OPERATION MANUAL

WHISPERWATT™ SERIES
MODEL
DCA300SSJU4F3PB
60 Hz GENERATOR
(JOHN DEERE 6090HFG06 DIESEL ENGINE)

INSTRUCTION MANUAL NO. M5844300604

Revision #0 (12/10/24)

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

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.


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

DCA300SSJU4F3PB 60 Hz Generator

NOTICE

Specifications are subject to change without notice.

SAFETY DECALS

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

NOTICE

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

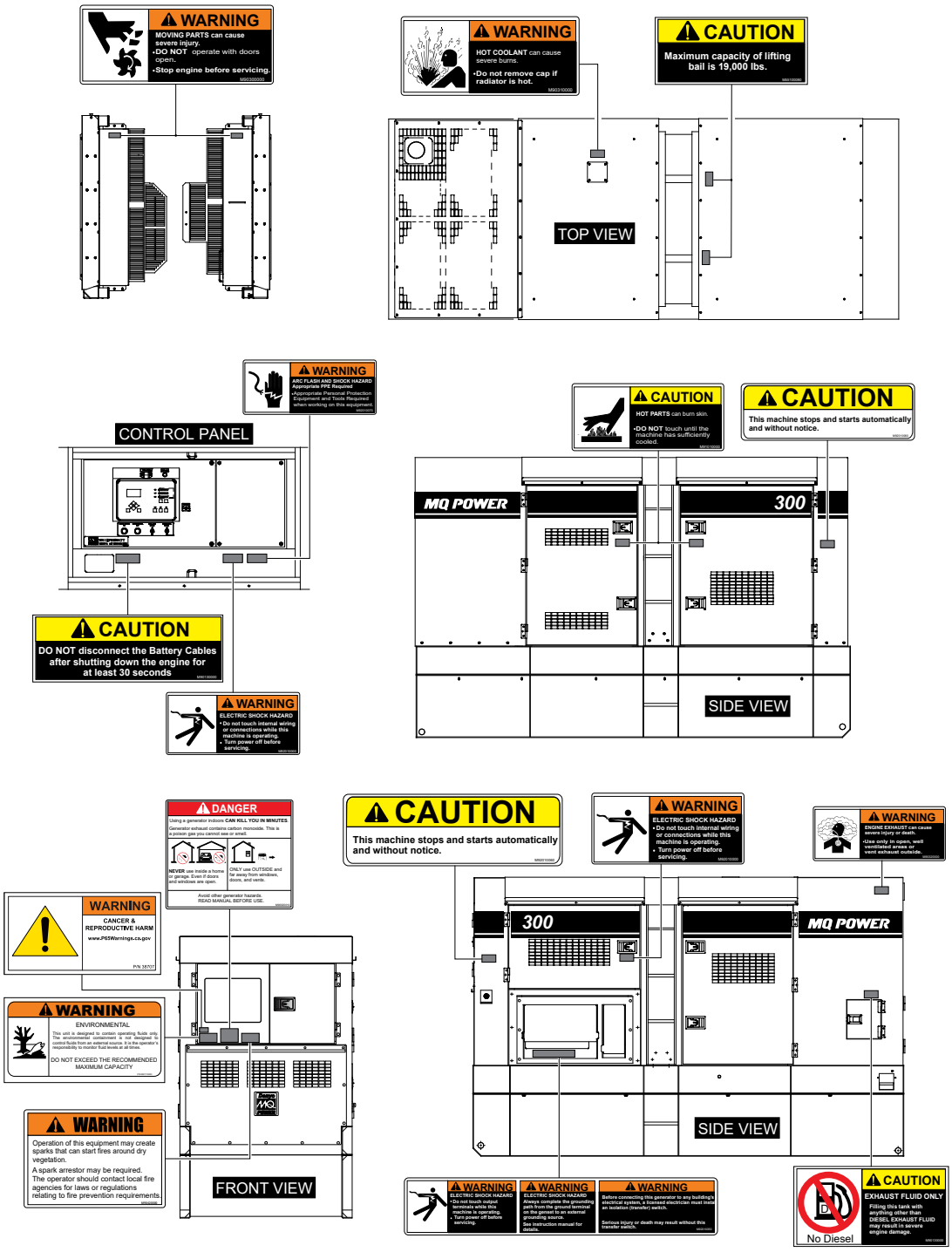


Figure 1. Safety Decals

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

SAFETY MESSAGES

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

SAFETY SYMBOLS

DANGER

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

WARNING

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

CAUTION

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

NOTICE

Addresses practices not related to personal injury.

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

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

GENERAL SAFETY

⚠ CAUTION

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

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

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

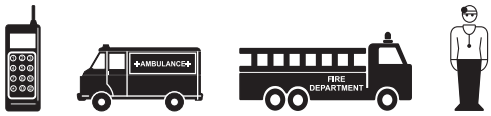
- **ALWAYS** check the generator for loosened threads or bolts before starting.
- **NEVER** use the generator for any purpose other than its intended purposes or applications.

NOTICE

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

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

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



GENERATOR SAFETY

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

ENGINE SAFETY

⚠ DANGER

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

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

⚠ WARNING

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

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

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

⚠ CAUTION

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

NOTICE

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

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

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

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

FUEL SAFETY

⚠ DANGER

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

TOWING SAFETY

⚠ CAUTION

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

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

ELECTRICAL SAFETY

⚠ DANGER

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

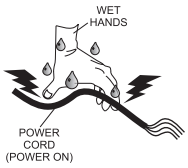
- The electrical voltage required to operate the generator can cause **severe injury or even death** through physical contact with live circuits. Turn the generator and all circuit breakers **OFF** before performing maintenance on the generator or making contact with the output terminals.
- **NEVER**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

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

Power Cord/Cable Safety

⚠ DANGER

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



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

NOTICE

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

Grounding Safety

⚠ DANGER

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

BATTERY SAFETY

⚠ DANGER

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

⚠ WARNING

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

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

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

⚠ CAUTION

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

ENVIRONMENTAL SAFETY/DECOMMISSIONING

NOTICE

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

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

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

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

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

EMISSIONS INFORMATION

NOTICE

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

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

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

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

Emission Control Label

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

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

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

Table 1. Generator Specifications		
Model	DCA300SSJU4F3PB	
Type	Revolving field, self-ventilated, open protected type synchronous generator	
Armature Connection	Star with neutral	
Phase	3	
Standby Output	264 kW (330 kVA)	
Prime Output	240 kW (300 kVA)	
3Ø Voltage (L–L/L–N) Voltage Change-Over Bd. at 3Ø 240/139	208Y/120, 220Y/127, 240Y/139	
3Ø Voltage (L–L/L–N) Voltage Change-Over Bd. at 3Ø 480/277	416Y/240, 440Y/254, 480Y/277	
1Ø Voltage (L–L/L–N) Voltage Change-Over Bd. at 1Ø 240/120	N/A	
Voltage Change-Over Board Tie Bolt Torque	221.3 lbf·in (25.0 N·m)	
Power Factor	0.8	
Frequency	50/60 Hz	
Speed	1,800 rpm	
Aux. AC Power	Single Phase, 60 Hz	
Pitch	2/3	
Subtransient	0.079	
Transient	0.201	
Synchronous	1.51	
Zero Sequence Reactance	0.009	
Overload Protection	OCR/main circuit breaker	
Aux. Voltage/Output	4.8 kW (2.4 kW × 2)	
Dry Weight	11,155 lb. (5,060 kg)	
Wet Weight	14,815 lb. (6,720 kg)	
Table 2. Engine Specifications		
Model	John Deere 6090HFG06 EPA Tier 4 Final Certified	
Type	4-cycle, water-cooled, direct-injection, turbocharged ,charged air-cooled, EGR, DOC and SCR	
No. of Cylinders	6	
Bore × Stroke	4.64 in. × 5.34 in. (118.4 mm × 136 mm)	
Displacement	549.2 cu. in. (9.0 liters)	
Rated Output	437 HP (326 kW) at 1,800 rpm	
Starting	Electric	
Cold Weather Starting Aid	NVT Dieselmatic Starting Fluid System	
Coolant Capacity	17.7 gal. (67 liters)[1]	
Lube Oil Capacity	9.3 gal. (35 liters)[2]	
Lube Oil Type	API service class CJ-4, ACEA E9 or ACEA E6	
DEF Tank Capacity	29.8 gal. (112.8 liters)	
Fuel Tank Capacity	430.6 gal. (1,630 liters)	
Fuel Type	#2 diesel fuel (ultra-low sulfur diesel fuel only)	
Fuel Consumption	16.7 gal. (63.2 L)/hr. at **full load**	12.5 gal. (47.4 L)/hr. at **3/4 load**
	8.9 gal. (33.8 L)/hr. at **1/2 load**	5.8 gal. (21.9 L)/hr. at **1/4 load**
Battery	8D (CCA 0°F 1,400 A) × 1	

[1] Includes engine, radiator, and sub tank with hoses [2] Includes filters

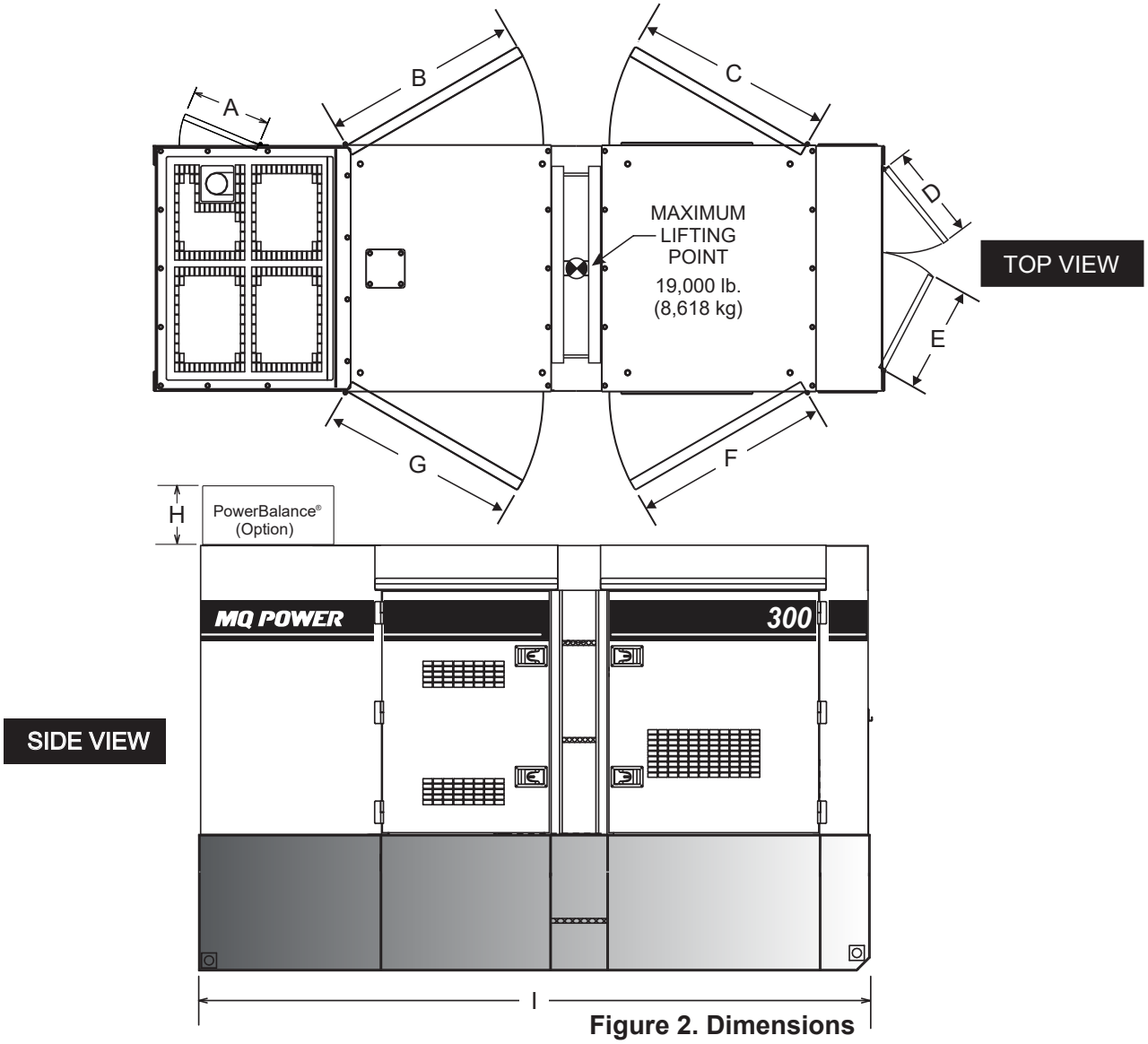


Figure 2. Dimensions

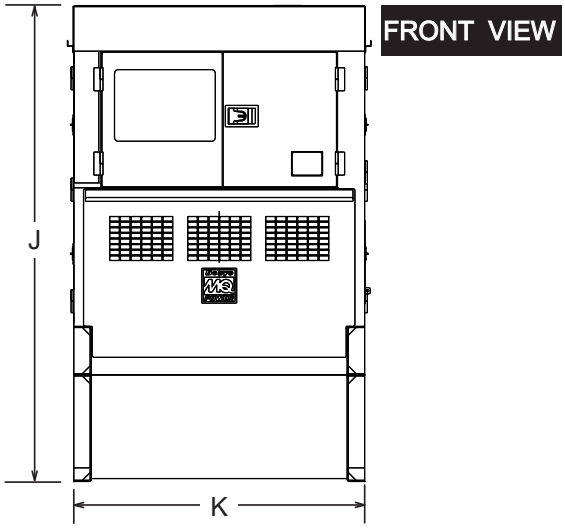


Table 3. Dimensions			
Reference Letter	Dimension in. (mm)	Reference Letter	Dimension in. (mm)
A	11.81 (300)	G	38.19 (970)
B	38.19 (970)	H	10.87 (276)
C	45.47 (1,155)	I	149.61 (3,800)
D	23.03 (585)	J	96.46 (2,450)
E	25.19 (640)	K	59.06 (1,500)
F	45.47 (1,155)		

GENERATOR GROUNDING

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

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

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

Connecting The Ground

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

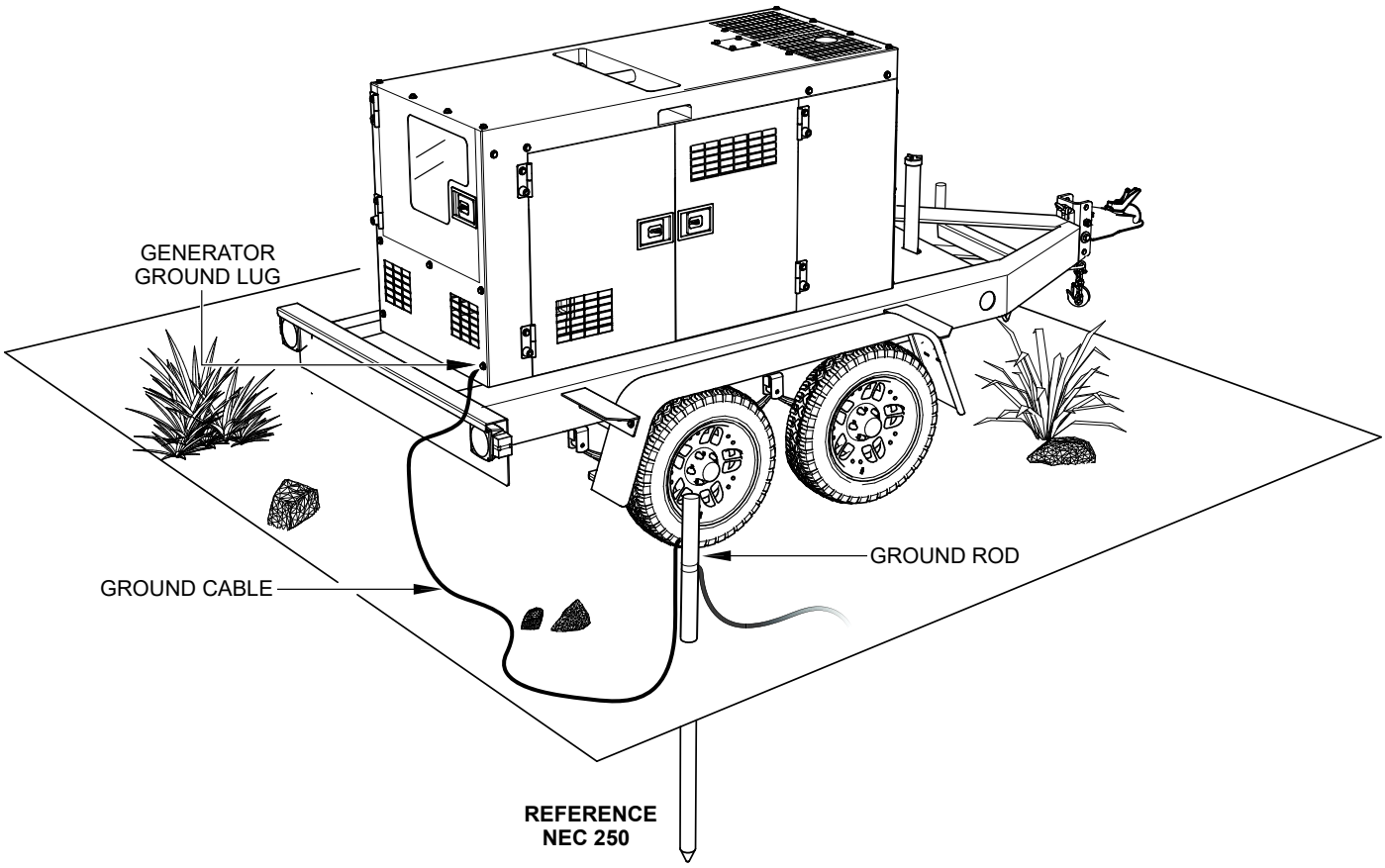


Figure 3. Typical Generator Grounding Application

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

OUTDOOR INSTALLATION

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

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

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

⚠ CAUTION

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

INDOOR INSTALLATION

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

MOUNTING

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

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

GENERATOR

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

CONTROL AND OPERATION PANEL

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

- Basler DGC-2020HD Digital Controller (Standard)
  - Liquid Crystal Display
  - Not In Auto Indicator
  - Alarm Indicator
  - Supplying Load Indicator
  - Alarm Silence Button
  - Lamp Test Button
  - Auto Button/Mode Indicator
  - Off Button/Mode Indicator
  - Run Button/Mode Indicator
  - Reset Button
  - Arrow Buttons (4)
  - Edit Button
  - Select Voltage Indicator Lamps (3)
- Circuit Breaker On Button
- Circuit Breaker Off Button
- Panel Light/Panel Light Switch
- Control Power Switch
- Pilot Lamp
- Voltage Regulator
- 3-Phase, 800-Amp Main Circuit Breaker
- **Control Box** (located behind control panel)
  - Regen Inhibit Switch
  - AC Voltage Select Switch
  - Automatic Voltage Regulator
  - Four Current Transformers
  - Overcurrent Relay
  - Starter Relay
  - Voltage Change-Over Board

OUTPUT TERMINAL PANEL

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

- Three 240/139V Output Receptacles (CS-6369), 50A
- Three Auxiliary Circuit Breakers, 50A
- Two 120V Output Receptacles (GFCI), 20A
- Two GFCI Circuit Breakers, 20A
- Eight Output Terminal Lugs (3Ø Power)
- Ground Lug
- Engine Block Heater
- Cam-Lok Connectors
- Battery Charger (Option)

OPEN-DELTA EXCITATION SYSTEM

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

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

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

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

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

ENGINE

This generator is powered by a 6-cylinder, 4-cycle, water-cooled, direct-injection, turbocharged, air-cooled EGR John Deere 6090HFG06 diesel engine. This engine is designed to meet every performance requirement for the generator. Refer to Table 2 for engine specifications.

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

MICROPROCESSOR CONTROL SYSTEM

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

EXTENSION CABLES

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

PARALLELING

Paralleling is the sharing of a load between two generator sets or more.

LOAD SHARING

Load sharing is defined as the proportional division of the **kW** and **kVAR** total load between multiple generator sets in a paralleled system.

Load sharing is essential to avoid overloading and stability problems on the system's generator sets.

ACTIVE POWER (KW) LOAD SHARING

When generator sets operate in parallel, the engine speed governor of each generator set determines the proportional sharing of the total active power requirements (kW) of the system.

The kW load sharing is achieved by increasing or decreasing fuel to the system's engines. As the fuel to the engine of one generator set in a group is increased it will not lead to an increase in speed and hence frequency (as it would if it were operating alone) but it will lead to an increase in the proportion of the total kW load that it will deliver.

As the fuel to the engine of one generator set in a group is decreased it will not lead to a decrease in speed and hence frequency (as it would if it were operating alone) but it will lead to a decrease in the proportion of the total kW load that it will deliver.

The control system of the generator sets (via the engine speed control system) monitors and controls the sharing of the total kW load in proportion to the relative rating of the engines on the system's generator sets.

REACTIVE POWER (KVAR) LOAD SHARING

When generator sets operate in parallel the alternator field excitation system of each generator set controls the proportional sharing of the total reactive power requirements (kVAR) of the system.

The kVAR load sharing is achieved by increasing or decreasing the field excitation to the system's alternators.

As the field excitation of one generator set in a group is increased (i.e. over excited) it will not lead to an increase in voltage (as it would if it were operating alone) but it will lead to an increase in the proportion of the total kVAR load it will deliver and a decrease in its power factor.

