OPERATION MANUAL

WHISPERWATT™ SERIES
MODEL DCA70SSIU4F
60Hz GENERATOR
(ISUZU BR-4JJ1X DIESEL ENGINE)

INSTRUCTION MANUAL NO. M2844000004

Revision #12 (02/11/25)

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

DCA70SSIU4F
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.

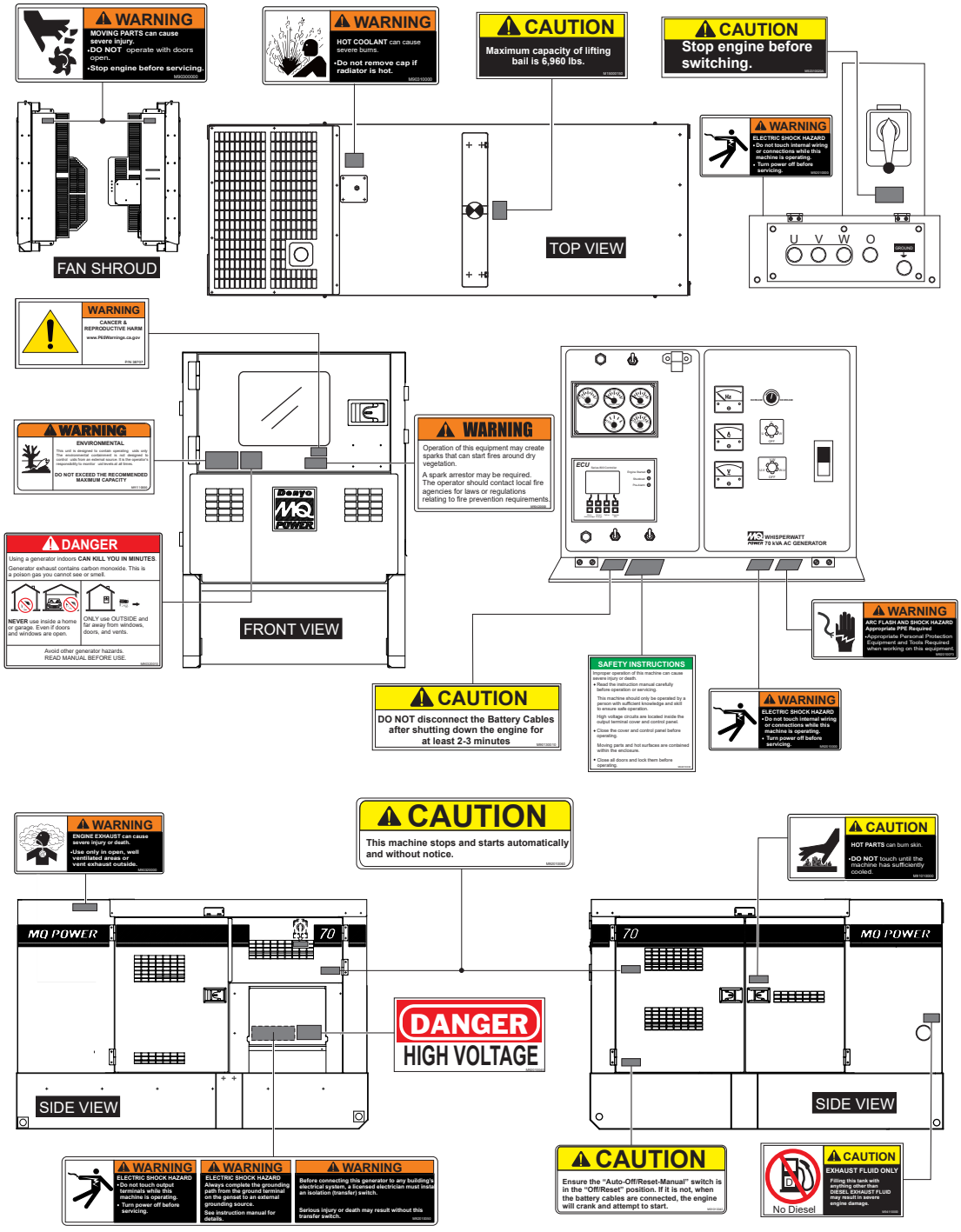


Figure 1. Safety Decals

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.

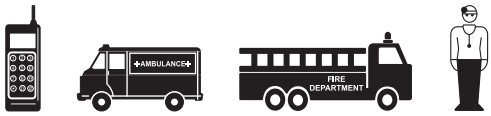
- **ALWAYS** check the generator for loosened threads or bolts before starting.
- **NEVER** use the generator for any purpose other than its intended purposes or applications.

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.

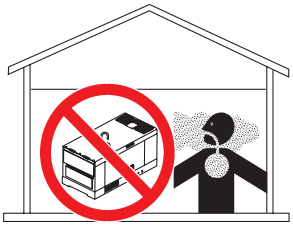
NOTICE

- **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.

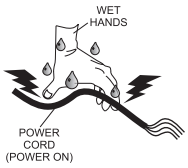
- **NEVER** insert any objects into the output receptacles during operation. This is extremely dangerous. The possibility exists of **electrical shock, electrocution or death**.

- 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.

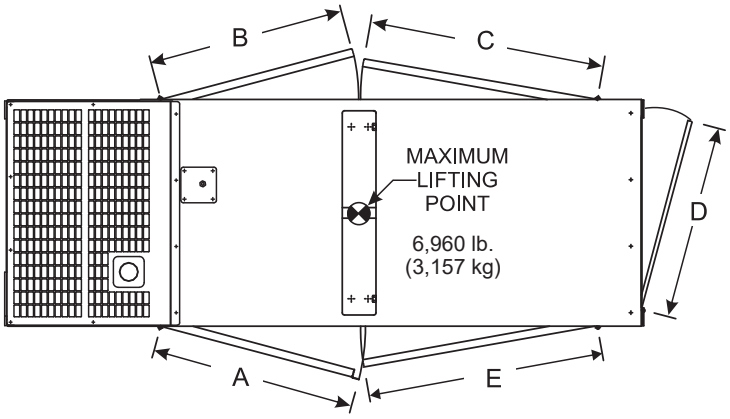
Table 1. Generator Specifications		
Model	DCA70SSIU4F	
Type	Revolving field, self-ventilated, protected type synchronous generator	
Armature Connection	**Star with Neutral**	**Zigzag**
Phase	3Ø	1Ø
Standby Output	62 kW (77 kVA)	44 kW
Prime Output	56 kW (70 kVA)	40 kW
3Ø Voltage (L-L/L-N) Voltage Selector Switch at 3Ø 240/139	208Y/120, 220Y/127, 240Y/139	N/A
3Ø Voltage (L-L/L-N) Voltage Selector Switch at 3Ø 480/277	416Y/240, 440Y/254, 480Y/277	N/A
1Ø Voltage (L-L/L-N) 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	
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	3,329 lb. (1,510 kg)	
Wet Weight	4,211 lb. (1,910 kg)	

Table 2. Engine Specifications		
Model	Isuzu BR-4JJ1X Final Tier 4	
Type	4-cycle, water-cooled, direct injection, turbocharged and cooled EGR	
No. of Cylinders	4	
Bore × Stroke	3.76 in. × 4.13 in. (95.4 mm × 104.9 mm)	
Displacement	183 cu. in. (3.0 liters)	
Rated Output	86.5 hp at 1,800 rpm	
Starting	Electric	
Coolant Capacity	5.5 gal. (21.0 liters)[1]	
Lube Oil Capacity	3.96 gal. (15 liters)[2]	
Lubricating Type Oil	API service class CJ-4 SAE 15W-40 or JASO DH-2	
DEF Tank Capacity	7.4 gal. (28 liters)	
Fuel Type	#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	27D (CCA 0°F 800A) × 1	

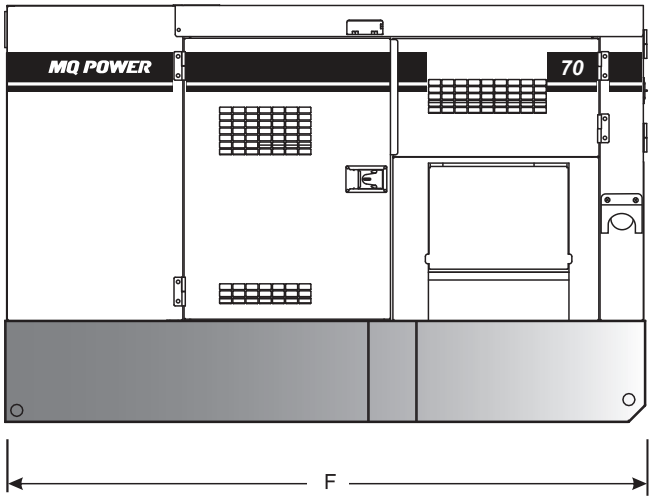
[1] Includes engine and radiator hoses

[2] Includes filters

TOP VIEW



SIDE VIEW



FRONT VIEW

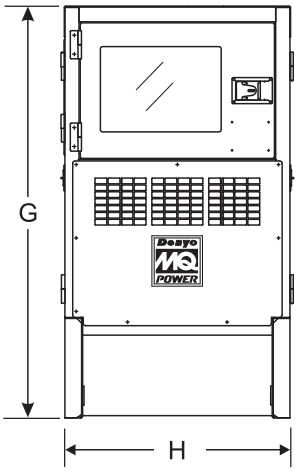


Figure 2. Dimensions

Table 3. Dimensions			
Reference Letter	Dimension in. (mm)	Reference Letter	Dimension in. (mm)
A	33.86 (860)	E	33.78 (858)
B	29.45 (748)	F	105.12 (2,670)
C	38.19 (970)	G	68.30 (1,735)
D	32.28 (820)	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.

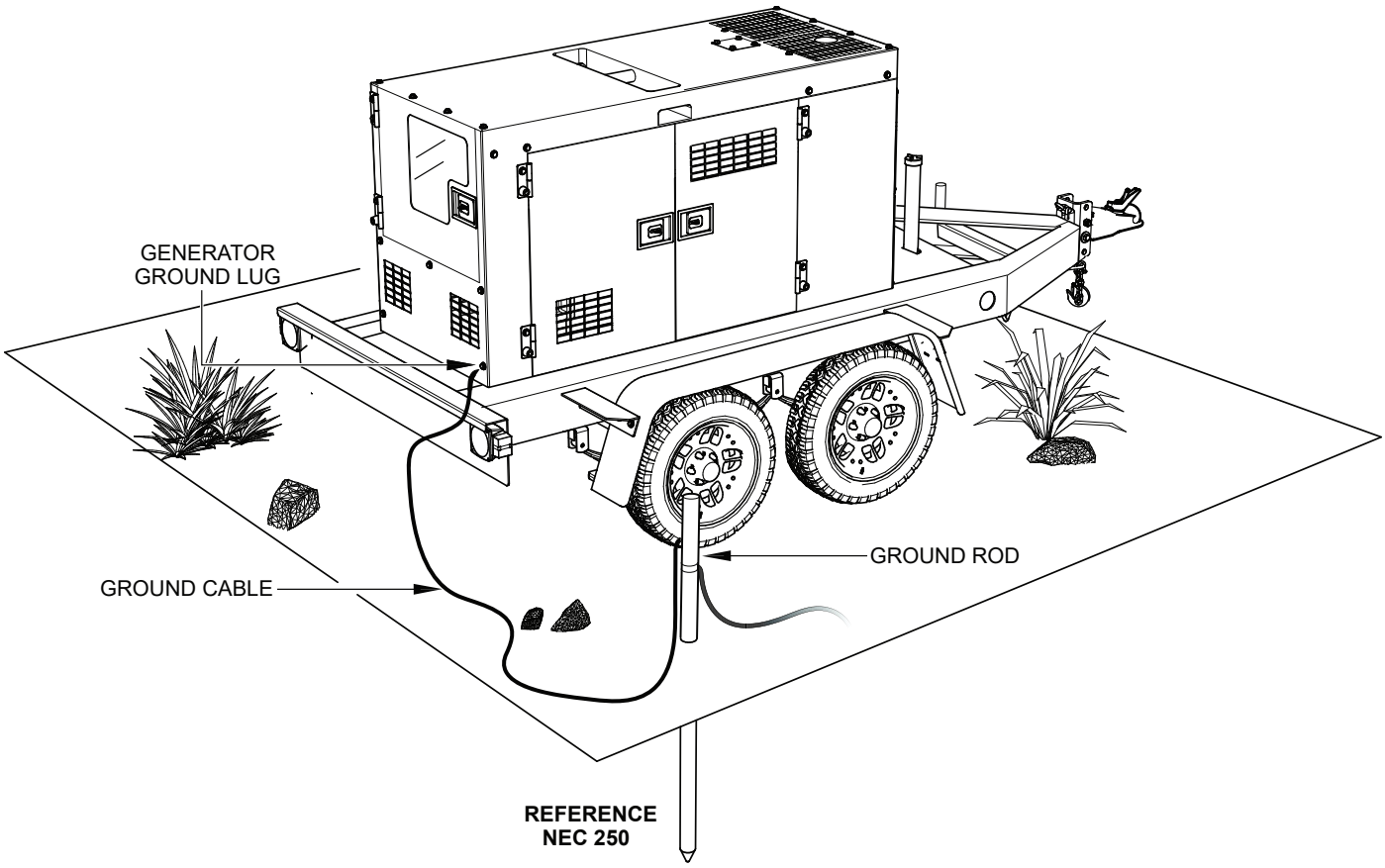


Figure 3. Typical Generator Grounding Application

> ***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 (requires a trailer for transport) power source for telecom sites, lighting facilities, power tools, submersible pumps and other industrial and construction machinery.

OPERATING PANEL

The "Operating Panel" is provided with the following:

- ECU Controller with Gauge Unit Assembly
  - Oil Pressure Gauge
  - Water Temperature Gauge
  - Charging Voltmeter
  - Fuel Level Gauge
  - Tachometer
  - DEF Level Gauge
  - Generator Load Gauge
  - Check DEF Lamp
  - Check Engine Lamp
  - SCR Purge Lamp
  - Refill DEF Lamp
  - Exhaust System Error Lamp
  - Low Fuel Alarm Lamp
- Panel Light/Panel Light Switch
- Engine Speed Switch
- Auto Start/Stop Switch
- Fuel Leak Detected Alarm Lamp
- Hour Check Button

CONTROL PANEL

The "Control Panel" is provided with the following:

- Frequency Meter (Hz)
- AC Ammeter (Amps)
- AC Voltmeter (Volts)
- Ammeter Change-Over Switch
- Voltmeter Change-Over Switch
- Voltage Regulator
- 3-Pole, 200-Amp Main Circuit Breaker
- "Control Box" (located behind Control Panel)
  - Automatic Voltage Regulator
  - Current Transformer
  - Overcurrent Relay
  - Starter Relay

OUTPUT TERMINAL PANEL

The "Output Terminal Panel" is provided with the following:

- Three 120/240V Output Receptacles (CS-6369), 50A
- Three Auxiliary Circuit Breakers, 50A
- Two 120V Output Receptacles (GFCI), 20A
- Two GFCI Circuit Breakers, 20A
- Five Output Terminal Lugs (3Ø power)
- Engine Block Heater
- Battery Charger (Option)
- Low Coolant Switch (Option)

OPEN-DELTA EXCITATION SYSTEM

Each generator is equipped with the 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 to the demands of the required load.

ENGINE

This generator is powered by a 4-cylinder, 4-cycle, water-cooled, direct injection, turbocharged, EGR, DOC, SCR, Isuzu BR-4JJ1X diesel engine. This engine is designed to meet every performance requirement for the generator. Reference 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 RPMs 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.

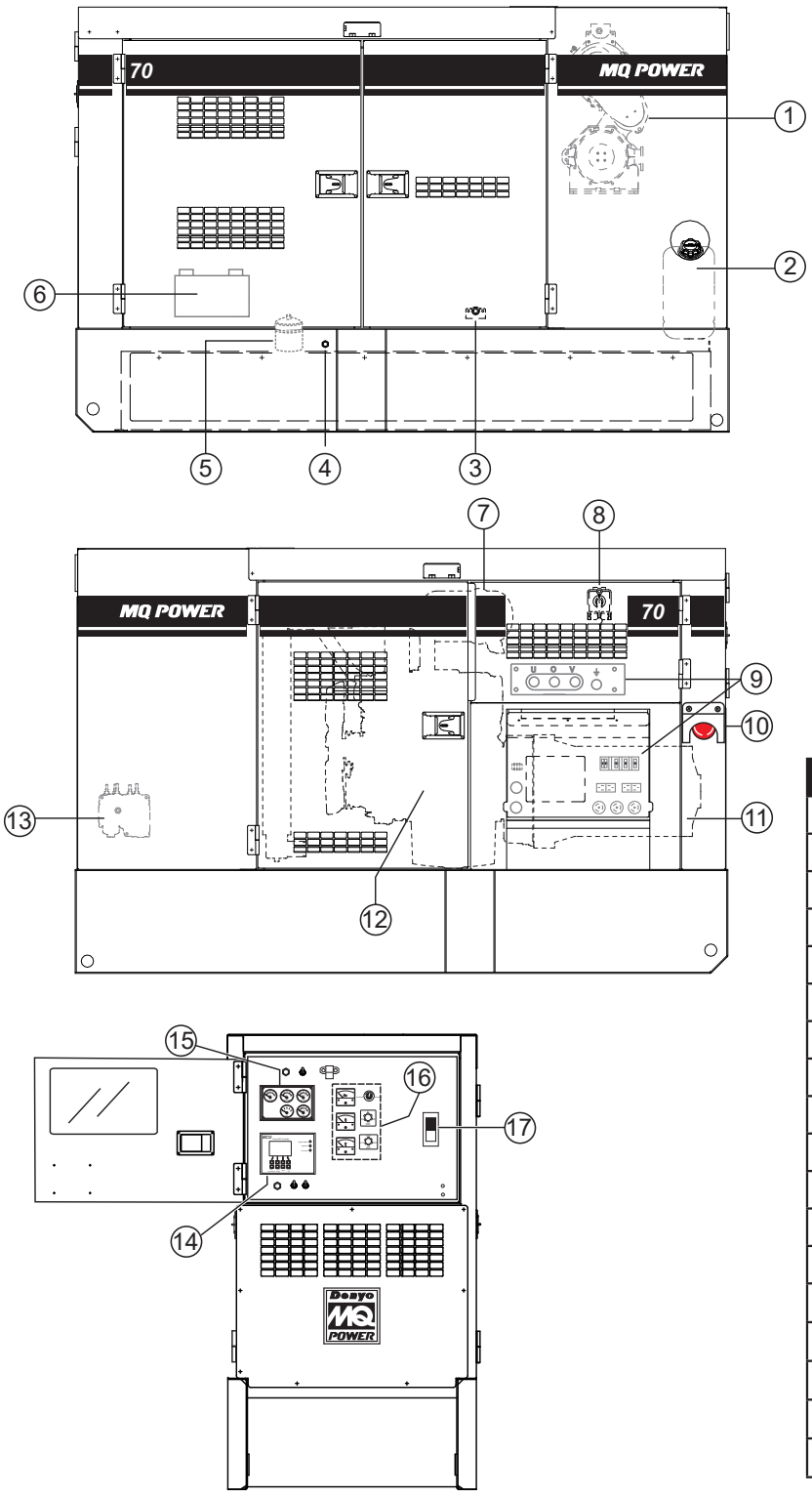


Figure 4. Major Components

Table 4. Generator Major Components	
ITEM NO.	**DESCRIPTION**
1	DOC/SCR Assembly
2	DEF Tank Assembly
3	Coolant Drain Plug
4	Oil Drain With Valve
5	Fuel Tank Assembly
6	Battery Assembly
7	Air Filter Assembly
8	Voltage Selector Switch Assembly
9	Output Terminal Panel Assembly
10	Emergency Stop Switch
11	Generator Assembly
12	Engine Assembly
13	DEF Supply Module Assembly
14	Engine-Generator Controller Assembly
15	Gauge Unit Assembly
16	Generator Control Panel Assembly
17	Main Circuit Breaker

