

OPERATION MANUAL



WHISPERWATT™ SERIES MODEL DCA40SSKU4F2 60 Hz GENERATOR (KUBOTA V2403-CR-TIE4BG DIESEL ENGINE)

INSTRUCTION MANUAL NO. M1844300204

Revision #2 (08/30/22)

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THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.

PROPOSITION 65 WARNING



DCA40SSKU4F2 60 Hz Generator

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NOTICE

Specifications are subject to change without notice.

SAFETY DECALS

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

NOTICE

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

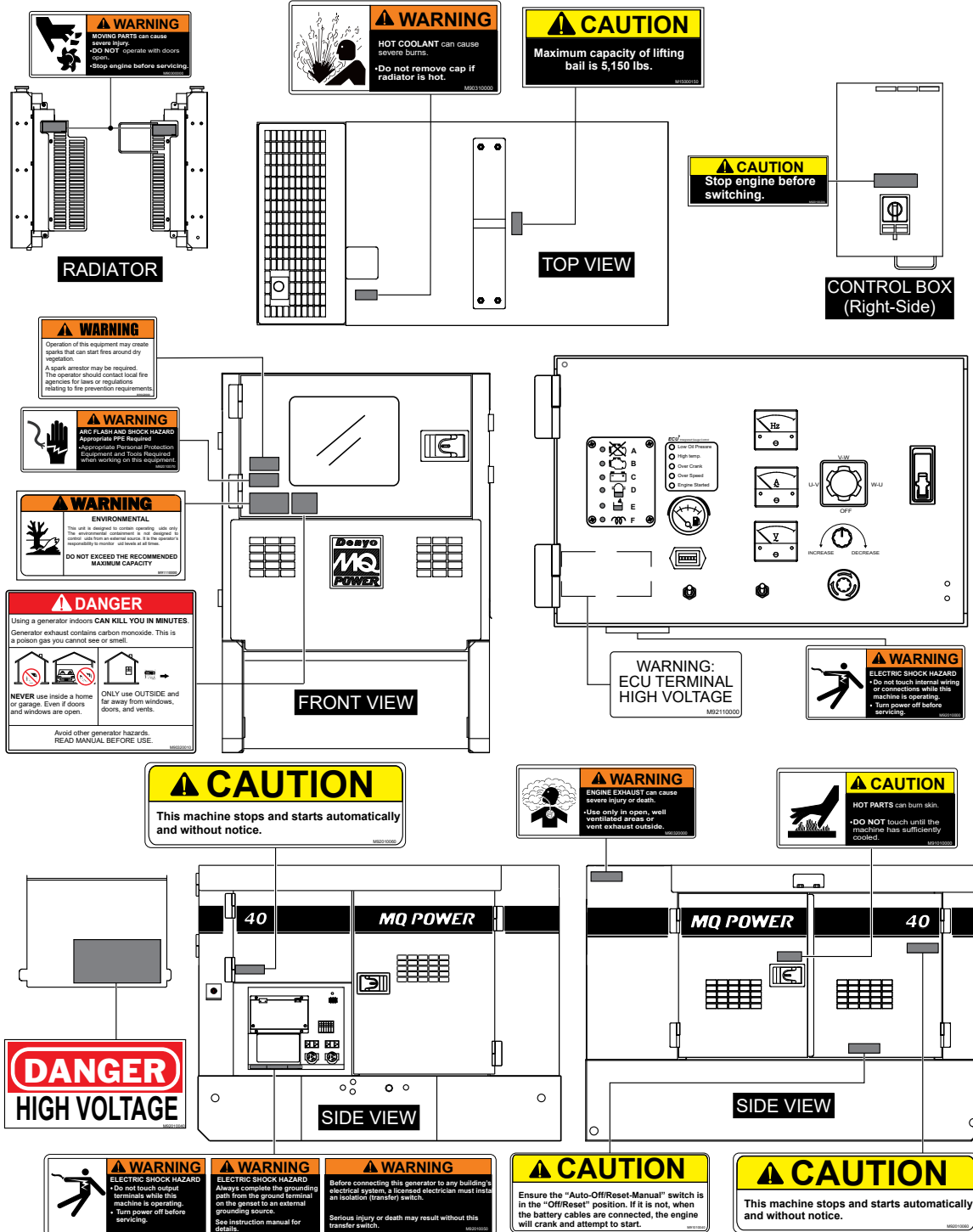


Figure 1. Safety Decals


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**.



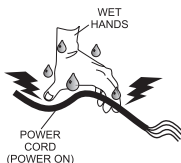
- Backfeed to a utility system can cause **electrocution** and/or property damage. **NEVER** connect the generator to a building's electrical system without a transfer switch or other approved device. All installations should be performed by a **licensed electrician** in accordance with all applicable 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 unrepairable safety risk due to wear or damage or is no longer cost effective to maintain (beyond life-cycle reliability) and is to be decommissioned (demolition and dismantlement), be sure to follow the rules below:

- **NEVER** pour waste or oil directly onto the ground, down a drain, or into any water source.
- Contact your country's Department of Public Works or recycling agency in your area and arrange for proper disposal of any electrical components, waste or oil associated with this equipment.
- When the life cycle of this equipment is over, remove the battery and bring it to an appropriate facility for lead reclamation. Use safety precautions when handling batteries that contain sulfuric acid.
- When the life cycle of this equipment is over, it is recommended that the frame and all other metal parts be sent to a recycling center.



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

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

EMISSIONS INFORMATION

NOTICE

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

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

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

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

Emission Control Label

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

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

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

SPECIFICATIONS

Table 1. Generator Specifications		
Model	DCA40SSKU4F2	
Type	Revolving field, protected type synchronous generator	
Armature Connection	Star with Neutral	Zigzag
Phase	3	1
Standby Output	30.2 kW (37.8 kVA)	27.3 kW
Prime Output	28.8 kW (36 kVA)	26 kW
3Ø Voltage (L-L/L-N) Voltage Selector Switch at 3Ø 240/139	208Y/120, 220Y/127, 240Y/139	N/A
3Ø Voltage (L-L/L-N) Voltage Selector Switch at 3Ø 480/277	416Y/240, 440Y/254, 480Y/277	N/A
1Ø Voltage (L-L/L-N) Voltage Selector Switch at 1Ø 240/120	N/A	240/120
Power Factor	0.8	1.0
Frequency	60 Hz	
Speed	1,800 rpm	
Aux. AC Power	Single phase, 60 Hz	
Subtransient	0.102	
Transient	0.224	
Synchronous	2.043	
Zero Sequence Reactance	0.011	
Overload Protection	OCR / main circuit breaker	
Aux. Voltage/Output	120V / 4.8 kW (2.4 kW × 2)	
Dry Weight	2,205 lb. (1,000 kg)	
Wet Weight	2,735 lb. (1,240 kg)	
Table 2. Engine Specifications		
Model	Kubota V2403-CR-TIE4BG, Tier 4 Final Certified	
Type	4-cycle, water-cooled, direct injection, turbocharged, air-to-air intercooler and cooled EGR	
No. of Cylinders	4	
Bore × Stroke	3.43 in. × 4.03 in. (87 mm × 102 mm)	
Displacement	149 cu. in. (2.43 liters)	
Rated Output	44.2 hp at 1,800 rpm	
Starting	Electric	
Coolant Capacity	4.75 gal. (18.0 liters) ¹	
Lube Oil Capacity	2.56 gal. (9.7 liters)	
Lube Oil Type	API service class CJ-4 or JASO DH-2	
Fuel Type	#2 diesel fuel (ultra low sulfur diesel fuel only)	
Fuel Tank Capacity	67.4 gal. (255 liters)	
Fuel Consumption	2.3 gal. (8.7 L)/hr. at full load	1.8 gal. (6.7 L)/hr. at 3/4 load
	1.3 gal. (5.1 L)/hr. at 1/2 load	0.8 gal. (3.0 L)/hr. at 1/4 load
Exhaust Gas After-Treatment System	DOC	
Battery	27 (CCA 0°F 800 A) × 1	

¹ Includes engine, radiator, reserve tank, and hoses

DIMENSIONS

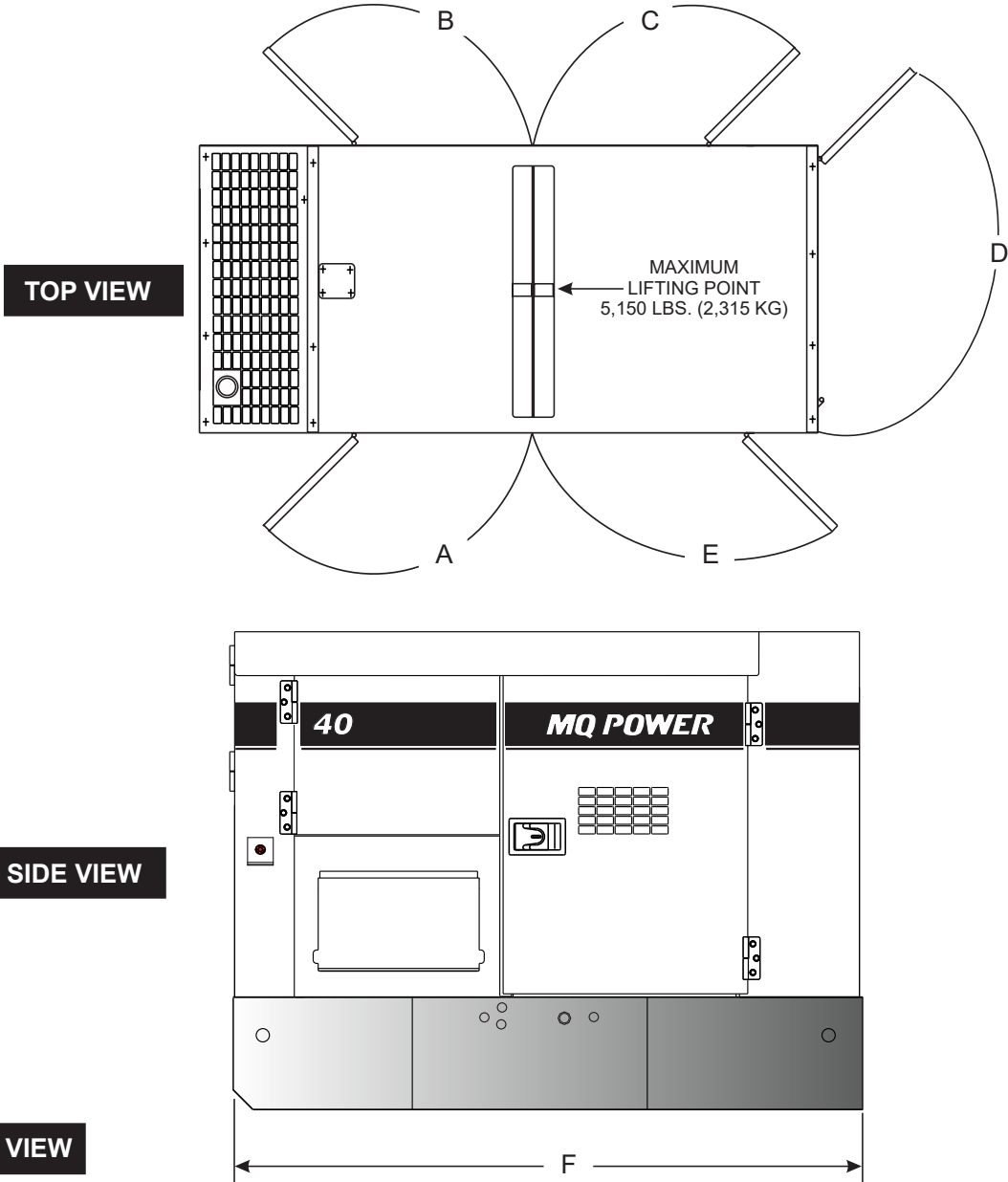


Figure 2. Dimensions

Table 3. Dimensions			
Reference Letter	Dimension in. (mm)	Reference Letter	Dimension in. (mm)
A	24.88 (632)	E	25.51 (648)
B	24.88 (632)	F	76.38 (1,940)
C	25.51 (648)	G	53.15 (1,350)
D	32.28 (820)	H	37.40 (950)

GENERATOR GROUNDING

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

NOTICE

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

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

Connecting The Ground

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

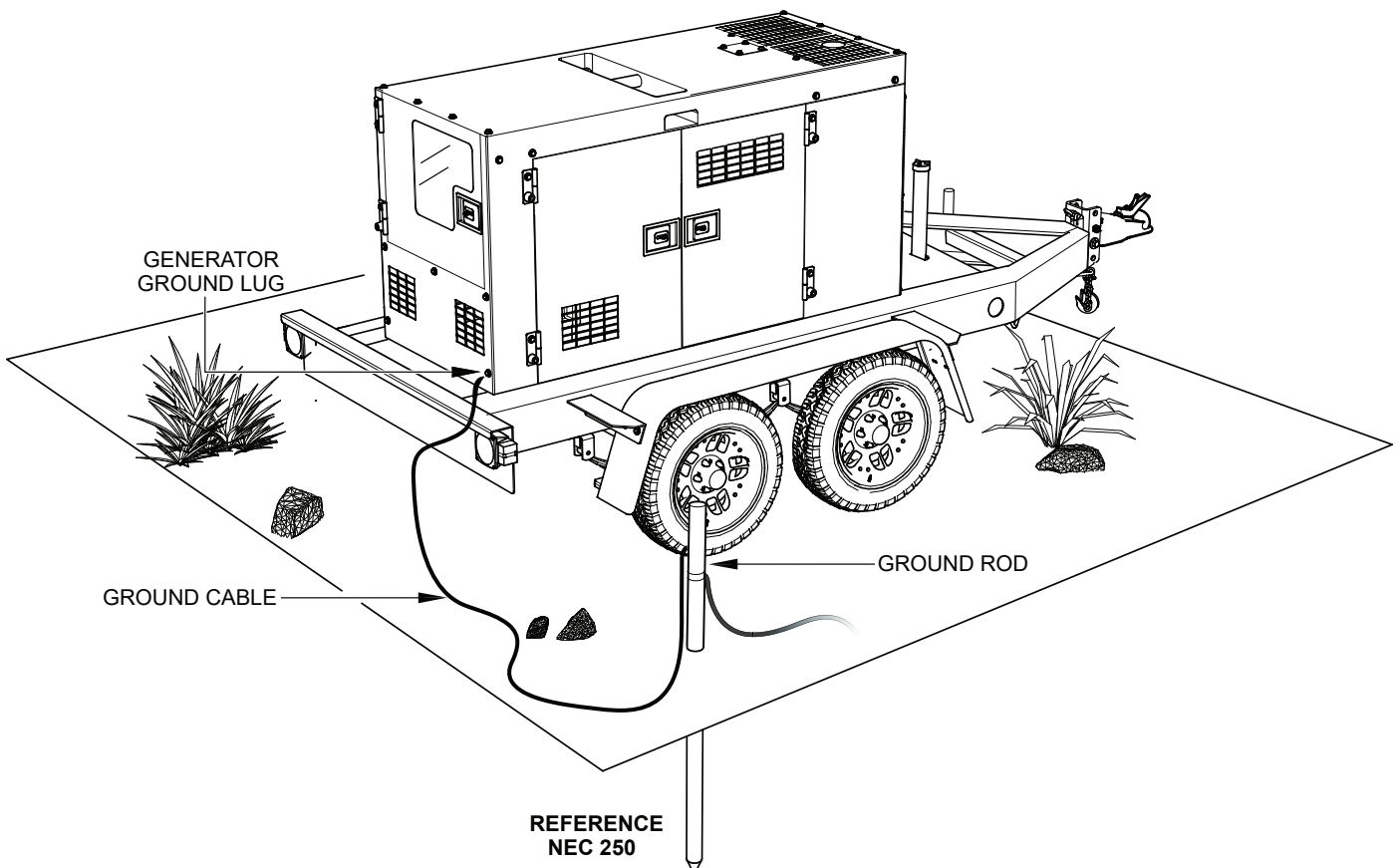


Figure 3. Typical Generator Grounding Application

NOTICE

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

OUTDOOR INSTALLATION

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

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

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

CAUTION

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

INDOOR INSTALLATION

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

MOUNTING

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

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

GENERAL INFORMATION

GENERATOR

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

CONTROL PANEL

The “Control Panel” is provided with the following:

- Auto Start/Stop Controller with Warning Lamp Unit
 - Engine Shutdown Warning Lamp
 - Engine Pre-Alarm Warning Lamp
 - Charging Battery Warning Lamp
 - Preheat Warning Lamp
 - Fuel Filter Water Level Warning Lamp
 - Fuel Leak Detected Warning Lamp
 - Low Oil Pressure Warning Lamp
 - High Coolant Temperature Warning Lamp
 - Over Crank Warning Lamp
 - Over Speed Warning Lamp
 - Engine Started Lamp
- Frequency Meter (Hz)
- AC Ammeter (A)
- AC Voltmeter (V)
- Ammeter Change-Over Switch
- Voltage Regulator
- 3-Pole, 110-Amp Main Circuit Breaker
- Auto Start/Stop Switch
- Engine Speed Switch
- Fuel Gauge
- Hour Meter
- Diagnostic Switch
- Emergency Stop Switch (Option)
- “Control Box” (located behind Control Panel)
 - Automatic Voltage Regulator
 - Current Transformer
 - Overcurrent Relay
 - Starter Relay

OUTPUT TERMINAL PANEL

The “Output Terminal Panel” is provided with the following:

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

OPEN-DELTA EXCITATION SYSTEM

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

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

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

The connections of the AVR to the AC output windings are for sensing only. No power is required from these windings. The open-delta design provides virtually unlimited excitation current, offering maximum motor-starting capabilities. The excitation does not have a ‘fixed ceiling’ and responds according to the demands of the required load.