As the field excitation of one generator set in a group is decreased (i.e. over excited) it will not lead to a decrease in voltage (as it would if it were operating alone) but it will lead to a decrease in the proportion of the total kVAR load it will deliver and an increase in its power factor.

An undesirable circulating reactive current (cross current) will flow in the system if the excitation of the alternators is not matched.

LOAD MANAGEMENT

These generators are set up to automatically manage load based on demand. Load management is only functional in **Auto mode**. While in Auto mode, if the auto-start contacts are closed, load management is active by default. Load management will only run the number of units needed to support the load.

If the load demand is small, only one generator will remain running while the other generators will remain in standby mode. If the load increases above 80% of its capacity, it will start the next generator. The next generator priority is based on the time remaining on the maintenance timer.

Generators with more time until scheduled maintenance will take priority over units that are almost due for maintenance. Once the second unit starts, it will synchronize and parallel in, then ramp up to share the load. If the load levels drop below 35% of its combined rating, the generator that is no longer needed will ramp off, shut down, and wait in standby mode.

SEQUENCING

NOTICE

Ethernet communication is required when the generators are configured for the sequencing mode of operation.

These generators are capable of sequencing for control of balanced maintenance schedules. As described above, these generators can start and stop as demand raises or lowers. In addition, if a unit gets to the point of maintenance, it will ramp off and start the next generator to relieve it based on the time remaining on the maintenance timer.

After maintenance is performed, the maintenance timers should be reset to the recommended service interval. This is usually 250 hours depending on the engine oil type.

MAINTENANCE INTERVAL

Maintenance intervals are factory set for 250 hours. The maintenance interval timer will count down to zero indicating that it is time for the unit to be serviced.

Once the timer counts down to zero, a pre-alarm will appear indicating that the unit is due for maintenance. To reset the maintenance interval back to the default time of 250 hours, press and hold the **Reset button** for 10 seconds.

To reset the maintenance interval using the Reset button, the **Maintenance Due pre-alarm** must be active, and the Basler controller must display the **Overview (main) screen**.

If the maintenance timer has not yet expired and it is desired to reset the unit back to 250 hours, navigate back to the **Settings menu**: Settings Menu->System Parameters->Engine Statistics->Hours To Maintenance.

ALARM SILENCE

Pre-Alarm Silence allows the user to suppress the toggling of the alarm screen when a new pre-alarm becomes active. While a pre-alarm is active, pressing the **Alarm Silence button** will suppress the fault display.

This is a very useful function when the **Maintenance Interval pre-alarm** occurs. Right after the pre-alarm occurs, it will begin toggling between the pre-alarm and the **Overview screen**.

While in this mode, pressing the Reset button does not reset the maintenance interval. In order to reset the maintenance interval, the Overview screen must be selected.

Pressing the Alarm Silence button will stop the toggling between the pre-alarm and the Overview screen.

Once the Overview screen is selected, the maintenance interval can be reset by pressing and holding the Reset button for 10 seconds.

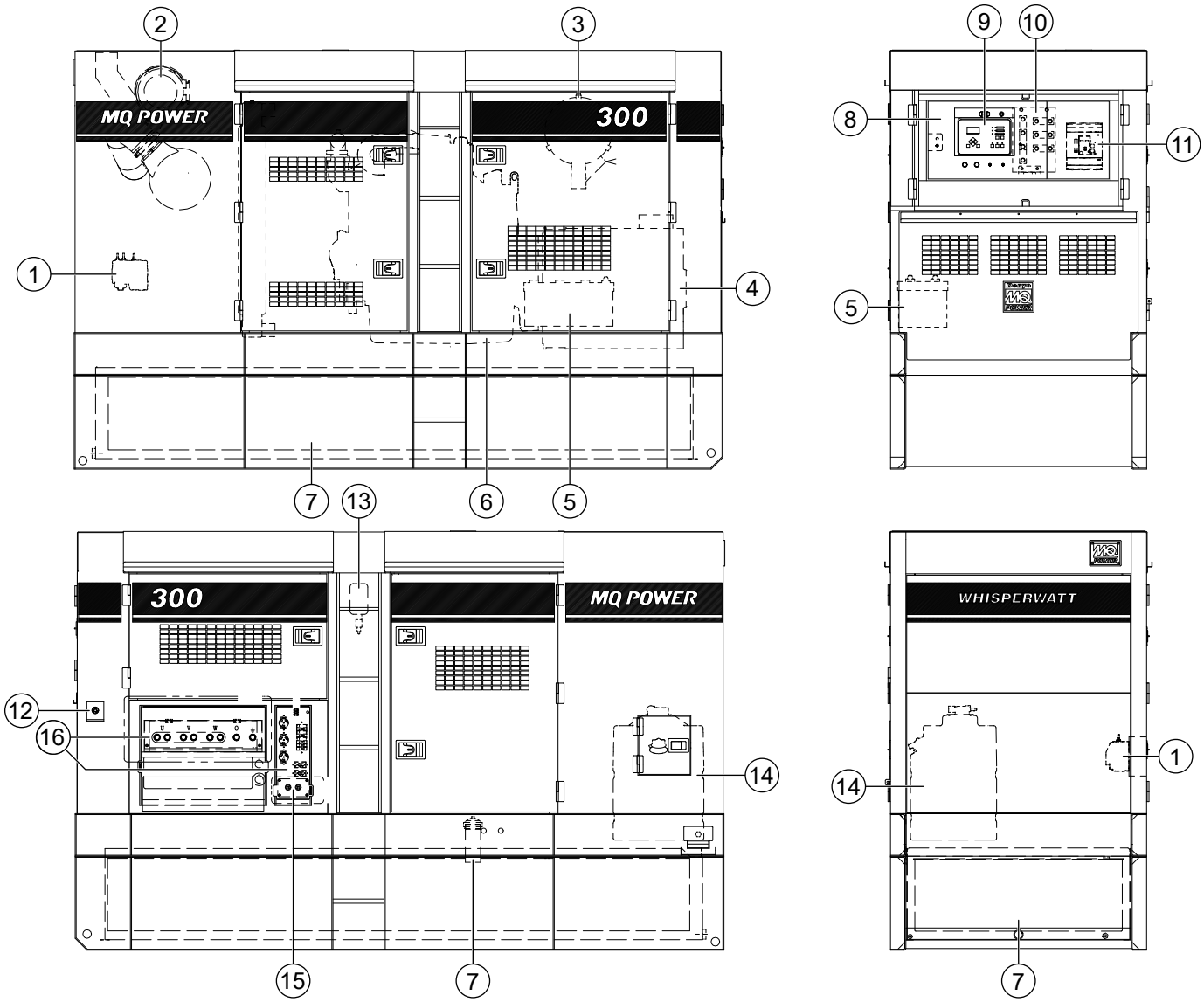


Figure 4. Major Components

Table 4. Major Components			
Item No.	**Description**	**Item No.**	**Description**
1	DEF Supply Module Assembly	9	Digital Controller Assembly
2	DOC/SCR Assembly	10	Voltage Change-Over Board Assembly
3	Air Cleaner Assembly	11	Main Circuit Breaker Assembly
4	Generator Assembly	12	Emergency Stop Switch Assembly
5	Battery Assembly	13	Starting Fluid Cylinder Assembly
6	Engine Assembly	14	DEF Tank Assembly
7	Fuel Tank Assembly	15	Parallel Communication Receptacles Assembly
8	Control and Operation Panel Assembly	16	Output Terminal Panel Assembly

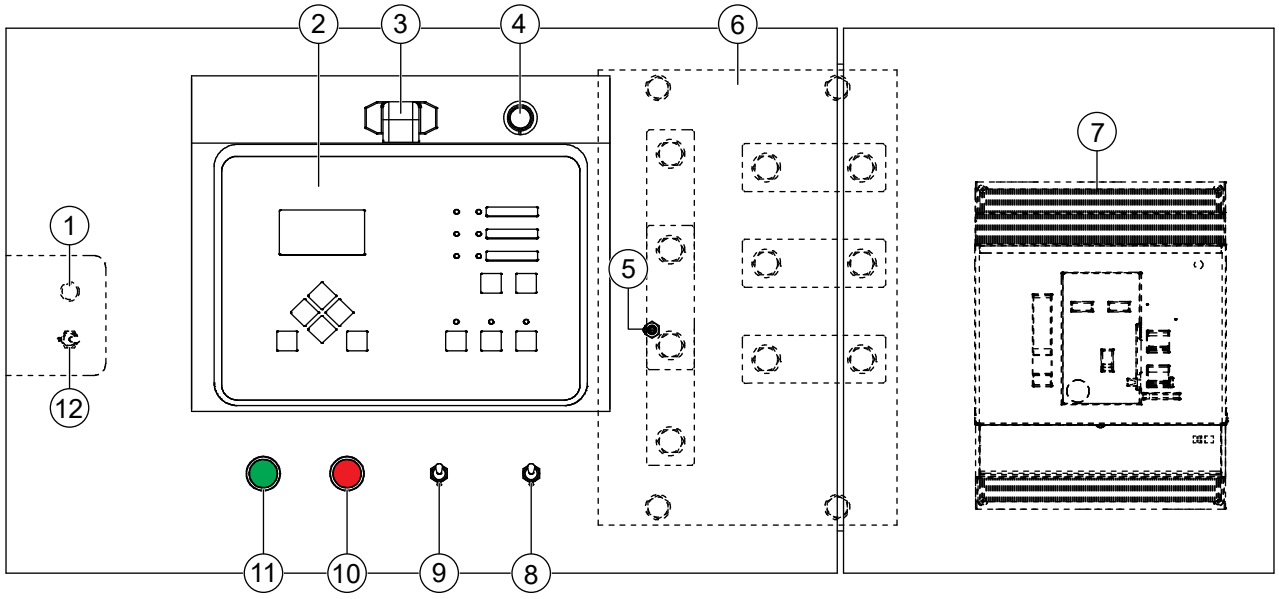


Figure 5. Control And Operation Panel

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

1. **Regen Inhibit Switch** — Press this button to inhibit regeneration in conditions where it may be unsafe for elevating exhaust temperatures. Press again to deactivate Regen Inhibit. Located inside the control box.
2. **Basler DGC-2020HD Digital Genset Controller** — Displays parameters (AC voltage, AC current, phase, frequency, fuel level, DEF level, oil pressure, engine run hours, water/coolant temperature, and battery voltage) as well as diagnostic trouble codes and messages. Refer to the section for more information.
3. **Panel Light** — Illuminates the control panel for operation in the dark.
4. **Pilot Lamp** — Turns on during engine operation.
5. **Voltage Regulator** — Allows fine manual adjustment of the generator's output voltage.
6. **Voltage Change-Over Board** — Consists of 6 jumper plates that allow the generator to be configured for either 240 or 480 VAC output. Located inside the control box.
7. **Main Circuit Breaker** — This 3-phase, 800-amp, main circuit breaker connects or disconnects the generator output to or from the output terminals, and protects the unit from short circuits or overcurrent. Located inside the control box.
8. **Control Power Switch** — Set this switch to the **ON** position prior to operation. The digital controller will turn **ON**. Make sure the switch is set to the **OFF** position when operation has ended. This switch is disabled while the engine is running.
9. **Panel Light Switch** — Turns the panel light on/off. Make sure the panel light switch is in the **OFF** position when the panel light is not needed.
10. **Circuit Breaker OFF Button** — Press this button during manual operation to turn the main circuit breaker **OFF**. The button LED will turn on **(red)** to indicate that the circuit breaker is **open**.
11. **Circuit Breaker ON Button** — Press this button during manual operation to turn the main circuit breaker **ON**. The button LED will turn on **(green)** to indicate that the circuit breaker is **closed**.
12. **AC Voltage Select Switch** — Use to select the output voltage (240V/208V) when the voltage change-over board is in the 240-volt position. Located inside the control box.

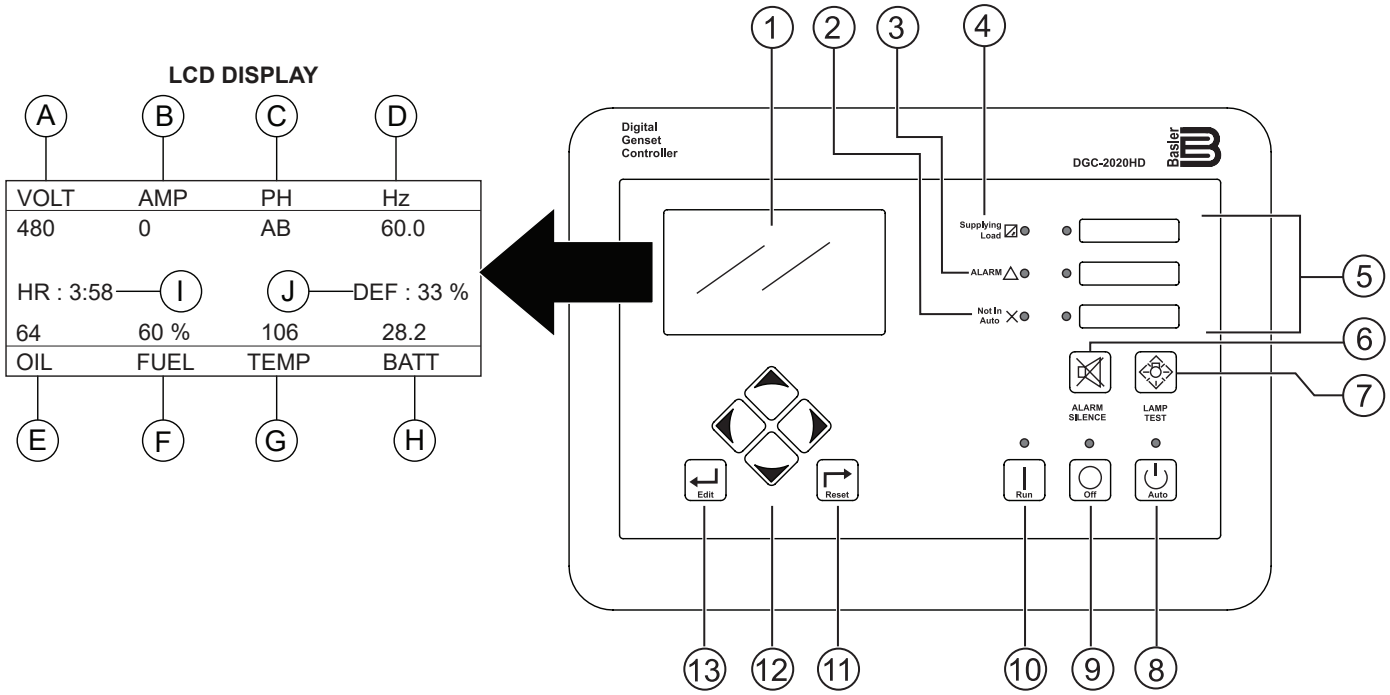


Figure 6. Basler DGC-2020HD

The definitions below describe the controls and functions of the Basler DGC-2020HD digital genset controller (Figure 6).

1. **LCD Display** — Backlit, 272 × 480-pixel LCD color touch screen serves as the local information source for metering, alarms, pre-alarms, and protective functions. Touch screen capability provides convenient navigation through metering and settings. Display operation is maintained down to –4°F (−20°C).

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

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

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

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

   E. **Oil Pressure Gauge** — During normal operation this gauge should read approximately 47 psi. (324 kPa). When starting the generator the oil pressure may read a little higher, but after the engine warms up the oil pressure should return to the correct pressure range.

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

   G. **Water Temperature Gauge** — During normal operation this gauge should read between 185°–207°F (85°–97°C).

   H. **Battery Voltmeter** — During normal operation this gauge should indicate a minimum of 12 VDC.

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

   J. **DEF Gauge** — Indicates the level (%) of diesel exhaust fluid in the DEF tank.

2. **Not In Auto Indicator** — This red LED lights when the DGC-2020HD is **not** operating in **Auto mode**.

3. **Alarm Indicator** — This red LED lights continuously during alarm conditions and flashes during pre-alarm conditions.

4. **Supplying Load Indicator** — This green LED lights when the generator current is greater than the emergency power supply (EPS) threshold current.

5. **Voltage Selection Indicators** — These three LEDs light to indicate the selected voltage. The **upper** lamp indicates **3-phase, 208-volt** operation. The **middle** lamp indicates **3-phase, 480-volt** operation. The **lower** lamp indicates **3-phase, 240-volt** operation.

6. **Alarm Silence Pushbutton** — Press this button to open the relay output programmed as the horn output.

7. **Lamp Test Pushbutton** — Press this button to test the DGC-2020HD indicators by exercising all LCD pixels and lighting all LEDs.

8. **Auto Pushbutton and Mode Indicator** — Press the **Auto button** to place the DGC-2020HD in **Auto mode**. The green **Auto Mode LED** lights when Auto mode is active.

   While in Auto mode, if the unit's auto-start contacts are connected to a transfer switch and the contacts between the terminals are closed, the unit will start and automatically close the circuit breaker.

   If running in parallel, the Basler controller will command the unit to start and close the breaker based on load demand. If a failure occurs with another generator in the paralleled system, the controller will start and synchronize, then close the motorized breaker to electrically lock the unit in parallel.

   If the bus is dead it will immediately close the circuit breaker to provide power to the load(s). If the bus is already hot from another generator it will first synchronize, then close its breaker, then slowly ramp up to share load if load is present.

9. **Off Pushbutton and Mode Indicator** — Press this button to place the DGC-2020HD in **Off mode**.The red **Off Mode LED** lights whenever the DGC-2020HD is in Off mode.

10. **Run Pushbutton and Mode Indicator** — Press this button to place the DGC-2020HD in **Run mode**. The green **Run Mode LED** lights whenever Run mode is active.

11. **Reset Pushbutton** — Press this button to cancel a settings editing session and discard any settings changes. When held, this button resets the **Breaker Management pre-alarms**. This button is also used to reset the maintenance interval when pressed for 10 seconds while viewing **Hours Until Maintenance** or the **Maintenance Due pre-alarm**.

12. **Arrow Pushbuttons** — These four buttons are used to navigate through the front panel display menus and to modify settings.

    - The **Left Arrow and Right Arrow buttons** are used to navigate through the menu levels. Press the **Right Arrow button** to move **downward** through the menu levels and press the **Left Arrow button** to move **upward** through the menu levels.

    - The **Up Arrow and Down Arrow buttons** are used to move among items within a menu level. Press the **Down Arrow button** to move to items lower on the list. Press the **Up Arrow button** to move to items higher on the list.

    - During a settings editing session, the Up Arrow and Down Arrow buttons are used to increase and decrease the value of the selected setting. The Right Arrow and Left Arrow buttons move to different digits.

13. **Edit Pushbutton** — Press the **Edit pushbutton** to start an editing session and enable changes to the DGC-2020HD settings. At the conclusion of an editing session, press this button again to save the setting changes.

OUTPUT TERMINAL PANEL

The **output terminal panel** (Figure 7) 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.