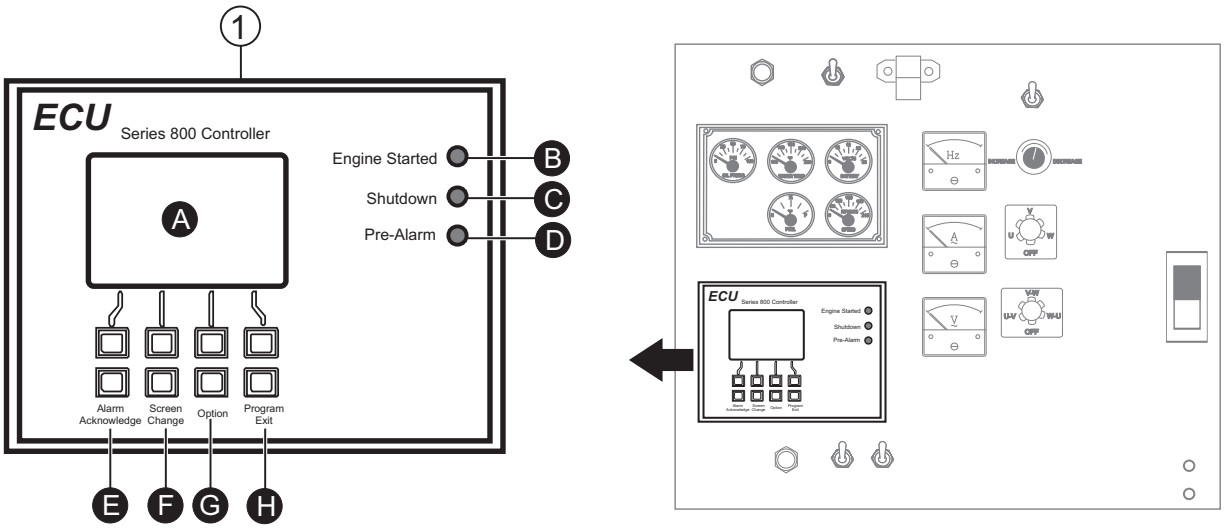


Figure 5. Engine Control Unit (ECU)

The definitions below describe the controls and functions of the Engine Control Unit (Figure 5).

1. **ECU Controller** — This engine-generator controller displays the parameters and the diagnostic troubleshooting messages of the engine.

   A. **ECU Display Screen** — Engine fault diagnostic messages are shown on this LCD display screen.

   B. **Engine Started Lamp** — This LED will light when the engine has started and is operating correctly

   C. **Engine Shutdown Lamp** — When an engine failure has occurred this lamp will blink, indicating that the engine has been shut down. The diagnostic fault message will be displayed on the LCD screen.

   D. **Pre-Alarm Lamp** — When an engine failure has occurred this lamp will blink, indicating a pre-fault engine condition and the possibility of engine shutdown. The diagnostic fault message will be displayed on the LCD screen.

   E. **Alarm Acknowledge Button** — When the engine experiences a fault, the “Pre Alarm Lamp” or the “Shutdown Lamp” will start blinking. Pushing this button will confirm the fault message and the blinking lamp will change to a solid lamp display. The fault message will be displayed on the screen. When multiple engine faults occur, the lamp will continue blinking until all fault messages are confirmed. The blinking lamp will change to a solid lamp display and all current confirmed fault messages will scroll across the screen.

   F. **Screen Change Button** — When this button is pushed during operation, the screen (Figure 6) will cycle through main and secondary parameter screens.

	VOLTS		AMPS
UO 139		**UV** 240	**U** 168
VO 139		**VW** 240	**V** 168
WO 139		**WU** 240	**W** 168
56 **kW**			70 **kVA**
60 **Hz**			105 **h**

Figure 6. Generator Parameter Screen

> ***NOTICE***
>
> The screen shown in Figure 6 represents the phase voltages for each phase to neutral (UO, VO and WO) and the line voltages between each phase (UV, VW and WU).

   G. **Option Button** — This button is not active. Do not use.

   H. **Program/Exit Button** — Push this button from the home screen to enter the main menu.

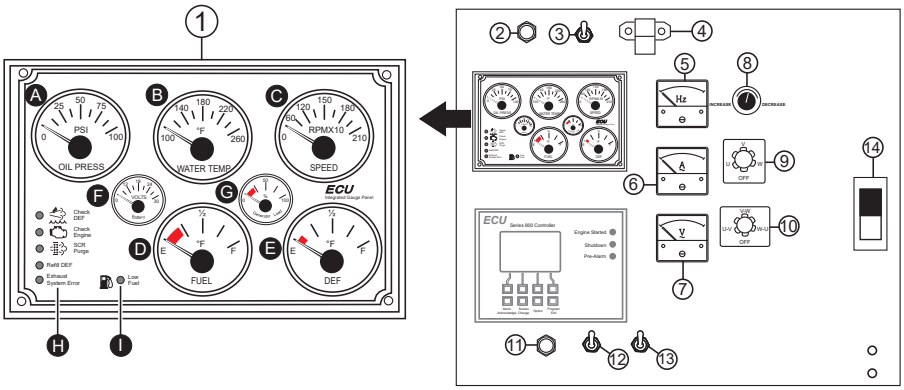


Figure 7. Gauge Unit Assembly

The definitions below describe the controls and functions of the Engine/Generator Control Panel (Figure 7).

1. **Gauge Unit Assembly** — Houses the various engine monitoring gauges: oil pressure, water temperature, engine speed RPM (tachometer), fuel, DEF, charging voltmeter, and generator load.
   - A. **Oil Pressure Gauge** — During normal operation this gauge should read between 42.1 and 85.6 psi (290–590 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.
   - B. **Water Temperature Gauge** — During normal operation this gauge should read between 167° and 194°F (75°–90°C).
   - C. **Tachometer** — Indicates engine speed in RPM for 60 Hz operation. This meter should indicate 1,800 rpm when the rated load is applied.
   - D. **Fuel Gauge** — Indicates the amount of diesel fuel available.
   - E. **DEF Level Gauge** — Indicates the DEF level in the tank. The red area on the gauge indicates low DEF level (10%).
   - F. **Charging Voltmeter Gauge** — During normal operation this gauge indicate 12.5–14 VDC.
   - G. **Generator Load Gauge** — Indicates the generator load rate. It is recommended that the load be above the red area (20%) in order to maintain sufficient exhaust temperature.
   - H. **Exhaust System State Indicator Lamps** — Indicate the exhaust system state or DEF state.
   - I. **Low Fuel Warning Lamp** — Illuminates when the fuel level in the fuel tank is low.
2. **Fuel Leak Detected Alarm Lamp** — This lamp when **ON** indicates that fluids in the containment area have reached a high level.
3. **Panel Light Switch** — When activated will turn on the control panel light.
4. **Panel Light** — For operation at night, the panel light illuminates the control panel for ease of reading meters and gauges. Make sure the panel light switch is in the **OFF** position when the light is not in use.
5. **Frequency Meter** — Indicates the output frequency in hertz (Hz). Normally 60 Hz.
6. **AC Ammeter** — Indicates the amount of current the load is drawing from the generator per leg selected by the ammeter phase-selector switch.
7. **AC Voltmeter** — Indicates the output voltage present at the **U,V, and W** output terminal lugs**.**
8. **Voltage Regulator Control** — Allows ±15% manual adjustment of the generator's output voltage.
9. **Ammeter Change-Over Switch** — This switch allows the AC ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off. This switch does not affect the generator output in any fashion, it is for current reading only.
10. **Voltmeter Change-Over Switch** — This switch allows the AC voltmeter to indicate phase-to-phase voltage between any two phases of the output terminals or to be switched off.
11. **Hour Check Button** — With the engine stopped, press and hold this button. The total running hours, fuel level, and battery voltage will be displayed.
12. **Auto Start-Stop Switch** — This switch selects either manual or automatic operation. Center position is **OFF** (reset).
13. **Engine Speed Switch** — This switch controls the speed of the engine, low or high.
14. **Main Circuit Breaker** — This three-pole, 200-amp main breaker is provided to protect the **U,V, and W** output terminal lugs from overload.

OUTPUT TERMINAL PANEL

The Output Terminal Panel (Figure 8) shown below is located on the right-hand side (left from the control panel) of the generator. 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.

NOTICE

Output Terminal Bolt Torque: 554.9 lbf·in (62.7 N·m)

OUTPUT TERMINAL FAMILIARIZATION

The "Output Terminal Panel" (Figure 8) is provided with the following:

- Three 240/120V Output Receptacles @ 50 amps
- Three Aux. Circuit Breakers @ 50 amps
- Two 120V GFCI receptacles @ 20 amps
- Two GFCI Circuit Breakers @ 20 amps
- Five Output Terminal Lugs (U, V, W, O, Ground)

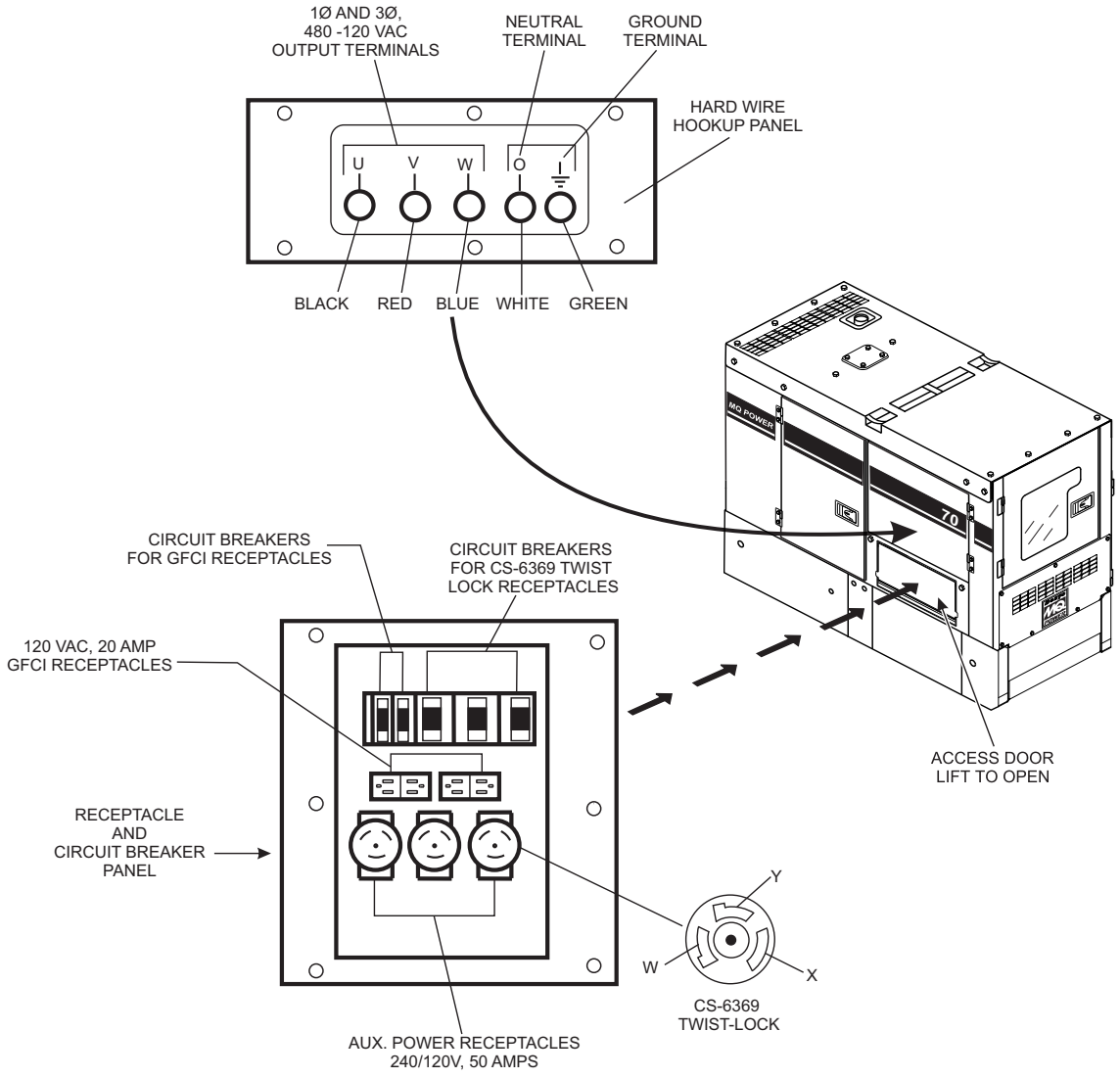


Figure 8. Output Terminal Panel

120 VAC 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 VAC, 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 the load output (current) of both GFCI receptacles is dependent on the load requirements of the U, V, and W output terminal lugs.

Pressing the **reset** button resets the GFCI receptacle after being tripped. Pressing the **test button** (See Figure 9) in the center of the receptacle will check the GFCI function. Both receptacles should be tested at least once a month. Reference the maintenance section in this manual for further testing of the GFCI receptacle.

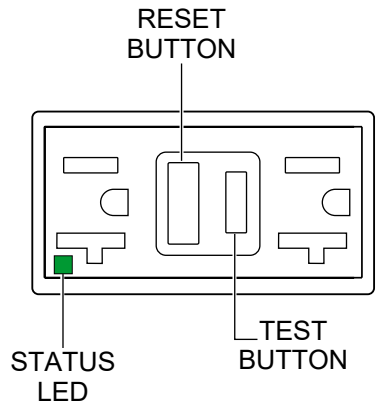


Figure 9. 120 VAC GFCI Receptacle

Twist-Lock Dual-Voltage 240/120 VAC Receptacles

There are three 240/120V, 50-amp, auxiliary twist-lock (CS-6369) receptacles (Figure 10) provided on the output terminal panel. These receptacles can **only** be accessed when the voltage selector switch is placed in the **single-phase 240/120V** position.

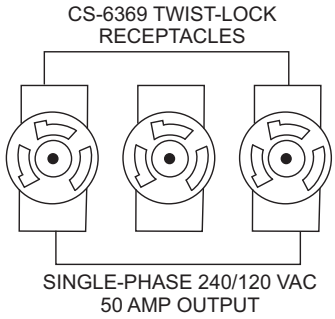


Figure 10. 240/120V Twist-Lock Auxiliary Receptacles

Each auxiliary receptacle is protected by a 50-amp circuit breaker. These breakers are located directly above the GFCI receptacles. Remember the load output (current) on both 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 11). 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.

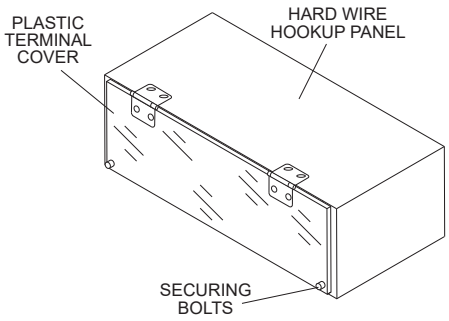


Figure 11. Plastic Face Plate (Output Terminal Lugs)

Connecting Loads

Loads can be connected to the generator by various methods, output terminal lugs, cam-loks, or the convenience receptacles (Figure 12). 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.

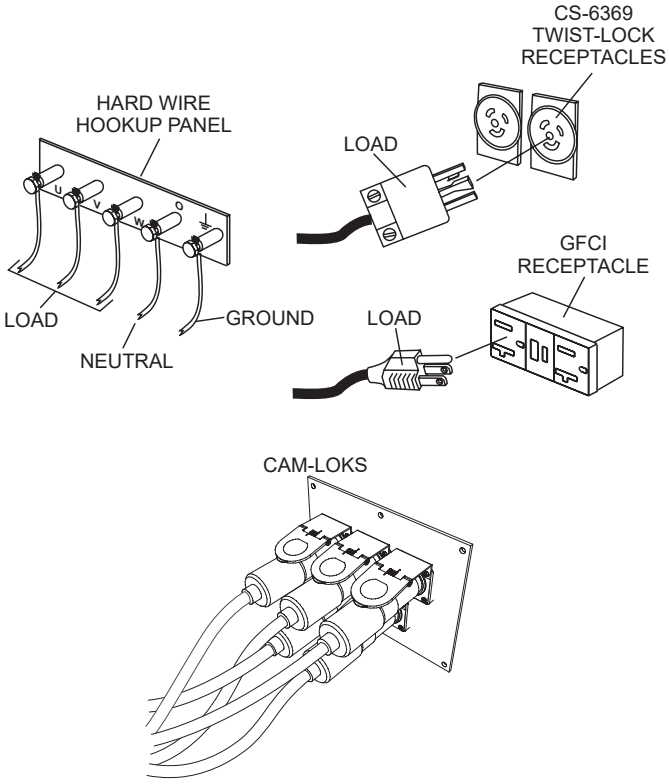


Figure 12. Connecting Loads

Overcurrent Relay

An **overcurrent relay** (Figure 13) 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 can not be reset, the **reset button** on the overcurrent relay must be pressed. The overcurrent relay is located inside the control box.

