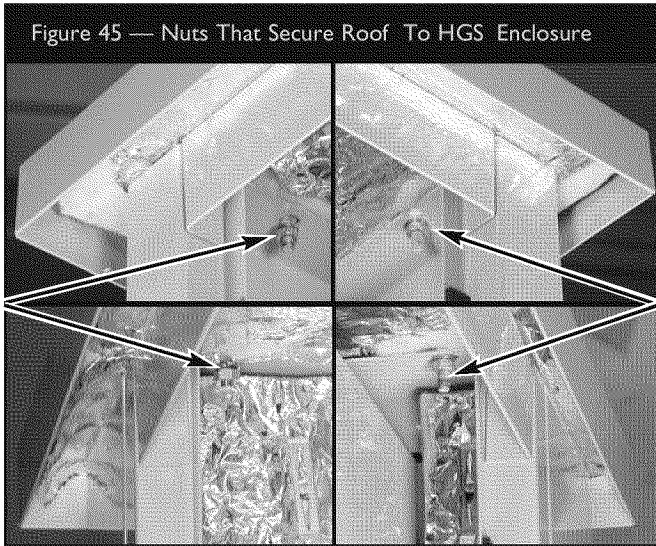
Roof Removal

CAUTION: Before enclosure disassembly:

- Turn Switch "OFF"
- Turn Fuel "OFF"
- Remove 15 Amp Fuse

The roof is secured to the "Standby" enclosure with four nuts that thread on studs welded to the structure of the roof, as shown in figure 45.

Figure 45 — Nuts That Secure Roof To HGS Enclosure



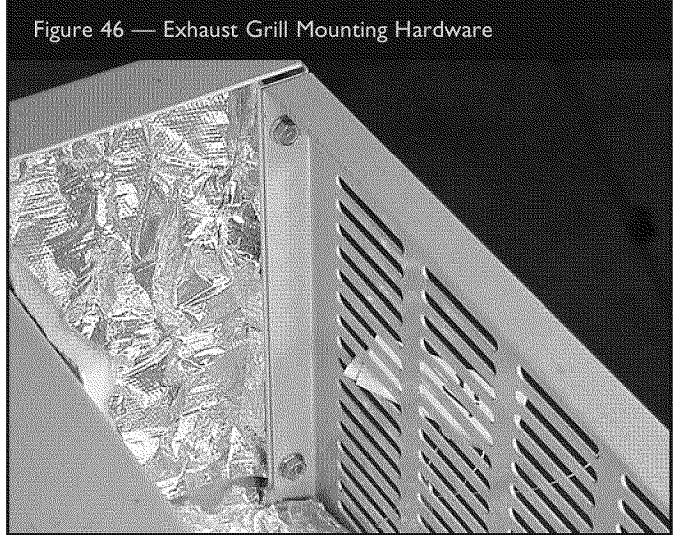
- Remove the nuts and hardware shown above.
- Lift the roof from the enclosure.

Muffler Box Removal

To gain sufficient clearance to extract the muffler box it is necessary to remove the the exhaust grill panel.

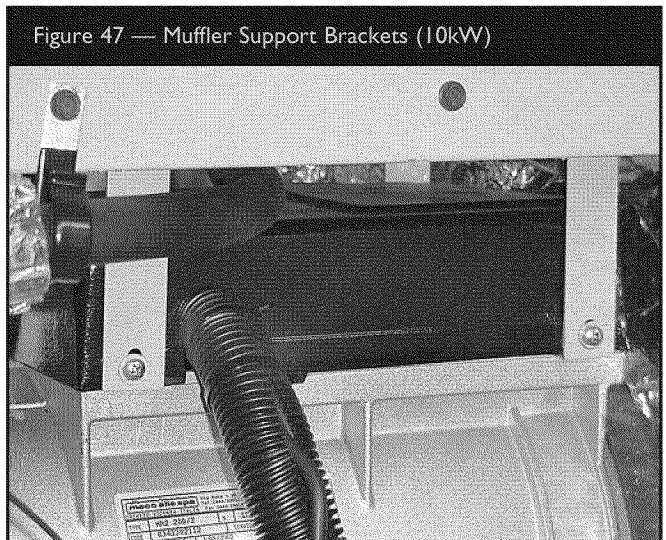
- Remove the four mounting screws that secure the exhaust grill to the enclosure. One side of the grill is shown in figure 46.

Figure 46 — Exhaust Grill Mounting Hardware



The muffler itself is supported by four metal brackets. These brackets bolt to flanges that have been welded to the muffler and fit over four machine screws that secure the metal cover on top of the generator housing. Two brackets are shown in figure 47.

Figure 47 — Muffler Support Brackets (10kW)



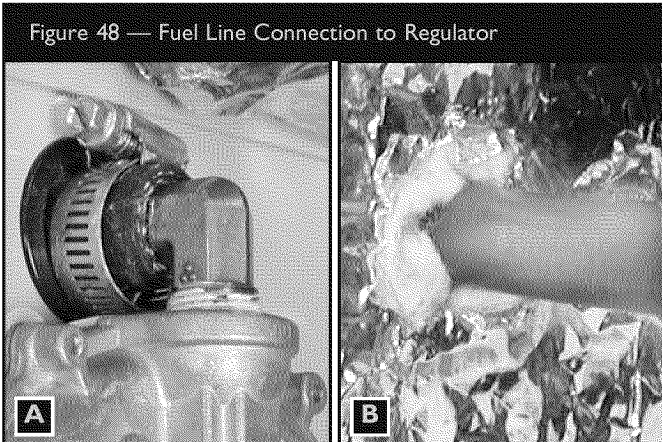
- Remove the four brackets and retain the hardware.



NOTE: All four brackets must be removed.

Fuel Line From Regulator Removal

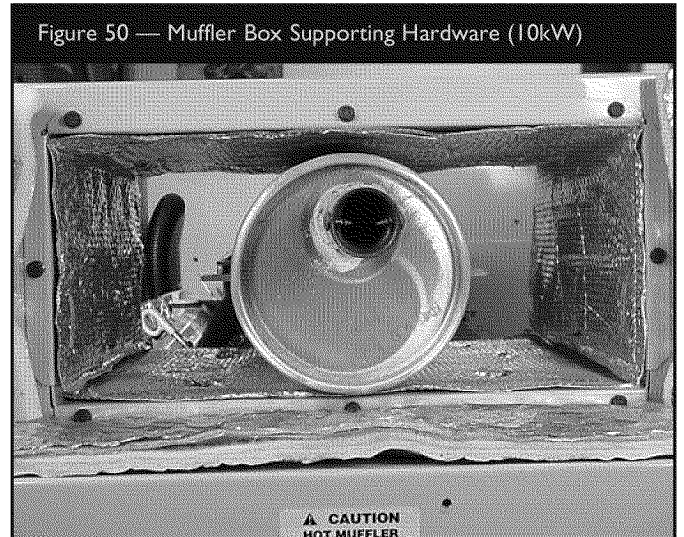
The fuel line passes through a hole in the bulkhead and connects to a fitting on top of the regulator, as shown in figure 48A & B.



- Loosen the clamp that secures the hose to the fitting.
- Disconnect the hose, cover end to prevent dirt ingestion and position out of the way.
- Remove the deflector that is mounted on the upper portion of the muffler box (Figure 49).



The muffler box is a two piece assembly that is secured to the bulkhead with five self-tapping sheet metal screws (Figure 50).



- Remove the five screws that secure the upper portion of the muffler box to the alternator bulkhead.
- Remove the screws that hold the upper portion of the muffler box to the lower portion (Figure 51).

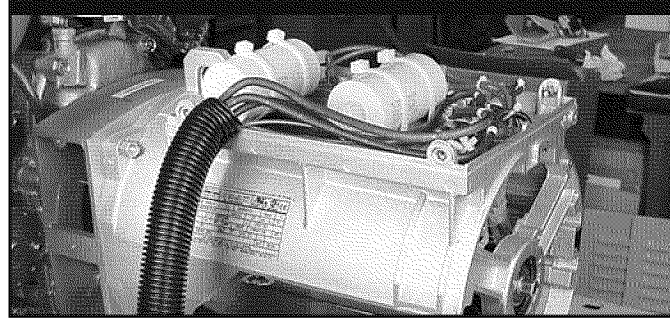


- Slide the upper portion of the muffler box out of the end of the enclosure.
- Remove the three remaining screws that secure the lower portion of the muffler box to the bulkhead and set the bottom of the muffler box aside.

Generator Assembly

This procedure allows you access (Figure 52) to the following tests of the generator:

Figure 52 — Generator Cover Removed



- Checking the Excitation Circuit (Page 43).
- Checking the Stator Power Winding (Page 43).
- Checking the Battery Charge Winding (Page 44).

