

OPERATION MANUAL



WHISPERWATT™ SERIES
MODEL
DCA25ESI
50/60 Hz GENERATOR
(ISUZU AA-4LE2 DIESEL ENGINE)

INSTRUCTION MANUAL NO. M1844301244

Revision #0 (05/21/26)

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THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PROPOSITION 65 WARNING



**DCA25ESI 50/60 Hz
Generator**

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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.

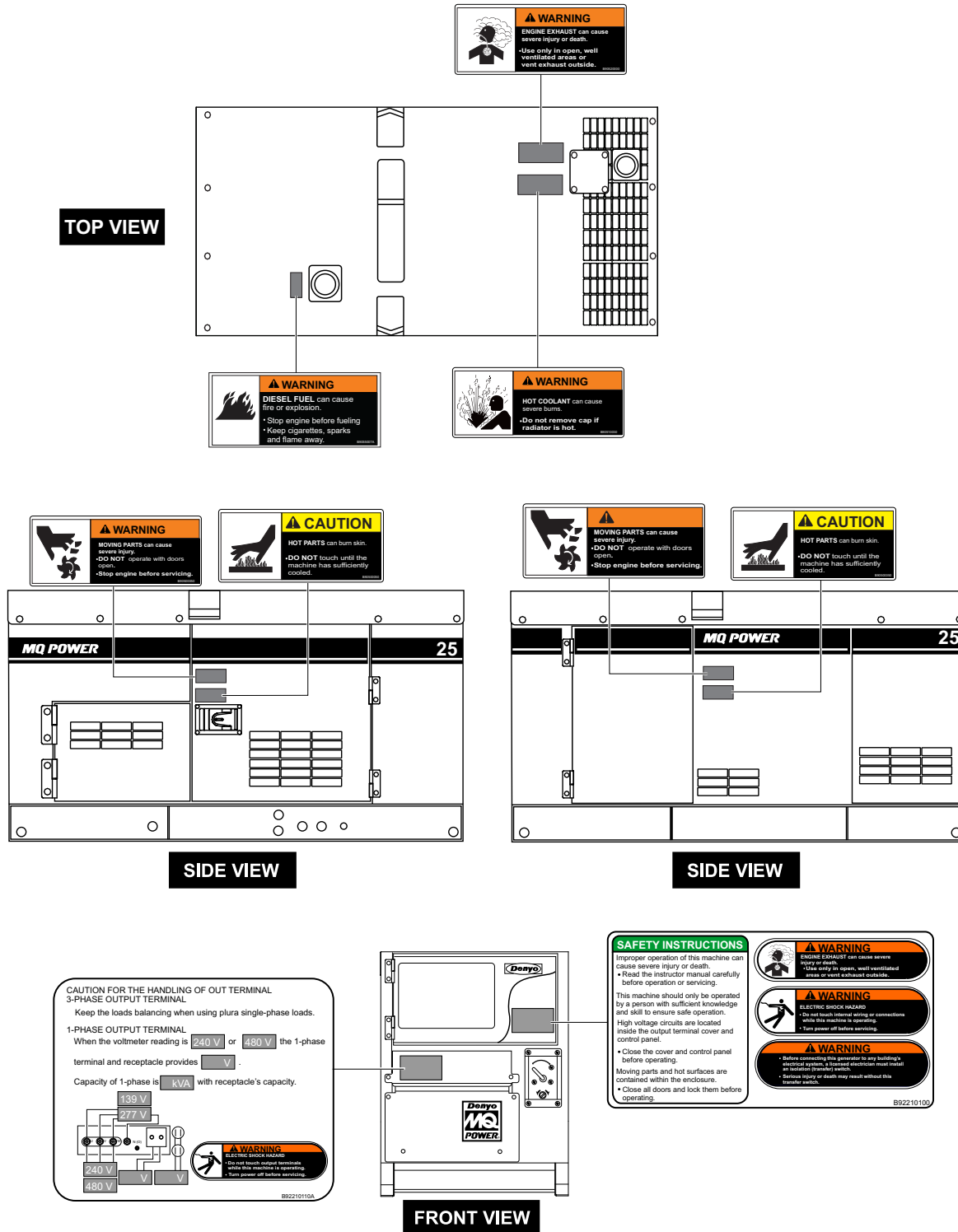


Figure 1. Safety Decals


SAFETY INFORMATION

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


SAFETY INFORMATION

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.

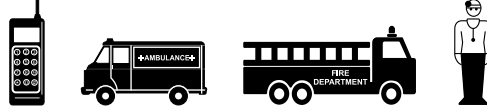


- **ALWAYS** check the generator for loosened threads or bolts before starting.
- **NEVER** use the generator for any purpose other than its intended purposes or applications.

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.

SAFETY INFORMATION

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.

SAFETY INFORMATION

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.

SAFETY INFORMATION

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**.



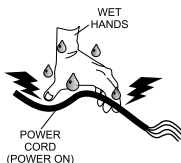
- Backfeed to a utility system can cause **electrocution** and/or property damage. **NEVER** connect the generator to a building's electrical system without a transfer switch or other approved device. All installations should be performed by a **licensed electrician** in accordance with all applicable 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

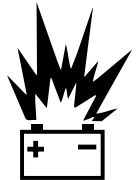
DANGER

- **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.



SAFETY INFORMATION

- 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 unreparable 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.

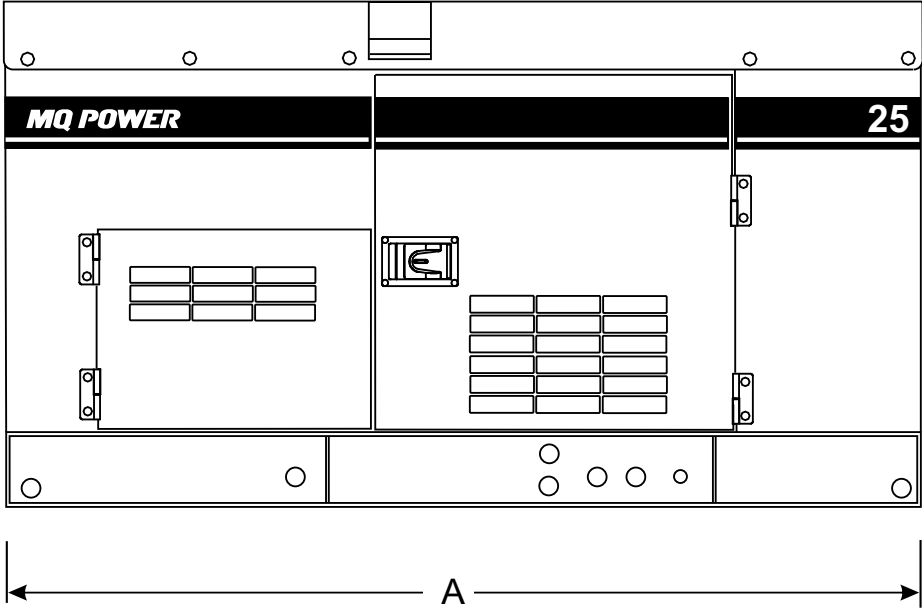
If a replacement emission label is needed, please contact your authorized engine distributor.

SPECIFICATIONS

Table 1. Generator Specifications	
Model	DCA25ESI
Type	Revolving field, self-ventilated, protected type synchronous generator
Armature Connection	Star with Neutral
Phase	3 (4 Wires)
Rating	Continuous
Standby Output 50/60 Hz	17.6 kW (22 kVA)/22.0 kW (27.5 kVA)
Continuous Output 50/60 Hz	16.0 kW (20 kVA)/20.0 kW (25.0 kVA)
Voltage 50/60 Hz	200 ~ 400V/220 ~ 440V
Current @ 50/60 Hz	57.7/28.9 amps/ 65.6/32.8 amps
Power Factor	0.8
Frequency	50/60 Hz
Speed 50/60 Hz	1,500/1,800 rpm
Main Line Circuit Breaker Rating	66 Amps
OCR Trip Point	3.0 Amps
Dry Weight	1,243 lb. (564 kg)
Wet Weight	1,415 lb. (642 kg)
Table 2. Engine Specifications	
Model	Isuzu 4LE2
Type	4-cycle, water-cooled, direct injection
No. of Cylinders	4
Bore × Stroke	3.35 in. × 3.78 in. (85 mm × 96 mm)
Displacement	133 cu. in. (2.179 liters)
Rated Output	19.1/23.5 kW 1,500/1,800 rpm
Starting	Electric Start (12V-2.0 kW)
Coolant Capacity	1.75 gal. (6.6 liters) ¹
Lube Oil Capacity	2.25 gal. (8.5 liters) ²
Lube Oil Type	API service class CJ-4 SAE or JASO DH-2
Fuel Tank Capacity	18.5 gal. (70 liters)
Fuel Type	#2 diesel fuel (ultra-low sulfur diesel fuel only)
Battery	80D26R (65-80 Ah) × 1, 550~620 CCA

¹ Includes engine and radiator hoses, ² Includes filters

SIDE VIEW



FRONT VIEW

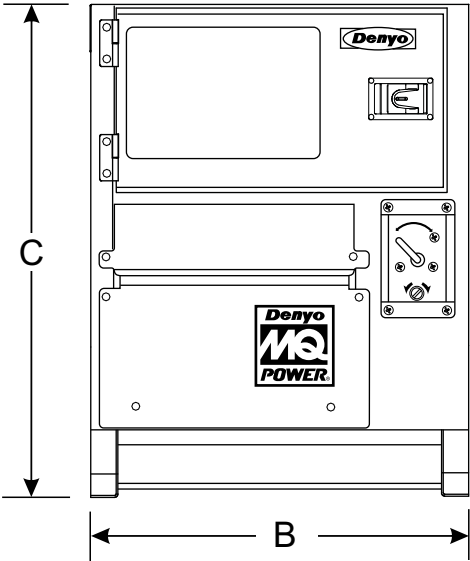


Table 3. Dimensions	
Reference Letter	Dimension in. (mm)
A	60.6 (1,540)
B	26.70 (680)
C	35.43 (900)

Figure 2. Dimensions

GENERATOR GROUNDING

NOTICE

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

Connecting The Ground

Consult with local electrical and safety codes for proper connection based on condition of use.

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

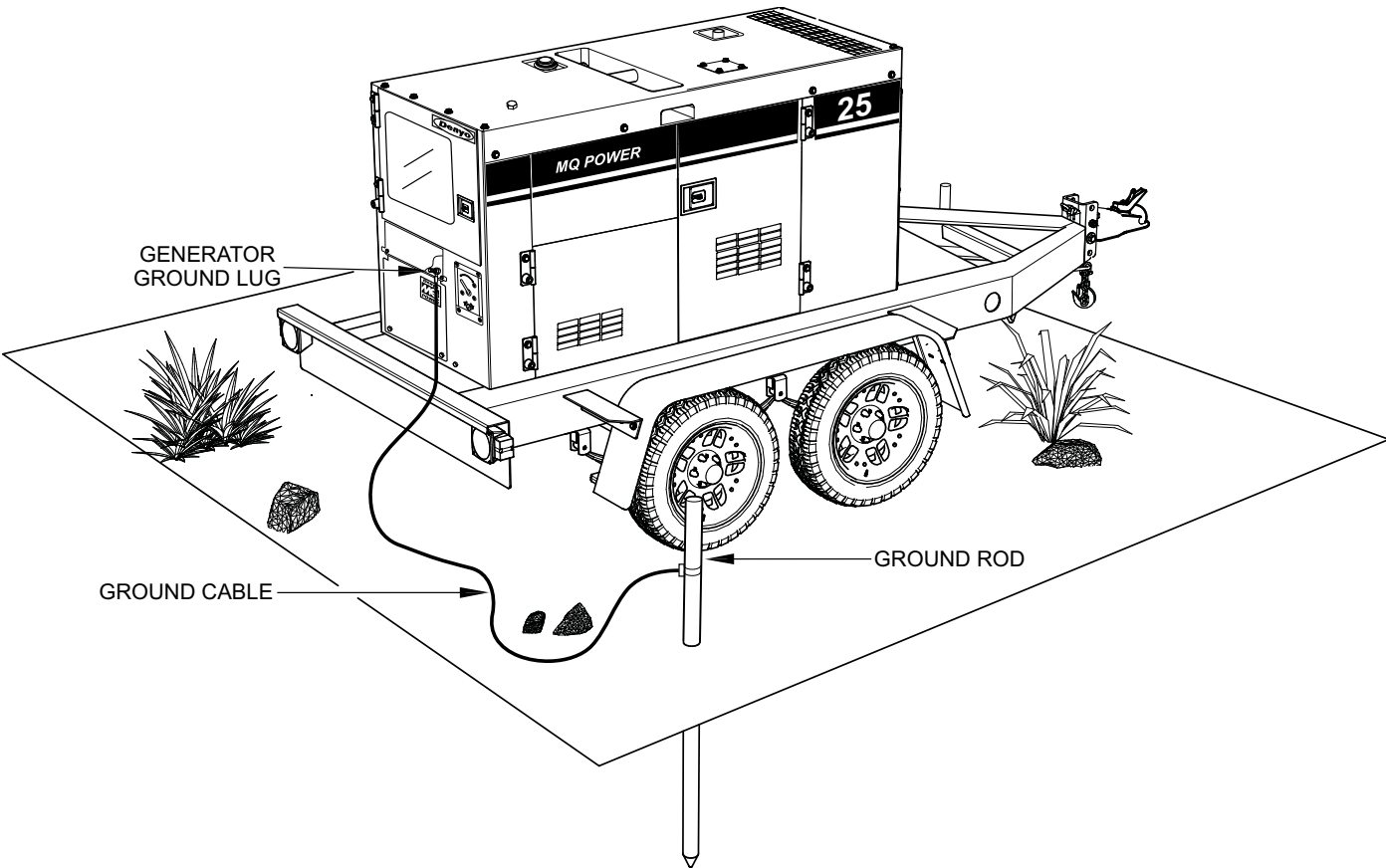


Figure 3. Typical Generator Grounding Application

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.

