# OPERATION MANUAL

# WHISPERWATT™ SERIES
# MODEL
# DCA70SSIU4FC8B
## 60 Hz GENERATOR
## (ISUZU BR-4JJ1X DIESEL ENGINE)

INSTRUCTION MANUAL NO. M2844000104

Revision #0 (06/27/23)

**To find the latest revision of this publication or associated parts manual, visit our website at:**
**www.mqpower.com**

**THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.**


WARNING
CANCER &
REPRODUCTIVE HARM
www.P65Warnings.ca.gov
P/N 38707

# DCA70SSIU4FC8B
# 60 Hz Generator



***NOTICE***

Specifications are subject to change without notice.

## SAFETY DECALS

Safety decals are attached to the generator as shown in Figure 1. Keep these safety decals clean at all times. When the safety decals become worn or damaged, contact your nearest dealer or the Multiquip Parts Department.

**NOTICE**

For safety decal part numbers, refer to the associated parts manual.

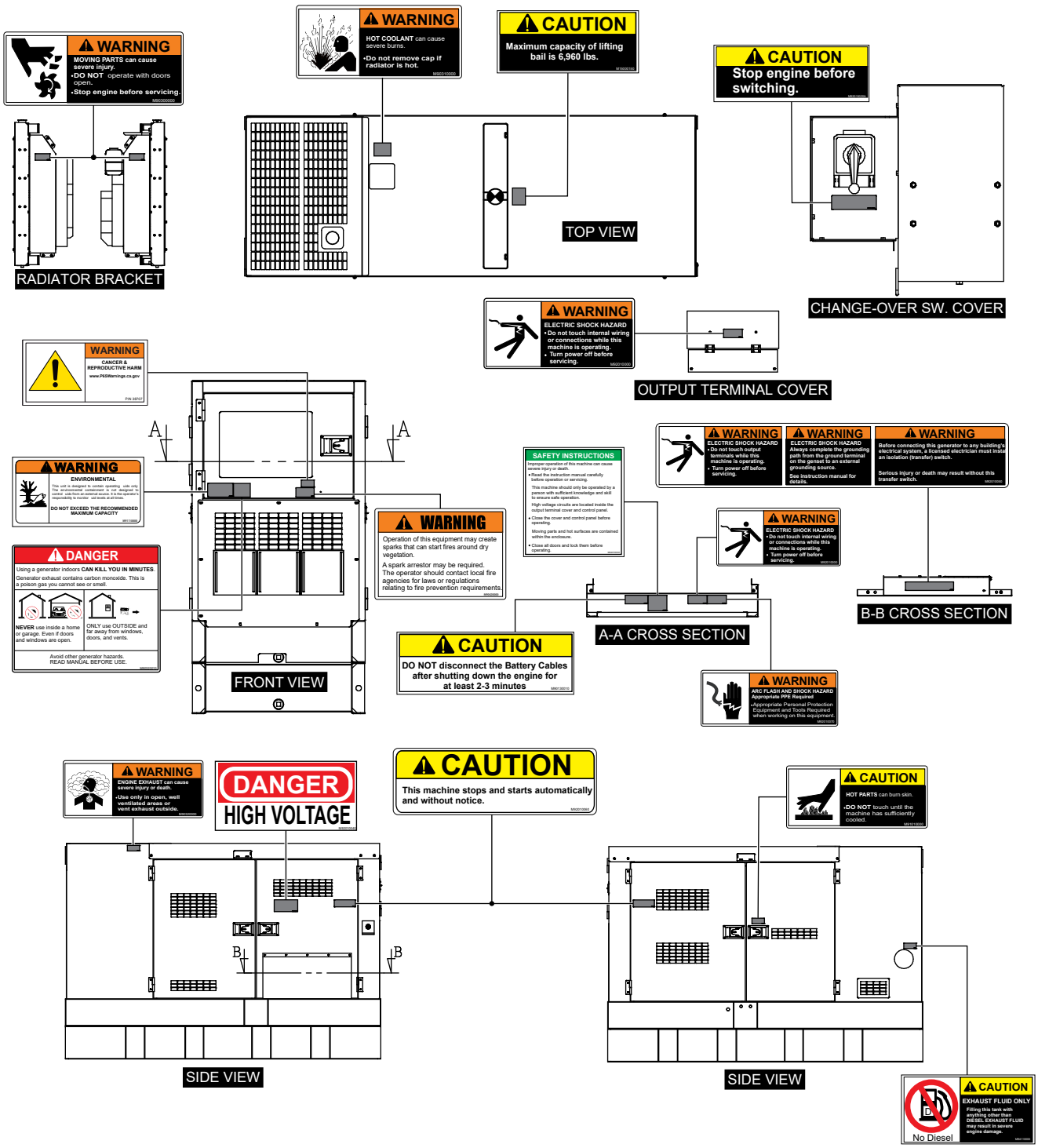



**Figure 1. Safety Decals**

Do not operate or service the generator before reading the entire manual. Safety precautions should be followed at all times when operating this generator. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.

## SAFETY MESSAGES

The four safety messages shown below will inform you about potential hazards that could injure you or others. The safety messages specifically address the level of exposure to the operator and are preceded by one of four words: **DANGER, WARNING, CAUTION** or **NOTICE.**

## SAFETY SYMBOLS

**DANGER**

Indicates a hazardous situation which, if not avoided, **WILL** result in **DEATH** or **SERIOUS INJURY.**

**WARNING**

Indicates a hazardous situation which, if not avoided, **COULD** result in **DEATH** or **SERIOUS INJURY.**

**CAUTION**

Indicates a hazardous situation which, if not avoided, **COULD** result in **MINOR** or **MODERATE INJURY.**

***NOTICE***

Addresses practices not related to personal injury.

Potential hazards associated with the operation of this generator will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety messages.

| Symbol | Safety Hazard |
|---|---|
|  | Lethal exhaust gas hazards |
|  | Explosive fuel hazards |
|  | Burn hazards |
|  | Overspeed hazards |
|  | Rotating parts hazards |
|  | Pressurized fluid hazards |
|  | Electric shock hazards |

## GENERAL SAFETY

**⚠ CAUTION**

- **NEVER** operate this generator without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.

- **NEVER** operate this generator when not feeling well due to fatigue or illness, or when on medication.

- **NEVER** operate this generator under the influence of drugs or alcohol.

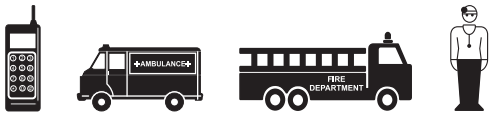
- **ALWAYS** check the generator for loosened threads or bolts before starting.
- **NEVER** use the generator for any purpose other than its intended purposes or applications.

***NOTICE***

- This generator should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult to read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized modification of the generator will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by MQ Power for this generator. Damage to the generator and/or injury to the user may result.
- **ALWAYS** know the location of the nearest **fire extinguisher.**

- **ALWAYS** know the location of the nearest **first aid kit.**


- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site.** Also, know the phone numbers of the nearest **ambulance, doctor,** and **fire department.** This information will be invaluable in the case of an emergency.




## GENERATOR SAFETY

**⚠ DANGER**

- **NEVER** operate the generator in an explosive atmosphere or near combustible materials. An explosion or fire could result causing **severe bodily harm or even death**.

**⚠ WARNING**

- **NEVER** disconnect any **emergency or safety devices**. These devices are intended for operator safety. Disconnection of these devices can cause **severe injury, bodily harm or even death**. Disconnection of any of these devices will void all warranties.

**⚠ CAUTION**

- **NEVER** lubricate components or attempt service on a **running** generator.

***NOTICE***

- **ALWAYS** ensure the generator is on level ground before use.
- **ALWAYS** keep the generator in proper running condition.
- Fix damage to the generator and replace any broken parts immediately.
- **ALWAYS** store the generator properly when it is not being used. The generator should be stored in a clean, dry location out of the reach of children and unauthorized personnel.

## ENGINE SAFETY

**⚠ DANGER**

- The engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause **death** if inhaled.
- The engine of this generator requires an adequate, free flow of cooling air. **NEVER** operate this equipment in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause injury to people and property and serious damage to the equipment or engine.

- When operating the generator outdoors, **DO NOT** place the generator near doors, windows or vents that could allow carbon monoxide to enter and build up in occupied spaces.

**⚠ WARNING**

- **NEVER** place hands or fingers inside the engine compartment when the engine is running.
- **NEVER** operate the engine with heat shields or guards removed.
- Keep fingers, hands, hair and clothing away from all moving parts to prevent injury.

- **NEVER** operate the generator with the doors open. Stop the engine before servicing.
- **DO NOT** remove the radiator cap while the engine is hot. High pressure boiling water will gush out of the radiator and severely scald any persons in the general area of the generator.

- **DO NOT** remove the coolant drain plug while the engine is hot. Hot coolant will gush out of the coolant tank and severely scald any persons in the general area of the generator.
- **DO NOT** drain the engine oil while the engine is hot. Hot oil will gush out and severely scald any persons near the generator.
- Operation of the generator may create sparks that can start fires around dry vegetation. A spark arrestor may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

**⚠ CAUTION**

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing the generator.

***NOTICE***

- **NEVER** run the engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service the air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or generator can result if operating in speed ranges above the maximum allowable.

- Wet stacking is a common problem with diesel engines which are operated for extended periods with light or no load applied. When a diesel engine operates without sufficient load (less than 30-35% of the rated output), it will not operate at its optimum temperature. This will allow unburned fuel to accumulate in the exhaust system, which can foul the fuel injectors, engine valves and exhaust system, including turbochargers, and reduce the operating performance.

  In order for a diesel engine to operate at peak efficiency, it must be able to provide fuel and air in the proper ratio and at a high enough engine temperature for the engine to completely burn all of the fuel.

  Wet stacking does not usually cause any permanent damage and can be alleviated if additional load is applied to relieve the condition. It can reduce the system performance and increase maintenance. Applying an increasing load over a period of time until the excess fuel is burned off and the system capacity is reached usually can repair the condition. This can take several hours to burn off the accumulated unburned fuel.

## FUEL SAFETY

**⚠ DANGER**

- **NEVER** start the engine near spilled fuel or combustible fluids. Diesel fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with **flammable** liquids.
- **NEVER** fill the fuel tank while the engine is **running** or **hot**.
- **NEVER** overfill the fuel tank. Spilled fuel can ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **NEVER** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine.

## TOWING SAFETY

**⚠ CAUTION**

- Check with your local county or state safety towing regulations, in addition to meeting ***Department of Transportation (DOT) Safety Towing Regulations***, before towing your generator.

- Refer to the MQ Power trailer manual for additional safety information.
- In order to reduce the possibility of an accident while transporting the generator on public roads, **ALWAYS** make sure that the trailer that supports the generator and the towing vehicle are both mechanically sound and in good operating condition.
- **ALWAYS** shut down the engine before transporting.
- Make sure the hitch and coupling of the towing vehicle are rated equal to or greater than the trailer **gross vehicle weight rating**.
- **ALWAYS** inspect the hitch and coupling for wear. **NEVER** tow a trailer with defective hitches, couplings, chains, etc.
- Check the tire air pressure on both the towing vehicle and the trailer. ***Inflate trailer tires as indicated on side wall of tire.*** Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer is equipped with **safety chains**.
- **ALWAYS** properly attach the trailer's safety chains to the towing vehicle.
- **ALWAYS** make sure the vehicle and trailer directional, backup, brake, and trailer lights are connected and working properly.
- DOT requirements include the following:
  - Connect and test electric brake operation.
  - Secure portable power cables in cable tray with tie wraps.
- The maximum speed for highway towing is **55 MPH** unless posted otherwise. Recommended off-road towing is not to exceed **15 MPH** or less depending on the type of terrain.
- Avoid sudden stops and starts. These can cause skidding or jackknifing. Smooth, gradual starts and stops will improve towing.
- Avoid sharp turns to prevent rolling.
- The trailer should be adjusted to a level position at all times when towing.
- Raise and lock the trailer wheel stand in the upright position when towing.
- Place ***chock blocks*** underneath the wheels to prevent **rolling** while parked.
- Place **support blocks** underneath the trailer's bumper to prevent **tipping** while parked.
- Use the trailer's swivel jack to adjust the trailer height to a level position while parked.

## ELECTRICAL SAFETY

**DANGER**

- **NEVER** touch the output terminals during operation. Contact with the output terminals during operation can cause **electrocution, electrical shock, or burn**.

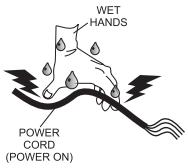
- The electrical voltage required to operate the generator can cause **severe injury or even death** through physical contact with live circuits. Turn the generator and all circuit breakers **OFF** before performing maintenance on the generator or making contact with the output terminals.
- **NEVER** insert any objects into the output receptacles during operation. This is extremely dangerous. The possibility exists of **electrical shock, electrocution or death**.

- Backfeed to a utility system can cause **electrocution** and/or property damage. **NEVER** connect the generator to a building's electrical system without a transfer switch or other approved device. All installations should be performed by a **licensed electrician** in accordance with all applicable laws and electrical codes. Failure to do so could result in electrical shock or burn, causing **serious injury or even death**.

### Power Cord/Cable Safety

**DANGER**

- **NEVER** let power cords or cables **lay in water**.
- **NEVER stand in water** while AC power from the generator is being transferred to a load.
- **NEVER** use **damaged** or **worn** cables or cords when connecting equipment to the generator. Inspect the insulation for cuts.
- **NEVER** grab or touch a live power cord or cable with wet hands. The possibility exists of **electrical shock, electrocution or death**.




- Make sure power cables are securely connected to the generator's output receptacles. Incorrect connections may cause electrical shock and damage to the generator.

***NOTICE***

- **ALWAYS** make certain that the proper power or extension cord has been selected for the job. See the Cable Selection Chart in this manual.

### Grounding Safety

**DANGER**

- **ALWAYS** make sure that electrical circuits are properly grounded to a suitable earth ground (ground rod) per the National Electrical Code (NEC) and local codes before operating the generator. **Severe injury or death by electrocution** can result from operating an ungrounded generator.
- **NEVER** use gas piping as an electrical ground.

## BATTERY SAFETY

**DANGER**

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **NEVER** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an explosion could occur.

**WARNING**

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.

- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gases.
- If the battery liquid (dilute sulfuric acid) comes into contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.

- If the battery liquid (dilute sulfuric acid) comes into contact with **eyes**, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.

**⚠ CAUTION**

- **ALWAYS** disconnect the **NEGATIVE battery terminal** before performing service on the generator.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.

## ENVIRONMENTAL SAFETY/DECOMMISSIONING

***NOTICE***

Decommissioning is a controlled process used to safely retire a piece of equipment that is no longer serviceable. If the equipment poses an unacceptable and unrepairable safety risk due to wear or damage or is no longer cost effective to maintain (beyond life-cycle reliability) and is to be decommissioned (demolition and dismantlement), be sure to follow the rules below:

- **NEVER** pour waste or oil directly onto the ground, down a drain, or into any water source.
- Contact your country's Department of Public Works or recycling agency in your area and arrange for proper disposal of any electrical components, waste or oil associated with this equipment.

- When the life cycle of this equipment is over, remove the battery and bring it to an appropriate facility for lead reclamation. Use safety precautions when handling batteries that contain sulfuric acid.
- When the life cycle of this equipment is over, it is recommended that the frame and all other metal parts be sent to a recycling center.

  Metal recycling involves the collection of metal from discarded products and its transformation into raw materials to use in manufacturing a new product.

  Recyclers and manufacturers alike promote the process of recycling metal. Using a metal recycling center promotes energy cost savings.

## EMISSIONS INFORMATION

***NOTICE***

The diesel engine used in this equipment has been designed to reduce harmful levels of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx) contained in diesel exhaust emissions.

This engine has been certified to meet US EPA evaporative emissions requirements in the installed configuration.

Attempting to modify or make adjustments to the engine emission system by unauthorized personnel without proper training could damage the equipment or create an unsafe condition.

Additionally, modifying the fuel system may adversely affect evaporative emissions, resulting in fines or other penalties.

### Emission Control Label

The emission control label is an integral part of the emission system and is strictly controlled by regulations.

The label must remain with the engine for its entire life.

If a replacement emission label is needed, please contact your authorized engine distributor.

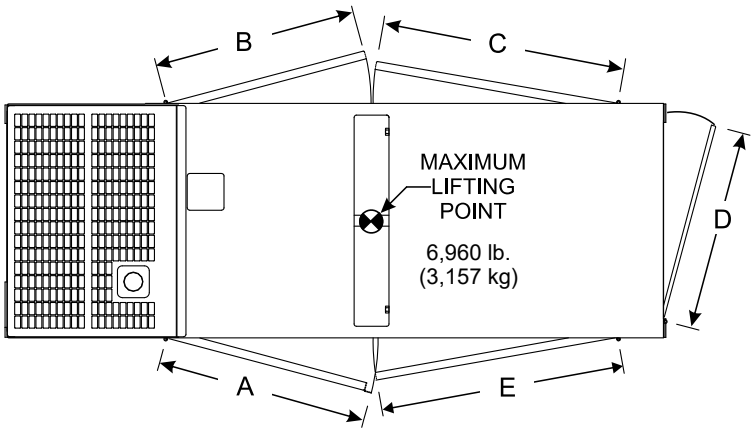
| Table 1. Generator Specifications | | |
|---|---|---|
| **Model** | DCA70SSIU4FC8B | |
| **Type** | Revolving field, self-ventilated, open protected type synchronous generator | |
| **Armature Connection** | **Star with Neutral** | **Zigzag** |
| **Phase** | 3 | Single |
| **Standby Output** | 61 kW (77 kVA) | 44 kW |
| **Prime Output** | 56 kW (70 kVA) | 40 kW |
| **3Ø Voltage (L–L/L–N)**<br>**Voltage Selector Switch at 3Ø 240/139** | 208Y/120, 220Y/127, 240Y/139 | N/A |
| **1Ø Voltage (L-L/L-N)**<br>**(Voltage Selector Switch at 1Ø 240/120)** | N/A | 240/120 |
| **Power Factor** | 0.8 | 1.0 |
| **Frequency** | 60 Hz | |
| **Speed** | 1,800 rpm | |
| **Aux. AC Power** | Single phase, 60 Hz | |
| **Pitch** | 2/3 | |
| **Subtransient** | 0.085 | |
| **Transient** | 0.203 | |
| **Synchronous** | 1.942 | |
| **Zero Sequence Reactance** | 0.0081 | |
| **Overload Protection** | OCR / main circuit breaker | |
| **Aux. Voltage/Output** | 120V / 4.8 kW (2.4 kW × 2) | |
| **Dry Weight** | 3,326 lb. (1,509 kg)[1] | |
| **Wet Weight** | 4,207 lb. (1,908 kg)[1] | |
| **Table 2. Engine Specifications** | | |
| **Model** | Isuzu BR-4JJ1X Tier 4 Final Certified | |
| **Type** | 4-cycle, water-cooled, direct-injection, turbocharged and cooled EGR, DOC, and SCR | |
| **No. of Cylinders** | 4 | |
| **Bore × Stroke** | 3.76 in. × 4.13 in. (95 mm × 105 mm) | |
| **Displacement** | 415 cu. in. (3.0 liters) | |
| **Rated Output** | 86.5 hp at 1,800 rpm | |
| **Starting** | Electric | |
| **Coolant Capacity** | 5.5 gal. (21.0 liters)[2] | |
| **Lube Oil Capacity** | 3.6 gal. (13.5 liters)[3] | |
| **Lube Oil Type** | API service class CJ-4 or JASO DH-2 | |
| **DEF Tank Capacity** | 7.4 gal. (28 liters) | |
| **Fuel Type** | No. 2 diesel fuel (ultra low sulfur diesel fuel only) | |
| **Fuel Tank Capacity** | 103 gal. (390 liters) | |
| **Fuel Consumption** | 4.4 gal. (16.6 L)/hr. at **full load** | 3.5 gal. (13.4 L)/hr. at **3/4 load** |
| | 2.6 gal. (9.8 L)/hr. at **1/2 load** | 1.7 gal. (6.4 L)/hr. at **1/4 load** |
| **Battery** | 12V 75Ah 27D (CCA 0°F 800A ) × 1 | |

[1] Does not include options

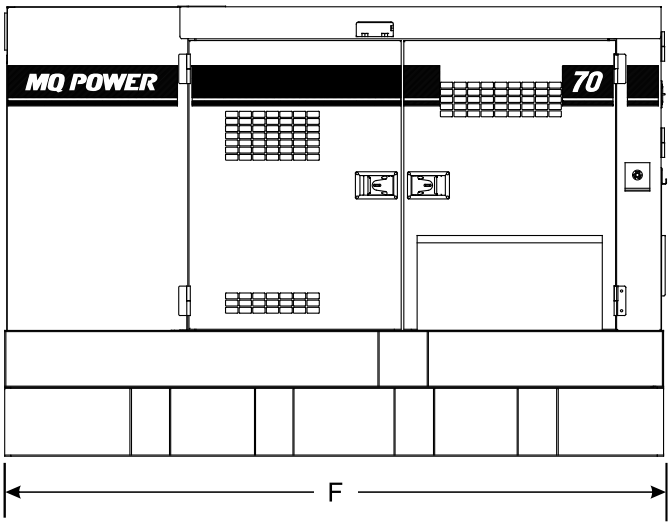
[2] Includes engine, radiator, and hoses

[3] Includes filters

**TOP VIEW**




**SIDE VIEW**




**FRONT VIEW**

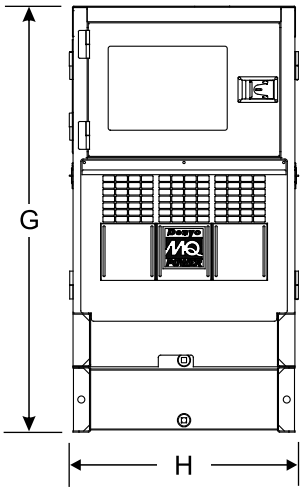



**Figure 2. Dimensions**

| Table 3. Dimensions | | | |
|---|---|---|---|
| Reference Letter | Dimension in. (mm) | Reference Letter | Dimension in. (mm) |
| A | 33.95 (862) | E | 33.86 (860) |
| B | 29.52 (750) | F | 105.12 (2,670) |
| C | 38.27 (972) | G | 71.79 (1,823) |
| D | 32.36 (822) | H | 37.40 (950) |

## GENERATOR GROUNDING

**ALWAYS** refer to Article 250 (Grounding and Bonding) of the National Electrical Code (NEC).

> ***NOTICE***
>
> **ALWAYS** check with state, province, district, and municipalities for electrical grounding requirements before using the generator.

**EXAMPLE of how to ground the unit (Figure 3) if the condition of use requires such a device:**

### Connecting The Ground

Consult with local electrical and safety codes for proper connection based on condition of use. Refer to the Conductor Grounding Table, Article 250 of the NEC handbook.