ENGINE

This generator is powered by a 4-cylinder, 4-cycle, water-cooled, direct injection, turbocharged, EGR, DOC, Kubota V2403-CR-TIE4BG diesel engine. This engine is designed to meet every performance requirement for the generator. Reference Table 2 for engine specifications.

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

MICROPROCESSOR CONTROL SYSTEM

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

EXTENSION CABLES

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

MAJOR COMPONENTS

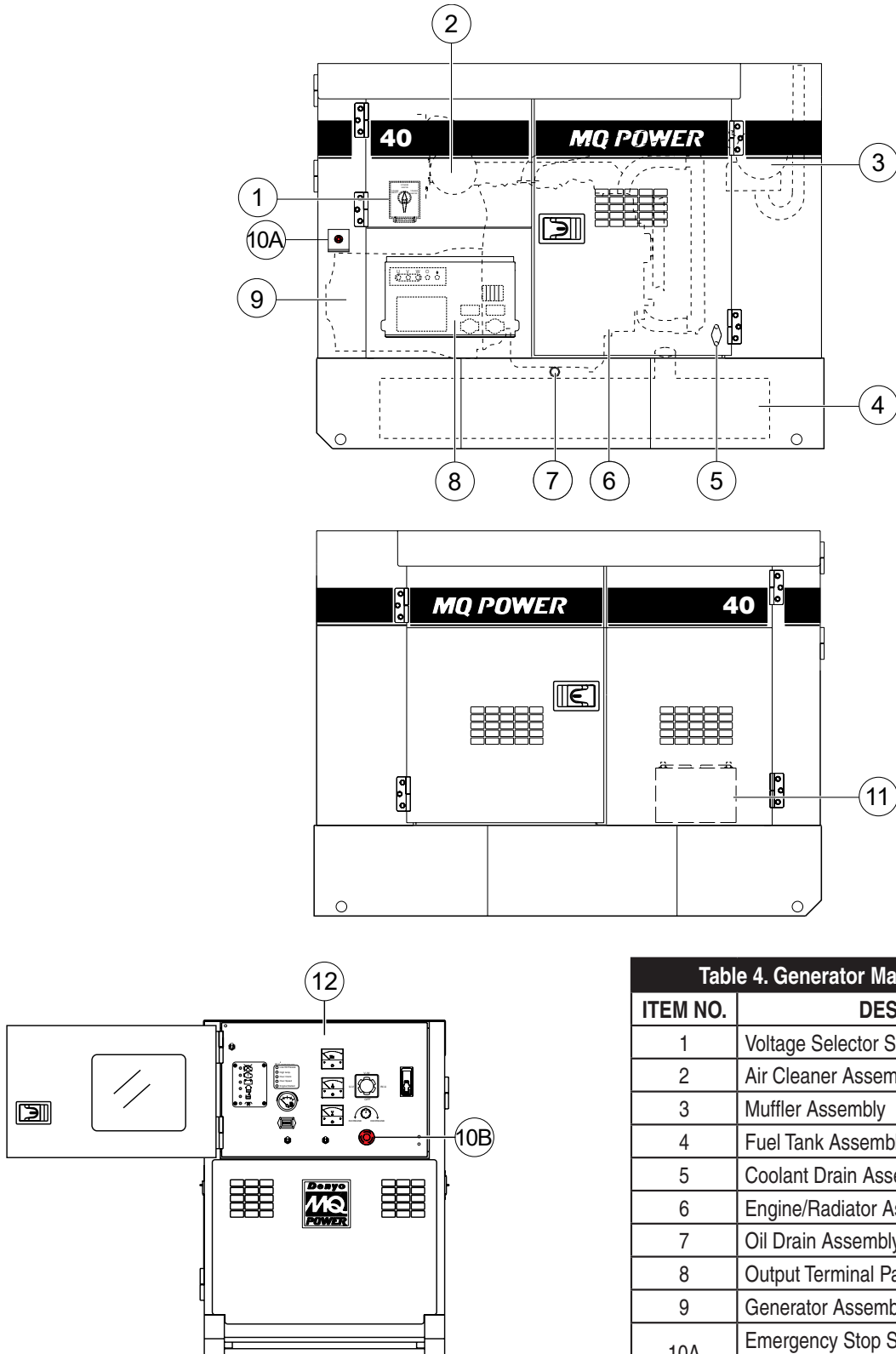


Figure 4. Major Components

Table 4. Generator Major Components	
ITEM NO.	DESCRIPTION
1	Voltage Selector Switch Assembly
2	Air Cleaner Assembly
3	Muffler Assembly
4	Fuel Tank Assembly
5	Coolant Drain Assembly
6	Engine/Radiator Assembly
7	Oil Drain Assembly
8	Output Terminal Panel Assembly
9	Generator Assembly
10A	Emergency Stop Switch Assembly S/N 9250704 and Above
10B	Emergency Stop Switch Assembly (Option)
11	Battery Assembly
12	Control Panel Assembly

ENGINE/GENERATOR CONTROL PANEL

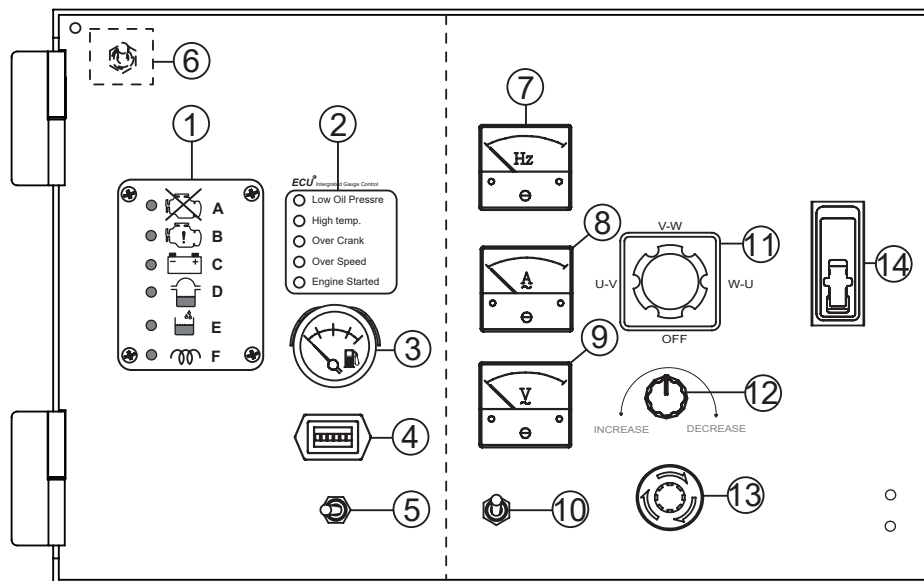


Figure 5. Engine/Generator Control Panel

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

1. **Engine Warning LEDs** — There are six engine warning lamps, they are defined as follows:

- A. **Engine Shutdown LED**— Indicates that the engine has shut down due to an engine failure. LED will turn **ON**.
- B. **Engine Pre-Alarm LED** — Indicates that an engine failure has occurred. LED will turn **ON** or blink.
- C. **Battery Charge Alarm LED** — This LED is **ON** when the output voltage of the alternator drops below a set value. If this lamp is on during normal operation, the emergency shutdown system will immediately stop the engine.
- D. **Fuel Filter Water Level LED** — This LED is **ON** when the water level in the fuel filter is extraordinarily high.
- E. **Fuel Leak Detected Lamp LED** — This LED is **ON** when the fluid in the containment is higher than the allowable level.
- F. **Pre-Heat LED** — The pre-heat LED will be **ON** during the pre-heating cycle (cold weather conditions). When the pre-heat cycle is completed the LED will turn **OFF** and the engine can be started.

2. **Auto START/STOP Controller (CAN 78)** — This controller has a vertical row of status LEDs (inset), that when lit, indicate that an engine malfunction (fault) has been detected. When a fault has been detected, the engine controller will evaluate the fault and all major faults will shut down the generator. During the cranking cycle, the ECU will attempt to crank the engine for 10 seconds before disengaging.

If the engine does not engage (start) by the third attempt, the engine will be shut down by the engine controller's Over Crank Protection mode. If the engine engages at a speed (RPM) that is not safe, the controller will shut down the engine by initializing the Over Speed Protection mode.

The engine controller will also shut down the engine in the event of low oil pressure, high coolant temperature, low coolant level, and loss of magnetic pickup. These conditions can be observed by monitoring the LED status indicators on the front of the controller module.

ENGINE/GENERATOR CONTROL PANEL

- **Low Oil Pressure LED** — This LED will light when the engine oil pressure drops to 14.2 psi. This condition will cause the engine to shut down.
 - **High Temperature LED** — This LED will light when the coolant temperature has reached 212°F (100°C). This condition will cause the engine to shut down.
 - **Over Crank LED** — This LED will light when the engine has attempted to start 3 times and failed. The interval between the 3 start cycles is approximately 11 seconds.
 - **Over Speed LED** — This LED will light when the engine is running at an unsafe speed. This condition will cause the engine to shut down.
 - **Engine Started LED** — This LED will light when the engine has started and is operating correctly.
3. **Fuel Gauge** — Indicates the amount of diesel fuel available.
 4. **Hour Meter** — Indicates the operational hours of the generator.
 5. **Auto Start-Stop Switch** — This switch selects either manual or automatic operation. Center position is **OFF** (reset).
 6. **Diagnostic Switch** — When activated, fault errors in the engine or the engine control system will be displayed on the engine warning module (LEDs).
 7. **Frequency Meter** — Indicates the output frequency in hertz (Hz). Normally 60 Hz.
 8. **AC Ammeter** — Indicates the amount of current the load is drawing from the generator per leg selected by the ammeter change-over switch.
 9. **AC Voltmeter** — Indicates the output voltage present at the **U,V, and W Output Terminal Lugs**.
 10. **Engine Speed Switch** — This switch controls the speed of the engine, low (idle) or high.
 11. **Ammeter Change-Over Switch** — This switch allows the AC ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off. This switch does not affect the generator output in any fashion, it is for current reading only.
 12. **Voltage Regulator Control Knob**— Allows $\pm 15\%$ manual adjustment of the generator's output voltage.
 13. **Emergency Stop Switch (Option)** — Push this button inward to stop the engine in the event of an emergency. **DO NOT** use this button as a normal means of stopping the engine.
 14. **Main Circuit Breaker** — This three-pole, 110-amp main breaker is provided to protect the **U,V, and W Output Terminal Lugs** from overload.

OUTPUT TERMINAL PANEL FAMILIARIZATION

OUTPUT TERMINAL PANEL

The Output Terminal Panel (Figure 6) shown below is provided for the connection of electrical loads. Lift up on the cover to gain access to receptacles and terminal lugs.

NOTICE

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

OUTPUT TERMINAL FAMILIARIZATION

The “Output Terminal Panel” (Figure 6) is provided with the following:

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

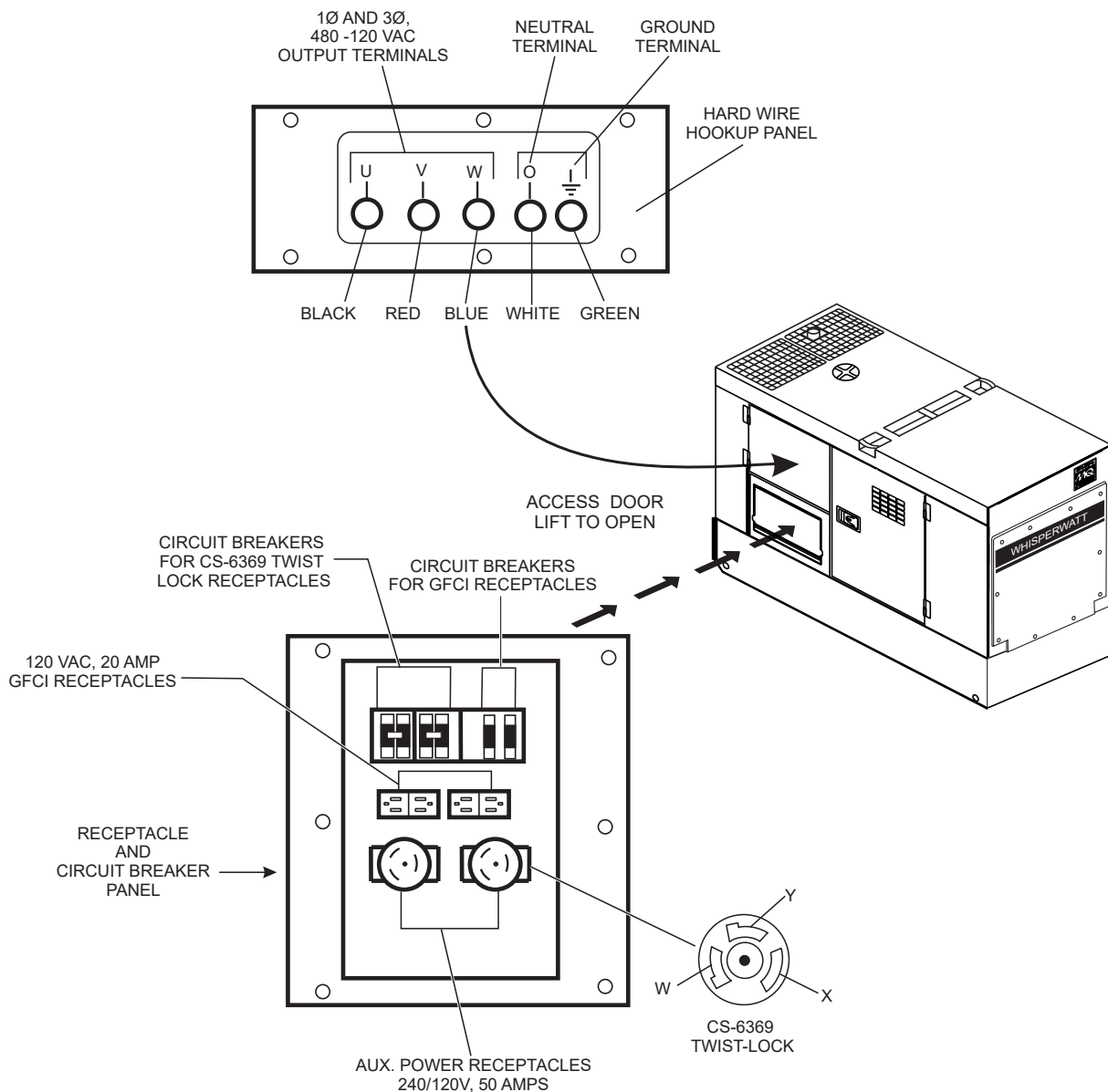


Figure 6. Output Terminal Panel

OUTPUT TERMINAL PANEL FAMILIARIZATION

120-Volt AC GFCI Receptacles

NOTICE

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

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

Press the **Reset button** (Figure 7) to reset the GFCI receptacle after it has been tripped. Press the **Test button** in the center of the receptacle to check the GFCI function. Both receptacles should be tested at least once a month. Reference the maintenance section in this manual for further testing of the GFCI receptacle.