NOTICE

Output Terminal Bolt Torque: 1088.6 lbf·in (123.0 N·m)

OUTPUT TERMINAL FAMILIARIZATION

The output terminal panel is provided with the following:

- Three (3) 240/139-volt output receptacles @ 50 amps
- Three (3) auxiliary circuit breakers @ 50 amps
- Two (2) 120-volt GFCI receptacles @ 20 amps
- Two (2) GFCI circuit breakers @ 20 amps
- Eight (8) output terminal lugs (U, V, W, O, Ground)
- Ten (10) Cam-Lok connectors (U, V, W, O, Ground)

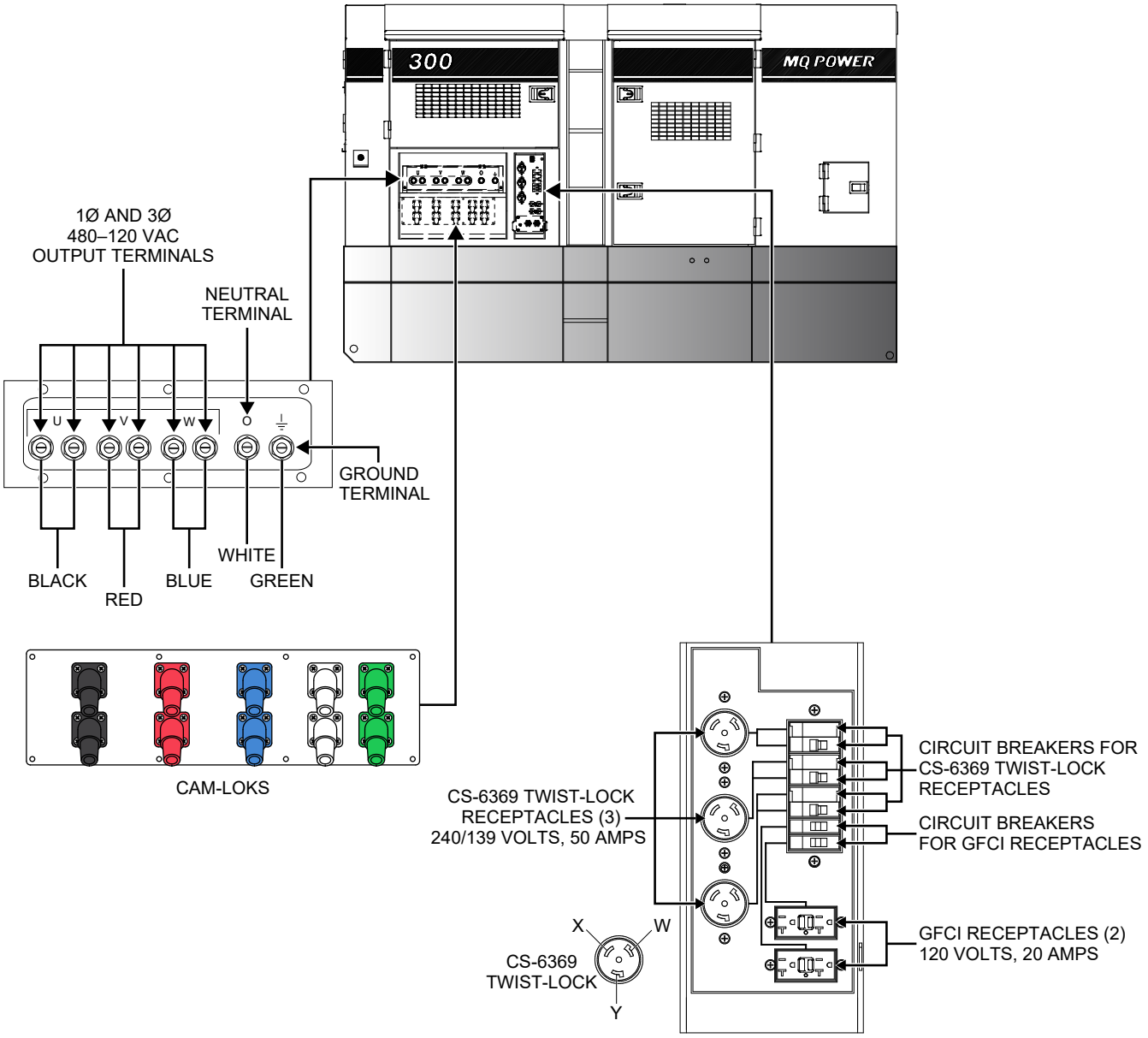


Figure 7. Output Terminal Panel

120-Volt AC GFCI Receptacles

NOTICE

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

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

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

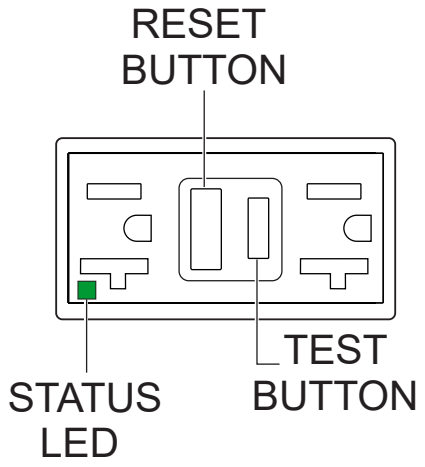


Figure 8. 120-Volt GFCI Receptacle

Twist-Lock Dual-Voltage 240/139-Volt AC Receptacles

There are **three 240/139-volt, 50-amp, auxiliary twist-lock (CS6369) receptacles** (Figure 9) provided on the output terminal panel. For 240/139-volt usage, these receptacles can be used at any time during operation. For 208/120-volt usage, configure the voltage change-over board for 240-volt output, then place the AC Voltage Select switch in the 208-volt position.

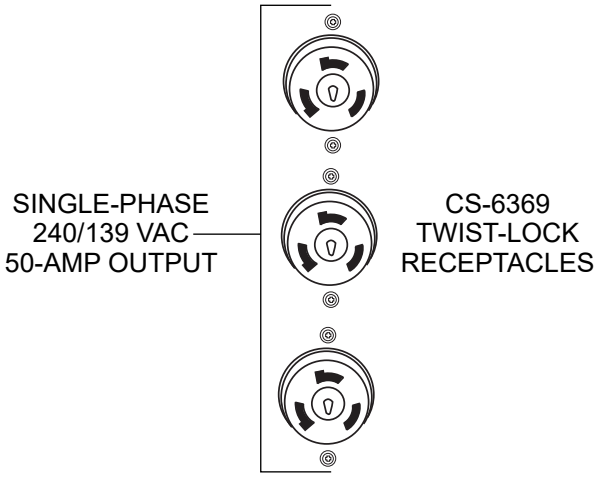


Figure 9. 240/139-Volt Twist-Lock Auxiliary Receptacles

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

Removing The Plastic Face Plate (Hard Wire Hookup Panel)

The **output terminal lugs** are located behind a protective cover (Figure 10). Unscrew the securing bolts and lift the cover to gain access to the output terminal lugs.

After the load wires have been securely attached to the output terminal lugs, lower the protective cover and reinstall the retaining bolts.

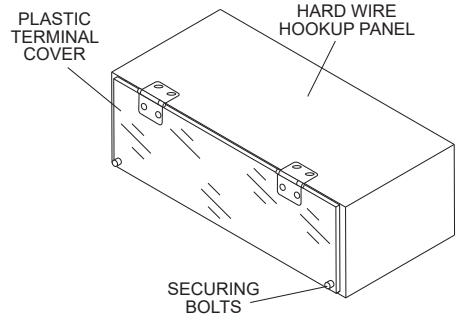


Figure 10. Protective Terminal Cover (Output Terminal Lugs)

Connecting Loads

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

To protect the output terminals from overload, a 3-pole, 800-amp, **main** circuit breaker is provided. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

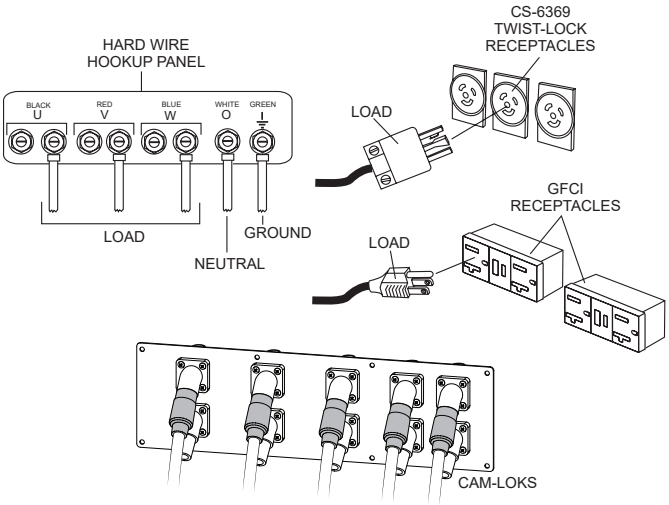


Figure 11. Connecting Loads

Overcurrent Relay

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

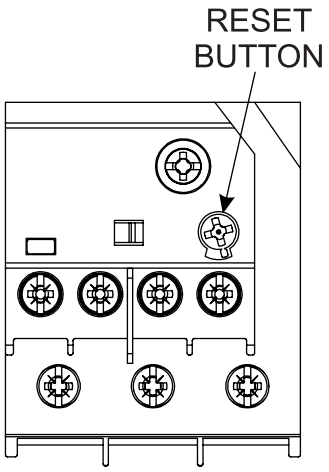


Figure 12. Overcurrent Relay

NOTICE

The **overcurrent relay** monitors the current flowing from the U,V, and W output terminal lugs to the load. In the event of a short circuit or overcurrent condition, it will automatically trip the 800-amp main circuit breaker.

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

SINGLE-PHASE LOAD

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

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

NOTICE

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

WATTS = VOLTAGE × AMPERAGE

The power factor of this generator 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:

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

NOTICE

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

NOTICE

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

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

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

DANGER

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

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

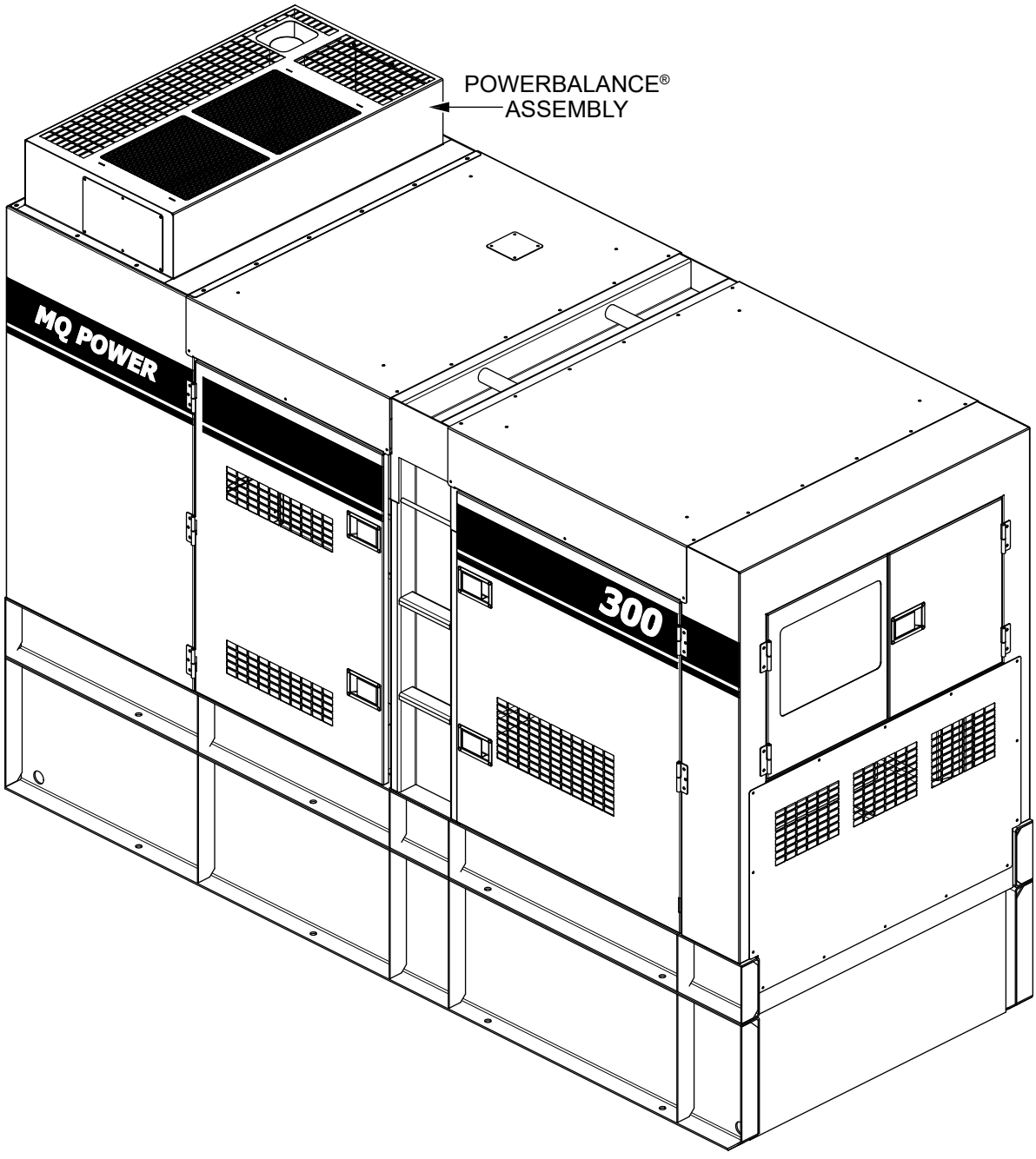


Figure 13. PowerBalance®

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

GENERATOR OUTPUT VOLTAGES

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

Table 7. Voltages Available

UVWO Output Terminal Lugs	Voltage Change-Over Board 3-Phase 240/139V Position			Voltage Change-Over Board 3-Phase 480/277V Position		
3Ø Line–Line	208V	220V	240V	416V	440V	480V
1Ø Line–Neutral	120V	127V	139V	240V	254V	277V

Voltages are selected by applying six jumper plates to the **voltage change-over board** (Figure 14), which is located inside the control box behind the generator control panel. This board has been provided for ease of voltage selection.

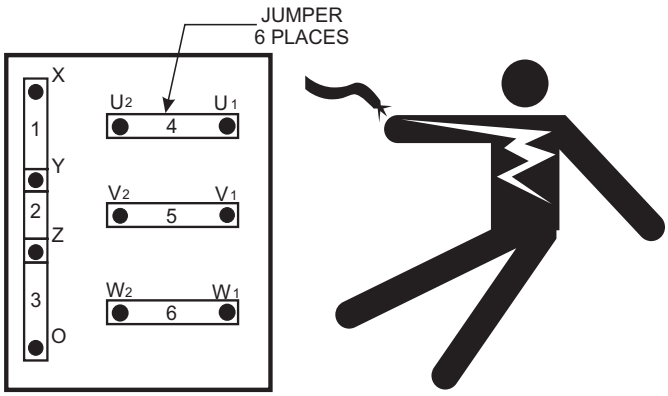


Figure 14. Voltage Change-Over Board

WARNING

NEVER attempt to place jumper plates on the **voltage change-over board** while the generator is in operation. There exists the possibility of **electrocution**, **electrical shock**, **or burn**, **which can cause severe bodily harm or even death!**

NOTICE

Make sure the tie bolts securing the voltage change-over board bus bars are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque bolts to 221.3 lbf·in (25.0 N·m).

AC VOLTAGE SELECT SWITCH

Also located inside the control box is the **AC Voltage Select switch** (Figure 15). Use this switch to select either 240-volt output or 208-volt output when the voltage change-over board is configured for 240 volts.

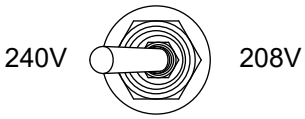


Figure 15. AC Voltage Select Switch

VOLTAGE REGULATOR

To obtain some of the voltages listed in Table 7 will require a fine voltage adjustment using the **voltage regulator** (Figure 16) located on the control panel.

Figure 16. Voltage Regulator

Maximum Amps

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

Table 8. Generator Maximum Amps

Rated Voltage	Maximum Amps
1Ø 120 Volts	666.7 × 2 amps (4 wire)
1Ø 240 Volts	333.3 amps (4 wire)
3Ø 208 Volts	722 amps
3Ø 240 Volts	722 amps
3Ø 480 Volts	360 amps
Main Line Circuit Breaker Rating	800 amps
Overcurrent Relay Trip Set Point 480V Mode Only	361 Amps

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 placement of the jumper plates (6) on the **voltage change-over board**, the position of the **AC Voltage Select switch**, and the adjustment of the **voltage regulator**.

The voltage change-over board determines the range of the output voltage and can be configured in two different positions that provide six different output voltages at the UVWO output terminals. The generator is shipped from the factory in the 240-volt configuration. Use the AC Voltage Select switch to select either 240V or 208V when the change-over board is configured for 240 volts. The voltage regulator (VR) allows the user to increase or decrease the selected voltage.

NOTICE

Make sure the tie bolts securing the voltage change-over board bus bars are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque bolts to 221.3 lbf·in (25.0 N·m).

NOTICE

ALWAYS make sure that the connections to the UVWO terminals are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque tie bolts to 1088.6 lbf·in (123.0 N·m).

3-Phase 240-Volt UVWO Terminal Output Voltages

1. Jumper the **voltage change-over board** for **240-volt operation** as shown in Figure 17.

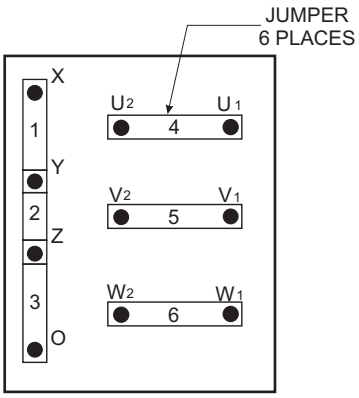


Figure 17. Voltage Change-Over Board 3-Phase 240/139-Volt Configuration

2. Make sure the **AC Voltage Select switch** (Figure 18) is placed in the **240-volt position**.

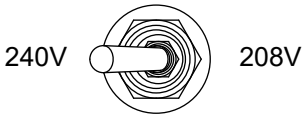


Figure 18. AC Voltage Select Switch 240-Volt Position

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

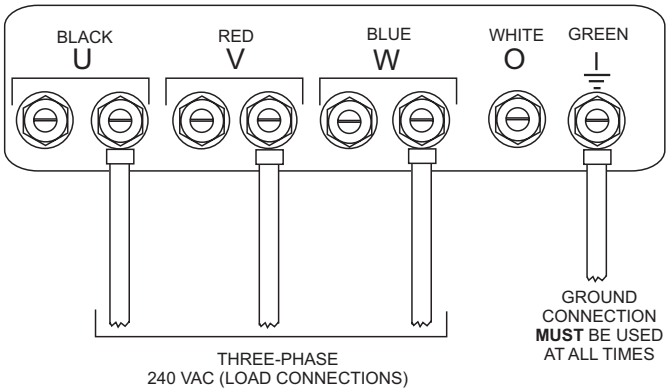


Figure 19. UVWO Terminal Lugs 3-Phase 240-Volt Connections

4. Use the **voltage regulator** (Figure 20) to increase or decrease voltage output as needed. Turn clockwise to increase voltage output and turn counterclockwise to decrease output.

Figure 20. Voltage Regulator

Single-Phase 240-Volt UVWO Terminal Output Voltages

1. Make sure the **voltage change-over board** is jumpered for **240-volt operation** as shown in Figure 17.
2. Make sure the **AC Voltage Select switch** (Figure 18) is placed in the **240-volt position**.
3. Connect the load wires to the UVWO terminals as shown in Figure 21.

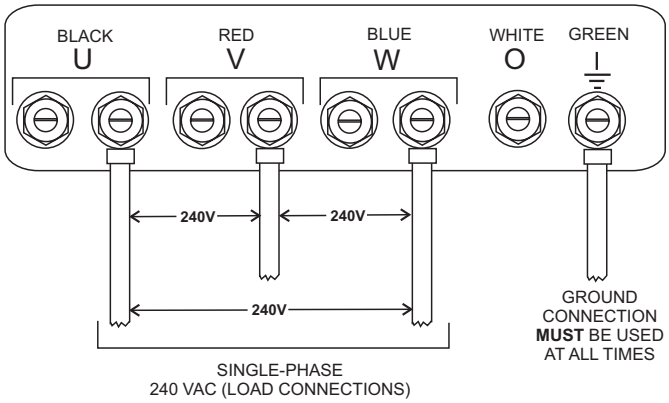


Figure 21. UVWO Terminal Lugs Single-Phase 240-Volt Connections

Single-Phase 120-Volt UVWO Terminal Output Voltages

1. Make sure the **voltage change-over board** is jumpered for **240-volt operation** as shown in Figure 17.
2. Place the **AC Voltage Select switch** (Figure 22) in the **208-volt position** to obtain 120 volts at the UVWO terminals.

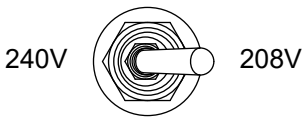


Figure 22. AC Voltage Select Switch 208-Volt Position

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

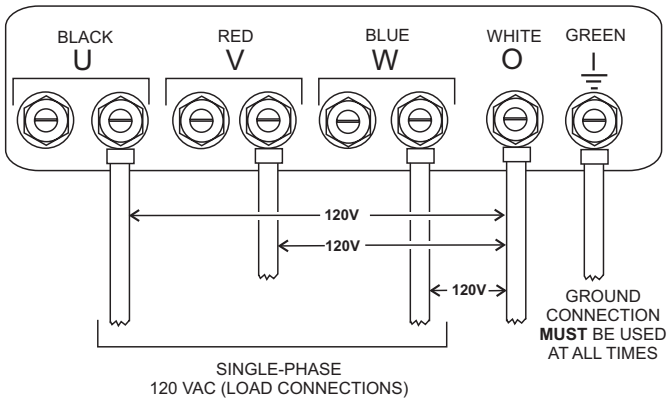


Figure 23. UVWO Terminal Lugs Single-Phase 120-Volt Connections

3-Phase 480-Volt UVWO Terminal Output Voltages

1. Jumper the **voltage change-over board** for **480-volt operation** as shown in Figure 24. This configuration uses 6 jumper plates in 3 different positions. Remember there are 2 jumper plates at every position. Every jumper plate **must** be used.

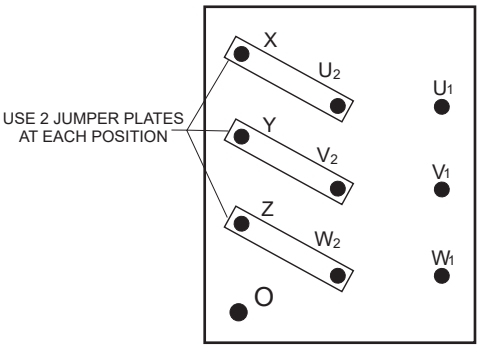


Figure 24. Voltage Change-Over Board 3-Phase 480/277-Volt Configuration

NOTICE

The AC Voltage Select switch does not affect the voltage output while the voltage change-over board is in the 480/277-volt configuration.

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

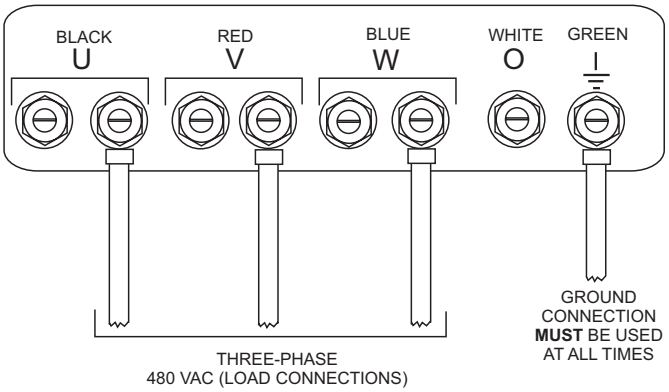


Figure 25. UVWO Terminal Lugs 3-Phase 480-Volt Connections

Single-Phase 480-Volt UVWO Terminal Output Voltages

1. Make sure the **voltage change-over board** is jumpered for **480-volt operation** as shown in Figure 24.

NOTICE

The AC Voltage Select switch does not affect the voltage output while the voltage change-over board is in the 480/277-volt configuration.