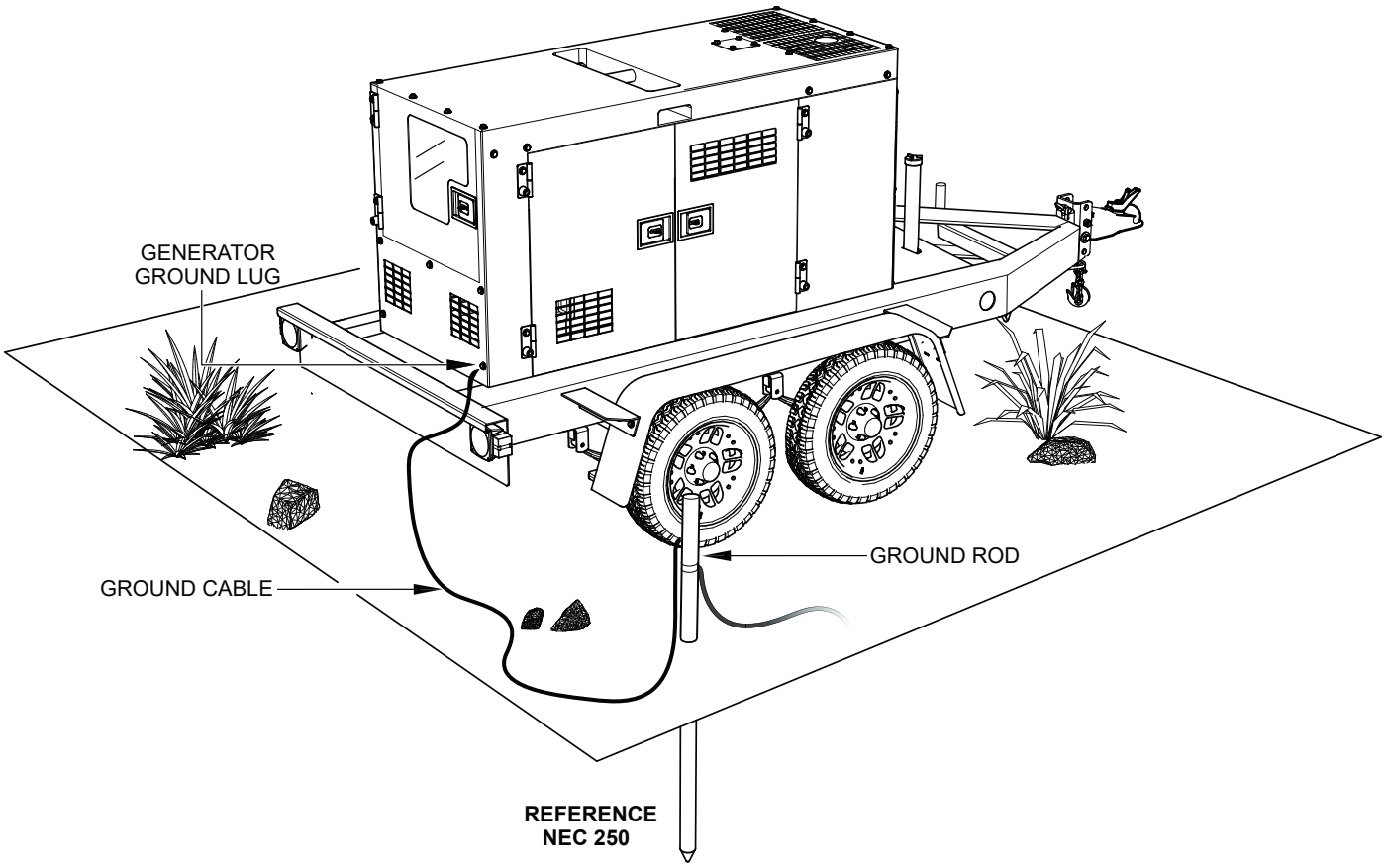



**Figure 3. Typical Generator Grounding Application**

> ***NOTICE***
>
> Trailer-mounted generators are the sole responsibility of MQ Power.

## OUTDOOR INSTALLATION

Install the generator in an area that is free of debris, bystanders, and overhead obstructions. Make sure the generator is on secure, level ground so that it cannot slide or shift around. Also, install the generator in a manner so that the exhaust will not be discharged in the direction of nearby homes.

The installation site must be relatively free from moisture and dust. All electrical equipment should be protected from excessive moisture. Failure to do so will result in deterioration of the insulation and will result in short circuits and grounding.

Foreign materials such as dust, sand, lint, and abrasive materials have a tendency to cause excessive wear to engine and alternator parts.

**⚠ CAUTION**

Pay close attention to ventilation when operating the generator inside tunnels and caves. The engine exhaust contains noxious elements. Engine exhaust must be routed to a ventilated area.

## INDOOR INSTALLATION

Exhaust gases from diesel engines are extremely poisonous. Whenever an engine is installed indoors the exhaust fumes must be vented to the outside. The engine should be installed at least two feet from any outside wall. Using an exhaust pipe which is too long or too small can cause excessive back pressure which will cause the engine to heat excessively and possibly burn the valves.

## MOUNTING

The generator must be mounted on a solid foundation (such as concrete) and set firmly on the foundation to isolate vibration of the generator when it is running. The generator must be mounted at least 6 inches above the floor or grade level as referenced in the National Fire Protection Association handbook (NFPA 110, Chapter 7, Section 7.4).

**DO NOT** remove the metal skids on the bottom of the generator. They are to resist damage to the bottom of the generator and to maintain alignment.

## GENERATOR

This generator (Figure 4) is designed as a high-quality, portable (requiring a trailer for transport) power source for telecom sites, lighting facilities, power tools, submersible pumps and other industrial and construction machinery.

## CONTROL PANEL

The **control panel** is provided with the following:

- Basler DGC2020 Digital Controller (Standard)
  - Liquid Crystal Display
  - Not In Auto Indicator
  - Alarm Indicator
  - Supplying Load Indicator
  - Alarm Silence Button
  - Lamp Test Button
  - Auto Button / Mode Indicator
  - Off Button / Mode Indicator
  - Run Button / Mode Indicator
  - Reset Button
  - Arrow Buttons (4)
  - Edit Button
- Panel Light / Panel Light Switch
- Control Power Switch
- Voltage Regulator
- 3-Phase, 200-Amp Main Circuit Breaker
- Emergency Stop Switch
  (located on side of unit near output terminal panel)
- **Control Box** (located behind control panel)
  - Automatic Voltage Regulator
  - Current Transformer
  - Overcurrent Relay
  - Starter Relay
  - Voltage Selector Switch

## OUTPUT TERMINAL PANEL

The **output terminal panel** is provided with the following:

- Three 240/120V Output Receptacles (CS-6369), 50A
- Three Auxiliary Circuit Breakers, 50A
- Two 120V Output Receptacles (GFCI), 20A
- Two GFCI Circuit Breakers, 20A
- Four Output Terminal Lugs (3Ø Power)
- Ground Lug
- Engine Block Heater
- Battery Charger (Option)
- Cam-Lok Connectors (Option)

## OPEN DELTA EXCITATION SYSTEM

Each generator is equipped with a state-of-the-art, **open-delta** excitation system. The open-delta system consists of an electrically independent winding wound among stationary windings of the AC output section.

There are four connections of the open delta—A, B, C, and D. During steady state loads, the power from the voltage regulator is supplied from the parallel connections of A to B, A to D, and C to D. These three phases of the voltage input to the voltage regulator are then rectified and are the excitation current for the exciter section.

When a heavy load such as a motor starting or a short circuit occurs, the automatic voltage regulator (AVR) switches the configuration of the open delta to the series connection of B to C. This has the effect of adding the voltages of each phase to provide higher excitation to the exciter section and thus better voltage response during the application of heavy loads.

The connections of the AVR to the AC output windings are for sensing only. No power is required from these windings.

The open-delta design provides virtually unlimited excitation current, offering maximum motor-starting capabilities. The excitation does not have a 'fixed ceiling' and responds according the demands of the required load.

## ENGINE

This generator is powered by a 4-cycle, water-cooled, direct-injection, turbocharged and cooled EGR, Isuzu BR-4JJ1X diesel engine. This engine is designed to meet every performance requirement for the generator. Refer to Table 2 for engine specifications.

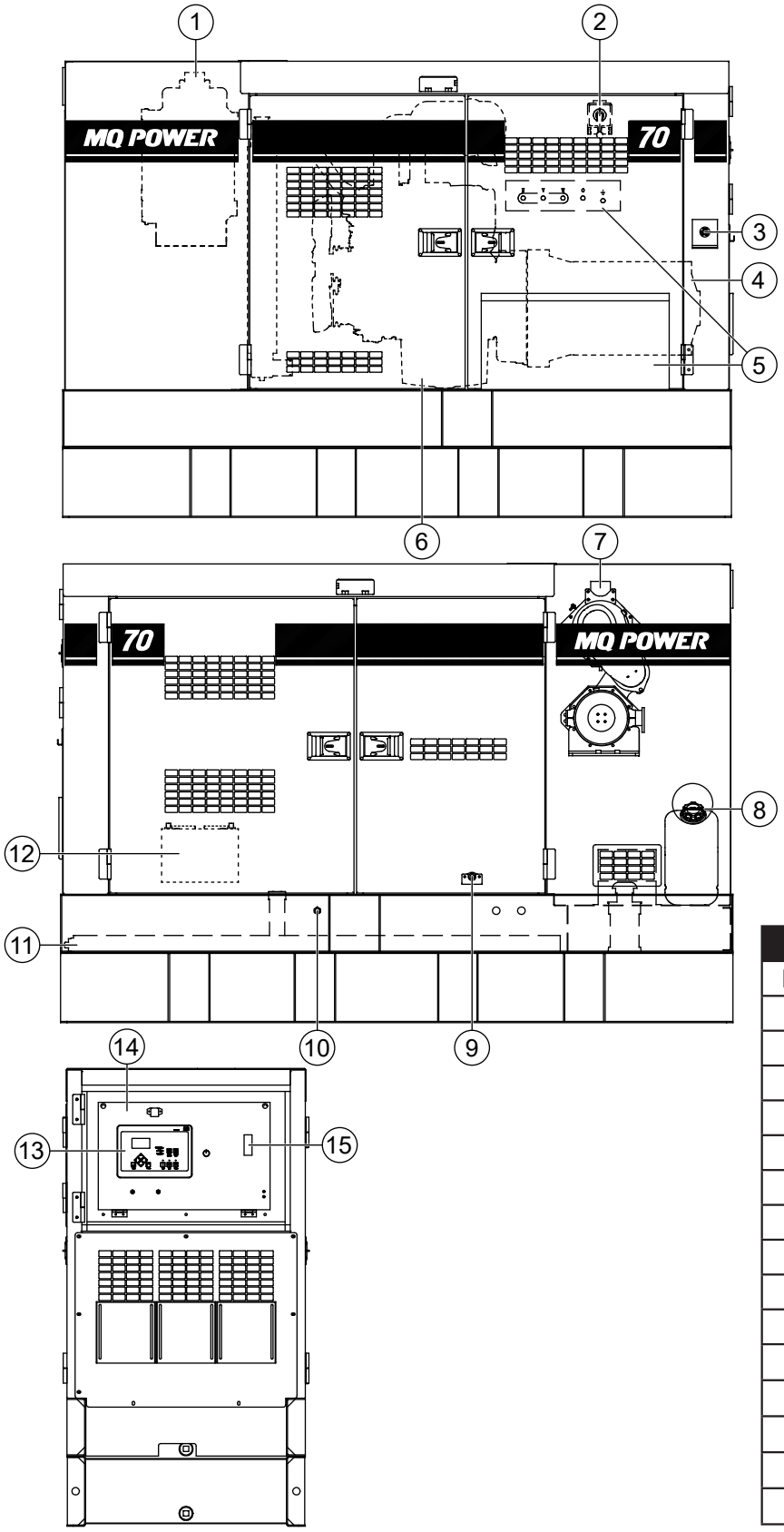
In keeping with MQ Power's policy of constantly improving its products, the specifications quoted herein are subject to change without prior notice.

## MICROPROCESSOR CONTROL SYSTEM

The microprocessor controls the RPM of the engine. When the engine demand increases or decreases, the microprocessor system regulates the frequency variation to ± 0.25%.

## EXTENSION CABLES

When electric power is to be provided to various tools or loads at some distance from the generator, extension cords are normally used. Cables should be sized to allow for distance in length and amperage so that the voltage drop between the generator and point of use (load) is held to a minimum. Use the cable selection chart (Table 6) as a guide for selecting the proper extension cable size.




| Table 4. Major Components | |
|---|---|
| **Item No.** | **Description** |
| 1 | Muffler Assembly |
| 2 | Voltage Selector Switch |
| 3 | Emergency Stop Switch |
| 4 | Generator Assembly |
| 5 | Output Terminal Panel Assembly |
| 6 | Engine Assembly |
| 7 | DOC/SCR Assembly |
| 8 | DEF Tank Assembly |
| 9 | Coolant Drain |
| 10 | Oil Drain with Valve |
| 11 | Fuel Tank Assembly |
| 12 | Battery Assembly |
| 13 | Digital Genset Controller Assembly |
| 14 | Control Panel Assembly |
| 15 | Main Circuit Breaker |

**Figure 4. Major Components**

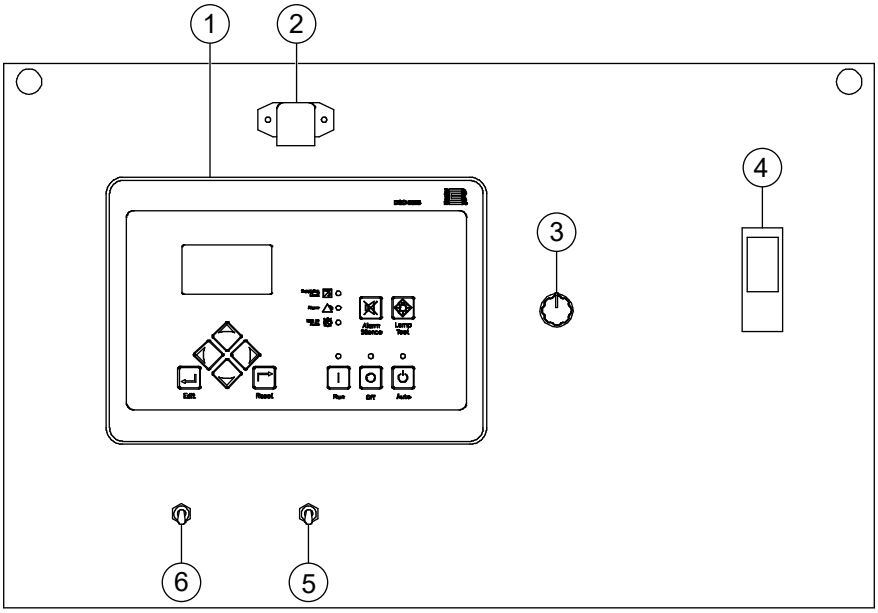



**Figure 5. Control Panel**

The definitions below describe the controls and functions of the **control panel** (Figure 5).

1. **Basler DGC-2020 Digital Genset Controller** — Displays parameters (AC voltage, AC current, phase, frequency, fuel level, DEF level, oil pressure, engine run hours, water/coolant temperature, and battery voltage), as well as diagnostic trouble codes and messages. Refer to the ***Basler Digital Genset Controller*** section for more information.
2. **Panel Light** — Illuminates the control panel for nighttime operation.
3. **Voltage Regulator Control Knob** — Allows ± 15% manual adjustment of the generator's output voltage.
4. **Main Circuit Breaker** — This 3-phase, 1000-amp, main circuit breaker protects the U, V, and W output terminal lugs from overload. Located inside the control box.
5. **Panel Light Switch** — When activated, will turn on the control panel light. Make sure the panel light switch is in the **OFF** position when the panel light is not needed.
6. **Control Power Switch** — Set this switch to the **ON** position prior to operation. The digital controller will turn **ON**. Make sure the switch is set to the **OFF** position when operation has ended. This switch will be disabled while the engine is running.

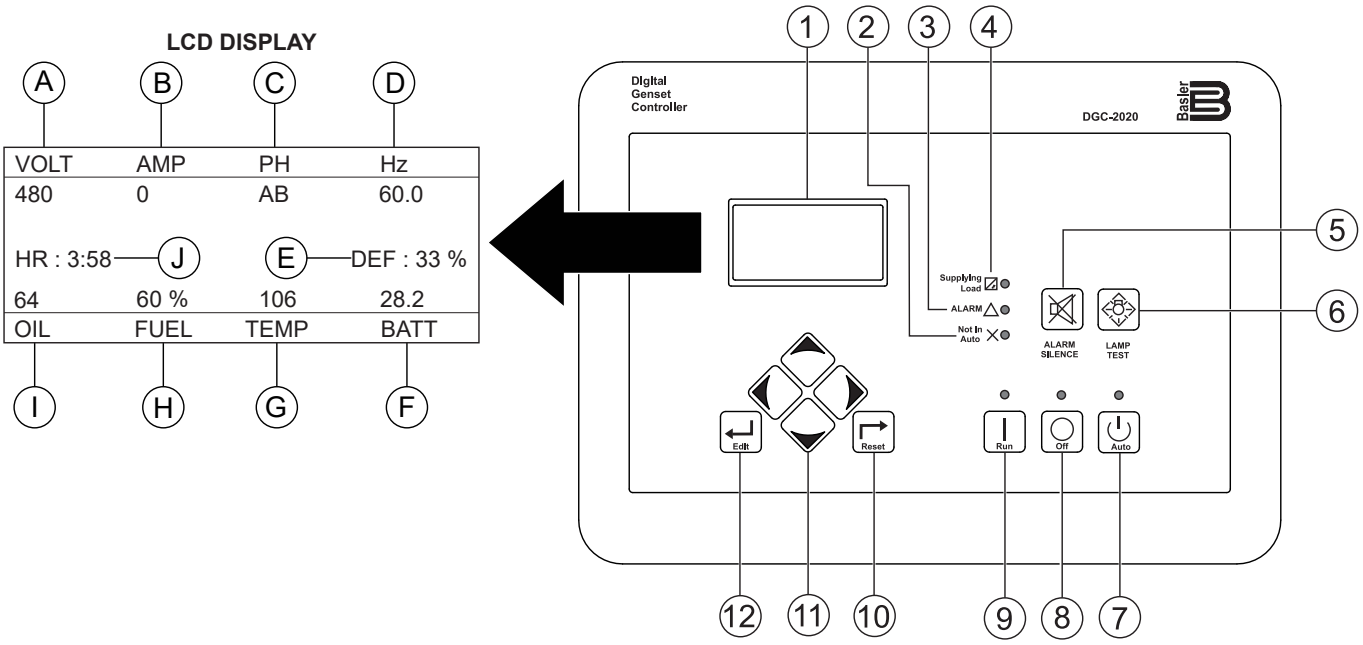



**Figure 6. Basler DGC-2020**

The definitions below describe the controls and functions of the **Basler DGC-2020 digital genset controller** (Figure 6). Refer to the digital controller's instruction manual for more information.

1. **LCD Display** — Serves as the local information source for metering, alarms, pre-alarms, and protective functions.

   A. **AC Voltmeter** — Indicates the phase-to-phase voltage of the output terminals.

   B. **AC Ammeter** — Indicates the current flowing to the load connected to the output terminals.

   C. **Phase Indicator** — Indicates the line at which the AC voltage is measured. A = U phase, B = V phase, C = W phase.

   D. **Frequency Meter** — Indicates the output frequency of the generator in hertz (Hz). Normally 60 Hz.

   E. **DEF Gauge** — Indicates the level (%) of DEF in the DEF tank.

   F. **Battery Voltmeter** — During normal operation this gauge should indicate a minimum of 25 VDC.

   G. **Water Temperature Gauge** — During normal operation this gauge should read between 167°–194°F (75°–90°C).

   H. **Fuel Gauge** — Indicates the level (%) of diesel fuel in the fuel tank.

   I. **Oil Pressure Gauge** — During normal operation this gauge should read between 56–100 psi (386–689 kPa). When starting the generator the oil pressure may read a little higher, but after the engine warms up the oil pressure should return to the correct pressure range.

   J. **Run Hours Meter** — Indicates the engine run time.

2. **Not In Auto Indicator** — This red LED lights whenever the DGC-2020 is **not** operating in **Auto mode**.
3. **Alarm Indicator** — This red LED lights continuously during alarm conditions and flashes during pre-alarm conditions.
4. **Supplying Load Indicator** — This green LED lights whenever the generator current is greater than the emergency power supply (EPS) threshold current.
5. **Alarm Silence Pushbutton** — Press this button to open the relay output programmed as the horn output.
6. **Lamp Test Pushbutton** — Press this button to test the DGC-2020 indicators by exercising all LCD pixels and lighting all LEDs.
7. **Auto Pushbutton and Mode Indicator** — Press the **Auto pushbutton** to place the DGC-2020 in **Auto mode**. The green **Auto Mode LED** lights whenever Auto mode is active.

   While in Auto mode, if the unit's auto-start contacts are connected to a transfer switch and the contacts between the terminals are closed, the unit will start and automatically close the circuit breaker.
8. **Off Pushbutton and Mode Indicator** — Press this button to place the DGC-2020 in **Off mode**.The red **Off Mode LED** lights whenever the DGC-2020 is in Off mode. This button also resets the **Breaker Management pre-alarms**.
9. **Run Pushbutton and Mode Indicator** — Press this button to place the DGC-2020 in **Run mode**. The green **Run Mode LED** lights whenever Run mode is active.
10. **Reset Pushbutton** — Press this button to cancel a settings editing session and discard any settings changes. When pressed momentarily, this button resets the **Breaker Management pre-alarms**. This button is also used to reset the maintenance interval when pressed for 10 seconds while viewing **Hours Until Maintenance** or the **Maintenance Due pre-alarm**.
11. **Arrow Pushbuttons** — These four buttons are used to navigate through the front panel display menus and to modify settings.

    - The **Left Arrow and Right Arrow buttons** are used to navigate through the menu levels. Press the **Right Arrow button** to move **downward** through the menu levels and press the **Left Arrow button** to move **upward** through the menu levels.
    - The **Up Arrow and Down Arrow buttons** are used to move among items within a menu level. Press the **Down Arrow button** to move to items lower on the list. Press the **Up Arrow button** to move to items higher on the list.
    - During a settings editing session, the Up Arrow and Down Arrow buttons are used to increase and decrease the value of the selected setting. The Right Arrow and Left Arrow buttons move to different digits.
12. **Edit Pushbutton** — Press the **Edit pushbutton** to start an editing session and enable changes to the DGC-2020 settings. At the conclusion of an editing session, press this button again to save the setting changes.

## OUTPUT TERMINAL PANEL

The **output terminal panel** (Figure 8) shown below is provided for the connection of electrical loads. Lift up on the cover to gain access to receptacles and terminal lugs.