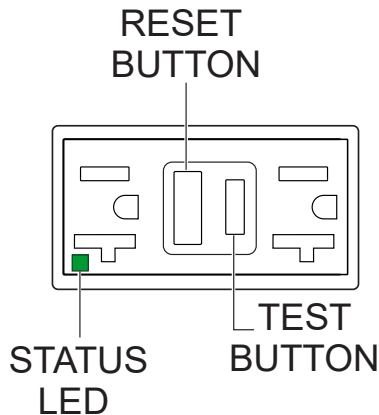


Figure 7. 120-Volt GFCI Receptacle

Twist-Lock Dual-Voltage 240/120 VAC Receptacles

There are two 240/120V, 50-amp, auxiliary twist-lock (CS-6369) receptacles (Figure 8) provided on the output terminal panel. These receptacles can **only** be accessed when the voltage selector switch is placed in the **single-phase 240/120V** position.

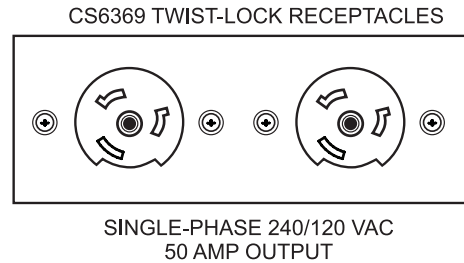


Figure 8. 240/120V Twist-Lock Auxiliary Receptacles

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

Removing the Plastic Face Plate (Hard Wire Hookup Panel)

The **Output Terminal Lugs** are protected by a plastic face plate cover (Figure 9). Unscrew the securing bolts and lift the plastic terminal cover to gain access to the terminal enclosure.

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

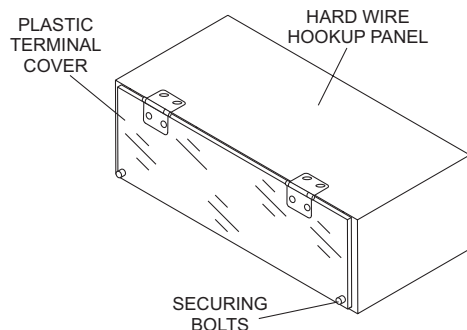


Figure 9. Plastic Face Plate (Output Terminal Lugs)

OUTPUT TERMINAL PANEL FAMILIARIZATION

Connecting Loads

Loads can be connected to the generator by the output terminal lugs, convenience receptacles, or optional cam-locks (Figure 10). Make sure to read the operation manual before attempting to connect a load to the generator.

To protect the output terminals from overload, a 3-pole, 110-amp, **main** circuit breaker is provided. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

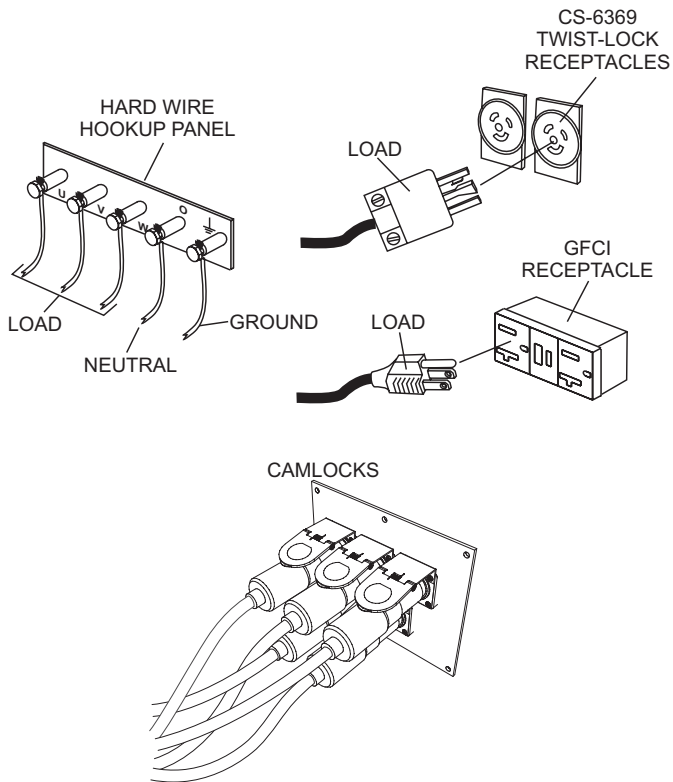


Figure 10. Connecting Loads

Overcurrent Relay

An **overcurrent relay** (Figure 11) is connected to the main circuit breaker. In the event of an overload, both the circuit breaker and the overcurrent relay may trip. If the circuit breaker cannot be reset, the **reset button** on the overcurrent relay must be pressed. The overcurrent relay is located inside the control box.

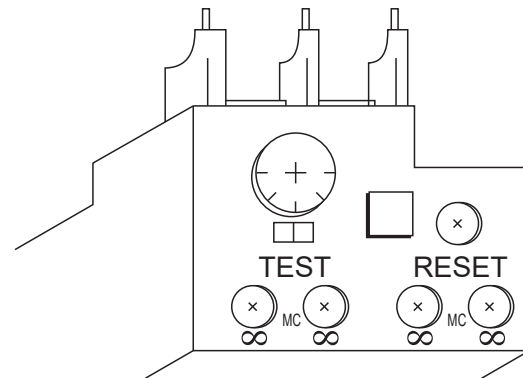


Figure 11. Overcurrent Relay

NOTICE

Remember the **overcurrent relay** monitors the current flowing from the **U,V, and W Output Terminal Lugs** to the load.

In the event of a short circuit or overcurrent condition, it will automatically trip the 110-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** position (**ON**).

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 the nameplate voltage by the nameplate amperage.

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

The power factor of this generator is 0.8. See Table 5 below when connecting loads.

Table 5. Power Factor By Load

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

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

Current in Amperes	Load in Watts		Maximum Allowable Cable Length			
	At 120 Volts	At 240 Volts	#10 Wire	#12 Wire	#14 Wire	#16 Wire
2.5	300	600	1,000 ft.	600 ft.	375 ft.	250 ft.
5	600	1,200	500 ft.	300 ft.	200 ft.	125 ft.
7.5	900	1,800	350 ft.	200 ft.	125 ft.	100 ft.
10	1,200	2,400	250 ft.	150 ft.	100 ft.	
15	1,800	3,600	150 ft.	100 ft.	65 ft.	
20	2,400	4,800	125 ft.	75 ft.	50 ft.	

CAUTION: Equipment damage can result from low voltage.

NOTICE

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

THREE-PHASE LOAD

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

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

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 6.

- 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 (Table 7) is available for many different applications.

Table 7. Voltages Available						
UVWO Output Terminal Lugs	Voltage Selector Switch 3-Phase 240/139V Position			Voltage Selector Switch 3-Phase 480/277V Position		
	3Ø Line-Line	208V	220V	240V	416V	440V
1Ø Line-Neutral	120V	127V	139V	240V	254V	277V
Voltage Selector Switch Single-Phase 240/120V Position						
1Ø Line-Neutral/ Line-Line	120V Line-Neutral	N/A	N/A	240V Line-Line	N/A	N/A

Voltage Selector Switch

Voltages are selected by using the **voltage selector** switch (Figure 12) which is located above the output terminal panel's Hard Wire Hook-Up Panel. This switch has been provided for ease of voltage selection.

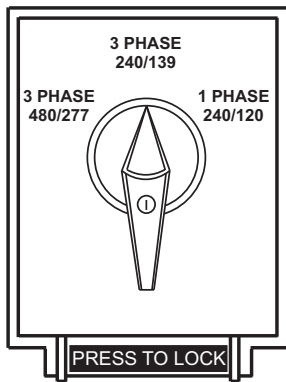


Figure 12. Voltage Selector Switch

CAUTION

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

Voltage Regulator

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



Figure 13. Voltage Regulator Control Knob

MAXIMUM AMPS

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

Table 8. Generator Maximum Amps	
Rated Voltage	Maximum Amps
1Ø 120 volts	80 amps (4 wire) 108A x 2 (zigzag)
1Ø 240 volts	40 amps (4 wire) 108A (zigzag)
3Ø 240 volts	86 amps
3Ø 480 volts	43 amps
Main Line Circuit Breaker Rating	110 amps
Over Current Relay Trip Set Point 480V Mode Only	43 Amps

GFCI Receptacle Load Capability

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

Figure 17, Table 9 and Table 10 show what amount of current is available at the GFCI receptacles when the output terminals and twist-lock receptacles are in use. Be careful that your load does not exceed the available current capability at the receptacles.

Table 9. 1Ø GFCI Receptacle Load Capacity	
kW in Use Twist Lock (CS6369)	Available Load Current (Amps)
1Ø 240/120V	GFCI Duplex 5-20R 120V
26.0	0 amps/receptacle
24.8	5 amps/receptacle
23.6	10 amps/receptacle
22.4	15 amps/receptacle
21.2	20 amps/receptacle

Table 10. 3Ø Generator Maximum Amps	
kVA in Use (UVWO Terminals)	Available Load Current (Amps)
3Ø 240/480V	GFCI Duplex 5-20R 120V
36.0	0 amps/receptacle
31.8	5 amps/receptacle
27.7	10 amps/receptacle
23.5	15 amps/receptacle
19.4	20 amps/receptacle

HOW TO READ THE AC AMMETER AND AC VOLTMETER GAUGES

Before taking a reading from either gauge, set the **Voltage Selector Switch** (Figure 14) to the position which produces the required voltage. For example, for 3Ø 240V, choose the center 3Ø 240/139V position on the voltage selector switch.

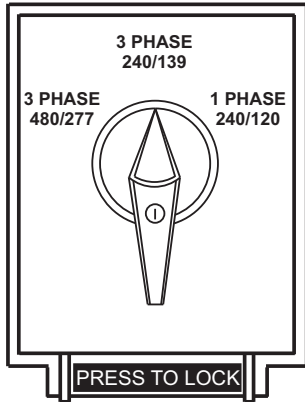


Figure 14. Voltage Selector Switch-240/3Ø Position

AC Voltmeter Gauge Reading

Observe the voltage present at the U, V, and W output terminals as indicated on the **AC Voltmeter Gauge** (Figure 15).

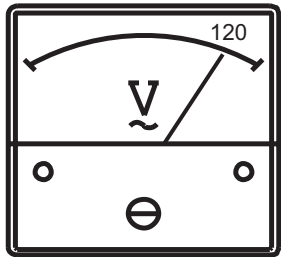


Figure 15. AC Voltmeter Gauge

AC Ammeter Gauge Reading

The AC ammeter gauge is controlled by the AC ammeter change-over switch.

This switch is located on the control panel and **DOES NOT** affect the generator output. It is provided to help observe how much current is being produced at the UVWO terminal lugs.

Place the **AC Ammeter Change-Over Switch** (Figure 16) in the U position and observe the current reading (load drain) on the U terminal as indicated on the **AC Ammeter Gauge** (Figure 17). This process can be repeated for terminals V and W.

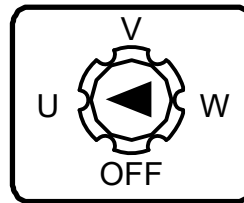


Figure 16. AC Ammeter Change-Over Switch

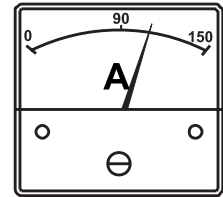


Figure 17. AC Ammeter (Amp Reading On U Lug)

NOTICE

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

OUTPUT TERMINAL PANEL CONNECTIONS

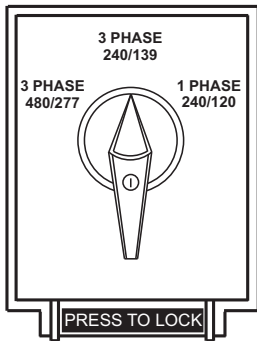
UVWO TERMINAL OUTPUT VOLTAGES

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

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

3Ø-240V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139 position as shown in Figure 18.



**Figure 18. Voltage Selector Switch
3Ø-240/139V Position**

2. Connect the load wires to the UVWO terminals as shown in Figure 19.

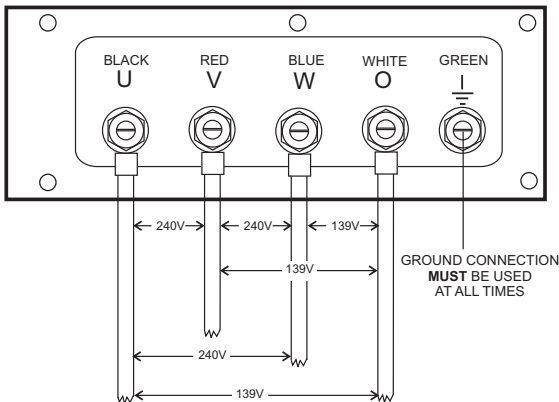


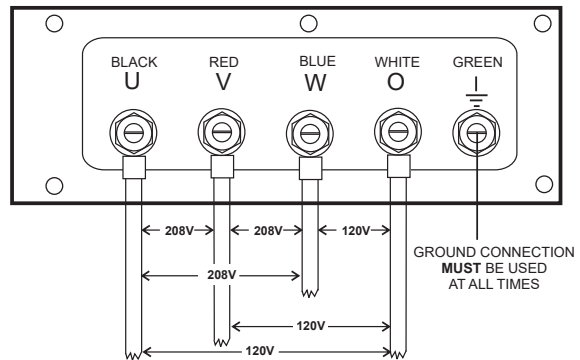
Figure 19. UVWO Terminal Lugs

3. Turn the voltage regulator control knob (Figure 20) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use the voltage regulator control knob whenever fine tuning of the output voltage is required.