GENERAL INFORMATION

GENERATOR

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

CONTROL PANEL

The Control Panel is provided with the following:

- Pilot Lamp
- AC Voltmeter (Volts)
- AC Ammeter (Amps)
- Frequency Meter (Hz)
- Panel Light/Panel Light Switch
- Voltage Regulator
- Earth Leakage Relay
- 3-Pole, 66-Amp Main Circuit Breaker
- Ignition Switch
- Emergency Stop Button
- Pre-Heat Lamp

CONTROL BOX

- Control Box (located behind Control Panel)
 - Automatic Voltage Regulator
 - Current Transformer
 - Overcurrent Relay
 - Starter Relay
 - Engine Controller
 - Set Board
 - Fuse Box
 - Glow Relay
 - Condenser

ENGINE INDICATOR PANEL

The Engine Indicator Panel is provided with the following:

- Engine Speed Display
- Reset Button
- Oil Pressure Display
- Water Temperature Display
- Battery Voltage Display
- Hour Meter Display
- Fuel Level
- Oil Pressure Warning Lamp
- Water Temperature Warning Lamp
- Air Filter Warning Lamp
- Overspeed Warning Lamp
- Fuel Filter Water Level Warning Lamp

OUTPUT TERMINAL PANEL

The Output Terminal Panel is provided with four output terminal lugs for single and three phase applications.

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, Isuzu 4LE2 diesel engine. This engine is designed to meet every performance requirement for the generator. Refer to Table 2 for engine specifications.

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

ENGINE CONTROLLER

This controller measures such parameters as engine temperature, speed, air intake and it also process real time data from sensors that monitor engine performance, fuel efficiency, emissions and ignition timing.

GENERAL INFORMATION

EXTENSION CABLES

When electrical 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 10) as a guide for selecting the proper extension cable size.

EARTH LEAKAGE RELAY GROUNDING

⚠
DANGER

Improper grounding may lead to death! due to electric shock. The use of an Earth Leakage Relay on the load side is highly recommended.

To prevent electrocution due to faulty or worn load insulation wiring, this generator is equipped with an "Earth Leakage Relay" (Figure 4). To prevent electrocution, the load circuit will be disconnected when current sensitivity exceeds 30 mA. Test the Earth Leakage Relay before each startup of the generator as referenced in the maintenance section of this manual.

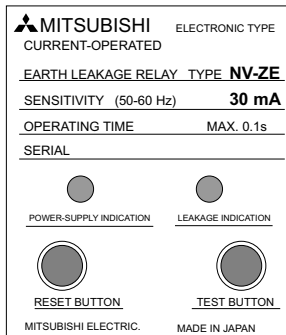


Figure 4. Earth Leakage Relay

To ensure further safety it is recommended that a earth leakage relay be installed for each load at a position near the load. Be sure to connect the **ground terminal** on the the earth leakage relay to the earth leakage ground terminal located on the output terminal panel on the generator.



Figure 5. Earth Leakage Ground Terminal

Connect all external earth leakage relays (load side) only to the terminal marked "Earth Leakage Relay" as shown in Figure 6.

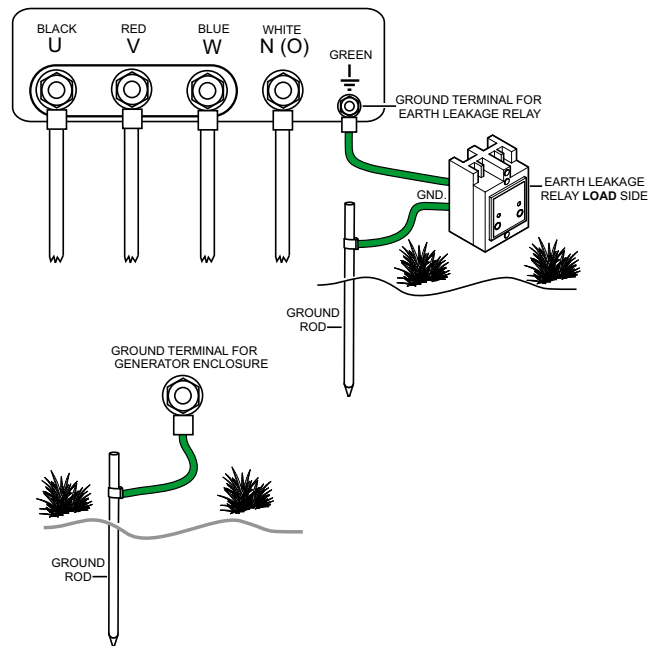


Figure 6. Ground Earth Leakage Relay

NOTICE

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

GENERAL INFORMATION

HOURLY METER INTERNAL BATTERY

The engine monitor incorporates both a rechargeable internal battery as well as a charging circuit.

While the generator is not in operation, the engine monitor will still indicate the hours operated via its internal battery. When the generator is in operation, the internal battery recharges.

When the generator remains unused for a long period of time, the battery will continue to lose its charge. Once the charge is exhausted, the hour meter will not indicate hours, and the battery will need to be recharged.

From a completely exhausted state, recharging the battery for 30 minutes will only result in a 30 minute charge to the battery. However, if charged for 3 hours, the hour meter will indicate hours for more than 10 days without another charge.

Please refer to the chart below (Figure 7) to see the relationship between battery charging time versus length of indication by the hour meter.

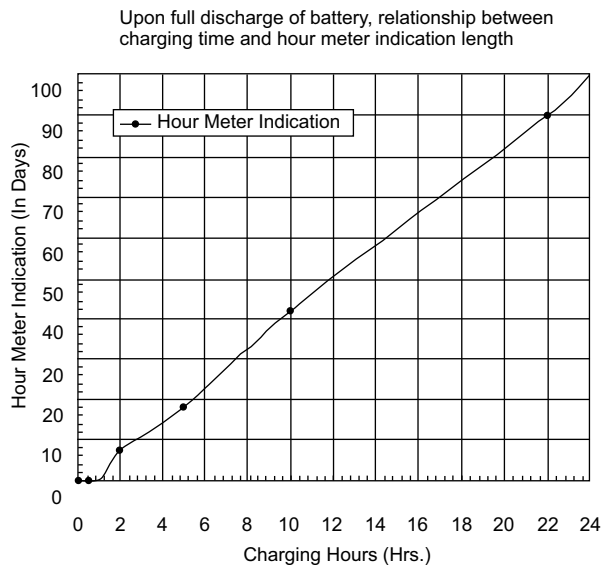


Figure 7. HM Charging vs Length Indication

OVERCURRENT RELAY

An **overcurrent relay** (Figure 8) 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.

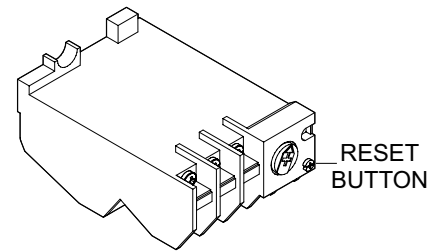


Figure 8. Overcurrent Relay

NOTICE

The **overcurrent relay** monitors the current flowing from the **U, V, and W output terminal lugs** to the load. In the event of a short circuit or overcurrent condition, it will automatically trip the 66-amp main circuit breaker.

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

GENERAL INFORMATION

FREQUENCY ADJUSTMENT SCREW

This unit is a dual frequency (50/60 Hz) generator. Use the frequency adjustment screw to obtain the desired frequency.

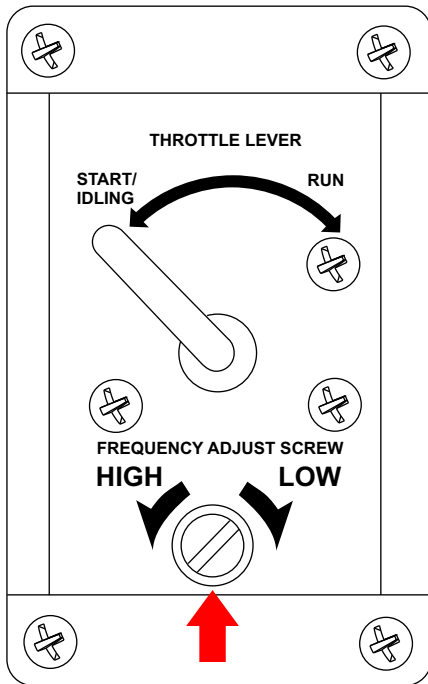


Figure 9. Frequency Adjustment Screw

ALARM AND MEMORY

When any abnormal condition occurs the following engine displays will flash depending on the type of fault (Figure 10).

- Engine Oil Pressure
- Battery Charging Voltage
- Engine Coolant Temperature

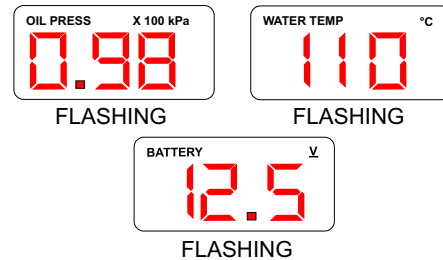


Figure 10. Engine Displays

The displays will indicate the value of the abnormal condition (fault) and store the value in memory. After the engine fault has been corrected, press the **RESET** button for at least 5 seconds on the **engine status panel** to restore the display for normal operation.