Alternator Bulkhead Removal

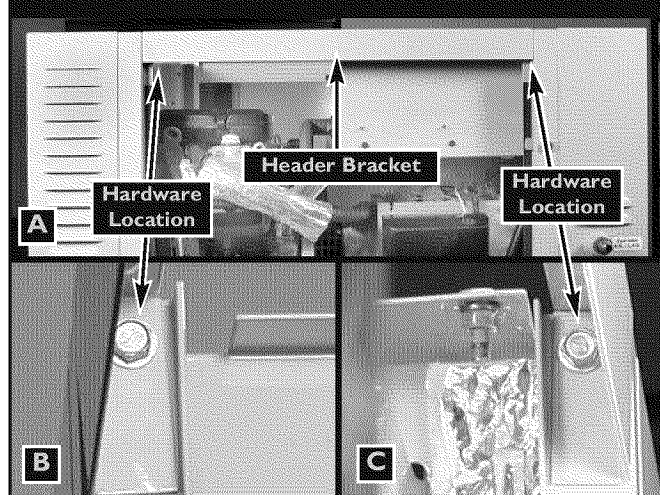
The alternator bulkhead must be removed in order to:

- Check or replace the Rotor Assembly.
- Replace the Stator Assembly or the complete Meccalte-Generator

The following procedure outlines the necessary steps required to gain access to the Meccalte-Generator as a complete assembly.

- Using a 3/8" socket and ratchet, remove both header brackets as shown in figure 53A, B & C.

Figure 53 — Header Bracket and Mounting Hardware



When these brackets have been removed:

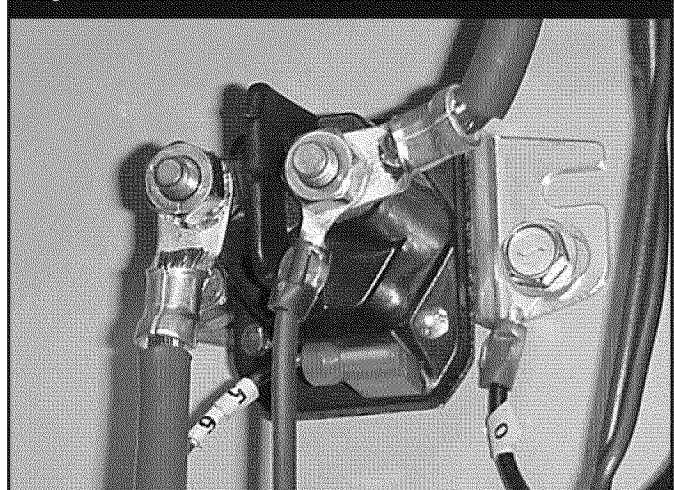
- Disconnect cables from the battery, being careful to remove the negative (-) cable first.
- Remove the bolts that secures the battery clamp, as shown in figure 54.

Figure 54 — Battery & Mounting Hardware



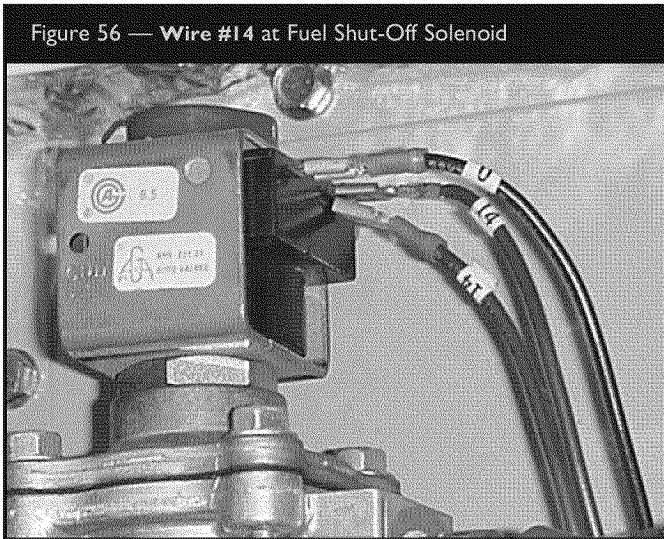
- Remove **Wire #16**, **Wire #13** and **Wire #56** from the Starter Contactor as shown in figure 55.

Figure 55 — Wire #s 16, #13 and #56

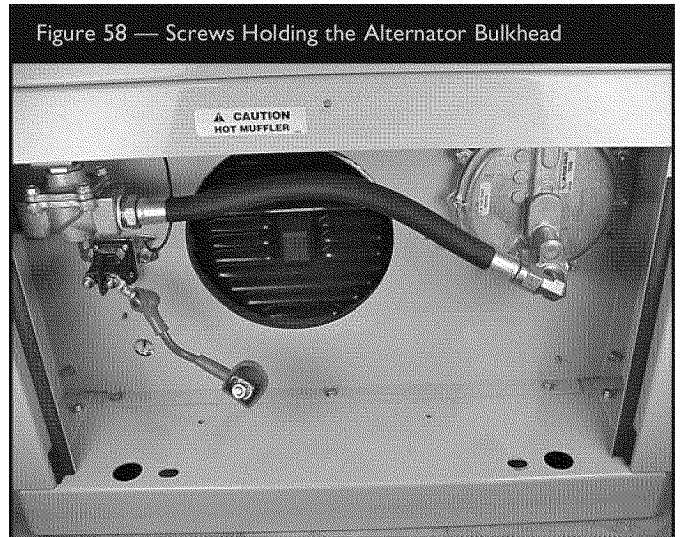


- Retain all hardware.

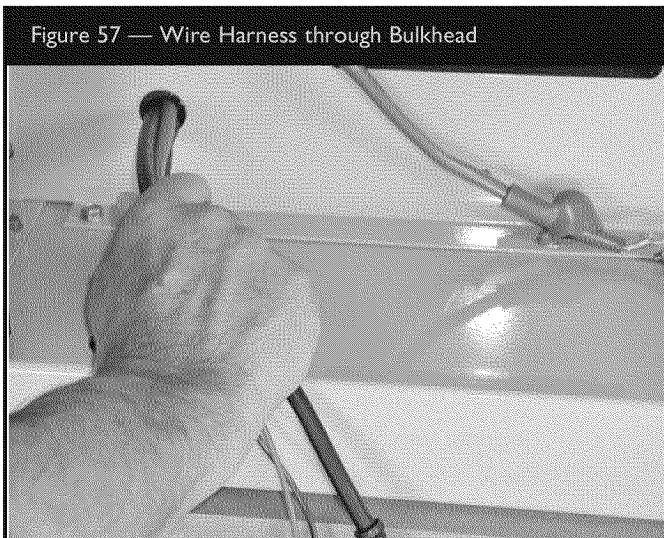
- Remove **Wire #14**, which is ganged to the fuel shut-off solenoid. See Figure 56.



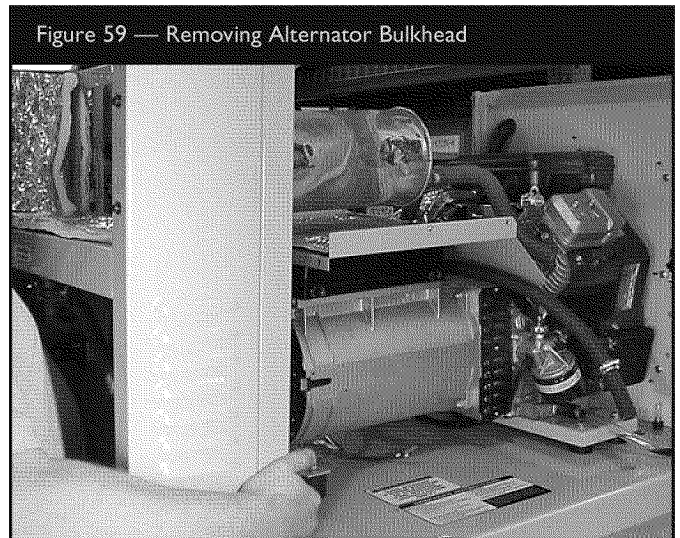
At this point, the alternator bulkhead is held to the mounting base with seven 1/4" self-tapping screws as illustrated in figure 58.



- Gather the wires in the harness and work them through the hole in the alternator bulkhead as shown in figure 57.



- Remove these fasteners.
- Carefully lift the alternator bulkhead from the standby enclosure (Figure 59).



- Ensure that all the wires in the harness are clear of the bulkhead.
- Make sure that the fuel hose is clear of the bulkhead.
- Remove the fuel supply from source at nipple on fuel solenoid.

Generator Assembly

Removing The Generator

With the alternator bulkhead removed as shown in figure 60, you are ready to begin removal of the Meccalte-Generator.