**Figure 20. Voltage Regulator Control Knob
3Ø-208V/1Ø-120V UVWO Terminal Output Voltages**

1. Place the voltage selector switch in the 3Ø 240/139 position as shown in Figure 18.
2. Connect the load wires to the UVWO terminals as shown in Figure 21.



**Figure 21. UVWO Terminal Lugs
3Ø-208/1Ø-120V Connections**

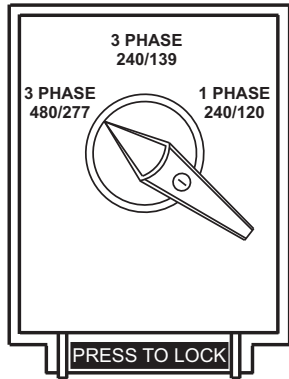
NOTICE

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

OUTPUT TERMINAL PANEL CONNECTIONS

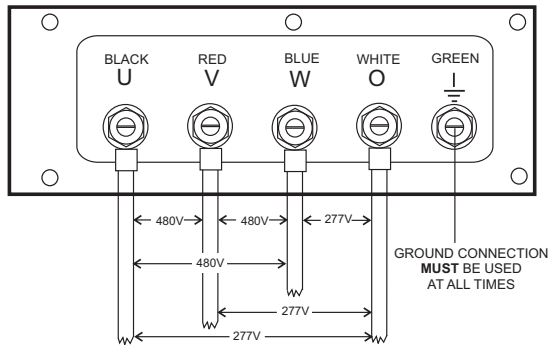
3Ø-480/277V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 480/277 position as shown in Figure 22.



**Figure 22. Voltage Selector Switch
3Ø-480/277V Position**

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



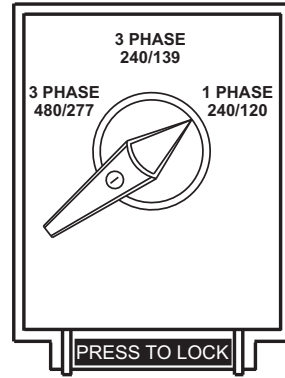
**Figure 23. UVWO Terminal Lugs 3Ø-480V
Connections**

NOTICE

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

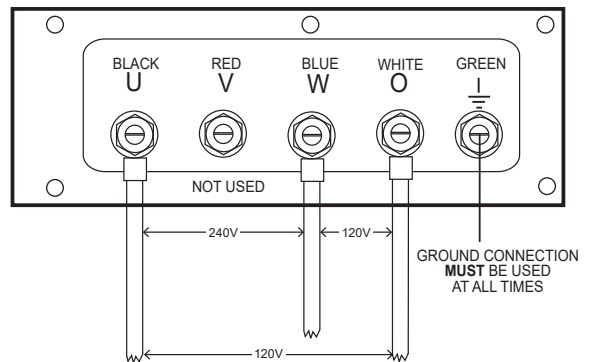
1Ø-240/120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 1Ø 240/120 position as shown in Figure 24.



**Figure 24. Voltage Selector Switch
1Ø-240/120V Position**

2. Connect the load wires to the UVWO terminals as shown in Figure 25.



**Figure 25. UVWO Terminal Lugs
1Ø-240/120V Connection**

3. Turn the voltage regulator control knob (Figure 20) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use the voltage regulator control knob whenever fine tuning of the output voltage is required.

ENGINE OIL CHECK

1. To check the engine oil level, place the generator on secure, level ground with the engine stopped.
2. Remove the dipstick from its holder (Figure 26) and wipe it clean.

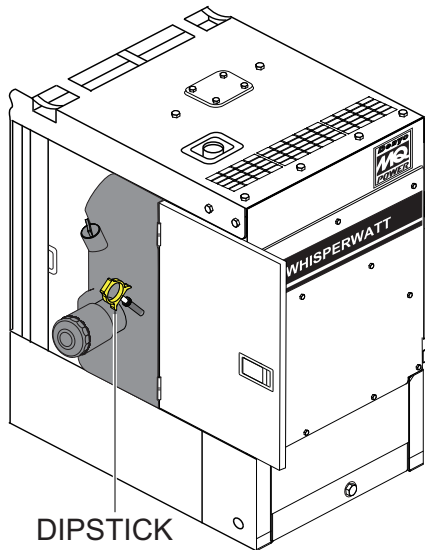


Figure 26. Engine Oil Dipstick Holder

3. Reinsert the dipstick, then remove the dipstick from its holder. Check the oil level shown on the dipstick (Figure 27).

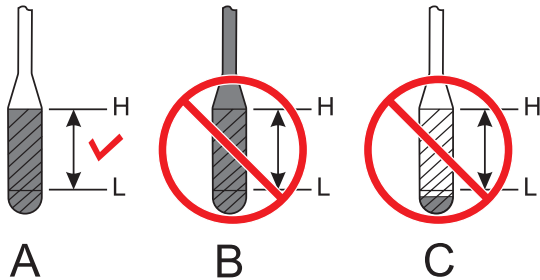


Figure 27. Engine Oil Dipstick

4. Verify that the engine oil level is maintained between the **H** and **L** markings on the dipstick as referenced in Figure 27A.
5. If the engine oil level is low (Figure 27C), remove the oil filler cap (Figure 28) and fill to a safe operating level (max) as indicated by the dipstick (Figure 27A). Fill with recommended type oil as listed in Table 11. Maximum oil capacity is 2.5 gallons (9.7 liters).

NOTICE

When adding engine oil **DO NOT** overfill (Figure 27B).

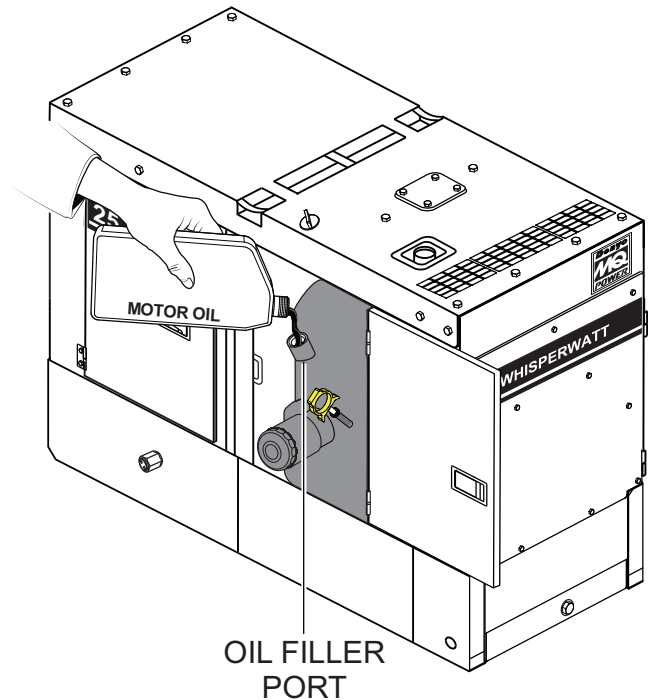


Figure 28. Engine Oil Filler Port


When checking the engine oil, be sure to check if the oil is clean. If the oil is not clean, drain the oil as referenced in the maintenance section of this manual.

Table 11. Recommended Motor Oil

SAE 30	
SAE 20, 20W	
SAE 10W	
SAE 10W-30	
SAE 40	
SAE 5W-40, 20W-40	
SAE 5W-20	
-20	100°F
-30	40°C

FUEL CHECK

⚠ DANGER



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

Refilling The Fuel System

NOTICE

DO NOT refuel while the engine is running.

⚠ CAUTION

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

ALWAYS fill the fuel tank (Figure 29) with clean, fresh #2 diesel fuel. **DO NOT** fill the fuel tank beyond its capacity.

Pay attention to the fuel tank capacity when replenishing fuel. The fuel tank cap must be closed tightly after filling. Handle fuel in a safety container. If the container does not have a spout, use a funnel. Wipe up any spilled fuel immediately.

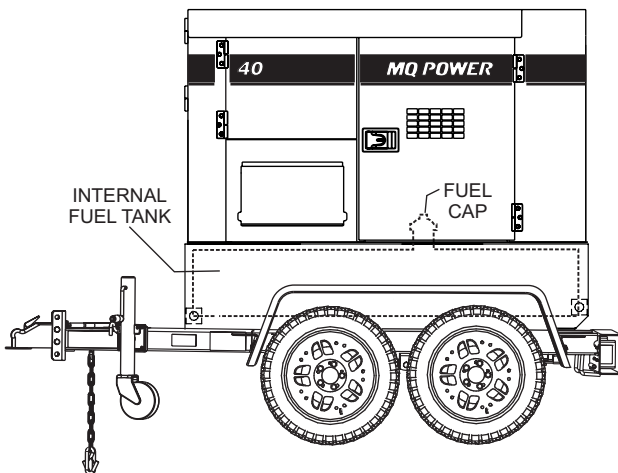



Figure 29. Fuel Tank

Refueling Procedure

⚠ WARNING



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

1. **Level Tanks** — Make sure fuel cells are level with the ground. Failure to do so will cause fuel to spill from the tank before reaching full capacity (Figure 30).

⚠ CAUTION

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

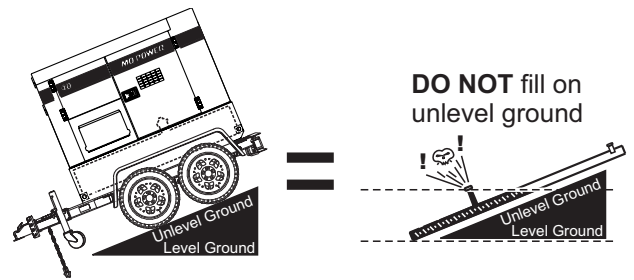


Figure 30. Only Fill On Level Ground

NOTICE

ONLY use #2 diesel fuel when refueling.

2. Open cabinet doors on the “right side” of the generator (from the generator control panel position). Remove the fuel cap and fill the tank (Figure 31).

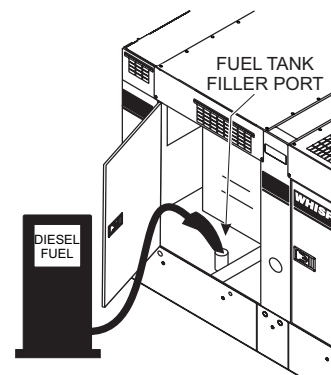


Figure 31. Fueling The Generator

- NEVER overfill the fuel tank** — It is important to read the fuel gauge when filling the trailer fuel tank. **DO NOT** wait for fuel to rise in the filler neck (Figure 32).

FUEL GAUGE LOCATED ON CONTROL PANEL

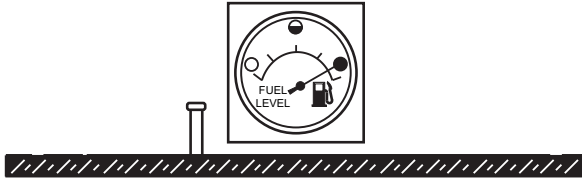


Figure 32. Full Fuel Tank

CAUTION

DO NOT OVERFILL the fuel system. Leave room for fuel expansion. Fuel expands when heated (Figure 33).

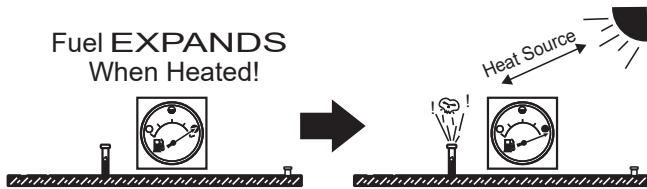


Figure 33. Fuel Expansion

COOLANT (ANTIFREEZE/SUMMER COOLANT/WATER)

Kubota 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 **Kubota Engine Owner's Manual** for further details.

WARNING



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

Day-to-day addition of coolant is done from the reserve tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 12 for engine, radiator, and reserve tank coolant capacities.

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 34.

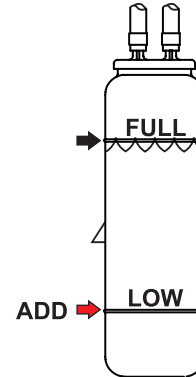


Figure 34. Coolant Reserve Tank

Table 12. Coolant Capacity

Engine and Radiator	4.75 gal (18 liters)
Reserve Tank	See markings

Operation in Freezing Weather

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

Table 13. Anti-Freeze Operating Temperatures

Vol % Anti-Freeze	Freezing Point		Boiling Point	
	°C	°F	°C	°F
50	-37	-34	108	226

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 35) 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.

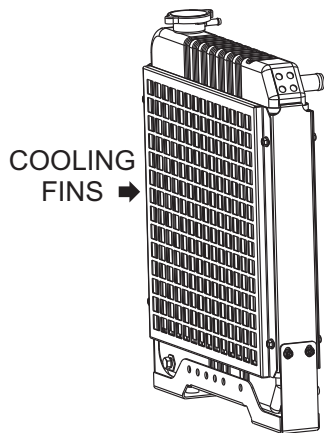


Figure 35. Radiator (Cooling Fins)

ENGINE AIR CLEANER

Periodic cleaning/replacement of the air cleaner is necessary. Inspect the air cleaner (Figure 36) in accordance with the maintenance section of this manual or the **Kubota Engine Owner's Manual**.

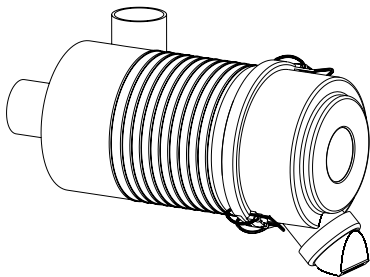


Figure 36. Engine Air Cleaner

FAN BELT TENSION

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

The fan belt tension is proper if the fan belt bends 0.4–0.6 in. (10–15 mm) when pressed with the thumb as shown in Figure 37.

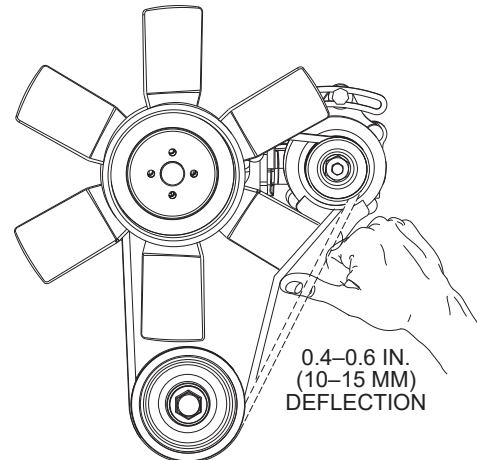


Figure 37. Fan Belt Tension

CAUTION



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

BATTERY

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

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

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

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

Battery Cable Installation

ALWAYS be sure the battery cables (Figure 38) are properly connected to the battery terminals as shown below. The **red cable** is connected to the positive terminal of the battery, and the **black cable** is connected to the negative terminal of the battery.

CAUTION

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

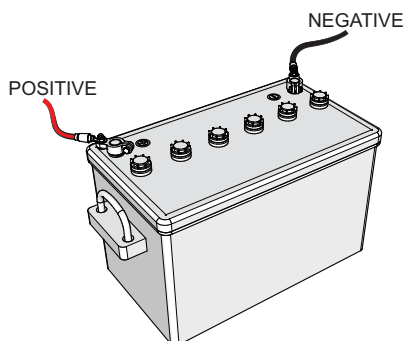


Figure 38. Battery Connections

When connecting the battery:

1. **NEVER** connect the battery cables to the battery terminals when the **Auto Start/Stop Switch** is in either the **AUTO** or **MANUAL** position. **ALWAYS** make sure that this switch is in the **OFF/RESET** position when connecting the battery.
2. Place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

NOTICE

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

CAUTION

Inadequate battery connections may cause poor starting of the generator, and create other malfunctions.