MAJOR COMPONENTS

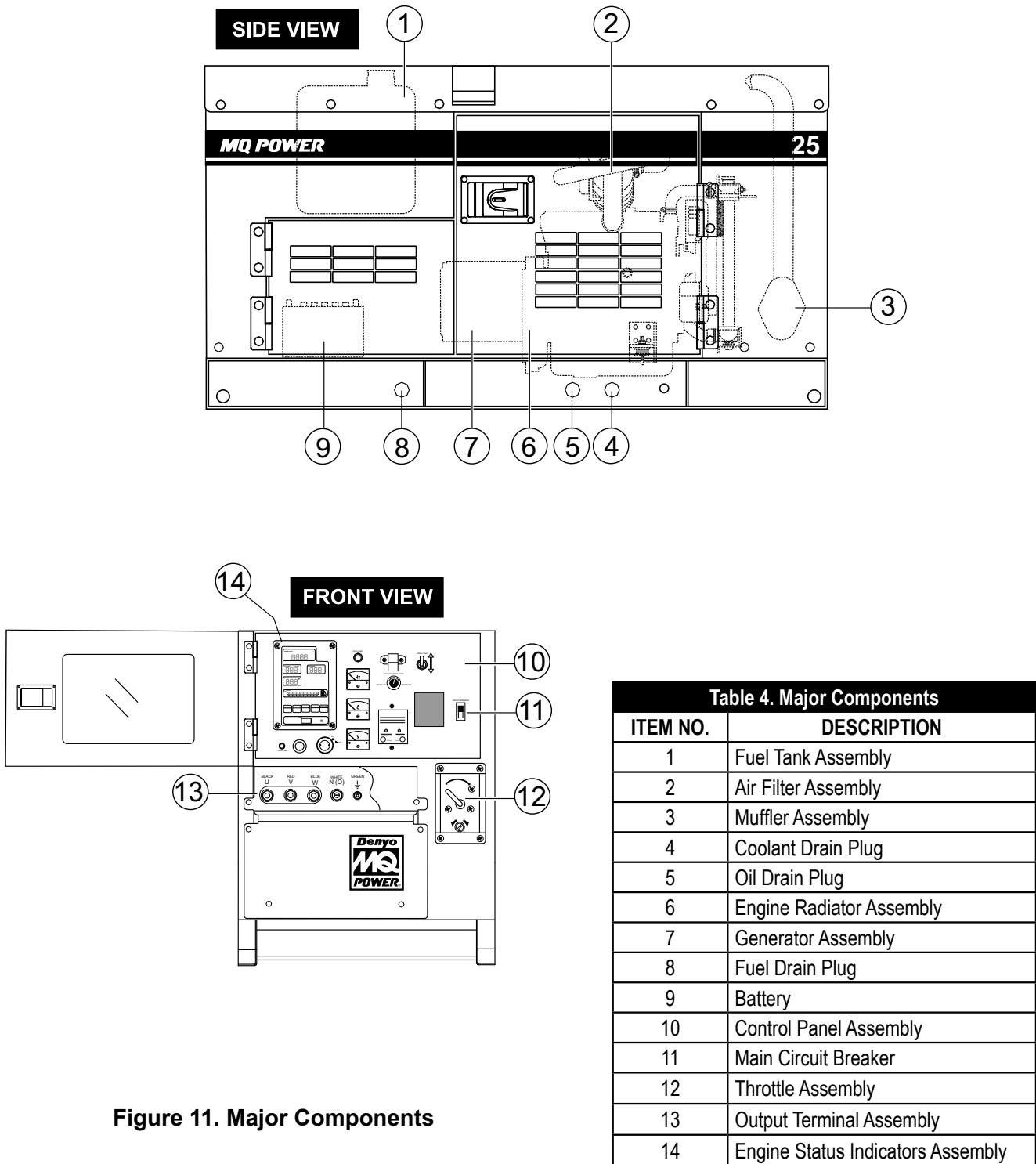


Figure 11. Major Components

ENGINE/GENERATOR CONTROL PANEL

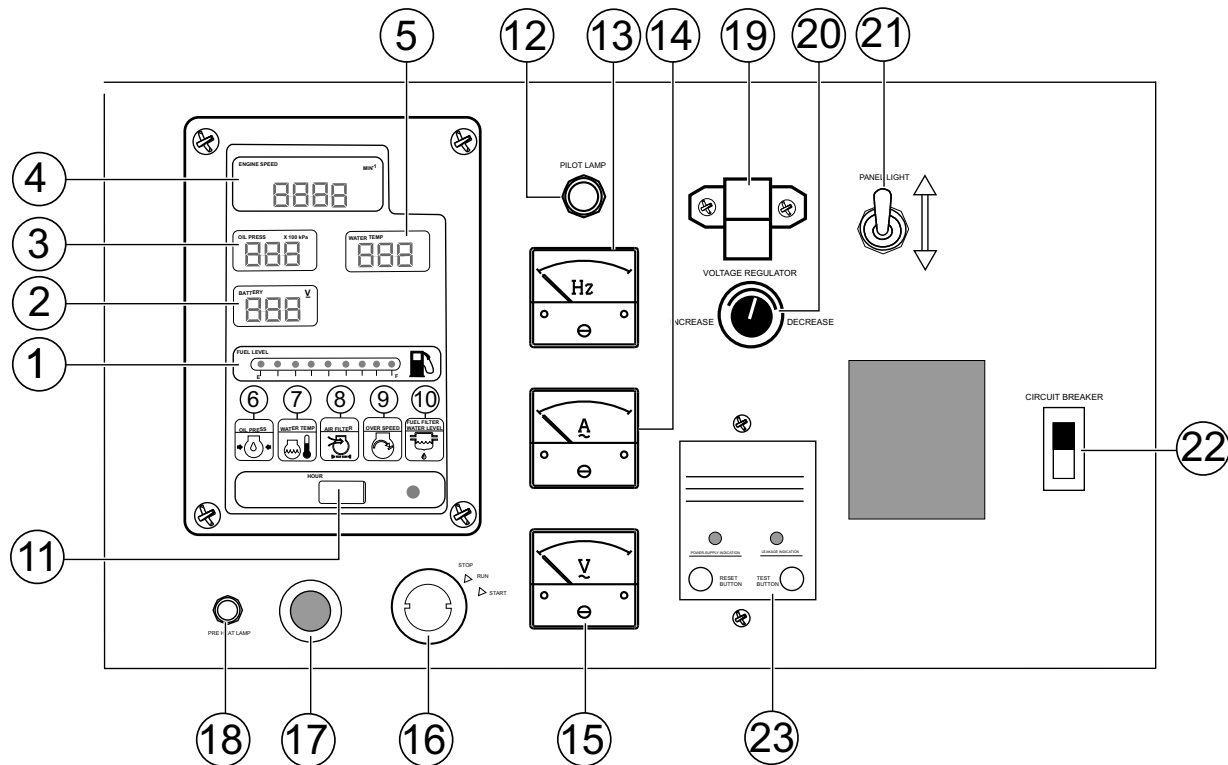


Figure 12. Engine/Generator Control Panel

The definitions below describe the controls and functions of the Engine/Generator Control Panel (Figure 12).

1. **Fuel Tank LED Indicators** — Consists of nine status LEDs indicating the amount of fuel in the fuel tank.
2. **Battery Display** — Indicates battery charging voltage. Reading should be more than 26V, when engine is running. Reading should always be higher than 12.5V.
3. **Oil Pressure Display** — During normal operation this display should read approximately 29 to 73 psi (200-500 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.
4. **Engine Speed Display** — For 60 Hz operation the engine speed shall be 1800 rpm. 1500 rpm for 50 Hz operation.
5. **Engine Coolant Temperature Display** — During normal operation this display should indicate approximately 167~203°F (75~95°C).
6. **Engine Oil Pressure Warning Lamp** — This lamp will light when the engine oil pressure drops to 14.2 psi (98.1 kPa). This condition will cause the engine to shut down.
7. **Engine Coolant Warning Lamp** — This lamp will light when the coolant temperature has reached 206°F (97°C). This condition will cause the engine to shut down.
8. **Air Filter Warning Lamp** — This lamp will light when the air filter is restricted (blocked) indicating that the air filter should immediately be cleaned or replaced.
9. **Overspeed Warning Lamp** — This lamp will light when the engine speed is abnormally high (2,070 rpm). This condition will cause the engine to shut down.
10. **Fuel Filter Water Level Warning Lamp** — This lamp will light when there is an abnormal amount of water in the fuel. Drain water in strainer. Reference maintenance section in this manual.

ENGINE/GENERATOR CONTROL PANEL

11. **Hour Meter Display**— Place ignition key in **RUN** position, then press selector button on right side of hour meter and verify ODO, Trip A and B parameters are displayed. To reset trip parameters hold down reset button for a least 1 second.
12. **Pilot Light** — Indicates system is operating.
13. **Frequency Meter** — Indicates the output frequency in hertz (Hz). Normally 60 or 50 Hz.
14. **AC Ammeter** — Indicates the amount of current the load is drawing from the generator per leg selected by the ammeter phase-selector switch.
15. **AC Voltmeter** — Indicates the output voltage present at the **U,V, and W Output Terminal Lugs**.
16. **Ignition Switch** — To start engine, place ignition key in **RUN** position.
17. **Emergency Stop Button** — When pressed automatically stops the engine.
18. **Pre-Heat Lamp** — This lamp will illuminate to indicate pre-heating of the engine glow plugs. When the lamp turns off, this indicates that the preheat cycle is complete and the engine can be started.
19. **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.
20. **Voltage Regulator** — Allows $\pm 15\%$ manual adjustment of the generator's output voltage.
21. **Panel Light Switch** — When activated will turn on the control panel light.
22. **Main Circuit Breaker** — This three-pole, 66-amp main breaker is provided to protect the **U,V, and W Output Terminal Lugs** from overload.
23. **Earth Leakage Relay** — Detects current leakage produced by poor load insulation. To prevent electrocution, load circuit will be disconnected when current sensitivity exceeds 30 mA.

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 13) and wipe it clean.

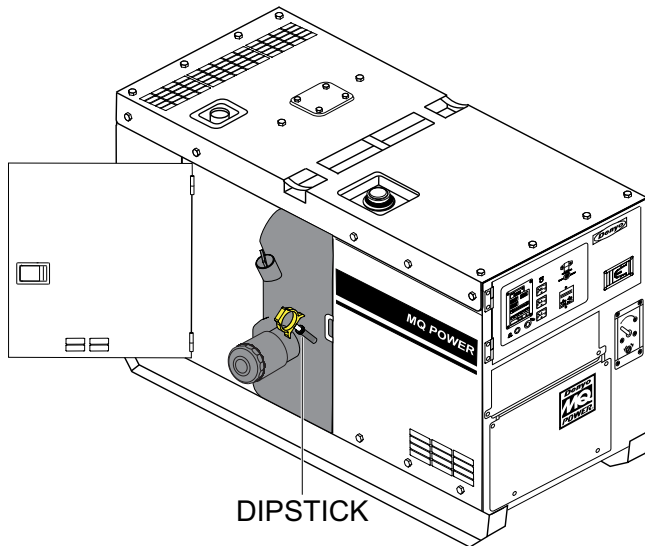


Figure 13. Engine Oil Dipstick

3. Reinsert the dipstick, then remove the dipstick from its holder. Check the oil level shown on the dipstick (Figure 14).

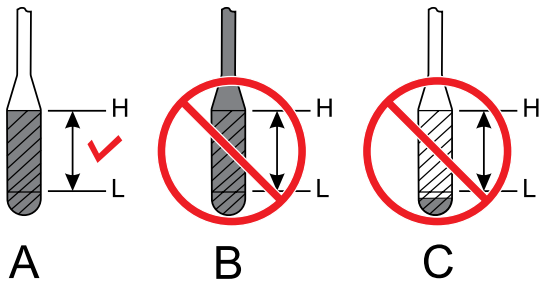


Figure 14. Engine Oil Level

4. Verify that the engine oil level is maintained between the H and L markings on the dipstick as shown in Figure 14A.
5. If the engine oil level is low (Figure 14C), remove the cap from the oil filler port (Figure 15) and fill to a safe operating level (max) as indicated by the dipstick (Figure 14A). Fill with recommended type oil as listed in Table 5. Maximum oil capacity is 9.0 quarts (8.5 liters).

NOTICE

When adding engine oil, **DO NOT** overfill (Figure 14B).

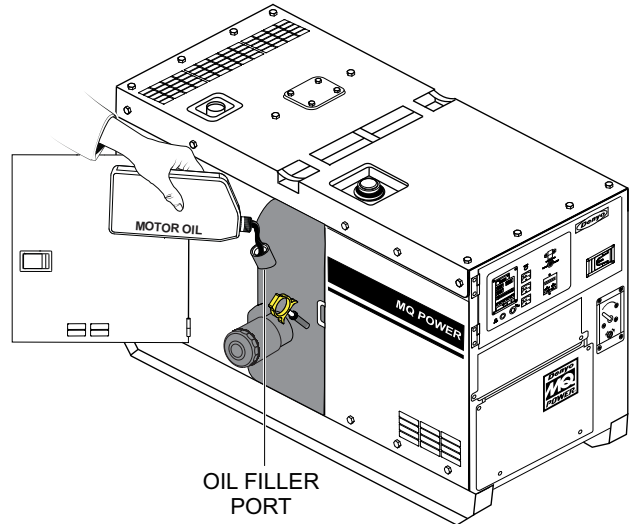


Figure 15. Engine Oil Filler Port

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.

Table 5. Recommended Motor Oil

SAE 30	
SAE 20, 20W	
SAE 10W	
SAE 10W-30	
SAE 40	
SAE 5W-40, 20W-40	
SAE 5W-20	

-20 0 20 40 60 80 100°F

-30 -20 -10 0 10 20 30 40°C

AMBIENT TEMPERATURE

FUEL CHECK

Refilling the Fuel System

CAUTION

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

1. Open the front cabinet door on the generator and insert the ignition key into the starter switch and place in the **RUN** position.
2. Next, read the fuel gauge status LEDs (Figure 16) on the engine status panel and determine if the fuel level is low. Reference Table 6 for LED fuel gauge level indication.
3. Place ignition key in **STOP** position and remove ignition key from starter switch.

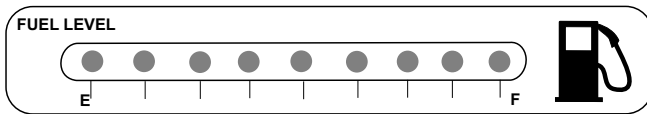


Figure 16. Fuel Gauge

Table 6. Fuel Gauge LEDs		
LED #	LED Color	Fuel Tank Level gal. (liters)
1	Red (Empty)	0~5.2 (0 ~ 20)
2	Green	5.2~6.6 (20 ~ 25)
3	Green	6.6~7.9 (25 ~ 30)
4	Green	7.9~9.2 (30 ~ 35)
5	Green	9.2~10.5 (35 ~ 40)
6	Green	10.5~11.8 (40 ~ 45)
7	Green	11.8~13.2 (45 ~ 50)
8	Green	13.2~14.5 (50 ~ 55)
9	Green (Full)	14.5~15.8 (55 ~ 60)

If fuel level is low, **ALWAYS** fill the fuel tank with clean fresh low sulfur or ultra low sulfur diesel fuel. No. 2 diesel fuel can be used as an alternative. **DO NOT** fill the fuel tank beyond its capacity.

WARNING



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

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

DO NOT refuel while the engine is running.

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

When the fuel status LEDs begin approaching **empty** (Figure 17) it is time to add fuel.

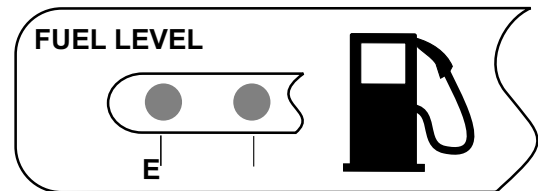


Figure 17. Fuel Status LED (Empty)

Pay attention to the fuel tank capacity when replenishing fuel. Handle fuel in a safety container. If the container does not have a spout, use a funnel. Wipe up any spilled fuel immediately.

Refueling Procedure

1. The fuel filler port is located on top of the generator. Remove the fuel cap and fill the tank with with No. 2 diesel fuel (Figure 18).

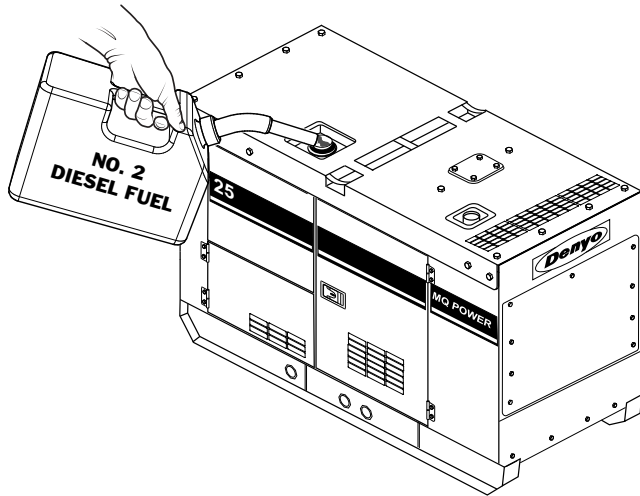


Figure 18. Fueling The Generator

2. **NEVER** overfill the fuel tank. Tighten the fuel tank cap securely after filling.
3. Verify that the fuel tank is **full** by observing the fuel status LEDs (Figure 19) on the engine status panel.

