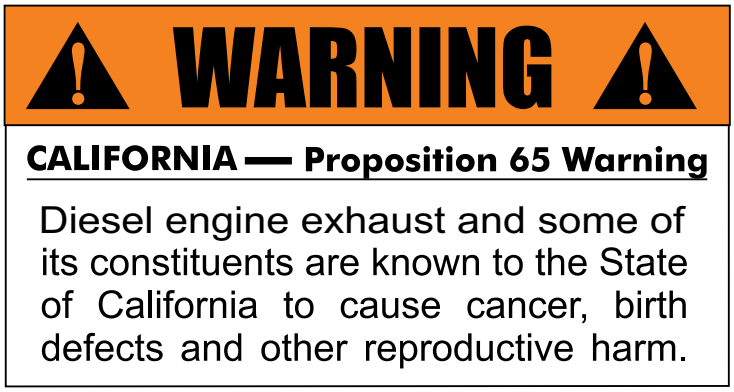
OPERATION MANUAL

WHISPERWATT™ SERIES
MODEL DCA220SSJU4F
60Hz GENERATOR
(JOHN DEERE 6068HFG09 DIESEL ENGINE)

Revision #4 (01/24/18)

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

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.


WARNING
CALIFORNIA — Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

DCA220SSJU4F 60 Hz-GENERATOR

NOTICE

Specifications are subject to change without notice.

NOTES

Do not operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. 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 equipment 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 equipment 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 equipment when not feeling well due to fatigue, illness or when under medication.

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

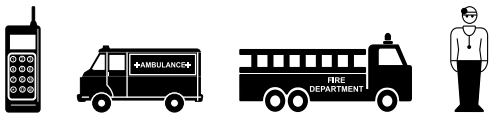
- **ALWAYS** check the equipment for loosened threads or bolts before starting.
- **DO NOT** use the equipment for any purpose other than its intended purposes or applications.

NOTICE

- This equipment 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 read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by MQ Power for this equipment. Damage to the equipment and/or injury to 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 equipment 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 machine.

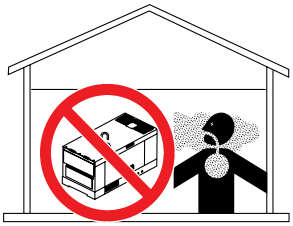
NOTICE

- **ALWAYS** ensure generator is on level ground before use.
- **ALWAYS** keep the machine in proper running condition.
- Fix damage to machine and replace any broken parts immediately.
- **ALWAYS** store equipment properly when it is not being used. Equipment 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 equipment 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.



⚠ WARNING

- **DO NOT** place hands or fingers inside engine compartment when 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.

- **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** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the generator.

⚠ CAUTION

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

NOTICE

- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment 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 40% 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.
- State Health Safety Codes and Public Resources Codes specify that in certain locations, spark arresters must be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

FUEL SAFETY

⚠ DANGER

- **DO NOT** 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.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **DO NOT** overfill tank, since spilled fuel could 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.
- **DO NOT** 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 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 the trailer that supports the generator and the towing vehicle are mechanically sound and in good operating condition.
- **ALWAYS** shutdown 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 towing vehicle and trailer. ***Trailer tires should be inflated to 50 psi cold.*** Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer is equipped with a **safety chain.**
- **ALWAYS** properly attach trailer's safety chains to 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 type of terrain.
- Avoid sudden stops and starts. This can cause skidding, or jack-knifing. Smooth, gradual starts and stops will improve towing.
- Avoid sharp turns to prevent rolling.
- Trailer should be adjusted to a level position at all times when towing.
- Raise and lock trailer wheel stand in up position when towing.
- Place ***chock blocks*** underneath wheel 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

- **DO NOT** touch output terminals during operation. Contact with 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 generator and all circuit breakers **OFF** before performing maintenance on the generator or making contact with output terminals.

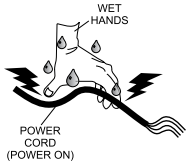
- **NEVER** insert any objects into the output receptacles during operation. This is extremely dangerous. The possibility exists of **electrical shock, electrocution or death.**

- 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 generator. Inspect for cuts in the insulation.



- **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 proper power or extension cord has been selected for the job. See 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 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.

- **DO NOT** 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 gasses.

- 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 rules below.

- **DO NOT** 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 battery and bring to 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 trowel 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.

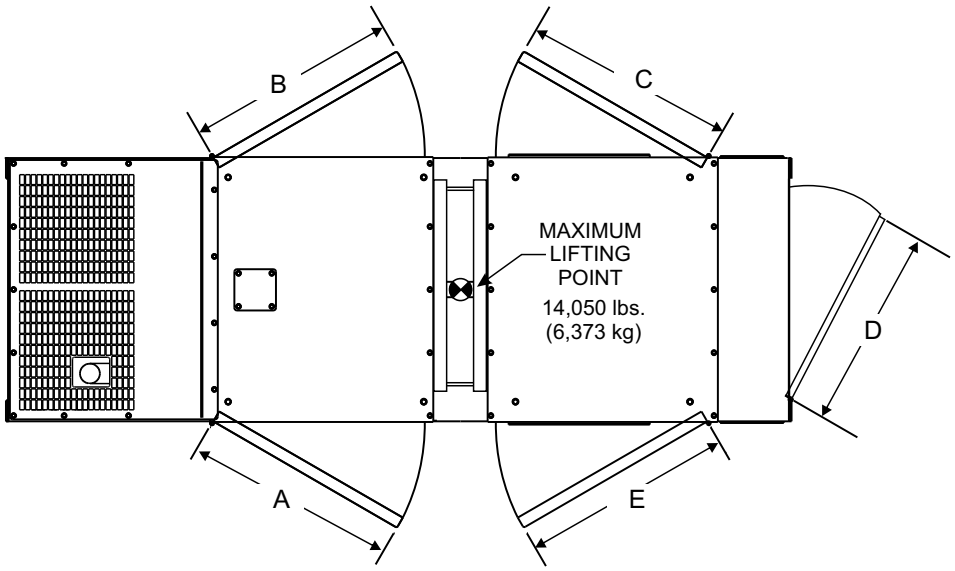
If a replacement emission label is needed, please contact your authorized engine distributor.

Table 1. Generator Specifications		
Model	DCA220SSJU4F	
Type	Revolving field, self ventilated, open protected type synchronous generator	
Armature Connection	**Star with Neutral**	
Phase	3Ø	
Standby Output	194 kW (242 kVA)	
Prime Output	176 kW (220 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	
Power Factor	0.8	
Frequency	60 Hz	
Speed	1800 rpm	
Aux. AC Power	Single Phase, 60 Hz	
Aux. Voltage/Output	4.8 Kw (2.4 kW x 2)	
Dry Weight	7,695 lbs. (3,490 kg)	
Wet Weight	8,489 lbs. (3,850 kg)	
Table 2. Engine Specifications		
Model	John Deere 6068HF08 Tier 4 Final Certified	
Type	4 cycle, water-cooled, direct injection, turbo-charged charged air cooled, EGR, DOC, DPF and SCR	
No. of Cylinders	6 cylinders	
Bore x Stroke	4.17 in. x 4.99 in. (106 mm x 127 mm)	
Displacement	415 cu. in. (6.8 liter)	
Rated Output	293 HP at 1800 rpm	
Starting	Electric	
Coolant Capacity	10.3 gal. (39 liters)[1]	
Lube Oil Capacity	8.18 gal. (31 liters)[2]	
Lubricating Type Oil	API service class CJ-4, John Deere Plus-50™ II	
DEF Tank Capacity	14.5 gal. (55 liters)	
Fuel Type	#2 Diesel Fuel (Ultra low sulfur diesel fuel only)	
Fuel Tank Capacity	69 gal. (260 liters)	
Fuel Consumption	12.5 gal. (47.1 L)/hr at **full load**	9.7 gal. (36.4 L)/hr at **3/4 load**
	6.9 gal. (26.1 L)/hr at **1/2 load**	4.4 gal. (16.7 L)/hr at **1/4 load**
Battery	12 (150Ah X 1	