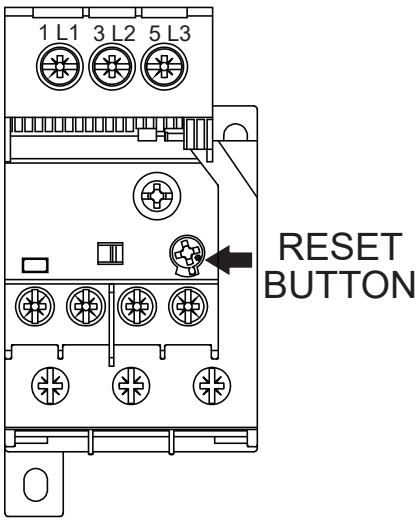


Figure 13. Overcurrent Relay

NOTICE

Remember 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 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** position **(ON)**.

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 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 120 Volts	At 240 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 3Ø load (kVA) is not given on the equipment nameplate, approximate 3Ø 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 14) 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).

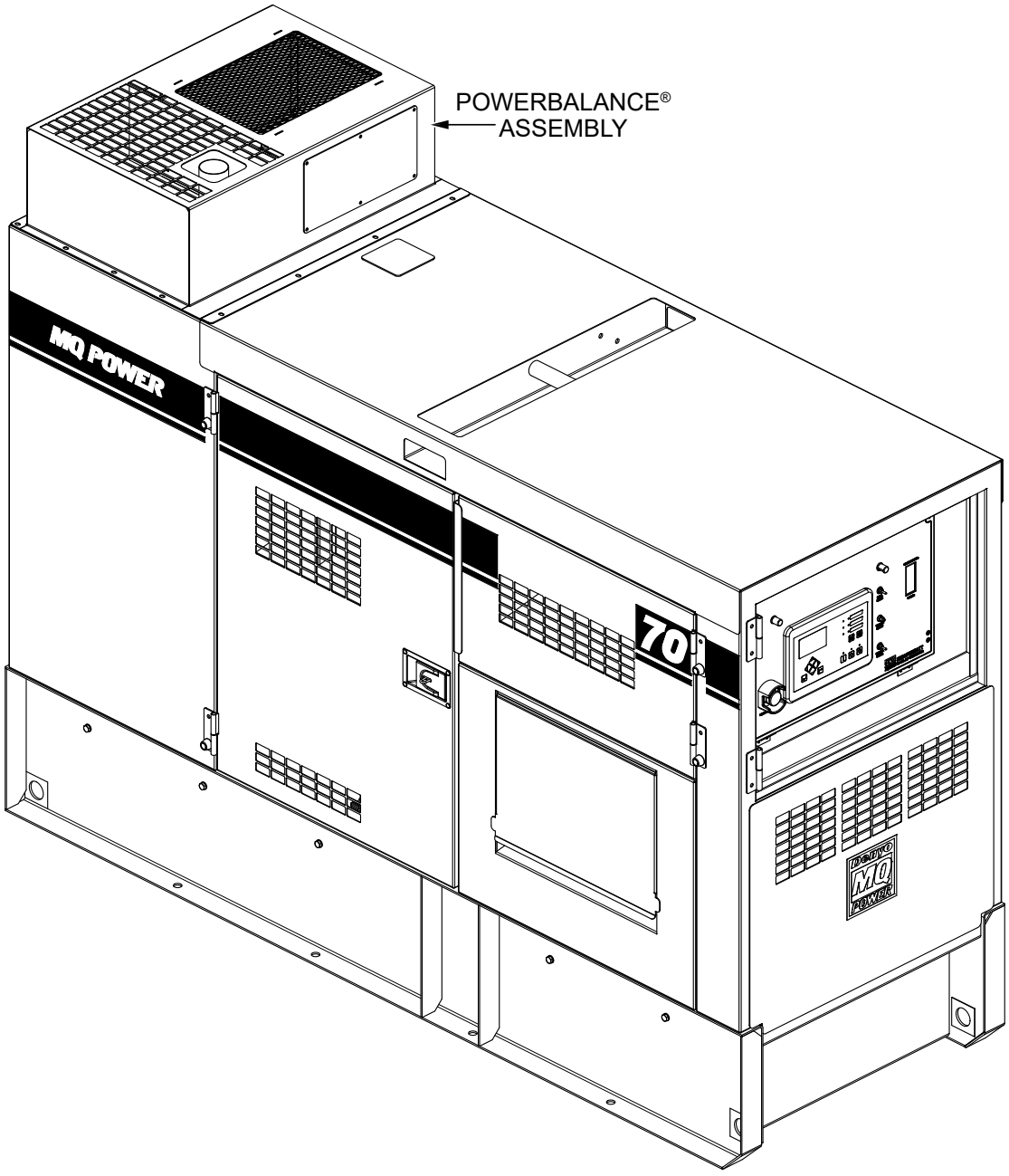


Figure 14. PowerBalance®

- 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 15) which is located above the output terminal panel's hard wire hook-up panel. This switch has been provided for ease of voltage selection.

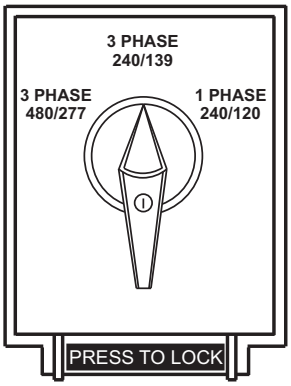


Figure 15. Voltage Selector Switch

⚠ 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 16) located on the control panel.

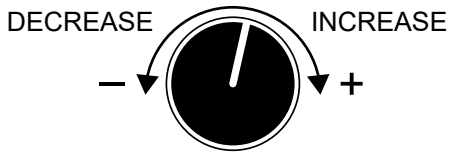


Figure 16. Voltage Regulator

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
1Ø 120 volts	155.4 amps (4 wire) 168 amps × 2 (zigzag)
1Ø 240 volts	77.8 amps (4 wire) 168 amps (zigzag)
3Ø 240 volts	168 amps
3Ø 480 volts	84 amps
Main Line Circuit Breaker Rating	200 amps

GFCI Receptacle Load Capability

The load capability of the GFCI receptacles is directly related to the voltage being supplied at either the output terminals or the three twist-lock auxiliary receptacles.

Figure 21, Table 9, and Table 10 show what amount of current is available at the GFCI receptacles when the output terminals and twist-lock receptacles are in use. Be careful that your load does not exceed the available current capability at the receptacles.

Table 9. 1Ø GFCI Receptacle Load Capacity

kW in Use Twist Lock (CS6369)	Available Load Current (Amps)
1Ø 240/120V	GFCI Duplex 5-20R 120V
40.4	0
39.2	5 amps/receptacle
38.0	10 amps/receptacle
36.8	15 amps/receptacle
35.6	20 amps/receptacle

Table 10. 3Ø Generator Maximum Amps

kVA in Use (UVWO Terminals)	Available Load Current (Amps)
3Ø 240/480V	GFCI Duplex 5-20R 120V
70.0	0 amps/receptacle
65.8	5 amps/receptacle
61.7	10 amps/receptacle
57.5	15 amps/receptacle
53.3	20 amps/receptacle

HOW TO READ THE AC AMMETER AND AC VOLTMETER GAUGES

The AC ammeter and AC voltmeter gauges are controlled by the AC ammeter and AC voltmeter change-over switches.

Both of these switches are located on the control panel and **DO NOT** affect the generator output. They are provided to help observe how much power is being produced at the UVWO terminal lugs.

Before taking a reading from either gauge, set the ***Voltage Selector Switch*** (Figure 17) to the position which produces the required voltage. For example, for 3Ø 240V, choose the center 3Ø 240/139V position on the voltage selector switch.

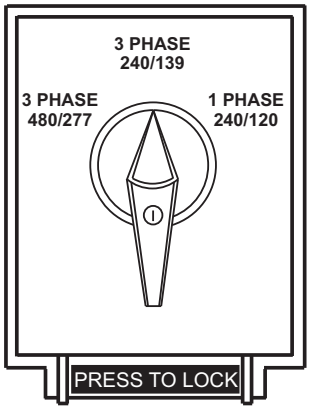


Figure 17. Voltage Selector Switch-240/3Ø Position

AC Voltmeter Gauge Reading

Place the ***AC Voltmeter Change-Over Switch*** (Figure 18) in the W-U position and observe the phase-to-phase voltage reading between the W and U terminals as indicated on the ***AC Voltmeter Gauge*** (Figure 19).

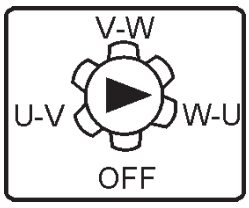


Figure 18. AC Voltmeter Change-Over Switch

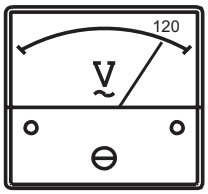


Figure 19. AC Voltmeter Gauge (Volt Reading On W-U Lug)

AC Ammeter Gauge Reading

Place the ***AC Ammeter Change-Over Switch*** (Figure 20) in the U position and observe the current reading (load drain) on the U terminal as indicated on the ***AC Ammeter Gauge*** (Figure 21). This process can be repeated for terminals V and W.

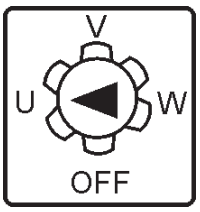


Figure 20. AC Ammeter Change-Over Switch

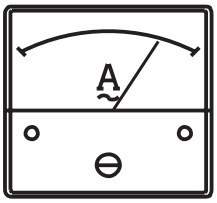


Figure 21. AC Ammeter (Amp Reading on U Lug)

NOTICE

The ***ammeter*** gauge will only show a reading when the ***Output Terminal Lugs*** are connected to a load and in use.

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**.

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.

NOTICE

ALWAYS make sure that the connections to the UVWO terminals are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque tie bolts to 554.9 lbf·in (62.7 N·m).

3Ø-240V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139V position as shown in Figure 22.

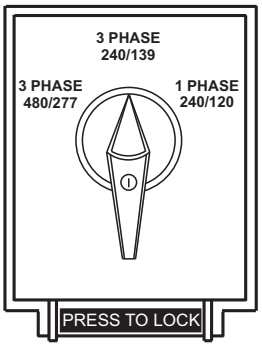


Figure 22. Voltage Selector Switch 3Ø-240/139V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 23.

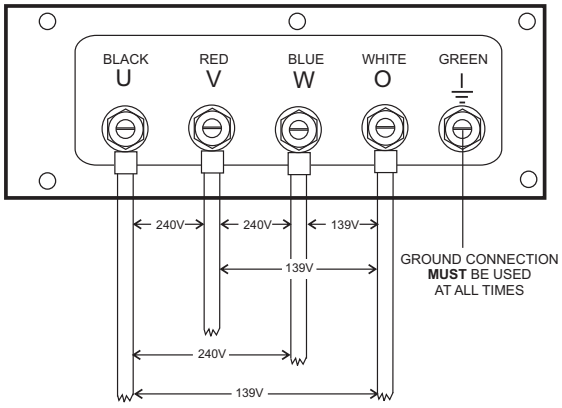


Figure 23. UVWO Terminal Lugs (3-Phase 240-Volt Connections)

3. Turn the voltage regulator (Figure 24) clockwise to increase voltage output, and turn counterclockwise to decrease voltage output. Use the voltage regulator whenever fine tuning of the output voltage is required.

Figure 24. Voltage Regulator

3Ø-208V/1Ø-120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139V position as shown in Figure 22.
2. Connect the load wires to the UVWO terminals as shown in Figure 25.

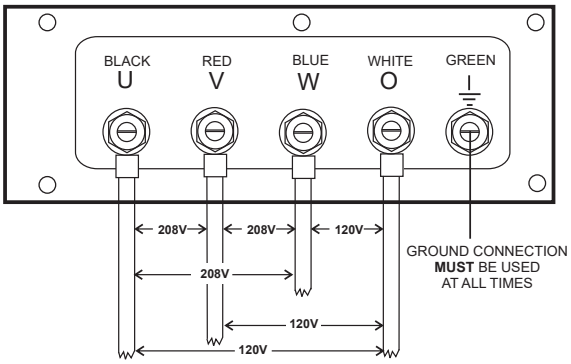


Figure 25. UVWO Terminal Lugs 3Ø-208/1Ø-120V Connections

NOTICE

To achieve a 3Ø 208V output the voltage selector switch must be in the 3Ø-240/139V position and the voltage regulator must be adjusted to 208V.

3Ø-480/277V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 480/277V position as shown in Figure 26.

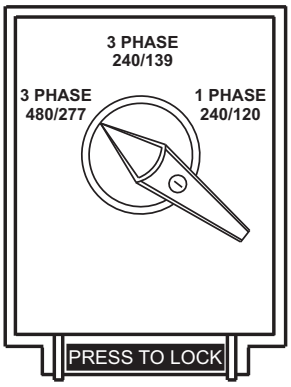


Figure 26. Voltage Selector Switch 3Ø-480/277V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 27.

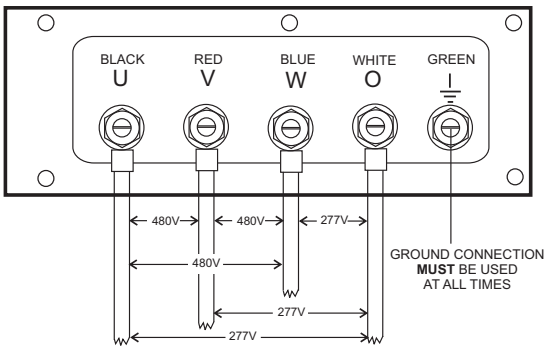


Figure 27. UVWO Terminal Lugs 3Ø-480V Connections

1Ø-240/120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 1Ø 240/120V position as shown in Figure 28.

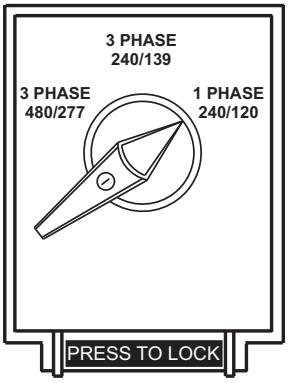


Figure 28. Voltage Selector Switch 1Ø-240/120V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 29.

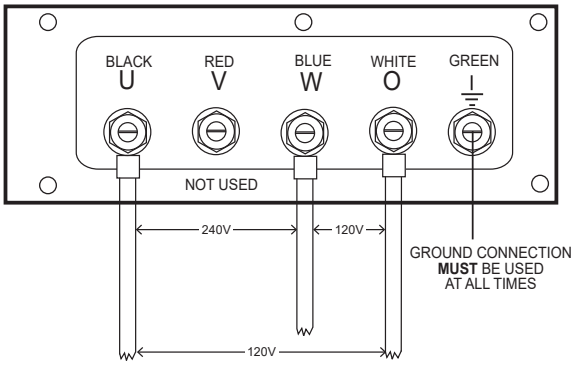


Figure 29. UVWO Terminal Lugs 1Ø-240/120V Connection

3. Turn the voltage regulator (Figure 24) clockwise to increase voltage output, or 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 30) and wipe it clean.

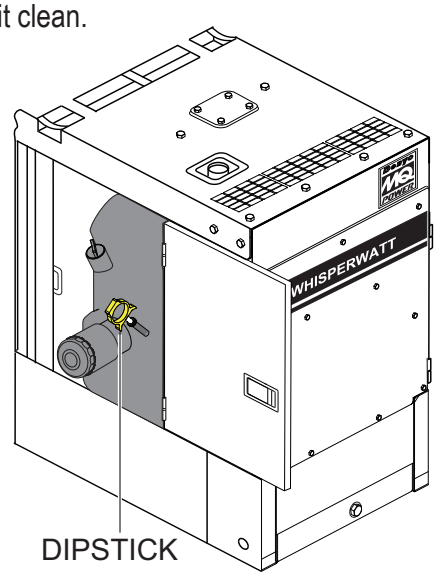


Figure 30. Engine Oil Dipstick

3. Reinsert the dipstick, then remove the dipstick from its holder. Check the oil level shown on the dipstick (Figure 31).

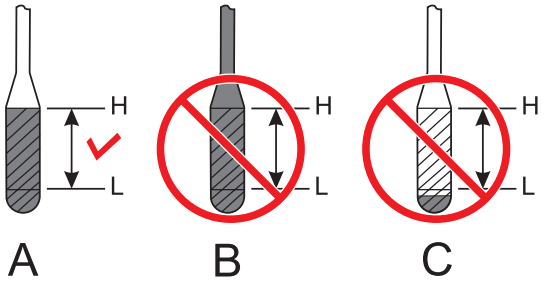


Figure 31. Engine Oil Dipstick

4. Verify that the engine oil level is maintained between the **H** and **L** markings on the dipstick as referenced in Figure 31**A**.
5. If the engine oil level is low (Figure 31**C**), remove the cap from the oil filler port (Figure 32) and fill to a safe operating level (max) as indicated by the dipstick (Figure 31**A**). Fill with recommended type oil as listed in Table 11. Maximum oil capacity is 15.8 quarts (15 liters).

NOTICE

When adding engine oil, **DO NOT** overfill (Figure 31**B**).

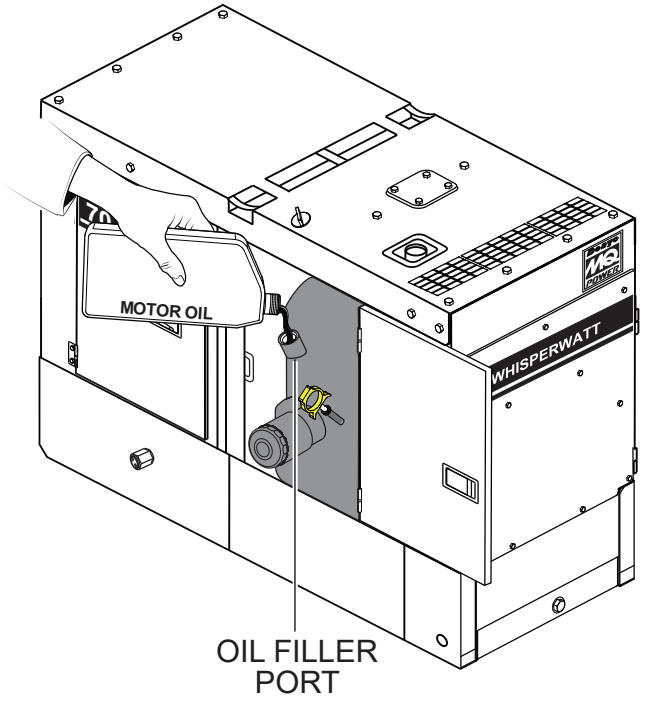
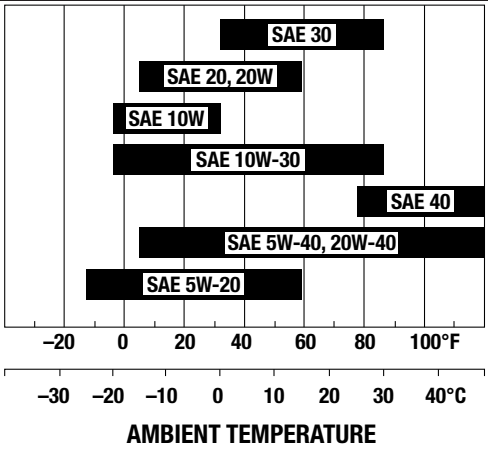


Figure 32. Engine Oil Filler Port

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 11. 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 system.