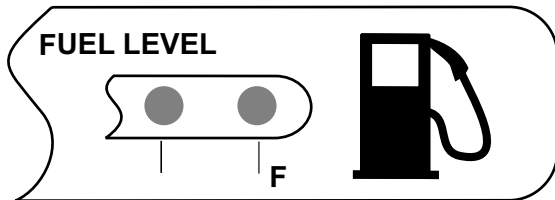


Figure 19. Fuel Status LED (Full)

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

Table 7. Coolant Capacity

Engine and Radiator	1.75 gal. (6.6 liters)
Reserve Tank	0.24 gal. (0.9 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 20.

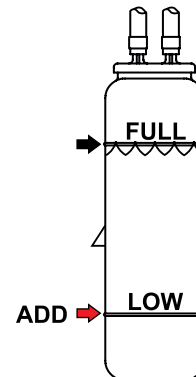


Figure 20. Coolant Reserve Tank

Operation In Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 8) has been added.

Table 8. Antifreeze Operating Temperatures		
Vol % Antifreeze	Freezing Point	
	°C	°F
50	-37	-34

NOTICE

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

CLEANING THE RADIATOR

The engine may overheat if the radiator cooling fins (Figure 21) 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.

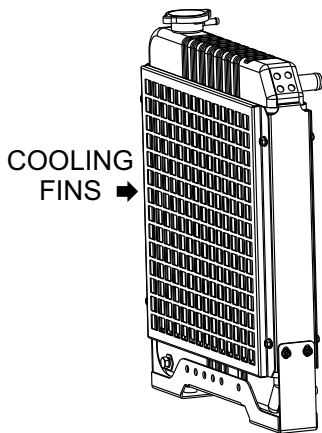


Figure 21. Radiator (Cooling Fins)

ENGINE AIR CLEANER

Periodic cleaning/replacement of the air cleaner is necessary. Inspect the air cleaner (Figure 22) in accordance with the maintenance section of this manual or the **Isuzu Engine Owner's Manual**.

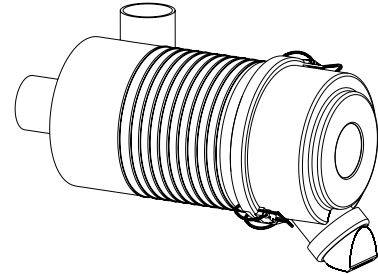


Figure 22. Engine Air Cleaner

FAN BELT TENSION

CAUTION



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

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

The fan belt tension (Figure 23) is proper if the fan belt bends 0.4~0.6 inches (10~15 mm) when depressed with the thumb as shown below.

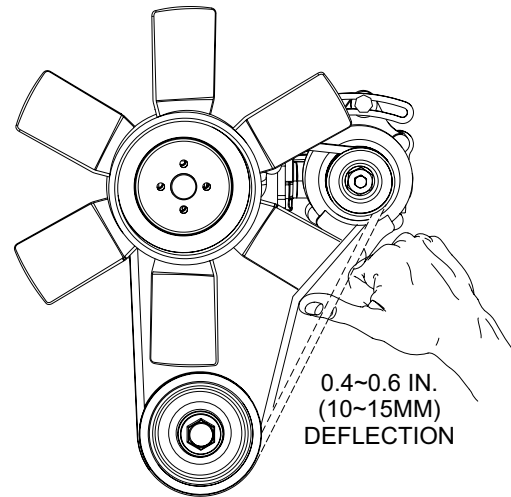


Figure 23. Fan Belt Tension

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 over fill. 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 battery with only recommended type battery. The battery type used in this generator is BCI Group 24R (CCA:620).

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 24) are properly connected to the battery terminals as shown below. **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 negative terminal **LAST**.

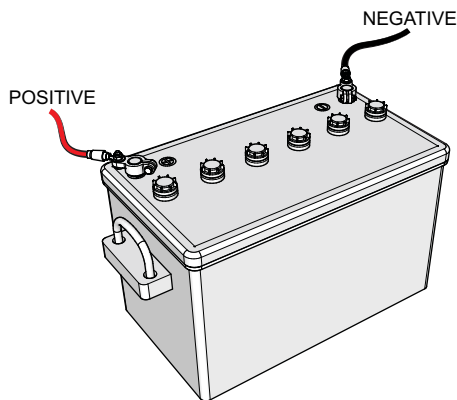


Figure 24. Battery

When connecting the battery do the following:

Place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

NOTICE

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

NOTICE

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

ALTERNATOR

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

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

WIRING

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

PIPING AND HOSE CONNECTIONS

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

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

OUTPUT TERMINAL PANEL FAMILIARIZATION

OUTPUT TERMINAL PANEL

The Output Terminal Panel (Figure 25) shown below is located just below the control panel at the front of the generator. Lift up on the cover to gain access to terminal lugs.

NOTICE

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

NOTICE

Output Terminal Bolt Torque: 65.0 lbf·in (7.4 N·m)

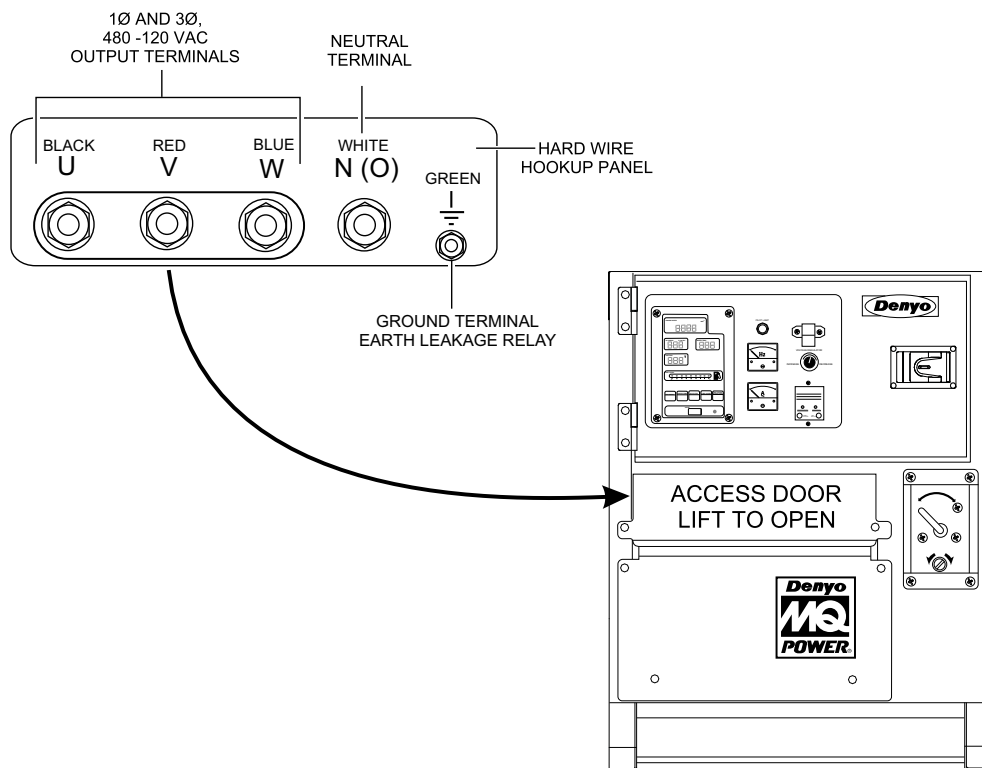


Figure 25. Output Terminal Panel

LOAD APPLICATION

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.

$$\text{WATTS} = \text{VOLTAGE} \times \text{AMPERAGE}$$

The power factor of this generator (single phase) is 1.0. See Table 9 below when connecting loads.

Table 9. 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 10. 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:

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

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 10.

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.

GENERATOR OUTPUTS

GENERATOR OUTPUT VOLTAGES

A wide range of voltages are available for many different applications. Reference Table 11, Table 13 and Table 13.

Frequency	Voltage Change-Over Board 3-Phase 200/220V Configuration	Voltage Change-Over Board 3-Phase 400/440 Configuration
50 Hz	190 ~220V	380 ~440V
60 Hz	200 ~240V	380 ~480V

UVW Output Terminal Lugs	Voltage Change-Over Board 3-Phase 200/220 Configuration			Voltage Change-Over Board 3-Phase 400/440 Configuration		
	208V	220V	240V	416V	440V	480V
3Ø Line-Line						
1Ø Line-Neutral	120V	127V	139V	240V	254V	277V
Voltage Change-Over Board 200/220V Configuration (1Ø)						
1Ø Line-Neutral/ Line-Line	120V Line-Neutral	N/A	N/A	240V Line-Line	N/A	N/A

UVW Output Terminal Lugs	50 Hz				60 HZ			
	kVA	kW	Rated Voltage (V)	Rated Current (A)	kVA	kW	Rated Voltage (V)	Rated Current (A)
Rated Output	20	16	190/380	60.8/30.4	25	16	190/380	123/61.5
Rated Output	20	16	400	28.9	25	20	200/400	124/62.1
Rated Output	20	16	415	27.8	25	20	440	59
Rated Output	20	16	220/440	52.5/26.2	25	20	240/480	108/54.1

Voltage Change-Over Board

Voltages are selected by configuring the **voltage change-over board** (Figure 27), which is located inside the control box behind the generator control panel. This board has been provided for ease of voltage selection.

The generator is shipped from the factory for 200/220 VAC operation.

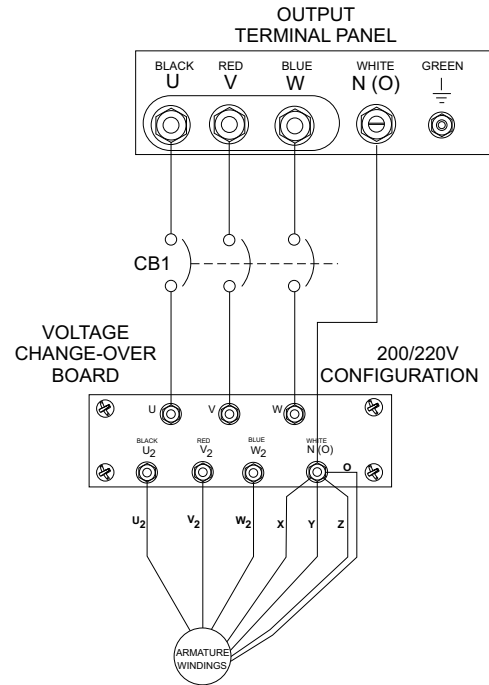


Figure 27. Voltage Change-Over Board



CAUTION

NEVER change the configuration of the **voltage change-over board** while the engine is running. **ALWAYS** place the circuit breaker in the **OFF** position before selecting desired voltage.

Voltage Regulator

To obtain some of the voltages listed in Table 13 will require a fine voltage adjustment using the **voltage regulator** (Figure 28) located on the control panel.



Figure 28. Voltage Regulator

OUTPUT TERMINAL PANEL CONNECTIONS

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 configuration of the **Voltage Change-Over Board** and the adjustment of the **Voltage Regulator**.

Remember the voltage change-over board 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 65.0 lbf·in (7.4 N·m).

3Ø-240V UVWO Terminal Output Voltages

1. Configure the Voltage Change-Over Board for 3Ø 200/220 output voltage as shown in Figure 29.

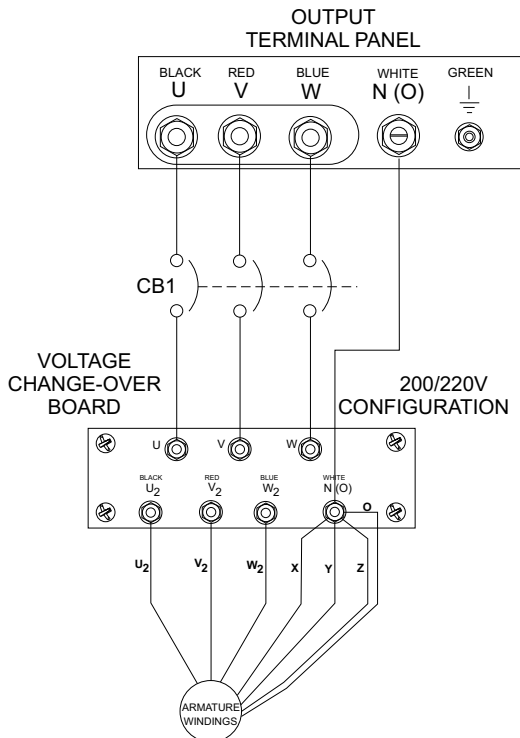


Figure 29. Voltage Change-Over Board 3Ø-240 Configuration

2. Connect the load wires to the UVWO terminals as shown in Figure 30.

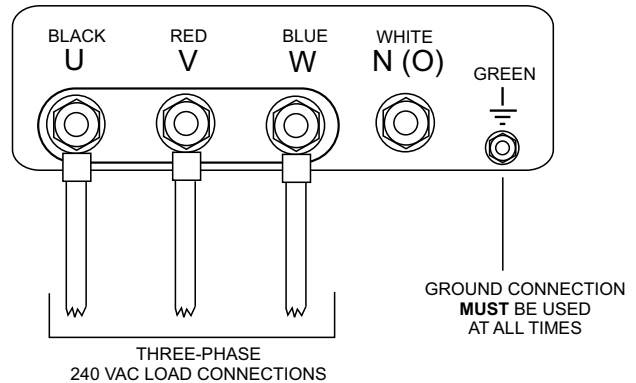


Figure 30. UVWO Terminal Lugs 3Ø-240 Connections

3. Turn the voltage regulator (Figure 31) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use the voltage regulator whenever fine tuning of the output voltage is required.