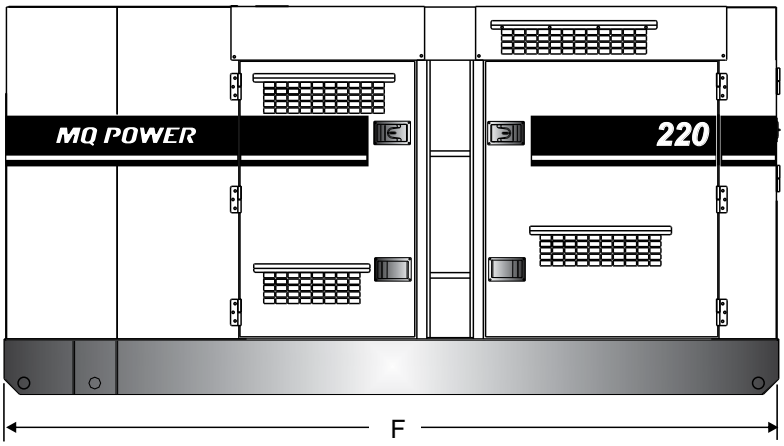
[1] Includes engine and radiator hoses

[2] Includes filters

TOP VIEW



SIDE VIEW



FRONT VIEW

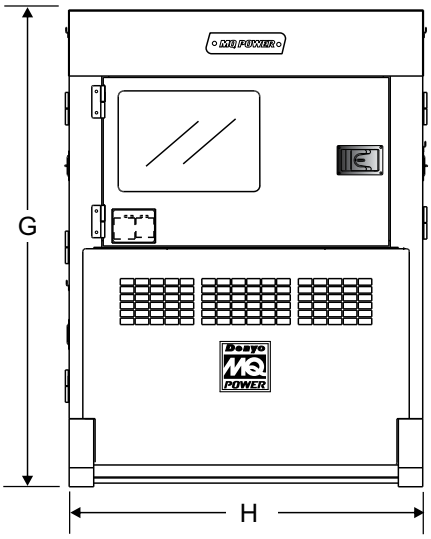


Figure 1. Dimensions

Table 3. Dimensions			
Reference Letter	**Dimension in. (mm)**	**Reference Letter**	**Dimension in. (mm)**
A	35.83 in. (910 mm)	E	43.70 in. (1,110 mm)
B	35.83 in. (910 mm)	F	137.79 in. (3,500 mm)
C	43.70 in. (1,110 mm)	G	70.86 in. (1,800 mm)
D	41.34 in. (1,050 mm)	H	51.18 in. (1,300 mm)

CONNECTING THE GROUND

Consult with local Electrical and Safety Codes for proper connection based on condition of use.

EXAMPLE of how to ground the unit if the condition of use requires such a device:

The ground terminal on the generator should always be used to connect the generator to a suitable ground when required.

The ground cable should be #8 size wire (aluminum) minimum. If copper wire is used, #10 size wire minimum should be used.

Connect one end of the ground cable terminal to the generator ground point (Figure 2). Connect the other end of the ground cable to a suitable earth ground (ground rod).

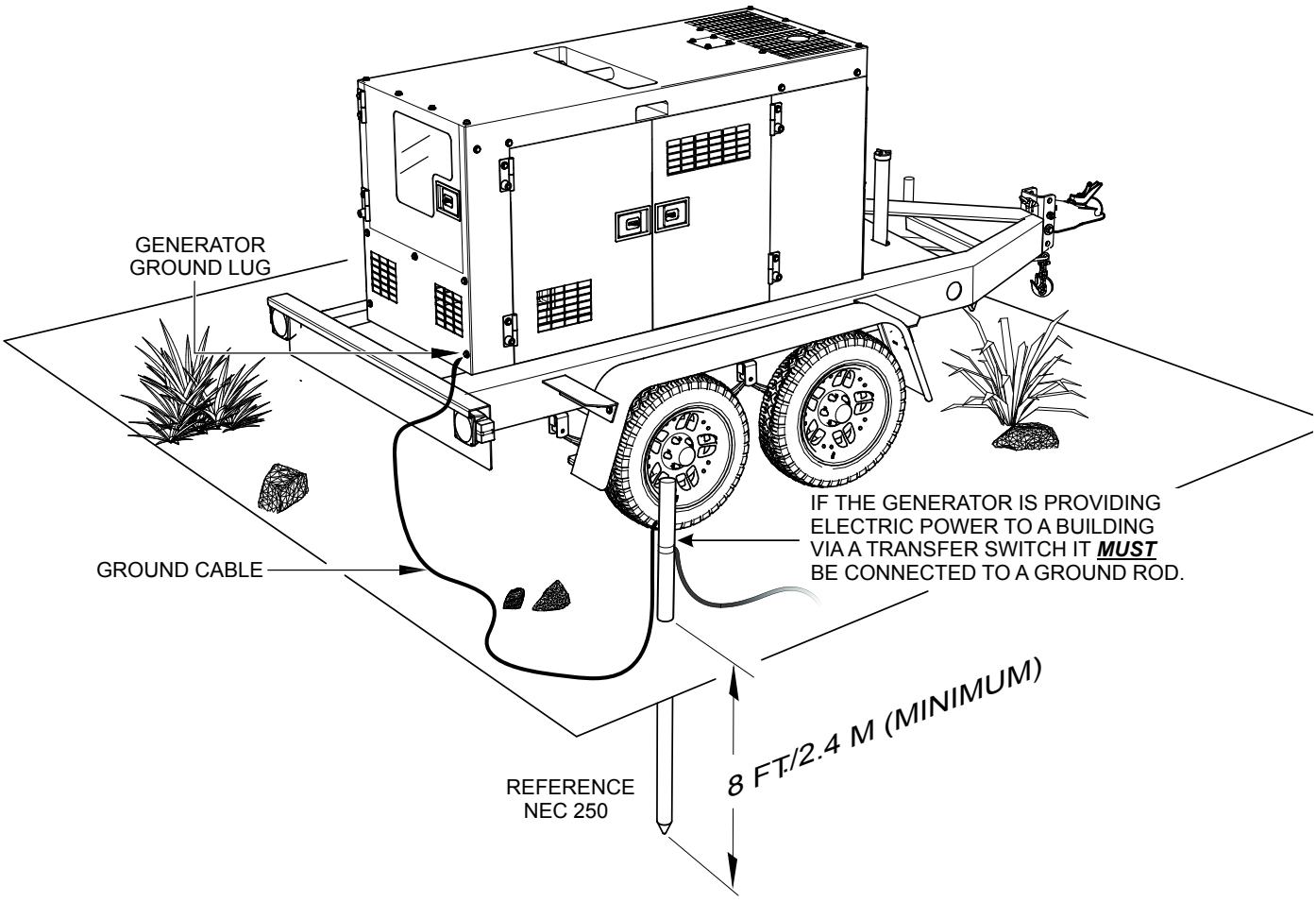


Figure 2. Typical Generator Grounding Application

OUTDOOR INSTALLATION

Install the generator in a 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 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 set at least 6 inches above the floor or grade level (in accordance to NFPA 110, Chapter 54.1). **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 GROUNDING

NOTICE

The Occupational Safety and Health Administration (OSHA) and the National Electrical Code (NEC) recommend that if the generator is providing electrical power to a structure (home, office shop, trailer or similar) it ***must*** be connected to a grounding electrode system, such as driven ground rod (Figure 2).

If applicable, to guard against electrical shock and possible damage to the equipment, it is important to provide a good **EARTH** ground, (Figure 2).

NOTICE

ALWAYS check with State, Province, District and Municipalities for electrical grounding requirements before using generator.

Article 250 (Grounding) of the NEC handbook provides guidelines for proper grounding and specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as practical.

NEC article 250 specifices the following grounding requirements:

1. Use one of the following wire types to connect the generator to earth ground.
   a. Copper 10 AWG (5.3 mm^2) or larger.
   b. Aluminum 8 AWG (8.4 mm^2) or larger.
2. When grounding of the generator (Figure 2) is required, connect one end of the ground cable to the ground lug on the generator. Connect the other end of the ground cable to the ground rod (earth ground).
3. NEC article 250 specifies that the earth ground rod should be buried a minimum of 8 ft. into the ground.

NOTICE

When connecting the generator to any buildings electrical system **ALWAYS** consult with a licensed electrician.