ALWAYS fill the fuel tank (Figure 33) with clean, fresh **#2 diesel fuel. DO NOT** fill the fuel tank beyond its capacity.

Pay attention to the fuel tank capacity when replenishing fuel. The fuel tank cap must be closed 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.

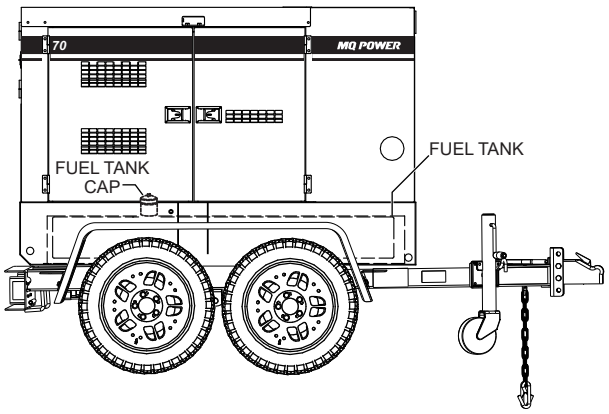


Figure 33. Fuel Tank

Refueling Procedure

WARNING

Diesel fuel and its vapors are dangerous to your health and the surrounding environment. Avoid skin contact and/or inhaling fumes.

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 34).

CAUTION

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

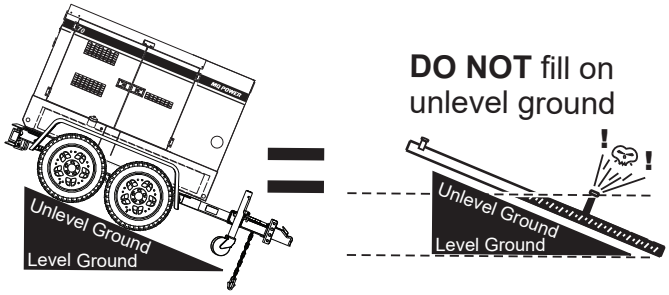


Figure 34. Only Fill On Level Ground

NOTICE

ONLY use **#2 diesel fuel** when refueling.

2. Open cabinet doors on the "right side" of the generator (from the generator control panel position). Remove the fuel cap and fill the tank (Figure 35).

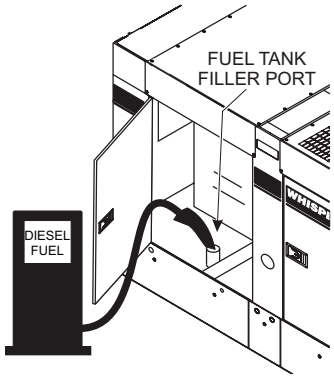


Figure 35. Fueling The Generator

3. **NEVER overfill the fuel tank** — It is important to read the fuel gauge when filling the trailer fuel tank. **DO NOT** wait for fuel to rise in the filler neck (Figure 36).

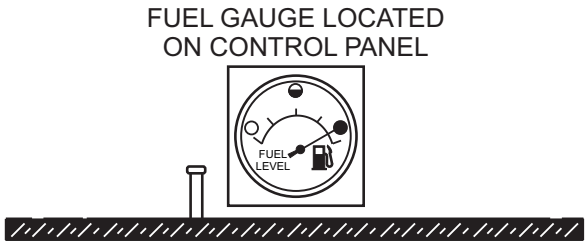


Figure 36. Full Fuel Tank

CAUTION

DO NOT OVERFILL the fuel system. Leave room for fuel expansion. Fuel expands when heated (Figure 37).

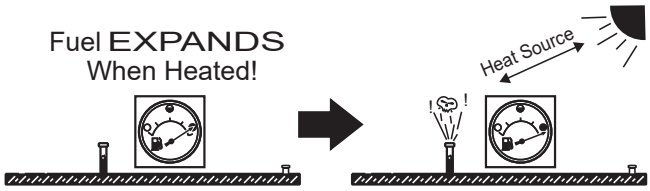


Figure 37. Fuel Expansion

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 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.

1. Make sure the engine is **OFF**.
2. Remove the filler cap from the DEF tank (Figure 38).

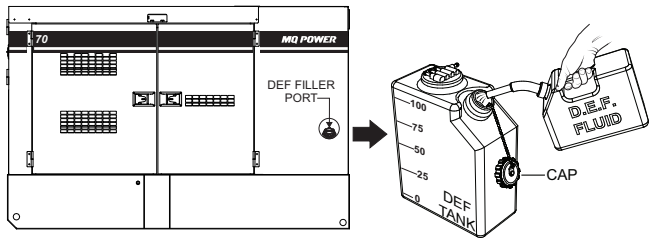


Figure 38. DEF Tank Filling

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, in 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

If 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.

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 12 for engine, radiator, and reserve tank coolant capacities.

Table 12. Coolant Capacity

Engine and Radiator	5.5 gal. (21 liters)
Reserve Tank	0.29 gal. (1.1 liters)

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.

Verify that the coolant level in the coolant reserve tank is between the **FULL** and **LOW** markings as shown in Figure 39.

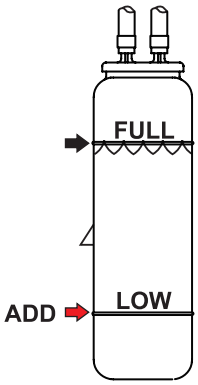


Figure 39. Coolant Reserve Tank

Operation In Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 13) has been added.

Table 13. Coolant Concentration

Climate	Outside Temperature	Long-Life Coolant Concentration
Warm	10°F (–12°C) or Above	30%
Cold	–22°F (–30°C) or Above	50%

Cleaning The Radiator

The engine may overheat if the radiator cooling fins (Figure 40) 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.

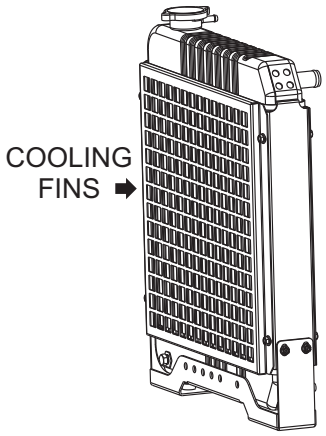


Figure 40. Radiator (Cooling Fins)

ENGINE AIR CLEANER

Periodic cleaning/replacement of the air cleaner is necessary. Inspect the air cleaner (Figure 41) in accordance with the maintenance section of this manual or the **Isuzu Engine Owner's Manual**.

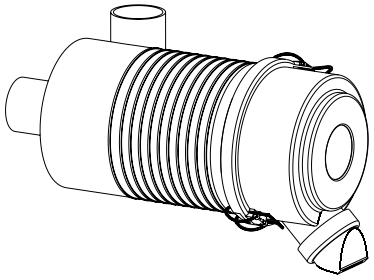


Figure 41. Air Cleaner

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 maintenance section of this manual or 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 42.

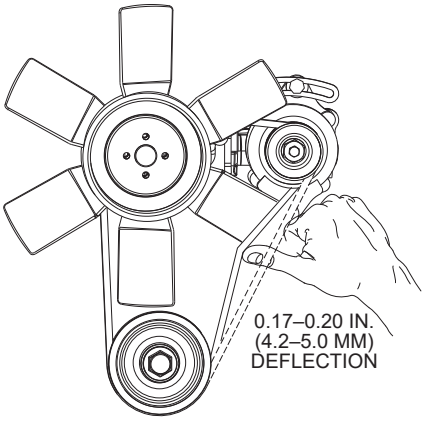


Figure 42. Fan Belt Tension

Table 14. Fan Belt Deflection		
Belt	Standard Value (Amount of Deflection)	Standard Value (Vibration Frequency)
New	0.17–0.20 in. (4.2–5.0 mm)	220–244 Hz
Used	0.26–0.29 in. (6.6–7.4 mm)	182–206 Hz

⚠ 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 battery fluid level between the specified marks. Battery life will be shortened if the fluid levels are 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 with only 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 electric source, be sure to disconnect the battery cables.

Battery Cable Installation

ALWAYS be sure the battery cables (Figure 43) 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**.

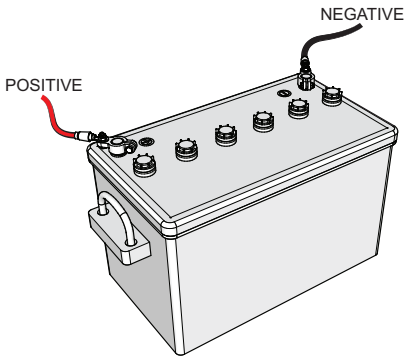


Figure 43. Battery Connections

When connecting the battery do the following:

1. **NEVER** connect the battery cables to the battery terminals when the ***Auto Start/Stop Switch*** is in either the **AUTO** or **MANUAL** position. **ALWAYS** make sure that this switch is in the **OFF/RESET** 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 cable is connected incorrectly, electrical damage to the generator will occur. Pay close attention to the polarity of the battery when connecting the battery.

⚠ CAUTION

Inadequate battery connections may cause poor starting of the generator, and create 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. Place the **main**, **auxiliary**, **and GFCI** circuit breakers (Figure 44) in the **OFF** position prior to starting the engine.

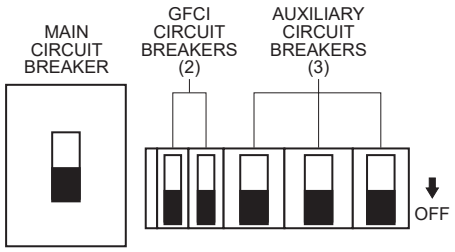


Figure 44. Main, Auxiliary, And GFCI Circuit Breakers (OFF)

2. Make sure the **voltage selector switch** has been configured for the desired output voltage.
3. Connect the load to the **receptacles**, **output terminal lugs**, or optional **cam-loks** as shown in Figure 12. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.

NOTICE

ALWAYS make sure that the connections to the UVWO terminals are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque tie bolts to 554.9 lbf·in (62.7 N·m).

4. Close all engine enclosure doors (Figure 45).

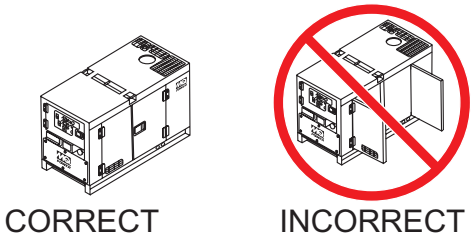


Figure 45. Engine Enclosure Doors

STARTING (MANUAL)

1. Place the **Engine Speed switch** in the **LOW** position (Figure 46).

Figure 46. Engine Speed Switch (Low Position)

2. To start the engine, place the **Auto Start/Stop switch** in the **MANUAL** position (Figure 47).

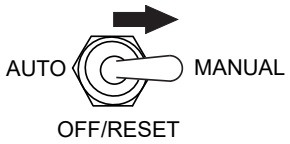


Figure 47. Auto Start/Stop Switch (Manual Position)

NOTICE

If the engine fails to start within three attempts, the Shutdown lamp will illuminate and the Auto Start/Stop switch must be placed in the Off/Reset position before the next attempt.

NOTICE

The engine will pre-heat automatically in cold weather conditions."Glow Plug Hold" message will be displayed and the engine will start automatically after pre-heating.

3. Once the engine starts, let the engine run for 1–2 minutes to warm up. For operation in below-freezing weather temperatures, this warmup period must be extended to 5–7 minutes. During the warmup period, check for any abnormal noise, vibration, or fluid leakage. Check the gauges on the control panel. If any abnormalities exist, shut down the engine and correct the problem.
4. After the warmup process has completed, place the **Engine Speed switch** in the **HIGH** (up) position. The engine speed will increase to 1,800 rpm and the unit is now ready for operation.

Figure 48. Engine Speed Switch (High Position)

5. The generator's **frequency meter** (Figure 49) should be displaying the 60-cycle output frequency in **HERTZ**.

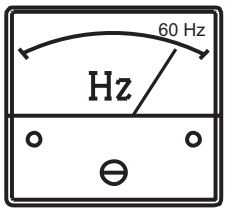


Figure 49. Frequency Meter

6. The generator's **AC voltmeter** (Figure 50) will display the generator's output in **VOLTS**.

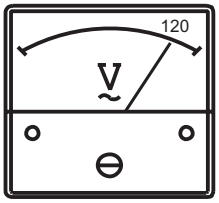


Figure 50. Voltmeter

7. If the voltage is not within the specified tolerance, use the **voltage regulator** (Figure 51) to increase or decrease the desired voltage.

Figure 51. Voltage Regulator

8. The **ammeter** (Figure 52) will indicate **zero amps** with no load applied. When a load is applied, the ammeter will indicate the amount of current that the load is drawing from the generator.

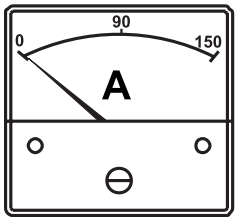


Figure 52. Ammeter (No Load)

9. The **engine oil pressure gauge** (Figure 53) will indicate the oil pressure of the engine. Under normal operating conditions the oil pressure should be between 42.1 and 85.6 psi (290–590 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.

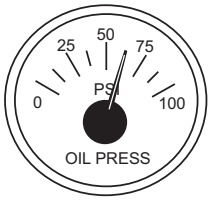


Figure 53. Oil Pressure Gauge

10. The **coolant temperature gauge** (Figure 54) will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be between 167°–194°F (75°–90°C) **(Green Zone)**.

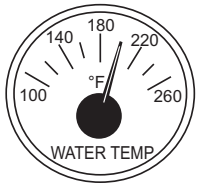


Figure 54. Coolant Temperature Gauge

11. The **tachometer gauge** (Figure 55) will indicate the speed of the engine when the generator is operating. Under normal operating conditions this speed is approximately 1,800 rpm.

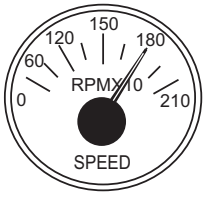


Figure 55. Engine Tachometer Gauge

12. Place the **main**, **auxiliary**, **and GFCI** circuit breakers in the **ON** position (Figure 56).

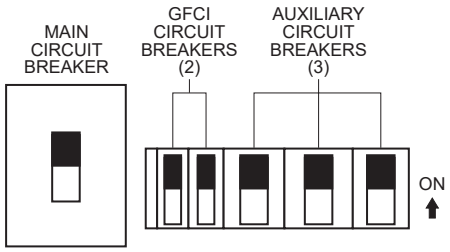


Figure 56. Main, Auxiliary, And GFCI Circuit Breakers (ON)

13. Observe the generator's ammeter (Figure 57) and verify it reads the anticipated amount of current with respect to the load. The ammeter will only display a current reading if a load is in use.

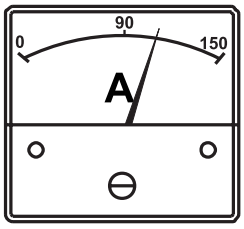


Figure 57. Ammeter (Load)

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

CAUTION

The Engine Speed switch **must** be set to the **High position** when running in **Auto mode**. Failing to set the switch in the proper position can result in damage to the generator when it turns on.

NOTICE

When the **Auto Start/Stop switch** is placed in the **AUTO** position, the engine glow plugs will be warmed and the engine will start automatically.

NOTICE

The battery charger option can only be operated when the generator is in Manual Start mode.

15. Perform steps 1–4 under ***Before Starting*** in the ***Generator Start-Up Procedure (Manual)*** section.
16. Place the **Engine Speed switch** in the **HIGH** position (Figure 58).

Figure 58. Engine Speed Switch (High Position)

17. Place the **Auto Start/Stop switch** (Figure 59) in the **AUTO** position.

Figure 59. Auto Start/Stop Switch (Auto Position)

18. Once the start signal is received (the remote-start contacts are closed), the pre-heating process will begin. When the pre-heating process has completed, the engine will start automatically and accelerate to rated speed. When the remote-start contacts are opened, the engine will stop.
19. If the engine fails to start, perform the manual starting procedure.

NORMAL SHUTDOWN PROCEDURE

WARNING

NEVER stop the engine suddenly except in an emergency.

To shut down the generator, use the following procedure:

1. Place the load's ON/OFF switch in the **OFF** position.
2. Place the **main**, **auxiliary**, **and GFCI** circuit breakers (Figure 60) in the **OFF** position.

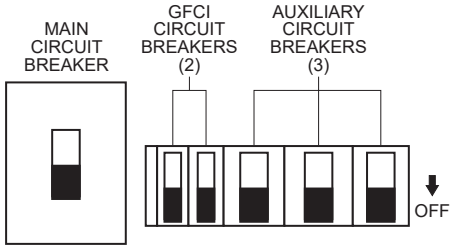


Figure 60. Main, Auxiliary, And GFCI Circuit Breakers (OFF)

3. Place the **Engine Speed switch** in the **LOW** position (Figure 61).

Figure 61. Engine Speed Switch (Low Position)

4. Let the engine cool by running it at low speed for 3–5 minutes with no load applied.
5. Place the **Auto Start/Stop switch** (Figure 62) in the **OFF/RESET** position.

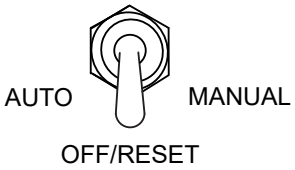


Figure 62. Auto Start/Stop Switch (Off/Reset Position)

NOTICE

DO NOT disconnect the battery cables immediately after the engine stops. Wait for at least 2–3 minutes before disconnecting the battery cables.

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

EMERGENCY SHUTDOWN PROCEDURE

NOTICE

The **Emergency Stop switch** should only be used to stop the engine in case of an emergency or to lock out operation during service. The Emergency Stop switch should **NEVER** be used for routine stopping of the engine.

1. To stop the engine in the event of an emergency, press the **Emergency Stop switch** (Figure 63), located on the side of the generator next to the output terminal panel.