Figure 31. Voltage Regulator

OUTPUT TERMINAL PANEL CONNECTIONS

3Ø-480 UVWO Terminal Output Voltages

1. Configure the Voltage Change-Over Board for 3Ø 480 voltage output as shown in Figure 32.

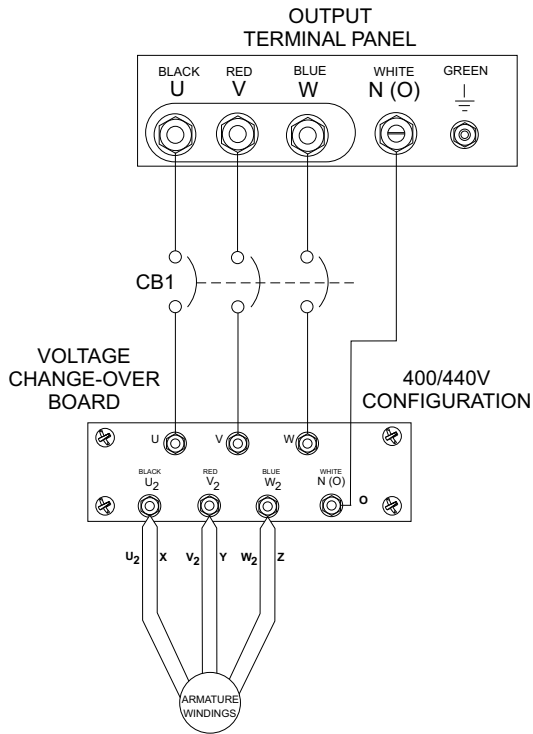


Figure 32. Voltage Change-Over Board 3Ø-480 Configuration

2. Connect the load wires to the UVWO terminals as shown in Figure 33.

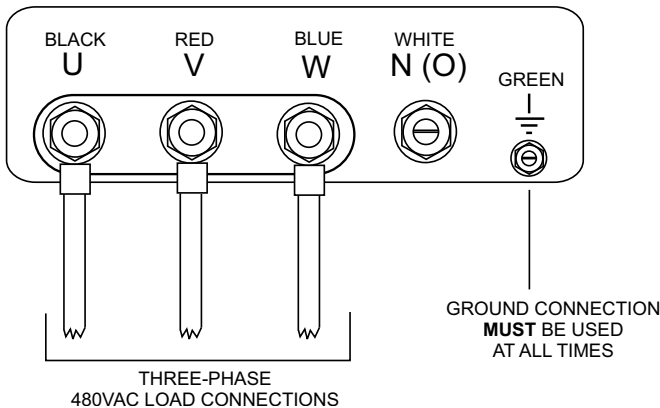


Figure 33. UVWO Terminal Lugs 3Ø-480 Connections

1Ø-120V UVWO Terminal Output Voltages

NOTICE

To obtain single-phase 120V output voltage, the voltage change-over board must be configured for 3-phase 200/220 volt (Figure 29).

1. Configure the Voltage Change-Over Board for 3Ø 200/220 output voltage as shown in Figure 29.
2. Connect the load wires to the UVWO terminals as shown in Figure 34.

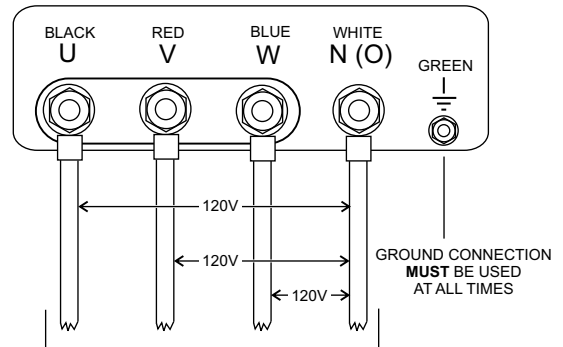


Figure 34. UVWO Terminal Lugs 1Ø-120V Connections

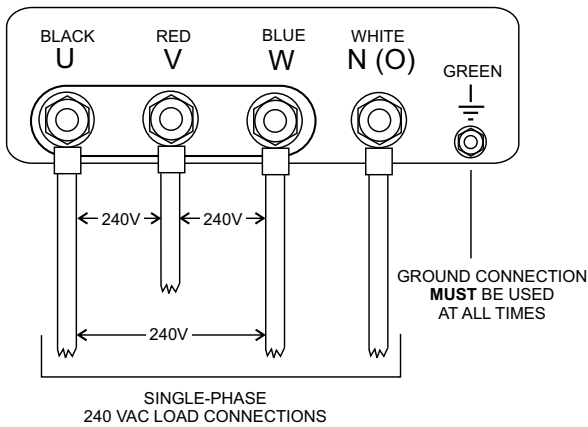
3. Turn the voltage regulator (Figure 31) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use the voltage regulator whenever fine tuning of the output voltage is required.

1Ø-240V UVWO Terminal Output Voltages

NOTICE

To obtain single-phase 240 output voltage, the voltage change-over board must be configured for 3-phase 200/220 volt (Figure 29).

1. Configure the Voltage Change-Over Board for 3Ø 200/220 output voltage as shown in Figure 29.
2. Connect the load wires to the UVWO terminals as shown in Figure 35.



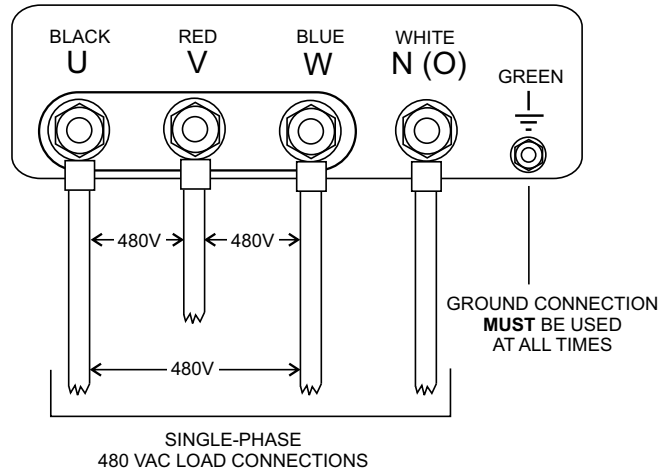
**Figure 35. UVWO Terminal Lugs
1Ø-240V Connections**

1Ø-480V UVWO Terminal Output Voltages

NOTICE

To obtain single-phase 480 output voltage, the voltage change-over board must be configured for 3-phase 400/440 volt (Figure 32).

1. Configure the Voltage Change-Over Board for 3Ø 400/440 output voltage as shown in Figure 32.
2. Connect the load wires to the UVWO terminals as shown in Figure 36.



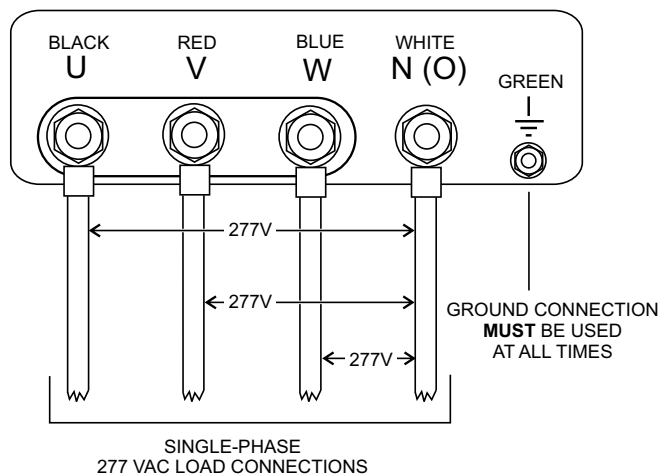
**Figure 36. UVWO Terminal Lugs
1Ø-480V Connections**

1Ø-277V UVWO Terminal Output Voltages

NOTICE

To obtain single-phase 277 output voltage, the voltage change-over board must be configured for 3-phase 400/440 volt (Figure 32).

1. Configure the Voltage Change-Over Board for 3Ø 400/440 output voltage as shown in Figure 32.
2. Connect the load wires to the UVWO terminals as shown in Figure 37



**Figure 37. UVWO Terminal Lugs
1Ø-277V Connections**

GENERATOR START-UP PROCEDURE

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* circuit breaker in the **ON** (closed) position.

1. Place the **main**, circuit breaker (Figure 38) in the **OFF** position prior to starting the engine.

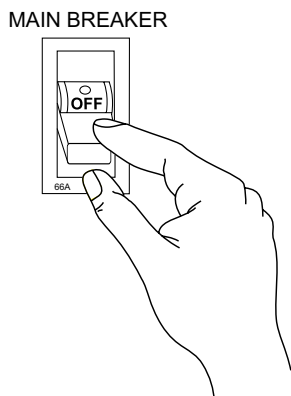


Figure 38. Main Circuit Breaker (OFF)

2. Make sure the **voltage change-over board** has been configured for the desired output voltage. Reference Figure 29 and Figure 32.

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 65.0 lbf·in (7.4 N·m).

3. Make sure all loads have been properly secured to the output terminal panel
4. Open the cabinet door where the fuel tank is located and place the fuel valve lever (Figure 39) in the **OPEN** position.

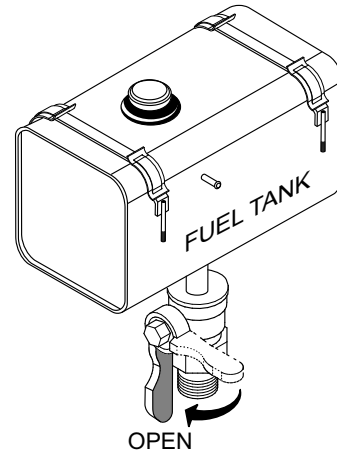
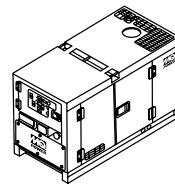
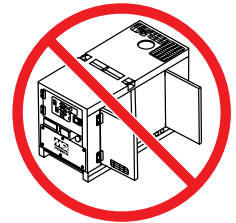


Figure 39. Fuel Valve Lever (Open)

5. Close all engine enclosure doors (Figure 40).



CORRECT



INCORRECT

Figure 40. Engine Enclosure Doors

6. Place **throttle lever** (Figure 41) in the start idling position.

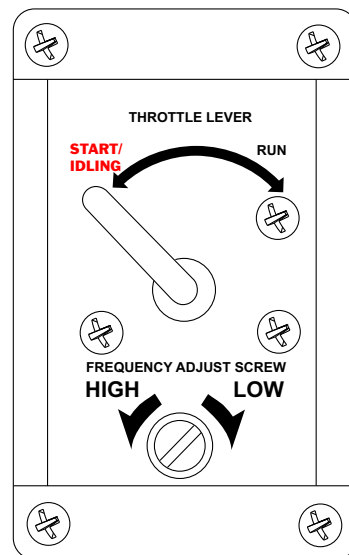


Figure 41. Throttle Lever (Start/Idling Position)

GENERATOR START-UP PROCEDURE

STARTING

NOTICE

In cold weather conditions pre-heating of the glow plugs will be required. When the ignition key is placed in the **RUN** position the Pre-Heat lamp will turn **ON** automatically indicating that the pre-heating process has started. The engine will start automatically after pre-heating.

1. Insert the ignition key (Figure 42) into the **starter switch** and turn the key clockwise to the **START** position.

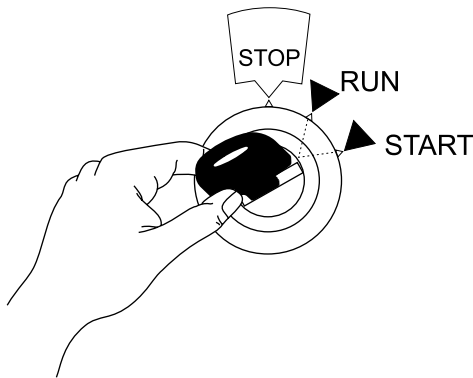


Figure 42. Starter Switch (Start Position)

2. In **warm** weather conditions the engine will start when the key is released to the **RUN** position.
3. In **cold** weather conditions with the ignition key placed in **RUN** position, the pre-heat lamp (Figure 43) will turn on (**RED**) indicating pre-heating of the glow plugs is underway. When the pre-heat lamp turns **OFF** the engine will start automatically.

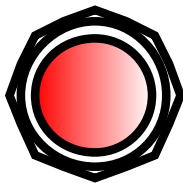


Figure 43. Pre-Heat Lamp

4. 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. If any abnormalities exist, shut down the engine and correct the problem.

5. After the engine has been warmed, verify that the engine oil pressure warning lamp is **OFF**.

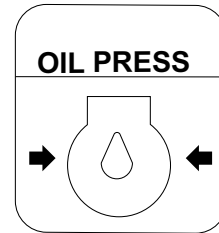


Figure 44. Oil Pressure Lamp (OFF)

6. After the engine warmup process has been completed, place the **throttle lever** in the **RUN** position (Figure 45). Reference Table 14 for desired engine speed versus frequency.