***NOTICE***

**Terminal O** is **neutral bonded** to the ground from the factory.

## OUTPUT TERMINAL FAMILIARIZATION

The **output terminal panel** (Figure 8) is provided with the following:

- Three (3) 240/120-volt, 50-amp output receptacles
- Three (3) 50-amp circuit breakers
- Two (2) 120-volt, 20-amp GFCI receptacles
- Two (2) 20-amp GFCI circuit breakers
- Five (5) output terminal lugs (U, V, W, O, Ground)

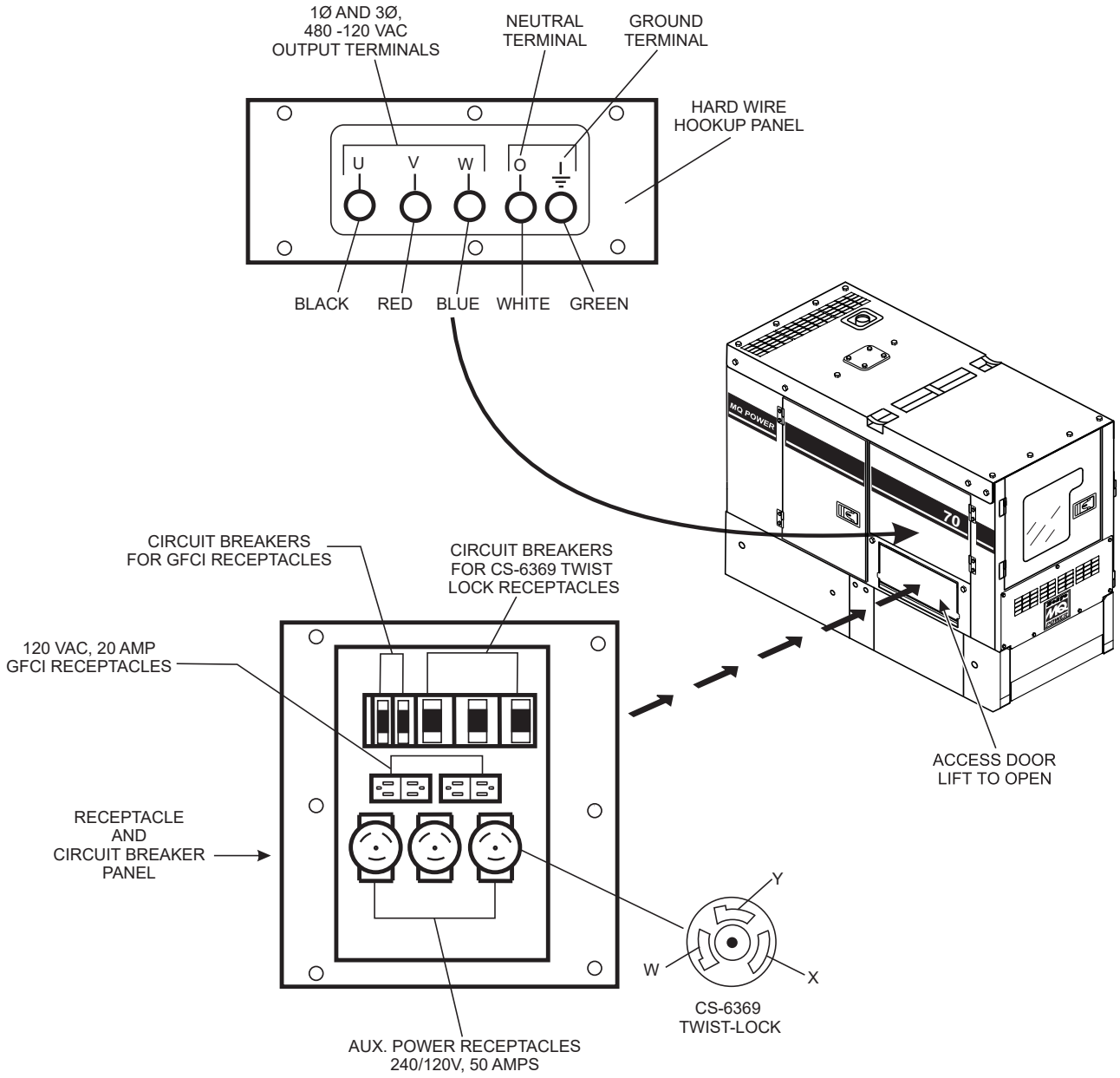



**Figure 7. Output Terminal Panel**

## 120-Volt AC GFCI Receptacles

**NOTICE**

It is recommended that the GFCI receptacles be tested when the generator is initially uncrated. The receptacles should then be tested daily at startup.

There are two 120-volt, 20-amp GFCI (duplex NEMA 5-20R) receptacles provided on the output terminal panel. These receptacles can be accessed in any voltage selector switch position. Each receptacle is protected by a 20-amp circuit breaker. These breakers are located directly above the GFCI receptacles. Remember that the load output (current) of both GFCI receptacles is dependent on the load requirements of the U, V, and W output terminal lugs.

Press the **Reset button** (Figure 8) to reset the GFCI receptacle after it has been tripped. Press the **Test button** in the center of the receptacle to check the GFCI function. Both receptacles should be tested at least once a month. Refer to the ***Maintenance*** section in this manual for further testing of the GFCI receptacle.

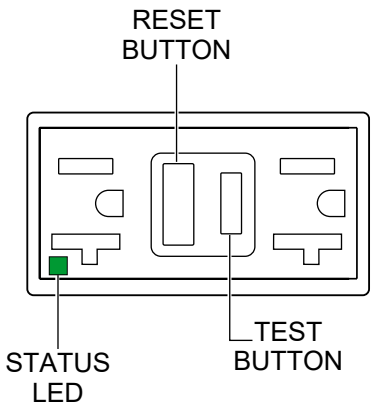



**Figure 8. 120-Volt GFCI Receptacle**

## Twist-Lock Dual-Voltage 240/120-Volt AC Receptacles

There are three 240/120-volt, 50-amp, auxiliary twist-lock (CS-6369) receptacles (Figure 9) provided on the output terminal panel. These receptacles can **only** be accessed when the voltage selector switch is configured for **single-phase**, **240/120-volt** operation.

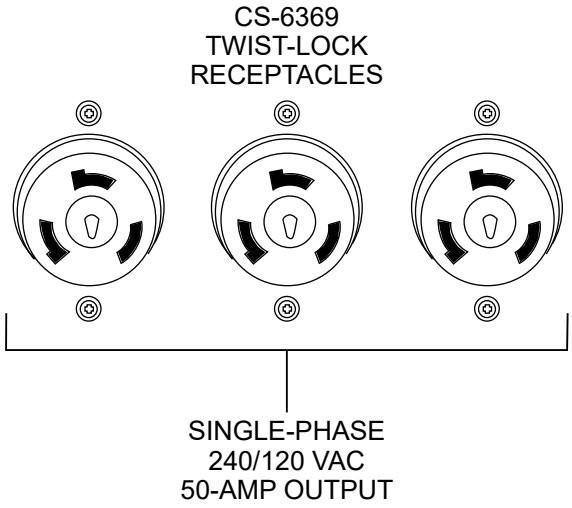



**Figure 9. 240/120-Volt Twist-Lock Auxiliary Receptacles**

Each auxiliary receptacle is protected by a 50-amp circuit breaker. These breakers are located next to the GFCI receptacles. Remember the load output (current) on all three receptacles is dependent on the load requirements of the **output terminal lugs**.

## Removing The Plastic Face Plate (Hard Wire Hookup Panel)

The output terminal lugs are protected by a plastic face plate cover (Figure 10). Unscrew the securing bolts and lift the plastic terminal cover to gain access to the terminal enclosure.

After the load wires have been securely attached to the terminal lugs, reinstall the plastic face plate.

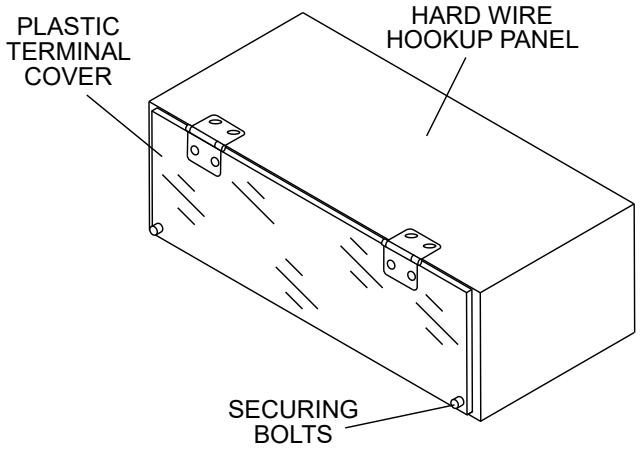



**Figure 10. Plastic Face Plate (Output Terminal Lugs)**

## Connecting Loads

Loads can be connected to the generator via the output terminal panel, convenience receptacles, or optional cam-loks (Figure 11). Make sure to read the operation manual before attempting to connect a load to the generator.

To protect the output terminals from overload, a 3-pole, 200-amp, main circuit breaker is provided. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

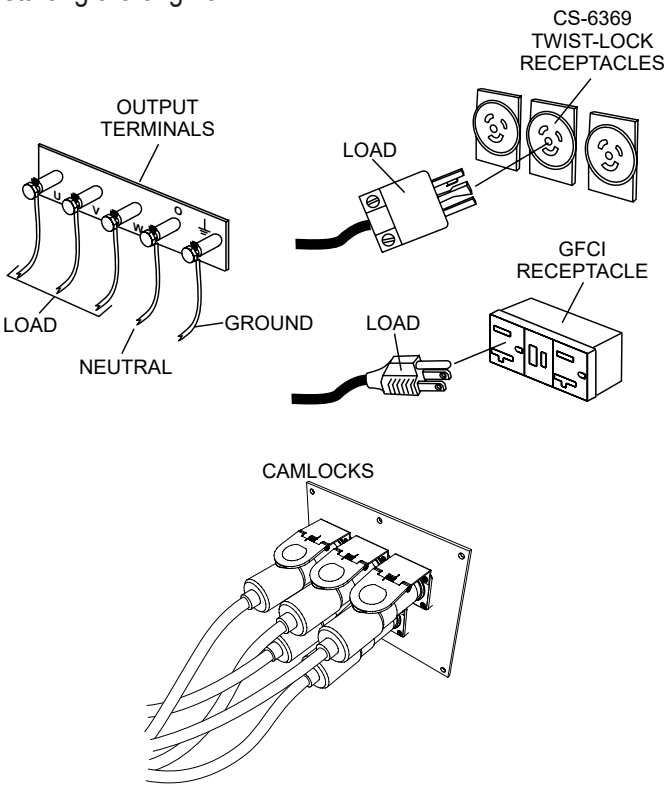



**Figure 11. Connecting Loads**

## OVERCURRENT RELAY

An **overcurrent relay** (Figure 12) is connected to the main circuit breaker. In the event of an overload, both the circuit breaker and the overcurrent relay may trip. If the circuit breaker cannot be reset, the **Reset button** on the overcurrent relay must be pressed. The overcurrent relay is located inside the control box.

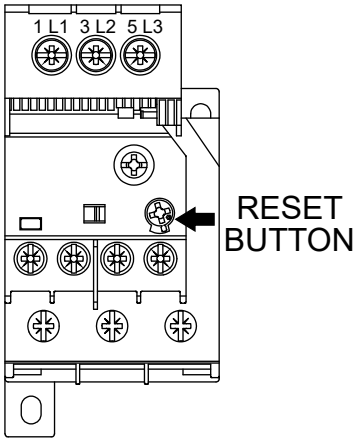



**Figure 12. Overcurrent Relay**

***NOTICE***

The overcurrent relay monitors the current flowing from the U,V, and W output terminal lugs to the load. In the event of a short circuit or overcurrent condition, it will automatically trip the 200-amp main circuit breaker.

To restore power to the output terminal panel, press the Reset button on the overcurrent relay and place the main circuit breaker in the **closed (ON)** position.

## SINGLE-PHASE LOAD

Always be sure to check the nameplate on the generator and equipment to ensure the wattage, amperage, frequency, and voltage requirements are satisfactorily supplied by the generator for operating the equipment.

Generally, the wattage listed on the nameplate of the equipment is its rated output. Equipment may require 130–150% more wattage than the rating on the nameplate, as the wattage is influenced by the efficiency, power factor and starting system of the equipment.

**NOTICE**

If wattage is not given on the equipment's nameplate, approximate wattage may be determined by multiplying the nameplate voltage by the nameplate amperage.

WATTS = VOLTAGE × AMPERAGE

The power factor of this generator (single phase) is 1.0. See Table 5 below when connecting loads.

**Table 5. Power Factor By Load**

| Type of Load | Power Factor |
|---|---|
| Single-phase induction motors | 0.4–0.75 |
| Electric heaters, incandescent lamps | 1.0 |
| Fluorescent lamps, mercury lamps | 0.4–0.9 |
| Electronic devices, communication equipment | 1.0 |
| Common power tools | 0.8 |

**Table 6. Cable Selection (60 Hz, Single-Phase Operation)**

| Current in Amperes | Load in Watts | | Maximum Allowable Cable Length | | | |
|---|---|---|---|---|---|---|
| | At 100 Volts | At 200 Volts | #10 Wire | #12 Wire | #14 Wire | #16 Wire |
| 2.5 | 300 | 600 | 1,000 ft. | 600 ft. | 375 ft. | 250 ft. |
| 5 | 600 | 1,200 | 500 ft. | 300 ft. | 200 ft. | 125 ft. |
| 7.5 | 900 | 1,800 | 350 ft. | 200 ft. | 125 ft. | 100 ft. |
| 10 | 1,200 | 2,400 | 250 ft. | 150 ft. | 100 ft. | |
| 15 | 1,800 | 3,600 | 150 ft. | 100 ft. | 65 ft. | |
| 20 | 2,400 | 4,800 | 125 ft. | 75 ft. | 50 ft. | |
| CAUTION: Equipment damage can result from low voltage. | | | | | | |

**NOTICE**

Cable selection table is a general guideline. **ALWAYS** consult local and national electrical codes when sizing cables.

## THREE-PHASE LOAD

When calculating the power requirements for 3-phase power, use the following equation:

$$KVA = \frac{VOLTAGE \times AMPERAGE \times 1.732}{1000}$$

**NOTICE**

If 3-phase load (kVA) is not given on the equipment nameplate, approximate 3-phase load may be determined by multiplying voltage by amperage by 1.732.

**NOTICE**

Motors and motor-driven equipment draw much greater current for starting than during operation.

An inadequately sized connecting cable which cannot carry the required load can cause a voltage drop which can burn out the appliance or tool and overheat the cable. See Table 6.

The power factor of this generator (3 phase) is 0.8.

- When connecting a resistance load such as an incandescent lamp or electric heater, a capacity of up to the generating set's rated output (kW) can be used.
- When connecting a fluorescent or mercury lamp, a capacity of up to the generating set's rated output (kW) multiplied by 0.6 can be used.
- When connecting an electric drill or other power tools, pay close attention to the required starting current capacity.
- When connecting ordinary power tools, a capacity of up to the generating set's rated output (kW) multiplied by 0.8 can be used.

**DANGER**

Before connecting this generator to any building's electrical system, a **licensed electrician** must install an **isolation (transfer) switch**. Serious damage to the building's electrical system may occur without this transfer switch.

**PowerBalance®** (Figure 13) is an optional load management solution that helps protect the engine generator from problems resulting from sustained low-load operations (defined as less than 30% of the generator full-load rating).

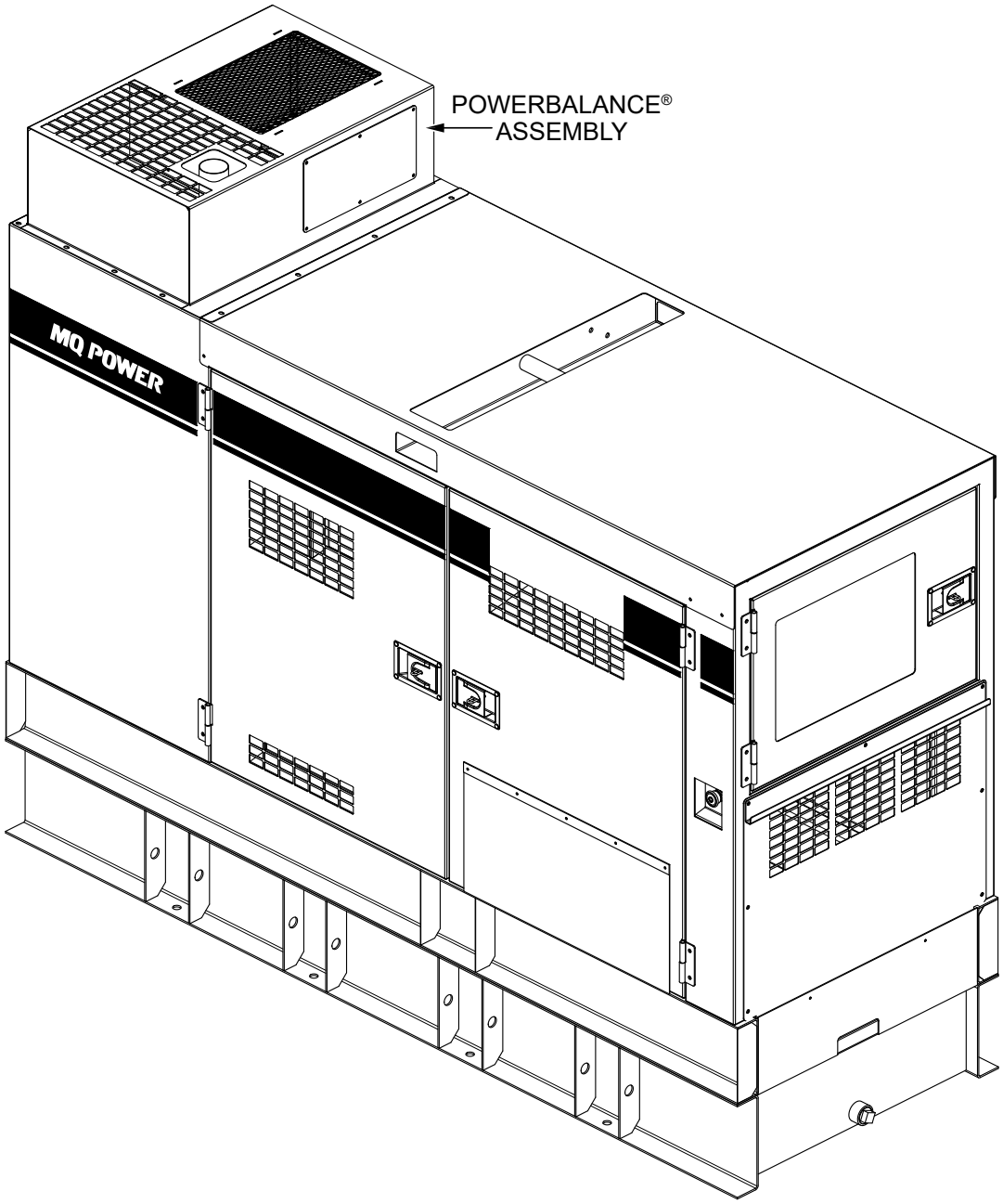



**Figure 13. PowerBalance®**

- PowerBalance® continuously monitors engine load. The load management controller senses and increases engine load automatically using resistive coils when the controller determines that the temperature and/or load is too low.
- When additional load demands are placed on the generator that bring it to an optimum level, PowerBalance® will automatically deactivate this additional load and remain ready for reactivation should exhaust temperatures drop.

## GENERATOR OUTPUT VOLTAGES

A wide range of voltages (Table 7) is available for many different applications.

**Table 7. Voltages Available**

| UVWO Output Terminal Lugs | Voltage Selector Switch 3-Phase 240/139V Position | | | Voltage Selector Switch 3-Phase 480/277V Position | | |
|---|---|---|---|---|---|---|
| 3Ø Line-Line | 208V | 220V | 240V | 416V | 440V | 480V |
| 1Ø Line-Neutral | 120V | 127V | 139V | 240V | 254V | 277V |
| Voltage Selector Switch Single-Phase 240/120V Position | | | | | | |
| 1Ø Line-Neutral/ Line-Line | 120V Line-Neutral | N/A | N/A | 240V Line-Line | N/A | N/A |

### Voltage Selector Switch

Voltages are selected using the **Voltage Selector switch** (Figure 14) which is located above the output terminal panel's hard wire hook-up panel. This switch has been provided for ease of voltage selection.

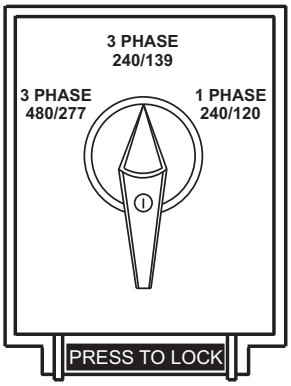



**Figure 14. Voltage Selector Switch**

**CAUTION**

**NEVER** change the position of the voltage selector switch while the engine is running. **ALWAYS** place the circuit breaker in the **OFF** position before selecting voltage.

### Voltage Regulator

To obtain some of the voltages listed in Table 7 will require a fine voltage adjustment using the **voltage regulator** (Figure 15) located on the control panel.


**Figure 15. Voltage Regulator**

## MAXIMUM AMPS

Table 8 shows the **maximum** amps the generator can provide. **DO NOT** exceed the maximum amps as listed.

**Table 8. Generator Maximum Amps**

| Rated Voltage | Maximum Amps |
|---|---|
| Single Phase 120 Volts | 155.4 amps (4 wire)<br>168 amps × 2 (zigzag) |
| Single Phase 240 Volts | 77.8 amps (4 wire)<br>168 amps (zigzag) |
| Three Phase 240 Volts | 168 amps |
| Three Phase 480 Volts | 84 amps |
| Main Line Circuit Breaker Rating | 200 amps |
| Overcurrent Relay Trip Set Point 480V Mode Only | 84 amps |

## SIMULTANEOUS POWER

**DO NOT** exceed the maximum available simultaneous power. Table 9 shows available power at various voltage and phase combinations.

**Table 9. Simultaneous Power**

| Power In Use | | Available Receptacle Power |
|---|---|---|
| 3-Phase 240/480V | 1-Phase 120/240V or Twist-Lock CS-6369 | Duplex NEMA 5-20R 120V Receptacle |
| kVA | kW | kW |
| 70.0 | 40.4 | 0 |
| 65.8 | 39.2 | 1.2 |
| 61.7 | 38.0 | 2.4 |
| 57.5 | 36.8 | 3.6 |
| 53.3 | 35.6 | 4.8 |

**CAUTION**

**DO NOT** exceed maximum available power.

## UVWO TERMINAL OUTPUT VOLTAGES

Various output voltages can be obtained using the UVWO output terminal lugs. The voltages at the terminals are dependent on the position of the **Voltage Selector switch** and the adjustment of the **Voltage Regulator control knob**.

Remember the Voltage Selector switch determines the **range** of the output voltage. The voltage regulator (VR) allows the user to increase or decrease the selected voltage.

### 3-Phase 240-Volt UVWO Terminal Output Voltages

1. Place the **Voltage Selector switch** in the **3-phase 240/139-volt position** as shown in Figure 16.

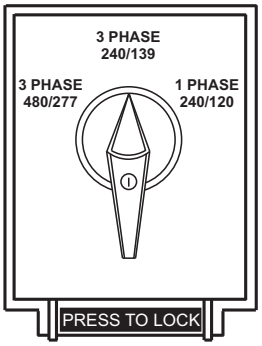



**Figure 16. Voltage Selector Switch (3-Phase 240/139-Volt Position)**

2. Connect the load wires to the **UVWO terminal lugs** as shown in Figure 17.

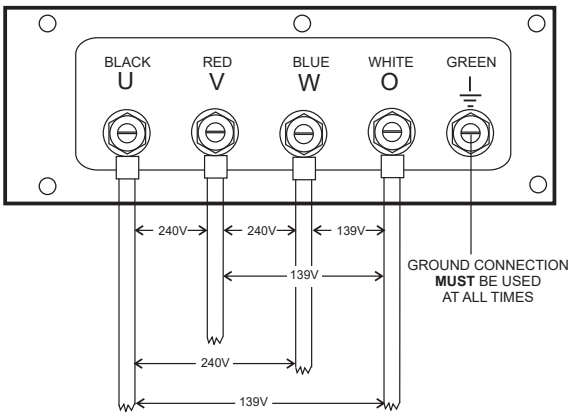



**Figure 17. UVWO Terminal Lugs (3-Phase 240-Volt Connections)**

3. Turn the **voltage regulator** (Figure 18) **clockwise to increase** voltage output, **counterclockwise to decrease** voltage output. Use the voltage regulator whenever fine tuning of the output voltage is required.


**Figure 18. Voltage Regulator**

### 3-Phase 208-Volt / Single-Phase 120-Volt UVWO Terminal Output Voltages

1. Place the **Voltage Selector switch** in the **3-phase 240/139-volt position** as shown in Figure 16.
2. Connect the load wires to the **UVWO terminal lugs** as shown in Figure 19.

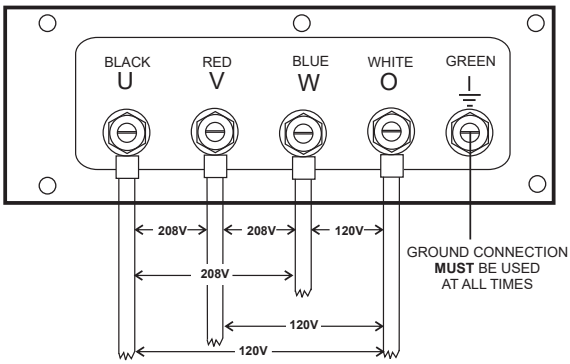



**Figure 19. UVWO Terminal Lugs (3-Phase 208-Volt / 1-Phase 120-Volt Connections)**

***NOTICE***

To achieve 3-phase 208-volt output, the Voltage Selector switch must be in the 3-phase 240/139-volt position and the voltage regulator must be adjusted to 208 volts.