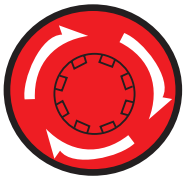


Figure 63. Emergency Stop Switch

2. Place the **main**, **auxiliary**, **and GFCI circuit breakers** in the **OFF** position as shown in Figure 60.
3. 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).

AUTOMATIC SHUTDOWN SYSTEM

This unit is equipped with safety devices that will automatically shut down the engine when a fault occurs. The Shutdown lamp on the controller will illuminate and diagnostic trouble codes will be displayed to signify the reason for the shutdown. Refer to the ***Troubleshooting*** sections of the operation manual for more information.

NOTICE

Before inspecting the generator after an automatic shutdown, place the Auto Start/Stop switch in the **OFF/RESET** position, and place all circuit breakers in the **OFF** position. Allow adequate time for cooling before troubleshooting. When all faults have been cleared, restart the engine according to the ***Generator Startup Procedure*** section of this manual.

Table 15. Inspection/Maintenance		10 Hours or Daily	250 Hours	500 Hours or Every 12 Months	3,000 Hours or Every 36 Months	Other
Engine	Check Engine Oil and Coolant Levels	X				
	Check Fuel Filter/Water Separator Bowl	X				
	Check Air Cleaner/Element	X				
	Clean Air Cleaner/Element		X			
	Check for Leaks/Hoses/Clamps	X				
	Check for Loosening of Parts	X				
	Change Engine Oil and Oil Filter * [1]		X			
	Clean Unit, Inside and Outside		X			
	Replace Fuel Filter Elements			X		
	Check Engine Mounts			X		
	Service Battery			X		
	Check Air Intake Hoses			X		
	Check Fan Belt Condition (Replace if Necessary)	X				
	Check Automatic Belt Tensioner	X		X		
	Check Electrical Ground Connection			X		
	Clean Radiator, Check Cooling System			X		
	Coolant Solution Analysis, Add SCAs as Required			X		
	Pressure Test Cooling System			X		
	Check Engine Speed			X		
	Test Thermostats				X	
	Check and Adjust Engine Valve Clearance					1,000 hours
	Test Glow Plugs				X	
	Replace DEF Filter (In Supply Module)					3,000 hours
	Check SCR System*[2]					4,500 hours
	Inspect Dosing Module (SCR System)					4,500 hours
	Flush and Refill Cooling System*[3]					1 year or 2,000 hours
	Clean Inside of Fuel Tank					1,000 hours
	Clean DEF Tank					As required
	Replace Air Cleaner Elements *[4]					As required
Generator	Measure Insulation Resistance Over 3M Ohms		X			
	Check Rotor Rear Support Bearing			X		

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

*2 Perform inspection and maintenance of Urea SCR system every 4,500 hours. The system does not need to be replaced/exchanged if no problem is found. Do not make any modifications or changes, nor remove the emission control system and related parts. Please contact your nearest dealer or Multiquip Service Dept. for SCR maintenance.

*3 Use fully formulated antifreeze/coolant.

*4 Replace primary air filter element when restriction indicator shows a vacuum of 635 mm (25 in. H_20).

*5 Add “Supplemental Coolant Additives” (SCAs) to recharge the engine coolant.

*6 Accumulation of carbon (soot, unburned fuel) in the exhaust pipe line and muffler could cause not only system derates but also could lead to fire incident. To destroy the soot and unburned fuel, run the unit at rated power for some period of time until the exhaust gas become mostly colorless every 250 hours of operation time. The carbon will be easier to be generated when the unit operates at less than 30% of rated power. In this case, perform the above procedures at a shorter interval time.

*7 Applying a large load at one time to the unit when carbon deposits have accumulated in the exhaust system could produce fire/sparks which could lead to abnormal combustion. Therefore it is recommended to ***appy the load gradually*** and observe the exhaust gas color (colorless) during the process.

*8 Fire or sparks may emit from the exhaust gas outlet during the ***carbon emission accumulation check*** (load). Make sure the area surrounding the unit is free from any ***flammable*** material.

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 15 as a general inspection and 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 64). 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.

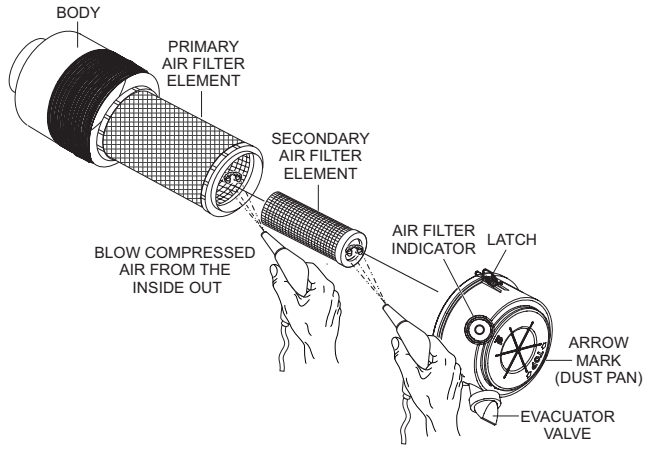


Figure 64. Engine Air Cleaner

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 64).
2. Remove the air cleaner cover (Figure 64) and set it aside.
3. Remove both the primary and secondary air cleaner elements (Figure 64).
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 64, 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/cm²), 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 64).
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 65). 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.

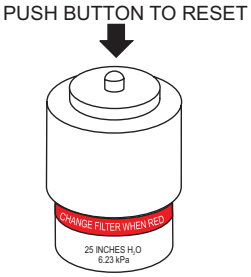


Figure 65. Air Cleaner Restriction Indicator

> ***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 66) 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 66**A**) approximately 3-1/2 turns until the valve drops down 1 inch (25.4 mm) and draining occurs (Figure 66**B**).

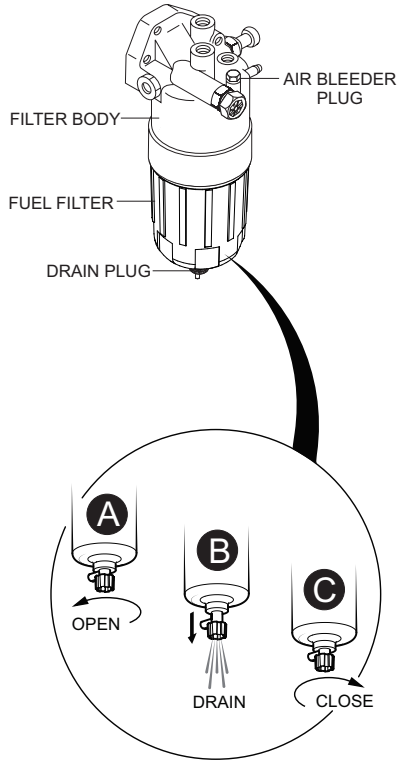


Figure 66. Draining The Fuel Filter

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 66**C**).

FUEL FILTER ELEMENT REPLACEMENT

1. Use a filter wrench to remove the element case (Figure 67) from the fuel filter body.

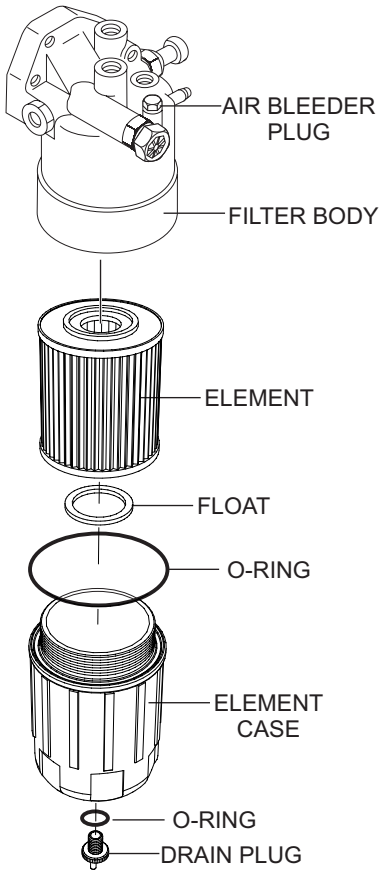


Figure 67. Fuel Filter Replacement

2. Wipe the inside of the filter body 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. Reference the Isuzu Owner's Manual, "Bleeding the Fuel System."

ELECTROMAGNETIC FUEL PUMP (500 HOURS)

The filter inside the fuel pump (Figure 68) 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 gasket from the fuel pump housing.

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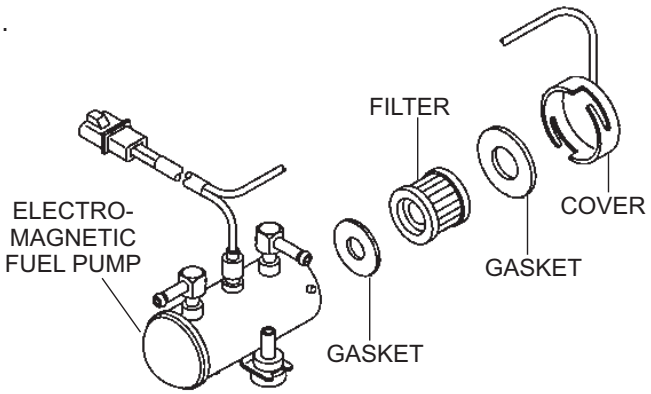


Figure 68. Electromagnetic Fuel Pump

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 tank becomes full with fluids, remove the drain bolt (Figure 69), then allow the fluids to drain into a suitable container.

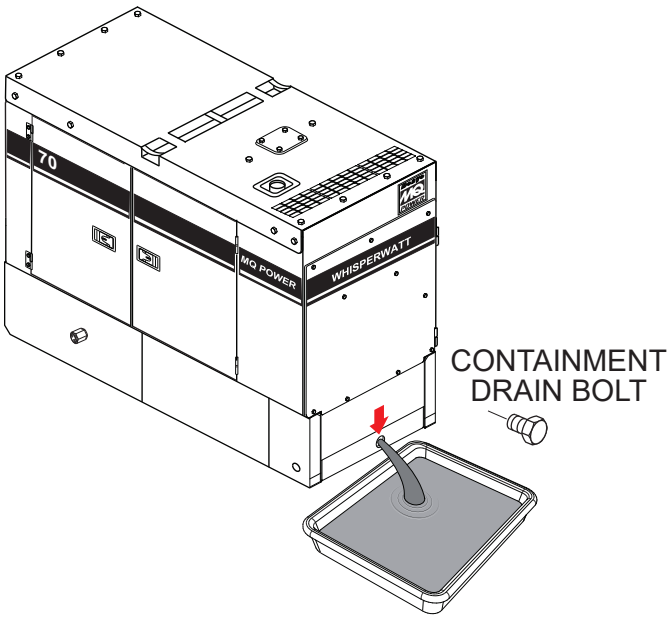


Figure 69. Draining The Containment Tank

CLEANING INSIDE THE FUEL TANK

If necessary, drain the fuel inside the fuel tank completely. Using a spray washer (Figure 70) wash out any deposits or debris that have accumulated inside the fuel tank.

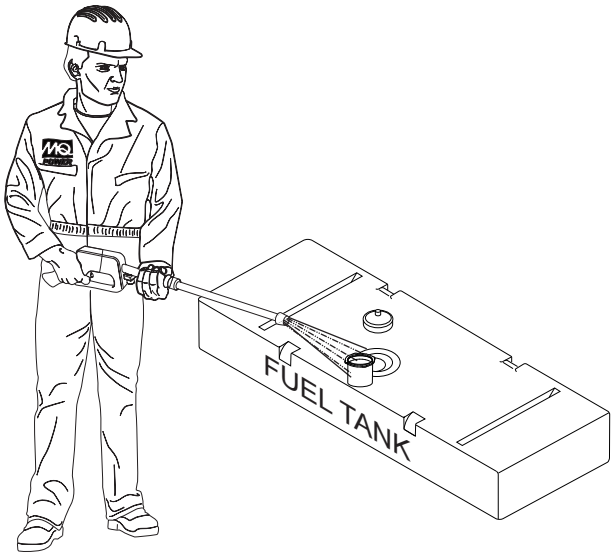


Figure 70. Fuel Tank Cleaning

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 THE ENGINE OIL

1. Run the engine until the engine coolant reaches a temperature of 140°F (60°C). Turn the engine off.
2. Remove the oil dipstick from its holder.
3. Remove the ***oil drain cap*** (Figure 71).
4. Place the ***oil drain valve*** in the **OPEN** position and allow the oil to drain into a suitable container.

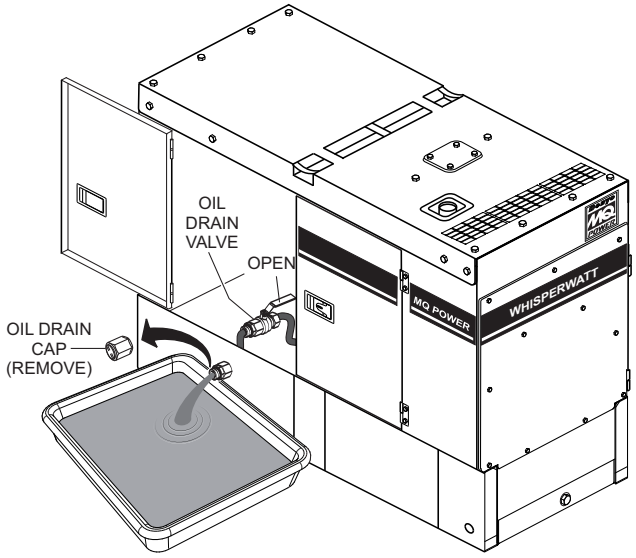


Figure 71. Draining The Engine Oil

5. After the engine oil has been completely drained, reinstall the oil drain cap and tighten securely.
6. Place the ***oil drain valve*** in the **CLOSED** position.

ENGINE OIL FILTER REPLACEMENT

1. Clean the area around the lubricating oil filter head.
2. Using an oil filter wrench (Figure 72), remove the engine oil filter.

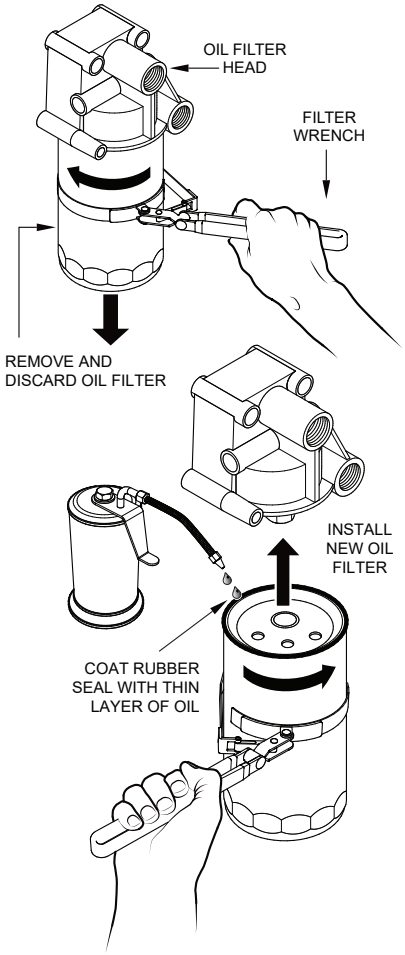


Figure 72. Oil Filter Removal

3. Coat the rubber seal (gasket) surface of the oil filter (Figure 72) with clean 15W-40 engine oil.
4. Install the new oil filter (main) first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using the 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. Reference Table 2 for engine crankcase 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 THE 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 73) only if the coolant temperature is below 120°F (50°C).

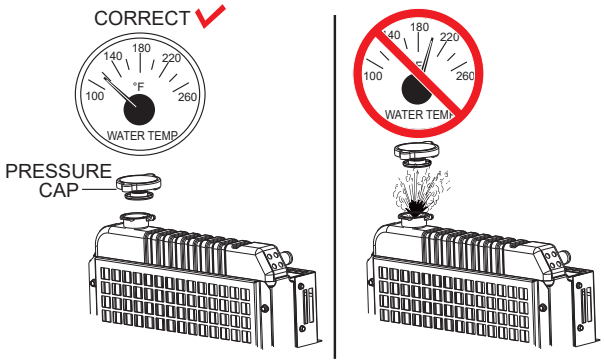
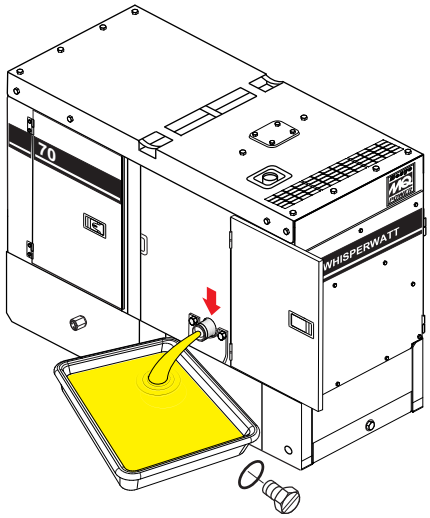


Figure 73. Radiator Pressure Cap Removal

2. Open the cabinet door and remove the coolant drain bolt and O-ring (Figure 74), then allow the coolant to drain into a suitable container.



COOLANT
DRAIN BOLT
AND O-RING

Figure 74. Draining The Engine Coolant

3. 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.

WARNING

Allow the engine to **cool** when flushing out the radiator. Flushing the radiator while hot could cause serious burns from water or steam.

RADIATOR CLEANING

The radiator (Figure 75) 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 75. Radiator Cleaning

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 Operator's manual.

Drive Belt Inspection

Inspect the drive belt (Figure 76) for damage and wear. Horizontal cracks (across the belt) are acceptable. Vertical (direction of belt ribs) cracks that intersect with horizontal cracks are not acceptable.