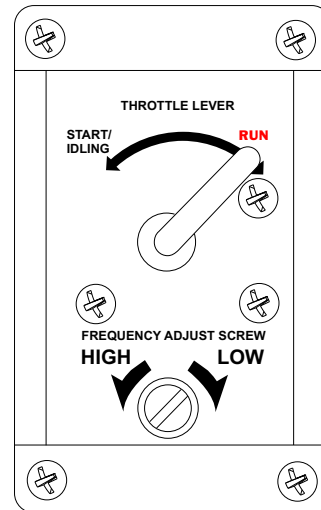


Figure 45. Throttle Lever (Run Position)

Table 14. Frequency vs. Idle Speed	
Comercial Frequency	Engine Speed
50 Hz	52.5 Hz (1,575 rpm)
60 Hz	62.5 (1,875 rpm)

GENERATOR START-UP PROCEDURE

7. The generator's **frequency meter** (Figure 46) should be displaying the 50 or 60-cycle output frequency in **HERTZ**.

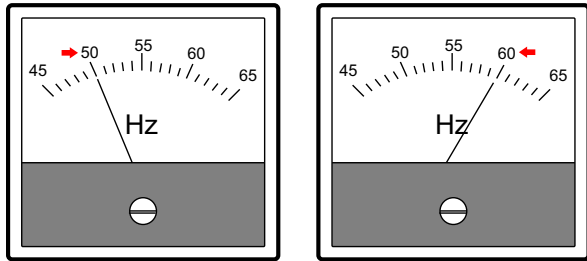


Figure 46. 50/60 Hz Frequency Meters

8. Use the frequency adjustment screw to obtain the desired frequency.

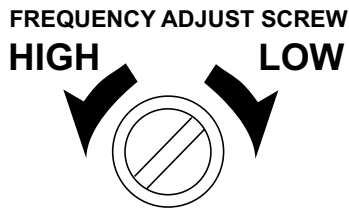


Figure 47. Frequency Adjust Screw

9. The generator's **AC voltmeter** (Figure 48) will display the generator's output in **VOLTS**.

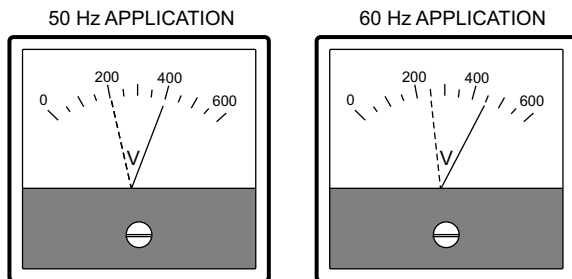


Figure 48. Voltmeter (50/60 Hz Application)

10. If the voltage is not within the specified tolerance, use the **voltage regulator** (Figure 49) to increase or decrease the desired voltage.

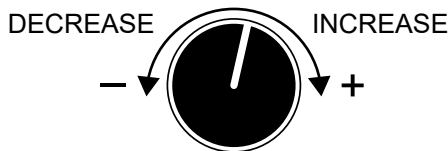


Figure 49. Voltage Regulator

11. The **ammeter** (Figure 50) 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.

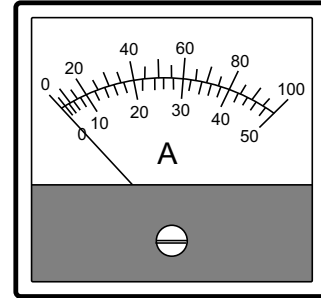


Figure 50. Ammeter (No Load)

12. The **engine oil display** (Figure 51) will indicate the oil pressure of the engine. Under normal operating conditions the oil pressure should be approximately 50 psi (345 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 51. Oil Pressure Display

13. The **coolant temperature gauge** (Figure 52) will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be approximately 180°F (82°C).

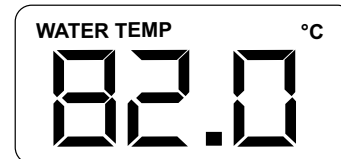


Figure 52. Coolant Temperature Display

GENERATOR START-UP/SHUTDOWN PROCEDURES

14. The **engine speed** display (Figure 53) will indicate the speed of the engine in **RPM**. Under normal operating conditions this speed is approximately 1,500 rpm (50 Hz) or 1,800 rpm (60 Hz).



Figure 53. Engine Tachometer

15. Place the **main** circuit breaker in the **ON** position (Figure 54).

MAIN BREAKER

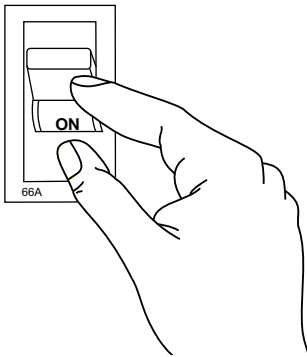


Figure 54. Main Circuit Breaker (ON)

16. Observe the generator's ammeter (Figure 55) 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.

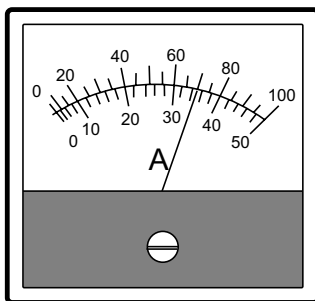


Figure 55. Ammeter (Load)

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

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 breaker** in the **OFF** position (Figure 56).

MAIN BREAKER

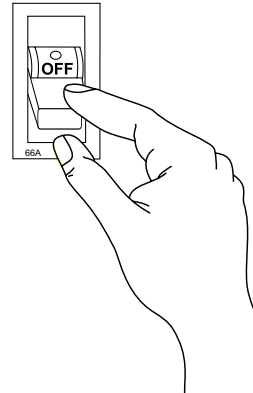


Figure 56. Main Circuit Breaker (OFF Position)

3. Place **throttle lever** (Figure 57) in the start idling position.

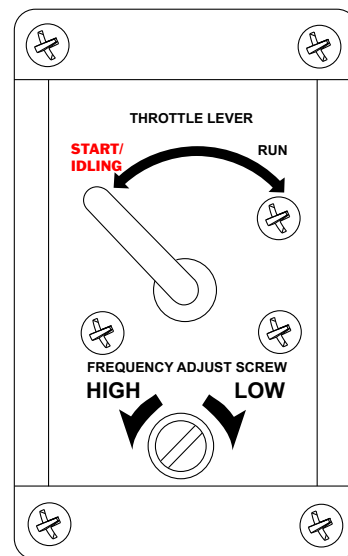


Figure 57. Throttle Lever (Start/Idling Position)

GENERATOR SHUTDOWN PROCEDURE

- Let the engine cool by running it for 3–5 minutes with no load applied.
- Place the ignition key (Figure 58) in the **STOP** position.

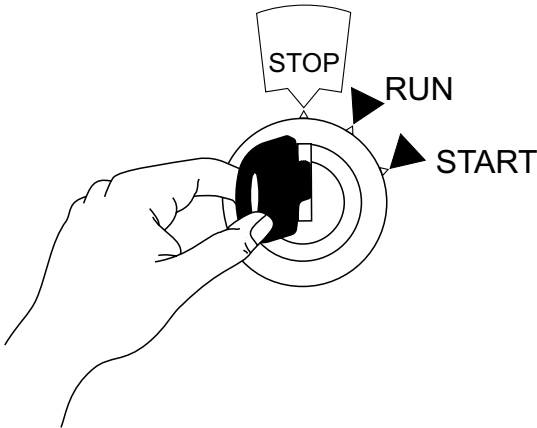


Figure 58. Starter Switch (Stop Position)

- Open the cabinet door where the fuel tank is located and place the fuel valve lever (Figure 59) in the **CLOSED** position.

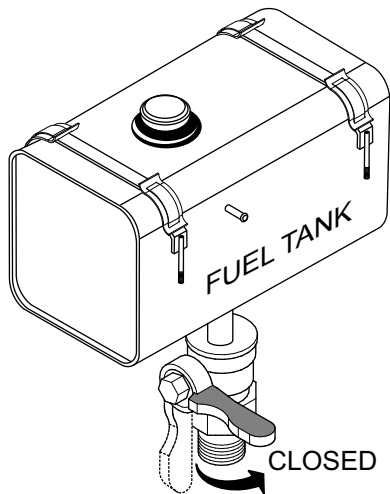


Figure 59. Fuel Valve Lever (Closed)

- Close cabinet door.
- Next, 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.

- To stop the engine in the event of an emergency, press the **Emergency Stop switch** (Figure 60), located just below the engine indicator panel.

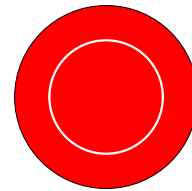




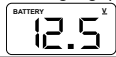
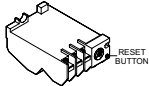
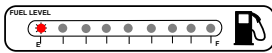


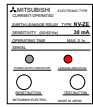



Figure 60. Emergency Stop Switch

- Place the **main circuit breaker** in the **OFF** position as shown in Figure 56.
- 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 can not be restarted until the contact is released (closed)

ENGINE SHUTDOWN DEVICES

Table 15. Automatic Engine Shutdown System

Warning Lamp	Circuit Breaker OFF	Engine Shutdown YES/NO	Operating Condition/ Set Point
Oil Pressure (Flashing-Red) 	—	NO	Set point 18.8 psi (130 kPa)
Oil Pressure (ON-Red) 	—	YES	Set point 14.2 (98.1 kPa)
High Coolant Temp. (Flashing-Red) 	—	NO	Set point 206°F (97°C)
High Coolant Temp. (ON-Red) 	—	YES	Set point 230°F (110°C)
Battery Charging (Flashing) 	—	YES	Set point 12.5V
Over Current Relay 	YES	NO	Set point 3 Amps Press reset button to re-activate
Low Fuel Level 	—	—	Set point: 5.28 gal. (20 liters)
Fuel Water Level 	—	—	Excessive amount of water in fuel strainer. Drain strainer
Air Filter Restriction. 	—	—	Air flow is restricted Replace or clean air filter.
Earth Leakage Relay (Red) 	YES	—	Set point 30mA Circuit breaker trips automatically. Press reset button to re-activate
Over Speed 	—	YES	Set point: 2,070 rpm

MAINTENANCE

Table 16. Inspection/Maintenance		10 Hours or Daily	Every 250 Hours	Every 500 Hours or 12 Months	Every 1,000 Hours or 36 Months	Other
Engine	Check Engine Oil and Coolant Levels	X				
	Check Fuel Filter/Water Separator Bowl	X				
	Check Air Cleaner	X				
	Check Air Cleaner Element	X				
	Check for Leaks/Hoses/Clamps	X				
	Check for Loosening of Parts	X				
	Drain Water in Fuel	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				
	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					3,000 hours
	Test Glow Plugs					3,000 hours
	Flush and Refill Cooling System					2,000 hr. or 2 yr.
	Clean Inside of Fuel Tank				X	
	Replace Air Cleaner Elements * 3					As Required
	Check Battery Acid Level	X				
Drain Environmental Tank		X				
Check All Hoses and Clamps				X		
Generator	Measure Insulation Resistance Over 3M Ohms		X			
	Check Rotor Rear Support Bearing			X		
	Check Earth Leakage Relay	X				
Complete Machine	Inspect Acoustic Insulation			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 Add supplemental coolant additives (SCAs) to recharge the engine coolant.

*3 Replace the primary air filter element when the restriction indicator shows a vacuum of 625 mm (25 in. H₂O).

*4 If the blowby hose needs to be replaced, ensure that the slope of the blowby hose is at least 1/2 inch per foot, with no sags or dips that could collect moisture and/or oil.

*5 Accumulation of carbon (soot, unburned fuel) in the exhaust pipeline and muffler could cause not only system derates but also could lead to a 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 generated easier when the unit operates at less than 40% of rated power. In this case, perform the above procedures at a shorter interval time.

*6 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 **apply the load gradually** and observe the exhaust gas color (colorless) during the process.

*7 Fire or sparks may be emitted 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 16 as a general inspection and maintenance guideline. For more detailed engine maintenance instructions, refer to the engine owner's manual.

ENGINE AIR CLEANER

The air cleaner (Figure 61) included with this Isuzu diesel engine is equipped with a replaceable, high-density, paper air filter element. Check the air cleaner daily or before starting the engine. Replace the air cleaner paper filter element 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.

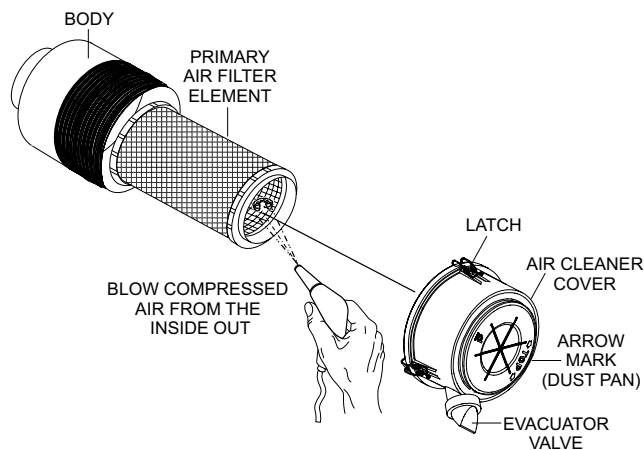


Figure 61. Engine Air Cleaner

Air Cleaner Element (Paper Air Filter)

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 61).
2. Remove the **air cleaner cover** (Figure 61) and set it aside.
3. Next, remove the **air cleaner element** (Figure 61).
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 **element** (paper air filter) as shown in Figure 61, 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. Replace element if it is damaged or excessively dirty.
7. Clean the inside of the **air cleaner body** (Figure 61).
8. Reinstall the air filter element back into the air cleaner body.
9. 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 Dust Sensor

The air cleaner is equipped with a **dust sensor** (Figure 62). This sensor monitors air intake to prevent particulate damage to the engine.