### 3-Phase 480/277-Volt UVWO Terminal Output Voltages

1. Place the **Voltage Selector switch** in the **3-phase 480/277-volt position** as shown in Figure 20.

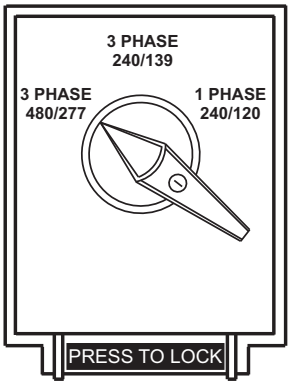



**Figure 20. Voltage Selector Switch (3-Phase 480/277-Volt Position)**

2. Connect the load wires to the **UVWO terminal lugs** as shown in Figure 21.

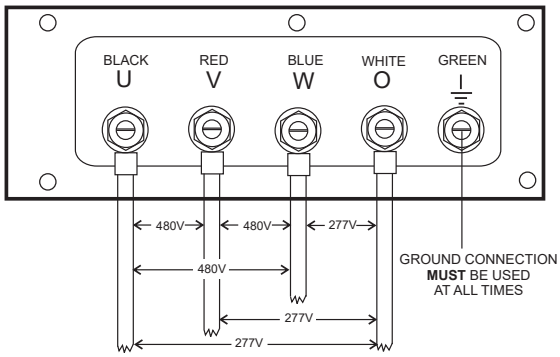



**Figure 21. UVWO Terminal Lugs (3-Phase 480-Volt Connections)**

**NOTICE**

**ALWAYS** make sure that the connections to the UVWO terminals are **secure and tight**. The possibility of arcing exists that could cause a fire.

### Single-Phase 240/120-Volt UVWO Terminal Output Voltages

1. Place the **Voltage Selector switch** in the **1-phase 240/120-volt position** as shown in Figure 22.

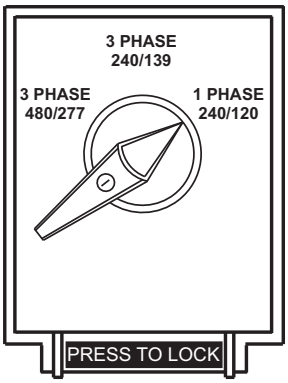



**Figure 22. Voltage Selector Switch (Single-Phase 240/120-Volt Position)**

2. Connect the load wires to the **UVWO terminal lugs** as shown in Figure 23.

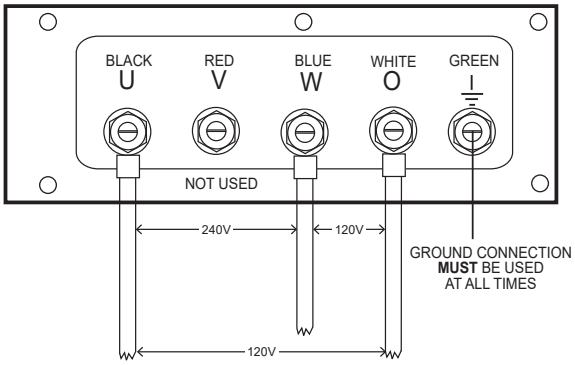



**Figure 23. UVWO Terminal Lugs (Single-Phase 240/120-Volt Connection)**

3. Turn the **voltage regulator** (Figure 18) **clockwise to increase** voltage output, **counterclockwise to decrease** voltage output. Use the voltage regulator whenever fine tuning of the output voltage is required.

## ENGINE OIL CHECK

1. To check the engine oil level, place the generator on secure, level ground with the engine stopped.
2. Remove the **dipstick** from its holder (Figure 24) and wipe it clean.

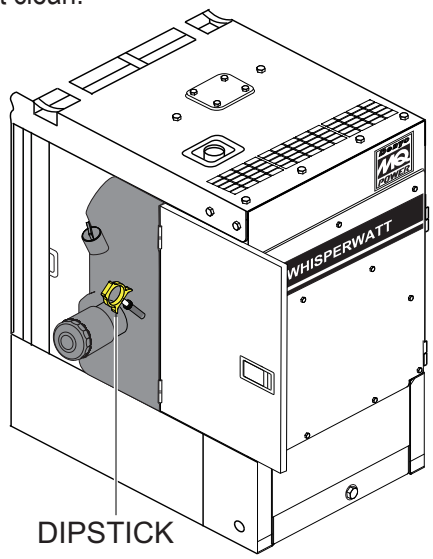



**Figure 24. Engine Oil Dipstick**

3. Reinsert the dipstick, then remove the dipstick from its holder. Check the oil level shown on the dipstick (Figure 25).

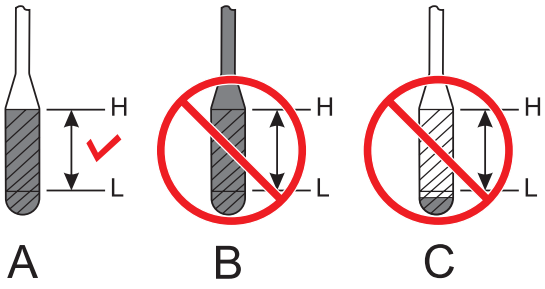



**Figure 25. Engine Oil Dipstick**

4. Verify that the engine oil level is maintained between the **H** and **L** markings on the dipstick as shown in Figure 25**A**.
5. If the engine oil level is low (Figure 25**C**), remove the cap from the **oil filler port** (Figure 26) and fill to a safe operating level (max) as indicated by the dipstick (Figure 25**A**). Fill with the recommended oil type listed in Table 10. Maximum oil capacity is 3.6 gallons (13.5 liters).

***NOTICE***

When adding engine oil, **DO NOT** overfill (Figure 25**B**).

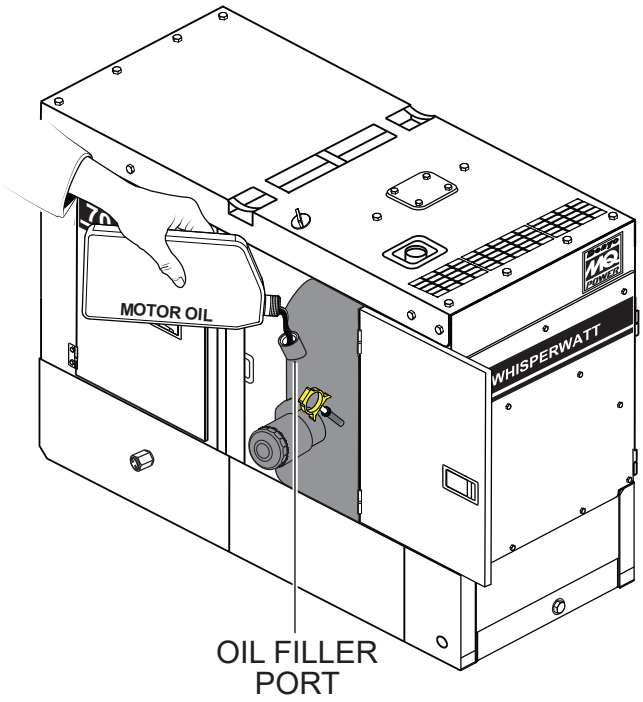
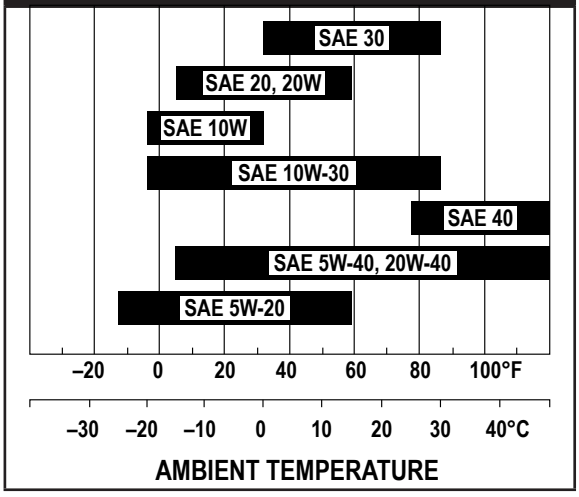



**Figure 26. Engine Oil Filler Port**

6. When checking the engine oil, be sure to check if the oil is clean. If the oil is not clean, drain the oil as described in the ***Maintenance*** section of this manual.
7. Allow enough time for any added oil to make its way to the oil pan before rechecking.

**Table 10. Recommended Motor Oil**



## FUEL CHECK

**DANGER**

Fuel spillage on a **hot** engine can cause a **fire or explosion**. If fuel spillage occurs, wipe up the spilled fuel completely to prevent fire hazards. **NEVER** smoke around or near the generator. **ALWAYS** shut down the engine prior to cleaning up any spilled fuel.

***NOTICE***

**ALWAYS** check the DEF tank level when adding fuel.

### Refilling The Fuel System

***NOTICE***

**DO NOT** refuel while the engine is running.

**CAUTION**

**ONLY properly trained personnel** who have read and understand this section should refill the fuel tank.

**ALWAYS** fill the **fuel tank** (Figure 27) with clean, fresh, **#2 diesel fuel**. Pay attention to the fuel tank capacity when replenishing fuel. **DO NOT** fill the fuel tank beyond its capacity.

Close the **fuel filler cap** (Figure 27) tightly after filling. Handle fuel in a safety container. If the container does not have a spout, use a funnel. Wipe up any spilled fuel **immediately**.

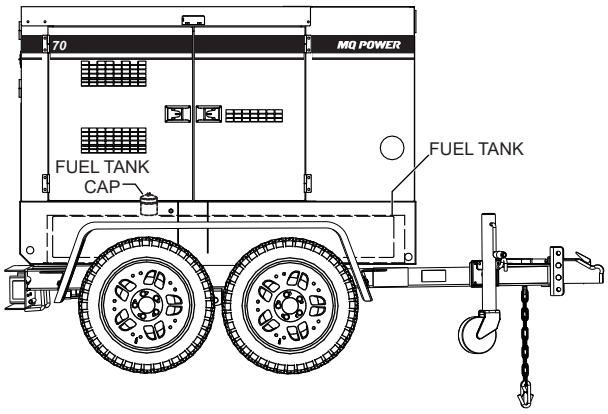



**Figure 27. Fuel Tank**

### Refueling Procedure

**WARNING**

**Diesel fuel** and its vapors are dangerous to your health and the surrounding environment. Avoid inhalation of fumes and contact with skin.

1. **Level Tanks** — Make sure fuel cells are level with the ground. Failure to do so will cause fuel to spill from the tank before reaching full capacity (Figure 28).

**CAUTION**

**ALWAYS** place the trailer on firm, level ground before refueling to prevent spilling and to maximize the amount of fuel that can be pumped into the tank.

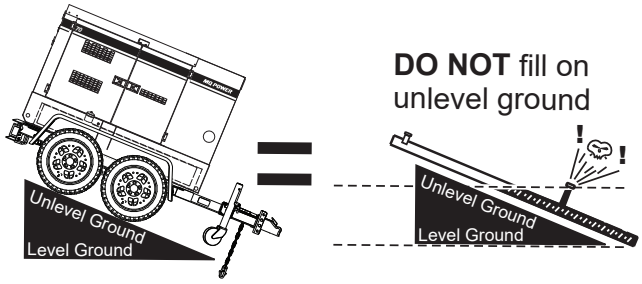



**Figure 28. Only Fill On Level Ground**

***NOTICE***

**ONLY** use **#2 diesel fuel** (ultra low sulfur diesel fuel) when refueling.

2. Remove the fuel cap and fill the fuel tank as shown in Figure 29.

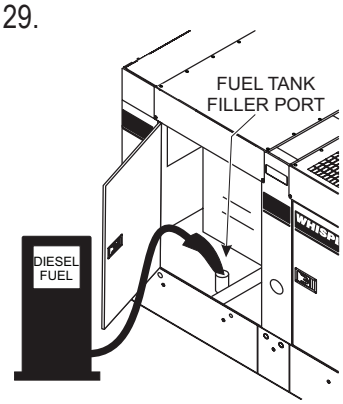



**Figure 29. Fueling The Generator**

3. **NEVER overfill the fuel tank.** When refueling, **DO NOT** wait for fuel to rise inside the filler neck (Figure 30). Leave room for fuel expansion. Fuel expands when heated (Figure 31).


**Figure 30. Full Fuel Tank**

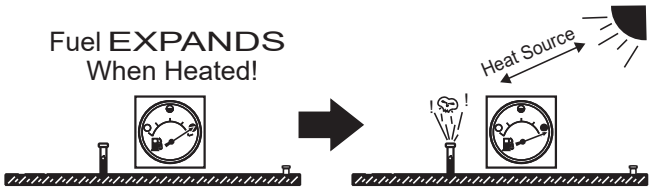



**Figure 31. Fuel Expansion**

## DIESEL EXHAUST FLUID

***NOTICE***

**ONLY** fill the DEF tank with **diesel exhaust fluid**. Any other type of fluid may cause severe engine damage.

**Diesel exhaust fluid (DEF)** is an aqueous solution made with 32.5% high-purity **urea (carbamide)** and 67.5% **deionized water**. DEF is used as a consumable in **selective catalytic reduction (SCR)** in order to lower $NO_x$ concentration from diesel exhaust emissions. **ALWAYS** check the DEF level when refueling.

1. Make sure the engine is **OFF**.
2. Remove the **DEF tank filler cap** (Figure 32).

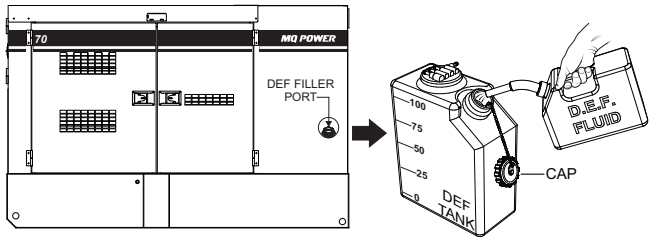



**Figure 32. Filling The DEF Tank**

3. Add diesel exhaust fluid to the tank. **DO NOT** overfill.

## DEF Refilling (Continuous Operation)

It is recommended to **shut down the engine** prior to refilling the DEF tank. However, during special applications where shutdown is not possible, it is recommended to **ONLY** refill the DEF tank when the fluid level has been consumed down to 50%.

The DEF level sending unit requires a gradual DEF level decrease during continuous operation to validate proper operation. Failure of this sensor to report the decrease could result in an engine shutdown. An engine service technician would be required to remedy the shutdown.

## COOLANT (ANTIFREEZE/SUMMER COOLANT/WATER)

Isuzu recommends antifreeze/summer coolant for use in their engines, which can be purchased in concentrate (and mixed with 50% demineralized water) or pre-diluted. See the **Isuzu engine owner's manual** for further details.

**⚠ WARNING**

When adding coolant/antifreeze mix to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. The possibility of **hot!** coolant exists which can cause **severe burns**.

1. Day-to-day addition of coolant is done from the reserve tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 11 for engine, radiator, and reserve tank coolant capacities.

**Table 11. Coolant Capacity**

| | |
|---|---|
| Engine and Radiator | 5.5 gal. (21.0 liters) |
| Reserve Tank | See markings |

***NOTICE***

Normally, only the coolant level in the reserve tank needs to be checked. However, the radiator cap should be opened once a week to verify that coolant is visible (full) inside the radiator.

2. Verify that the coolant level in the **coolant reserve tank** is between the **FULL** and **LOW** markings as shown in Figure 33.

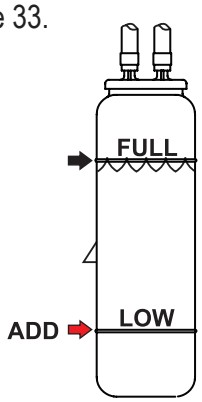



**Figure 33. Coolant Reserve Tank**

## Operation In Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 12) has been added.

**Table 12. Coolant Capacity**

| Climate | Outside Temperature | Longlife Coolant Concentration |
|---|---|---|
| Warm | 10°F (–12°C) or above | 30% |
| Cold | –22°F (–30°C) or above | 50% |

***NOTICE***

When the antifreeze is mixed with water, the antifreeze mixing ratio **must be** less than 50%.

## Cleaning The Radiator

The engine may overheat if the radiator cooling fins (Figure 34) become overloaded with dust or debris. Periodically clean the radiator fins with compressed air. Cleaning inside the machine is dangerous, so clean only with the engine turned **OFF** and the negative battery terminal disconnected.

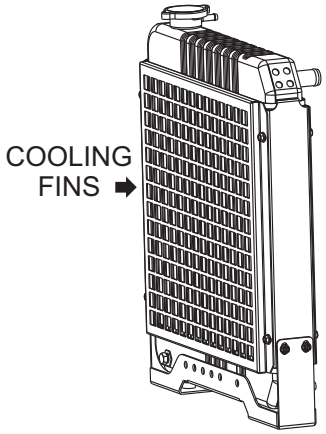



**Figure 34. Radiator (Cooling Fins)**

## ENGINE AIR CLEANER

Periodic cleaning and replacement of the **engine air cleaner** (Figure 35) is necessary. Inspect the air cleaner in accordance with the **Isuzu engine owner's manual**.

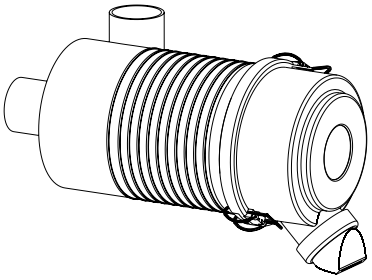


**Figure 35. Engine Air Cleaner**

## FAN BELT TENSION

A slack fan belt may contribute to overheating, or to insufficient charging of the battery. Inspect the fan belt for damage and wear and adjust it in accordance with the **Isuzu engine owner's manual**.

The fan belt tension is proper if the fan belt bends 0.17–0.20 in. (4.2–5.0 mm) when pressed with the thumb as shown in Figure 36.

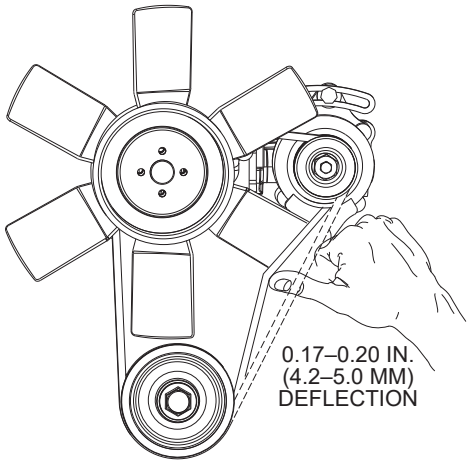



**Figure 36. Fan Belt Tension**

**CAUTION**

**NEVER** place hands near the belts or fan while the generator set is running.

## BATTERY

This unit is of negative ground. **DO NOT** connect in reverse. **ALWAYS** maintain the battery fluid level between the specified marks. Battery life will be shortened if the fluid level is not properly maintained. Add only **distilled water** when replenishment is necessary.

**DO NOT** overfill. Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunctions. **ALWAYS** keep the terminals firmly tightened. Coat the terminals with an approved battery terminal treatment compound. Replace the battery only with the recommended type battery. The battery type used in this generator is BCI Group 27.

The battery is sufficiently charged if the specific gravity of the battery fluid is 1.28 (at 68°F). If the specific gravity should fall to 1.245 or lower, it indicates that the battery is dead and needs to be recharged or replaced.

Before charging the battery with an external electrical source, be sure to disconnect the battery cables.

### Battery Cable Installation

**ALWAYS** be sure the battery cables (Figure 37) are properly connected to the battery terminals as shown below. The **red cable** is connected to the positive terminal of the battery, and the **black cable** is connected to the negative terminal of the battery.

**CAUTION**

**ALWAYS** disconnect the negative terminal **FIRST** and reconnect the negative terminal **LAST**.

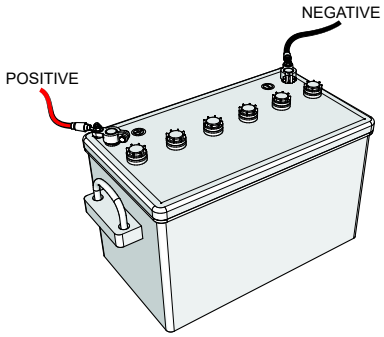



**Figure 37. Battery Connections**

When connecting the battery:

1. **NEVER** connect the battery cables to the battery terminals while the **Control Power switch** is in the **ON** position. **ALWAYS** make sure that this switch is in the **OFF** position when connecting the battery.
2. Place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

***NOTICE***

If the battery cables are connected incorrectly, electrical damage to the generator will occur. Pay close attention to the polarity of the battery when connecting the battery.

***NOTICE***

Inadequate battery connections may cause poor starting of the generator or other malfunctions.

## ALTERNATOR

The polarity of the alternator is negative grounding type. When an inverted circuit connection takes place, the circuit will be in short circuit instantaneously resulting in alternator failure.

**DO NOT** put water directly on the alternator. Entry of water into the alternator can cause corrosion and damage the alternator.

## WIRING

Inspect the entire generator for bad or worn electrical wiring or connections. If any wiring or connections are exposed (insulation missing) replace wiring immediately.

## PIPING AND HOSE CONNECTIONS

Inspect all piping, oil hose, and fuel hose connections for wear and tightness. Tighten all hose clamps and check hoses for leaks.

If any fuel or oil hose lines are defective, replace them immediately.

## BEFORE STARTING

**⚠ CAUTION**

The engine's exhaust contains harmful emissions. **ALWAYS have adequate ventilation when operating.** Direct exhaust away from nearby personnel.

**⚠ WARNING**

**NEVER** manually start the engine with the **main**, **GFCI**, **or auxiliary** circuit breakers in the **ON** (closed) position.

1. Make sure all circuit breakers are in the **OFF** position.
2. Make sure the **Voltage Selector switch** (Figure 38) has been configured for the desired output voltage.

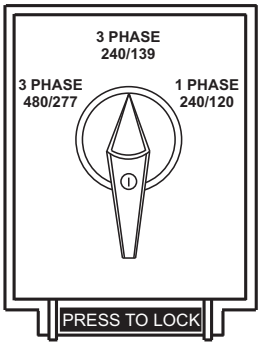



**Figure 38. Voltage Selector Switch**

3. Place the **Control Power switch** (Figure 39) in the **ON** position.

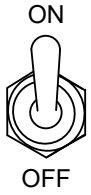



**Figure 39. Control Power Switch (ON)**

4. Connect the load to the **receptacles** or the **output terminal lugs** as shown in Figure 11. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.
5. Tighten terminal nuts securely to prevent load wires from slipping out.
6. Close all engine enclosure doors (Figure 40).

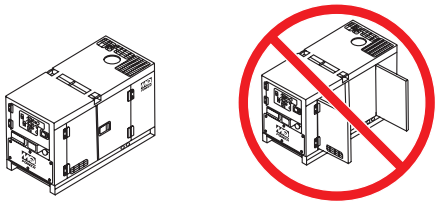



**Figure 40. Engine Enclosure Doors**

## STARTING (MANUAL)

1. To start the engine, press the **Run button** (Figure 41) on the digital controller.

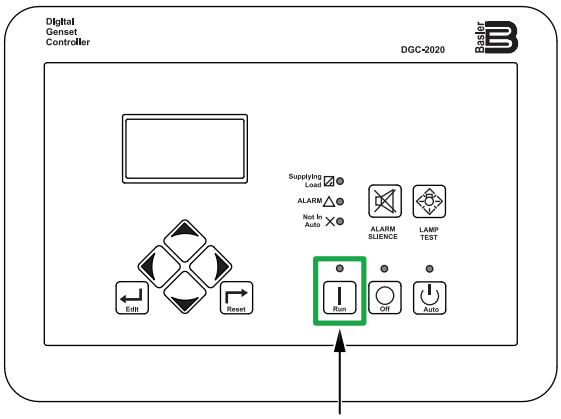



**Figure 41. Digital Controller (Run Button)**

***NOTICE***

If the engine fails to start in the specified number of attempts, press the **OFF button** on the controller and wait for at least 1 minute before repeating the starting process.