Figure 60 — Meccalte Generator Fully Exposed

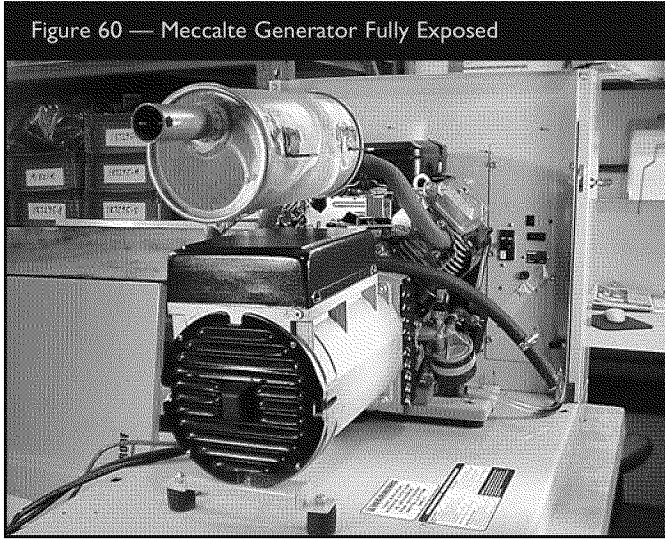
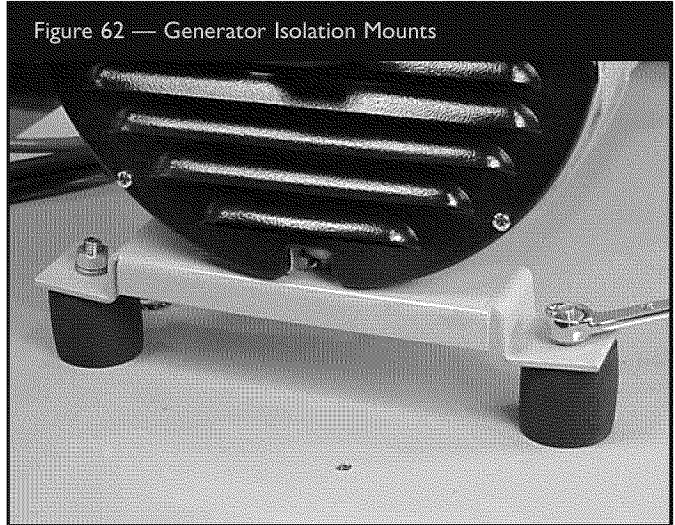


Figure 62 — Generator Isolation Mounts



NOTE: Do attempt to loosen or remove the hardware that attaches the isolation mounts to the enclosure base.

Removing Stator Mounting Hardware

- Remove the cooling fan grids (Figure 63).

Blind End Cover Removal

- Remove the four screws holding the cover on the blind end of the generator housing (Figure 61).

Figure 61 — Removing the "Blind End" Cover Screws

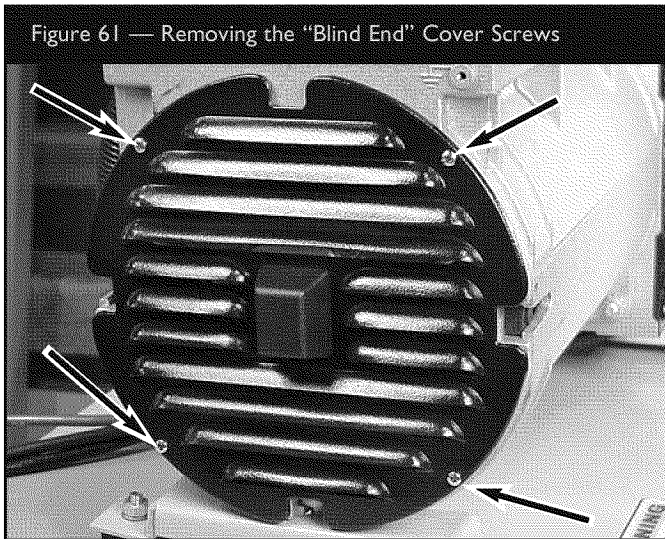
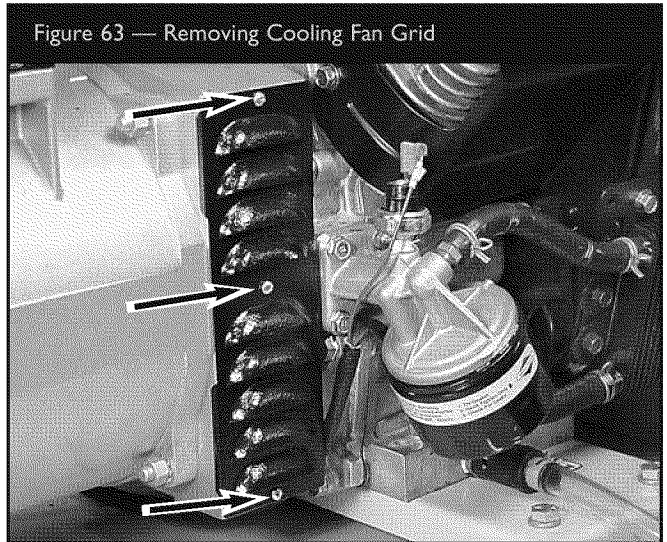


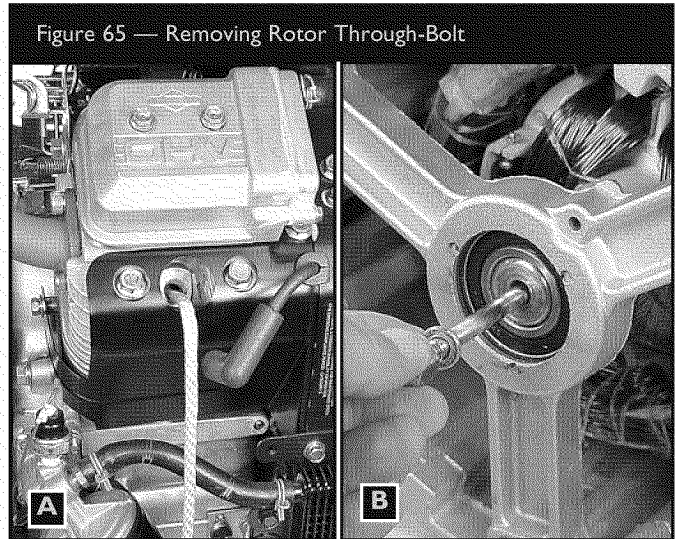
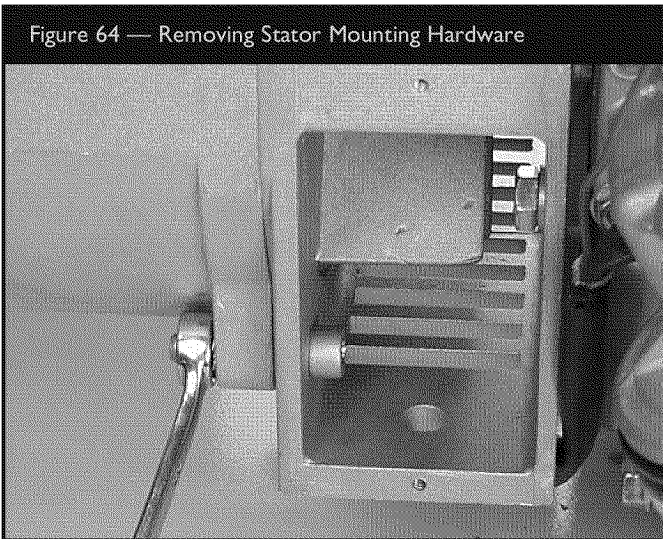
Figure 63 — Removing Cooling Fan Grid



Generator Isolation Mounts

- Remove the nuts from the top of the isolation mounts (Figure 62).

- Remove the nuts from the bolts that mount the stator housing to the engine adapter (Figure 64).

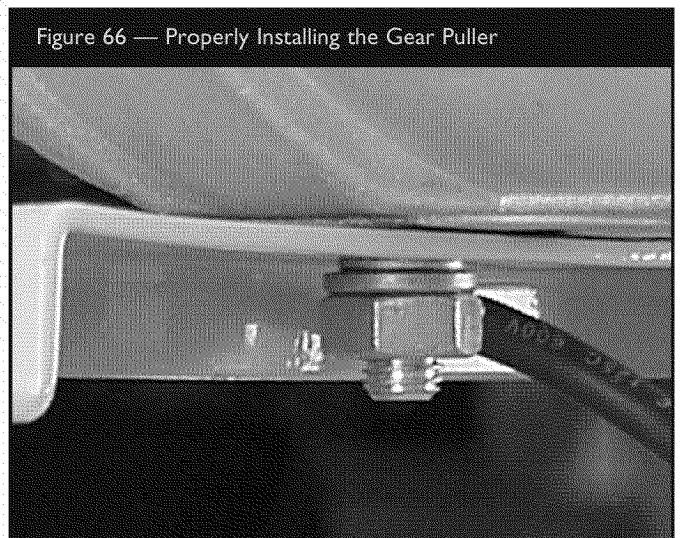


Removing Rotor Through-Bolt (“Stay Shaft Bolt”)

⚠ WARNING: Do not attempt to stop the rotor from turning by placing something under the fins. The rotor cooling fins will break. Warranty will not cover a rotor due to this type of fin damage.

- Remove the spark plugs from the engine.
- Insert a length of nylon rope into the cylinder as shown in figure 65A.
- Use a 13mm socket and turn the rotor counterclockwise until the rope is compressed inside the cylinder.
- Using a suitable breaker bar, loosen and remove the rotor bolt (Figure 65B).