As the air cleaner element becomes clogged, air intake restriction increases and the dust sensor lamp turns on **RED**, indicating that the element needs to be replaced.

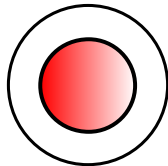


Figure 62. Air Cleaner Dust Sensor

NOTICE

The air cleaner element should not be changed until the dust sensor lamp turns **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. To discharge the fuel inside the fuel filter cartridge, open the **drain valve** on the fuel filter by turning the knob **counterclockwise** (Figure 63A) approximately 3½ turns until the valve drops down 1 inch (25.4 mm) and draining occurs (Figure 63B).

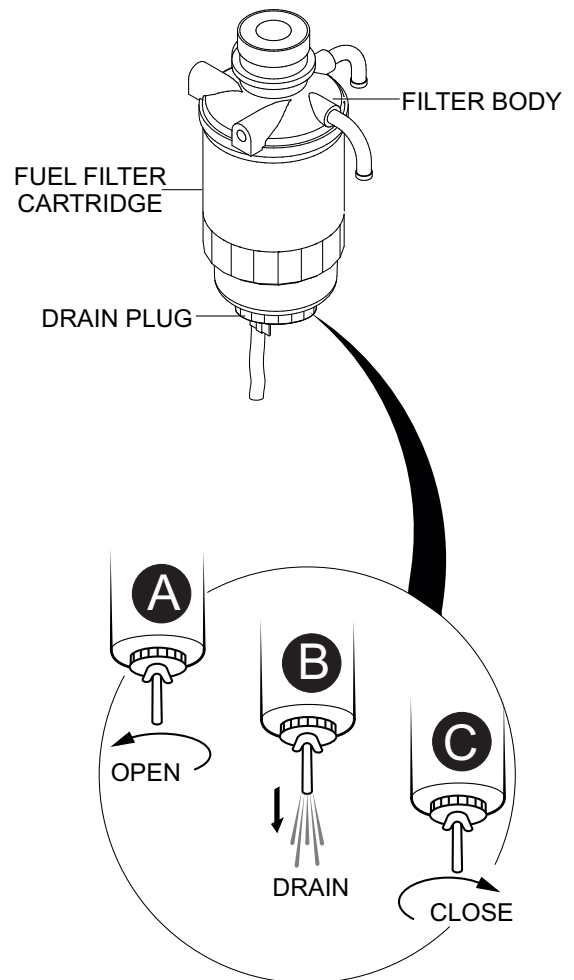


Figure 63. Draining The Fuel Filter

2. Let the residue or foreign substances inside the fuel filter flow into a suitable container.
3. At completion of draining, close the drain valve (Figure 63C).

Fuel Filter Cleaning

1. Using a filter wrench, remove the **cartridge** from the fuel filter body (Figure 64).

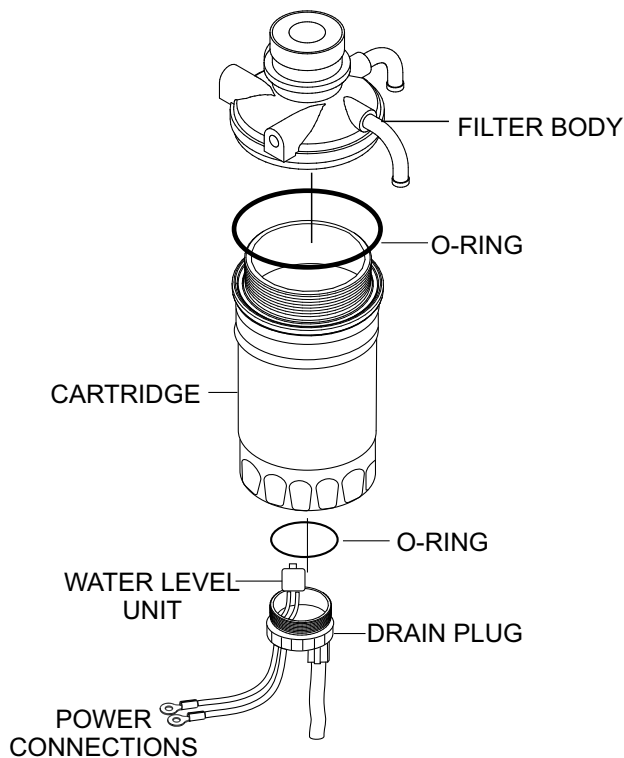


Figure 64. Fuel Filter Replacement

2. Wipe the inside of the **filter body** and **cartridge** (Figure 64) with a clean cloth to remove any foreign matter or debris that may have accumulated.
3. Replace both **O-rings**. Coat each O-ring with a small amount of clean 15W-40 engine oil.
4. Reinstall the cartridge first by hand until it makes contact with the fuel filter body surface.
5. Torque the cartridge to 22.4 lbf-ft (30 N·m).
6. Torque the drain plug to 1.4 lbf-ft (2.0 N·m).
7. Remove the air from the fuel system. Refer to **Bleeding the Fuel System** in the Isuzu engine owner's manual.

ELECTROMAGNETIC FUEL PUMP (500 HOURS)

The filter inside the **electromagnetic fuel pump** (Figure 65) is either a paper type or steel mesh type depending on the fuel pump type. Clean or replace the fuel pump filter as follows:

1. Disconnect any electrical connections that are attached to the fuel pump.
2. Prepare a fuel collector to drain the fuel into. Secure any fuel lines to prevent fuel from spilling.
3. Remove the fuel pump from the generator enclosure.
4. Remove the **filter** and **gaskets** (Figure 65) from the fuel pump housing.

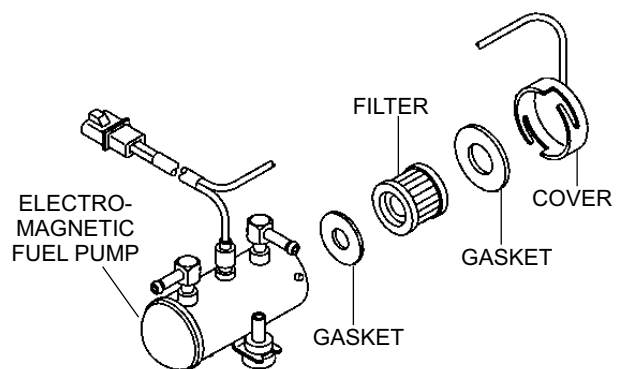


Figure 65. Electromagnetic Fuel Pump

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.

CLEANING INSIDE THE FUEL TANK

If necessary, drain the fuel inside the fuel tank completely. Using a **spray washer** (Figure 66), wash out any deposits or debris that have accumulated inside the fuel tank.



Figure 66. Cleaning The Fuel Tank

FUEL TANK INSPECTION

In addition to cleaning the fuel tank, inspect the following components for wear:

- **Rubber Tank Pads/Straps** — 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).
2. Turn the engine **OFF**.
3. Remove the oil **dipstick** from its holder.

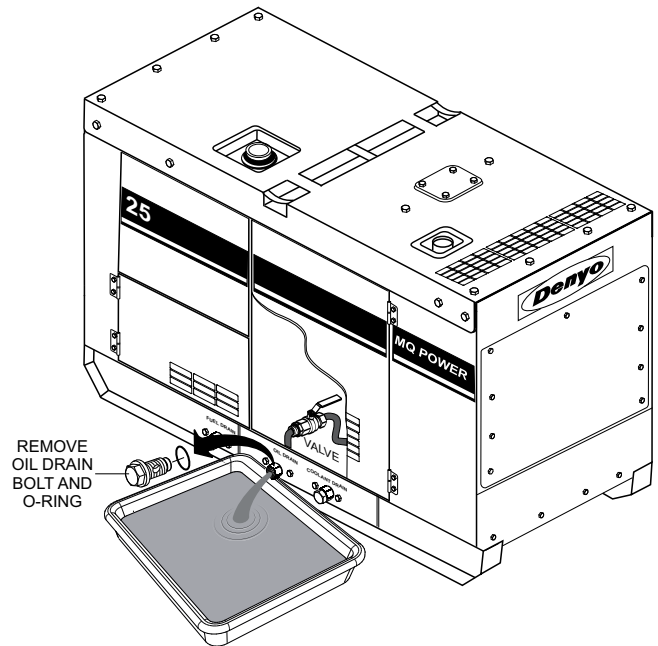


Figure 67. Draining The Engine Oil

4. Remove the **oil drain bolt and O-ring** (Figure 67).
5. Place the oil drain valve in the **OPEN** position and allow the oil to drain into a suitable container.
6. After the engine oil has completely drained, reinstall the oil **oil drain bolt and O-ring**. Tighten securely.
7. Place the oil drain valve in the closed position.
8. Reinstall the oil **dipstick** back into its holder.

ENGINE OIL FILTER REPLACEMENT

1. Clean the area around the oil filter head.
2. Using an **oil filter wrench** (Figure 68), remove the engine oil filter.

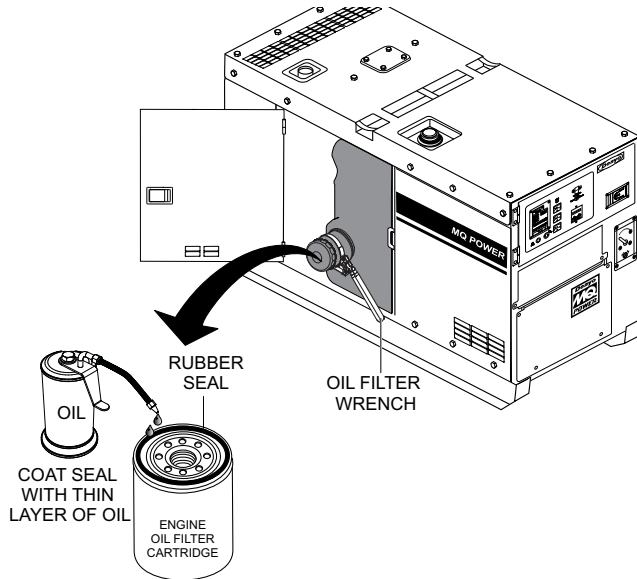


Figure 68. Oil Filter Replacement

3. Coat the rubber seal (gasket) surface of the new oil filter with clean 15W-40 engine oil (Figure 68).
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 a filter wrench.
5. Fill the engine crankcase with high-quality detergent oil classified "For Service CI-4." Fill to the upper limit of the dipstick. **DO NOT** overfill. Refer to Table 2 for engine oil capacity.
6. Run the engine for several minutes. Watch for oil leakage. Shut the engine down and allow it to sit for several minutes. Top off the oil to the upper limit on the dipstick.

DRAINING 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 69) only when the coolant temperature is below 120°F (50°C).

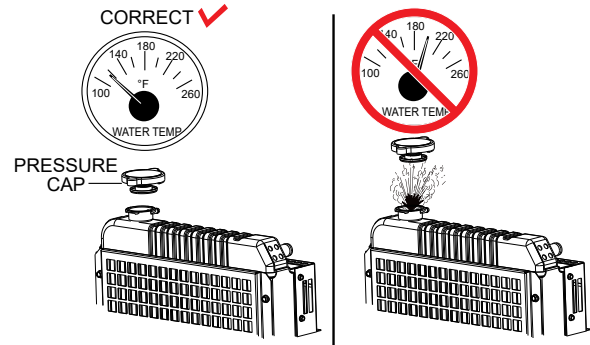


Figure 69. Radiator Pressure Cap Removal

2. Remove the **coolant drain bolt and O-ring** (Figure 70), then allow the coolant to drain into a suitable container.

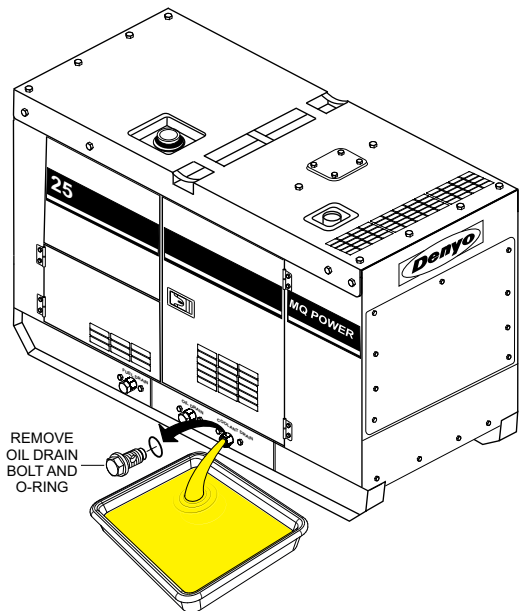


Figure 70. Draining The Engine Coolant

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

RADIATOR CLEANING

The radiator (Figure 71) should be spray-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 71. Cleaning The Radiator

DRIVE BELT

Drive Belt Tension

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

Drive Belt Inspection

1. Inspect the **drive belt** (Figure 72) for damage and wear. Horizontal cracks (across the belt) are acceptable. Vertical cracks (direction of belt ribs) that intersect with horizontal cracks are not acceptable.