2. Connect the load wires to the UVWO terminals as shown in Figure 26.

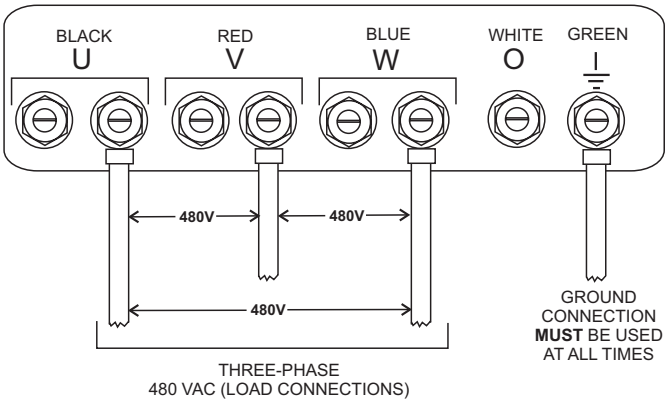


Figure 26. UVWO Terminal Lugs Single-Phase 480-Volt Connections

Single-Phase 277-Volt UVWO Terminal Output Voltages

1. Make sure the **voltage change-over board** is jumpered for **480-volt operation** as shown in Figure 24.

NOTICE

The AC Voltage Select switch does not affect the voltage output while the voltage change-over board is in the 480/277-volt configuration.

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

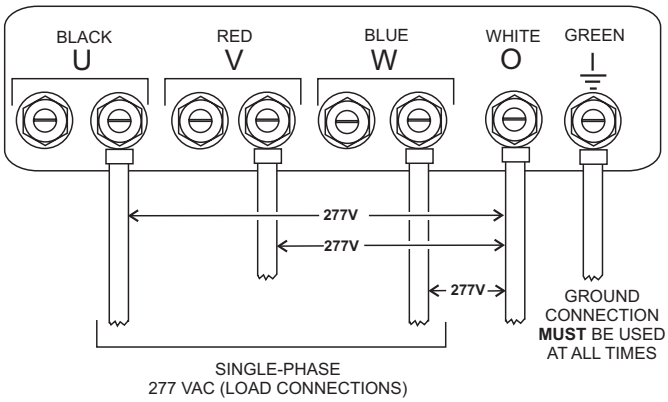


Figure 27. UVWO Terminal Lugs Single-Phase 277-Volt Connections

ENGINE OIL

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 28) and wipe it clean.

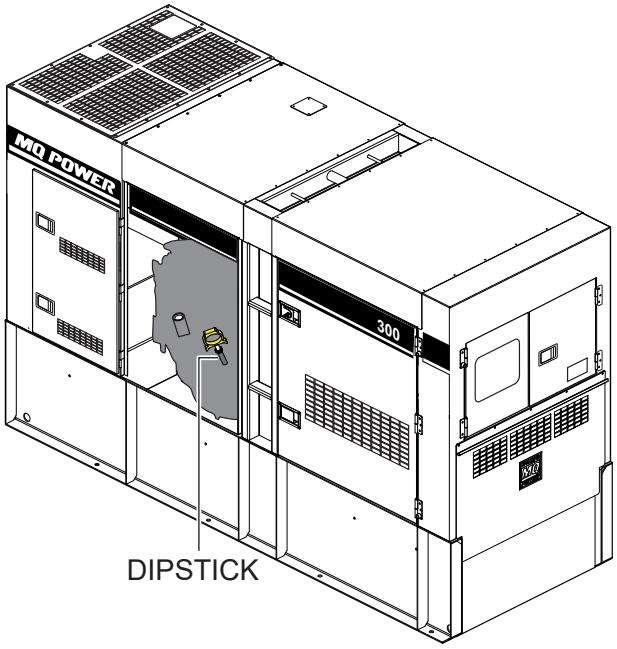


Figure 28. Engine Oil Dipstick Location

3. Reinsert the dipstick, then remove the dipstick from its holder. Check the oil level shown on the dipstick (Figure 29).

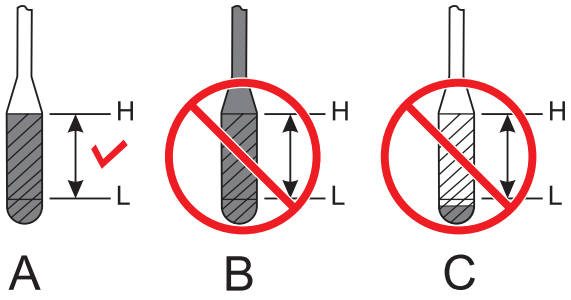


Figure 29. Engine Oil Dipstick Level

4. Verify that the engine oil level is maintained between the **H** and **L** markings on the dipstick as referenced in Figure 29**A**.
5. If the engine oil level is low (Figure 29**C**), remove the cap from the oil filler port (Figure 30) and fill to a safe operating level (max) as indicated by the dipstick (Figure 29**A**). Fill with recommended type oil as listed in Table 9. Maximum oil capacity is 37 quarts (35 liters).

> ***NOTICE***
>
> When adding engine oil, **DO NOT** overfill (Figure 29**B**).

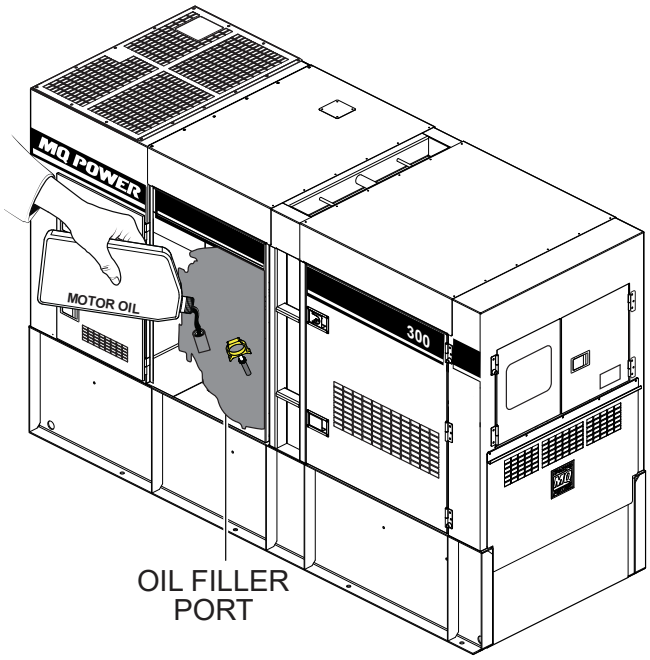
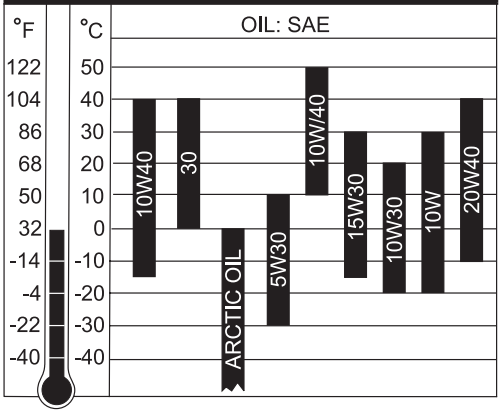


Figure 30. Engine Oil Filler Port

Table 9. Recommended Motor Oil



FUEL CHECK

DANGER

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

NOTICE

ALWAYS check the DEF tank level when adding fuel.

Refilling The Fuel System

NOTICE

DO NOT refuel while the engine is running.

CAUTION

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

ALWAYS fill the fuel tank (Figure 31) with clean, fresh, #2 diesel fuel. Pay attention to the fuel tank capacity when replenishing fuel. **DO NOT** fill the fuel tank beyond its capacity.

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.

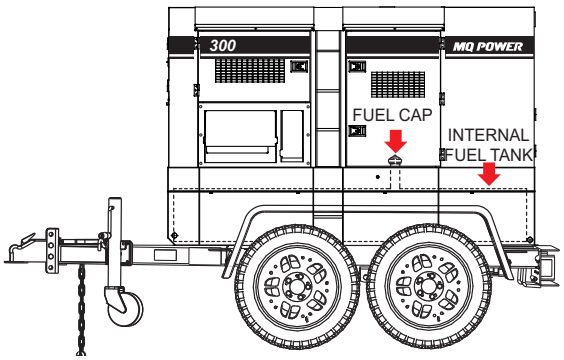


Figure 31. Fuel Tank

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 32).

CAUTION

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

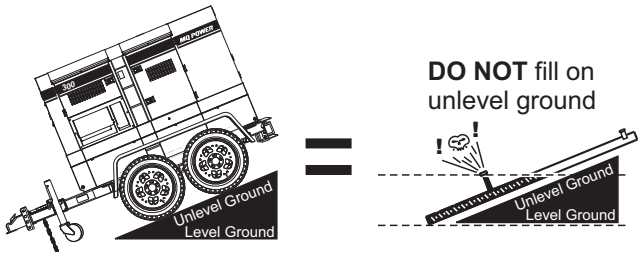


Figure 32. Only Fill On Level Ground

NOTICE

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

2. Open the enclosure door, remove the fuel cap and fill tank as shown in Figure 33.

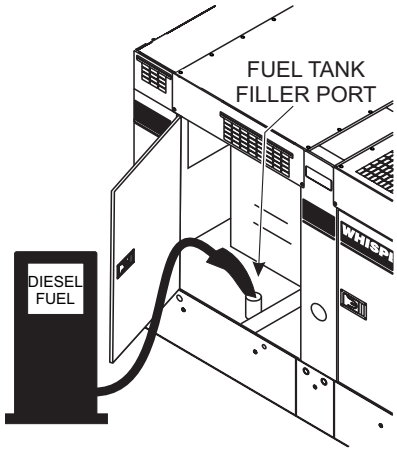


Figure 33. Fueling The Generator

3. **NEVER overfill the fuel tank.** When refueling, **DO NOT** wait for fuel to rise inside the filler neck (Figure 34). Leave room for fuel expansion. Fuel expands when heated (Figure 35).

Figure 34. Full Fuel Tank

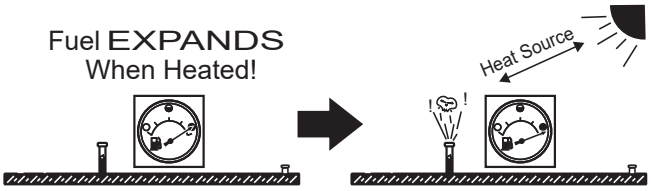


Figure 35. Fuel Expansion

DIESEL EXHAUST FLUID

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

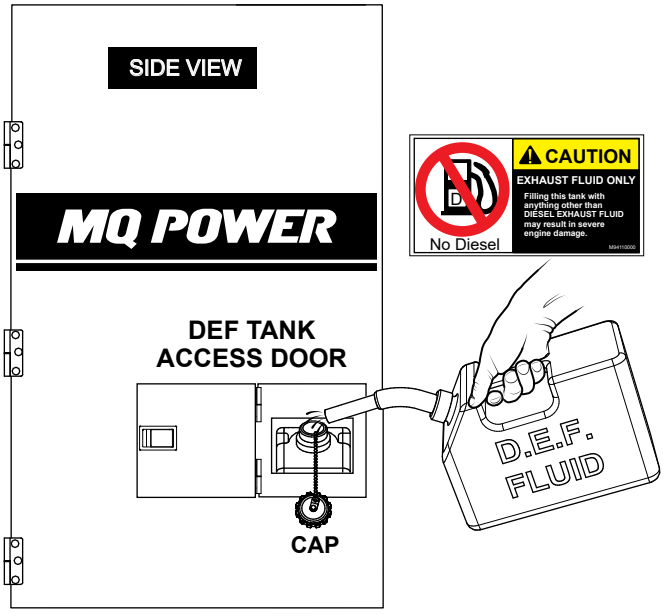


Figure 36. Filling The DEF Tank

DEF Refilling

NOTICE

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

1. Make sure the engine is **OFF**.
2. Open the **DEF tank access door** (Figure 36) and remove the **DEF tank filler cap**.
3. Add diesel exhaust fluid to the tank. **DO NOT** overfill.
4. Before initial start-up, completely fill the DEF tank with DEF fluid. **DO NOT** overfill.
5. Reinstall the DEF tank cap. Tighten securely.

DEF Refilling (Continuous Operation)

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

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

COOLANT (ANTIFREEZE/SUMMER COOLANT/WATER)

John Deere recommends **Cool-Gard II** 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 **John Deere 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 10 for engine, radiator, and reserve tank coolant capacities.

Table 10. Coolant Capacity	
Engine and Radiator	17.7 gal. (67 liters)
Reserve Tank	See markings

NOTICE

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

Verify that the coolant level in the **coolant reserve tank** is between the **MIN** and **MAX** markings as shown in Figure 37.

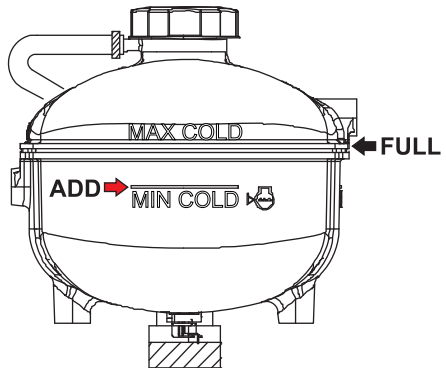


Figure 37. Coolant Reserve Tank

Operation In Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 11) has been added.

Table 11. Coolant Capacity		
Climate	Outside Temperature	Longlife Coolant Concentration
Warm	10°F (–12°C) or Above	30%
Cold	–22°F (30°C) or Above	50%

NOTICE

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

Cleaning The Radiator

The engine may overheat if the radiator fins 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.

ENGINE AIR CLEANER

Periodic cleaning/replacement is necessary. Inspect air cleaner in accordance with the **John Deere engine owner's manual**.

FAN BELT TENSION

The engine fan belt is automatically tensioned and does not require adjustment.

CAUTION

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

BATTERY

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

DO NOT overfill. Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunctions. **ALWAYS** keep the terminals firmly tightened. Coat the terminals with an approved battery terminal treatment compound. Replace the battery only with the recommended type battery. The battery type used in this generator is BCI Group Size 8D.

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

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

Battery Cable Installation

ALWAYS make sure the battery cables are properly connected to the battery terminals as shown in Figure 38. 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**.

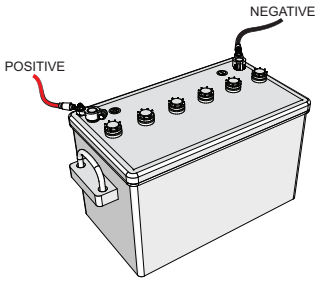


Figure 38. Battery Connections

When connecting battery do the following:

1. **NEVER** connect the battery cables to the battery terminals while the **Control Power switch** is in the **ON** position. **ALWAYS** make sure that this switch is in the **OFF/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.

NOTICE

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

WIRING

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

PIPING AND HOSE CONNECTIONS

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

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

COLD WEATHER ENGINE STARTING FLUID (ETHER) SYSTEM

This unit is equipped with an automatically controlled engine starting fluid system (KBi DIESELMATIC NVT) that assists engine starting in cold weather conditions.

The system is designed to spray a controlled amount of starting fluid into the air intake system of the engine during and immediately after the engine cranks. The fluid cylinder is located on the unit's right-side center frame.

⚠ WARNING

The engine-starting fluid used in the system is extremely flammable and toxic. It can be harmful and fatal if swallowed. Avoid contact with skin or breathing fumes.

DO NOT smoke when installing, removing, maintaining, testing or troubleshooting the system. Make sure you are in a well-ventilated area away from heat, open flames, or sparks.

During low ambient temperature conditions, if the engine does not start within a normal period of cranking, the starting fluid cylinder may be empty and need to be replaced. For more information about the system, refer to the **KBi DIESELMATIC NVT instruction 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. Make sure the **voltage change-over board** has been configured for the desired output voltage.

NOTICE

Make sure the tie bolts securing the voltage change-over board bus bars are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque bolts to 221.3 lbf·in (25.0 N·m).

2. If the voltage change-over board has been configured for 240/139-volt output, make sure the **AC Voltage Select switch** (Figure 39) is in the correct position for the desired voltage output (240V or 208V).

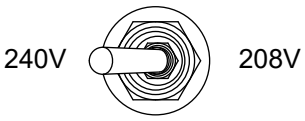


Figure 39. AC Voltage Select Switch 240-Volt Position

3. Place the **Control Power switch** (Figure 40) in the **ON** position.

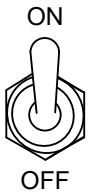


Figure 40. Control Power Switch (ON)

4. Make sure the **Circuit Breaker OFF button LED** is **ON (red)**. See Figure 41.

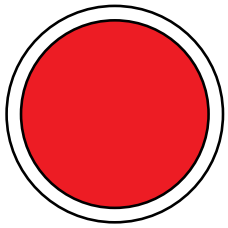


Figure 41. Circuit Breaker OFF Button (ON/RED)

5. Connect the load to the **receptacles**, **cam-loks**, or **output terminal lugs** as shown in Figure 11. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.

NOTICE

ALWAYS make sure that the connections to the UVWO terminals are **secure** and **tight**. The possibility exists of arcing that could cause a fire. Torque tie bolts to 1,088.6 lbf·in (123.0 N·m).

6. Close all engine enclosure doors (Figure 42).

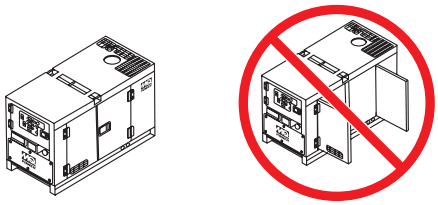


Figure 42. Engine Enclosure Doors

STARTING (MANUAL)

1. To start the engine, press the **Run button** (Figure 43) on the digital controller.

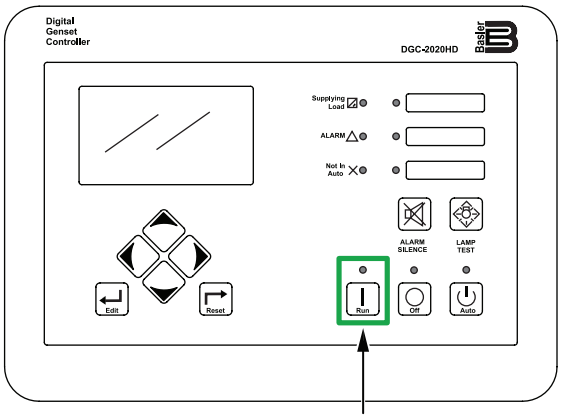


Figure 43. Digital Controller (Run Button)

NOTICE

If the engine fails to start within 3 attempts, press the **OFF button** on the controller and place the battery switch in the **OFF** position. Wait for at least 1 minute before repeating the starting process.

NOTICE

The engine will pre-heat automatically in cold weather conditions.The message **"Glow Plug Hold"** will be shown on the controller display and the engine will start automatically after pre-heating.

2. Once the engine starts, let the engine run at idle (1,200 rpm) for approximately 30 seconds. Let the engine idle longer in cold weather conditions. Listen for any abnormal noises. If any abnormalities exist, shut down the engine and correct the problem.

NOTICE

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

3. The controller display will indicate the 60-cycle output frequency in **HERTZ** (Figure 44**C**).

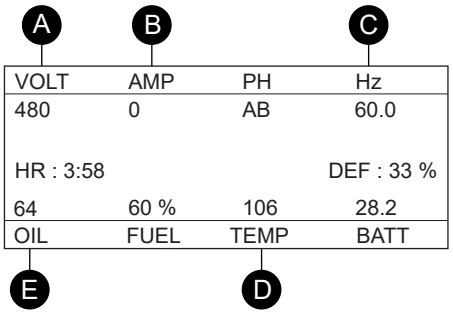


Figure 44. Controller Display

4. The controller display will indicate the generator's output in **VOLTS** (Figure 44**A**).

5. If the voltage is not within the specified tolerance, use the **voltage regulator** (Figure 45) to increase or decrease the desired voltage.

Figure 45. Voltage Regulator

6. The controller display will indicate **zero amps** with no load applied (Figure 44**B**). When a load is applied, the display will indicate the amount of current that the load is drawing from the generator.

7. The controller display will indicate the **oil pressure** of the engine (Figure 44**E**). Under normal operating conditions the oil pressure should be approximately 47 psi. (324 kPa).

NOTICE

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

8. The controller display will indicate the **coolant temperature** (Figure 44**D**). Under normal operating conditions the coolant temperature should be 185°–207°F (85°–97°C).

9. Press the **Circuit Breaker ON button** (Figure 46). The button LED will turn **ON (green)** and power will be supplied to the output terminals , cam-loks, and receptacles.

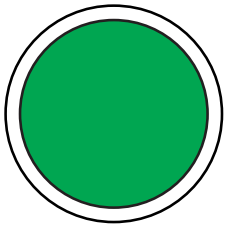


Figure 46. Circuit Breaker ON Button (ON/GREEN)

10. Observe the amperage reading on the controller display (Figure 44**B**) and verify that it is the anticipated amount of current with respect to the load. The ammeter will only display an amperage reading if a load is in use.