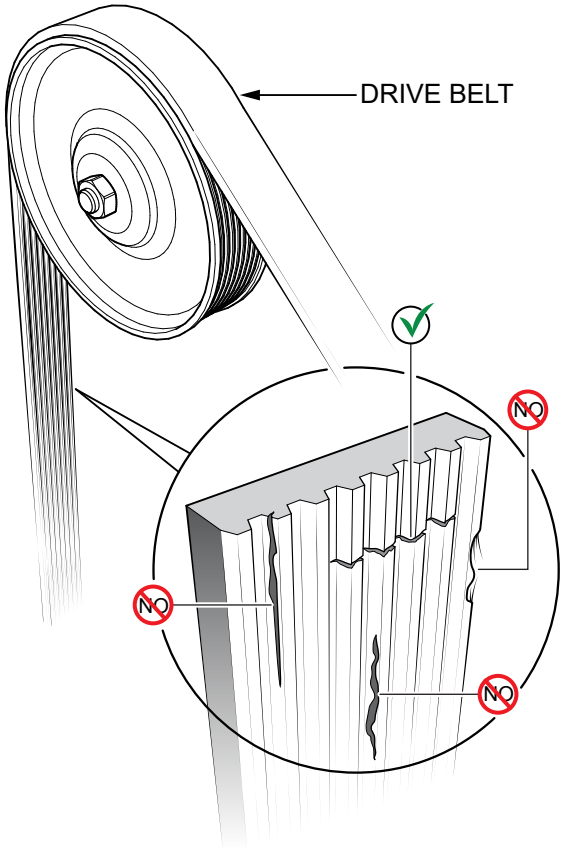


Figure 76. Drive Belt Inspection

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 outlined in the start-up procedure in this manual.
2. Place a GFCI circuit breaker (Figure 77) in the **ON** position.

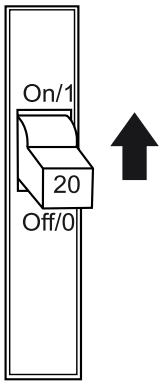


Figure 77. GFCI Circuit Breaker

3. Verify that the status LED on the corresponding GFCI receptacle (Figure 78) is **ON (GREEN)**.

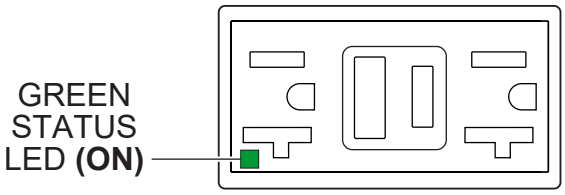


Figure 78. GFCI Receptacle (ON)

4. Press the **TEST** button (Figure 79) on the GFCI receptacle and verify that the status LED turns **OFF**.

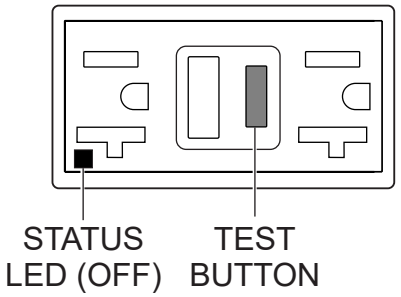


Figure 79. GFCI Receptacle (OFF)

5. Press the **RESET** button (Figure 80) to restore power to the GFCI receptacle and verify that the status LED is **ON (GREEN)**.

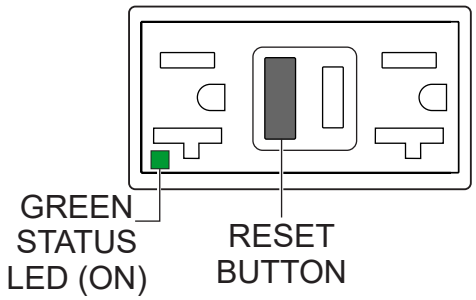


Figure 80. GFCI Receptacle (ON/Restore)

6. If the status LED (Figure 81) is **flashing (RED)**, **DO NOT** use the GFCI receptacle and replace it immediately.

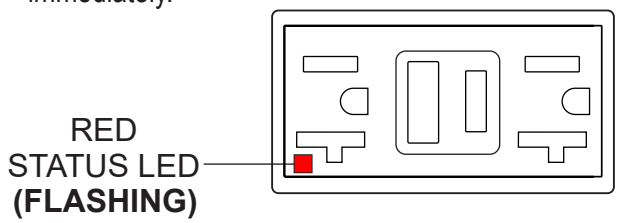


Figure 81. GFCI Receptacle (RED Flashing LED)

7. Repeat the above procedure for any 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.
- Cover the generator and store in a clean, dry place.
- Disconnect the battery.
- Make sure engine coolant is at the proper level.
- 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 82) 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.

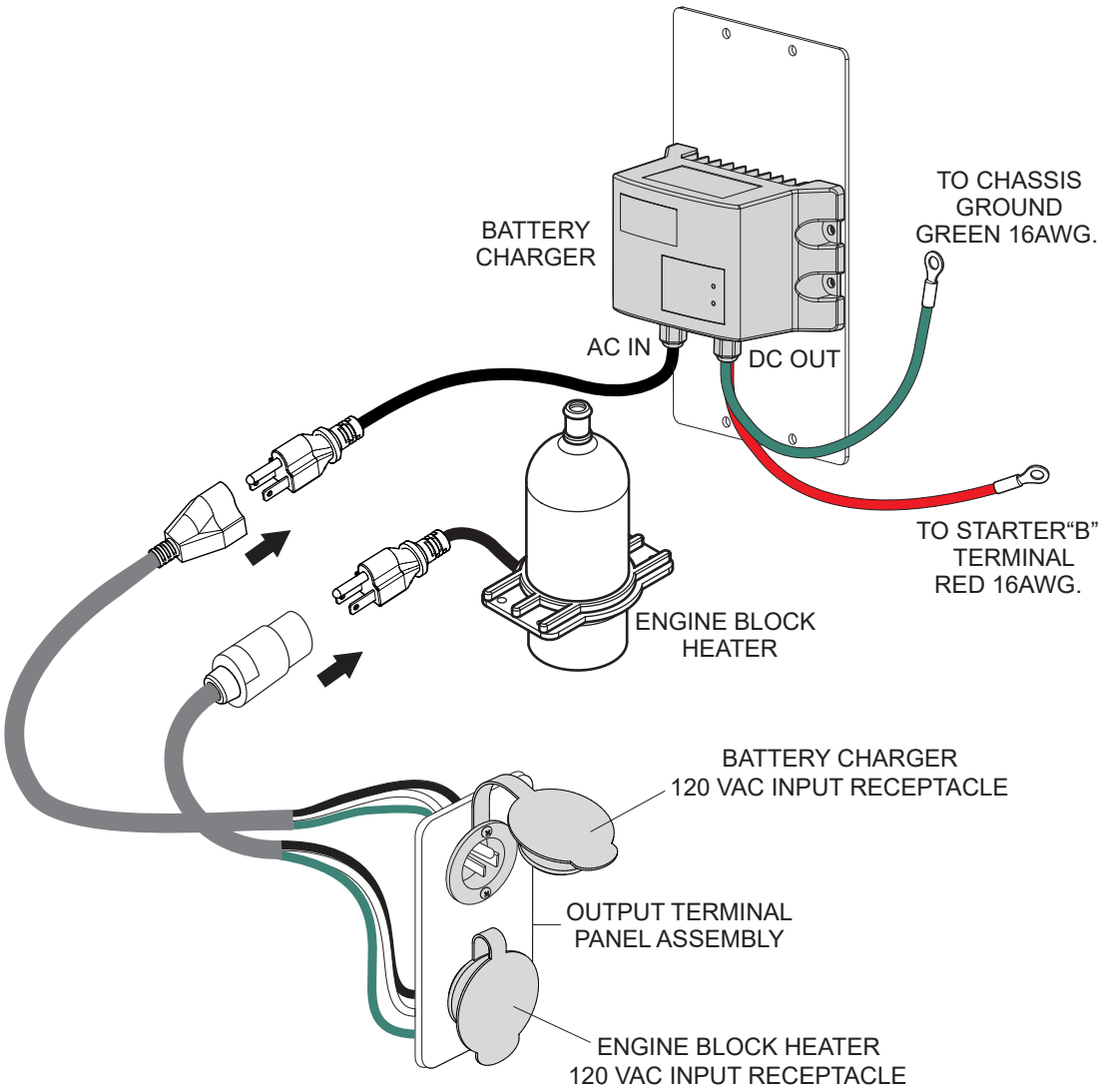


Figure 82. Engine Block Heater And Optional Battery Charger

EMISSION CONTROL

The emission control system employed with the Isuzu BR-4JJ1X diesel engine consists of a Diesel Oxidation Catalyst (DOC).

This device oxidizes large amounts of harmful nitrogen oxides (NOx) and particulate matter (PM) which are emitted by diesel engines. These exhaust emissions pose serious environmental and health risks. No maintenance or service is required for the DOC device used on this generator.

Diesel Oxidation Catalyst (DOC)

The DOC (Figure 83) 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.

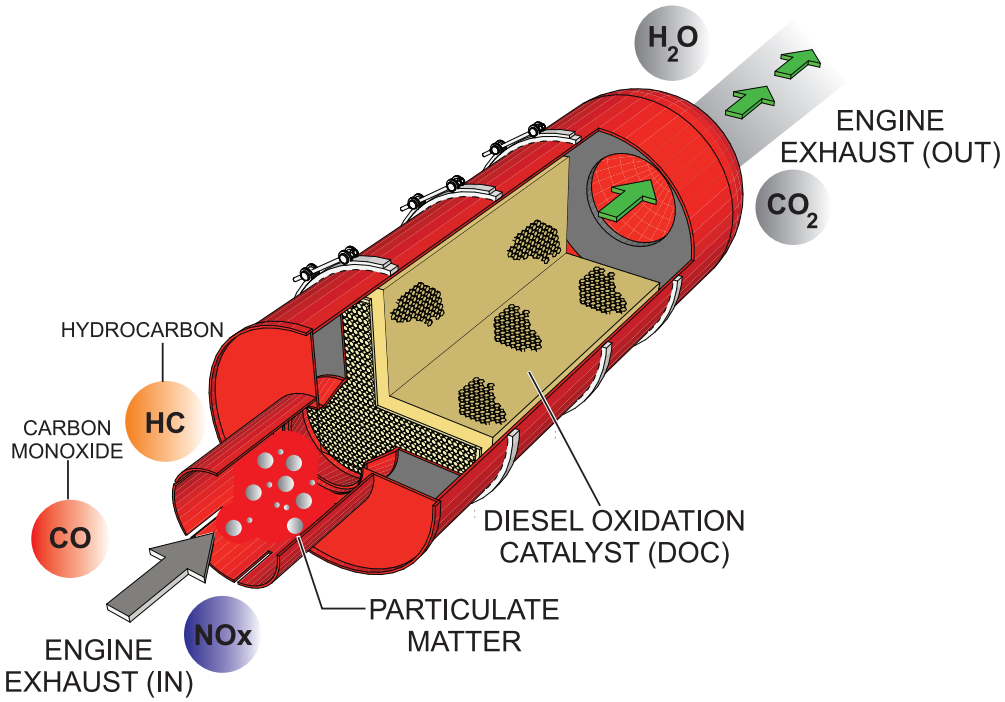


Figure 83. Diesel Oxidation Catalyst (DOC)

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*** is used to reduce the amount of NO_x released into the atmosphere.

Diesel Exhaust Fluid (DEF) from a separate tank is injected into the exhaust pipeline, where the aqueous urea vaporizes and decomposes to form ammonia and carbon dioxide. Within the SCR catalyst, the NO_x 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 in SCR catalyst. During purging 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).

The SCR Purge symbol (Figure 84) will be displayed on the ECU controller during operation when either an ***automatic*** or ***forced*** system purge operation is in process.

The pre-alarm lamp is only **ON** during SCR forced system purging and **OFF** during automatic system purging

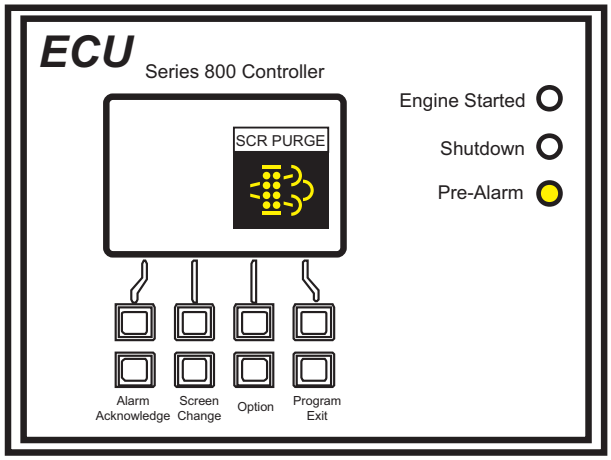


Figure 84. SCR Purge Symbol

> ***NOTICE***
>
> During urea SCR system purging, ***white smoke*** may be temporarily emitted from the exhaust tailpipe. This should not be considered a failure. In addition, the smell of ***ammonia*** during the purging process should not be considered a failure.
>
> If the purging process is underway while running a light load (0–30%) the unit may produce unusual sounds. This should not be considered a failure or malfunction.

SYSTEM PURGING GUIDELINES

> ***NOTICE***
>
> **DO NOT** perform purging in conditions where it may be unsafe due to high exhaust temperatures.

For safe operation of equipment, safety of the surrounding area, and the prevention of bodily harm, use the guidelines below when system purging is required:

> ***NOTICE***
>
> The area above and around the generator during the purging process should be free of any type of debris, flammable or combustible materials, as temperatures during the purging process can reach as high 1,022°F (550°C).

- **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.
- Due to the exhaust emission reduction functions of the exhaust system, exhaust emissions from the tailpipe have a different smell from those emitted from engines without urea SCR systems.

If the ***diesel exhaust fluid*** (DEF) symbol (Figure 85) is displayed during ECU controller operation, it indicates the following:

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

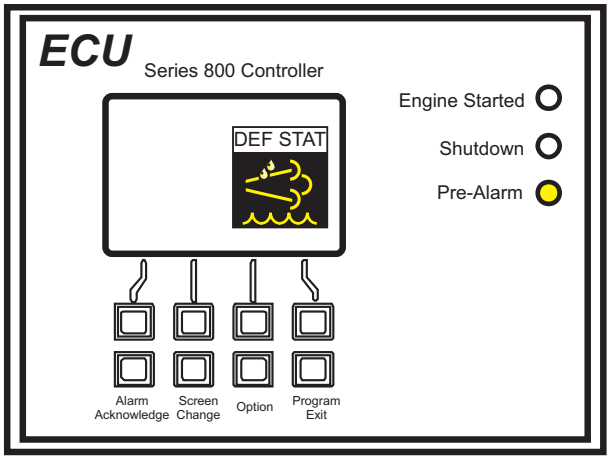


Figure 85. ECU DEF State Pre-Alarm

NOTICE

The unit will enter emergency shutdown when the DEF level has reached 0% and emergency protective measures are necessary. When this condition exists, the unit can only be restarted after the ESCAPE MODE is activated and the unit will run for 30 minutes. Reference the "Escape Mode" section in this manual.

DIESEL EXHAUST FLUID (DEF)

The amount of fluid in the DEF tank will be shown on the ECU Controller main screen during operation. The symbol shown in Figure 86 will be shown on the ECU monitor indicating the level of fluid in the DEF tank.

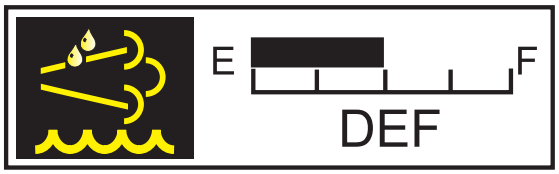


Figure 86. DEF Tank Level Gauge

Table 16. DEF Level System Action System

DEF Level	Over 10%	Below 10%	Below 5%	0%
Controller Message	—	DEF TANK <10% REFILL DEF	DEF TANK <5% REFILL DEF	DEF TANK <0% SD REFILL DEF
DEF Symbol	—	ON	Slow Blinking	Blinking
Pre-Alarm Lamp	—	ON	ON	ON
Shutdown Lamp	—	—	—	ON Engine Shutdown

INDUCEMENT

When the system senses improper usage such as no supply of DEF, use of poor quality DEF, problems with DEF jets, 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 three warning levels are referenced in Table 17:

NOTICE

Replace the DEF filter (located in the urea SCR system supply module) every 3,000 hours of operation. Refer to the ***Replacement of DEF Filter*** section in the Isuzu engine owner's manual.

Table 17. DEF Inducement

Stage	Controller Message	SCR System Pop-Up	DEF Symbol	Pre-Alarm Lamp	Shutdown Lamp
Stage 1 Warning Level 1	SCR System Malfunction	SCR SYS ERR		ON	—
Stage 2 Warning Level 2	SCR System Malfunction	SCR SYS ERR	 Slow Blinking	ON	—
Stage 3 Shutdown[1]	SCR System Malfunction	SCR SYS ERR	 Fast Blinking	ON	ON

[1]When emergency shutdown occurs, inspection and repair should generally be performed promptly. However, if emergency protective measures are necessary, the unit will enter **ESCAPE MODE** and may require as much as 30 minutes to restart.

HOW TO ACTIVATE ESCAPE MODE

If the ECU displays any messages referenced in Table 17, it may be necessary to restart via **ESCAPE MODE**.

Starting

1. Start the Diagnostic Mode as referenced in the "Troubleshooting Diagnostics" section in this manual.
2. Exit the Status Check Screen by pressing the [**EXIT**] button (Figure 87).