GENERATOR

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

OPERATING PANEL

The "Operating Panel" is provided with the following:

- ECU 835 Controller (Standard)
- Gauge Unit Assembly
  - Oil Pressure Gauge
  - Water Temperature Gauge
  - Charging Voltmeter
  - Fuel Gauge
  - Tachometer
- Panel Light/Panel Light Switch
- Hour Check Button
- Auto Start/Stop Switch
- Emergency Stop Button
- Basler DGC2020 Digital Controller (Option)

CONTROL PANEL

The "Control Panel" is provided with the following:

- Frequency Meter (Hz)
- AC Ammeter (Amps)
- AC Voltmeter (Volts)
- Ammeter Change-Over Switch
- Voltmeter Change-Over Switch
- Voltage Regulator
- 3-Pole, 600 amp Main Circuit Breaker
- "Control Box" (located behind Control Panel)
  - Automatic Voltage Regulator
  - Current Transformer
  - Over-Current Relay
  - Starter Relay
  - Voltage Change-Over Board

OUTPUT TERMINAL PANEL

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

- Three 120/240V output receptacles (CS-6369), 50A
- Three auxiliary circuit breakers, 50A
- Two 120V output receptacles (GFCI), 20A
- Two GFCI circuit breakers, 20A
- Eight output terminal lugs (3Ø power)
- Ground Lug
- Battery Charger (Optional)
- Camloks (Optional)
- Jacket Water Heater (Optional)

OPEN DELTA EXCITATION SYSTEM

Each generator is equipped with the state of the art **"Open-Delta"** excitation system. The open delta system consist 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 6068HFG09 diesel engine. This engine is designed to meet every performance requirement for the generator. Reference Table 2 for engine specifications.

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

ELECTRIC GOVERNOR SYSTEM

The electric governor system controls the RPMs of the engine. When the engine demand increases or decreases, the governor system regulates the frequency variation to ±.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 7) as a guide for selecting proper extension cable size.

GENERAL PARALLELING INFORMATION (OPTION)

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 systems' 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 systems'.

The kW load sharing is achieved by increasing or decreasing fuel to the systems' 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 systems' 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 systems' 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 an decrease in voltage (as it would if it were operating alone) but It will lead to an decrease in the proportion of the total **kVAR** load it will deliver and a increase in its power factor.

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

ETHERNET COMMUNICATION

Ethernet communication is the preferred method for paralleling. This method supports breaker negotiation to avoid simultaneous breaker closures, kW load sharing and kVAR sharing, soft load transfers on and off loading.

The Ethernet ports are located at the output bus splash panel area. There are two ports which are identical so either one can be used. Using a standard Ethernet cable, interconnect units to be paralleled and or sequenced.

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 be 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 the units get 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 ten 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 Screen” (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.

When highlighted, press the “Edit” button. Username and Password is required. User Name is **A** and Password is **A**. Use the up arrow button (↑) and scroll to the alpha character **A**, then press edit to select.

Next, the cursor will move to the ***password*** field, press the up arrow button (↑) and scroll to the alpha character **A**, then press edit to select.

Full Password key sequence is ^ Edit ^Edit. The set-point for the desired hours until maintenance can now be changed. Press edit to save.

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 happens to be very handy 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.

ANALOG LOAD SHARING

If no Ethernet cable is available or if paralleling to other equipment with traditional analog load sharing, there is a terminal block to connect a shielded wire pair between the two controls. The voltage ranges are programmable with the default value set by Multiquip at 0-3VDC, which is a common voltage for most controllers.

Please note that when in the load sharing mode the voltage is set to droop at 5%. This setting is programmable, but the default setting is 5%.

THREE PHASE 480V/208V PARALLEL WIRING VIA CAMLOCKS

REQUIRED EQUIPMENT

- 4/0 Single Conductor Cable (User Supplied)
- CAT5E Shielded Cable or Better (User Supplied)
- Power Distribution Panel (User Supplied)

The following procedure intended to assist the user with the parallel wiring configuration for the DCA220SSJU4F generator using the camlok connector panel.

NOTICE

Only a **qualified service technician** or **licensed electrician** with proper training should perform this installation. Follow all shop safety rules when performing this installation.

PREPARATION

1. Make sure generator is turned off and engine is cool.
2. Disconnect any loads connected to the generator.
3. Place the main circuit breaker in the **OFF** position.
4. Place the generator in an area free of dirt and debris Make sure it is on secure level ground.
5. Disconnect ***negative*** battery cable from the battery.

3Ø-480 VAC PARALLEL WIRING CONFIGURATION

1. Using 4/0 cables connect the two generators to the power distribution panel as referenced in the 3Ø-480V parallel wiring diagram.

DANGER

To prevent arcing make sure cables are securely tighten at power distribution panel, the possibility exist of the unit catching on fire thus causing equipment damage and severe bodily harm.

NOTICE

When connecting load cables to the power distribution panel be sure to select the correct size of the load cables to handle full load/amperage of both generators (parallel).

3Ø-208 VAC PARALLEL WIRING CONFIGURATION

1. Using 4/0 cables connect the two generators to the power distribution panel as referenced in the 3Ø-208V parallel wiring diagram.