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

STARTING (AUTO MODE)

DANGER

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

NOTICE

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

NOTICE

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

WARNING

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

NOTICE

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

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

1. Perform steps 1 through 6 in ***Before Starting*** found in the ***Generator Start-Up Procedure (Manual)*** section.
2. Press the **Auto button** (Figure 47) on the digital controller. When a start signal is received from the auto-start contacts, the engine will start automatically after the preheating process has completed.

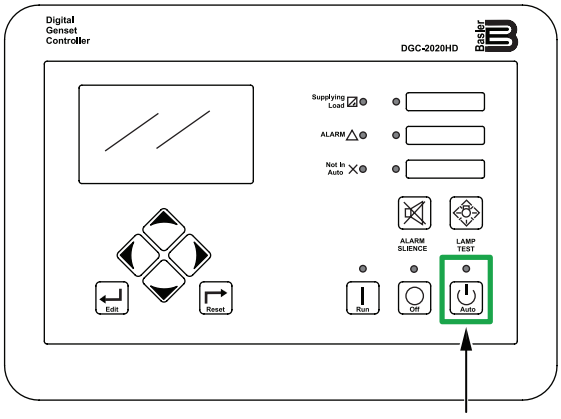


Figure 47. Digital Controller (Auto Button)

3. The main circuit breaker will automatically turn **ON** after the engine starts. Observe that the LED on the **Circuit Breaker ON button** has turned **ON (green)**. See Figure 46.

NOTICE

If the unit has **PowerBalance®** installed and the main breaker is closed, PowerBalance® should activate after 1 minute if the load is below 30% of the rated load.

If at any time the load spikes to 90% or more, PowerBalance® will immediately drop out and wait 5 minutes to re-evaluate the load.

WARNING

NEVER stop the engine suddenly except in an emergency.

NORMAL SHUTDOWN PROCEDURE (MANUAL)

1. Place the load's ON/OFF switch in the **OFF** position.
2. Press the **Circuit Breaker OFF button**. The button LED will turn **ON (red)**.

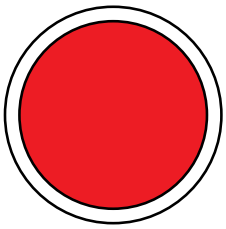


Figure 48. Circuit Breaker OFF Button (ON/RED)

3. Press the **OFF button** on the digital controller (Figure 49) to stop the engine. The engine will stop after a 1-minute cool-down process.

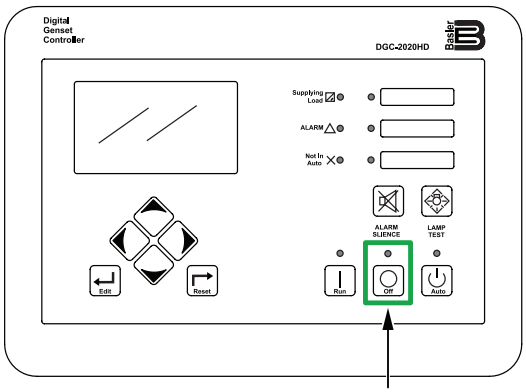


Figure 49. Digital Controller (OFF Button)

4. After the engine has stopped completely, place the **Control Power switch** in the **OFF** position (Figure 50).

Figure 50. Control Power Switch (OFF)

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

NORMAL SHUTDOWN PROCEDURE (AUTO)

1. Open the remote-start contacts. The circuit breaker will automatically turn **OFF** and the engine will stop after a 1-minute cool-down process.
2. Press the **OFF button** on the digital controller (Figure 49).
3. Place the **Control Power switch** in the **OFF** position (Figure 50).

EMERGENCY SHUTDOWN PROCEDURE

1. To stop the engine in the event of an emergency, push the **Emergency Stop switch** (Figure 51). This switch is located on the side of the generator next to the output terminal panel.

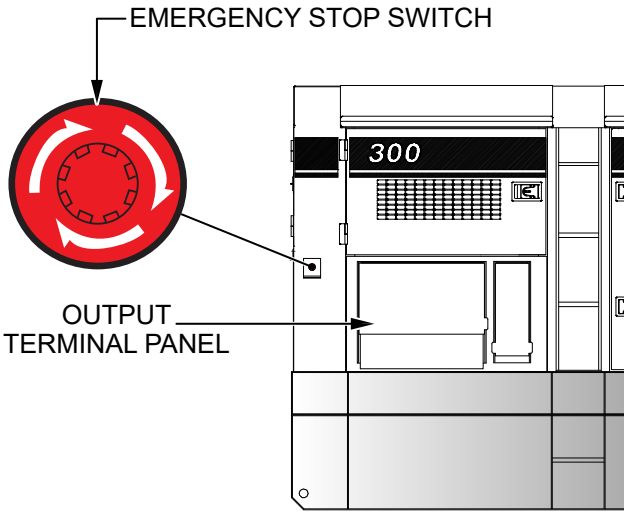


Figure 51. Emergency Stop Switch

2. After the engine has completely stopped, press the **OFF button** on the digital controller (Figure 49) and place the **Control Power switch** in the **OFF** position (Figure 50).
3. The Emergency Stop switch is a push-locked type switch. The switch contact can only be released by rotating the button in the clockwise direction. The engine cannot be restarted until the contact is released (closed).

AUTOMATIC SHUTDOWN SYSTEM

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

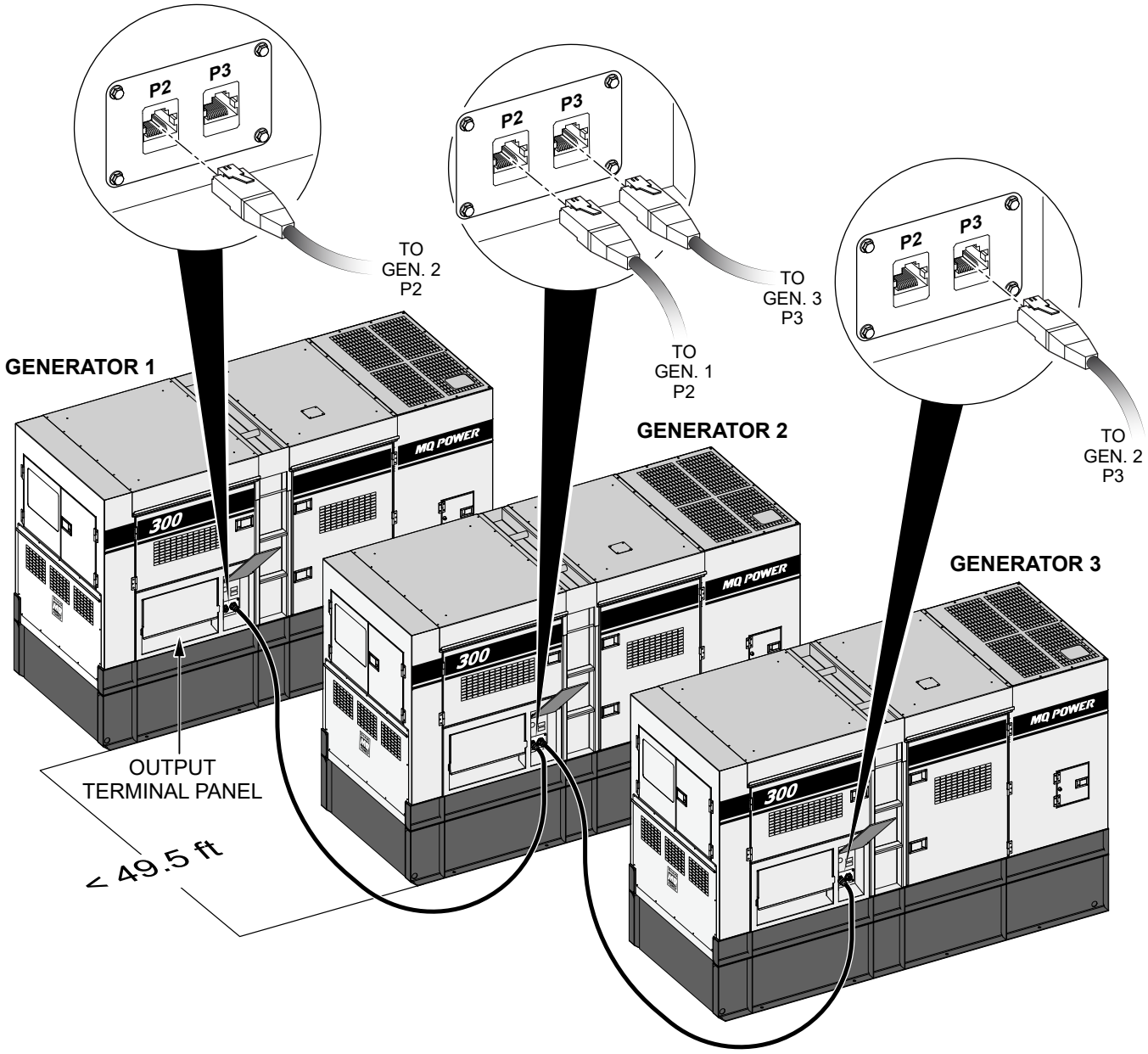


Figure 52. Communication Cable Connections (Parallel Operation)

PARALLEL OPERATION (2 OR MORE UNITS)

NOTICE

To ensure stable operation of multiple generator units connected in parallel and working as one unit, it is necessary to maintain equal voltage, frequency, and engine governor characteristics between them.

For this reason, it is necessary to perform parallel operation using generator units with identical alternator pitch and brand-compatible controllers. **Therefore, using multiple units of the same model generator for paralleling is recommended.**

NOTICE

If the preset voltage (set on the voltage change-over board) is different between the paralleling units, the main circuit breakers **will not turn on**.

Preparation

NOTICE

Make sure the engines of all generator units in the system are turned **OFF** before connecting the units.

1. Make sure the spacing between each generator control panel does not exceed **49.5 feet (15.08 m)**. See Figure 52.
2. **On the first generator**, connect one end of the 49.5-foot (15.08 m) RJ45 Ethernet cable to the Ethernet communication port labeled **P2**. See Figure 52.
3. **On the second generator**, connect the other end of the 49.5-foot (15.08 m) RJ45 Ethernet cable to the Ethernet communication port labeled **P2** (Figure 52).
4. If there are more generators to be connected to the system (Figure 52):
   - **On the second generator**, connect another 49.5-foot (15.08 m) RJ45 Ethernet cable to the Ethernet communication port labeled **P3**.
   - **On the third generator**, connect the other end of the 49.5-foot (15.08 m) RJ45 Ethernet cable to the Ethernet communication port labeled **P3**.
   - Continue connecting all remaining generators in the same manner, until all of the generators in the system are connected via Ethernet.

NOTICE

Use **only** category 5, 5e, 6, or 6e Ethernet cables with 8C8P modular connectors (RJ45 jacks) to connect the units. Cables must comply with ANSI TIA-568A/TIA-568B standards. Shielded cables are recommended to prevent interference and signal loss.

5. Connect the output terminals on each paralleled unit in accordance with local state/county and National Electrical Code requirements.

NOTICE

If the phase sequence (connection of U, V, W, O) is incorrect, the protective function of the digital controller will be activated. If this condition occurs, stop the engine and correct the U, V, W, O connections.

6. Make sure the load's power switch is in the **OFF** position.
7. Perform steps 1–3 of the ***Before Starting*** section of the ***Generator Start-Up Procedure (Manual)*** on each generator in the paralleled system.
8. You can verify the number of units connected to the generator network by navigating to the Generator Network Status screen: Metering –> Gen Network Status –> Units.

Starting (Manual)

1. Make sure the load's ON/OFF switch is in the **OFF** position.
2. Perform steps 1–4 of the ***Starting (Manual)*** section of the ***Generator Start-Up Procedure (Manual)*** on each generator in the system.
3. **On the first generator**, press the **Circuit Breaker ON button** (Figure 53).

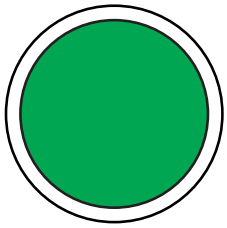


Figure 53. Circuit Breaker ON Button (ON/GREEN)

4. **On the second generator**, press the **Circuit Breaker ON button** (Figure 53). The voltage and frequency will be automatically adjusted. The circuit breaker will turn **ON** automatically when synchronization is complete.

> ***NOTICE***
>
> When synchronization has completed and the units are in normal operation, check the frequency and voltage readings on the digital controller.

5. Repeat step 3 for any additional generator units (3–n) in the paralleled system.
6. When all of the generators' circuit breakers are turned **ON** and no problems or faults are detected, place the load's ON/OFF switch in the **ON** position. Power will be supplied to the load equipment.

Starting (Auto)

1. Make sure the load's ON/OFF switch is in the **OFF** position.
2. Perform steps 1–4 of the ***Starting (Manual)*** section of the ***Generator Start-Up Procedure (Manual)*** on each generator in the system.
3. **On the first generator**, press the **Auto button** (Figure 54) on the digital controller.

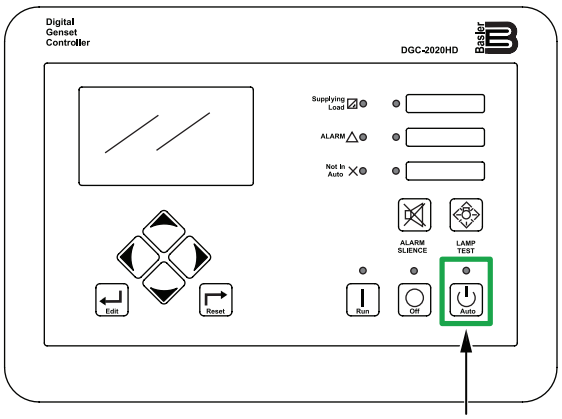


Figure 54. Digital Controller (Auto Button)

4. When the remote-start contacts for the first generator are closed, the engine will start automatically after the preheating process has completed, and the circuit breaker will turn **ON**.
5. Once the engine starts, let the engine run at low idle for a few minutes and check for any abnormal noises, vibration, or fluid leakage. If any abnormalities exist, stop the engine and correct the problem.

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

6. Check the voltage reading on the digital controller display (Figure 55).

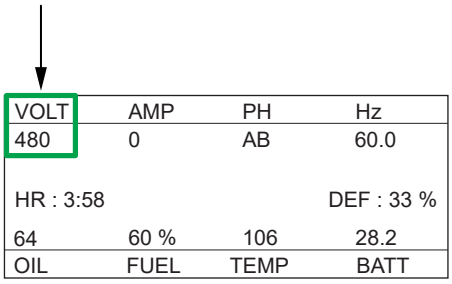


Figure 55. Controller Display (Voltmeter)

7. Perform steps 3–6 **on the second generator**.The voltage and frequency will be automatically adjusted. The circuit breaker will turn **ON** automatically when synchronization is complete.

NOTICE

When synchronization has completed and the units are in normal operation, check the frequency and voltage readings on the digital controller.

NOTICE

If the preset voltage (set on the voltage change-over board) is different between the paralleling units, the main circuit breakers **will not turn on**.

8. Repeat steps 3–6 for any additional generator units (3–n) in the paralleled system.
9. When all of the generators' circuit breakers are turned **ON** and no problems or faults are detected, place the load's ON/OFF switch in the **ON** position. Power will be supplied to the load equipment.

Changing The Number Of Units In Parallel Operation

1. **If the load decreases** during automatic parallel operation and the number of units involved in parallel operation needs to be decreased, push the **Off button** on the unit to be stopped. After the load is automatically transferred to the other paralleling units, the circuit breaker of the stopped unit will automatically turn off and the engine will stop after one minute of cool-down.
2. **If the load increases** during automatic parallel operation and the number of units involved in parallel operation needs to be increased, push the **Auto button** on the unit to be started. After the synchronization process is completed, the load will be redistributed automatically.

NOTICE

If one of the paralleled units runs out of fuel during parallel operation, the other paralleled units could become overloaded, causing circuit breakers to trip due to overcurrent, and the entire paralleling system may shut down.

PARALLEL OPERATION SHUTDOWN PROCEDURE (MANUAL)

1. Place the load's ON/OFF switch in the **OFF** position.
2. Press the **Circuit Breaker OFF button** (Figure 56) on each generator in the paralleled system.

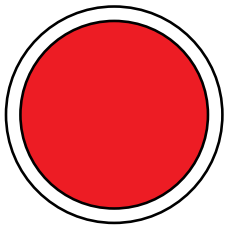


Figure 56. Circuit Breaker OFF Button

3. Press the **OFF button** on the digital controller (Figure 57) on each generator in the paralleled system. Each engine will stop after a 1-minute cool-down process.

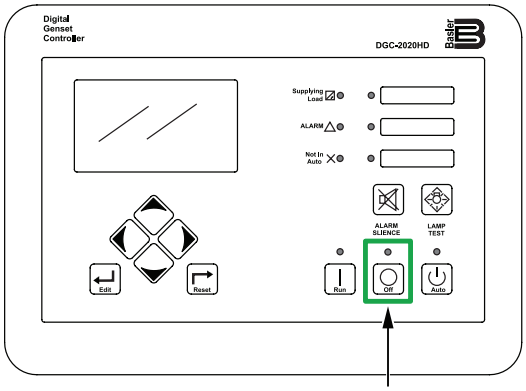


Figure 57. Digital Controller (OFF Button)

4. On each generator, after the engine has completely stopped, place the **Control Power switch** in the **OFF** position (Figure 58).

Figure 58. Control Power Switch (OFF)

PARALLEL OPERATION SHUTDOWN PROCEDURE (AUTO)

NOTICE

During parallel operation in Auto mode, the Circuit Breaker ON button and Circuit Breaker OFF button are disabled.

1. Place the load's ON/OFF switch in the **OFF** position.
2. Open the remote-start contacts for all generators in the paralleled system. Each circuit breaker will automatically turn **OFF** and each engine will stop after a 1-minute cool-down process.
3. Press the **OFF button** on the digital controller (Figure 57) on each generator in the paralleled system.
4. On each generator, after the engine has completely stopped, place the **Control Power switch** in the **OFF** position (Figure 58).

NOTICE

Remove the Ethernet cables when the generators are not in parallel operation.

Table 12. Inspection/Maintenance		10 Hours or Daily	250 Hours	Every 500 Hours or 12 Months	Every 3,000 Hours or 36 Months	Other
Engine	Check Engine Oil and Coolant Levels	X				
	Check Fuel Filter/Water Separator Bowl	X				
	Check Air Cleaner/Element	X				
	Clean or Replace Air Cleaner/Element		X			
	Check for Leaks/Hoses/Clamps	X				
	Check for Loosening of Parts	X				
	Change Engine Oil and Oil Filter *1		X			
	Clean Unit, Inside and Outside		X			
	Replace Fuel Filter Elements			X		
	Check Engine Mounts			X		
	Service Battery			X		
	Check Air Intake Hoses			X		
	Check Fan Belt Condition			X		
	Check Automatic Belt Tensioner			X		
	Check Electrical Ground Connection			X		
	Clean Radiator, Check Cooling System			X		
	Coolant Solution Analysis, Add SCAs as Required			X		
	Pressure Test Cooling System			X		
	Check Engine Speed			X		
	Test Thermostats				X	
	Check and Adjust Engine Valve Clearance					1,000 hours
	Test Glow Plugs				X	
	Replace DEF Supply Module Filter					4,500 hours
	Replace DOC Catalyst*5					As Required
	Check SCR System*2					4,500 hours
	Inspect Dosing Module (SRC System)					4,500 hours
	Flush and Refill Cooling System*3					1 year or 2,000 hours
	Clean Inside of Fuel Tank					1,000 hours
	Clean DEF Tank					As Required
	Replace Air Cleaner Elements *4					As Required
Generator	Measure Insulation Resistance Over 3M ohms		X			
	Check Rotor Rear Support Bearing			X		
	Inspect Voltage Change-Over Board Bus Bars and Tie Bolts and Re-Torque Tie Bolts*6			X		

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

*3 If John Deere COOL-GARD™ II is used, the flushing intervals may be extended. See ***Testing Diesel Coolant*** in engine manual.

*4 Replace primary air filter element when restriction indicator shows a vacuum of 625 mm (25 in. H_20).

*5 Service should be done as indicated by diagnostic gauge. Contact Multiquip Service Department for DOC replacement.

*6 Torque bolts to 221.3 lbf·in (25.0 N·m).

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

ENGINE AIR CLEANER

This John Deere diesel engine is equipped with a replaceable, high-density, paper air cleaner element (Figure 59). 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.

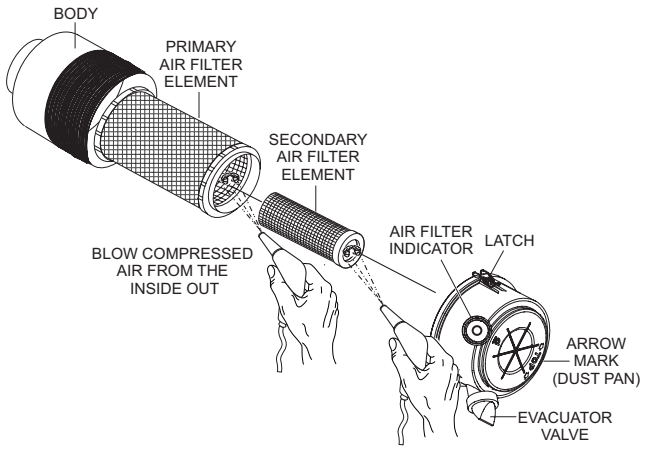


Figure 59. Engine Air Cleaner

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 **air cleaner cover** to the **air cleaner body** (Figure 59).
2. Remove the air cleaner cover (Figure 59) and set it aside.
3. Remove both the primary and secondary **air cleaner elements** (Figure 59).
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 59, tap the filter element several times on a hard surface to remove dirt, or blow compressed air, not to exceed 30 psi (207 kPa, 2.1 kgf/cm^2), through the filter element from the inside out.
6. Clean the **secondary element** (paper air filter) as described in step 5.
7. Replace both elements if they are damaged or excessively dirty.
8. Clean the inside of the air cleaner body (Figure 59).
9. Reinstall the primary and secondary air filter elements back into the air cleaner body.
10. Reinstall the air cleaner cover and secure with the latches.