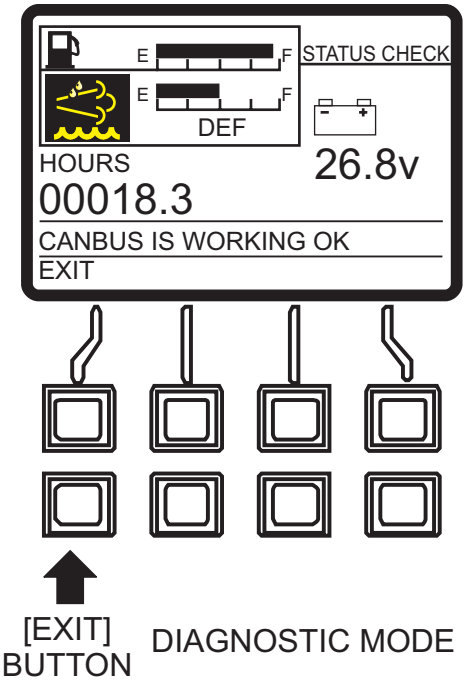


Figure 87. Status Check Screen (Diagnostic Mode)

3. Press the [**Program/Exit**] button (Figure 88) to enter the Main Menu.

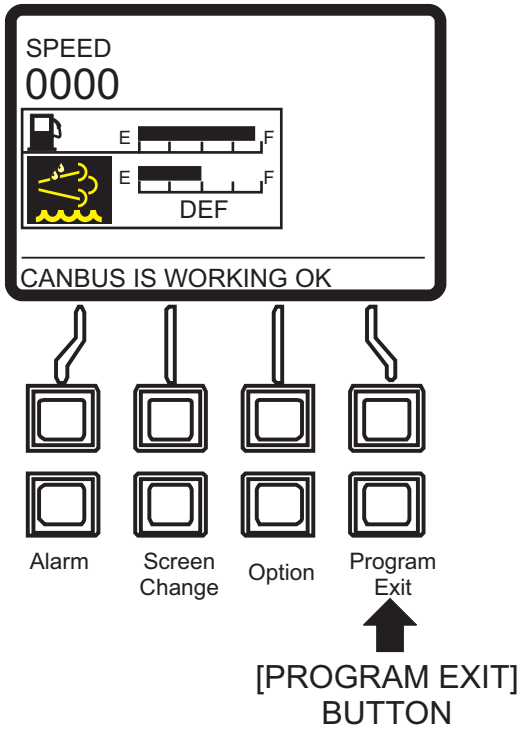


Figure 88. Main Screen

4. Press the [**DOWN**] button (Figure 89) to scroll to the Escape Mode item.

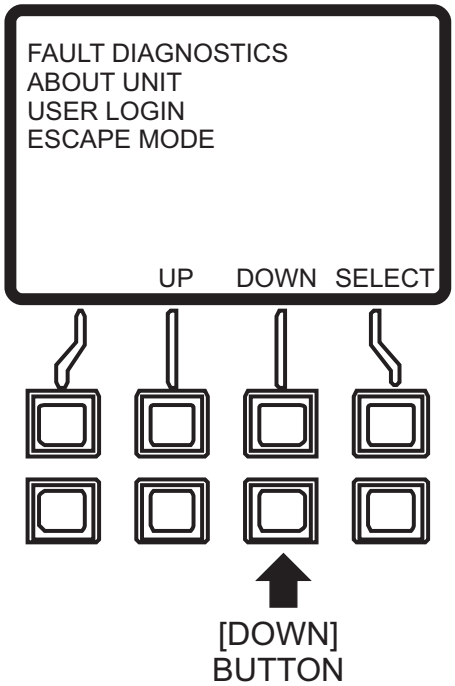


Figure 89. Main Menu (Down Button)

5. Press the [**SELECT**] button (Figure 90) to enter the "Escape Mode" menu.

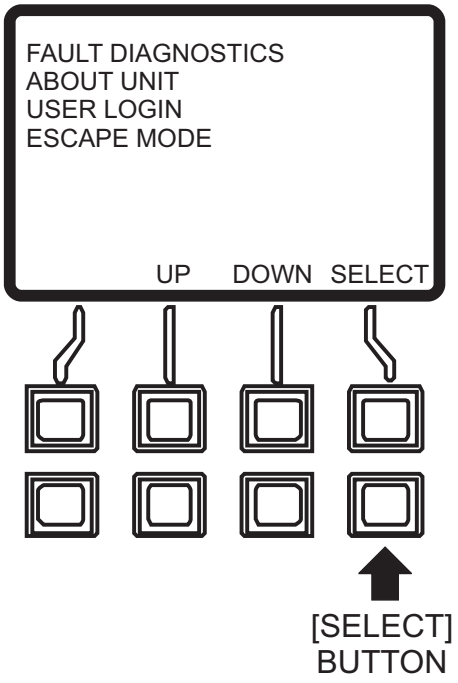


Figure 90. Main Menu (Select Button)

6. Press the [**REQUEST**] button (Figure 91) to send "Escape Mode Request" signal to ECM.

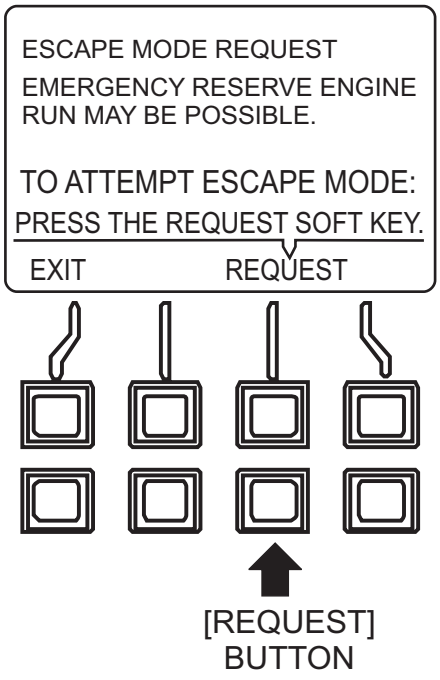


Figure 91. Escape Mode (Request Button)

7. Place the Auto Start/Stop Switch (Figure 92) in the "Off/Reset" position.

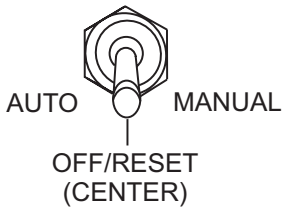


Figure 92. Auto Start/Stop Switch (Off/Reset Position)

8. Place the Auto Start/Stop Switch (Figure 93) in the "Manual" position to start the engine.

Figure 93. Auto Start/Stop Switch (Manual Position)

9. The ***Escape Mode Timer*** (Figure 94) will appear on the ***main*** screen. This timer displays the remaining Escape Mode operation time.

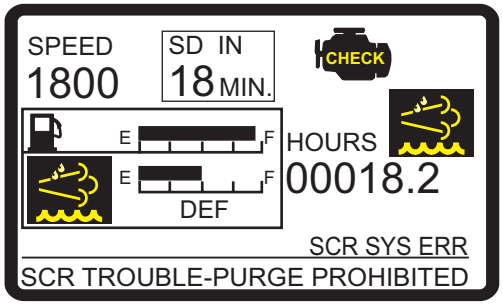


Figure 94. Escape Mode Timer

- If ESCAPE MODE is temporarily suspended, it is not necessary to return to the ESCAPE MODE screen and press the [**REQUEST**] button. ESCAPE MODE operation will be available until around 30 minutes after operation has been ended.
- Once the ESCAPE MODE timer reaches zero minutes, the engine will stop since the ESCAPE MODE time has expired. Please perform maintenance to return the unit to proper operating condition.
- If the unit returns to Warning Level 1 while ESCAPE MODE is running, ESCAPE MODE will be cancelled, the ESCAPE MODE timer display will close, and normal operation will resume.

PROTECTION DEVICES

Automatic Shutdown System

This unit is equipped with engine protection devices that automatically shut down the engine if any of the faults shown in Table 18 occur. The “Shutdown” LED on the ECU Controller will turn on just before the shutdown and will stay on after the shutdown. Messages will appear on the ECU display.

After the automatic shutdown, check all Diagnostic Trouble Codes (DTC) displayed on the ECU Controller. Reference the Troubleshooting (Diagnostics) section in this manual.

Place the Auto Start/Stop Switch in the “Off/Reset” position. In addition, place all circuit breakers in the **OFF** position. Before troubleshooting, allow sufficient time for adequate cooling. Before attempting to restart the generator, perform an overall inspection of the generator and correct the problem that caused the shutdown. If necessary, contact your nearest Multiquip dealer for additional technical support.

Restart the generator as referenced in the Generator Startup Procedure (Manual Start).

NOTICE

Although the unit is equipped with engine protection devices, regularly scheduled ***preventive maintenance*** is strongly advised.

Table 18. Automatic Engine Shutdown System

Operating Parameter	ECU Shutdown LED	Operating Condition/Set Point
Low Oil Pressure	ON	Set Point: 7.0 psi (48 kPa)
High Water Temperature	ON	Set Point: 212°F (100°C)
Low Coolant Level	ON	Falls Below Specified Level
Exhaust System Severe Malfunction	ON	Reference Exhaust System, DEF, Regeneration Sections
Over Voltage	ON	Set Point: 110%
Under Voltage	ON	Set Point: 75%
High Power (kW)	ON	Set Point: 115%
Over Frequency (Hz)	ON	Set Point: 110%
Under Frequency (Hz)	ON	Set Point: 90%
Over Current	Main CB Trip	Load Capacity Exceeded

The engine controller of this generator diagnoses problems (faults/errors) that arise from the engine control system and the engine itself.

1. With the engine stopped **(OFF)**, push and hold the ***Hour Check button*** (Figure 95) located on the control panel.

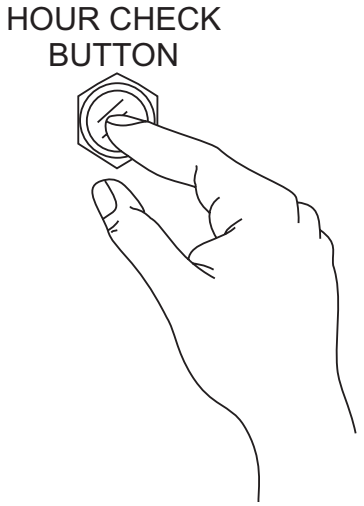


Figure 95. Hour Check Button

2. While keeping the ***Hour Check button*** pressed, place the ***Auto Start/Stop switch*** (Figure 96) in the **MANUAL** position.

Figure 96. Auto Start/Stop Switch (Manual Position)

3. The ***Hour Check Menu screen*** will be displayed on the ECU controller.
4. Release the ***Hour Check button*** and push the ***Program/Exit button*** on the ECU controller to return the controller to the main screen.
5. Push the ***Program/Exit button*** on the ECU controller and select the ***Fault Diagnostics*** mode. This mode enables the ability to carry out the fault diagnostics as listed below:

- **DM1 Active Faults** — Displays active fault messages and codes.
- **DM2 Messages and Codes** — Displays messages and codes which previously occurred that are recorded in the Engine Control Module (ECM).
- **Last Shutdown** — Displays the messages and codes that caused the most recent shutdown.

6. After performing diagnostic tests, place the ***Auto Start/Stop switch*** in the **OFF** position.

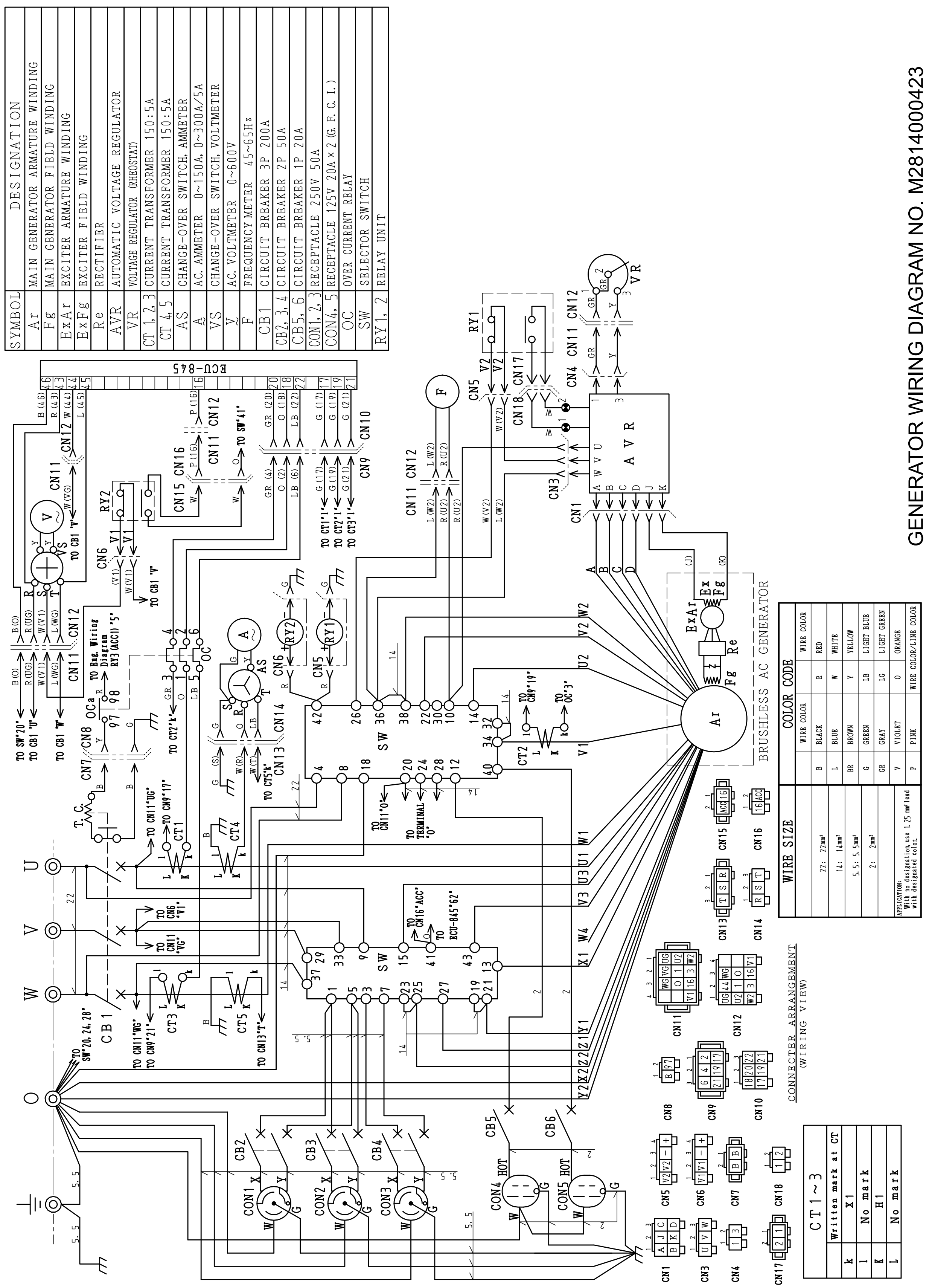
Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 19 for diagnosis of the generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 19. 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.

Troubleshooting (Engine)		
Symptom	**Possible Problem**	**Solution**
Engine will not start or start is delayed, although engine can be turned over.	No fuel reaching injection pump?	Add fuel. Check entire fuel system.
	Defective fuel pump?	Replace fuel pump.
	Fuel filter clogged?	Replace fuel filter and clean tank.
	Faulty fuel supply line?	Replace or repair fuel line.
	Compression too low?	Check piston, cylinder and valves. Adjust or repair per engine repair manual.
	Fuel pump not working correctly?	Repair or replace fuel pump.
	Oil pressure too low?	Check engine oil pressure.
	Low starting temperature limit exceeded?	Comply with cold starting instructions and proper oil viscosity.
	Defective battery?	Charge or replace battery.
	Air or water mixed in fuel system?	Check carefully for loosened fuel line coupling, loose cap nut, etc.
At low temperatures engine will not start.	Engine oil too thick?	Refill engine crankcase with correct type of oil for winter environment.
	Defective battery?	Replace battery.
Engine fires but stops as soon as starter is switched off.	Fuel filter blocked?	Replace fuel filter.
	Fuel supply blocked?	Check the entire fuel system.
	Defective fuel pump?	Replace fuel pump.
Engine stops by itself during normal operation.	Fuel tank empty?	Add fuel.
	Fuel filter blocked?	Replace fuel filter.
	Defective fuel pump?	Replace fuel pump.
	Mechanical oil pressure shutdown sensor stops the engine due to low oil?	Add oil. Replace low oil shutdown sensor if necessary.
Low engine power, output and speed.	Fuel tank empty?	Add fuel.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure tank is adequately vented.
	Leaks at pipe unions?	Check threaded pipe unions. Tape and tighten unions as required.
	Speed control lever does not remain in selected position?	See engine manual for corrective action.
	Engine oil level too full?	Correct engine oil level.
	Injection pump wear?	Use No. 2-D diesel fuel only. Check the fuel injection pump element and delivery valve assembly and replace as necessary.

Troubleshooting (Engine) - continued		
Symptom	**Possible Problem**	**Solution**
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.
Engine overheats.	Too much oil in engine crankcase?	Drain off engine oil down to upper mark on dipstick.
	Entire cooling air system contaminated or blocked?	Clean cooling air system and cooling fin areas.
	Fan belt broken or elongated?	Change belt or adjust belt tension.
	Coolant insufficient?	Replenish coolant.
	Radiator net or radiator fin clogged with dust?	Clean net or fin carefully.
	Fan, radiator, or radiator cap defective?	Replace defective part.
	Thermostat defective?	Check thermostat and replace if necessary.
	Head gasket defective or water leakage?	Replace parts.



SYMBOL	DESIGNATION
Ar	MAIN GENERATOR ARMATURE WINDING
Fg	MAIN GENERATOR FIELD WINDING
ExAr	EXCITER ARMATURE WINDING
ExFg	EXCITER FIELD WINDING
Re	RECTIFIER
AVR	AUTOMATIC VOLTAGE REGULATOR
VR	VOLTAGE REGULATOR (RHEOSTAT)
CT1,2,3	CURRENT TRANSFORMER 150:5A
CT4,5	CURRENT TRANSFORMER 150:5A
AS	CHANGE-OVER SWITCH, AMMETER
A	AC. AMMETER 0~150A, 0~300A/5A
VS	CHANGE-OVER SWITCH, VOLTMETER
V	AC. VOLTMETER 0~600V
F	FREQUENCY METER 45~65Hz
CB1	CIRCUIT BREAKER 3P 200A
CB2,3,4	CIRCUIT BREAKER 2P 50A
CB5,6	CIRCUIT BREAKER 1P 20A
CON1,2,3	RECEPTACLE 250V 50A
CON4,5	RECEPTACLE 125V 20A×2 (G.F.C.I.)
OC	OVER CURRENT RELAY
SW	SELECTOR SWITCH
RY1,2	RELAY UNIT

WIRE SIZE

22: 22mm²
14: 14mm²
5.5: 5.5mm²
2: 2mm²

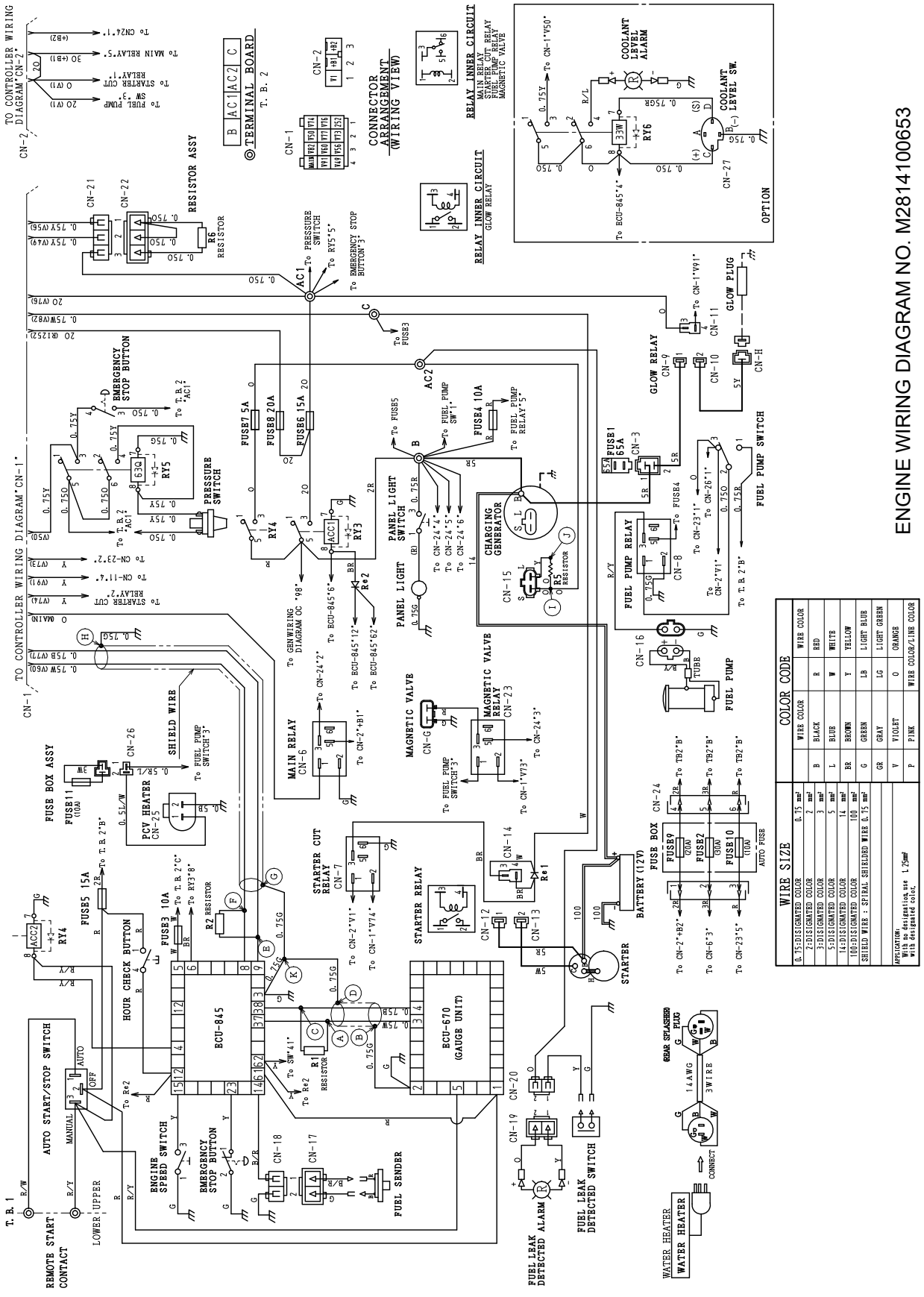
APPLICATION: With no designation, use 1.25 mm² lead with designated color.