- Support the drive end of the generator with a suitable wooden block.
- Remove the grounding lug from the stator housing (Figure 66).



Using a three-legged gear puller:

- Install the spindle of the puller in the countersunk hole of the rotor shaft (Figure 67).

Figure 67 — Installing the Gear Puller

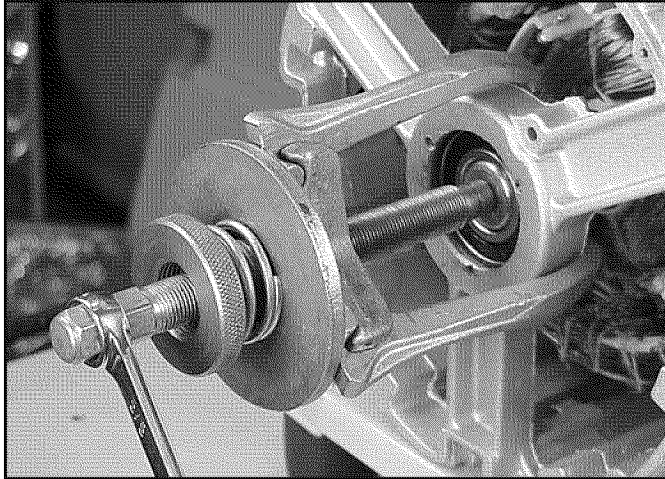
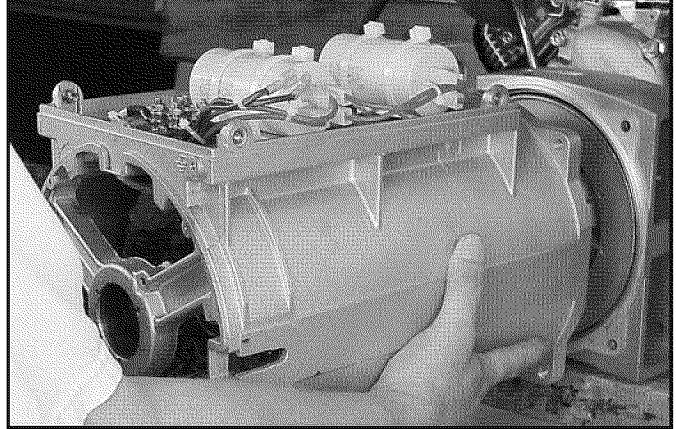


Figure 69 — Removing the Stator Housing

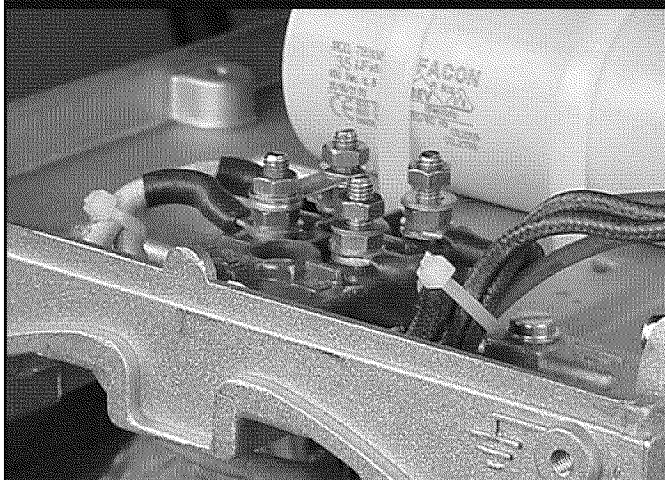


- Extend the puller spindle until the housing clears the mounting studs and the rotor bearing comes free of the stator housing.

When the stator housing is free of the rotor bearing and mounting studs:

- Disconnect the wiring harness from the terminal block of the generator (Figure 68).

Figure 68 — Removing the Hasrness



- Carefully lift and draw the stator housing clear of the rotor assembly (Figure 69).

Removing The Rotor Assembly

The rotor assembly is held to the tapered shaft of the engine by means of the rotor through-bolt ("Stay Shaft Bolt"). In order to help support the weight of the rotor:

- Install the rotor through-bolt a few turns into the threads of the engine crankshaft.

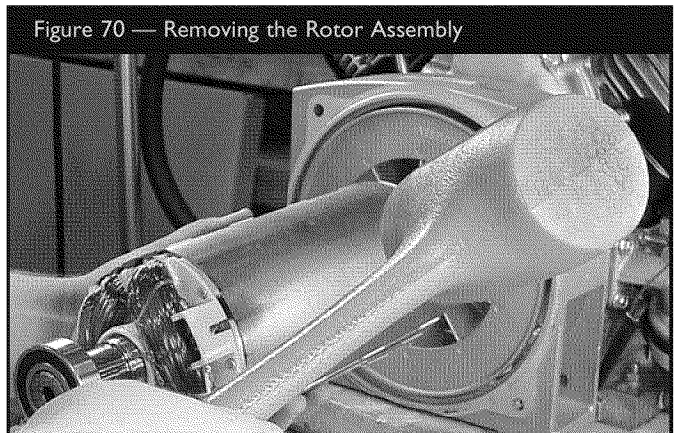


NOTE: Do not tighten the rotor through-bolt. Allow at least two threads of space between the nut and the end of the rotor shaft.

With the rotor bolt installed and using a soft rubber mallet:

- Support the rotor with one hand
- Gently tap the rotor on the flat surface of the laminations until the rotor comes free of the shaft (Figure 70).

Figure 70 — Removing the Rotor Assembly



NOTES

A large grid of dotted lines for taking notes, covering most of the page below the 'NOTES' header.