***NOTICE***

The engine will pre-heat automatically in cold weather conditions. The engine will start automatically after pre-heating.

2. Once the engine starts, the engine will run at low idle (1,000 rpm) for approximately 60 seconds. During the warmup process, check for any abnormal noise, vibration, or fluid leakage. If any abnormalities exist, shut down the engine and correct the problem.

**NOTICE**

Once the engine has warmed up, engine speed will automatically increase to 1,800 rpm.

3. The controller display will indicate the 60-cycle output frequency in **HERTZ** (Figure 42**C**).

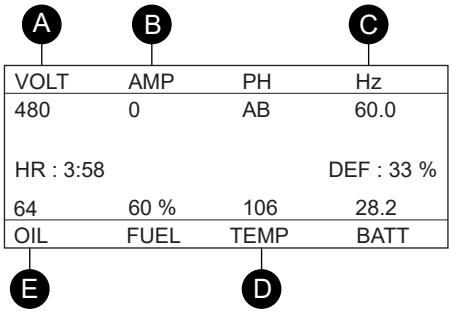



**Figure 42. Controller Display**

4. The controller display will indicate the generator's output in **VOLTS** (Figure 42**A**).

5. If the voltage is not within the specified tolerance, use the **voltage regulator** (Figure 43) to increase or decrease the desired voltage.

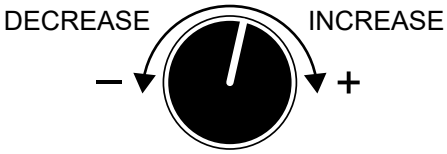



**Figure 43. Voltage Regulator**

6. The controller display will indicate **zero amps** with no load applied (Figure 42**B**). When a load is applied, the display will indicate the amount of current that the load is drawing from the generator.

7. The controller display will indicate the **oil pressure** of the engine (Figure 42**E**). Under normal operating conditions the oil pressure should be between 42.1 and 85.6 psi (290–590 kPa).

**NOTICE**

Oil pressure readings may be higher immediately after starting, especially in cold weather conditions, but should return to normal as the engine temperature increases.

8. The controller display will indicate the **coolant temperature** (Figure 42**D**). Under normal operating conditions the coolant temperature should be 167°–194°F (75°–90°C).

9. Place all circuit breakers in the **ON** position. Power will be supplied to the output terminals and receptacles.

10. Observe the amperage reading on the controller display (Figure 42**B**) and verify that it is the anticipated amount of current with respect to the load. The ammeter will only display a current reading if a load is in use.

11. The generator will run until manually stopped or an abnormal condition occurs.

## STARTING (AUTO MODE)

**DANGER**

Before connecting this generator to any building's electrical system, a **licensed electrician** must install an **isolation (transfer) switch**. Serious damage to the building's electrical system may occur without this transfer switch.

***NOTICE***

When connecting the generator to an isolation (transfer) switch, **ALWAYS** have power applied to the generator's internal battery charger. This will ensure that the engine will not fail due to a dead battery.

***NOTICE***

When the generator is set to **Auto mode**, the generator will **automatically start** in the event of commercial power falling below a prescribed level by means of a contact closure that is generated automatically by a transfer switch.

**WARNING**

When running the generator in **Auto mode**, remember the generator can start up at any time without warning. **NEVER** attempt to perform any maintenance while the generator is in Auto mode.

***NOTICE***

When the **Auto button** is pressed, the engine glow plugs will be warmed and the engine will start automatically after a start signal is received from the auto-start contacts.

When starting the generator in **Auto mode** use the manual start-up procedure except where noted (see below).

1. Perform steps 1 through 6 in ***Before Starting*** found in the ***Generator Start-Up Procedure (Manual)*** section.
2. Press the **Auto button** (Figure 44) on the digital controller. When a start signal is received from the auto-start contacts, the engine will start automatically after the preheating process has completed.

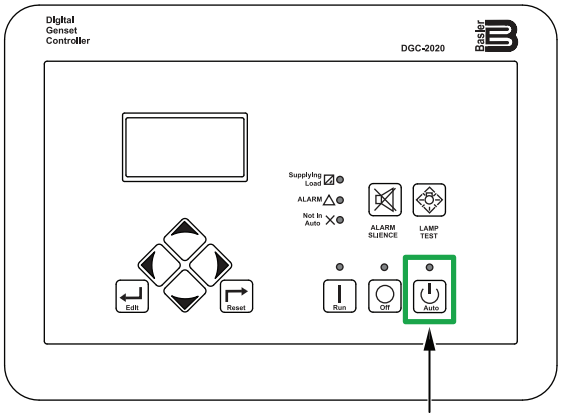



**Figure 44. Digital Controller (Auto Button)**

3. The main circuit breaker will automatically turn **ON** after the engine starts.

**WARNING**

**NEVER** stop the engine suddenly except in an emergency.

## NORMAL SHUTDOWN PROCEDURE (MANUAL)

1. Place the load's ON/OFF switch in the **OFF** position.
2. Place the main circuit breaker in the **OFF** position.
3. Press the **OFF button** on the digital controller (Figure 45) to stop the engine. The engine will stop after a 1-minute cool-down process.

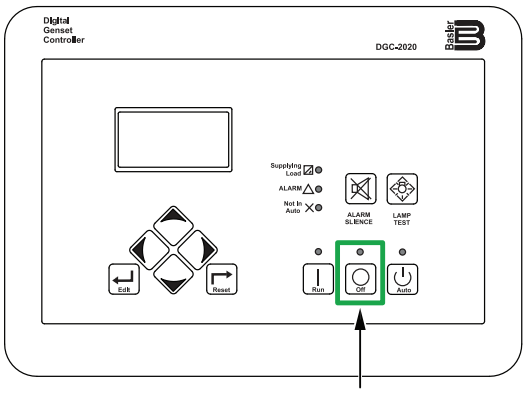



**Figure 45. Digital Controller (OFF Button)**

4. After the engine has stopped completely, place the **Control Power switch** in the **OFF** position (Figure 46).


**Figure 46. Control Power Switch (OFF)**

5. Allow sufficient time for adequate cooling, then inspect the entire generator for any damage or loosening of components that may have occurred during operation.

## NORMAL SHUTDOWN PROCEDURE (AUTO)

When the remote contacts are opened, the engine will stop. To exit Auto mode, press the **OFF button** on the digital controller (Figure 45). The circuit breaker will automatically turn **OFF** and the engine will stop after a 1-minute cool-down process.

## EMERGENCY SHUTDOWN PROCEDURE

1. To stop the engine in the event of an emergency, push the **Emergency Stop switch** (Figure 47). This switch is located on the side of the generator next to the output terminal panel.

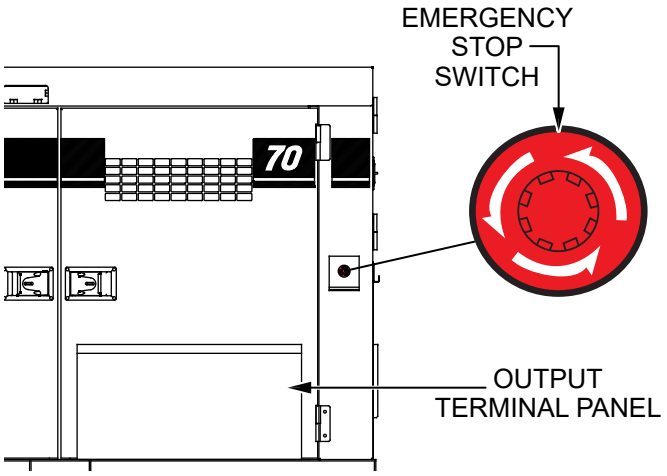



**Figure 47. Emergency Stop Switch**

2. The Emergency Stop switch is a push-locked type switch. The switch contact can only be released by rotating the button in the clockwise direction. The engine cannot be restarted until the contact is released (closed).
3. Press the **OFF button** on the digital controller (Figure 45).

## AUTOMATIC SHUTDOWN SYSTEM

This unit is equipped with safety devices to automatically stop the engine in the event of a fault. Refer to ***Protection Devices*** in the ***Troubleshooting (Diagnostics)*** section for more information.

| Table 13. Inspection/Maintenance | | Daily | Every 250 Hours | Every 500 Hours | Every 1,000 Hours | Other |
|---|---|---|---|---|---|---|
| Engine | Check Engine Oil and Coolant Levels | X | | | | |
| | Check Fuel Filter/Water Separator Bowl | X | | | | |
| | Check Battery Fluid Level | X | | | | |
| | Check Air Cleaner | X | | | | |
| | Check for Leaks | X | | | | |
| | Visual Walk Around Inspection | X | | | | |
| | Clean Air Cleaner Element | | X | | | |
| | Replace Engine Oil and Oil Filter*1 | | (X) | X | | |
| | Replace Fuel Filter Elements | | (X) | X | | |
| | Check Fan Belt Condition | X | | X | | |
| | Check Electrical Ground Connection | | | X | | |
| | Clean Radiator and Check Cooling System | | | X | | |
| | Check and Adjust Engine Valve Clearance | | | | X | |
| | Clean Inside Fuel Tank | | | | X | |
| | Check All Hoses and Clamps | | | | X | |
| | Check Engine Mounts | | | | X | |
| | Replace Air Cleaner Elements*2 | | | | X | |
| | Replace DEF Filter (in Supply Module) | | | | | 3,000 hours |
| | Check SCR System*3 | | | | | 4,500 hours |
| | Inspect Dosing Module (SCR System)*3 | | | | | 4,500 hours |
| | Flush and Refill Cooling System*4 | | | | | 1 year or 2,000 hours |
| Generator | Measure Insulation Resistance Over 3M Ohms*5 | | X | | | |
| | Check Rotor Rear Support Bearing | | | X | | |

*1 During the initial operation of a new engine, change engine oil and filter between a minimum of 100 hours and a maximum of 250 hours. The service interval depends on the type of engine oil.

*2 Replace the air cleaner element when the restriction indicator shows a vacuum of 635 mm (25 in.) $H_2O$.

*3 Perform inspection and maintenance of the SCR system every 4,500 hours. The system does not need to be replaced/exchanged if no problem is detected. **DO NOT** make any modification or changes, or remove the emission control system's related parts. Contact your nearest dealer or Multiquip Inc. for SCR maintenance.

*4 Use fully formulated antifreeze/coolant.

*5 Make sure to disconnect the O – Earth line and CN8 – CN9 before performing the measurement. Refer to the ***Generator Wiring Diagram***.

## GENERAL INSPECTION

Prior to each use, the generator should be cleaned and inspected for deficiencies. Check for loose, missing, or damaged nuts, bolts, or other fasteners. Also check for fuel, oil, and coolant leaks. Use Table 13 as a general maintenance guideline. For more detailed engine maintenance instructions, refer to the engine owner's manual.

## ENGINE AIR CLEANER

This Isuzu diesel engine is equipped with a replaceable, high-density, paper air cleaner element (Figure 48). The air cleaner is also equipped with an inner (secondary) element that is used as a backup filter should the primary element become damaged. Check the air cleaner daily or before starting the engine. Replace the air cleaner as needed.

***NOTICE***

If the engine is operating in very dusty or dry grass conditions, a clogged air cleaner will result. This can lead to a loss of power, excessive carbon buildup in the combustion chamber, and high fuel consumption. Change the air cleaner more frequently if these conditions exist.

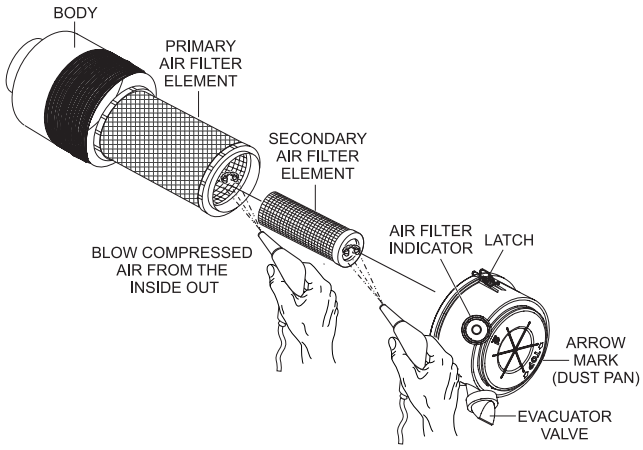



**Figure 48. Engine Air Cleaner**

### Primary And Secondary Air Cleaner Elements

**Every 250 hours:** Remove the air cleaner elements and clean them with a light spray of compressed air.

**⚠ CAUTION**

Wear protective equipment such as approved safety glasses or face shields and dust masks or respirators when cleaning air filters with compressed air.

1. Release the latches that secure the cover to the air cleaner body (Figure 48).
2. Remove the **air cleaner cover** (Figure 48) and set it aside.
3. Remove both the primary and secondary air cleaner elements (Figure 48).
4. Check for and correct heavy buildup of dirt and debris along with loose or damaged components.

***NOTICE***

Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

5. To clean the **primary element** (paper air filter) as shown in Figure 48, tap the filter element several times on a hard surface to remove dirt, or blow compressed air, not to exceed 30 psi (207 kPa, 2.1 kgf/cm$^2$), through the filter element from the inside out.
6. Clean the **secondary element** (paper air filter) as described in step 5.
7. Replace both elements if they are damaged or excessively dirty.
8. Clean the inside of the **air cleaner body** (Figure 48).
9. Reinstall the primary and secondary air filter elements back into the air cleaner body.
10. Reinstall the air cleaner cover and secure with latches.

***NOTICE***

**DO NOT** run the engine with the air cleaner removed or without an element.

## Air Cleaner Restriction Indicator

The air cleaner is equipped with a **restriction indicator** (Figure 49). As the air cleaner element becomes clogged, air intake restriction increases and the indicator signal shows **RED**, indicating that the element needs to be replaced. After replacing the air cleaner element, press the restriction indicator button to reset the indicator.

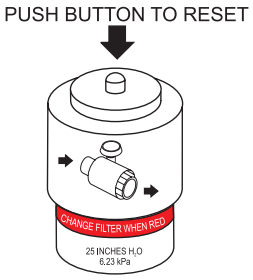



**Figure 49. Air Cleaner Restriction Indicator**

***NOTICE***

The air cleaner element should not be changed until the indicator displays **RED**. Dispose of the old element. It cannot be cleaned or reused.

## ENGINE FUEL FILTER

Inspect the **engine fuel filter** daily. If the fuel filter has collected a significant amount of water and sediment at the bottom of the cup, it should be drained off immediately.

## Draining The Fuel Filter

1. Loosen the **air bleeder plug** (Figure 50) on the fuel filter body.
2. To discharge the fuel inside the fuel filter cartridge, open the **drain valve** on the fuel filter by turning the knob **counterclockwise** (Figure 50**A**) approximately 3-1/2 turns until the valve drops down 1 inch (25.4 mm) and draining occurs (Figure 50**B**).

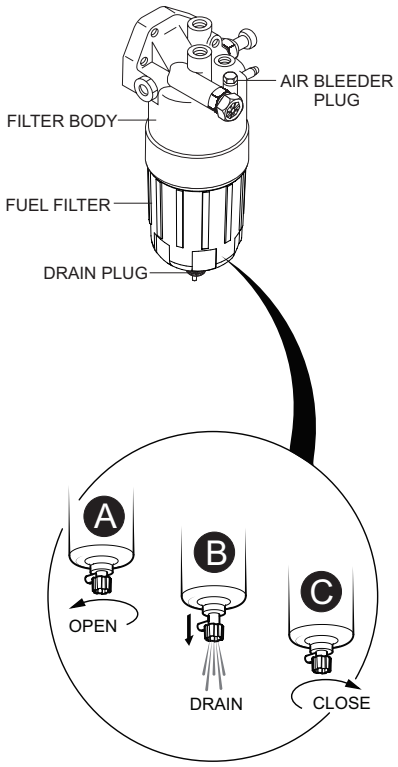



**Figure 50. Draining The Fuel Filter**

3. Let the residue or foreign substances inside the fuel filter flow into a suitable container.
4. At completion of draining, close the drain valve (Figure 50**C**).

## Fuel Filter Element Replacement

1. Using a **filter wrench**, remove the **element case** from the **fuel filter body** (Figure 51).

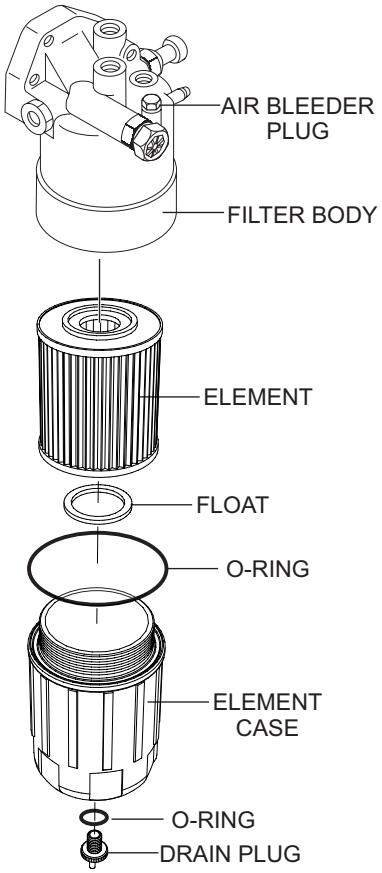



**Figure 51. Fuel Filter Replacement**

2. Wipe the inside of the **filter body** (Figure 51) with a clean cloth to remove any foreign matter or debris that may have accumulated.
3. Insert the new fuel filter element into the element case.
4. Replace both **O-rings**. Coat each O-ring with a small amount of clean 15W-40 engine oil.
5. Reinstall the element case first by hand until it makes contact with the fuel filter body surface.
6. Torque the element case to 22.4 lbf·ft (30 N·m).
7. Torque the drain plug to 1.4 lbf·ft (2.0 N·m).
8. Remove the air from the fuel system. Refer to ***Bleeding the Fuel System*** in the Isuzu engine owner's manual.

## ELECTROMAGNETIC FUEL PUMP (500 HOURS)

The filter inside the **electromagnetic fuel pump** (Figure 52) is either a paper type or steel mesh type depending on the fuel pump type. Clean or replace the fuel pump filter as follows:

1. Disconnect any electrical connections that are attached to the fuel pump.
2. Prepare a fuel collector to drain the fuel into. Secure any fuel lines to prevent fuel from spilling.
3. Remove the fuel pump from the generator enclosure.
4. Remove the **filter** and **gaskets** (Figure 52) from the fuel pump housing.

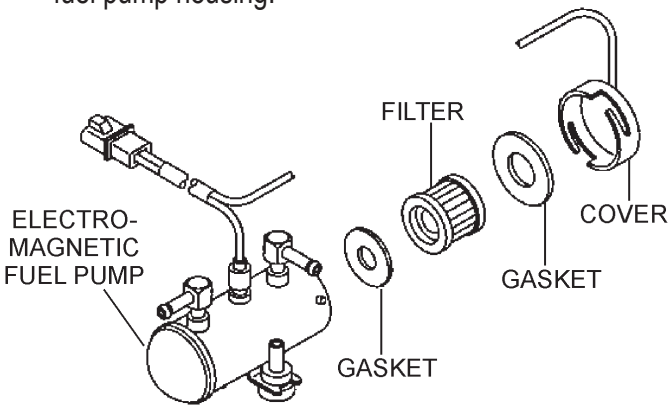



**Figure 52. Electromagnetic Fuel Pump**

***NOTICE***

When the fuel pump filter is removed, always make sure to replace both gaskets and clean the magnet portion inside the cover.

5. Clean or replace the fuel pump filter. Replace both gaskets.
6. Reassemble the fuel pump and mount it back onto the generator enclosure.
7. Reconnect all fuel lines and electrical components.
8. Check for fuel leaks.

## DRAINING THE CONTAINMENT TANK

1. This generator is equipped with an environmental containment tank. Inspect this tank regularly.
2. If the containment tank becomes full with fluids, remove the **containment tank drain plug** (Figure 53) and allow the fluids to drain into a suitable container.

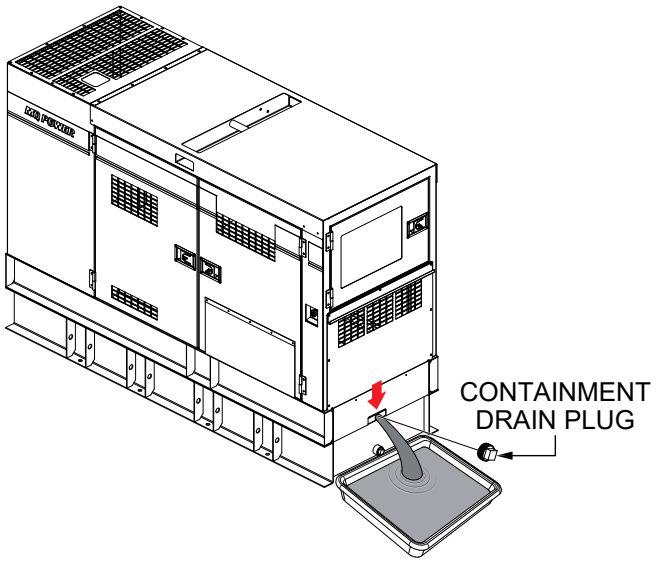



**Figure 53. Draining The Containment Tank**

## REMOVING WATER FROM THE FUEL TANK

After prolonged use, water and other impurities accumulate in the bottom of the fuel tank. Occasionally inspect the fuel tank for water contamination and drain the contents if required.

During cold weather, the more empty volume inside the tank, the easier it is for water to condense. This can be reduced by keeping the tank full with diesel fuel.

If water contamination is present within the fuel tank, remove the **fuel tank drain plug** (Figure 54), then allow the fuel to drain into a suitable container. When finished, reinstall the fuel tank drain plug.

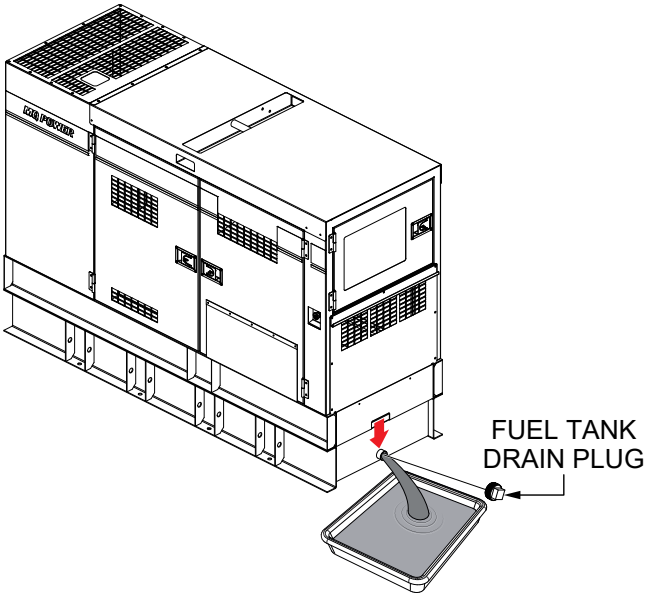



**Figure 54. Draining The Fuel Tank**

## CLEANING INSIDE THE FUEL TANK

If necessary, drain the fuel inside the fuel tank completely. Using a spray washer (Figure 55), wash out any deposits or debris that have accumulated inside the fuel tank.