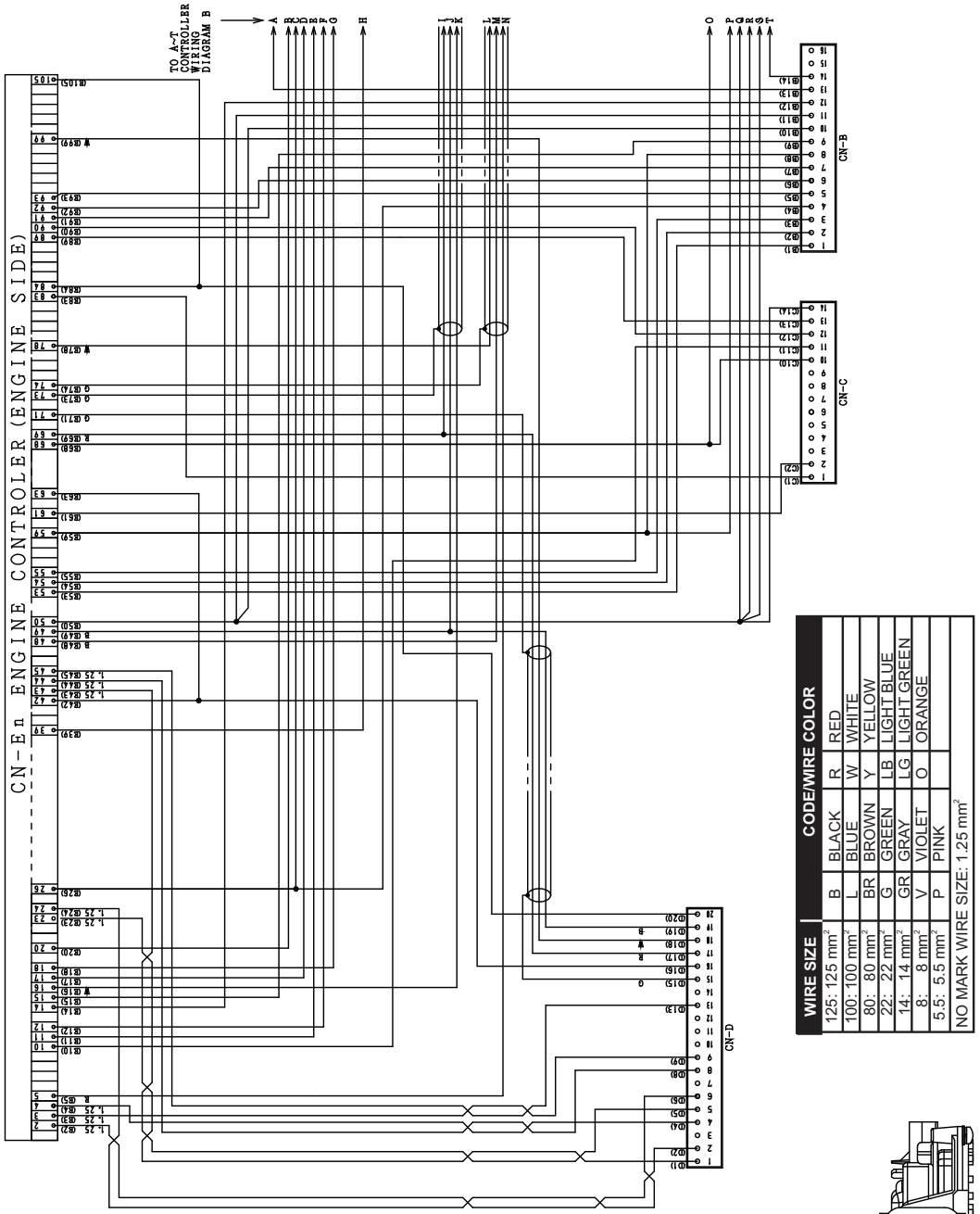
COLOR CODE

	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

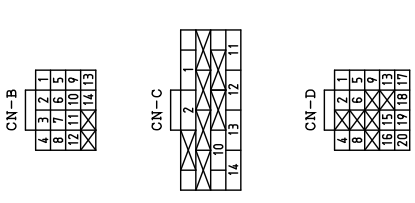
CT1~3

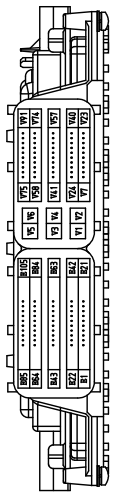
	Written mark at CT
k	X1
l	No mark
K	H1
L	No mark


ENGINE WIRING DIAGRAM NO. M2814100653
TO CONTROLLER WIRING DIAGRAM "CN-2".
TO CONTROLLER WIRING DIAGRAM "CN-1".
TERMINAL BOARD
T. B. 2
CONNECTOR ARRANGEMENT (WIRING VIEW)
RELAY INNER CIRCUIT
MAIN RELAY
STARTER CUT RELAY
FUEL PUMP RELAY
MAGNETIC VALVE
GLOW RELAY
RESISTOR ASSY
R6 RESISTOR
OPTION
COOLANT LEVEL ALARM
COOLANT LEVEL SW.
RY6
CN-27
GLOW PLUG
CN-11
CN-10
CN-9
FUEL PUMP SWITCH
FUEL PUMP RELAY
CN-8
FUSE4 10A
FUSE1 65A
CN-3
CHARGING GENERATOR
CN-15
PANEL LIGHT SWITCH
PANEL LIGHT
RY3
RY4
RY5
PRESSURE SWITCH
EMERGENCY STOP BUTTON
FUSE6 15A
FUSE8 20A
FUSE7 5A
AC1
AC2
MAGNETIC VALVE
MAGNETIC VALVE RELAY
CN-23
CN-6
MAIN RELAY
CN-7
STARTER CUT RELAY
STARTER RELAY
CN-12
CN-13
CN-14
Re1
Re2
R1 RESISTOR
R2 RESISTOR
FUSE BOX ASSY
FUSB11 (10A)
SHIELD WIRE
CN-26
PCV HEATER
CN-25
FUSB5 15A
FUSB3 10A
HOUR CHECK BUTTON
RY4
ACC2
ECU-845
ECU-670 (GAUGE UNIT)
CN-1
CN-2
CN-17
CN-18
CN-19
CN-20
CN-21
CN-22
FUEL SENDER
ENGINE SPEED SWITCH
EMERGENCY STOP BUTTON
AUTO START/STOP SWITCH
AUTO
MANUAL
OFF
REMOTE START CONTACT
LOWER
UPPER
T. B. 1
FUEL LEAK DETECTED ALARM
FUEL LEAK DETECTED SWITCH
FUEL PUMP
CN-16
TUBE
BATTERY (12V)
FUSE BOX
CN-24
FUSB9 (20A)
FUSB2 (30A)
FUSB10 (10A)
AUTO FUSE
STARTER
SW
GEAR SPLASHED
G PLUG
14AWG 3WIRE
CONNECT
WATER HEATER
WATER HEATER
WIRE SIZE
COLOR CODE
0.75:DISIGNATED COLOR
2:DISIGNATED COLOR
3:DISIGNATED COLOR
5:DISIGNATED COLOR
14:DISIGNATED COLOR
100:DISIGNATED COLOR
SHIELD WIRE : SPIRAL SHIELDED WIRE 0.75 mm²
APPLICATION:
With no designation, use 1.25mm²
With designated color.
WIRE COLOR
WIRE COLOR/LINE COLOR
BLACK
RED
BLUE
WHITE
BROWN
YELLOW
GREEN
LIGHT BLUE
GRAY
LIGHT GREEN
VIOLET
ORANGE
PINK



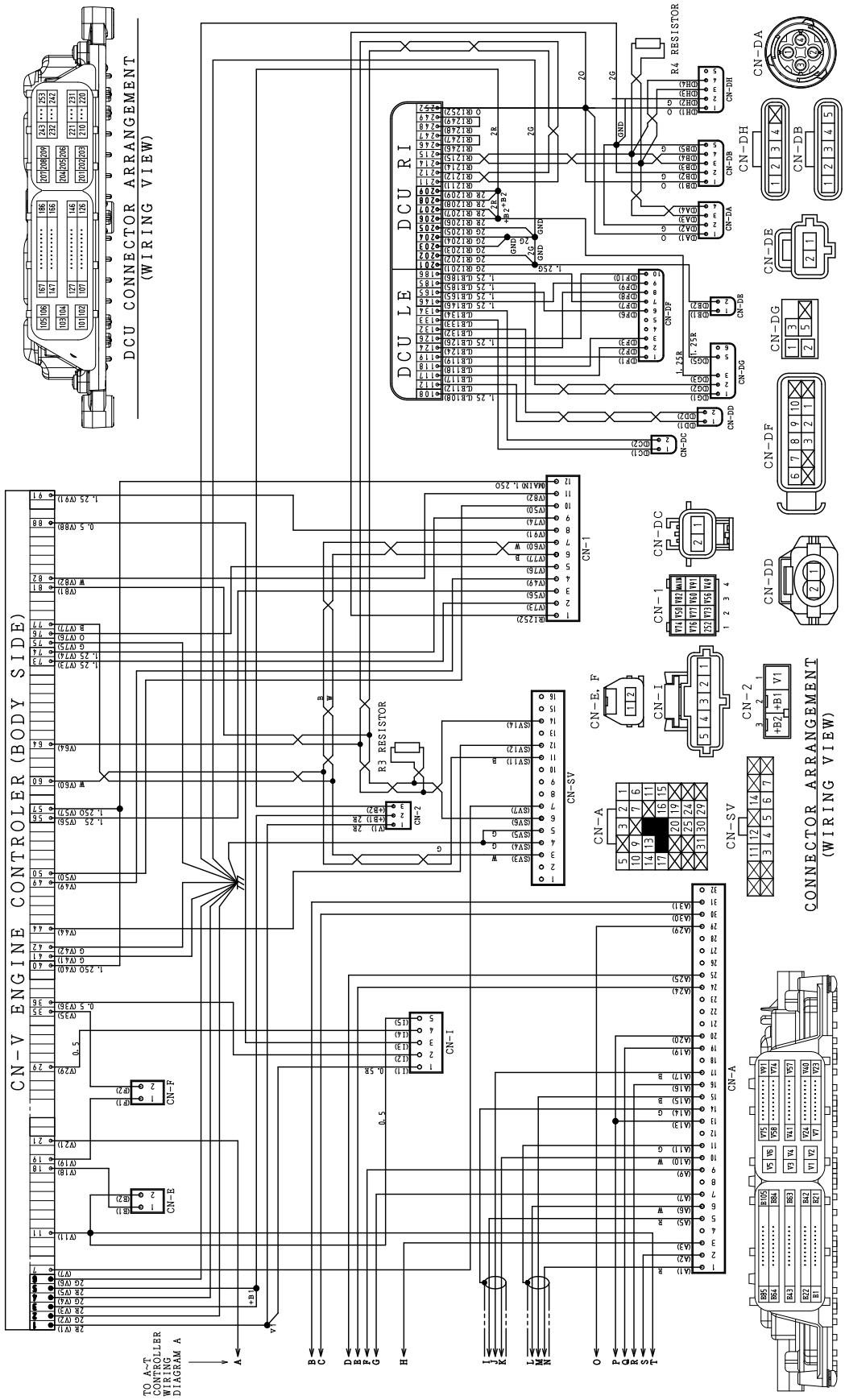
CONNECTOR ARRANGEMENT
(WIRING VIEW)





ECM CONNECTOR ARRANGEMENT
(WIRING VIEW)

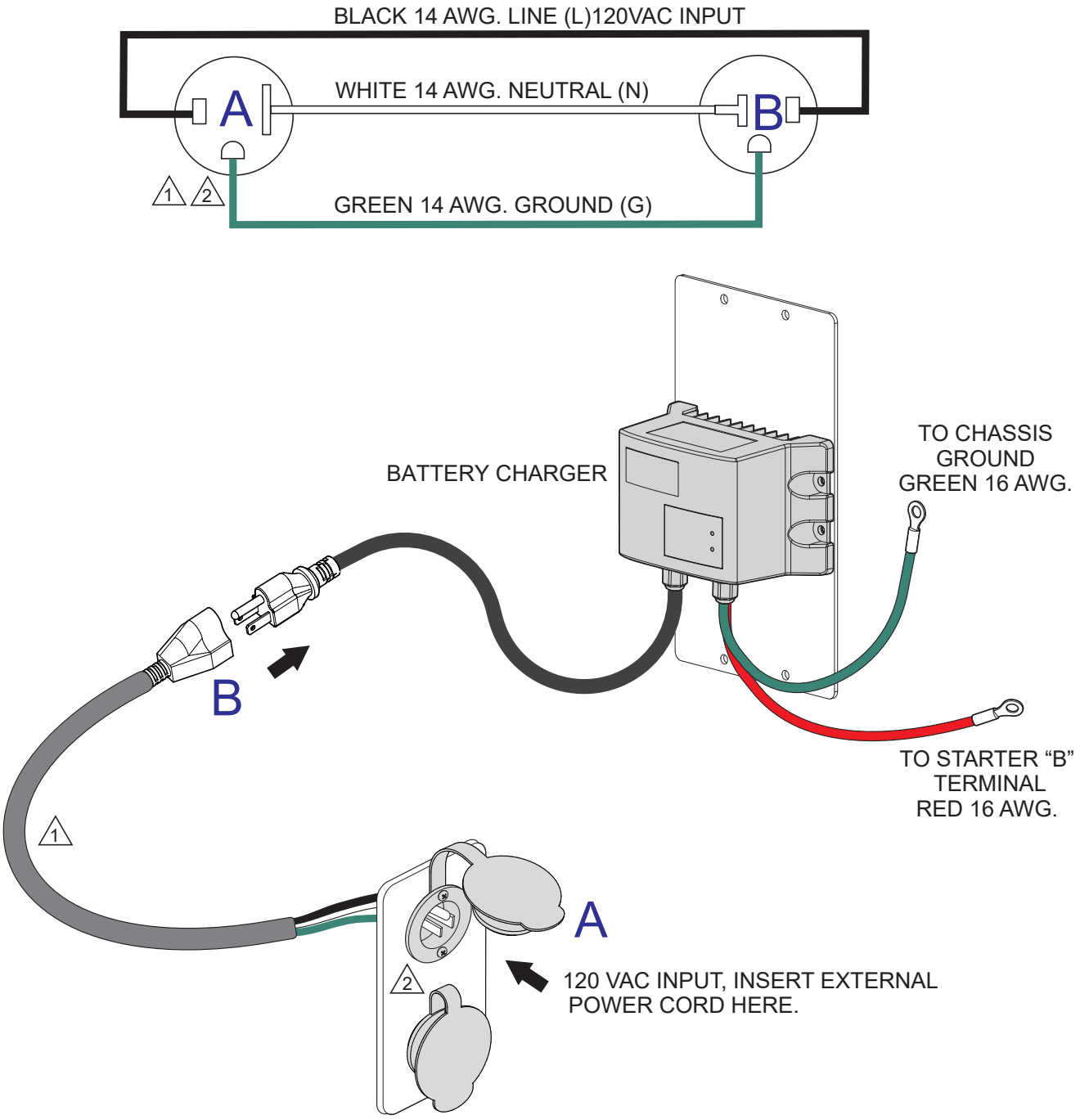
CONTROLLER WIRING DIAGRAM (B) (M2814100813)



WIRE SIZE	CODE/WIRE COLOR			
125: 125 mm^2	B	BLACK	R	RED
100: 100 mm^2	L	BLUE	W	WHITE
80: 80 mm^2	BR	BROWN	Y	YELLOW
22: 22 mm^2	G	GREEN	LB	LIGHT BLUE
14: 14 mm^2	GR	GRAY	LG	LIGHT GREEN
8: 8 mm^2	V	VIOLET	O	ORANGE
5.5: 5.5 mm^2	P	PINK		
NO MARK WIRE SIZE: 1.25 mm^2				

CONTROLLER WIRING DIAGRAM NO. M2814100813

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.

NOTES

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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Manufactured for
MQ Power Inc.
by
DENYO MANUFACTURING CORP.