ALTERNATOR

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

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

WIRING

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

PIPING AND HOSE CONNECTIONS

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

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

GENERATOR START-UP PROCEDURE (MANUAL)

BEFORE STARTING

CAUTION

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

WARNING

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

1. Place the **main, GFCI, and aux.** circuit breakers (Figure 39) in the **OFF** position prior to starting the engine.

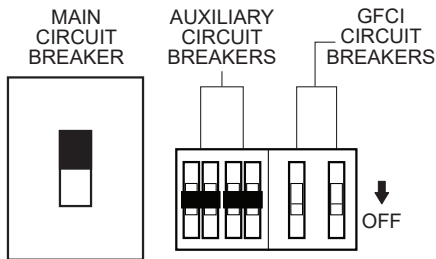


Figure 39. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Make sure the **voltage selector switch** has been configured for the desired output voltage.
3. Connect the load to the **receptacles** or the **output terminal lugs** as shown in Figure 10. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.
4. Tighten terminal nuts securely to prevent load wires from slipping out.
5. Close all engine enclosure doors (Figure 40).

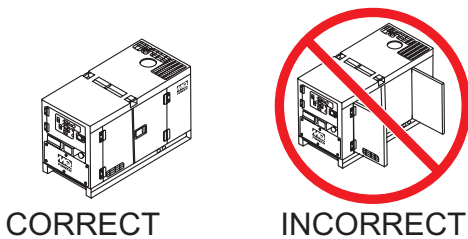


Figure 40. Engine Enclosure Doors

STARTING (MANUAL)

1. Place the **voltage selector switch** in the desired voltage position (Figure 41).

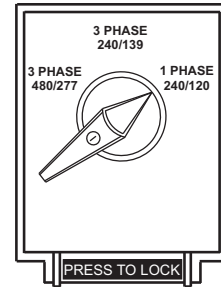


Figure 41. Voltage Selector Switch

2. Place the **engine speed switch** (Figure 42) in the **LOW** (down) position.



Figure 42. Engine Speed Switch (Low)

3. Place the **Auto Start/Stop Switch** in the **MANUAL** position to start the engine (Figure 43).



Figure 43. Auto Start/Stop Switch (Manual Position)

4. Depending on the temperature of the coolant (cold weather conditions), the pre-heat LED (Figure 44) will light **(ON)** and remain on until the pre-heating cycle has completed. After completion of the pre-heating cycle, the LED will go **OFF** and the engine will start.

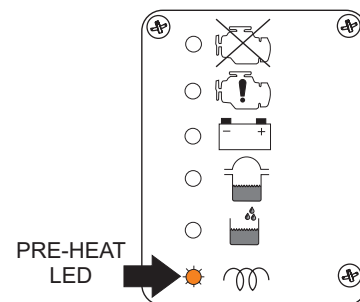


Figure 44. Pre-Heat LED Engine Warning Unit

GENERATOR START-UP PROCEDURE (MANUAL)

NOTICE

If the engine fails to start within a specified number of attempts, the shutdown lamp will illuminate and the Auto Start/Stop Switch must be placed in the Off/Reset position before the engine can be restarted.

- Verify that the Engine Started status LED on the ECU controller is **ON** (Figure 45).

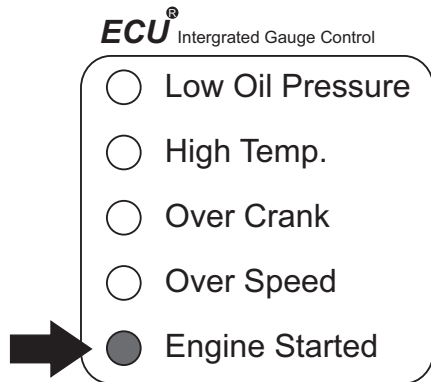


Figure 45. ECU Controller (Engine Started LED)

- Once the engine starts, let the engine run for 1–2 minutes (or 5–7 minutes in cold weather conditions). Listen for any abnormal noises. If any abnormalities exist, shut down the engine and correct the problem.
- If the engine is running smoothly, place the engine speed switch (Figure 46) in the **HIGH** (up) position.



Figure 46. Engine Speed Switch (High)

- The generator's frequency meter (Figure 47) should be displaying the 60-cycle output frequency in **HERTZ**.

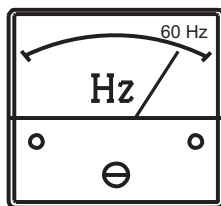


Figure 47. Frequency Meter

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

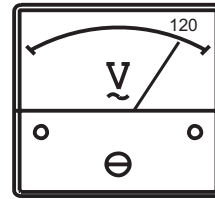


Figure 48. Voltmeter

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



Figure 49. Voltage Regulator Control Knob

- 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.

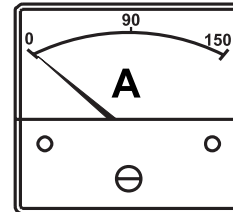


Figure 50. Ammeter (No Load)

- Place the **main, GFCI, and aux.** circuit breakers in the **ON** position (Figure 51).

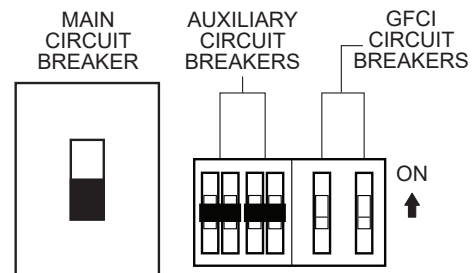


Figure 51. Main, Aux. and GFCI Circuit Breakers (ON)

GENERATOR START-UP PROCEDURE (MANUAL)

13. Observe the generator's ammeter (Figure 52) 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.

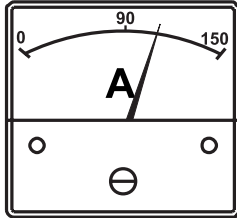


Figure 52. Ammeter (Load)

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

GENERATOR START-UP PROCEDURE (AUTO MODE)

STARTING (AUTO MODE)

DANGER



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

CAUTION

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

NOTICE

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

WARNING

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

CAUTION

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

NOTICE

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

When starting the generator in **AUTO** mode use the "Manual Start-Up" procedure except where noted (see below).

1. Perform steps 1 through 5 in the Before Starting section as outlined in the Manual Starting Procedure.
2. Place the **Auto Start/Stop Switch** (Figure 53) in the **AUTO** position.



Figure 53. Auto Start/Stop Switch (AUTO)

3. Continue operating the generator as outlined in the Manual Start-Up procedure (start at step 4).

GENERATOR SHUTDOWN PROCEDURES

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 **MAIN, GFCI and LOAD** circuit breakers as shown in Figure 54 to the **OFF** position.

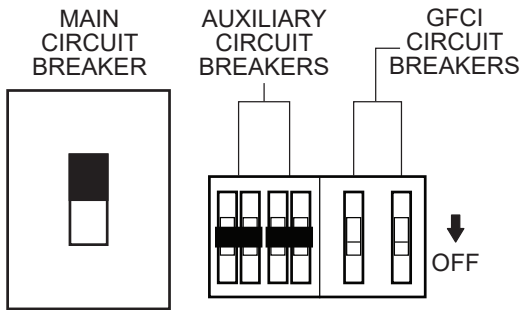


Figure 54. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Place the engine speed control switch (Figure 55) in the Low (Idle) position (down).



Figure 55. Engine Speed Switch Low/Idle Position

3. Let the engine cool by running it at low speed for 3–5 minutes with no load applied.
4. Place the **Auto Start/Stop Switch** (Figure 56) in the **OFF/RESET** position.



Figure 56. Auto Start/Stop Switch (Off/Reset)

5. Verify that all status LEDs on the ECU control panel are **OFF** (not lit).
6. Remove all loads from the generator.
7. Inspect the entire generator for any damage or loosening of components that may have occurred during operation.

EMERGENCY SHUTDOWN PROCEDURE

NOTICE

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

1. To stop the engine in the event of an emergency, push the **Emergency Stop switch** (Figure 57), located on the side of the generator next to the output terminal panel. Or, if equipped, press the optional Emergency Stop switch located on the control panel.

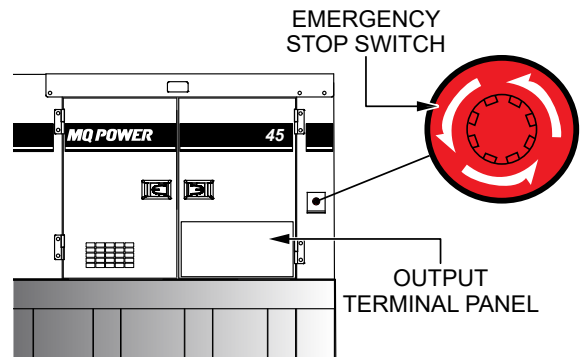


Figure 57. Emergency Stop Switch

2. Place the **main, auxiliary, and GFCI circuit breakers** in the **OFF** position as shown in Figure 54.
3. The emergency stop switch is a push-locked type switch. The switch contact can only be released by rotating the button in the clockwise direction. The engine can not be restarted until the contact is released (closed).

AUTOMATIC SHUTDOWN SYSTEM

This unit is equipped with safety devices to automatically stop the engine in the event of low oil pressure, approximately 14 psi (97 kPa), high water temperature, approximately 212°F (100°C), or over crank (engine fails to start 3 times). The alarm lamps on the ECU illuminate to signify the reason for the shutdown.

NOTICE

Before inspecting the generator, check that the Auto Start/Stop switch is in the **OFF/RESET** position, and place all circuit breakers in the **OFF** position. Allow sufficient time for adequate cooling. When ready to restart, complete all steps in the Generator Startup Procedure section of this manual.

MAINTENANCE

Table 14. Inspection/Maintenance		10 Hrs DAILY	250 Hrs	500 Hrs or Every 12 Months	3,000 Hrs or Every 36 Months	OTHER
Engine	Check Engine Oil and Coolant Levels	X				
	Check Fuel Filter/Water Separator Bowl	X				
	Check Air Cleaner	X				
	Visual Walk-Around Inspection	X				
	Check for Leaks/Hoses/Clamps	X				
	Check for Loosening of Parts	X				
	Clean Air Element Element		X			
	Change Engine Oil and Oil Filter *1, 2		X	(X)		
	Check Engine Mounts			X		
	Service Battery			X		
	Check Crankcase Ventilation System			X		
	Check Air Intake Hoses, Connections, and System			X		
	Replace Fuel Filter Elements			X		
	Check Automatic Belt Tensioner and Belt Wear			X		
	Check Electrical Ground Connection			X		
	Clean Radiator, Check Cooling System			X		
	Coolant Solution Analysis, Add SCAs as Required *4			X		
	Pressure Test Cooling System			X		
	Check Engine Speed			X		
	Check and Adjust Engine Valve Clearance				X	
	Test Glow Plugs				X	
	Flush and Refill Cooling System					2 yrs. or 2,000 hrs.
	Clean Inside Fuel Tank					1,000 hrs.
	Replace Diesel Oxidation Catalyst (DOC) *3					4,500 hrs.
Test Thermostats					6,000 hrs.	
Replace Air Cleaner Elements *4					As Required	
Add Coolant					As Required	
Clean Unit, Inside and Outside					As Required	
Generator	Measure Insulation Resistance Over 3M Ohms		X			
	Check Rotor Rear Support Bearing			X		s

*1 During initial operation of a new engine, change oil and filter between a minimum of 100 hours and a maximum of 500 hours. Service interval depends on type of oil.

*2 When different kind of oil is to be used, remove all old oil before putting in new one.

*3 Expectation for minimal service interval will be at least 4,500 hours based on engine power. However, actual service should take place when indicated by diagnostic gauge. Please contact nearest authorized Multiquip Service Center for DOC cleaning.

*4 Replace primary air filter element when restriction indicator shows a vacuum of 635 mm (25 in. H₂O).

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 14 as a general inspection and maintenance guideline. For more detailed engine maintenance instructions, refer to the engine owner's manual.

ENGINE AIR CLEANER

This Kubota diesel engine is equipped with a replaceable, high-density, paper air cleaner element (Figure 58). The air cleaner is also equipped with an inner (secondary) element that is used as a backup filter should the primary element become damaged. Check the air cleaner daily or before starting the engine. Replace the air cleaner as needed.

NOTICE

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

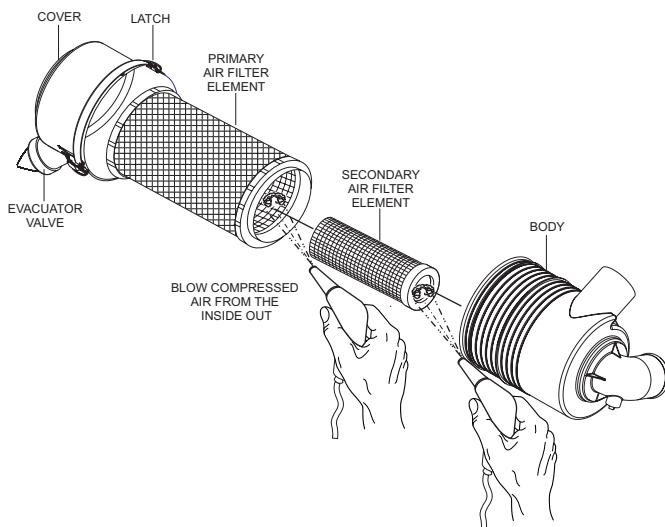


Figure 58. Engine Air Cleaner

Primary And Secondary Air Cleaner Elements

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

CAUTION



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

1. Release the latches that secure the cover to the air cleaner body (Figure 58).
2. Remove the **air cleaner cover** (Figure 58) and set it aside.
3. Remove both the primary and secondary air cleaner elements (Figure 58).
4. Check for and correct heavy buildup of dirt and debris along with loose or damaged components.

NOTICE

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

5. To clean the **primary element** (paper air filter) as shown in Figure 58, tap the filter element several times on a hard surface to remove dirt, or blow compressed air, not to exceed 30 psi (207 kPa, 2.1 kgf/cm²), through the filter element from the inside out.
6. Clean the **secondary element** (paper air filter) as described in step 5.
7. Replace both elements if they are damaged or excessively dirty.
8. Clean the inside of the **air cleaner body** (Figure 58).
9. Reinstall the primary and secondary air filter elements back into the air cleaner body.
10. Reinstall the air cleaner cover and secure with latches.

NOTICE

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

ENGINE FUEL FILTER REPLACEMENT

1. Clean the area around the fuel filter head.
2. Using a filter wrench (Figure 59), remove the fuel filter.

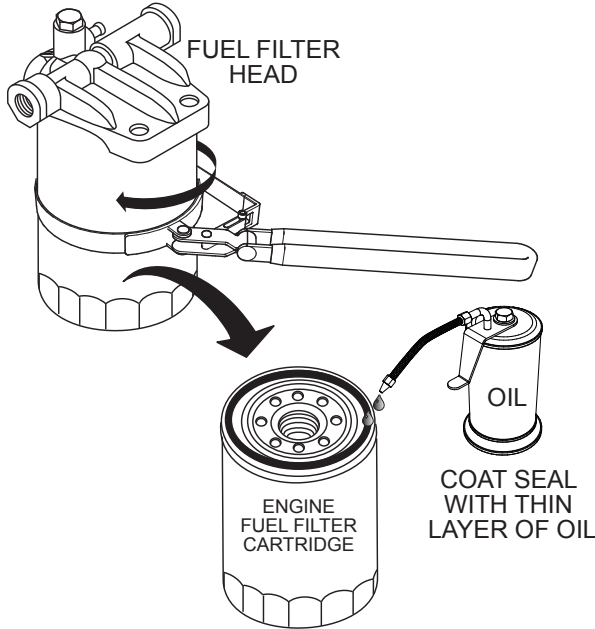


Figure 59. Fuel Filter Removal

3. Coat the rubber seal (gasket) surface of the fuel filter with clean 15W-40 engine oil.
4. Install the new oil filter first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using the filter wrench.