ETHERNET CABLE CONNECTION

1. Connect a CAT5E Ethernet cable (shielded) between port 1 on both generators as shown in Figure 3.

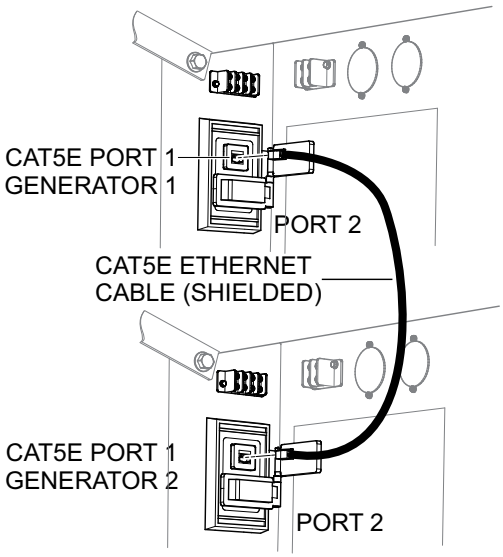


Figure 3. Ethernet Cable Connection

2. Reference Table 4 for additional Ethernet port connections.

Table 4. Ethernet Cable Connections

Generator 1	Generator 2
Port 2	Port 1
Port 1	Port 2
Port 2	Port 2

3. Reconnect battery.
4. Start generator as outlined in start up section of this manual.

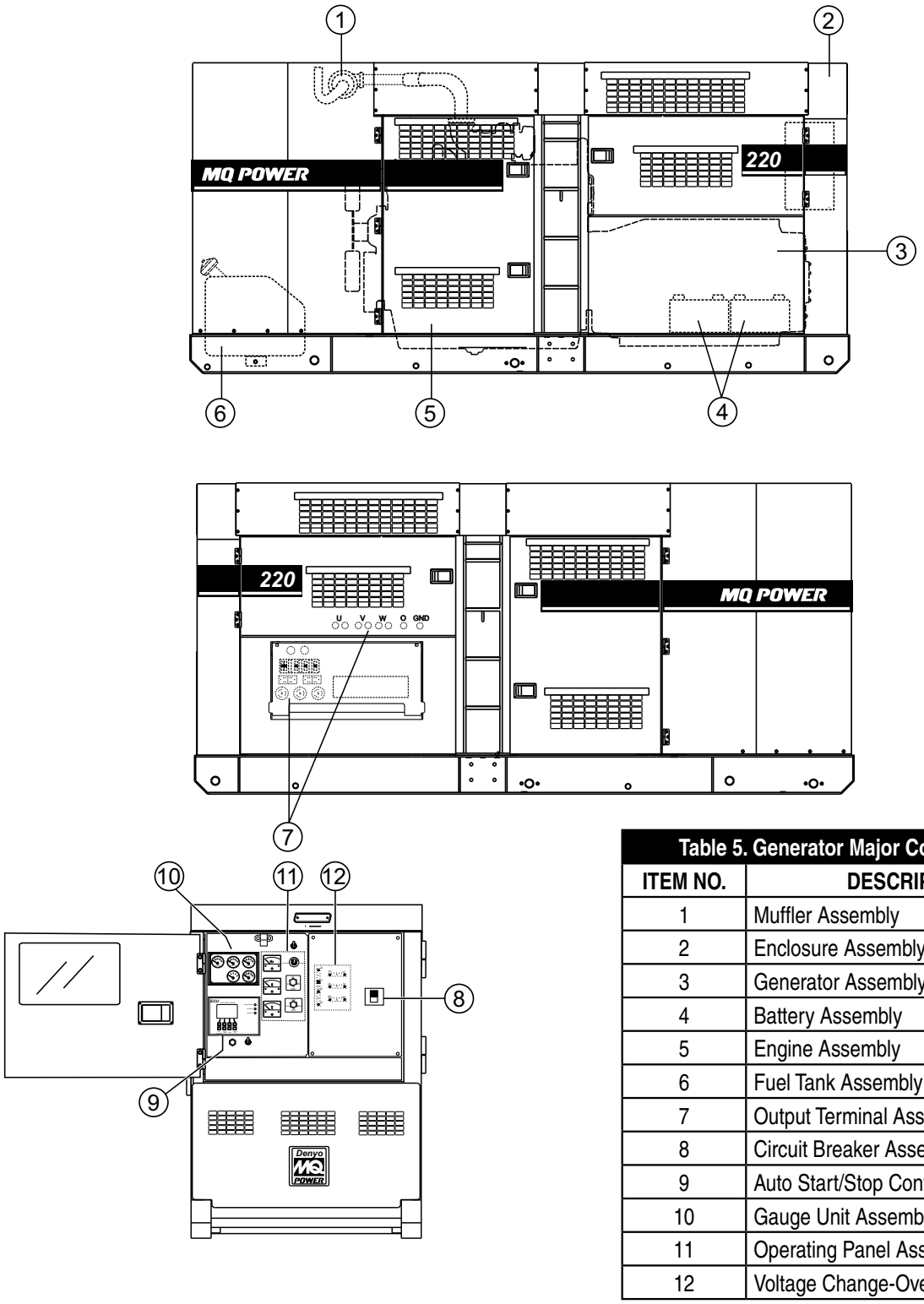


Table 5. Generator Major Components	
ITEM NO.	**DESCRIPTION**
1	Muffler Assembly
2	Enclosure Assembly
3	Generator Assembly
4	Battery Assembly
5	Engine Assembly
6	Fuel Tank Assembly
7	Output Terminal Assembly
8	Circuit Breaker Assembly
9	Auto Start/Stop Controller Assembly
10	Gauge Unit Assembly
11	Operating Panel Assembly
12	Voltage Change-Over Board

Figure 4. Major Components

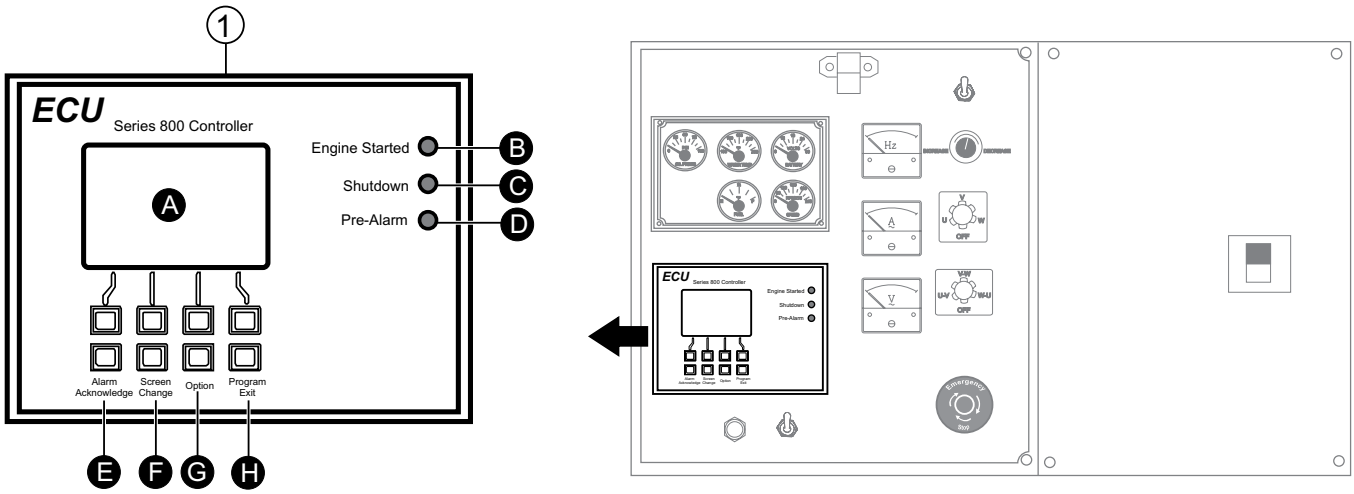


Figure 5. Engine Control Unit (ECU)

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

1. **ECU 835 Controller** — This auto start/stop controller displays the parameters and the diagnostic troubleshooting messages of the engine, and controls DPF regeneration.

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

   B. **Engine Started Lamp** — This lamp when lit indicates engine is operating normally.

   C. **Engine Shutdown Lamp** — When an engine failure has occured this lamp will blink. Indicating the engine has been shutdown. The diagnostic fault message will be displayed on the LCD screen.

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

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

   F. **Screen Change Button** — When this button is pushed during operation, the screen will cycle through each parameter screen.

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

   H. **Program/Exit Button** — Pushing this button allows the DPF Force Regen and diagnostic code to be confirmed.

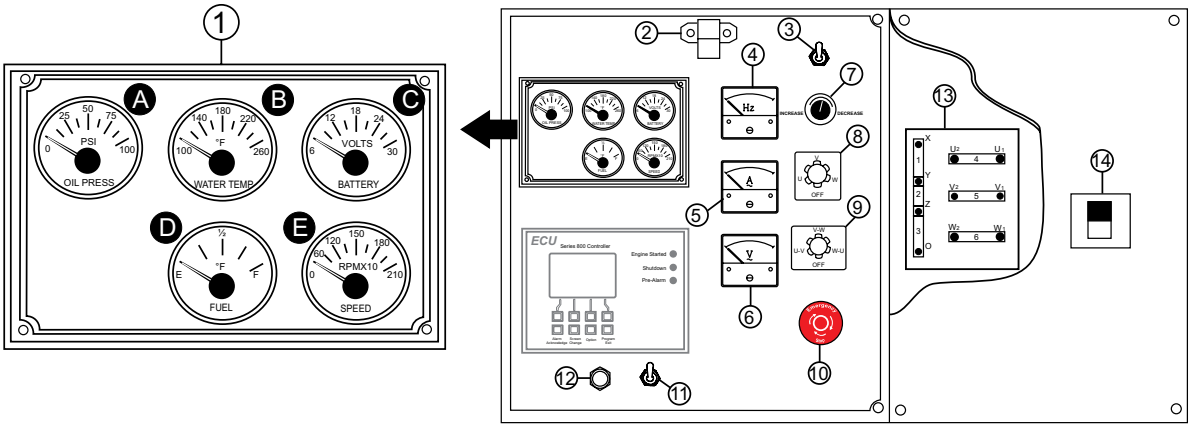


Figure 6. Gauge Unit Assembly

The definitions below describe the controls and functions of the Engine/Generator Control Panel (Figure 6).

1. **Gauge Unit Assembly** — This assembly houses the various engine monitoring gauges. These gauges indicate: oil pressure, water temperature, charging voltmeter, fuel and engine speed RPM (tachometer).

   A. **Oil Pressure Gauge** — During normal operation this gauge should read approximately 44 psi. (303 kPa). When starting the generator the oil pressure may read a little higher, but after the engine warms up the oil pressure should return to the correct pressure range.

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

   C. **Charging Voltmeter Gauge** — During normal operation this gauge indicate minimum 26 VDC

   D. **Fuel Gauge** — Indicates amount of diesel fuel available.

   E. **Tachometer** — Indicates engine speed in RPM's for 60 Hz operation. This meter should indicate 1800 RPM's when the rated load is applied.

2. **Panel Light** — For operation at night, panel light illuminates control panel for ease of reading meters and gauges. Make sure panel light switch is in the OFF position when light is not in use.

3. **Panel Light Switch** — When activated will turn on control panel light.

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

5. **AC Ammeter** — Indicates the amount of current the load is drawing from the generator per leg selected by the ammeter phase-selector switch.

6. **AC Voltmeter** — Indicates the output voltage present at the **U,V, and W Output Terminal Lugs.**

7. **Voltage Regulator Control** — Allows ±15% manual adjustment of the generator's output voltage.

8. **Ammeter Change-Over Switch** — This switch allows the AC ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off. This switch does not effect the generator output in any fashion, it is for current reading only.

9. **Voltmeter Change-Over Switch** — This switch allows the AC voltmeter to indicate phase to phase voltage between any two phases of the output terminals or to be switched off.

10. **Emergency Stop Switch Button** — In the event of an emergency press this button to shut down the generator.

11. **Auto/Start Switch** — This switch selects either manual or automatic operation. Center position is **OFF** (reset).

12. **Hour Check Button** — With the engine stopped, press and hold this button. The total running hours, fuel level, and battery voltage will be displayed.

13. **Voltage Change-Over Board** — 6 jumper plates that allows the generator to be configured for either 3Ø, 240 or 480 VAC output.

14. **Main Circuit Breaker** — This three-pole, 600 amp main breaker is provided to protect the **U,V, and W Output Terminal Lugs** from overload.