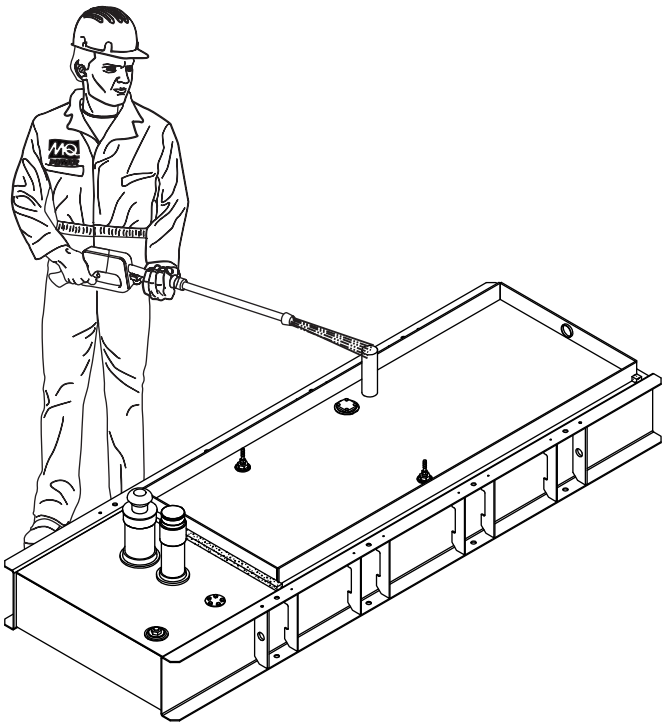


**Figure 55. Cleaning The Fuel Tank**

## FUEL TANK INSPECTION

In addition to cleaning the fuel tank, the following components should be inspected for wear:

- **Rubber Suspension** — Look for signs of wear or deformity due to contact with oil. Replace the rubber suspension if necessary.
- **Fuel Hoses** — Inspect nylon and rubber hoses for signs of wear, deterioration or hardening.
- **Fuel Tank Lining** — Inspect the fuel tank lining for signs of excessive amounts of oil or other foreign matter.

## DRAINING ENGINE OIL

1. Run the engine until the engine coolant reaches a temperature of 140°F (60°C).
2. Turn the engine **OFF**.
3. Remove the oil dipstick from its holder.
4. Remove the **oil drain cap** (Figure 56).

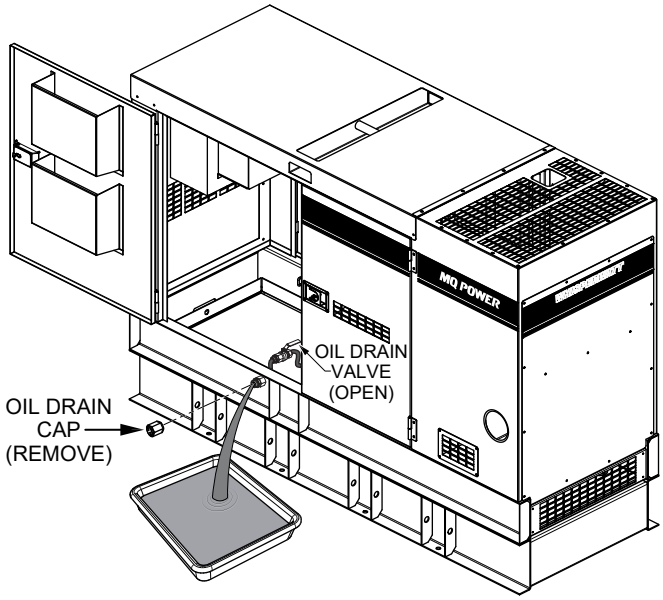



**Figure 56. Draining The Engine Oil**

5. Place the **oil drain valve** in the open position (Figure 56) and allow the oil to drain into a suitable container.
6. After the engine oil has completely drained, reinstall the oil drain cap and tighten securely.
7. Place the oil drain valve in the closed position and reinstall the oil dipstick.

## ENGINE OIL FILTER REPLACEMENT

***NOTICE***

Filter head appearance may vary.

1. Clean the area around the **oil filter head** (Figure 57).

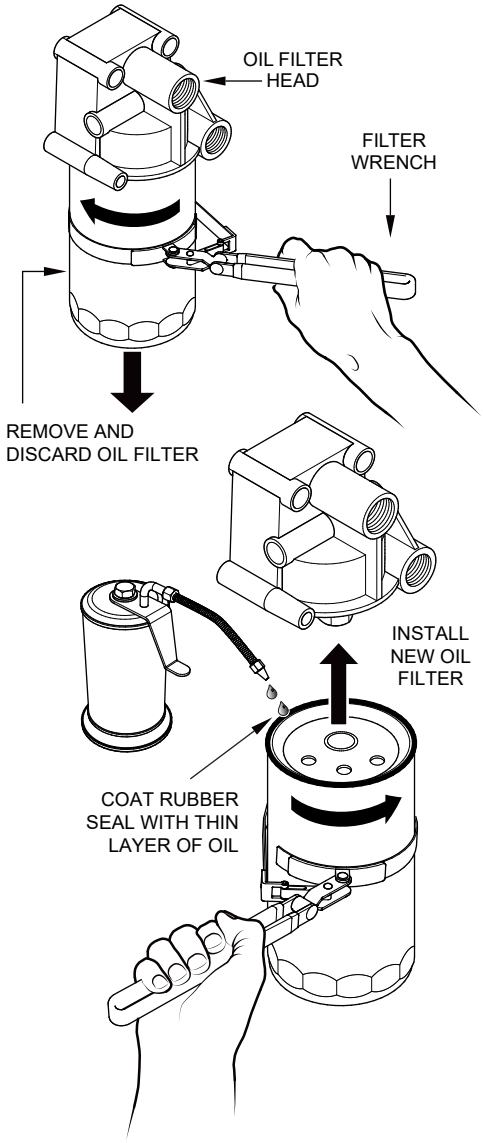



**Figure 57. Engine Oil Filter Removal**

2. Using an **oil filter wrench**, remove the **engine oil filter** (Figure 57).
3. Coat the rubber seal (gasket) surface of the new oil filter with clean 15W-40 engine oil (Figure 57).
4. Install the new (main) oil filter first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using a filter wrench.

5. Fill the engine crankcase with high-quality detergent oil classified “For Service CI-4.” Fill to the upper limit of the dipstick. **DO NOT** overfill. Refer to Table 2 for engine oil capacity.
6. Run the engine for several minutes. Watch for oil leakage. Shut the engine down and allow it to sit for several minutes. Top off the oil to the upper limit on the dipstick.

## DRAINING ENGINE COOLANT

**WARNING**

**DO NOT** remove the pressure cap from the radiator when the engine is hot! Wait until the coolant temperature is below 120°F (50°C) before removing the pressure cap.

Heated coolant spray or steam can cause severe scalding and personal injury.

1. Remove the **radiator pressure cap** (Figure 58) only when the coolant temperature is below 120°F (50°C).

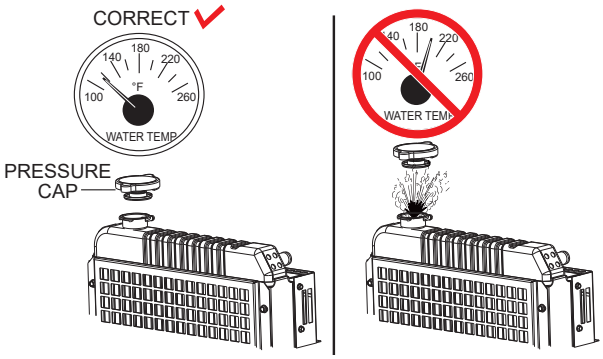



**Figure 58. Radiator Pressure Cap Removal**

2. Open the cabinet door and remove the **coolant drain bolt** and **O-ring** (Figure 59), then allow the coolant to drain into a suitable container.

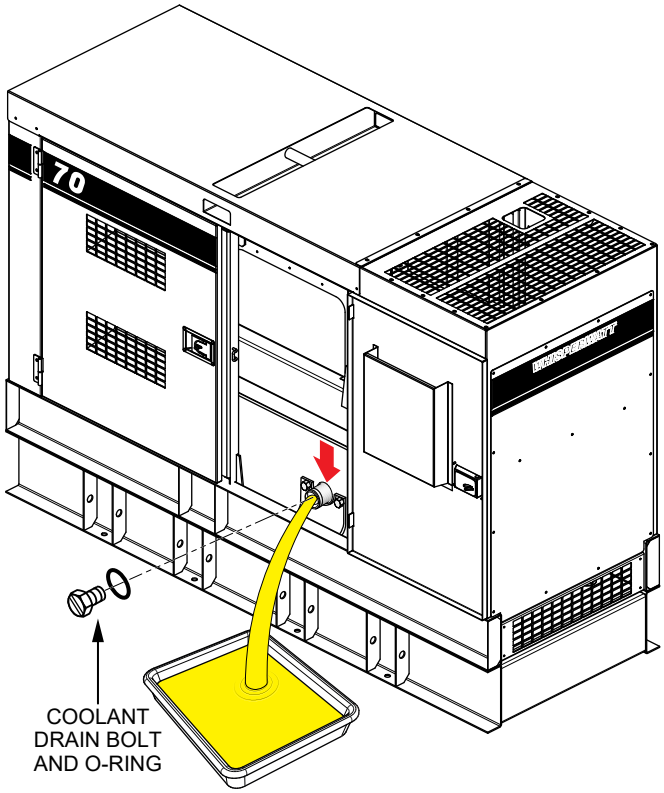



**Figure 59. Draining The Engine Coolant**

3. After the coolant has completely drained, reinstall the coolant drain bolt and O-ring.
4. Reinstall the radiator pressure cap and tighten securely.
5. Flush out the radiator and replace the coolant. Refer to ***Cleaning the Coolant Passages*** and ***Filling the Coolant System*** in the Isuzu engine owner’s manual.

## RADIATOR CLEANING

The radiator (Figure 60) should be sprayed (cleaned) with a high-pressure washer when excessive amounts of dirt and debris have accumulated on the cooling fins or tube. When using a high-pressure washer, stand at least 5 feet (1.5 meters) away from the radiator to prevent damage to the fins and tube.

***NOTICE***

It may be necessary to remove additional generator components in order to access the radiator for cleaning.

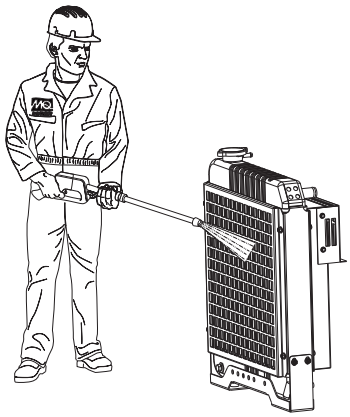


**Figure 60. Radiator Cleaning**

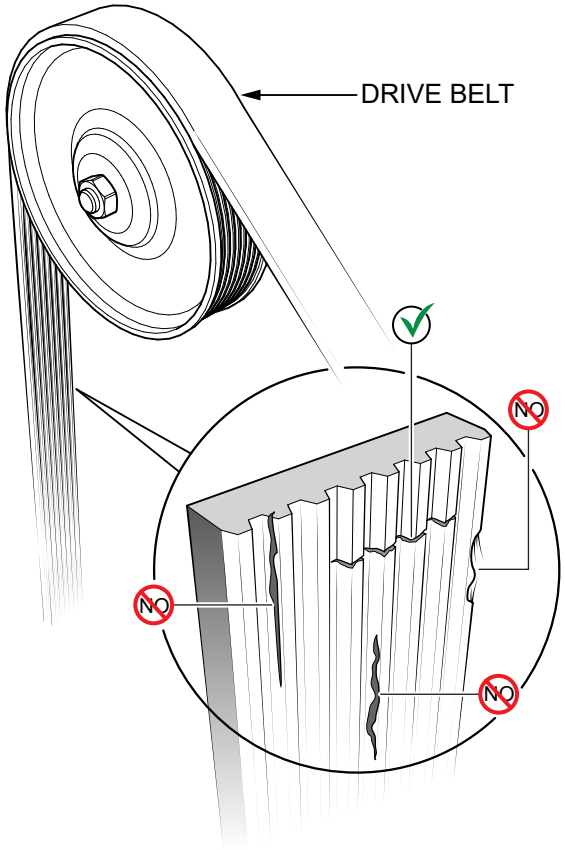



**Figure 61. Drive Belt Inspection**

## DRIVE BELT

### Drive Belt Tension

A slack drive belt may contribute to overheating or insufficient charging of the battery. Adjust the drive belt in accordance with the Isuzu engine owner's manual.

### Drive Belt Inspection

Inspect the **drive belt** (Figure 61) for damage and wear. Horizontal cracks (across the belt) are acceptable. Vertical cracks (direction of belt ribs) that intersect with horizontal cracks are not acceptable.

Also, examine the belt and determine if it is **oil soaked** or **glazed** (a hard shiny appearance on the sides of the belt). Either of these two conditions can cause the belt to run hot, which can weaken it and increase the danger of it breaking.

If the drive belt exhibits any of the above wear conditions, replace the drive belt immediately.

## TESTING THE GFCI RECEPTACLE

***NOTICE***

The GFCI receptacle is designed to interrupt power when a ground fault exists to prevent injuries and shock hazards. **DO NOT** use the GFCI receptacle if the test below fails. Consult a qualified electrician for repair or replacement of the GFCI receptacle. Test the GFCI receptacle **at least once a month**.

1. Start the generator as shown in the start-up procedure in this manual.
2. Place a **GFCI circuit breaker** (Figure 62) in the **ON** position.

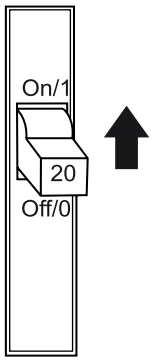



**Figure 62. GFCI Circuit Breaker**

3. Verify that the status LED on the corresponding GFCI receptacle (Figure 63) is **ON (GREEN)**.

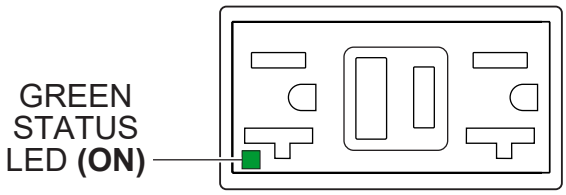



**Figure 63. GFCI Receptacle (ON)**

4. Press the **TEST** button (Figure 64) on the GFCI receptacle and verify that the status LED turns **OFF**.

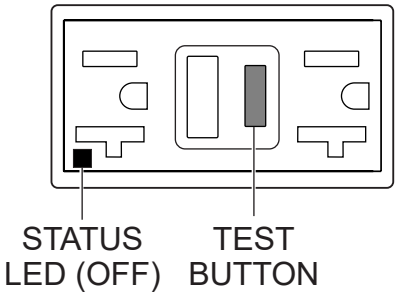



**Figure 64. GFCI Receptacle (OFF)**

5. Press the **RESET** button (Figure 65) to restore power to the GFCI receptacle and verify that the status LED is **ON (GREEN)**.

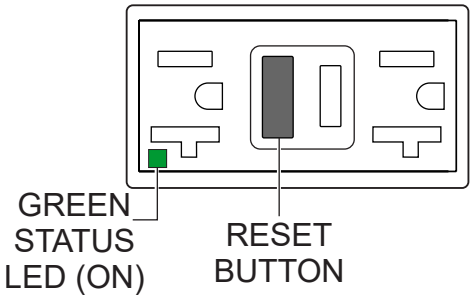



**Figure 65. GFCI Receptacle (ON/Restore)**

6. If the status LED (Figure 66) is **flashing (RED)**, **DO NOT** use the GFCI receptacle. Replace it immediately.

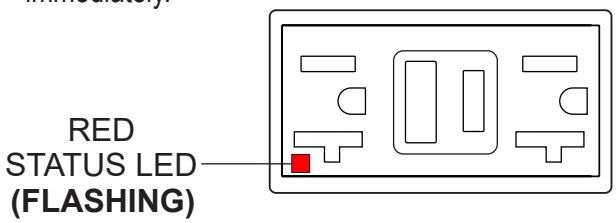



**Figure 66. GFCI Receptacle (Red Flashing LED)**

7. Repeat the above procedure for all other GFCI receptacles.

## GENERATOR STORAGE

For long-term storage of the generator the following is recommended:

- Drain the fuel tank completely. Treat with a fuel stabilizer if necessary.
- Completely drain the oil from the crankcase and refill if necessary with fresh oil.
- Clean the entire generator, internal and external.
- Disconnect the battery.
- Make sure engine coolant is at the proper level.
- Cover the generator and store it in a clean, dry place.
- If the generator is mounted on a trailer, jack the trailer up and place it on blocks so the tires do not touch the ground, or block and completely remove the tires.

## ENGINE BLOCK HEATER AND OPTIONAL INTERNAL BATTERY CHARGER 120 VAC INPUT RECEPTACLES

This generator comes equipped with an **engine block heater**. An **internal battery charger** is available as an **option**. These components are provided with electrical power cords to connect to a commercial power source.

The engine block heater and internal battery charger (Figure 67) both require 120 VAC in order to operate. Two power receptacles are provided on the output terminal panel to allow commercial power to be applied.

These units will **ONLY** function when commercial power has been supplied to them. When using extension cords, refer to Table 6 for the correct size and length.

When using the generator in hot climates there is no reason to apply power to the engine block heater. However, if the generator will be used in cold climates it is always a good idea to apply power to the heater at all times.

If the generator will be used daily, the battery should normally not require charging. If the generator will be idle (not used) for long periods of time, apply power to the battery charger receptacle via commercial power using a power cord of adequate size.

***NOTICE***

If the generator will be idle (not used) for long periods of time, **ALWAYS** keep power supplied to the generator's internal battery charger to ensure adequate starting capability.

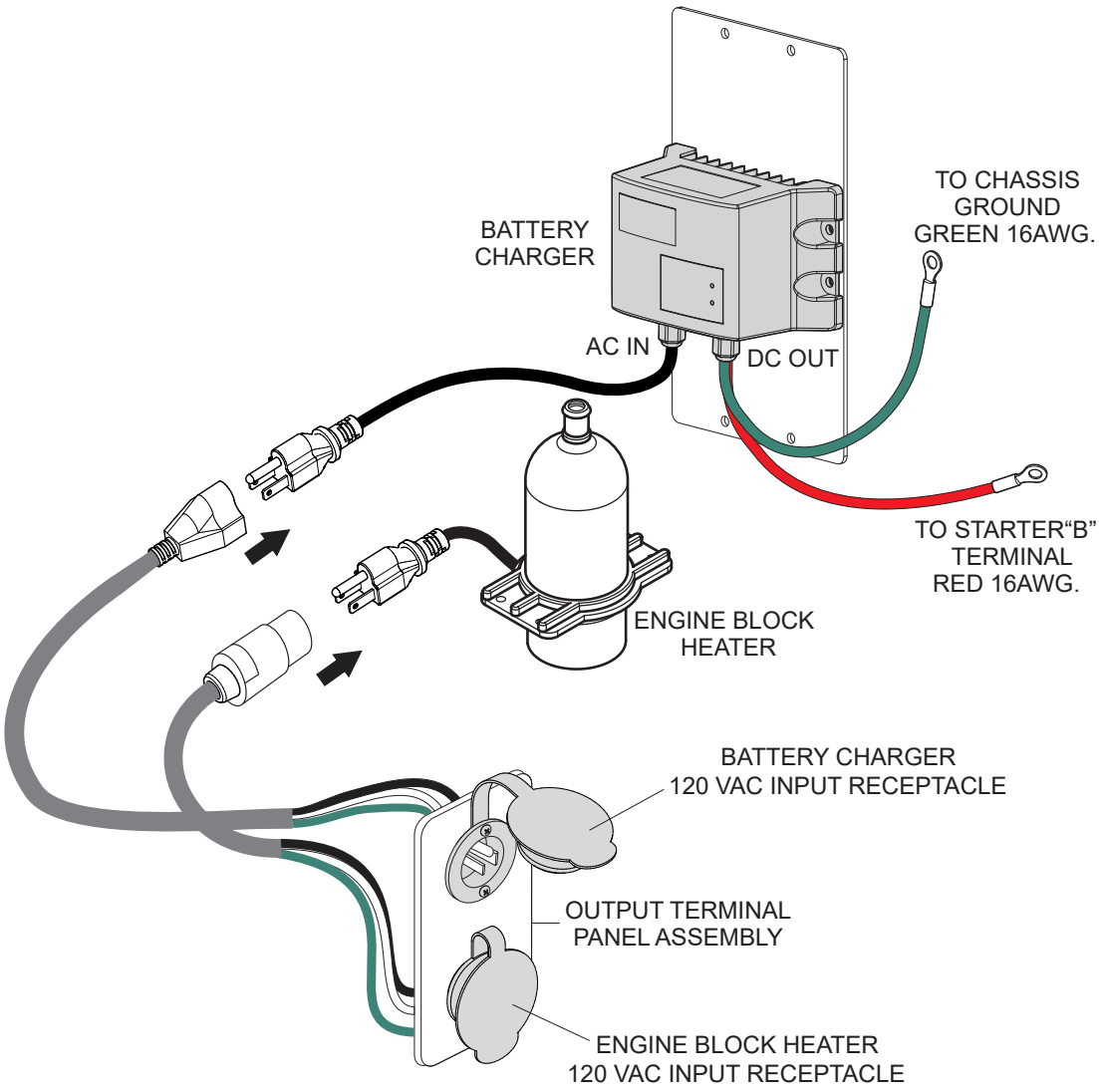



**Figure 67. Engine Block Heater And Optional Battery Charger**

## EMISSION CONTROL

The emission control system employed with this diesel engine consists of a **diesel oxidation catalyst (DOC)** and a **selective catalytic reduction (SCR)** catalyst as an exhaust gas after-treatment system that helps reduce harmful gases and destroy the organic fraction of particulate matter produced from the exhaust gas to meet the requirement for EPA Tier 4 (Final) regulations.

The DOC device (Figure 68) helps filter out large amounts of harmful nitrogen oxides ($NO_X$) and particulate matter (PM) which are emitted by diesel engines. These exhaust emissions pose serious environmental and health risks. It is important to maintain and service the DOC emission safety device on a periodic basis.

### Diesel Oxidation Catalyst (DOC)

The DOC does not filter particles; it oxidizes them. This catalyst (honeycomb-like structure) uses a chemical process to break down pollutants in the exhaust stream into less harmful components. In general this catalyst collects/burns accumulated particulates. The DOC contains palladium and platinum which serve as catalysts to oxidize hydrocarbons and carbon monoxide.

## PREVENTIVE MAINTENANCE PROGRAMS

Most challenging to a rental organization is the fact that a customer's power assumptions may not meet the minimum load requirements of the power equipment selected. When in doubt, it is always recommended to apply a **load bank application** to the equipment following a longer rental period.

Equipment on extended, long-term contracts needs periodic on-site inspection. If possible, interview the operator and survey the equipment hooked up to the generator to estimate load conditions.

Preventive maintenance and a few extra steps prevent downtime and protect your investment and business. A well-planned preventive maintenance program will reward you with years of service.