FUEL FILTER/WATER SEPARATOR

Inspect the fuel filter/water separator daily. If the fuel filter/water separator (Figure 60) has collected a significant amount of water and sediment at the bottom of the cup (indicator mark), it should be drained off.

Draining The Fuel Water Separator

NOTICE

As water is collected, the red float goes up. When the float has reached the indicator mark (Figure 60), immediately drain the fuel water separator.

1. Place the Open/Close fuel valve lever (Figure 60) in the **CLOSED** position.
2. Loosen the screw at the top of the filter head and also loosen the drain cock located at the bottom of the filter.
3. Let the residue or foreign substances inside the cup flow into a suitable container.
4. Tighten the screw and place the fuel valve lever in the **OPEN** position.

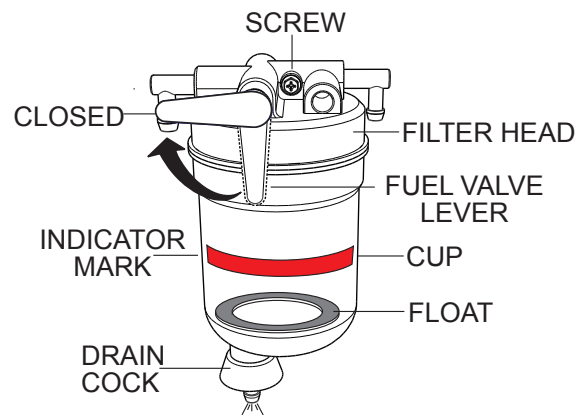


Figure 60. Fuel Filter/Water Separator

Cleaning The Fuel Water Separator

NOTICE

If air enters the fuel injection system of a diesel engine, starting becomes impossible. After running out of fuel or after disassembling the fuel system, air bleed the fuel system in accordance with the **KUBOTA Engine Service Manual**.

To restart the engine after running out of fuel, place the **Auto Start/Stop Switch** in the **MANUAL** position. Try again, if needed.

1. Place the fuel valve lever in the **CLOSED** position.
2. Remove the cup from the filter head assembly.

3. Clean the inside of the cup with a light oil.
4. Clean the area around the fuel filter/water separator head.
5. Reattach the cup to the filter head assembly.
6. Place the fuel valve lever in the **OPEN** position.
7. Air bleed the fuel system before starting the engine.

DRAINING THE CONTAINMENT TANK

NOTICE

When the “Fuel Leak Detect Lamp” turns on it indicates that the fluid level in the environmental tank has reached the warning level and that it is now time to drain the environmental tank.

1. This generator is equipped with an environmental containment tank. Inspect this tank regularly.
2. If the tank becomes full with fluids, remove the drain bolt (Figure 61), then allow the fluids to drain into a suitable container.

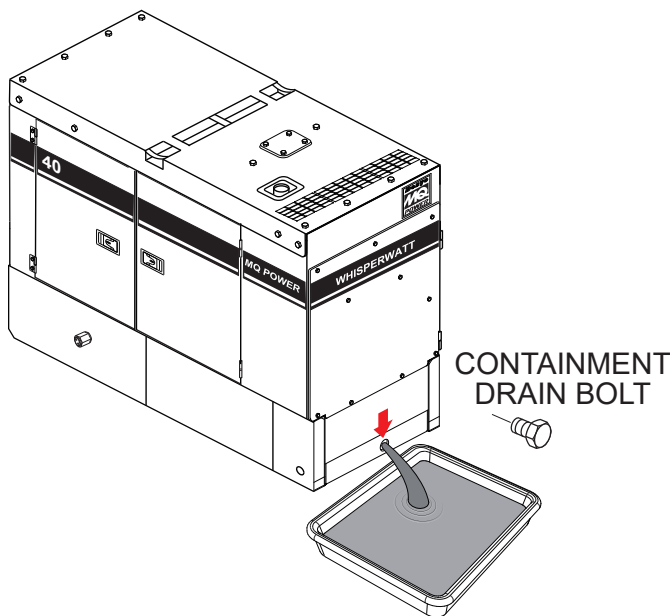


Figure 61. Draining Containment Tank

CLEANING INSIDE THE FUEL TANK

If necessary, drain the fuel inside the fuel tank completely. Using a spray washer (Figure 62) wash out any deposits or debris that have accumulated inside the fuel tank.

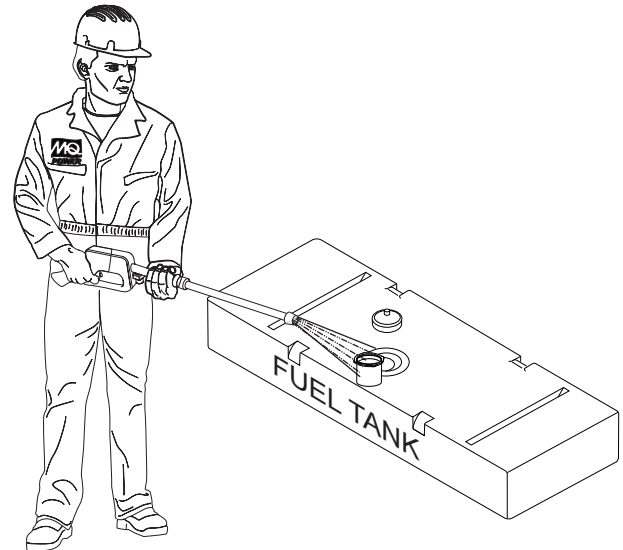


Figure 62. Fuel Tank Cleaning

FUEL TANK INSPECTION

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

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

DRAINING ENGINE OIL

1. Run the engine until the engine coolant reaches a temperature of 140°F (60°C). Turn the engine off.
2. Remove the oil dipstick from its holder.
3. Remove the **oil drain cap** (Figure 63).
4. Place the **oil drain valve** in the **OPEN** position and allow the oil to drain into a suitable container.

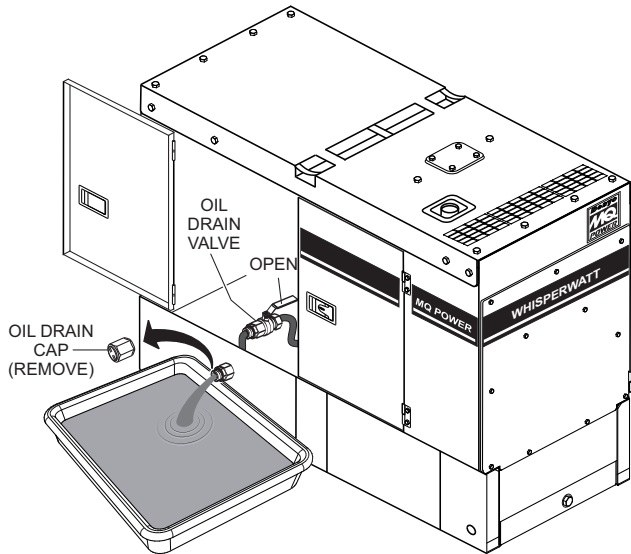


Figure 63. Draining Engine Oil

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

ENGINE OIL FILTER REPLACEMENT

1. Clean the area around the lubricating oil filter head.
2. Using an oil filter wrench (Figure 64), remove the engine oil filter.

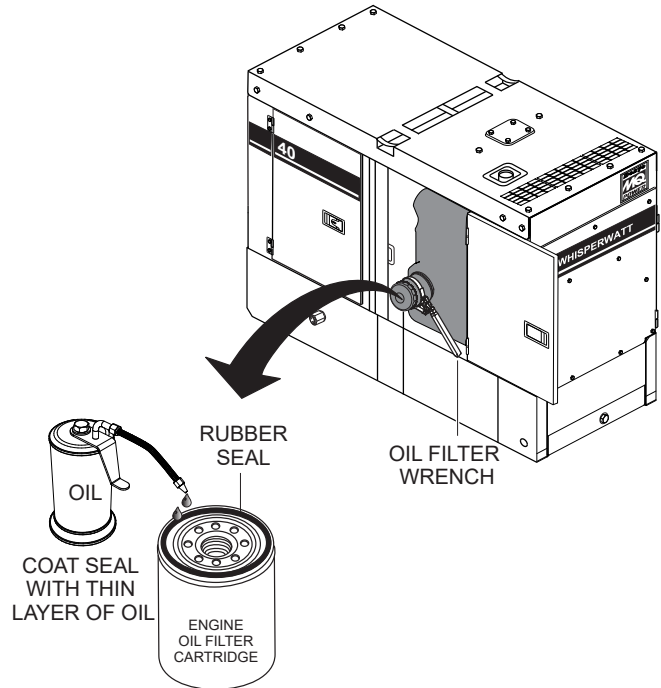


Figure 64. Oil Filter Removal

3. Coat the rubber seal (gasket) surface of the oil filter (Figure 64) with clean 15W-40 engine oil.
4. Install the new oil filter first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using the filter wrench.
5. Fill the engine crankcase with high-quality detergent oil classified "For Service CI-4." Fill to the upper limit of the dipstick. **DO NOT** overfill. Reference Table 2 for engine crankcase oil capacity.
6. Run the engine for several minutes. Watch for oil leakage. Shut the engine down and allow it to sit for several minutes. Top off the oil to the upper limit on the dipstick.

DRAINING 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 65) only if the coolant temperature is below 120°F (50°C).

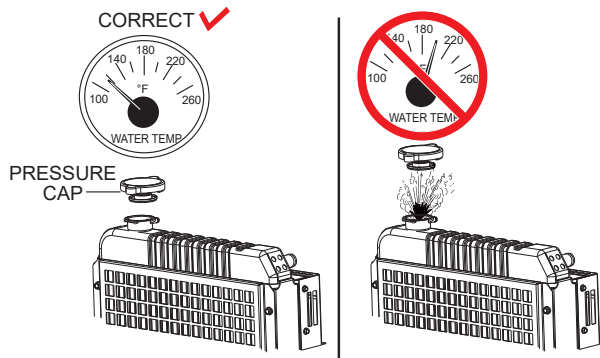


Figure 65. Radiator Pressure Cap Removal

2. Open the cabinet door and remove the coolant drain bolt and O-ring (Figure 66), then allow the coolant to drain into a suitable container.

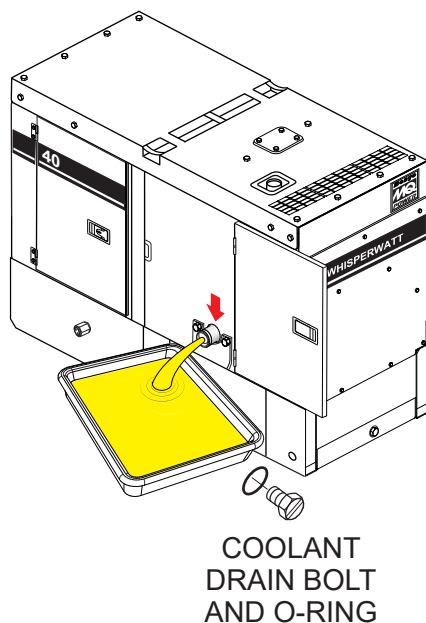


Figure 66. Draining Radiator Coolant

FLUSHING OUT THE RADIATOR AND REPLACING COOLANT

- Open both cocks located at the crankcase side and at the lower part of the radiator and drain the coolant. Open the radiator cap while draining. Remove the overflow tank and drain.
- Check hoses for softening and kinks. Check clamps for signs of leakage.
- Tighten both cocks and replace the overflow tank.
- Replace with coolant as recommended by the engine manufacturer.
- Close the radiator cap tightly.
- Flush the radiator by running clean tap water through the radiator until signs of rust and dirt are removed. **DO NOT** clean the radiator core with any objects, such as a screwdriver.

WARNING



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

RADIATOR CLEANING

The radiator (Figure 67) should be sprayed (cleaned) with a high-pressure washer when excessive amounts of dirt and debris have accumulated on the cooling fins or tube. When using a high-pressure washer, stand at least 5 feet (1.5 meters) away from the radiator to prevent damage to the fins and tube.

NOTICE

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



Figure 67. Radiator Cleaning

DRIVE BELT (DAILY)

Drive Belt Tension

A slack drive belt (Figure 68) may contribute to overheating or insufficient charging of the battery. Adjust the drive belt in accordance with the Kubota engine operator's manual.

Drive Belt Inspection

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

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

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

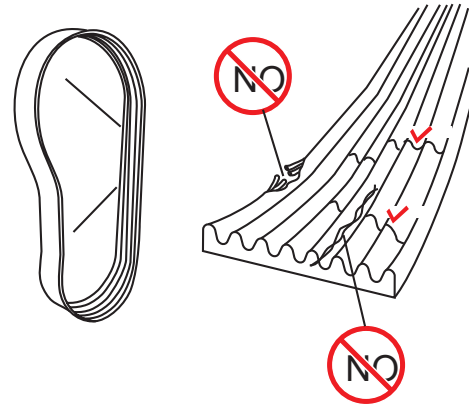


Figure 68. Drive Belt Inspection

TESTING THE GFCI RECEPTACLE

NOTICE

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

1. Start the generator as outlined in the start-up procedure in this manual.
2. Place a **GFCI circuit breaker** (Figure 69) in the **ON** position.

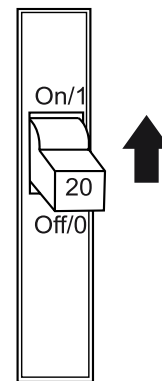


Figure 69. GFCI Circuit Breaker

3. Verify that the **status LED** on the corresponding **GFCI receptacle** (Figure 70) is **ON (GREEN)**.

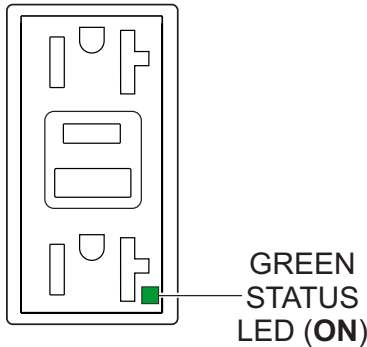


Figure 70. GFCI Receptacle (ON)

4. Press the **TEST button** (Figure 71) on the GFCI receptacle and verify that the status LED turns **OFF**.

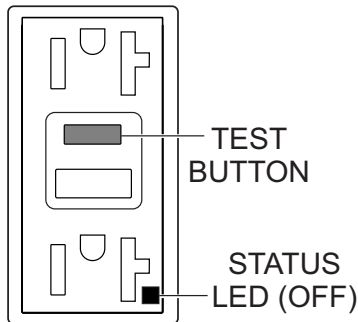


Figure 71. GFCI Receptacle (OFF)

5. Press the **RESET button** (Figure 72) to restore power to the GFCI receptacle and verify that the status LED is **ON (GREEN)**.