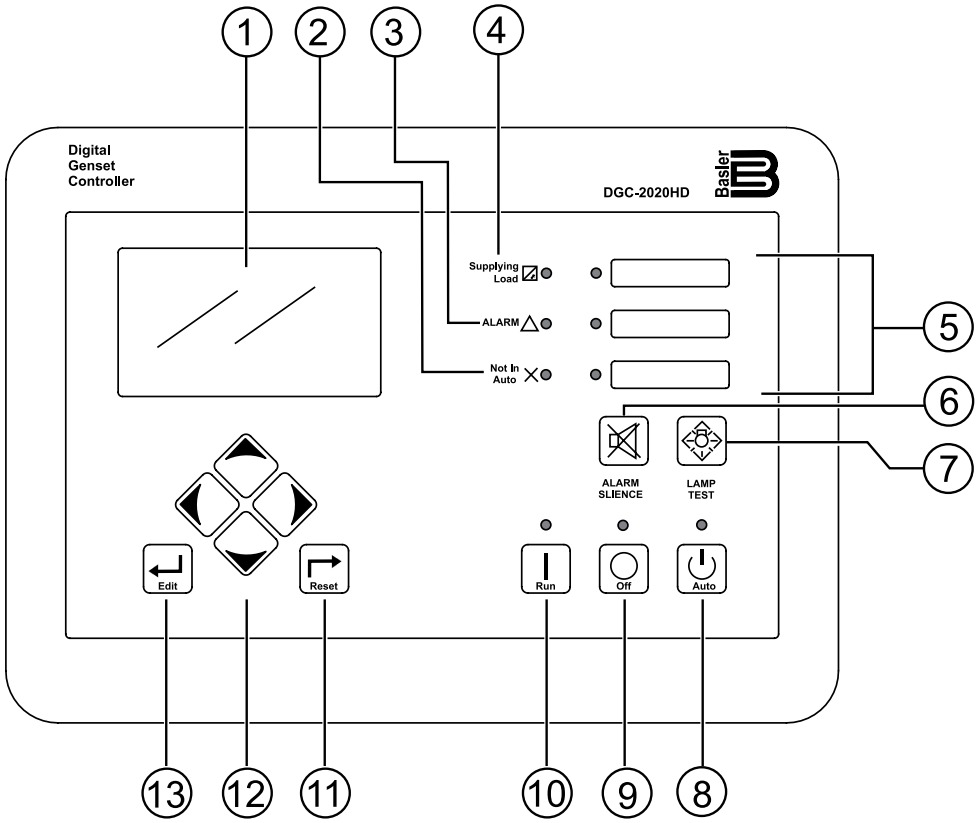


Figure 7. Basler DGC-2020HD

NOTICE

The Basler DGC-2020HD is an ***option***. It replaces the ECU 835 that comes standard with this generator. For detailed programming information refer to the Basler programming appendix in this manual.

The definitions below describe the controls and functions of the Digital Genset Controller (Figure 7).

1. **LCD Display** — Display consists of a LCD ***color touch screen***. The backlit, 272X480 pixel color LCD 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).
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 emergency power supply (EPS) threshold current.
5. **Programmable Indicators** — These three ***red*** LEDs light when the corresponding logic element is set true. Logic element PROGLED 1 controls the ***upper*** LED, PROGLED 2 controls the ***middle*** LED, and PROGLED 3 controls the ***lower*** LED. A card is provided for labeling the programmable indicators. See Programmable Indicator Configuration, below.
6. **Alarm Silence Pushbutton** — Pressing this button tests the DGC-2020HD indicators by exercising all LCD pixels and lighting all LEDs.
7. **Lamp Test Pushbutton** — Pressing this button tests the DGC-2020HD indicators by exercising all LCD pixels and lighting all LEDs.
8. **Auto Pushbutton and Mode Indicator** — Pressing the Auto button places the DGC-2020HD in ***Auto*** mode. The ***green Auto*** mode LED lights when Auto mode is active.

   While in "AUTO" the controller will be in standby awaiting a signal to start via the remote start terminals. While in auto, closure of the auto start contacts will immediately start the engine. Once the generator is up to speed and voltage it will compare its voltage to the bus.

   If the bus is dead it will immediately close the contactor to provide power to the load(s). If the bus is already hot from another generator it will first synchronize then close its contactor then slowly ramp up to share load if load were present.
9. **Off Pushbutton and Mode Indicator.** — Pressing this button places the DGC-2020HD in Off mode.The ***red Off*** mode LED lights when the DGC-2020HD is in ***Off*** mode. This button also resets the Breaker Management Pre-Alarms and all MTU ECU Alarms.
10. **Run Pushbutton and Mode Indicator.** — Pressing this button places the DGC-2020HD in ***Run*** mode. The ***green Run*** mode LED lights when Run mode is active.
11. **Reset Pushbutton** — This button is pressed to cancel a settings editing session and discard any settings changes. When pressed momentarily, this button resets the Breaker Management Pre-Alarms and all MTU ECU Alarms. This button is also used to reset the Maintenance Interval when pressed for 10 seconds while viewing Hours Until Maintenance or Maintenance Due Pre-Alarm.
12. **Arrow Pushbuttons** — These four buttons are used to navigate through the front panel display menus and modify settings.
    - The ***left*** and ***right*** arrow buttons are used to navigate through the menu levels. The right arrow button is pressed to move downward through the menu levels and the left arrow button is pressed to move upward through the menu levels.
    - Within a level, the ***up*** and ***down*** arrow buttons are used to move among items within the menu level. Pressing the down arrow button moves to items lower in the list. Pressing the up arrow button moves to items higher in the list.
    - During a settings editing session, the up and down arrow buttons are used to raise and lower the value of the selected setting. The right and left arrow buttons move to different digits.
13. **Edit Pushbutton** — Pressing this button starts an editing session and enables changes to DGC-2020HD settings. At the conclusion of an editing session, the ***Edit*** pushbutton is pressed again to save the setting changes.