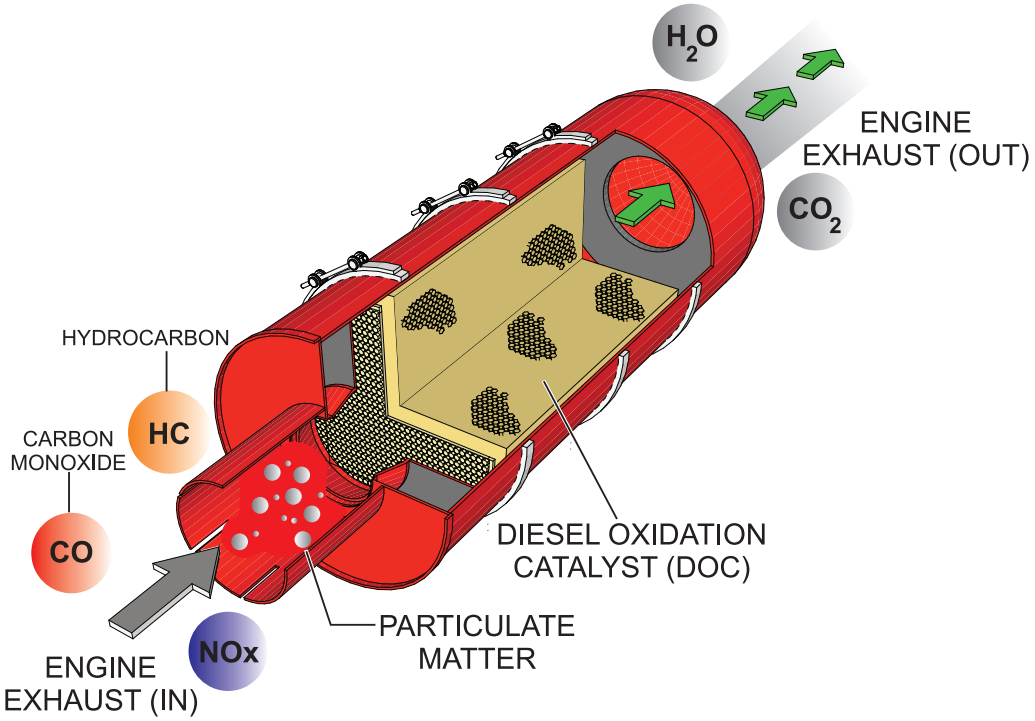



**Figure 68. Diesel Oxidation Catalyst (DOC)**

## SELECTIVE CATALYTIC REDUCTION (SCR)

Diesel engines can be run with a lean burn air-to-fuel ratio, to ensure the full combustion of soot and to prevent the exhaust of unburnt fuel. The excess of air necessarily leads to generation of nitrogen oxides ($NO_X$), which are harmful pollutants, from the nitrogen in the air. **Selective catalytic reduction (SCR)** is used to reduce the amount of $NO_X$ released into the atmosphere.

**Diesel exhaust fluid (DEF)** is injected from a separate tank into the exhaust pipeline, where the aqueous urea solution vaporizes and decomposes to form ammonia and carbon dioxide. Within the SCR catalyst, the nitrogen oxides are catalytically reduced by the ammonia ($NH_3$) into water ($H_2O$) and nitrogen ($N_2$), which are both harmless; these are then released through the exhaust.

The SCR system creates a certain amount of ammonia ($NH_3$) that is stored within the SCR catalyst. During purge operations the increase in temperature at regular intervals eliminates the stored ammonia.

The process of keeping accurate ammonia storage amounts is by counting urea injection quantities from the **dosing control unit (DCU)**.

During either Automatic or Forced Purge operation, the **Alarm lamp** on the digital controller will start **flashing (red)**, and a message will appear on the controller display next to the **SCR Purge symbol**. See Figure 69.

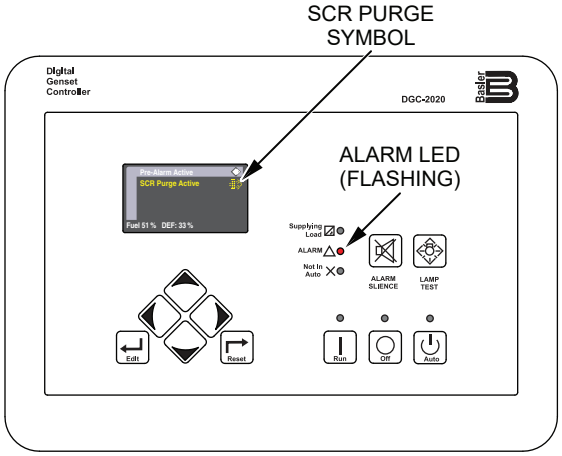



**Figure 69. Digital Controller (SCR Purge)**

Refer to Table 14 for digital controller messages displayed during SCR Purge operation.

**Table 14. SCR Purge Controller Messages**

| SCR Purge Type | Automatic Purge | Forced Purge |
|---|---|---|
| Controller Message | SCR Purge Active | SCR Forced Purge |
| SCR Purge Indicator |  |  |
| Alarm Lamp | FLASHING | FLASHING |

### System Purging Guidelines

For the safe operation of equipment, protection of the surrounding area, and prevention of bodily harm, use the guidelines below when a purge operation is required:

- **DO NOT** perform purge operations in conditions where it may be unsafe due to high exhaust temperatures.
- **DO NOT** operate the unit in an area with poor ventilation.
- If operating the engine indoors, install exhaust/ventilation equipment and ensure that there is sufficient ventilation.
- If you begin to feel sick, stop the unit immediately and ventilate the area.
- **Remember** — Due to the emission reduction functions of the exhaust system, exhaust emissions from the tailpipe have a different smell than those emitted from engines without urea SCR systems.
- During the purge operation, the area above and around the generator should be free of any type of debris or flammable/combustible materials, as temperatures during the purge process can reach as high as 1,022°F (550°C).
- If a purge operation is performed while the unit is operating under a light load (0–30%), unusual sounds may be produced. This should not be considered a problem.
- During SCR purge operations, white smoke may be temporarily emitted from the exhaust tailpipe. This shoud not be considered a failure. In addition, the smell of ammonia during the purge process should not be considered a failure.

## Automatic Purge Operation

The purging operation is automatically performed every 30 hours. The **Alarm lamp** will begin flashing (red) and the message **"SCR Purge Active"** will appear on the controller screen (Figure 69) while the purge operation is in progress.

## Forced Purge Operation

**NOTICE**

Only a qualified service technician with proper training should perform a Forced Purge operation.

If the Automatic Purge operation is interrupted by an engine shutdown or otherwise cannot be completed, the message **"SCR Forced Purge Req"** will be displayed on the digital controller (Figure 70). When this occurs, a Forced Purge operation must be performed by a trained service technician utilizing the Isuzu Diagnostic Service Tool (IDST).

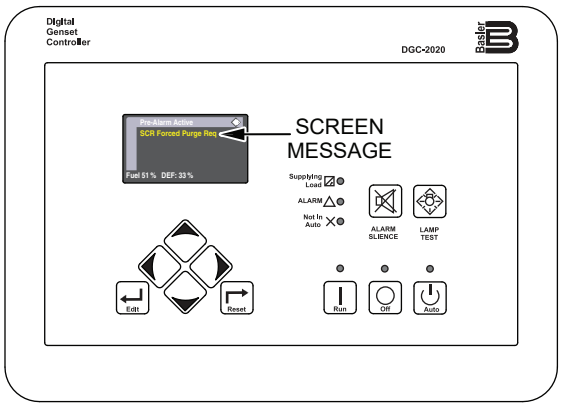



**Figure 70. Digital Controller (Forced Purge Request)**

While a Forced Purge operation is in progress, the **Alarm lamp** will begin flashing (red) and the message **"SCR Forced Purge"** will appear on the controller screen (Figure 71).

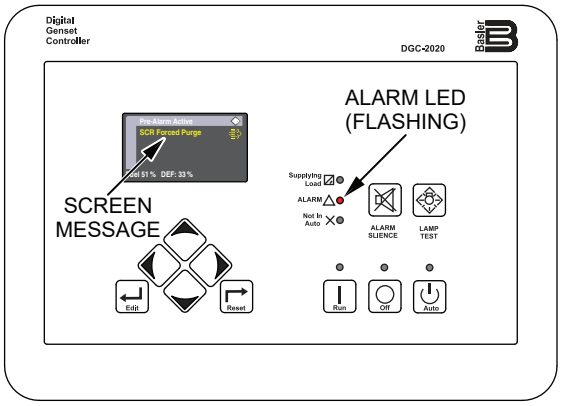



**Figure 71. Digital Controller (Forced Purge Active)**

If the Forced Purge operation is interrupted by an engine shutdown, it will not be completed automatically when the engine fault is cleared and the engine is restarted. The Forced Purge operation must still be performed manually by a trained service technician using the IDST.

## DIESEL EXHAUST FLUID (DEF)

The **Diesel Exhaust Fluid (DEF) indicator** (Figure 72) will be displayed on the digital controller during either of the following operating conditions:

- DEF tank level is below 10%. Refer to Table 15, DEF Level System Action and Table 16, DEF Inducement.
- DEF quality is poor. Refer to Table 16 and check active **diagnostic trouble codes (DTC)**.

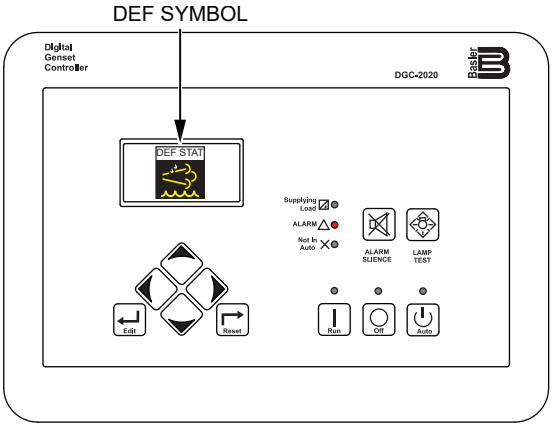



**Figure 72. Digital Controller (DEF Indicator)**

The amount of fluid in the DEF tank will be displayed on the digital controller during operation (Figure 73).

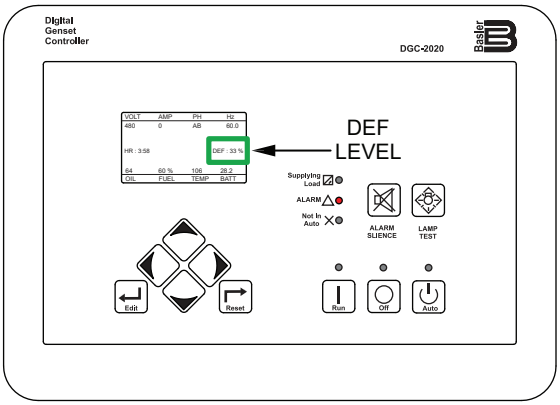



**Figure 73. DEF Level Gauge**

**NOTICE**

The unit will enter emergency shutdown when the DEF level has reached 0% and emergency protective measures are necessary. In this condition, the unit can only be restarted after **Escape mode** is activated, and the unit will only run for 30 minutes. Refer to ***Escape Mode*** on page 53 for more information.

**Table 15. DEF Level System Action**

| DEF Level | Over 10% | Below 10% | Below 5% | 0% |
|---|---|---|---|---|
| **Alarm Screen Message** | — | — | DEF Presvr Inducmt | DEF Severe Inducmt<br>DEF Low Refill DEF |
| **Pre-Alarm Screen Message** | — | DEF Low Refill DEF | DEF Presvr Inducmt<br>DEF Low Refill DEF | DEF Low Refill DEF |
| **DEF Indicator** | — | ON | ON | ON |
| **Alarm Lamp** | — | Flashing | Flashing | ON |
| **Engine Shutdown** | — | — | | Restart Unavailable |

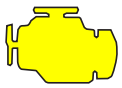
## INDUCEMENT

When the system senses improper usage such as no supply of DEF, use of poor quality DEF, problems with DEF dosing, or disconnection of sensors, a warning will be issued before the situation becomes critical. If the warnings are ignored and the unit enters intermittent operation, the emergency shutdown will activate. The warning levels are shown in Table 16:

***NOTICE***

Replace the DEF filter (located in the urea SCR system supply module) every 1,000 hours of operation. Refer to the ***Replacement of DEF Filter*** section in the Isuzu engine owner's manual.

**Table 16. DEF Inducement**

| Stage | Alarm Screen Message | Pre-Alarm Screen Message | DEF Indicator | Engine Emission Indicator | Check Engine Indicator | Alarm Lamp |
|---|---|---|---|---|---|---|
| **Stage 1** Warning Level 1 | — | EXHAUST System Err |  |  |  |  Flashing |
| **Stage 2** Warning Level 2 | — | DEF Presvr Inducmt EXHAUST System Err |  |  |  |  Flashing |
| **Stage 3** Shutdown | DEF Severe Inducmt EXHAUST System Err | — |  |  |  |  ON |

## ESCAPE MODE

When emergency shutdown occurs, inspection and repair should generally be performed promptly. However, if emergency protective measures are necessary which require the unit to be running, the engine can be started in **Escape mode**, which allows the unit to run for 30 minutes.

### Escape Mode Activation

Confirm the message displayed on the digital controller. Escape mode can only be activated if one of the error messages shown in Table 16 is displayed.

1. Start **Diagnostic mode** as described in the ***Troubleshooting (Diagnostics)*** section of this manual.
2. Use the **Arrow buttons** (Figure 79) to navigate to the **Escape Mode Request menu**: (Settings->Communication->ECU Setup->Isuzu ECU Setup->Escape Mode).
3. Press the **Edit button** (Figure 74).

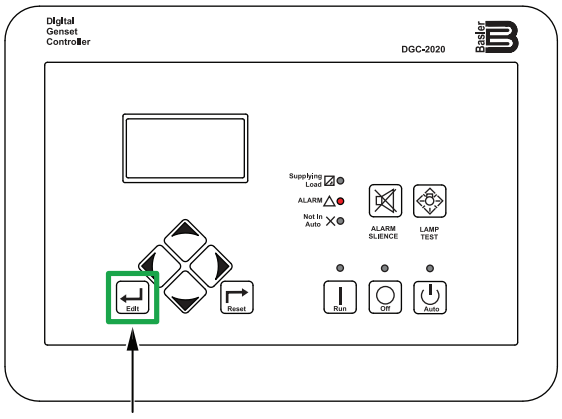



**Figure 74. Digital Controller (Edit Button)**

4. Use the Arrow buttons to enter the username and password.

> ***NOTICE***
>
> The username and password for the digital controller are initially set to defaults which can be found in the Basler DGC-2020 instruction manual.

5. After the Escape Mode request changes from OFF to ON, press the **Edit button** (Figure 74).
6. When Escape mode is enabled, the **Alarm lamp** will flash and the message **"Escape Mode PA"** will appear on the Pre-Alarm screen.
7. Press the **Run button** (Figure 75) to start the engine.

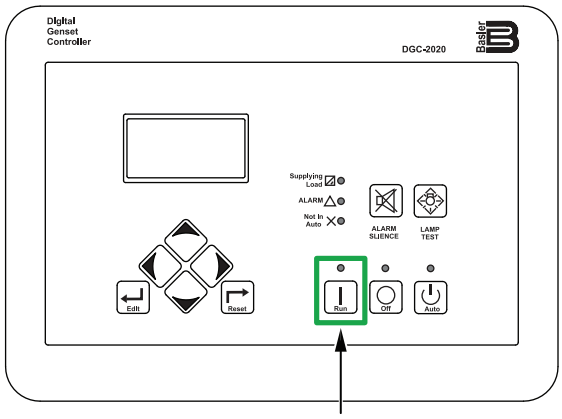



**Figure 75. Digital Controller (Run Button)**

- This unit will enter emergency shutdown when the DEF level has reached 0% and emergency protective measures are necessary. In this condition, the unit can only be restarted after Escape mode is activated, and the unit will only run for 30 minutes.
- Escape mode operation will be available until around 30 minutes after operation has been stopped. If Escape mode is temporarily suspended before the end of the 30-minute period, it is not necessary to request Escape mode again when the unit is restarted. The 30-minute countdown from before the last shutdown will resume automatically once the unit is restarted.
- Once the 30-minute Escape mode period ends, the engine will automatically stop. Escape mode can only be requested **one time**. Perform inspection and repair the fault before restarting the engine.
- If the unit returns to Warning Level 1 while Escape mode is running, Escape mode will be cancelled and normal operation will resume.

## Escape Mode Deactivation

1. Press the **Off button** on the digital controller (Figure 76) to stop the engine. The engine will stop after a 1-minute cool-down process.

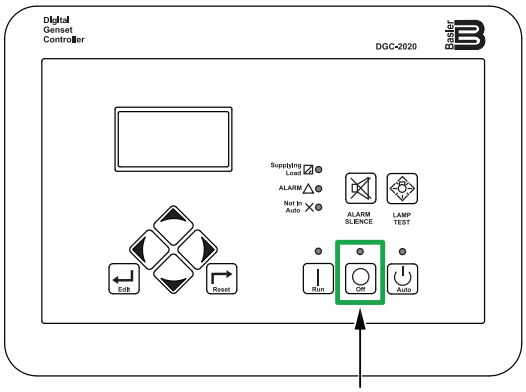



**Figure 76. Digital Controller (OFF Button)**

2. After the engine has stopped completely, place the **Control Power switch** in the **OFF** position (Figure 77).


**Figure 77. Control Power Switch (OFF)**

## DIAGNOSTIC MODE

The digital controller can be placed in **Diagnostic mode** which will keep the key switch on for service tool purposes. To place the unit in Diagnostic mode, the engine must be turned **OFF**.

1. Press and hold the **Alarm Silence button** and the **Lamp Test button** (Figure 78) simultaneously for 5 seconds.

**NOTICE**

When Diagnostic mode is enabled, the message **"DIAGNOSTIC MODE"** will be displayed on the Pre-Alarm screen.

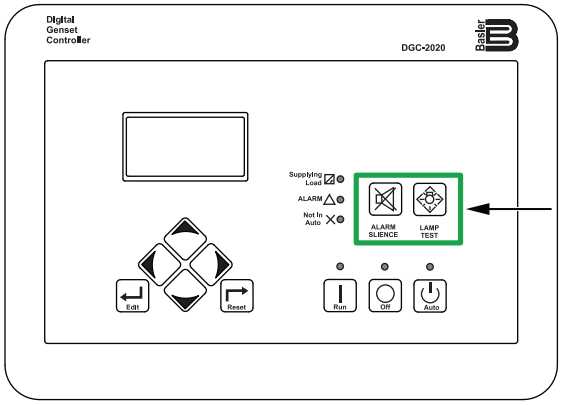



**Figure 78. Digital Controller (Alarm Silence And Lamp Test Buttons)**

2. Use the Arrow buttons (Figure 79) to navigate to the **Alarms Status menu** (Metering->Alarm-Status). This will allow the operator to perform the following fault diagnostics:

- **DTC Active Data** — Displays active fault messages and codes.
- **DTC Previous Data** — Displays messages and codes which previously occurred that are recorded in the engine control module (ECM).

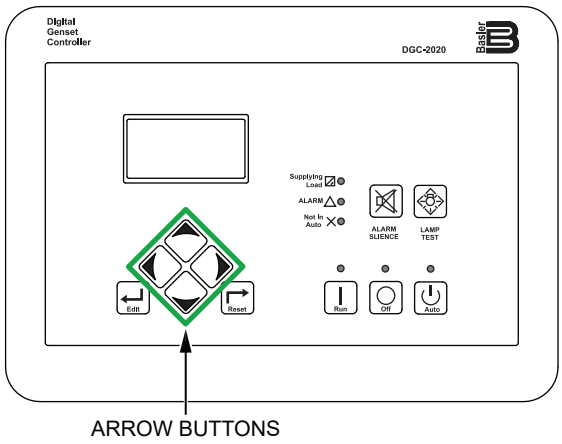



**Figure 79. Digital Controller (Arrow Buttons)**

3. After performing the diagnostic test, press the **Reset button** on the digital controller to exit Diagnostic mode.

## PROTECTION DEVICES

### Automatic Shutdown System

This generator is equipped with engine protection devices that will automatically shut down the engine and provide a warning to the operator when a fault occurs. Table 17 contains a complete list of engine protection devices and fault codes.

When a fault is detected, the **Alarm lamp** on the digital controller will illuminate and/or begin flashing **(red)**, and an alarm message will appear on the controller display. When this occurs, press the **Off button** on the digital controller to shut down the engine. Allow a sufficient cooling period, then inspect the unit and repair the problem before restarting operation. If necessary, contact your nearest MQ Power dealer for additional technical support.

When the unit is ready to restart, press the **Off button** on the digital controller. The **Off button LED** (Figure 80) will turn **ON (red)**.

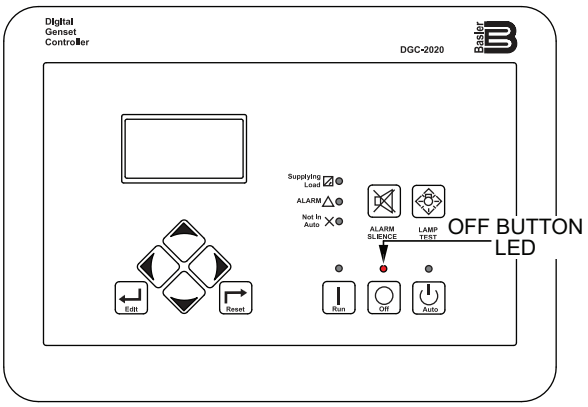



**Figure 80. Digital Controller (Off Button LED)**

Make sure all fault messages have been cleared from the digital controller display, then restart the generator as shown in the ***Generator Start-Up Procedure (Manual)*** section.

***NOTICE***

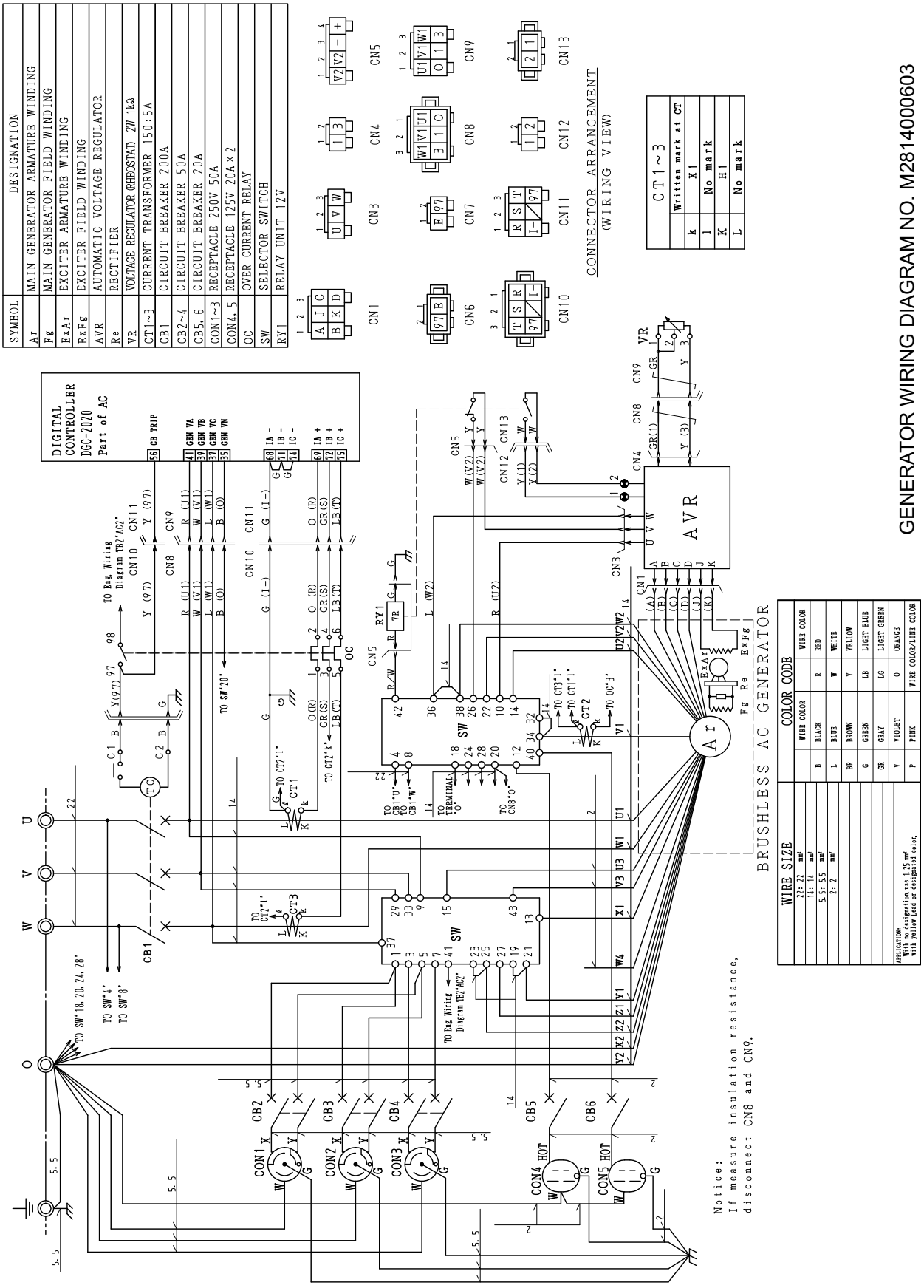
Although the unit is equipped with engine protection devices, regularly scheduled preventive maintenance is strongly advised. Refer to Table 13.