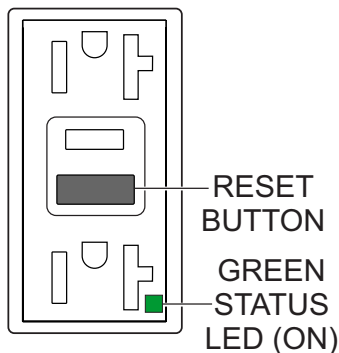


Figure 72. GFCI Receptacle (ON/Restore)

6. If the status LED (Figure 73) is **flashing (RED)**, **DO NOT** use the GFCI receptacle. Replace it immediately.

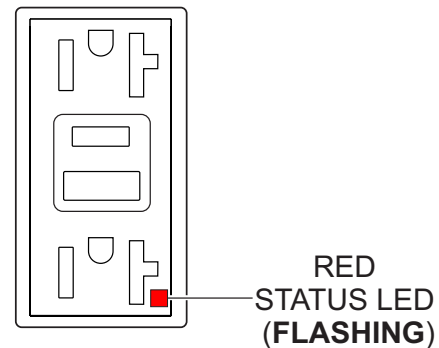


Figure 73. GFCI Receptacle (Red Flashing LED)

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

GENERATOR STORAGE

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

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

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

This generator can be equipped with an **engine block heater** and an **internal battery charger** as **options**. They are provided with electric cords to connect to a commercial power source.

The engine block heater and internal battery charger both require 120 VAC in order to operate. A receptacle (Figure 74) has been provided on the output terminal panel to allow commercial power to be applied.

These receptacles will **ONLY** function when commercial power has been supplied to them (Figure 74). To apply commercial power to these receptacles, a power cord of adequate size will be required (See Table 6).

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

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

NOTICE

If the generator will be idle (not used) for long periods of time and to ensure adequate starting capability, always have power applied to the generator's internal battery charger.

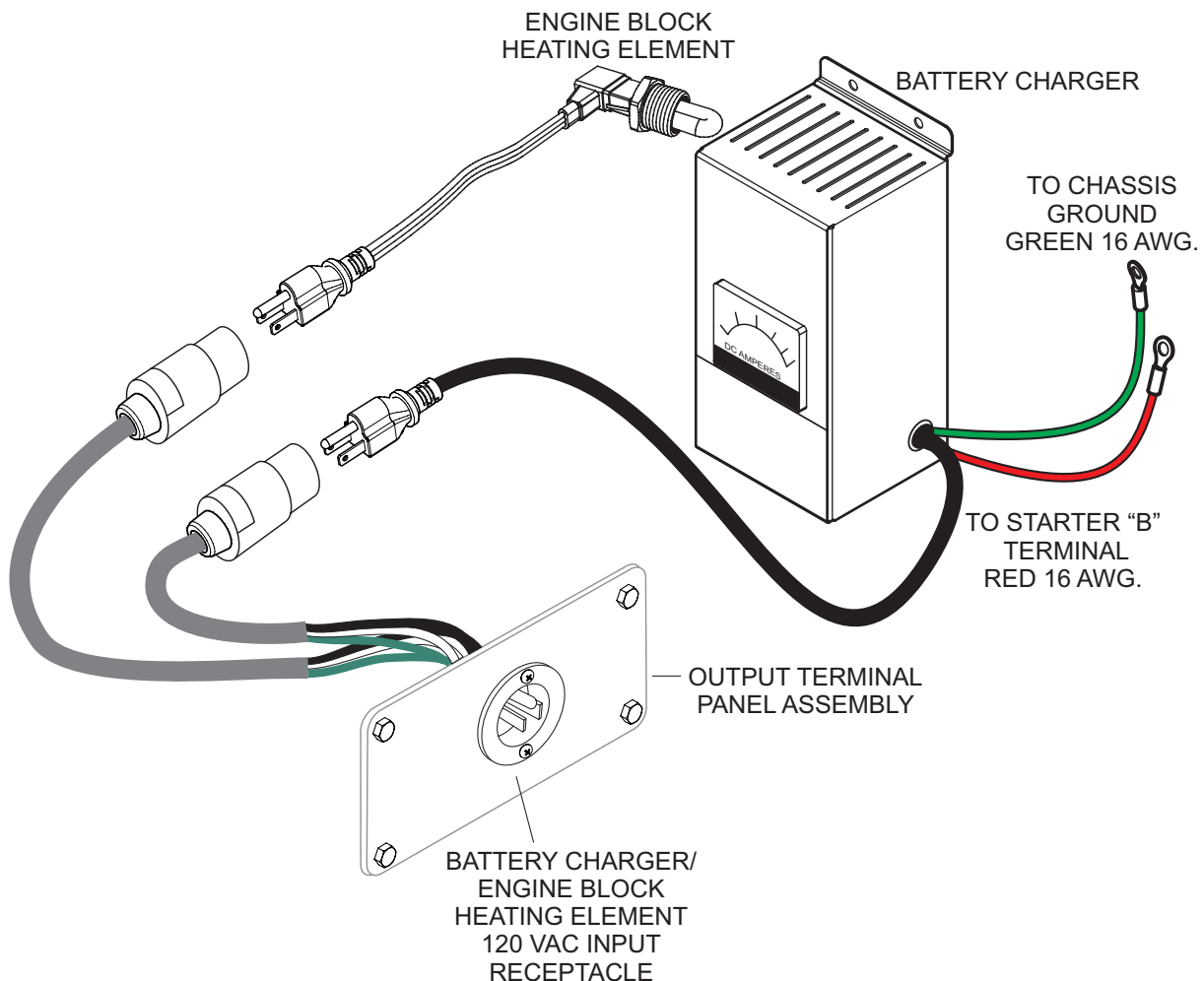


Figure 74. Battery Charger and Jacket Water Heater (Options)

EMISSION CONTROL

The emission control system employed with the Kubota diesel engine consists of a Diesel Oxidation Catalyst (DOC).

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

Diesel Oxidation Catalyst (DOC)

The DOC (Figure 75) does not filter particles, it oxidizes them. This catalyst (honeycomb-like structure) uses a chemical process to break down pollutants in the exhaust stream into less harmful components. In general this catalyst collects/burns accumulated particulates. The DOC contains palladium and platinum which serve as catalysts to oxidize hydrocarbons and carbon monoxide.

PREVENTIVE MAINTENANCE PROGRAMS

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

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

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

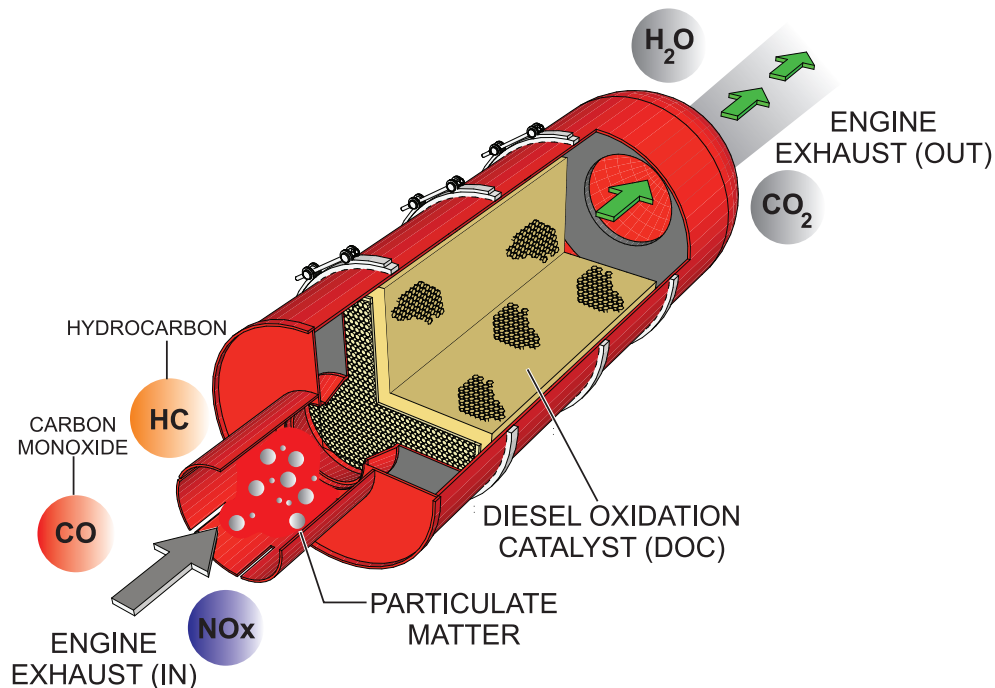


Figure 75. Diesel Oxidation Catalyst (DOC)

TROUBLESHOOTING (DIAGNOSTICS)

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

When any engine faults occur during operation of the generator the **warning lamp** (diagnostic lamp) located on the control panel will turn on. If this condition occurs please perform immediately the engine fault code diagnostic procedure below.

ENGINE FAULT CODE DIAGNOSTIC PROCEDURE

1. Remove all loads from the generator and place all circuit breakers in the **OFF** position.
2. Stop the engine.
3. Release the retaining screws that secure the control panel to the generator frame.
4. Slowly let the control panel fall forward so that the control box is exposed.
5. To start the diagnostic process, place the **diagnostic switch** to the **ON** (Figure 76) position.

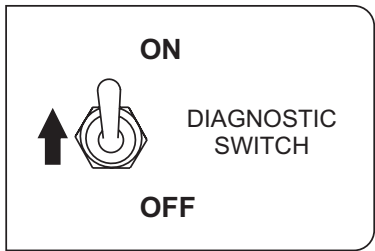


Figure 76. Diagnostic Panel

NOTICE

Make sure to place the diagnostic switch back to the **OFF** position after completing engine fault code diagnostic procedures.

6. Verify that the **Engine Shutdown lamp** (Figure 77A) or **Engine Pre-Alarm lamp** (Figure 77B) is **ON**. This indicates that there is a fault/error in the engine or the engine control system.

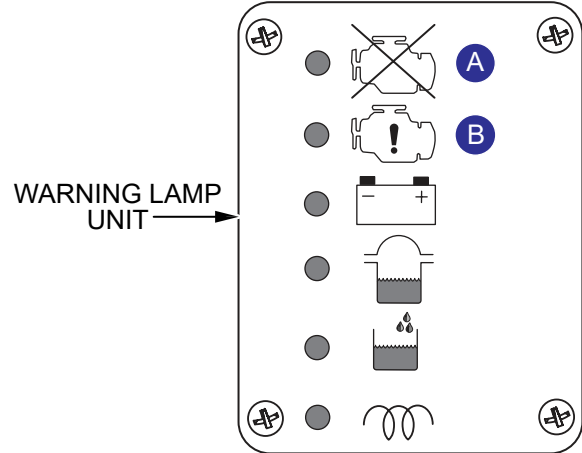


Figure 77. Engine Warning Lamp Unit

7. Refer to the Engine Instruction Manual for the contents/ locations of the fault and troubleshooting procedures.

NOTICE

For a complete understanding of error codes and troubleshooting procedures, refer to the enclosed engine instruction manual.

NOTICE

When a fault is detected the fault code will automatically be saved as a previous code in the ECM even after the fault has been repaired.

TROUBLESHOOTING (GENERATOR)

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 15 shown below for diagnosis of the generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 15. 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	Low engine speed?	Check and adjust.
	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.

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 as soon as starter is switched off.	Fuel filter blocked?	Replace fuel filter.
	Fuel supply blocked?	Check the entire fuel system.
	Defective fuel pump?	Replace fuel pump.
Engine stops by itself during normal operation.	Fuel tank empty?	Add fuel.
	Fuel filter blocked?	Replace fuel filter.
	Defective fuel pump?	Replace fuel pump.
	Mechanical oil pressure shutdown sensor stops the engine due to low oil?	Add oil. Replace low oil shutdown sensor if necessary.
Low engine power, output and speed.	Fuel tank empty?	Add fuel.
	Fuel filter clogged?	Replace fuel filter.
	Fuel tank venting is inadequate?	Ensure tank is adequately vented.
	Leaks at pipe unions?	Check threaded pipe unions. Tape and tighten unions as required.
	Speed control lever does not remain in selected position?	See engine manual for corrective action.
	Engine oil level too full?	Correct engine oil level.
	Injection pump wear?	Use No. 2-D diesel fuel only. Check the fuel injection pump element and delivery valve assembly and replace as necessary.

TROUBLESHOOTING (ENGINE)

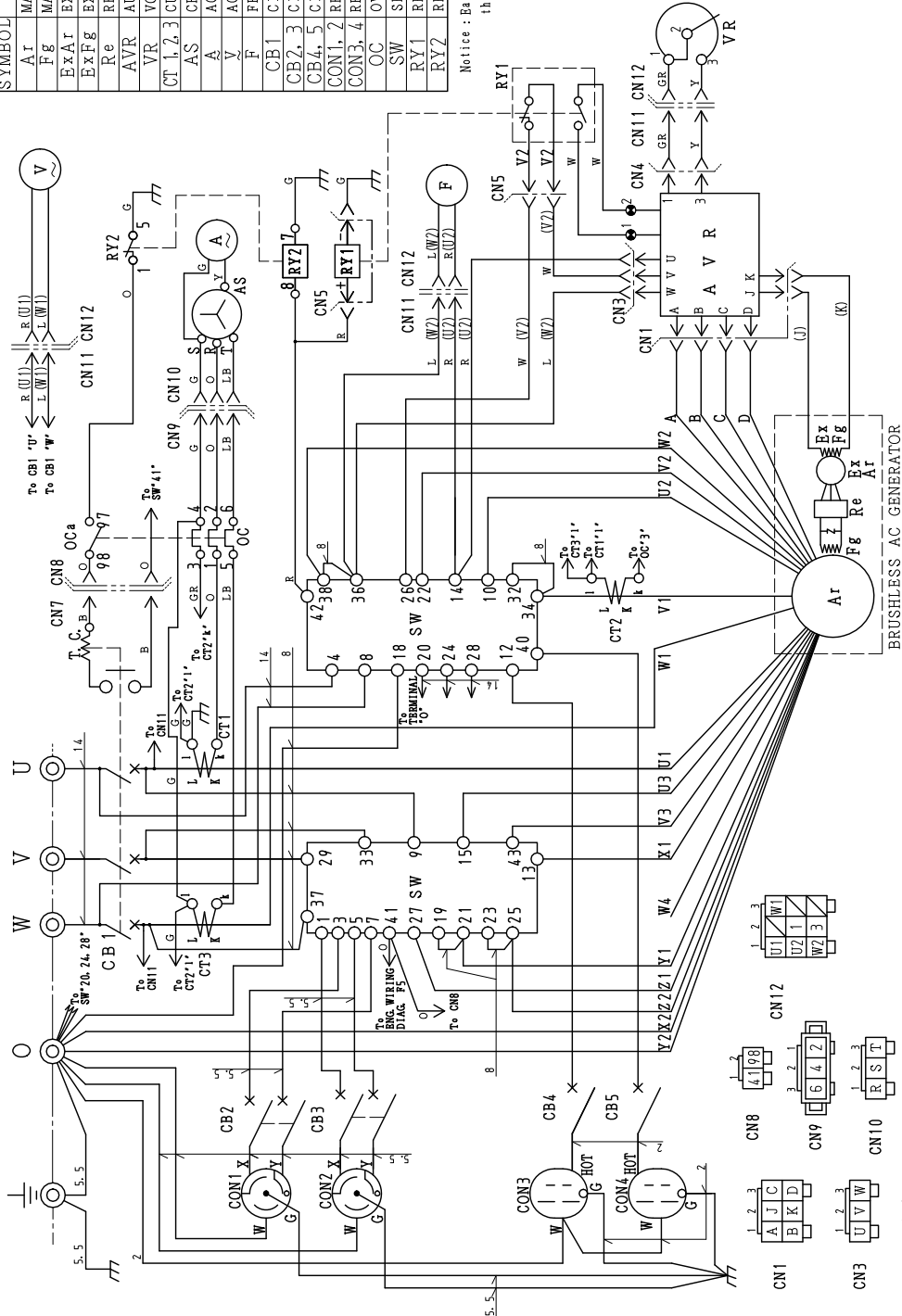
Troubleshooting (Engine) - continued		
Symptom	Possible Problem	Solution
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.
Engine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

GENERATOR WIRING DIAGRAM (M1814001203A)

SYMBOL	DESIGNATION
Ar	MAIN GENERATOR ARMATURE WINDING
Fg	MAIN GENERATOR FIELD WINDING
ExAr	EXCITER ARMATURE WINDING
ExFg	EXCITER FIELD WINDING
Re	RECTIFIER
AVR	AUTOMATIC VOLTAGE REGULATOR
VR	VOLTAGE REGULATOR (RHEOSTAT)
CT 1, 2, 3	CURRENT TRANSFORMER
AS	CHANGE-OVER SWITCH, AMMETER
A	AC. AMMETER
V	AC. VOLTMETER
F	FREQUENCY METER
CB1	CIRCUIT BREAKER 3P 110A
CB2, 3	CIRCUIT BREAKER 2P 50A
CB4, 5	CIRCUIT BREAKER 1P 20A
CON1, 2	RECEPTACLE 750V 50A
CON3, 4	RECEPTACLE 125V 20A X2 (G. F. C. I.)
OC	OVER CURRENT RELAY
SW	SELECTOR SWITCH
RY1	RELAY UNIT
RY2	RELAY

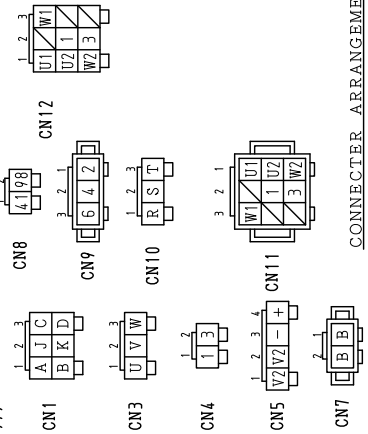
Notice: Each cables are passed twice through the CT1, 2 and 3.