NOTICE

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

Air Cleaner Restriction Indicator

The air cleaner is equipped with a **restriction indicator** (Figure 60). As the air cleaner element becomes clogged, air intake restriction increases and the indicator signal shows **RED**, indicating that the element needs to be replaced. After replacing the air cleaner element, press the restriction indicator button to reset the indicator.

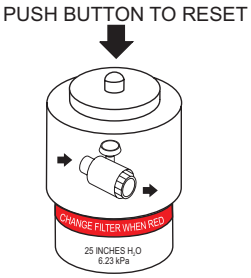


Figure 60. Air Cleaner Restriction Indicator

NOTICE

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

ENVIRONMENTAL CONTAINMENT TANK

This generator is equipped with an **environmental containment tank**. Inspect this tank regularly. When the tank becomes full of fluids, remove the **drain bolt** (Figure 61) and allow the fluids to drain into a suitable container. Reinstall the drain bolt and tighten securely after draining has completed.

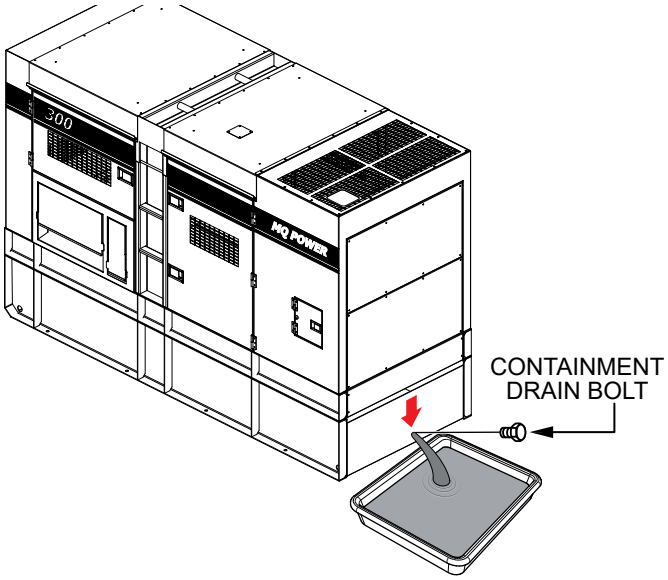


Figure 61. Draining The Containment Tank

ENGINE FUEL FILTER

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

Draining The Fuel Filter

1. Loosen the **air bleeder plug** (Figure 62) on the fuel filter head.

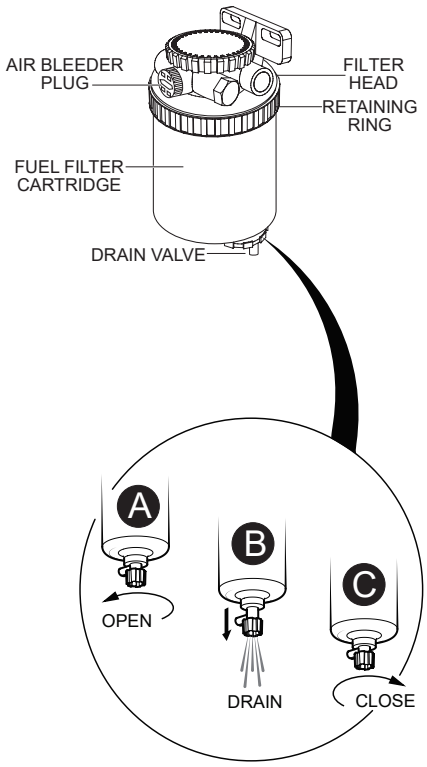


Figure 62. Draining The Fuel Filter

2. To discharge the fuel inside the fuel filter cartridge, open the **drain valve** on the fuel filter by turning the knob **counterclockwise** (Figure 62**A**) approximately 3-1/2 turns until the valve drops down 1 inch (25.4 mm) and draining occurs (Figure 62**B**).
3. Let the residue or foreign substances inside the cartridge flow into a suitable container.
4. At completion of draining, close the drain valve (Figure 62**C**).

Fuel Filter Element Replacement

1. Using a **filter wrench**, remove the **fuel filter cartridge** from the filter head (Figure 63).

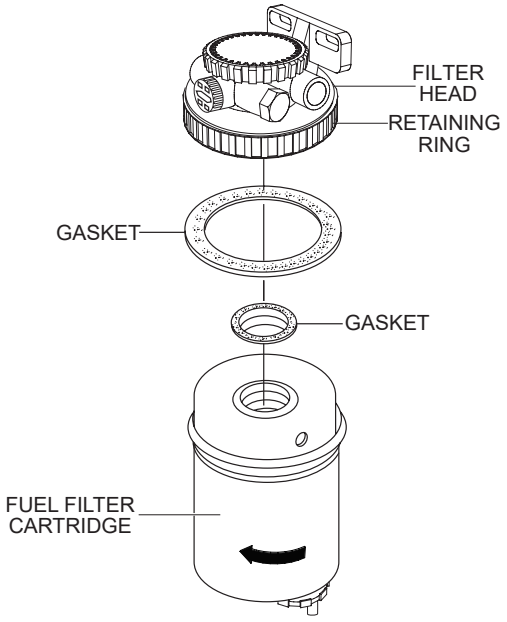


Figure 63. Fuel Filter Cartridge Replacement

2. Wipe the inside of the **filter head** (Figure 63) with a clean cloth to remove any foreign matter or debris that may have accumulated.
3. Replace both **gaskets** (Figure 63). Coat each gasket with a small amount of clean 15W-40 engine oil.
4. Install the new fuel filter cartridge first by hand until it makes contact with the fuel filter head surface.
5. Tighten the fuel filter cartridge securely. **DO NOT** overtighten.
6. Remove the air from the fuel system. Refer to ***Bleeding the Fuel System*** in the John Deere engine owner's manual.

Fuel Water Separator Sediment Bowl

1. Remove the **sediment bowl** (Figure 64) from the **fuel water separator cartridge**.

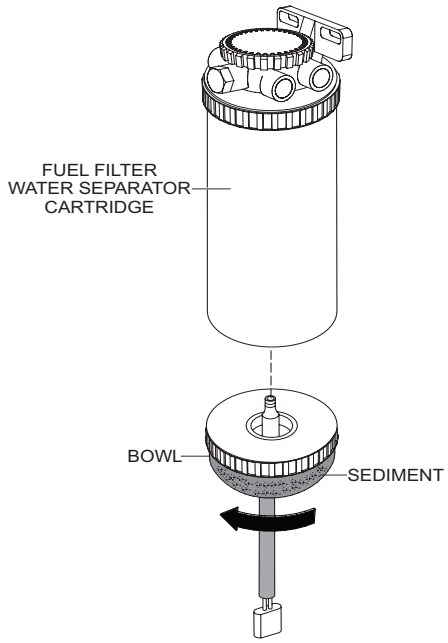


Figure 64. Fuel Water Separator Sediment Bowl

2. Let the residue or foreign substances inside the sediment bowl flow into a suitable container.
3. Wipe the inside of the sediment bowl with a clean cloth to remove any foreign matter or debris that may have accumulated.
4. Reinstall the sediment bowl back onto the fuel water separator cartridge.
5. Tighten securely. **DO NOT** overtighten.

Fuel Water Separator Replacement

1. Using a **filter wrench**, remove the **fuel water separator cartridge** (Figure 65) from the **cartridge head**.

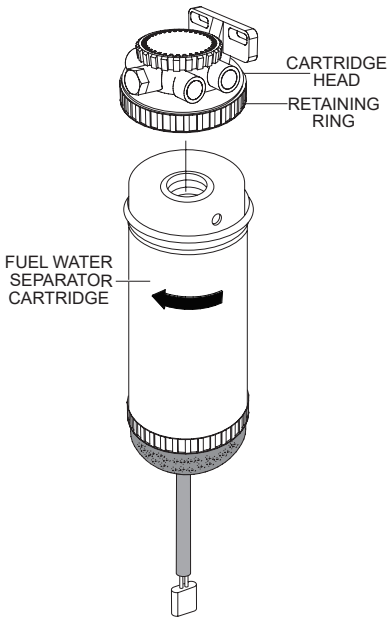


Figure 65. Fuel Water Separator

2. Wipe the inside of the **cartridge head** with a clean cloth to remove any foreign matter or debris that may have accumulated.
3. Install the new fuel water separator cartridge first by hand until it makes contact with the cartridge head surface.
4. Tighten the fuel water cartridge securely. **DO NOT** overtighten.

CLEANING INSIDE THE FUEL TANK

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

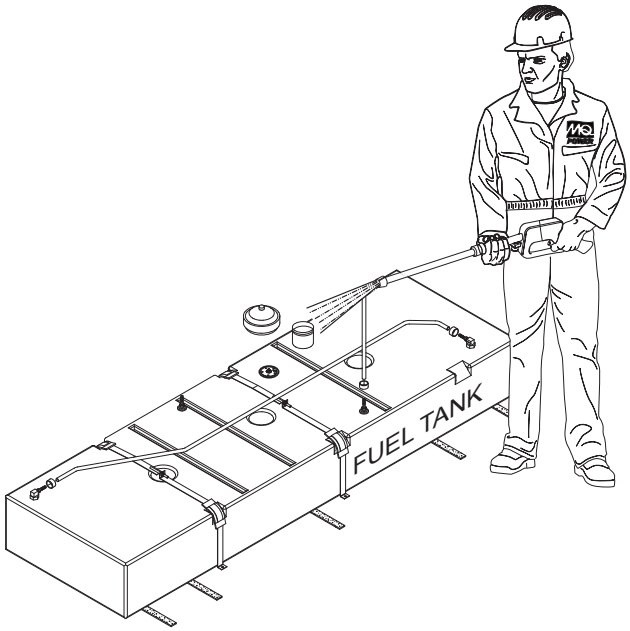


Figure 66. Cleaning The Fuel Tank

FUEL TANK INSPECTION

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

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

DRAINING THE ENGINE OIL

1. Run the engine until the engine coolant reaches a temperature of 140°F (60°C).
2. Turn the engine **OFF**.
3. Remove the oil dipstick from its holder.
4. Open the cabinet door and remove the **oil drain cap** (Figure 67).

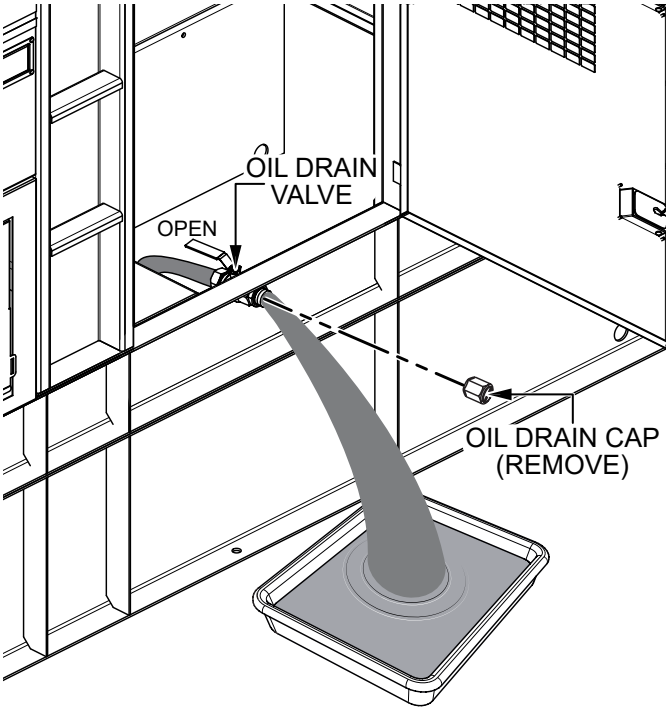


Figure 67. Draining The Engine Oil

5. Place the **oil drain valve** in the open position (Figure 67) and allow the oil to drain into a suitable container.
6. After the engine oil has completely drained, reinstall the oil drain cap and tighten securely.
7. Close the oil drain valve.

ENGINE OIL FILTER REPLACEMENT

NOTICE

Filter head appearance may vary.

1. Clean the area around the **oil filter head** (Figure 68).

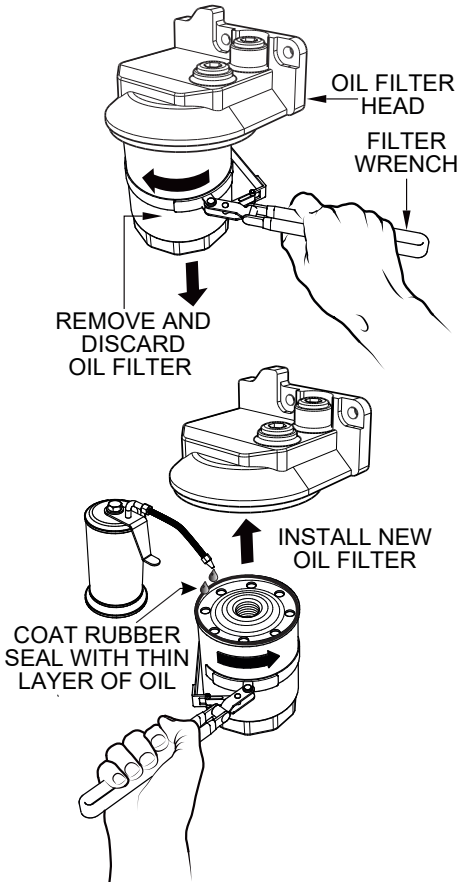


Figure 68. Oil Filter Removal

2. Using an **oil filter wrench**, remove the **engine oil filter** (Figure 68).
3. Coat the rubber seal (gasket) surface of the oil filter with clean 15W-40 engine oil (Figure 68).
4. Install the new oil filter (main) first by hand until it makes contact with the filter head surface. Tighten it another 3/4 turn using a filter wrench.
5. Fill the engine crankcase with high-quality detergent oil classified “For Service CJ-4.” Fill to the upper limit of the dipstick. **DO NOT** overfill. Refer to Table 2 for engine oil capacity.
6. Run the engine for several minutes. Watch for oil leakage. Shut the engine down and allow it to sit for several minutes. Top off the oil to the upper limit on the dipstick.

DRAINING THE ENGINE COOLANT

WARNING

DO NOT remove the pressure cap from the radiator while the engine is hot! Wait until the coolant temperature is below 120°F (50°C) before removing the pressure cap. Heated coolant spray or steam can cause severe scalding and personal injury.

1. Remove the **radiator pressure cap** (Figure 69) only when the coolant temperature is below 120°F (50°C).

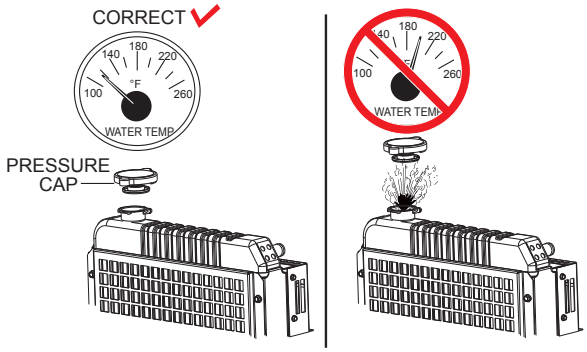


Figure 69. Radiator Pressure Cap Removal

2. Place the **coolant drain valve** in the **OPEN** position (Figure 70) and allow the coolant to drain into a suitable container.

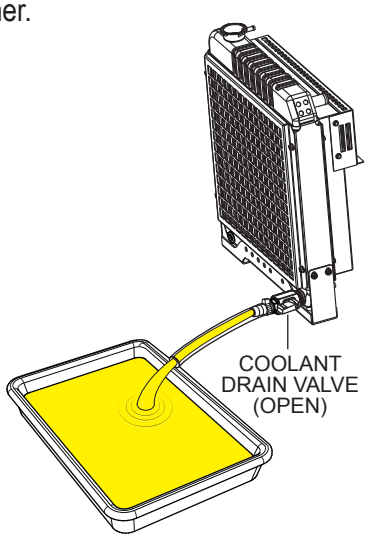


Figure 70. Draining The Engine Coolant

3. After the coolant has completely drained, place the coolant drain valve in the **CLOSED** position.
4. Reinstall the radiator pressure cap and tighten securely.

FLUSHING OUT THE RADIATOR AND REPLACING COOLANT

WARNING

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

- 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.

RADIATOR CLEANING

The radiator (Figure 71) 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 71. Radiator Cleaning

DRIVE BELT

Drive Belt Tension

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

Drive Belt Inspection

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

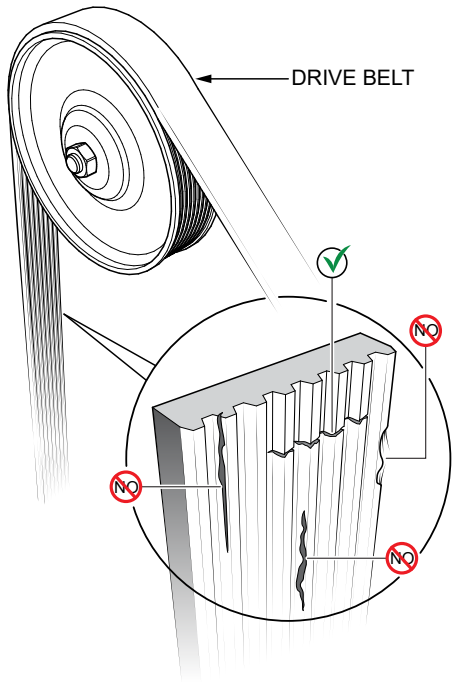


Figure 72. Drive Belt Inspection

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

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

TESTING THE GFCI RECEPTACLE

NOTICE

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

1. Start the generator as shown in the start-up procedure in this manual.
2. Place a **GFCI circuit breaker** (Figure 73) in the **ON** position.

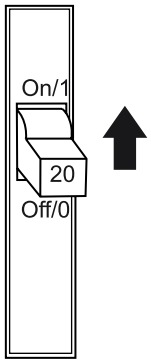


Figure 73. GFCI Circuit Breaker

3. Verify that the **status LED** on the corresponding **GFCI receptacle** (Figure 74) is **ON (GREEN)**.

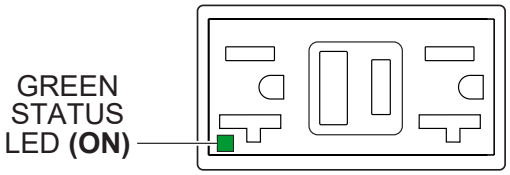


Figure 74. GFCI Receptacle (ON)

4. Press the **TEST** button (Figure 75) on the GFCI receptacle and verify that the status LED turns **OFF**.

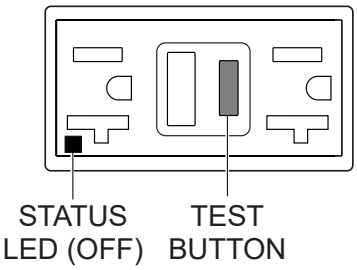


Figure 75. GFCI Receptacle (OFF)

5. Press the **RESET** button (Figure 76) to restore power to the GFCI receptacle and verify that the status LED is **ON (GREEN)**.

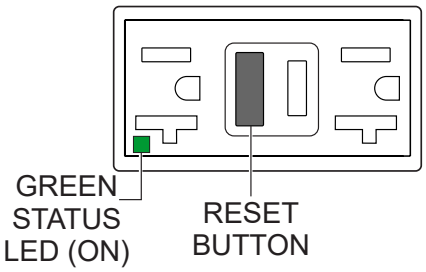


Figure 76. GFCI Receptacle (ON/Restore)

6. If the status LED (Figure 77) is **flashing (RED)**, **DO NOT** use the GFCI receptacle and replace it immediately.

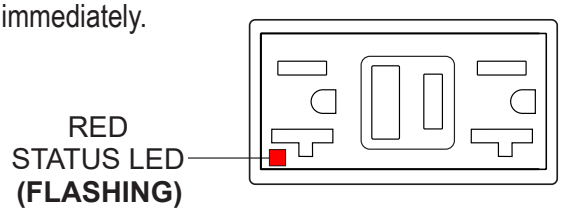


Figure 77. GFCI Receptacle (Red Flashing LED)

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 it in a clean, dry place.
- Disconnect the battery.
- Make sure engine coolant is at the proper level.
- If the generator is mounted on a trailer, jack the trailer up and place it on blocks so the tires do not touch the ground, or block and completely remove the tires.

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

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

The engine block heater and internal battery charger (Figure 78) both require 120 VAC in order to operate. Two power receptacles are provided on the output terminal panel to allow commercial power to be applied.