APPENDIX

Figure 72 — CMA Schematic

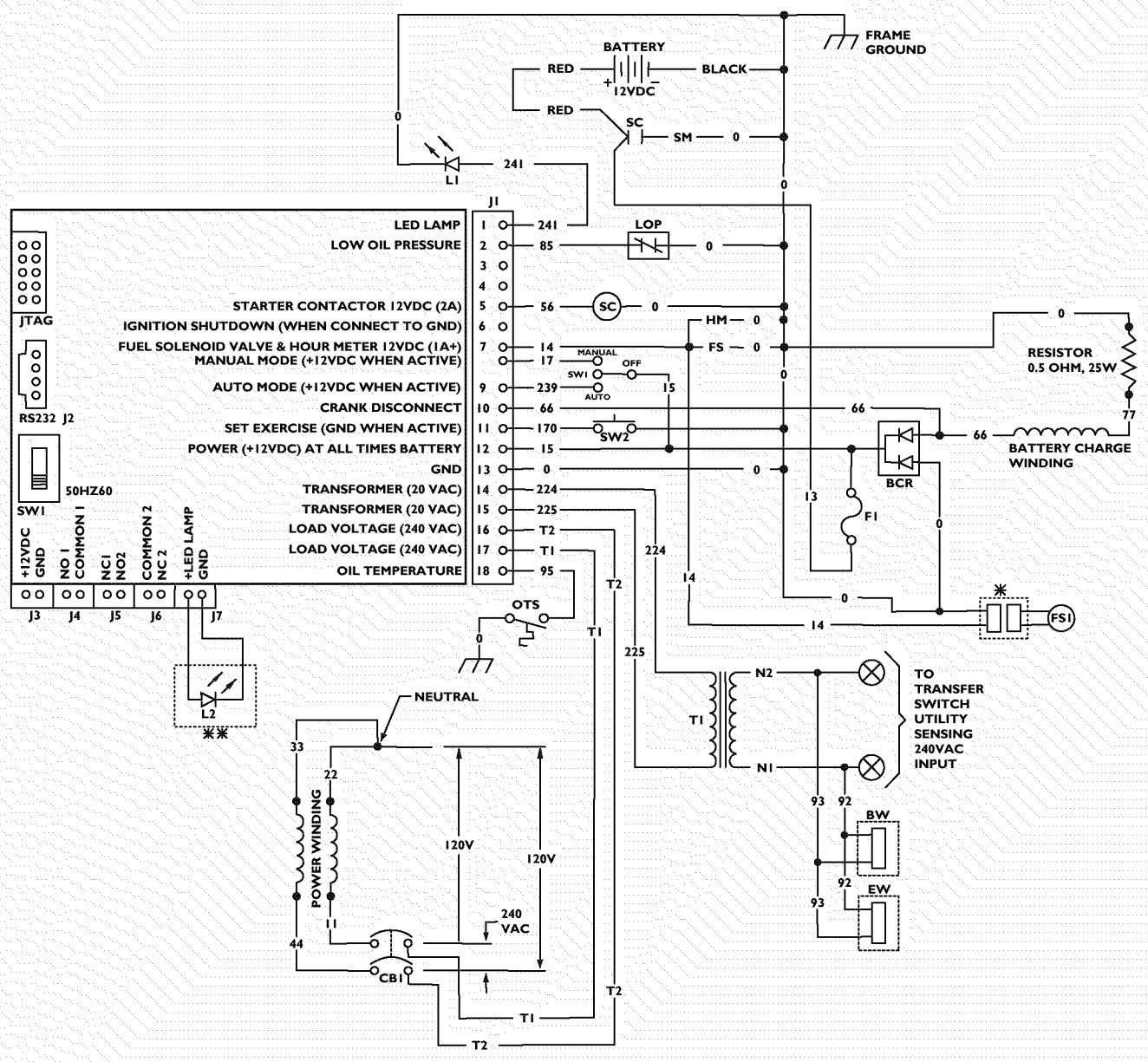
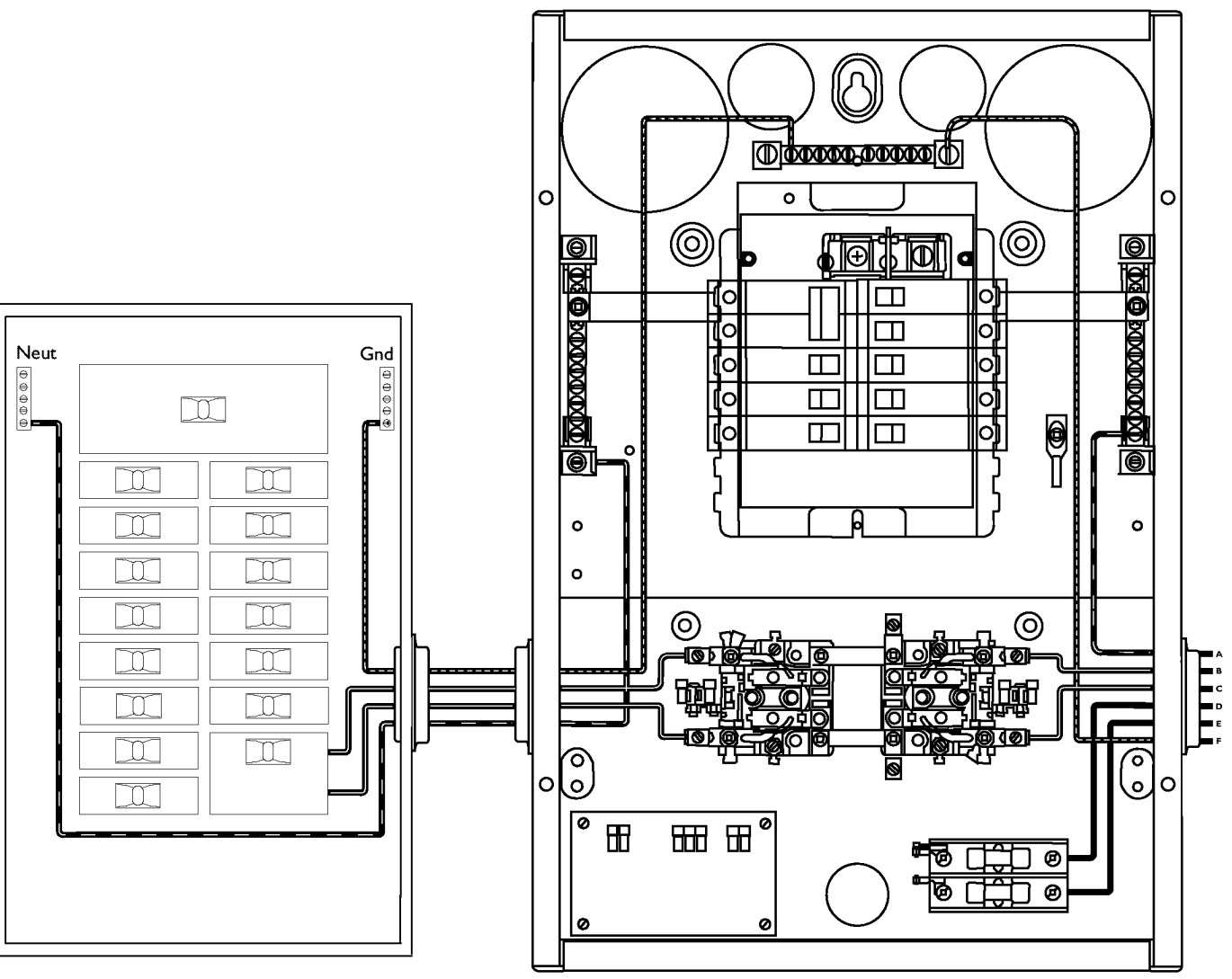


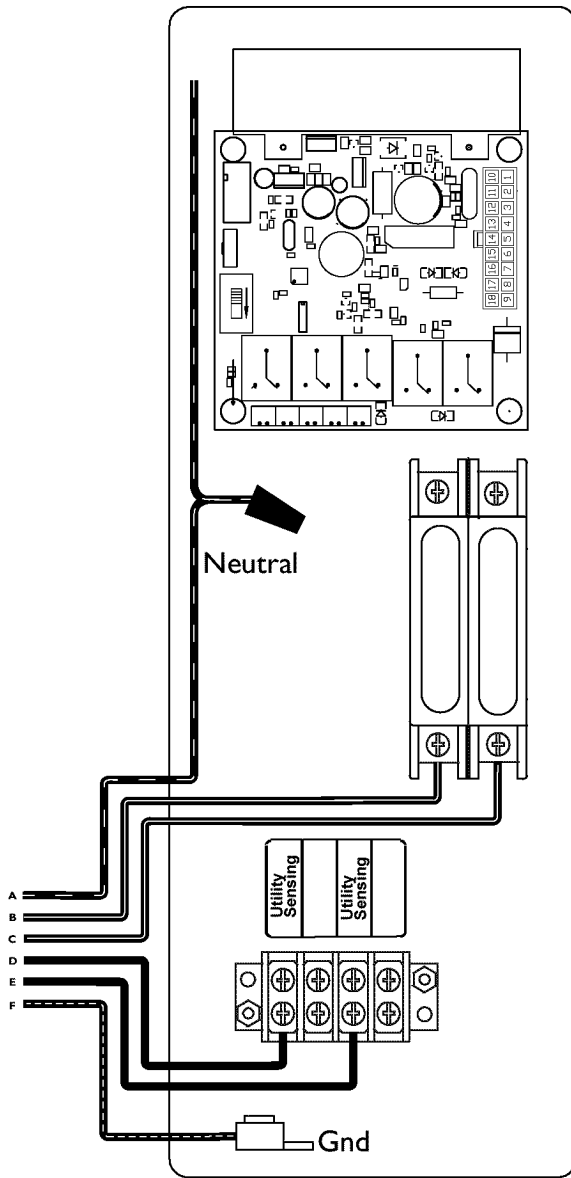
Figure 74 — Model 1917 50 Amp Transfer Switch NEMA I Typical Wiring Diagram