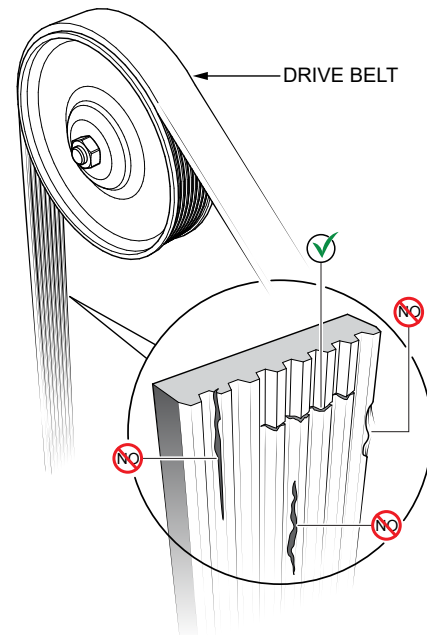


Figure 72. Drive Belt Inspection

2. 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.
3. If the drive belt exhibits any of the above wear conditions, replace it immediately.

BOOSTER/JUMPER CABLES

The following procedure outline the steps when connecting booster cables to the air compressor's battery.

1. Connect one end of the booster cable with the **RED** clamp (Figure 73) to the positive terminal on the generator's battery.

Connecting Booster Cables

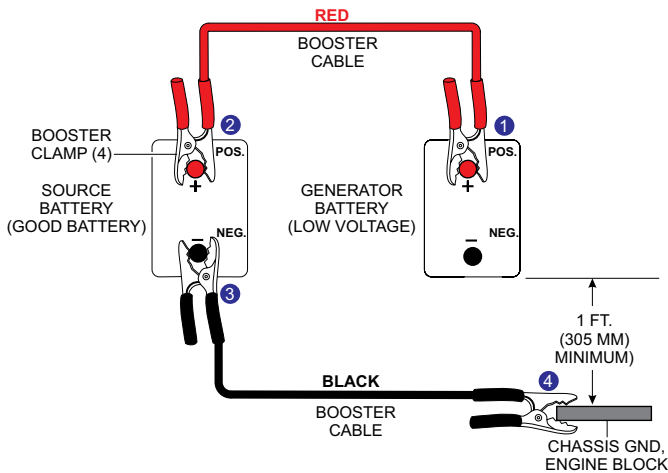


Figure 73. Connecting Booster Cables

2. Connect the other end of the booster cable with the **RED** clamp to the positive terminal on the source battery (working good battery).
3. Next, connect one end of the booster cable with the **BLACK** clamp to the negative terminal on the source battery.
4. Connect the other end of the booster cable with the **BLACK** clamp to the negative ground point (chassis ground/frame) on the generator.

REMOVAL OF BOOSTER/JUMPER CABLES

The following procedure outline the steps when removing booster cables from the air compressor's battery.

1. Remove the booster cable with the **BLACK** clamp (Figure 74) from the negative ground point (chassis ground/frame) on the generator.

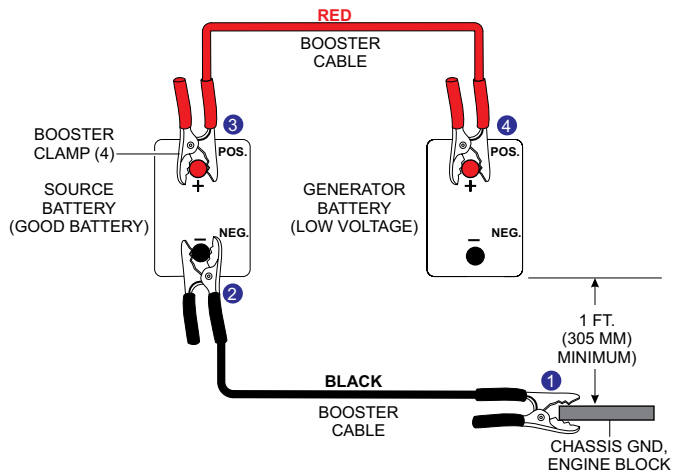


Figure 74. Removing Booster Cables

2. Next, remove the other end of the booster cable with the **BLACK** clamp from the negative terminal on the source battery.
3. Remove the booster cable with the **RED** clamp from the positive terminal on the source battery.
4. Last, remove the other end of the booster cable with the **RED** clamp from the positive terminal on the generator.

EARTH LEAKAGE RELAY TESTING

The earth leakage relay should always be tested before using the generator.

Testing Procedure

1. Start generator as referenced in the start-up procedure in this manual.
2. Make sure all circuit breakers on the load side are in the **OFF** position or disconnect loads from the **UVW** terminals.
3. Place main circuit breaker (Figure 75) to **ON** position.

MAIN BREAKER

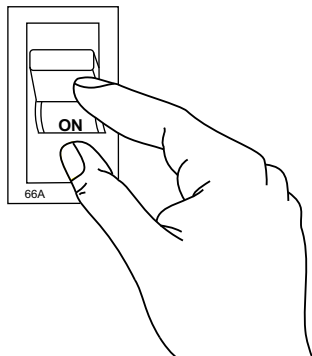


Figure 75. Main Circuit Breaker On

4. Press the **TEST** button (Figure 76) on the earth leakage relay and verify that the leakage indicator lamp turns on **RED**.

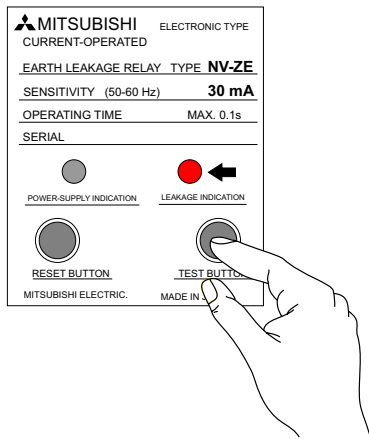


Figure 76. Earth Leakage Relay (Test Button)

5. Verify that the **main circuit** breaker (Figure 77) **trips** automatically to the **OFF** position.

MAIN BREAKER

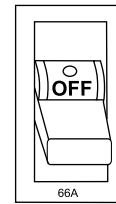


Figure 77. Main Breaker Tripped

6. If the main breaker **trips** when the test button on the earth leakage relay is pressed, it can be assumed that the relay is functioning correctly.
7. Next, press the **RESET** button on the earth leakage relay to return the relay back to its active state.

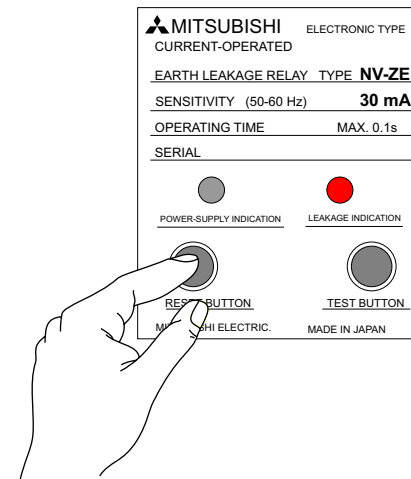


Figure 78. Earth Leakage Relay (Reset Button)

8. Place the main breaker (Figure 75) back to the ON position.

TROUBLESHOOTING (GENERATOR)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 17 for diagnosis of the generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 17. Generator Troubleshooting		
Symptom	Possible Problem	Solution
No Voltage Output	Defective AC voltmeter?	Check output voltage and replace if necessary.
	Loose wiring connection?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
	Defective rotating rectifier?	Check and replace.
Low Voltage Output	Loose wiring connection?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
High Voltage Output	Loose wiring connection?	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.
Voltmeter will not operate	Defective AVR?	Check. Replace if necessary.
	Defective ZNR?	Replace.
	Defective rotary rectifier?	Replace.
	Disconnected rotor wiring?	Check and repair.
	Burned generator wiring?	Check and repair.
Rated voltage cannot be reached	Voltmeter failure?	Replace.
	Defective AVR?	Check. Replace if necessary.
	Defective VR?	Replace.
	Defective rotary rectifier?	Replace.
	Burned generator wiring?	Check and repair.
	Low Engine speed?	Increase engine speed
Voltage goes too high	Defective AVR?	Check. Replace if necessary.
	Defective VR?	Replace.
Applied load causes voltage drop	Defective rotary rectifier?	Replace.
	Defective AVR?	Check. Replace if necessary.
	Burned main field and exciter field wiring?	Check and repair wiring
	Unbalanced load?	Balance load.

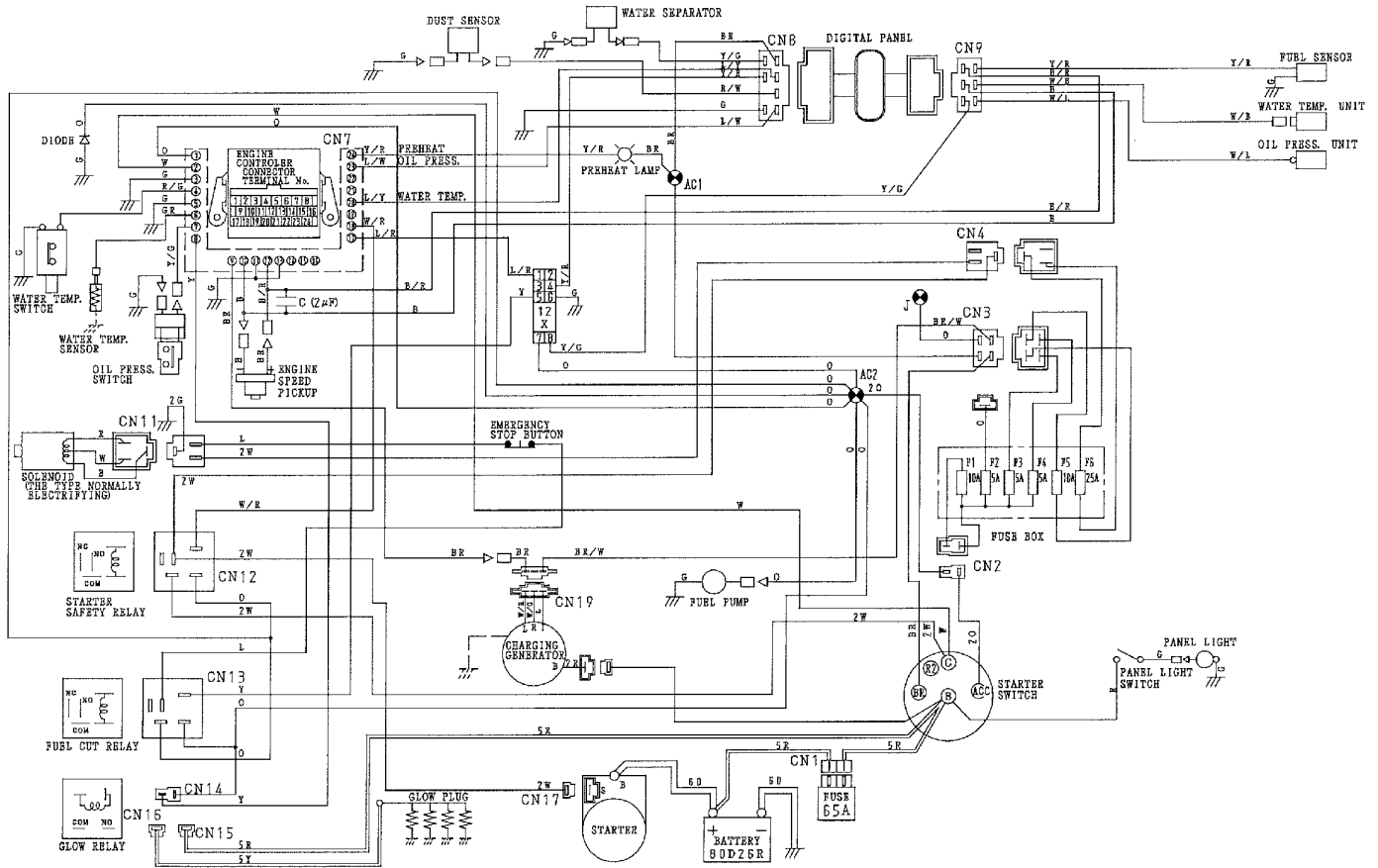
TROUBLESHOOTING (ENGINE)

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 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?	Replace fuel filter.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure that 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.

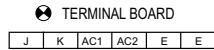
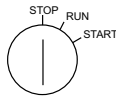
TROUBLESHOOTING (ENGINE)

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 uppermark on dipstick.
	Entire cooling air system contaminated/ 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.	

ENGINE WIRING DIAGRAM (B1844301244)



KEY CONNECTION DIAGRAM	
	STOP RUN START
STOP	B ACC R2 C BR
RUN	○ ○ ○ ○ ○
START	○ ○ ○ ○ ○



WIRE SIZE		COLOR CODE	
60: 60 MM ²	SYM.	WIRE COLOR	SYM. WIRE COLOR
5: 5 MM ²	B	BLACK	R RED
3: 3 MM ²	L	BLUE	W WHITE
2: 2 MM ²	BR	BROWN	Y YELLOW
	G	GREEN	LB LIGHT BLUE
	GR	GRAY	LG LIGHT GREEN
	V	VIOLET	O ORANGE
NO MARK WIRE SIZE: 1.25 MM ²	P	PINK	

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

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