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

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

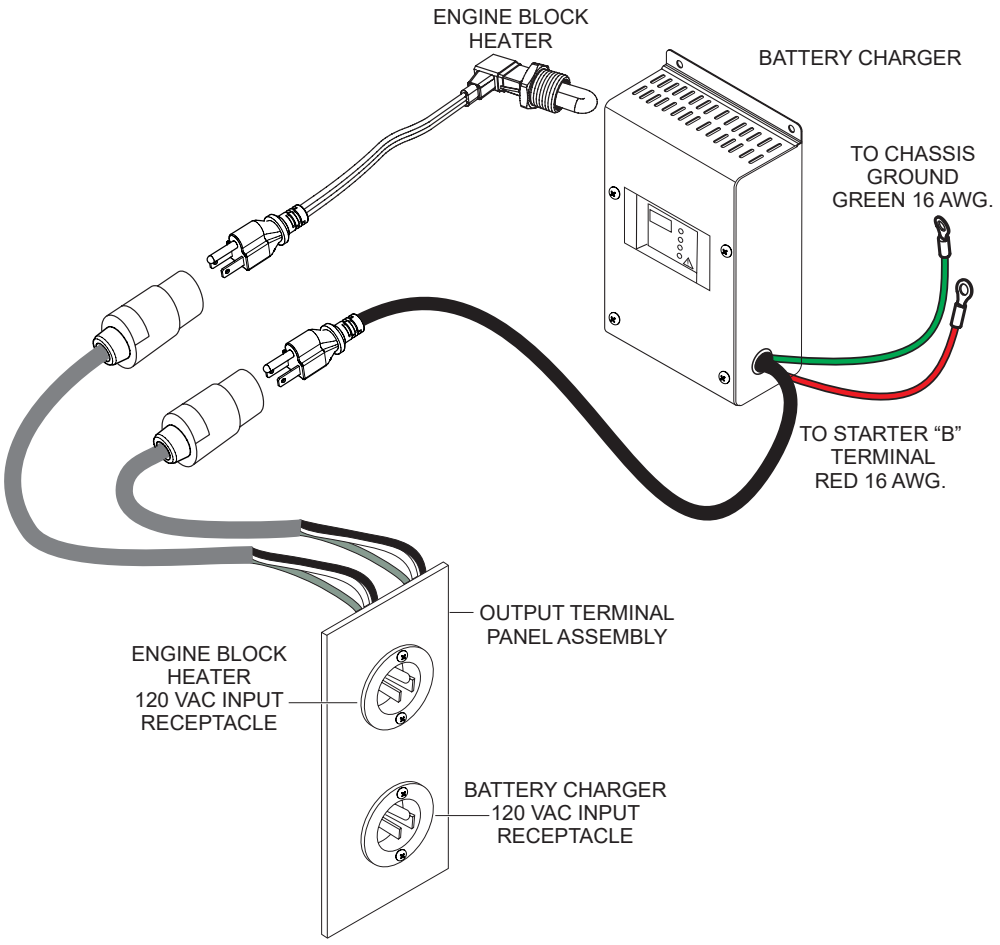


Figure 78. Engine Block Heater And Optional Battery Charger

EMISSION CONTROL

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

The DOC device (Figure 79) helps in filtering out large amounts of harmful nitrogen oxides (NO_X) and particulate matter (PM) which are emitted by diesel engines. These exhaust emissions pose serious environmental and health risks. It is important to maintain and service the DOC emission safety device on a periodic basis.

Diesel Oxidation Catalyst (DOC)

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

PREVENTIVE MAINTENANCE PROGRAMS

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

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

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

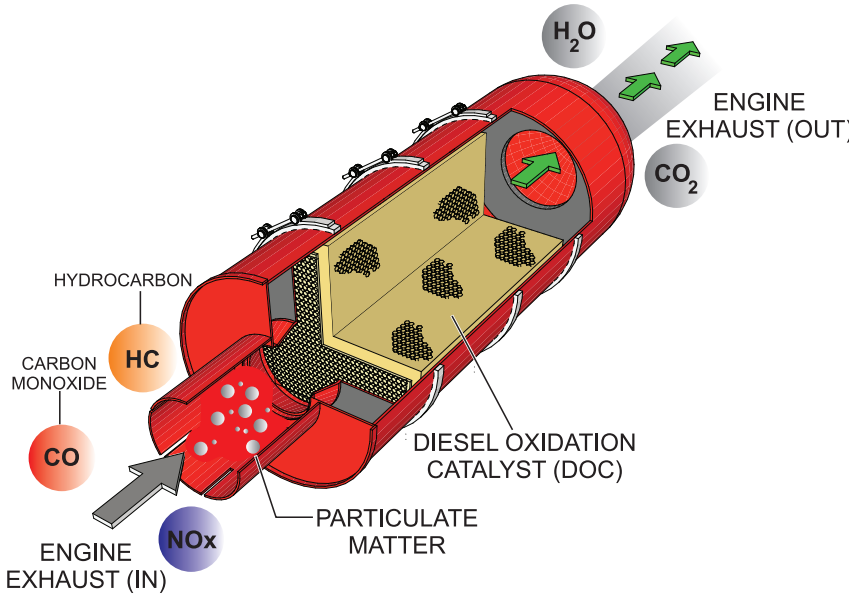


Figure 79. Diesel Oxidation Catalyst (DOC)

SELECTIVE CATALYTIC REDUCTION (SCR)

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

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

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

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

DOC/SCR REGENERATION

Regeneration is a cleaning process that eliminates accumulated DEF deposits from the exhaust system. Under normal conditions where the exhaust temperature is sufficient for urea sublimation, deposits will be removed from the system as quickly as they accumulate. This process does not have any influence on the unit operation and does not require any operator action. However, if this natural cleaning process cannot be achieved due to lighter loads or cold ambient weather conditions for an extended period of time, the accumulated urea must be removed using either the **automatic regeneration** or **forced regeneration** process.

Regeneration Guidelines

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

- **DO NOT** perform regeneration in conditions where it may be unsafe due to high exhaust temperatures.
- **DO NOT** operate the unit in an area with poor ventilation.
- If operating the engine indoors, install exhaust/ventilation equipment and ensure that there is sufficient ventilation.
- If you begin to feel sick, stop the unit immediately and ventilate the area.
- **Remember** — Due to the emission reduction functions of the exhaust system, exhaust emissions from the tailpipe have a different smell than those emitted from engines without urea SCR systems.
- During the regeneration process, the area above and around the generator should be free of any type of debris or flammable/combustible materials, as temperatures during the regeneration process can reach as high as 1,022°F (550°C).

NOTICE

During DOC/SCR system regeneration, **white smoke** may be temporarily emitted from the exhaust tailpipe. This shoud not be considered a failure. In addition, the smell of **ammonia** during the regeneration process should not be considered a failure.

If the regeneration process is underway while running a light load (0–30%), the unit may produce unusual sounds. This also should not be considered a failure or malfunction.

Automatic Regeneration

When enough DEF deposits accumulate in the system, the automatic DOC/SCR regeneration process will occur automatically. A small amount of fuel will be injected into the exhaust stream to elevate the exhaust temperature. No operator action is required for this process.

The **High Exhaust Temperature** indicator (Figure 80) may appear on the digital controller display during the automatic regeneration process. Allow the engine to run until the process is completed.

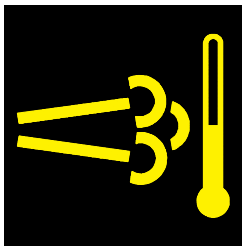


Figure 80. High Exhaust Temperature Indicator

Forced (Manual) Regeneration

Forced regeneration is required if the conditions for automatic regeneration cannot be achieved or when the DEF deposits accumulated in the exhaust system are excessive.

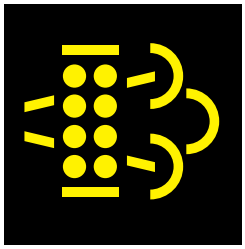


Figure 81. Regeneration Needed Indicator

The **Regeneration Needed** indicator (Figure 81) will appear on the digital controller display indicating that forced regeneration is required. When this occurs, perform the following procedure:

1. Make sure the **Circuit Breaker OFF button LED** is **ON (red)**. See Figure 82. **DO NOT** load the generator during forced regeneration.

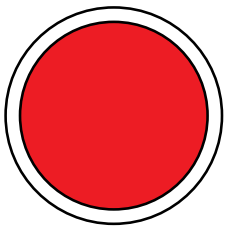


Figure 82. Circuit Breaker OFF Button (ON/RED)

2. While the engine is running, press and hold the **Run button** (Figure 83) on the digital controller.

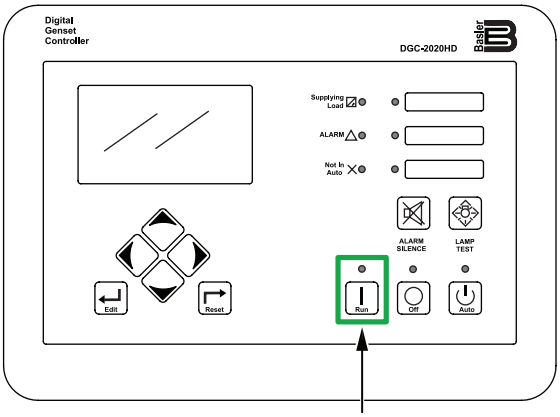


Figure 83. Digital Controller (Run Button)

3. After forced regeneration begins, the message **"MAN REGEN ACTIVE"** and the **High Exhaust Temperature** indicator (Figure 80) will be displayed on the controller.

NOTICE

If the forced regeneration operation is not performed within a specified amount of time, the message **"Force Regen Err"** will appear and the engine will automatically shutdown after a few minutes. When this occurs, check and repair any issues such as disconnections before restarting the engine.

DIESEL EXHAUST FLUID (DEF)

The amount of fluid in the DEF tank will be displayed on the digital controller during operation (Figure 84).

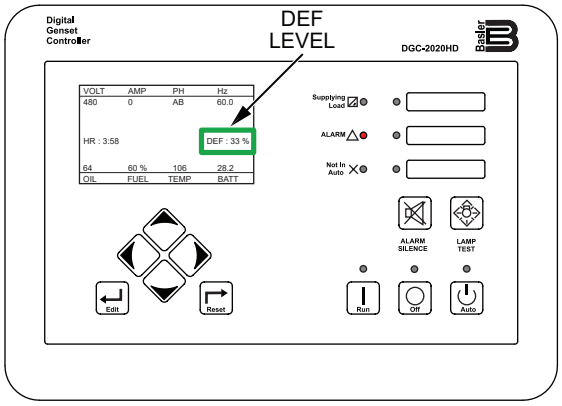


Figure 84. DEF Level Gauge

The **Diesel Exhaust Fluid (DEF) indicator** (Figure 85) will be displayed next to a diagnostic message on the digital controller during either of the following operating conditions:

- DEF tank level is below 10%. Refer to Table 13, DEF Level System Action.
- DEF quality is poor. Check the DEF tank level and check active **diagnostic trouble codes (DTC)**.

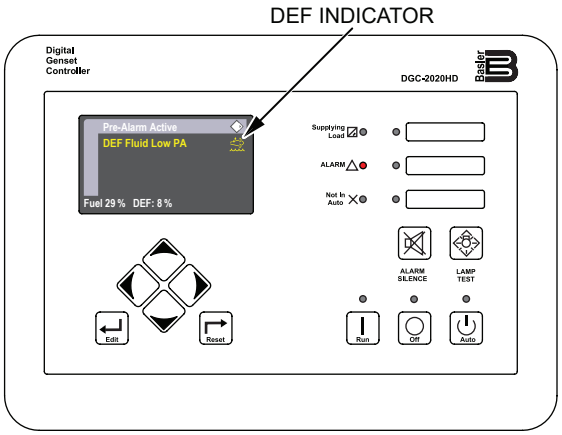


Figure 85. Digital Controller (DEF Indicator)

NOTICE

When the DEF level falls to 5%, the engine will shut down, and will not be able to restart until DEF is replenished to 10% or more.

NOTICE

When replenishing diesel fuel, **ALWAYS** make sure to check the DEF level and replenish if necessary.

Table 13. DEF Level System Action

DEF Level	10% or More	Below 10%	Below 5%	0%
Controller Message	—	DEF Fluid Low PA	DEF Fluid Low PA	LOW DEF SHUTDOWN DEF Fluid Low PA
DEF Indicator	—			
Engine Shutdown	—	—	Restart Unavailable	Restart Unavailable

DIAGNOSTIC MODE

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

1. Press the **Alarm Silence button** and the **Lamp Test button** (Figure 86) simultaneously for 5 seconds.

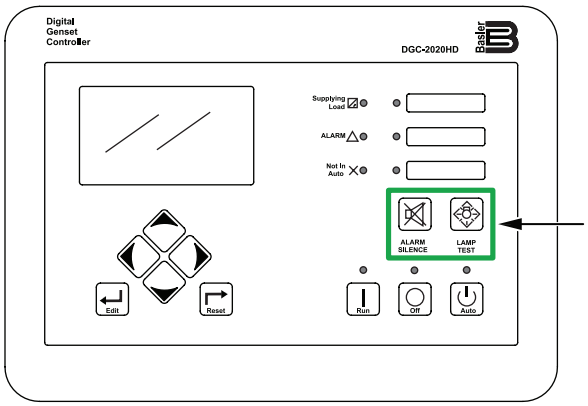


Figure 86. Digital Controller (Alarm Silence And Lamp Test Buttons)

NOTICE

When diagnostic mode is enabled, the message **"DIAG MODE ACTIVE Pre-Alarm"** will be displayed on the Pre-Alarm screen.

2. Use the **Arrow buttons** (Figure 87) to navigate to the **J1939 ECU menu** (Metering->J1939 ECU). This will allow the operator to perform the following diagnostics:

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

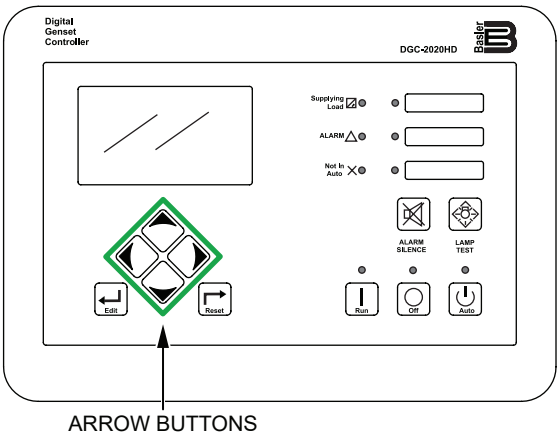


Figure 87. Digital Controller (Arrow Buttons)

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

PROTECTION DEVICES

Automatic Shutdown System

This generator is equipped with engine protection devices that will automatically shut down the engine and provide a warning to the operator when a fault occurs. Table 14 contains a complete list of engine protection devices and fault codes.

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

When the unit is ready to restart, press the **Off button** on the digital controller. The **Off button LED** (Figure 88) will turn **ON (red)**.

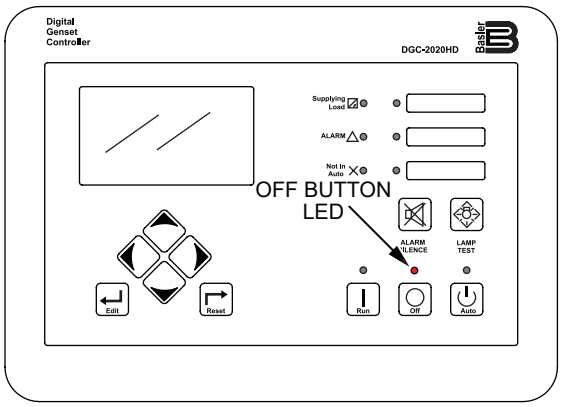


Figure 88. Digital Controller (Off Button LED)

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

NOTICE

Although the unit is equipped with engine protection devices, regularly scheduled preventive maintenance is strongly advised. Refer to Table 12.

Table 14. Automatic Engine Shutdown System				
Operating Parameter	**Circuit Breaker Off LED**	**Engine Shutdown**	**Digital Controller Display Message**	**Operating Condition/ Set Point**
Under Voltage	●	●	27P-1 UndVolt Alarm	Set point: 408 V
Over Voltage	●	●	59P-1 OvrVolt Alarm	Set point: 528 V
Under Frequency	—	—	81-2 UndFreq Prealarm	Set point: 56 Hz
Under Frequency	●	●	81-1 UndFreq Alarm	Set point: 54 Hz
Over Frequency	—	—	81-3 OvrFreq Prealarm	Set point: 64 Hz
Over Frequency	●	●	81-2 OvrFreq Alarm	Set point: 66 Hz
Over Current	—	—	51-1,3 OvrCurr Prealarm	When overcurrent occurs
Over Current	●	Stops engine after 1-minute cooldown	51-2,5,6 OvrCurr Alarm	When overcurrent occurs
Over Reverse Power	—	—	32-1 Rvs Pwr Prealarm	Set point: –32 kW
Over Reverse Power	●	●	32-2 Rvs Pwr Alarm	Set point: –36 kW
Over Power	—	—	32-3 kW Ovrld Prealarm	Set point: 240 kW
Over Power	●	Stops engine after 1-minute cooldown	32-4 kW Ovrld Alarm	Set point: 252 kW
Loss of Excitation	—	—	40Q-1 Exc Loss Prealarm	When loss of excitation occurs
Loss of Excitation	●	●	40Q-2 Exc Loss Alarm	When loss of excitation occurs
Battery Overvoltage	—	—	Batt Over Volt PreAlm	Set point: 15 V
Low Battery Voltage	—	—	Low Batt Volt PreAlm	Set point: 11 V
Weak Battery Voltage	—	—	Weak Battery PreAlm	Set point: 7.5 V
Low Fuel Level	—	—	Low Fuel PreAlarm	Set point: 20%
Low Fuel Level	●	●	Low Fuel Alarm	Set point: 5%
Low Oil Pressure	—	—	Low Oil Pressure PreAlarm	Set point: 14.36 psi (99 kPa)
Low Oil Pressure	●	●	Low Oil Pressure Alarm	Set point: 8.85 psi (61 kPa)
High Coolant Temperature	—	—	High Coolant Temp PA	Set point: 217°F (102.7°C)
High Coolant Temperature	●	●	High Coolant Temp A	Set point: 235°F (112.7°C)
Over Speed	●	●	OverSpeed Alarm	Set point: 2,070 rpm

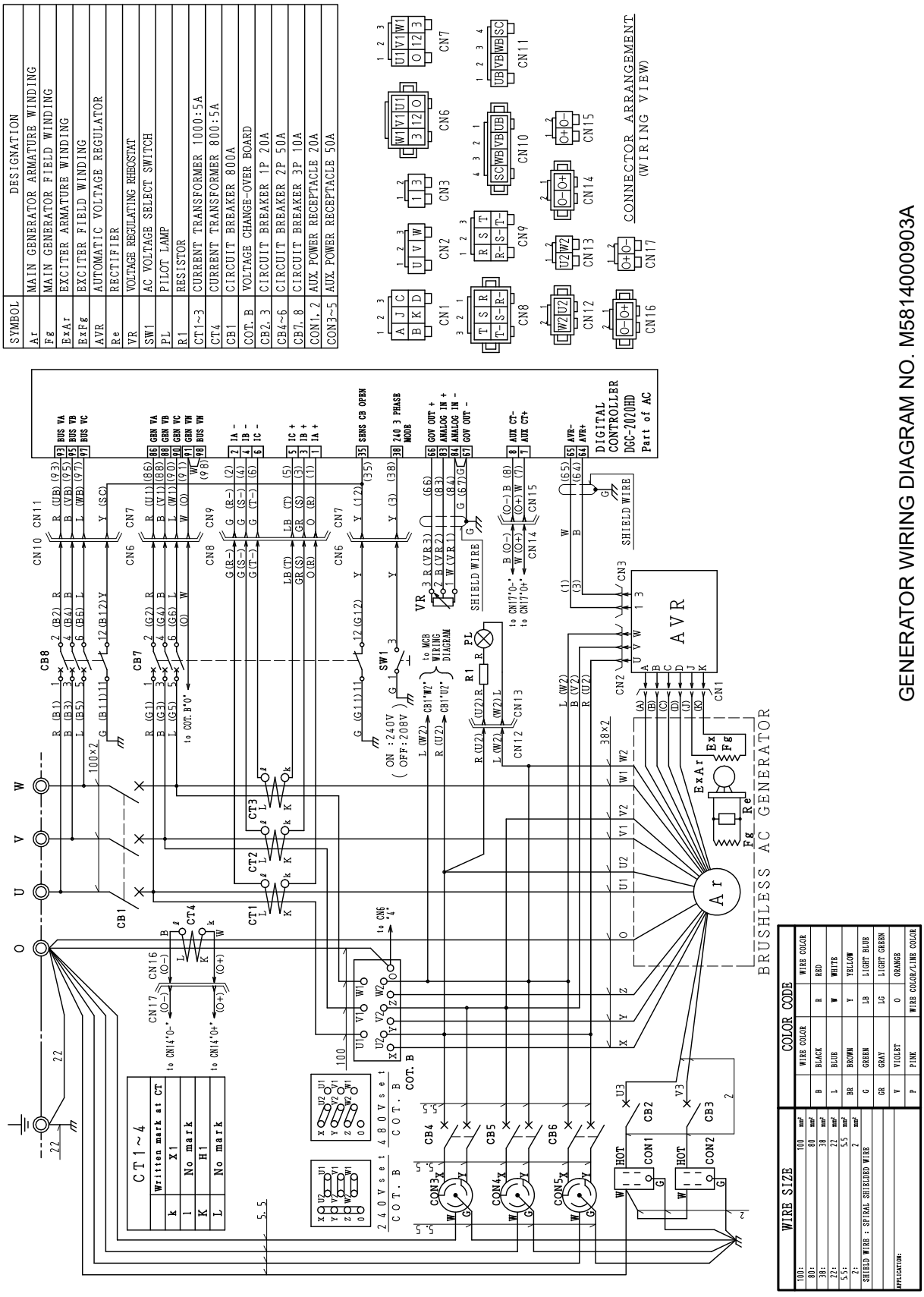
Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 15 for diagnosis of the generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 15. Generator Troubleshooting