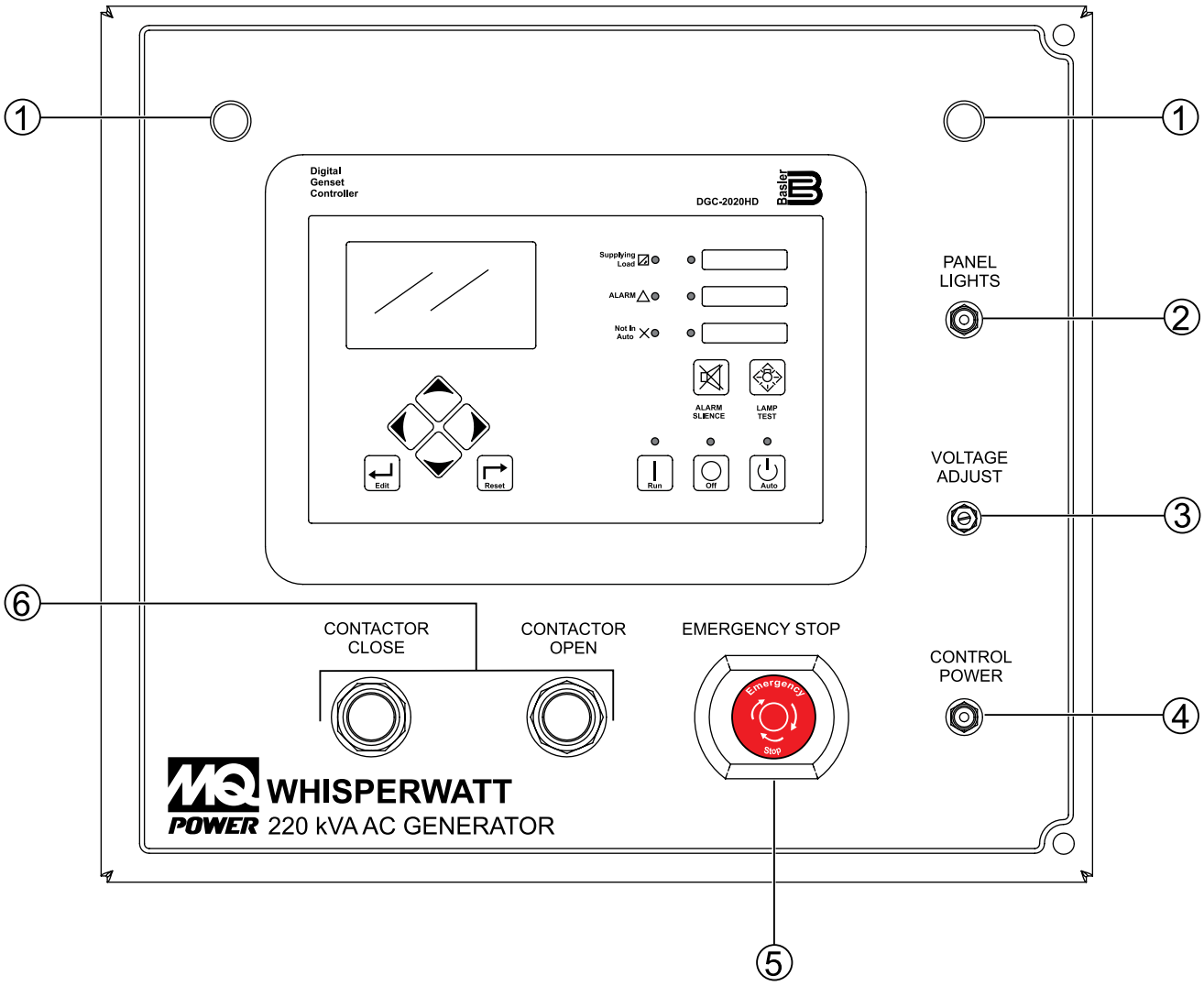


Figure 8. Paralleling Panel Components

The definitions below describe the controls and functions of the Paralleling Panel (Figure 8).

1. **Panel Lights** — For operation at night or in dark areas, panel light illuminates paralleling panel for ease of reading.

2. **Panel Light Switch** — When activated will turn on control panel light.

3. **Voltage Adjust potentiometer** — The ***voltage adjust potentiometer*** is a way to adjust the voltage up or down for fine tuning. The adjustment sends a signal to the controller to offset the system rated voltage (Trim Voltage). It is important that all machines are set to the same value when paralleling.

   When first turning on the control power, the controller will begin its boot sequence much like a computer does. After completing the boot sequence the unit will be ready to run or be placed in auto for auto start applications.

4. **Control Power Toggle Switch** — The control power switch is a master power switch for the digital controller. The control power switch has a latch feature that prevents powering down control power while the engine is running.

5. **Emergency Stop Button Switch** — The Emergency Stop pushbutton switch is used to stop the engine in case of emergency or to lock out operation during service. The emergency stop button ***should not be used for routine stopping of the engine***.

   Actuation of the Emergency stop button while the control power is on will illuminate the light on the button as well as display “Emergency Stop” on the controller display. Actuating the Emergency stop button will de-energize all controller outputs and cause the engine to stop as well as tripping the circuit breaker. This condition is a latched condition that must be reset prior to restarting the engine.

   The procedure for resetting the emergency stop requires several actions. Rotate the emergency stop button to release the spring latch. To clear the latch, the controller must be placed into the off mode by pressing the “OFF” button. While in the “OFF” mode, the “RESET” button must be pressed to clear the E-STOP fault.

   For units with manual operated breakers, the breaker will need to be reset by toggling the handle down, then can be turned back to the “ON” position. On models with spring charged breakers resetting the breaker is not necessary.

6. **Contactor Operation (Manual Mode)** — The For manual run applications, user action is required to get the generator power to the output bus. Depending on the model, some utilize contactors in series with toggle handle circuit breakers and others have spring charged automatic circuit breakers.

   On the spring charged types, the buttons on the breaker itself are not intended for circuit breaker operation. For instructional purposes both will be referred to as “contactor”.

   There are two pushbuttons on the control panel for controlling the contactor. There is a green “CLOSE CONTACTOR” button to close the contactor and a red “OPEN CONTACTOR” button to open the contactor. These buttons illuminate to show the contactor status. If the contactor is open, the red “OPEN CONTACTOR” button will be illuminated. If the contactor is closed the green “CLOSE CONTACTOR” button will be illuminated.

   These buttons can sometimes be multifunctional depending on the situation. For stand-alone operation the buttons simply close and open the contactor as expected. For paralleling the buttons can act a little different.

   When the bus is already hot from another generator, pressing the green online button will initiate a synchronizing sequence before closing the contactor. There will be an image of a synchro scope on the controller display and when the voltage and phases are matched, the contactor will close.

   If there was already load on the bus the unit will slowly ramp up load until it is sharing equally with the other generator(s). While sharing load with other generators, pressing the red “OPEN CONTACTOR” button once will initiate a ramp down sequence. The unit will begin to ramp down and when at a low level of load it will automatically open it contactor. Pressing the red “OPEN CONTACTOR” button twice will immediately open the contactor.

OUTPUT TERMINAL PANEL

The Output Terminal Panel (Figure 10) 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 legs "O" and "Ground" are considered bonded grounds

OUTPUT TERMINAL FAMILIARIZATION

The "Output Terminal Panel" (Figure 10) is provided with the following:

- Three (3) 240/139V output receptacles @ 50 amp
- Three (3) Circuit Breakers @ 50 amps
- Two (2) 120V GFCI receptacles @ 20 amp
- Two (2) GFCI Circuit Breakers @ 20 amps
- Eight (8) Output Terminal Lugs (U, V, W, O, Ground)

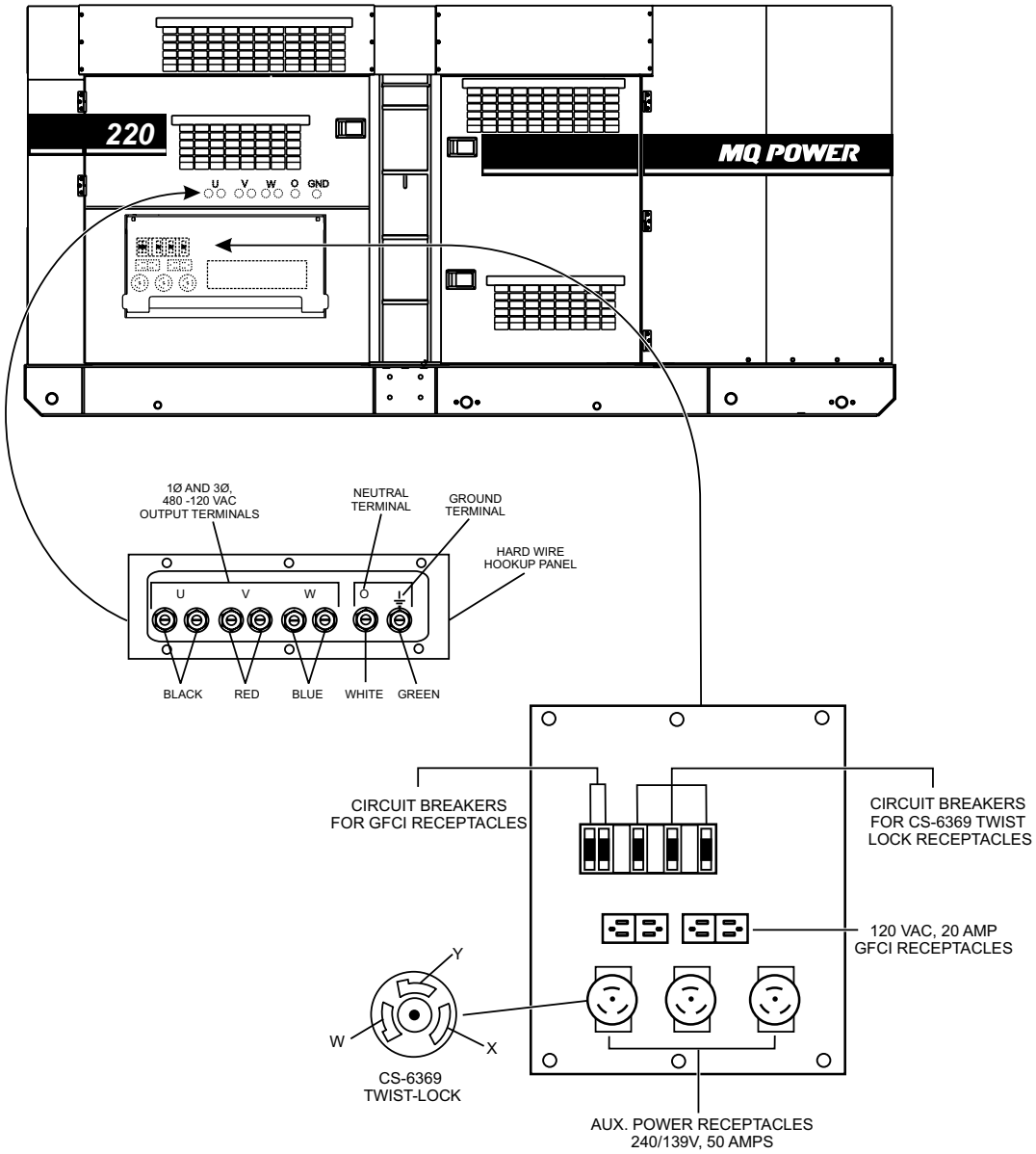


Figure 9. Output Terminal Panel

120 VAC GFCI Receptacles

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

Pressing the **reset** button resets the GFCI receptacle after being tripped. Pressing the **test button** (See Figure 10) in the center of the receptacle will check the GFCI function. Both receptacles should be tested at least once a month.