Main Distribution Panel

Model 1917 Transfer Switch

10kW Generator Connections

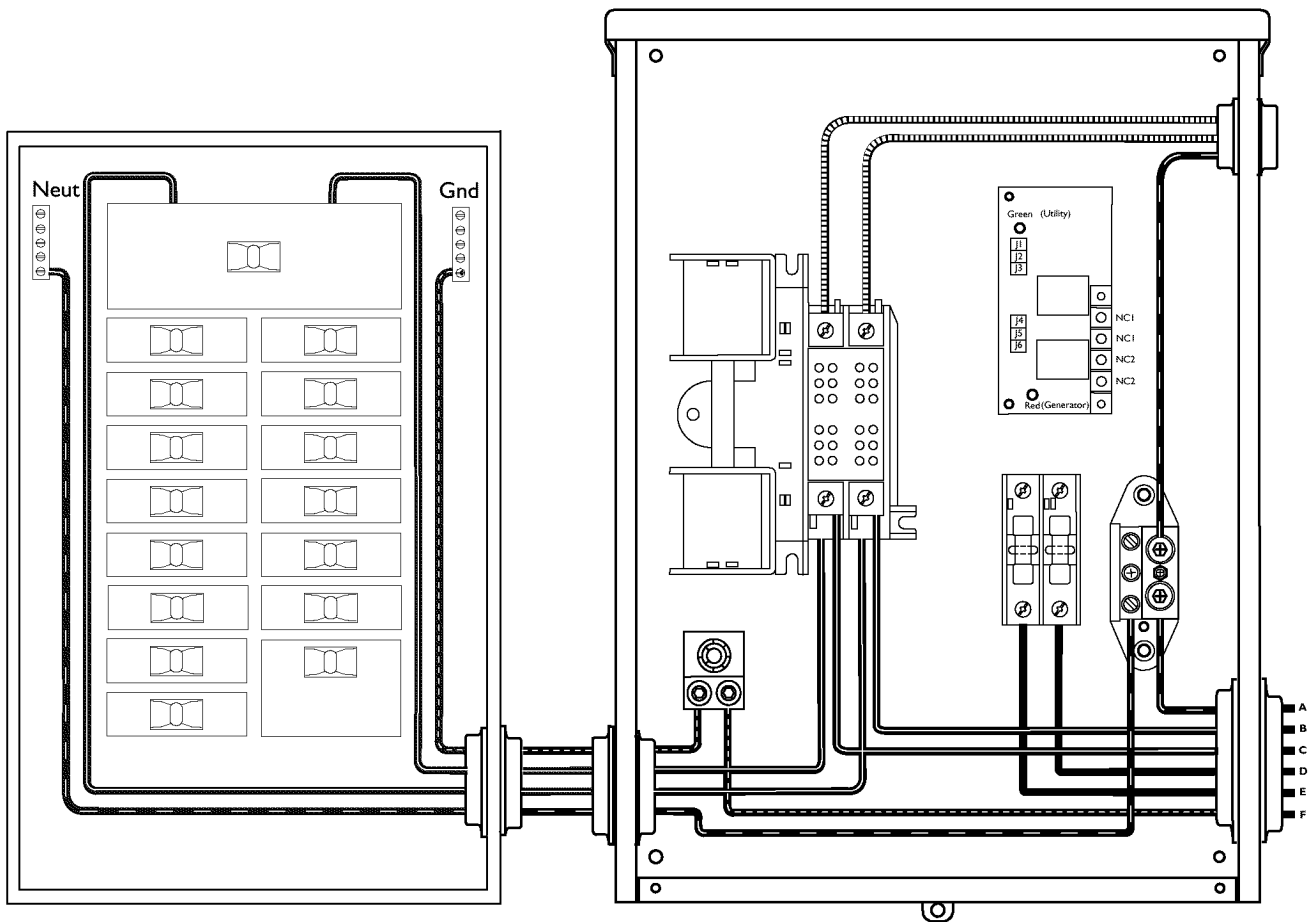


Generator

Figure 75 — Recommended Torque Values (Model 1917)

Connections:	Torque Values	
	Minimum	Maximum
In Main Distribution Panel:		
Refer To Panel Manufacturers' Specs.		
In Transfer Switch:		
Utility Connection Lugs	35 in-lb	45 in-lb
Generator Connection Lugs	35 in-lb	45 in-lb
Line Connection Lugs	35 in-lb	45 in-lb
Neutral Lugs	35 in-lb	45 in-lb
Ground Lugs	45 in-lb	50 in-lb
Barrier Terminal Strip Screws	5 in-lb	13 in-lb
In Generator Housing:		
Dual Pole Breaker Screws	25 in-lb	27 in-lb
Ground Lug Screws	35 in-lb	45 in-lb
Barrier Terminal Strip Screws	5 in-lb	8 in-lb

Figure 76 — Model 1814 200 Amp Automatic Transfer Switch Typical Wiring Diagram

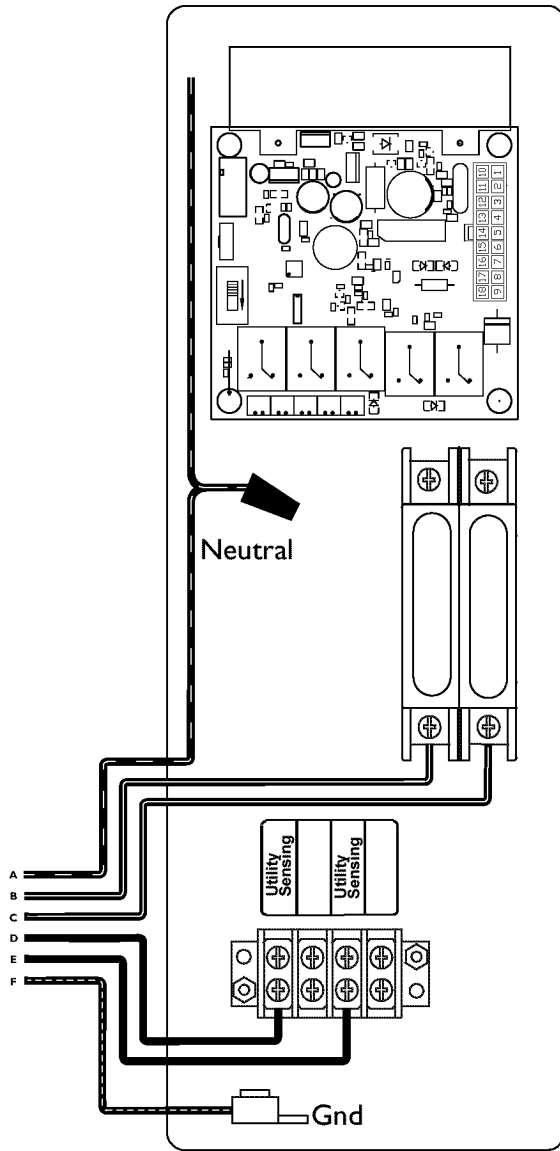


Main Distribution Panel

Model 1814 Transfer Switch



10kW Generator Connections

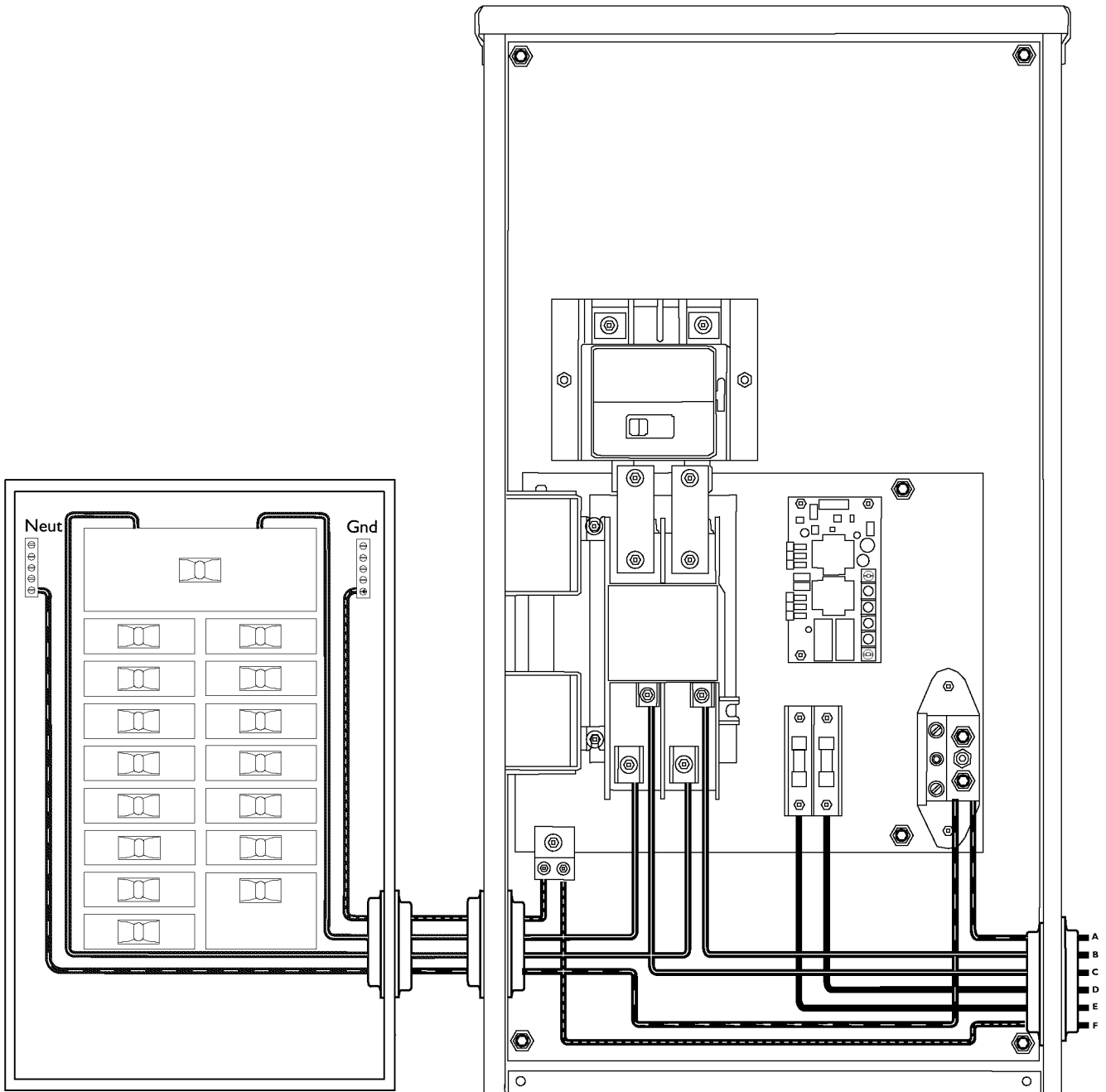


Generator

Figure 77 — Recommended Torque Values (Model 1814)

Connections:	Torque Values	
In Main Distribution Panel: Refer To Panel Manufacturers' Specs.	Minimum	Maximum
In Transfer Switch:		
Ground Lugs	45 in-lb	50 in-lb
Barrier Terminal Strip Screws	5 in-lb	8 in-lb
In Generator Housing:		
Dual Pole Breaker Screws	25 in-lb	27 in-lb
Ground Lug Screws	35 in-lb	45 in-lb
Barrier Terminal Strip Screws	8 in-lb	13 in-lb