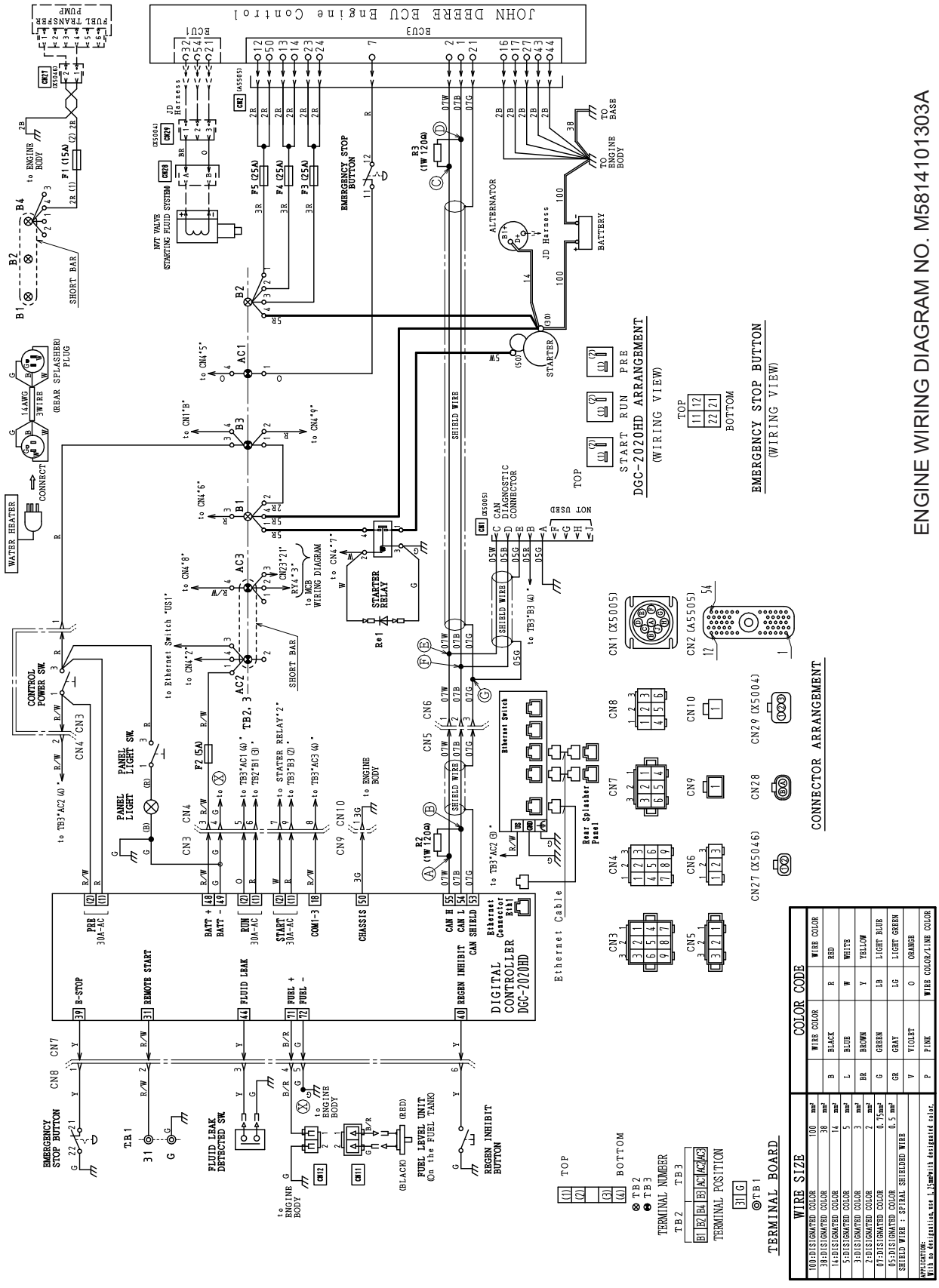
Symptom	Possible Problem	Solution
No Voltage Output	AC voltmeter defective?	Check output voltage and replace if necessary.
	Wiring connections loose?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
	Defective rotating rectifier?	Check and replace.
Low Voltage Output	Engine speed incorrect?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

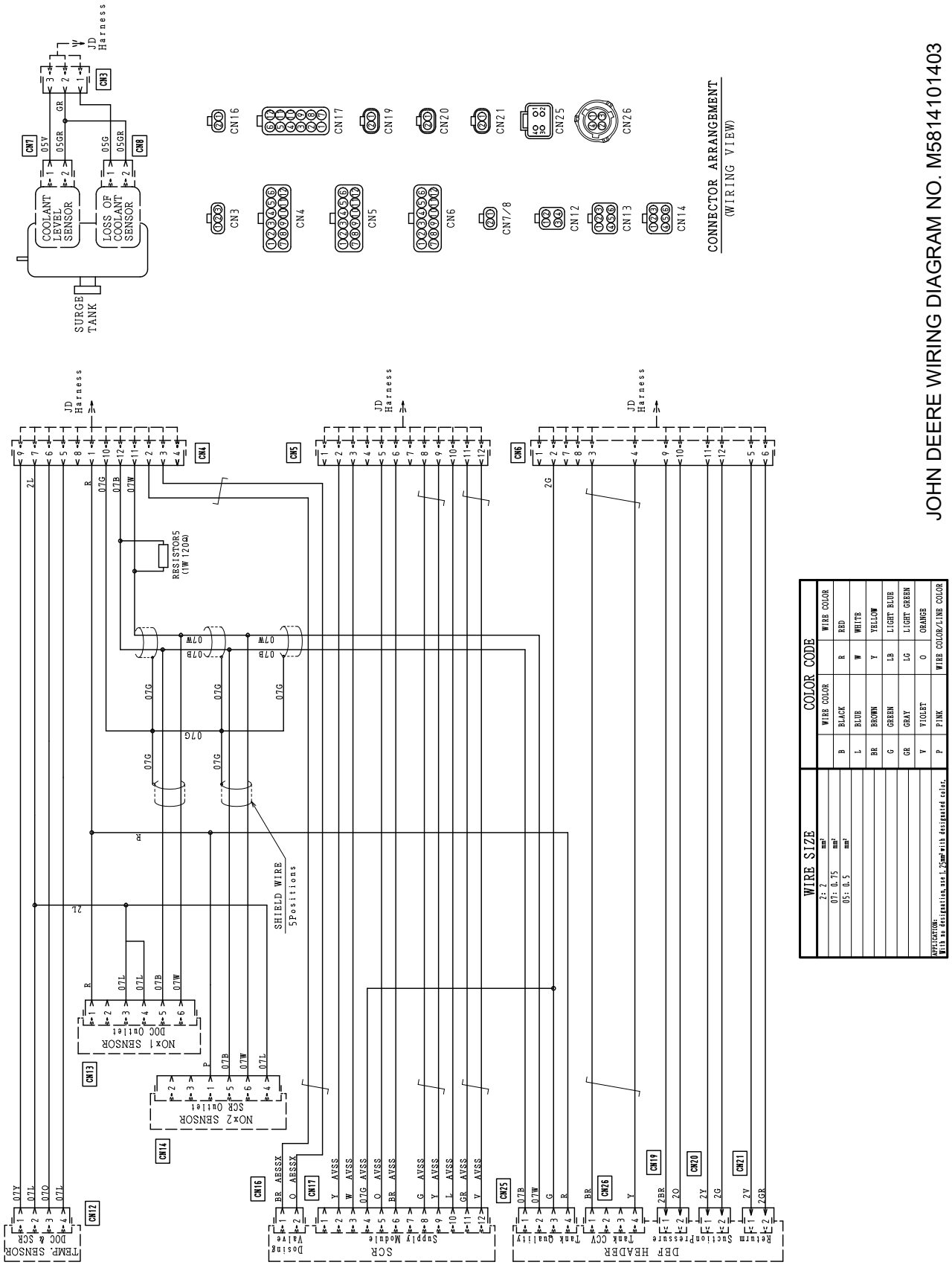
Troubleshooting (Engine)		
Symptom	**Possible Problem**	**Solution**
Engine will not start or start is delayed, although engine can be turned over.	No fuel reaching injection pump?	Add fuel. Check entire fuel system.
	Defective fuel pump?	Replace fuel pump.
	Fuel filter clogged?	Replace fuel filter and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

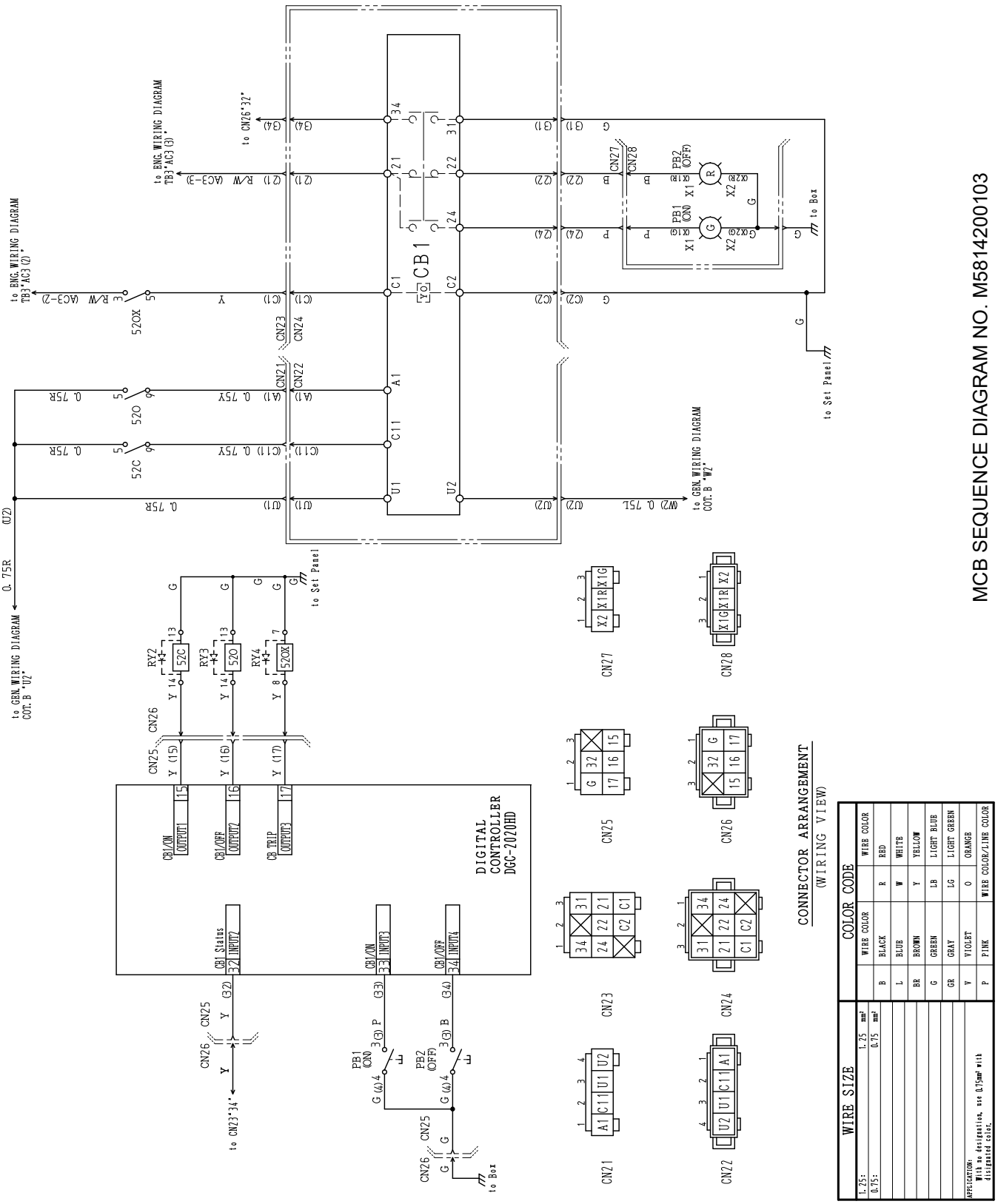
Troubleshooting (Engine) - continued		
Symptom	**Possible Problem**	**Solution**
Low engine power output and low speed, black exhaust smoke.	Air filter blocked?	Clean or replace air filter.
	Incorrect valve clearances?	Adjust valves per engine specification.
	Malfunction at injector?	See engine manual.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



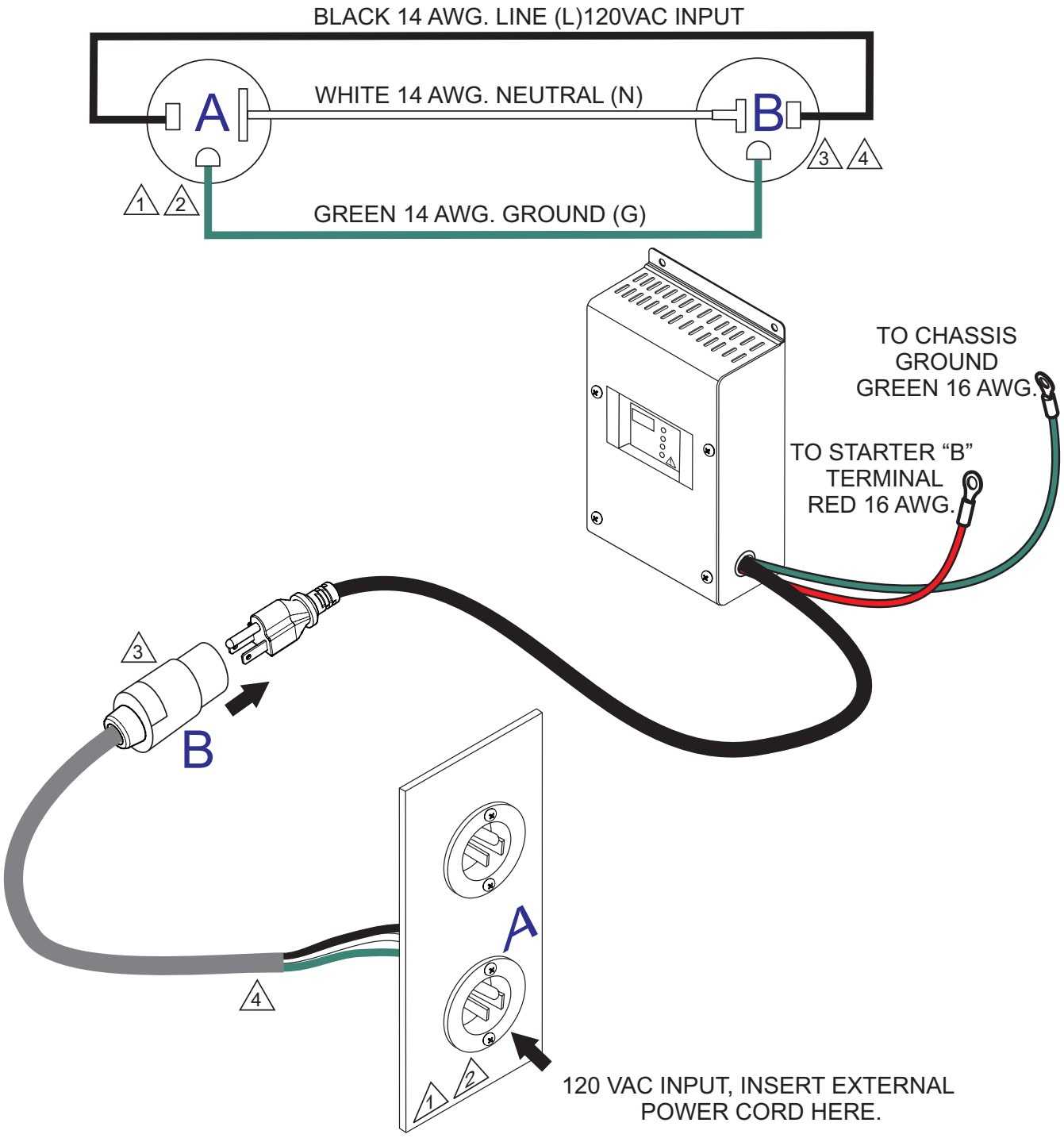
GENERATOR WIRING DIAGRAM NO. M5814000903A


JOHN DEERE ECU Engine Control
ECU1
ECU3
FUEL TRANSFER PUMP
CN27
J1939-03
CN29
J1939-03
CN28
JD Harness
CN26
CN25
NOT USED
CN1
J1939-03
CN2
J1939-03
CN27
J1939-03
CN28
J1939-03
CN29
J1939-03
CN1 (X5005)
CN2 (A550S)
CN27 (X5046)
CN28
CN29 (X5004)
CONNECTOR ARRANGEMENT
TOP
BOTTOM
TOP
BOTTOM
START RUN PRE
DGC-2020HD ARRANGEMENT
(WIRING VIEW)
EMERGENCY STOP BUTTON
(WIRING VIEW)
ENGINE WIRING DIAGRAM NO. M5814101303A
WATER HEATER
CONNECT
14AWG 3WIRE
(REAR SPLASHER) PLUG
CONTROL POWER SW.
PANEL LIGHT SW.
PANEL LIGHT
F2 (5A)
F1 (15A)
P5 (25A)
P4 (25A)
P3 (25A)
R3 (1W 120Ω)
R2 (1W 120Ω)
Rr1
STARTER RELAY
EMERGENCY STOP BUTTON
NVT VALVE STARTING FLUID SYSTEM
ALTERNATOR
BATTERY
STARTER
SHORT BAR
SHIELD WIRE
Ethernet Switch
Rear Splasher Panel
Ethernet Cable
DIGITAL CONTROLLER DGC-2020HD
Ethernet Connector
CAN DIAGNOSTIC CONNECTOR
TO ENGINE BODY
TO BASE
B-STOP
REMOTE START
FLUID LEAK
FUEL +
FUEL -
REGEN INHIBIT
CAN H
CAN L
CAN SHIELD
BATT +
BATT -
RUN
START
COM1-3
CHASSIS
PRE
FLUID LEAK DETECTED SW.
FUEL LEVEL UNIT (On the FUEL TANK)
REGEN INHIBIT BUTTON
T.B.1
TERMINAL BOARD
TERMINAL POSITION
TERMINAL NUMBER
CN3
CN4
CN5
CN6
CN7
CN8
CN9
CN10
AC1
AC2
AC3
B1
B2
B3
B4
TB2, 3
WIRE SIZE
100=DISIGNATED COLOR 100 mm²
38=DISIGNATED COLOR 38 mm²
14=DISIGNATED COLOR 14 mm²
5=DISIGNATED COLOR 5 mm²
3=DISIGNATED COLOR 3 mm²
2=DISIGNATED COLOR 2 mm²
07=DISIGNATED COLOR 0.75mm²
05=DISIGNATED COLOR 0.5 mm²
SHIELD WIRE : SPIRAL SHIELDED WIRE
APPLICATION:
Wire designation, use 1.25mm² with designated color.
COLOR CODE
B BLACK
R RED
W WHITE
Y YELLOW
LB LIGHT BLUE
LG LIGHT GREEN
O ORANGE
WIRE COLOR/LINE COLOR
P PINK
V VIOLET
G GREEN
GR GRAY
L BLUE
BR BROWN


JOHN DEERE WIRING DIAGRAM NO. M5814101403
CONNECTOR ARRANGEMENT
(WIRING VIEW)
CN16
CN17
CN19
CN20
CN21
CN25
CN26
CN3
CN4
CN5
CN6
CN7/8
CN12
CN13
CN14
COOLANT LEVEL SENSOR
LOSS OF COOLANT SENSOR
SURGE TANK
JD Harness
RESISTOR5 (1W 120Ω)
SHIELD WIRE
5Positions
NOx1 SENSOR
DOC Outlet
NOx2 SENSOR
SCR Outlet
TEMP. SENSOR
DOC & SCR
Dosing Valve
SCR
Supply Module
DEF HEADER
Tank Quality
Tank CCV
Suction Pressure
Return
WIRE SIZE
2: 2 mm²
07: 0.75 mm²
05: 0.5 mm²
COLOR CODE
WIRE COLOR
WIRE COLOR
B BLACK
R RED
L BLUE
W WHITE
BR BROWN
Y YELLOW
G GREEN
LB LIGHT BLUE
GR GRAY
LG LIGHT GREEN
V VIOLET
O ORANGE
P PINK
WIRE COLOR/LINE COLOR
APPLICATION:
With no designation, use 1.25mm² with designated color.


MCB SEQUENCE DIAGRAM NO. M5814200103
DIGITAL CONTROLLER DGC-2020HD
CB1
52C
52O
52OX
PB1 (ON)
PB2 (OFF)
CONNECTOR ARRANGEMENT
(WIRING VIEW)
COLOR CODE
WIRE SIZE
APPLICATION: With no designation, use 0.75mm² with designated color.

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.

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
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Multiquip (UK) Limited Head Office

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

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

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by
DENYO MANUFACTURING CORP.