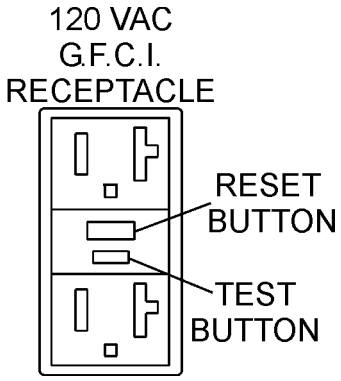


Figure 10. G.F.C.I. Receptacle

Twist Lock Dual Voltage 240/139 VAC Receptacles

There are three 240/139V, 50 amp auxiliary twist-lock (CS-6369) receptacles (Figure 11) provided on the output terminal panel. These receptacles can be accessed in any change-over board configuration.

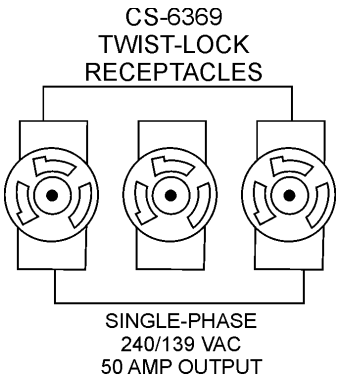


Figure 11. 240/139V Twist-Lock Auxiliary Receptacles

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

Turn the ***voltage regulator control knob*** (Figure 12) on the control panel to obtain the desired voltage. Turning the knob clockwise will **increase** the voltage, turning the knob counter-clockwise will **decrease** the voltage.

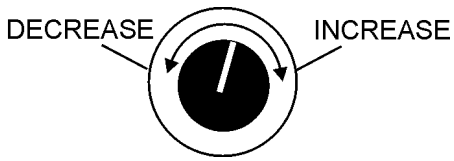


Figure 12. Voltage Regulator Control Knob

Removing the Protective Cover (Hard Wire Hookup Panel)

The ***output terminal lugs*** are protected by a protective cover (Figure 13). Un-screw the securing bolts (8) and remove the cover to gain access to the output terminal lugs.

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

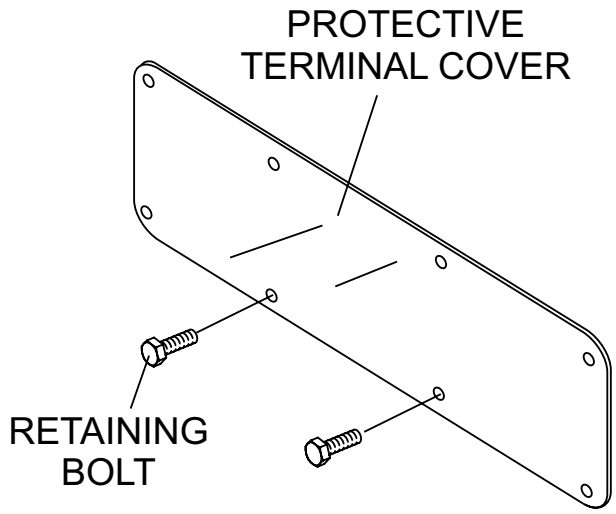


Figure 13. Protective Terminal Cover (UVWO Terminal Lugs)

Connecting Loads

Loads can be connected to the generator by the **Output Terminal Lugs** or the convenience receptacles (Figure 14). 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, 600A **main** circuit breaker is provided. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

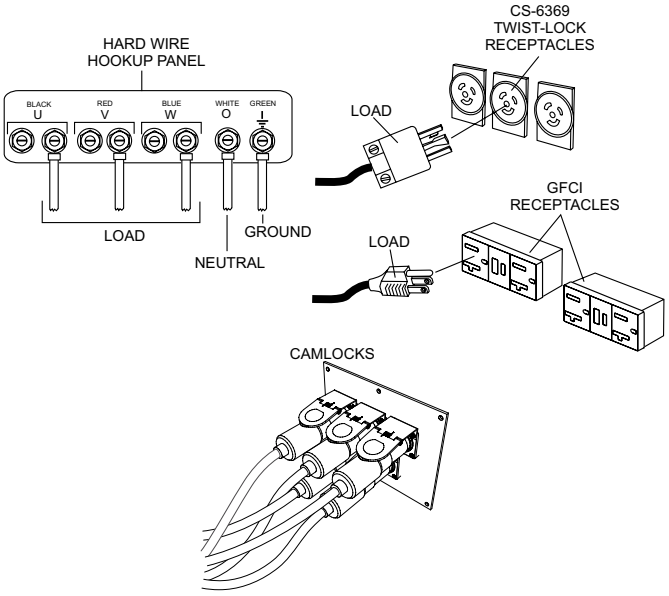


Figure 14. Connecting Loads

Over Current Relay

An **over current relay** (Figure 15) is connected to the main circuit breaker. In the event of an overload, both the circuit breaker and the over current relay may trip. If the circuit breaker can not be reset, the **reset button** on the over current relay must be pressed. The over current relay is located in the control box.

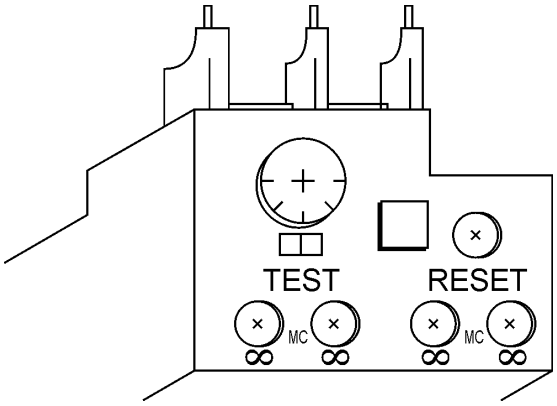


Figure 15. Over Current Relay

NOTICE

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

In the event of a short circuit or over current condition, it will automatically trip the 600 amp main breaker.

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

SINGLE PHASE LOAD

Always be sure to check the nameplate on the generator and equipment to insure 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 name plate, approximate wattage may be determined by multiplying nameplate voltage by the nameplate amperage.

WATTS = VOLTAGE x AMPERAGE

The power factor of this generator is 0.8. See Table 6 below when connecting loads.

Table 6. 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 7. Cable Selection (60 Hz, Single Phase Operation)

Current in Amperes	Load in Watts		Maximum Allowable Cable Length			
	At 100 Volts	At 200 Volts	#10 Wire	#12 Wire	#14 Wire	#16 Wire
2.5	300	600	1000 ft.	600 ft.	375 ft.	250 ft.
5	600	1200	500 ft.	300 ft.	200 ft.	125 ft.
7.5	900	1800	350 ft.	200 ft.	125 ft.	100 ft.
10	1200	2400	250 ft.	150 ft.	100 ft.	
15	1800	3600	150 ft.	100 ft.	65 ft.	
20	2400	4800	125 ft.	75 ft.	50 ft.	
CAUTION: Equipment damage can result from low voltage						

THREE PHASE LOAD

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

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

NOTICE

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

NOTICE

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

An inadequate size 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 itch.

GENERATOR OUTPUT VOLTAGES

A wide range of voltages are available to supply voltage for many different applications. Voltages are selected by using the **voltage change-over board** (Figure 16). To obtain some of the voltages as listed in Table 8 (see below) will require a fine adjustment using the **voltage regulator** (VR) **control knob** located on the control panel.

Voltage Change-Over Board

The **voltage change-over board** (Figure 16) is located on the control box, behind the generator control panel. This board has been provided for ease of voltage selection n..