Figure 78 — Model 1929 200 Amp Transfer Switch with Main Line Disconnect Typical Wiring Diagram



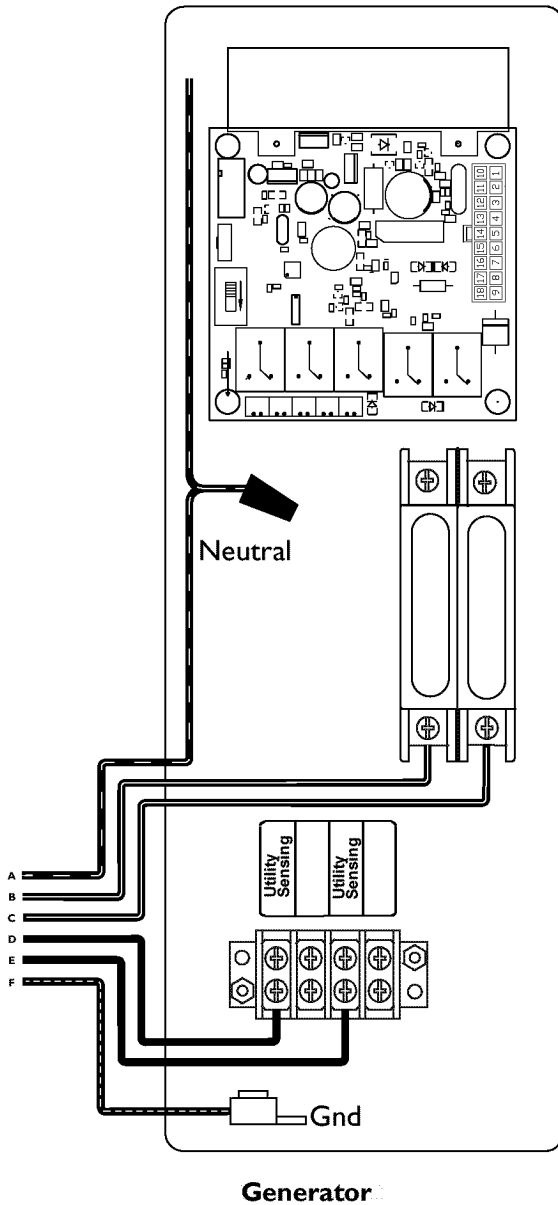
Main Distribution Panel

Model 1929 Transfer Switch



10kW Generator Connections

Figure 79 — Recommended Torque Values (Model 1929)



Connections:	Torque Values	
In Main Distribution Panel: Refer To Panel Manufacturers' Specs.	Minimum	Maximum
In Transfer Switch:		
Generator Connection Lugs	35 in-lb	45 in-lb
Ground Lugs	45 in-lb	50 in-lb
In Generator Housing:		
Dual Pole Breaker Screws	25 in-lb	27 in-lb
Ground Lug Screws	35 in-lb	45 in-lb
Barrier Terminal Strip Screws	8 in-lb	13 in-lb

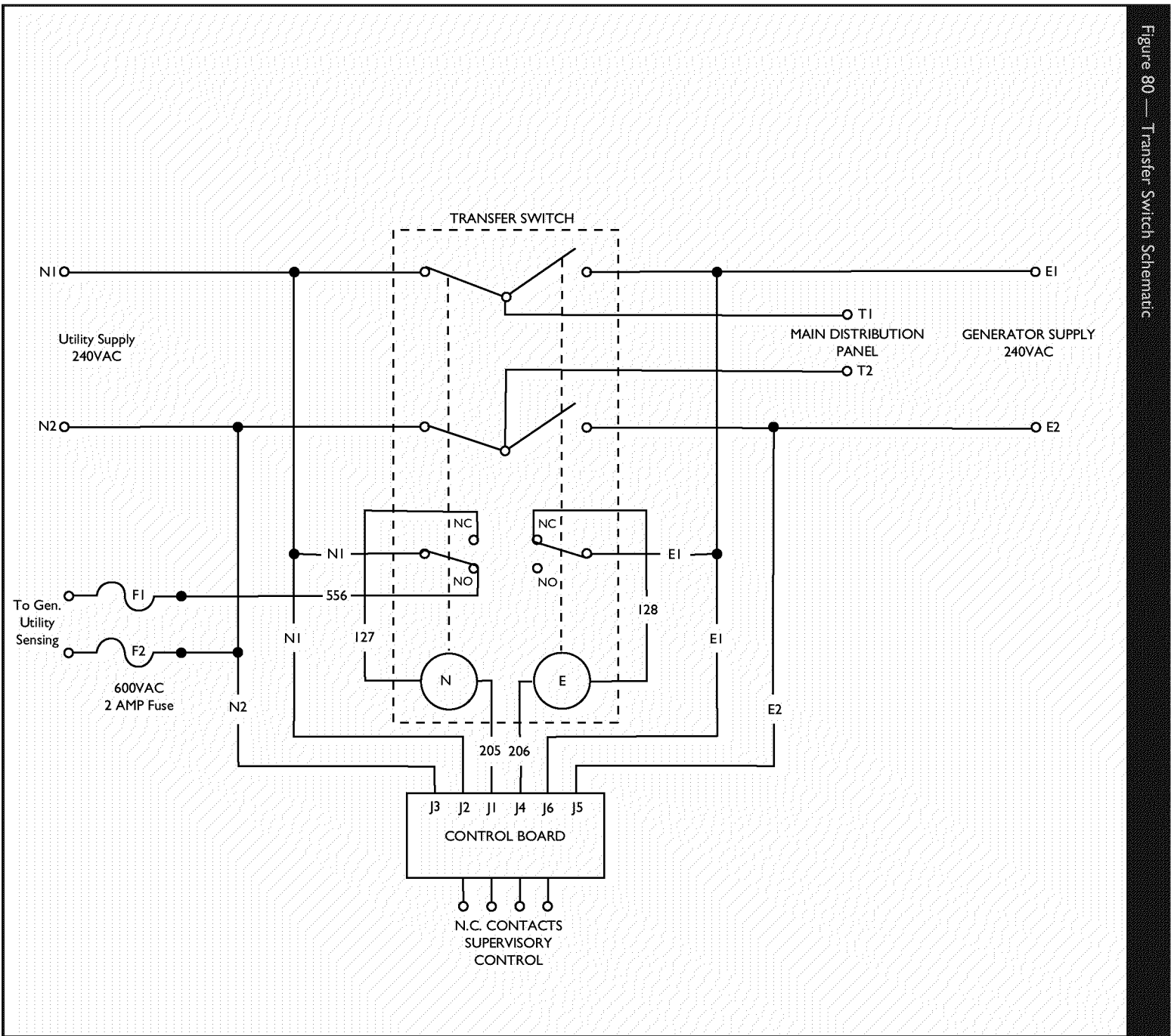


Figure 80 — Transfer Switch Schematic



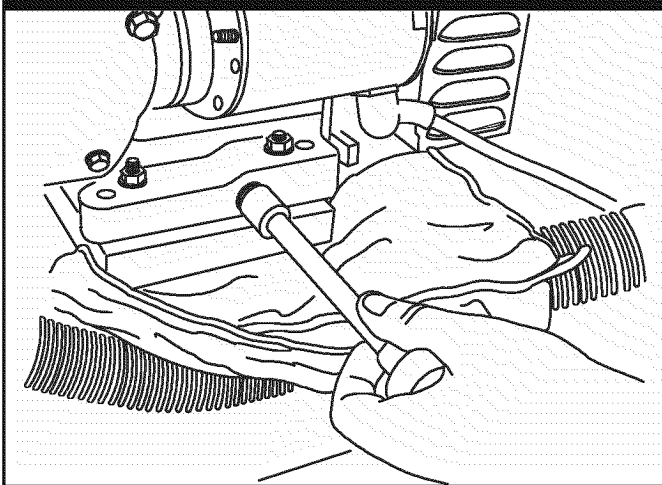
Control by Edison's ClearChoice™

OIL HEATER

Oil Heater

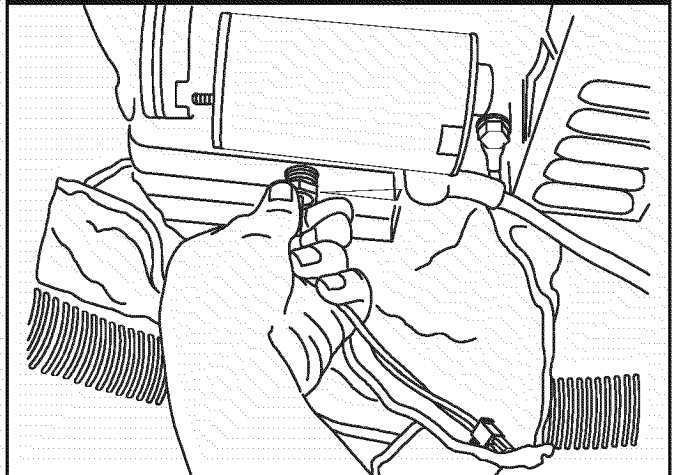
1. Remove the control panel and oil service doors as described on page 7.
2. Set the AUTO/OFF/MANUAL switch to the **OFF** position.
3. Set the generator's main circuit breaker to the **OFF** position.
4. Disconnect power by removing 2 Amp fuses from inside the transfer switch.
5. Drain oil from generator as described on page 37.
6. Remove the crankcase plug from the generator through the "oil service" access panel of the unit (Figure 81).