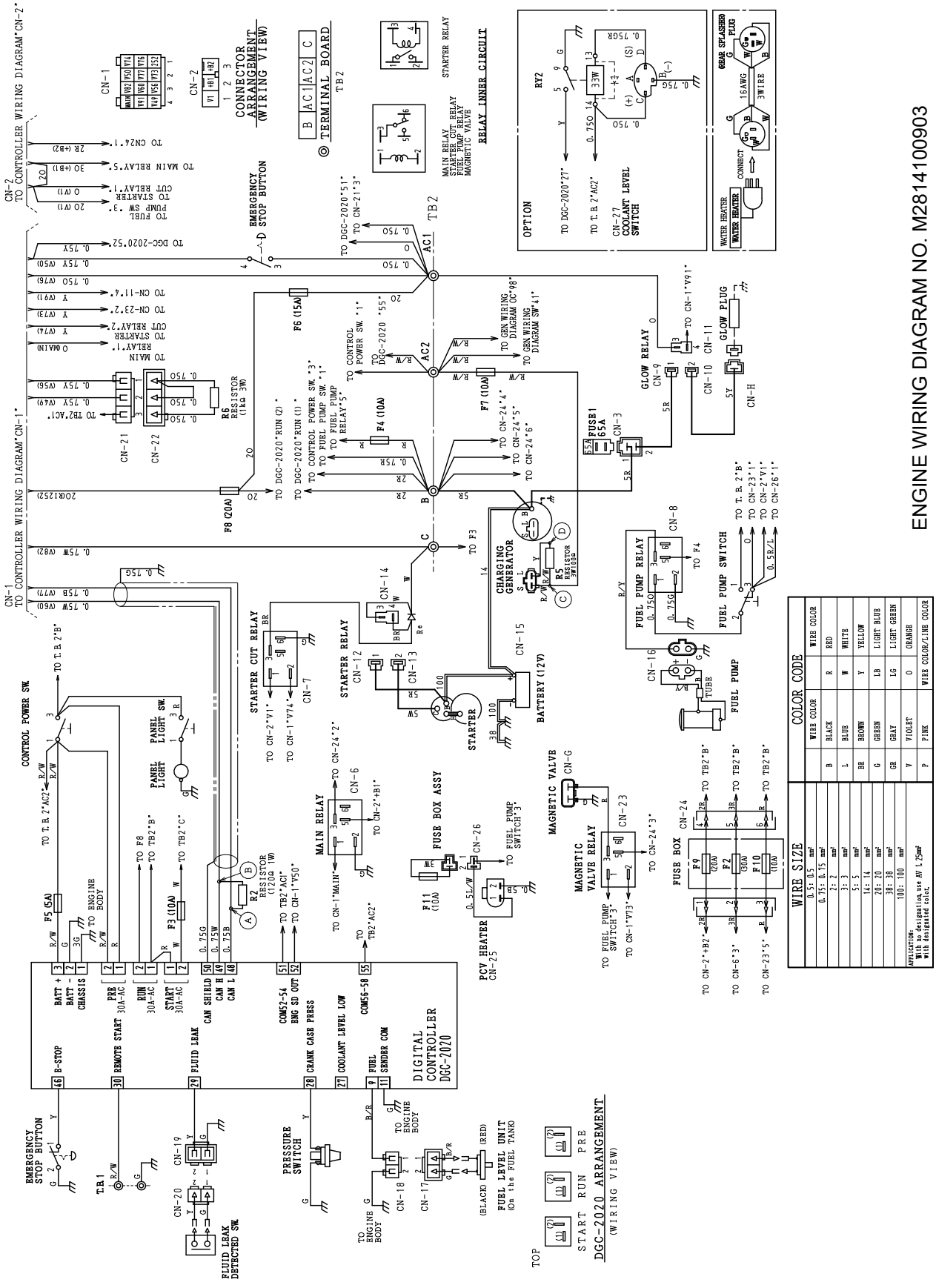
| Table 17. Automatic Engine Shutdown System | | | | |
|---|---|---|---|---|
| **Operating Parameter** | **Circuit Breaker OFF LED** | **Engine Shutdown LED** | **Digital Controller Display Message** | **Operating Condition/ Set Point** |
| Under Voltage | — | — | 27-1 UndVolt Prealarm | When under voltage occurs |
| Under Voltage | ON | ON | 27-2 UndVolt Alarm | When under voltage occurs |
| Over Voltage | — | — | 59-1 OvrVolt Prealarm | When over voltage occurs |
| Over Voltage | ON | ON | 59-2 OvrVolt Alarm | When over voltage occurs |
| Under Frequency | ON | ON | 81U UndFreq Alarm | Set point: 54 Hz |
| Over Frequency | ON | ON | 81O OvrFreq Alarm | Set point: 66 Hz |
| Over Current | ON | ON | Over Current | When overcurrent occurs |
| High Battery Voltage | — | — | Batt Over Volt PreAlm | Set point: 15 V |
| Low Battery Voltage | — | — | Low Batt Volt PreAlm | Set point: 11 V |
| Weak Battery Voltage | — | — | Weak Battery PreAlm | Set point: 8.5 V |
| Low Fuel Level | — | — | Low Fuel PreAlarm | Set point: 20% |
| Low Fuel Level | ON | ON | Low Fuel Alarm | Set point: 5% |
| Low Oil Pressure | — | — | Low Oil Pres PreAlarm | Set point: 25 psi (172 kPa) |
| Low Oil Pressure | ON | ON | Low Oil Pressure Alarm | Set point: 7 psi (48 kPa) |
| High Coolant Temperature | — | — | High Coolant Temp PA | Set point: 200°F (93°C) |
| High Coolant Temperature | ON | ON | High Coolant Temp A | Set point: 212°F (100°C) |
| Over Speed | ON | ON | OverSpeed Alarm | Set point: 2,070 rpm |

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 18 shown below for diagnosis of the generator. If the problem cannot be remedied, consult our company's business office or service plant.

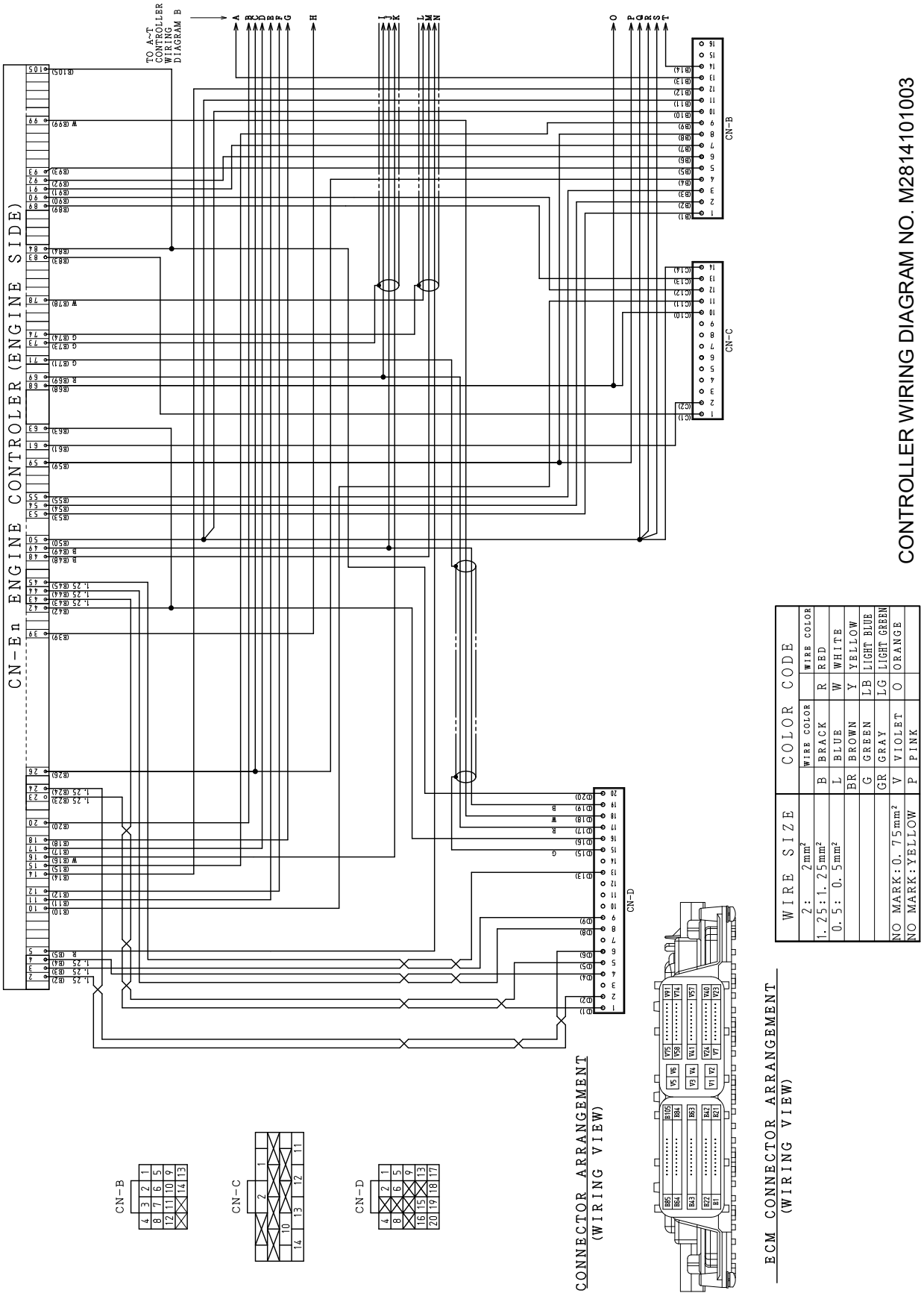
**Table 18. Generator Troubleshooting**

| Symptom | Possible Problem | Solution |
|---|---|---|
| No Voltage Output | Defective AC voltmeter? | Check output voltage and replace if necessary. |
| | Loose wiring connections? | Check wiring and repair. |
| | Defective AVR? | Replace if necessary. |
| | Defective rotating rectifier? | Check and replace. |
| Low Voltage Output | Low engine speed? | Check and adjust. |
| | Loose wiring connections? | Check wiring and repair. |
| | Defective AVR? | Replace if necessary. |
| High Voltage Output | Loose wiring connections? | Check wiring and repair. |
| | Defective AVR? | Replace if necessary. |
| Circuit Breaker Tripped | Short circuit in load? | Check load and repair. |
| | Over current? | Confirm load requirement and reduce. |
| | Defective circuit breaker? | Check and replace. |
| | Overcurrent relay actuated? | Confirm load requirement and reset. |


GENERATOR WIRING DIAGRAM NO. M2814000603
DIGITAL CONTROLLER DGC-2020 Part of AC
AVR
VR
Ar
BRUSHLESS AC GENERATOR
CONNECTOR ARRANGEMENT (WIRING VIEW)
CT1~3
Written mark at CT
k X1
l No mark
K H1
L No mark
SYMBOL DESIGNATION
Ar MAIN GENERATOR ARMATURE WINDING
Fg MAIN GENERATOR FIELD WINDING
ExAr EXCITER ARMATURE WINDING
ExFg EXCITER FIELD WINDING
AVR AUTOMATIC VOLTAGE REGULATOR
Re RECTIFIER
VR VOLTAGE REGULATOR (RHEOSTAT) 2W 1kΩ
CT1~3 CURRENT TRANSFORMER 150:5A
CB1 CIRCUIT BREAKER 200A
CB2~4 CIRCUIT BREAKER 50A
CB5, 6 CIRCUIT BREAKER 20A
CON1~3 RECEPTACLE 250V 50A
CON4, 5 RECEPTACLE 125V 20A×2
OC OVER CURRENT RELAY
SW SELECTOR SWITCH
RY1 RELAY UNIT 12V
WIRE SIZE
COLOR CODE
WIRE COLOR
WIRE COLOR
B BLACK
R RED
L BLUE
W WHITE
BR BROWN
Y YELLOW
G GREEN
LB LIGHT BLUE
GR GRAY
LG LIGHT GREEN
V VIOLET
O ORANGE
P PINK
WIRE COLOR/LINE COLOR
APPLICATION
Wire size designation use 1.25 mm²
With yellow band or designated color.
Notice:
If measure insulation resistance,
disconnect CN8 and CN9.


ENGINE WIRING DIAGRAM NO. M2814100903
DIGITAL CONTROLLER DGC-2020
DGC-2020 ARRANGEMENT (WIRING VIEW)
CONNECTOR ARRANGEMENT (WIRING VIEW)
TERMINAL BOARD TB2
CONTROL POWER SW.
EMERGENCY STOP BUTTON
PANEL LIGHT SW.
PANEL LIGHT
STARTER CUT RELAY
STARTER RELAY
MAIN RELAY
FUSE BOX ASSY
MAGNETIC VALVE
MAGNETIC VALVE RELAY
CHARGING GENERATOR
BATTERY (12V)
STARTER
GLOW RELAY
GLOW PLUG
FUEL PUMP RELAY
FUEL PUMP SWITCH
FUEL PUMP
FUSE BOX
PCV HEATER CN-25
PRESSURE SWITCH
FUEL LEVEL UNIT
FLUID LEAK DETECTED SW
RELAY INNER CIRCUIT
OPTION
COOLANT LEVEL SWITCH
WATER HEATER
REAR SPASSER PLUG
WIRE SIZE
COLOR CODE

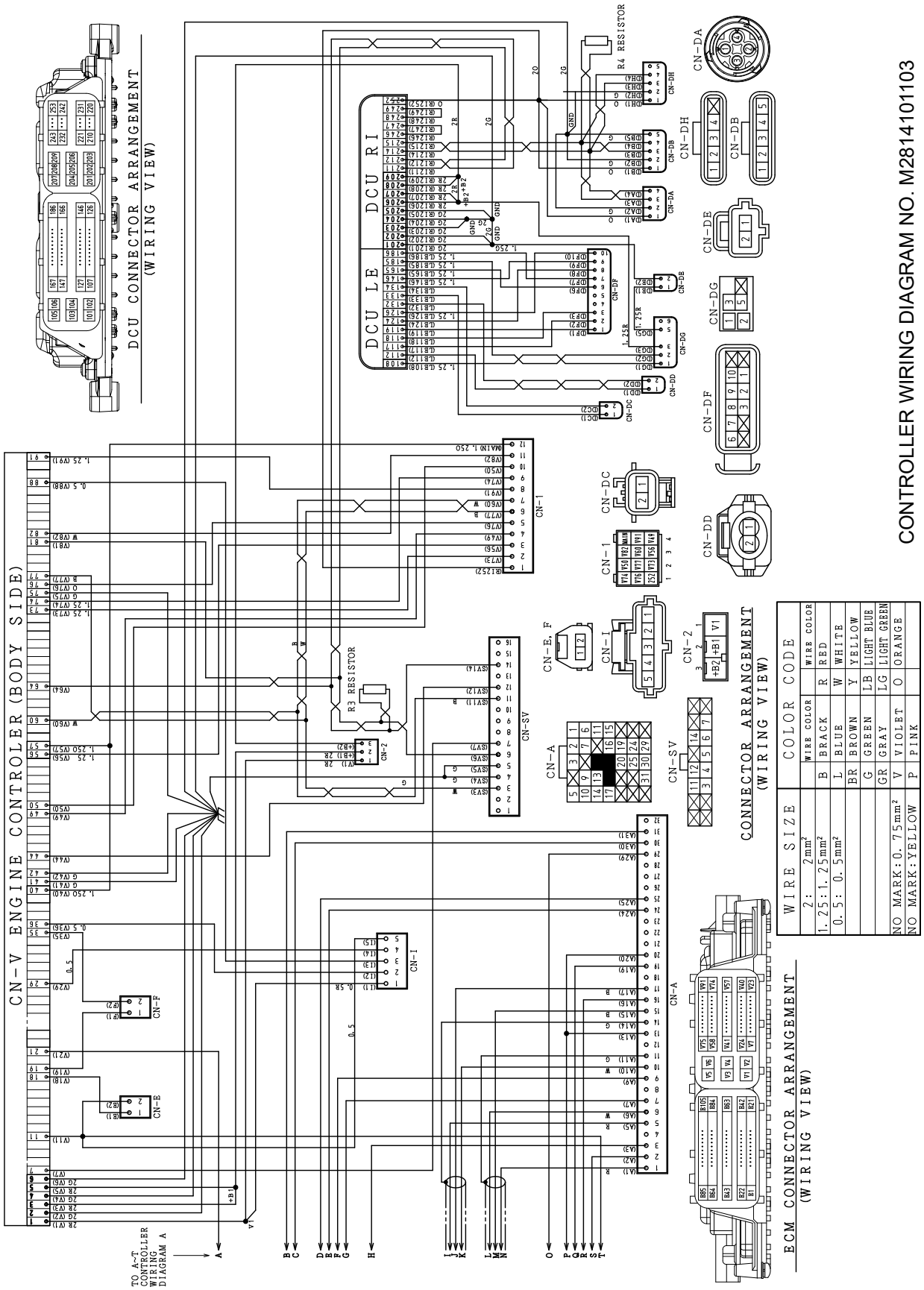
# CONTROLLER WIRING DIAGRAM (A) (M2814101003)



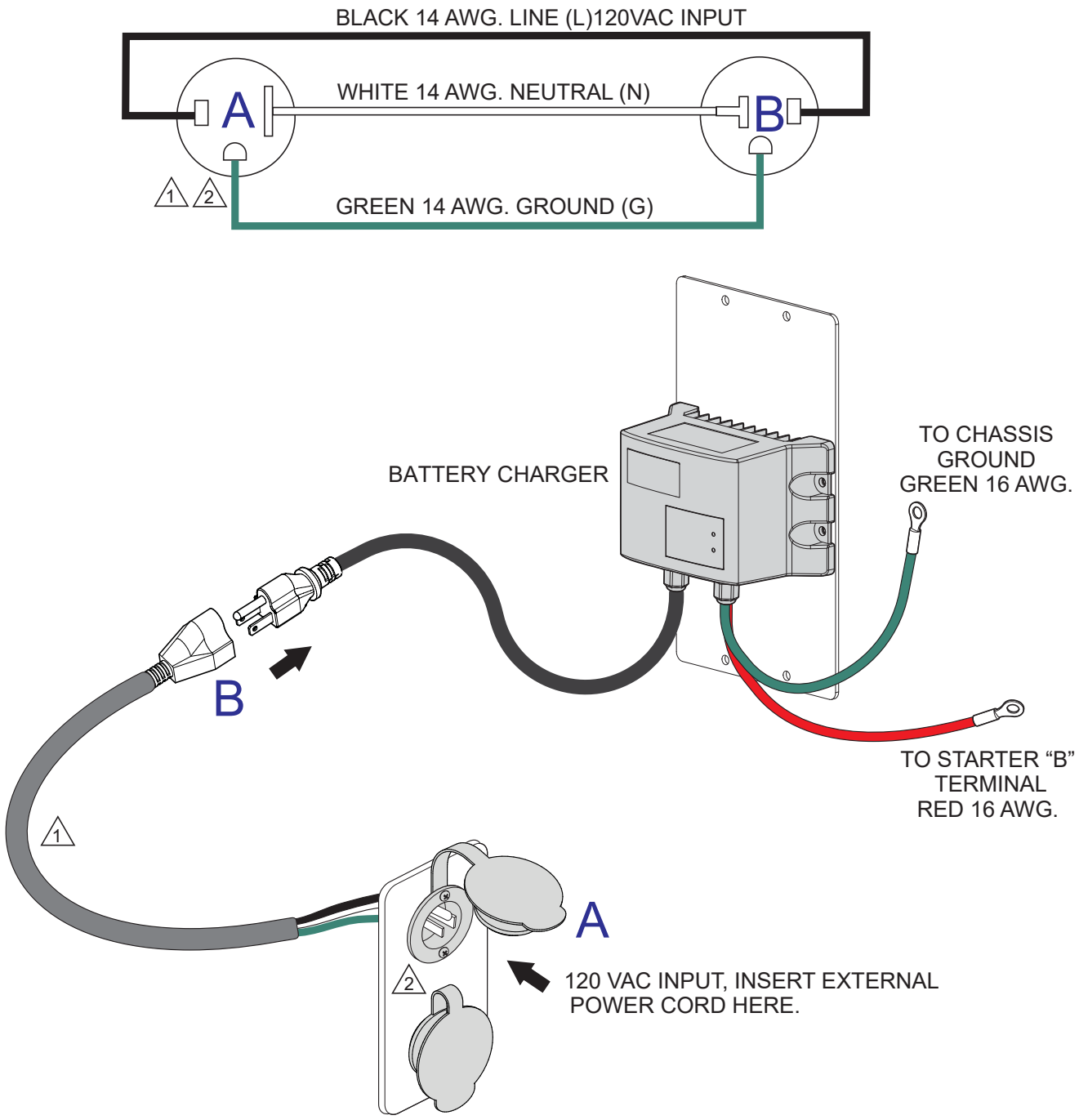

CONTROLLER WIRING DIAGRAM NO. M2814101003

| WIRE SIZE | COLOR CODE | | |
|---|---|---|---|
| 2: 2mm² | WIRE COLOR | | WIRE COLOR |
| 1.25:1.25mm² | B BRACK | R | RED |
| 0.5: 0.5mm² | L BLUE | W | WHITE |
| | BR BROWN | Y | YELLOW |
| | G GREEN | LB | LIGHT BLUE |
| | GR GRAY | LG | LIGHT GREEN |
| NO MARK:0.75mm² | V VIOLET | O | ORANGE |
| NO MARK:YELLOW | P PINK | | |

# CONTROLLER WIRING DIAGRAM (B) (M2814101103)



# BATTERY CHARGER WIRING DIAGRAM (OPTION)




NOTES:

1. INLET RECEPTACLE & CORD, NEMA 5-15P,15 AMP,125V, P/N EE62076
2. RECEPTACLE IS MOUNTED ON OUTPUT TERMINAL PANEL ASSY.

# OPERATION MANUAL

# HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL NUMBER ON HAND WHEN CALLING


## UNITED STATES

***Multiquip Inc.***

(310) 537- 3700
6141 Katella Avenue Suite 200
Cypress, CA 90630
E-MAIL: mq@multiquip.com
WEBSITE: www.multiquip.com

## CANADA

***Multiquip***

(450) 625-2244
4110 Industriel Boul.
Laval, Quebec, Canada H7L 6V3
E-MAIL: infocanada@multiquip.com

## UNITED KINGDOM

***Multiquip (UK) Limited Head Office***

0161 339 2223
Unit 2, Northpoint Industrial Estate, Globe Lane,
Dukinfield, Cheshire SK16 4UJ
E-MAIL: sales@multiquip.co.uk




This manual MUST accompany the equipment at all times. This manual is considered a permanent part of the equipment and should remain with the unit if resold.

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