CT 1 ~ 3	
k	Written mark at CT
l	No. mark
K	H1
L	No. mark



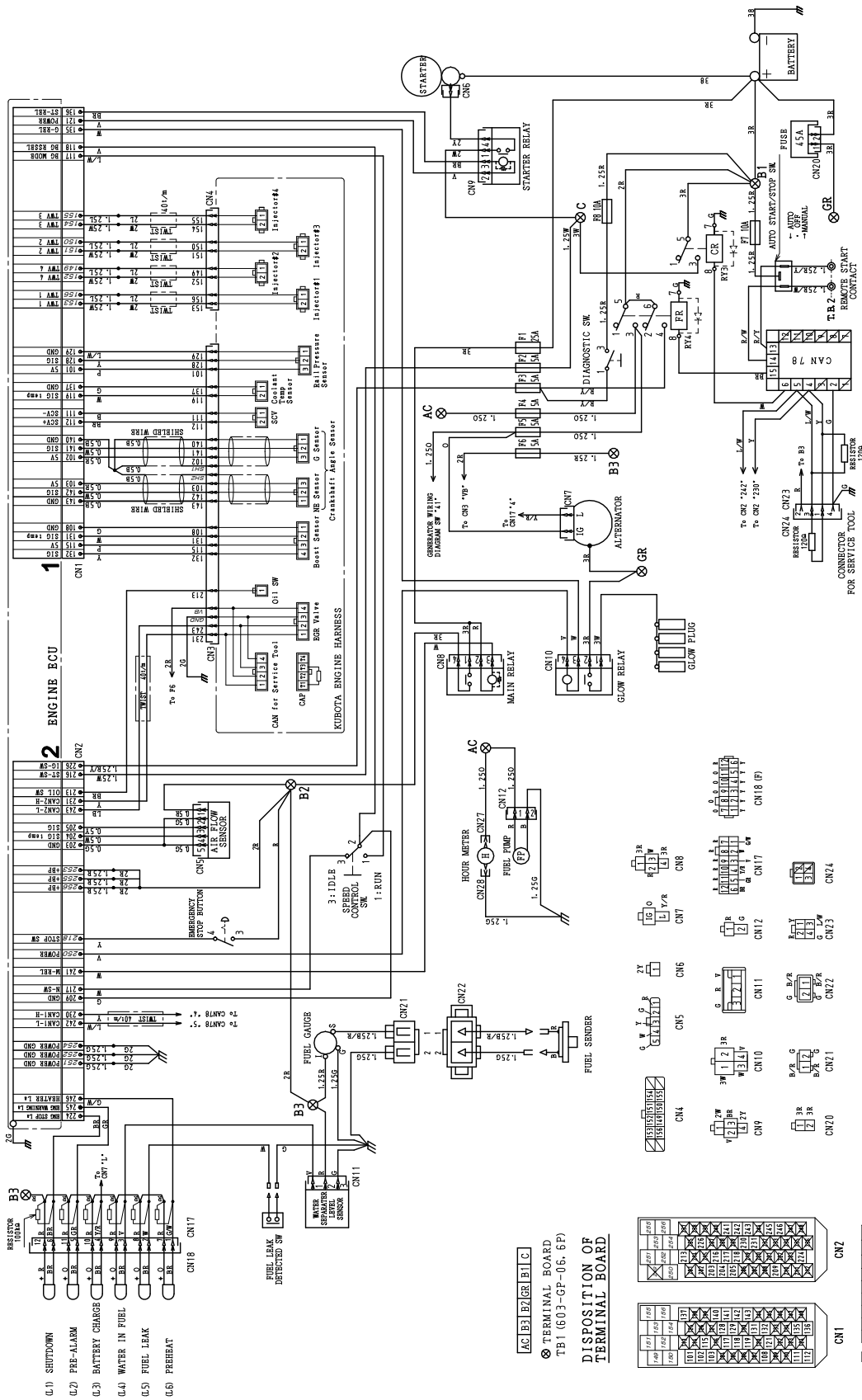
WIRE SIZE		COLOR CODE	
14:	14 AWG	WIRE COLOR	WIRE COLOR
8:	8 AWG	B	BLACK
5.5:	5.5 AWG	L	BLUE
2:	2 AWG	W	WHITE
APPLICATION: Designating wire size is 1/16" diameter with enameled color.			
		BR	BROWN
		G	GREEN
		GR	GRAY
		V	VIOLET
		P	PINK
		LG	LIGHT GREEN
		LB	LIGHT BLUE
		Y	YELLOW
		R	RED
		OR	ORANGE

CONNECTER ARRANGEMENT (WIRING VIEW)



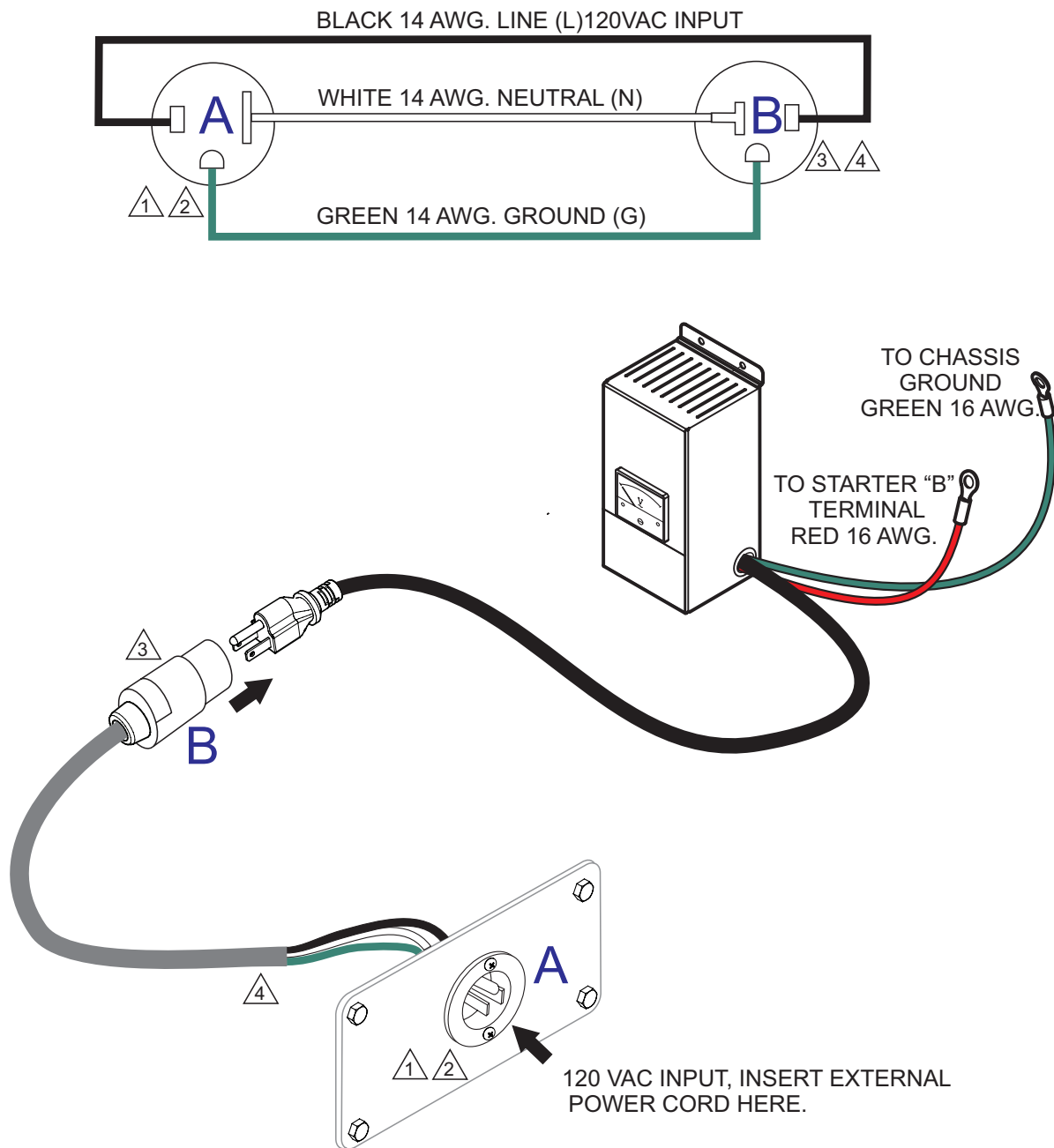
GENERATOR WIRING DIAGRAM NO. M1814001203A

ENGINE WIRING DIAGRAM (M1814102013)



ENGINE WIRING DIAGRAM NO. M1814102013

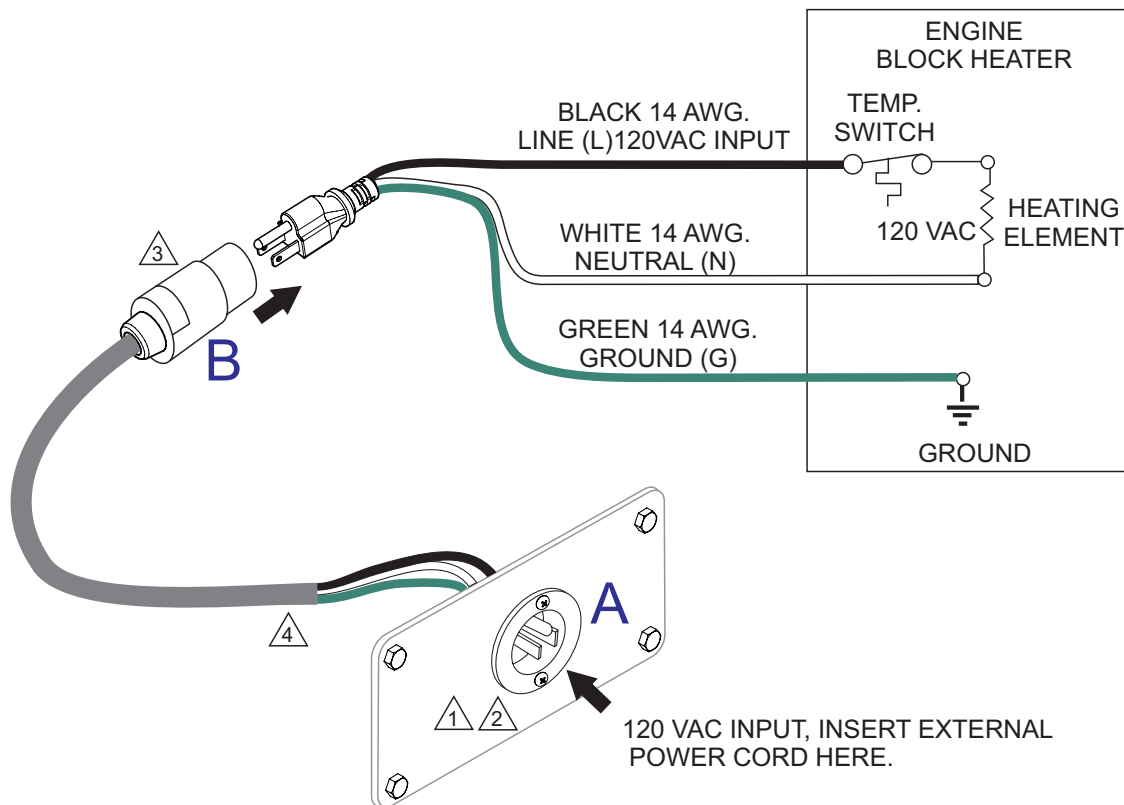
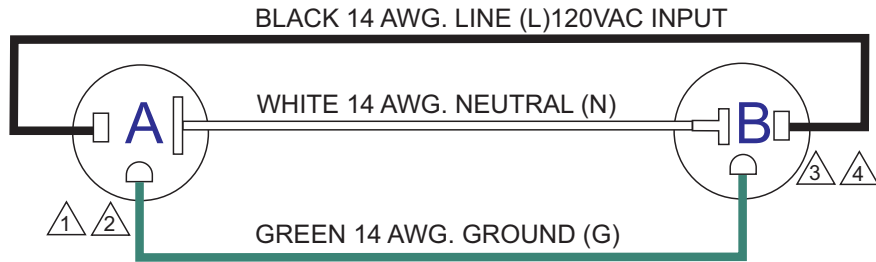
BATTERY CHARGER WIRING DIAGRAM (OPTION)



NOTES:

- ① NEMA 5-15, 15A, 120 VAC, P/N HBL5278C/HUBBLE RECEPTACLE.
- ② RECEPTACLE IS MOUNTED ON OUTPUT TERMINAL PANEL ASSY.
- ③ 20 AMP, 5-20R RECEPTACLE, P/N HBL5369C/HUBBLE RECEPTACLE.
- ④ CORD, CAROL 3/C 14 AWG., P/N EE56557.

ENGINE BLOCK HEATER WIRING DIAGRAM (OPTION)



NOTES:

- ① NEMA 5-15, 15A, 120 VAC, P/N HBL5278C/HUBBLE RECEPTACLE.
- ② RECEPTACLE IS MOUNTED ON OUTPUT TERMINAL PANEL ASSY.
- ③ 20 AMP, 5-20R RECEPTACLE, P/N HBL5369C/HUBBLE RECEPTACLE.
- ④ CORD, CAROL 3/C 14 AWG., P/N EE56557.

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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by
DENYO MANUFACTURING CORP.