Figure 81 — Remove plug from engine block.



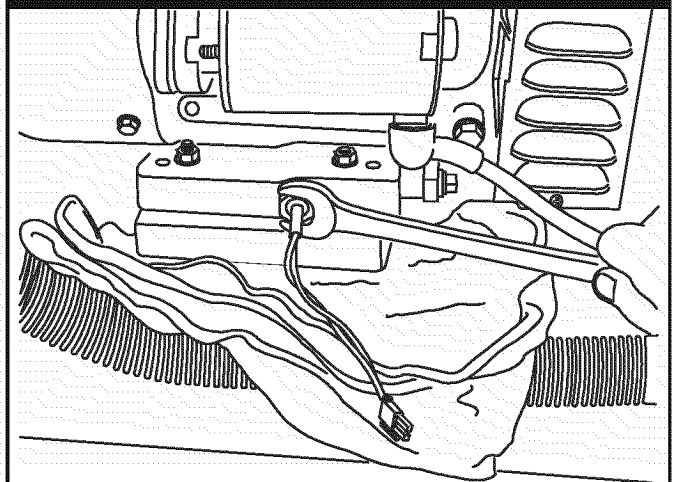
7. Place Teflon tape on the threads of the oil heater fitting (figure 82).

Figure 82 — Teflon Tape on Heater Threads



8. Install oil heater into engine crankcase. Tighten to ¼ turn past "snug" (Figure 83).

Figure 83 — Install Oil Heater



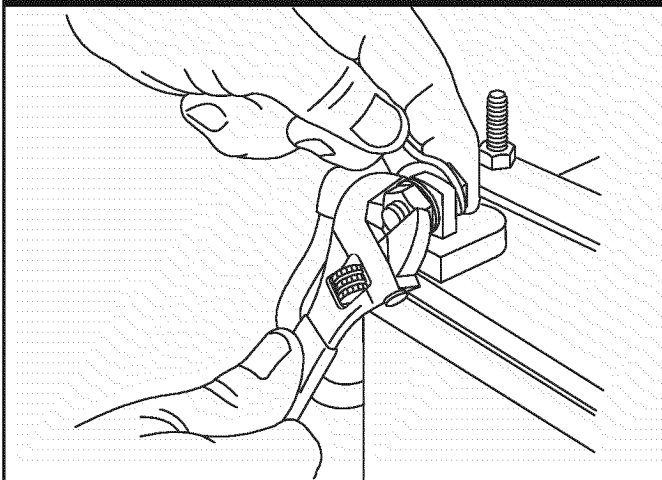
9. Connect oil heater's 2-pin connector to the 2-pin connector provided in the units wiring harness (Figure 84).

BATTERY WARMER

240 Volt Battery Warmer

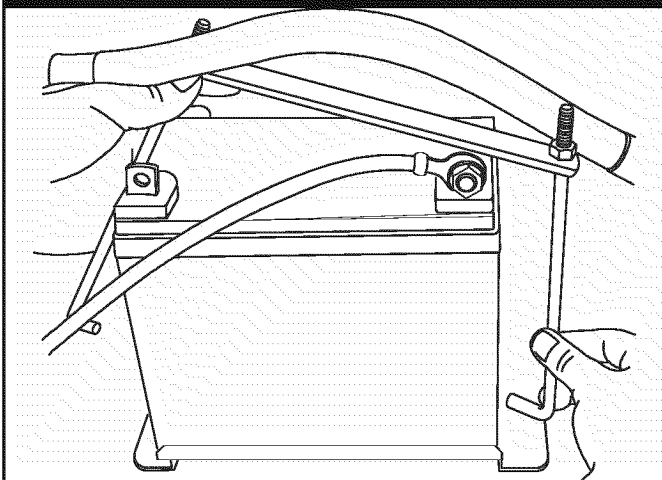
1. Remove control panel and oil service doors as described on page 7.
2. Set AUTO/OFF/MANUAL switch on generator's control panel to **OFF**.
3. Set main circuit breaker to **OFF** position.
4. Disconnect power by removing 2 Amp fuses inside transfer switch.
5. Disconnect negative (-) battery cable (Figure 85).

Figure 85 — Disconnect (-) Negative Battery Cable



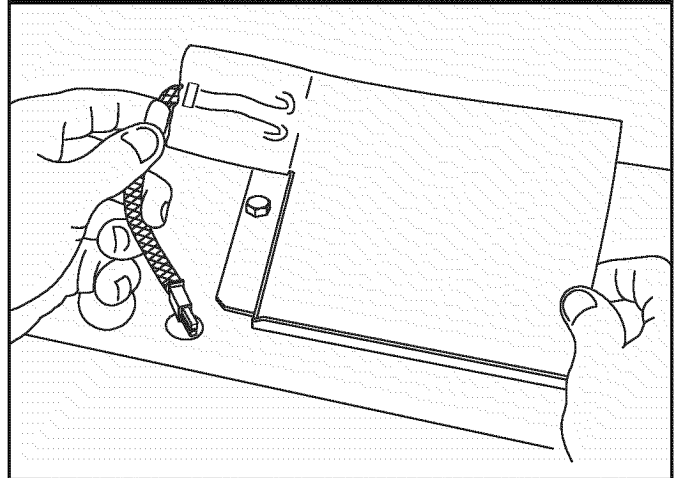
6. Remove battery bracket (Figure 86) and place battery to the side.

Figure 86 — Remove Battery Bracket



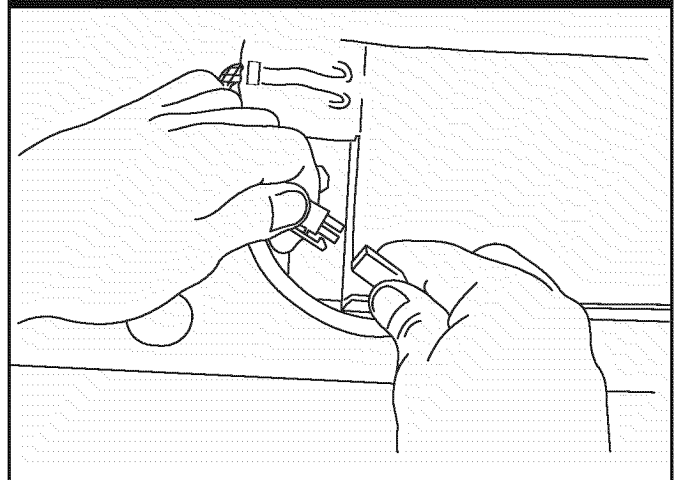
7. Place battery on top of battery tray (Figure 87).

Figure 87 — Place Heater on Battery Tray



8. Remove the tie wrap securing wiring harness 2-pin connector.
9. Plug battery warmer's 2-pin connector into wiring harness 2-pin connector (Figure 88).

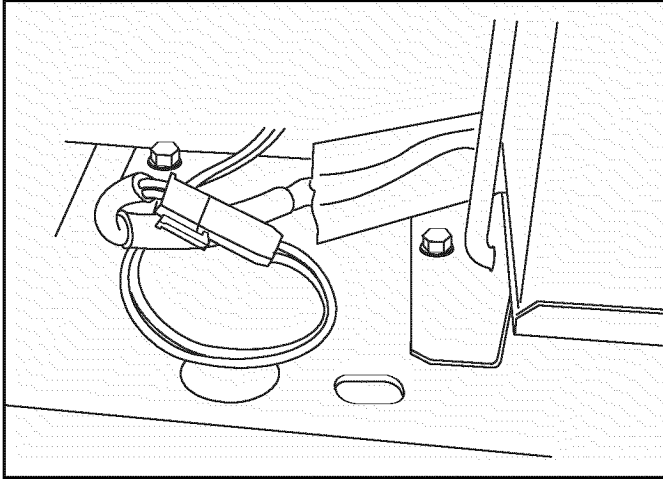
Figure 88 — Connect 2-Pin Connector



10. Place battery on top of battery warmer (Figure 89).

N **NOTE:** Do not place battery on top of battery warmer's leads or thermostat.

Figure 89 — Place Battery on Heater Pad



NOTES

11. Secure battery bracket.
12. Reconnect negative battery cable.
13. Reinstall 2 Amp fuses in transfer switch.
14. Set generator's main circuit breaker to the **ON** position.
15. Set AUTO/OFF/MANUAL switch to the **AUTO** position.
16. Reassemble the generator enclosure.