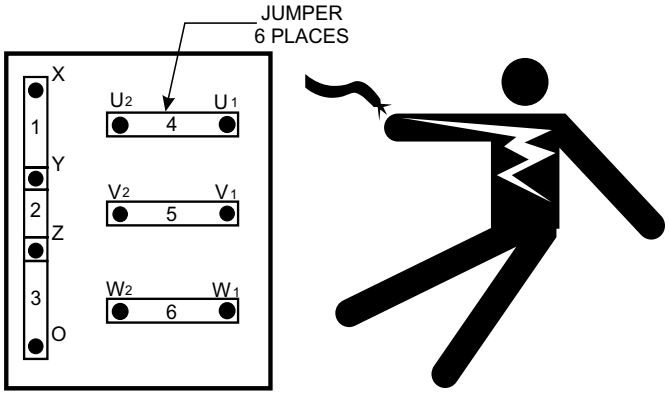


Figure 16. Voltage Change-Over Board

CAUTION

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

Table 8. Voltages Available

UVWO Output Terminal Lugs	Voltage Change-Over Board 3-Phase 240/139V Position			Voltage Change-Over Board 3-Phase 480/270V Position		
3Ø **Line-Line**	208V	220V	240V	416V	440V	480V
1Ø **Line-Neutral**	120V	127V	139V	240V	254V	277V

Maximum Amps

Table 9 shows the **maximum** amps the generator can provide. **DO NOT** exceed the maximum amps as listed.

Table 9. Generator Maximum Amps

Rated Voltage	Maximum Amps
1Ø 120 Volt	488.9 X 2 amps (4 wire)
1Ø 240 Volt	244.4 amps (4 wire)
3Ø 240 Volt	529 amps
3Ø 480 Volt	264 amps

HOW TO READ THE AC AMMETER AND AC VOLTAGE GAUGES

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

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

Before taking a reading from either gauge, configure the ***Voltage Change-Over Board*** (Figure 17) which produces the desired output voltage.

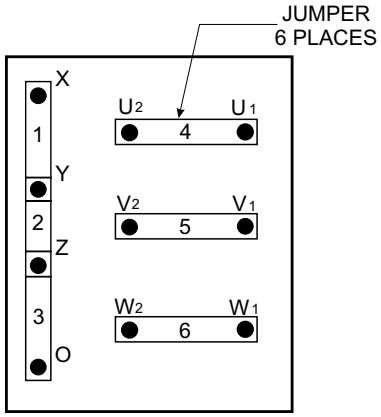


Figure 17. Voltage Change-Over Board-240/3Ø Position

AC Voltmeter Gauge Reading

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

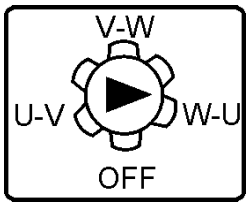


Figure 18. AC Voltmeter Change-Over Switch

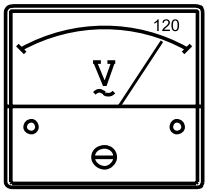


Figure 19. AC Voltmeter Gauge (Volt reading on W-U Lug)

AC Ammeter Gauge Reading

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

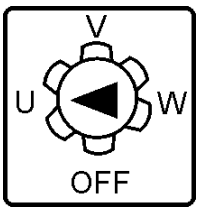


Figure 20. AC Ammeter Change-Over Switch

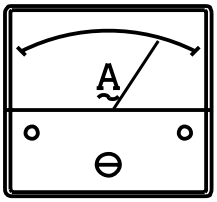


Figure 21. AC Ammeter (Amp reading on U Lug)

NOTICE

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

UVWO TERMINAL OUTPUT VOLTAGES

Various output voltages can be obtained using the UVWO output terminal lugs. The voltages at the terminals are dependent on the placement of the jumpers plates (6) on the **Voltage Change-Over Board** and the adjustment of the **Voltage Regulator Control Knob**.

Remember the voltage change-over board determines the **range** of the output voltage and can be configured in two different positions that provide 6 different output voltages at the UVWO output terminals. The generator is shipped from the factory in the 240V configuration. The voltage regulator (VR) allows the user to increase or decrease the selected voltage.

3Ø-240V UVWO Terminal Output Voltages

1. Jumper the voltage change-over board for 240V operation as shown in Figure 22.

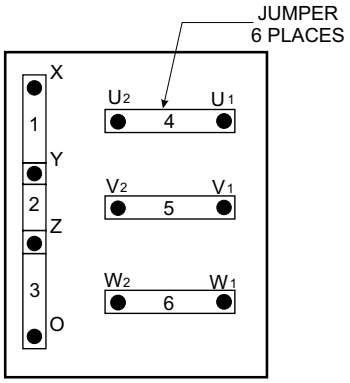


Figure 22. Voltage Change-Over Board 3Ø 240/139V Configuration

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

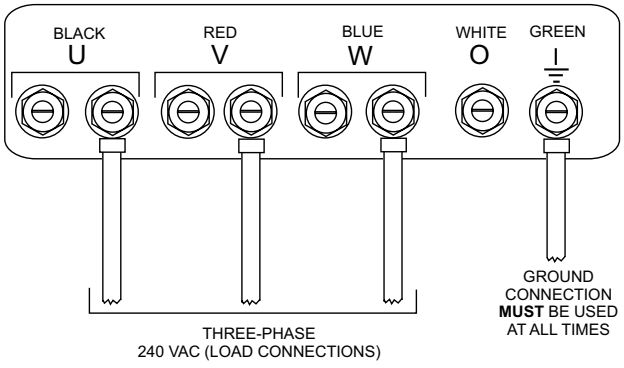


Figure 23. UVWO Terminal Lugs 3Ø-240/1Ø-139 Connections

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

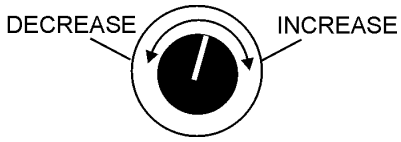


Figure 24. Voltage Regulator Knob

1Ø-240V UVWO Terminal Output Voltages

1. Make sure the voltage change-over board is jumpered for 240V operation as shown in Figure 22.
2. Connect the load wires to the UVWO terminals as shown in Figure 25.

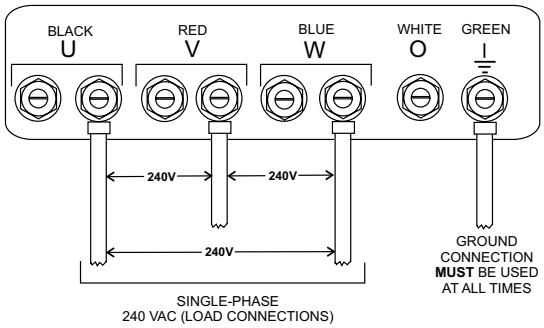


Figure 25. UVWO Terminal Lugs 1Ø-240V Connections

1Ø-120V UVWO Terminal Output Voltages

1. Make sure the voltage change-over board is jumpered for 240V operation as shown in Figure 22.
2. Adjust voltage regulator knob (Figure 24) for an output of 208V to obtain 120V at the UVWO terminals.
3. Connect the load wires to the UVWO terminals as shown in Figure 26.

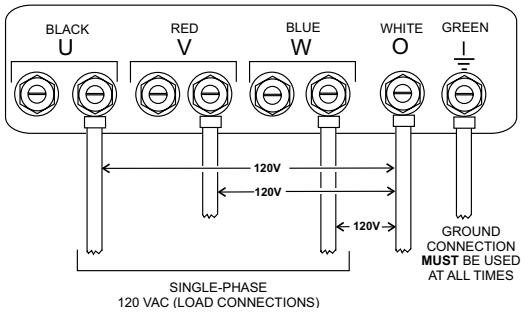


Figure 26. UVWO Terminal Lugs 1Ø-120V Connections

NOTICE

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

3Ø-480V UVWO Terminal Output Voltages

1. Jumper the voltage change-over board for 480V operation as shown in Figure 27. 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.

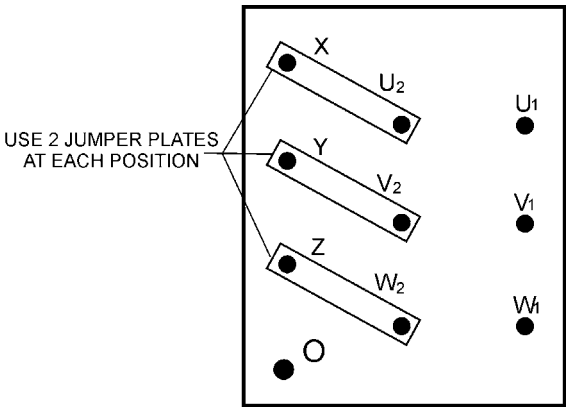


Figure 27. Voltage Change-Over Board 3Ø 480/277V Configuration

2. Connect the load wires to the UVWO terminals as shown in Figure 28.

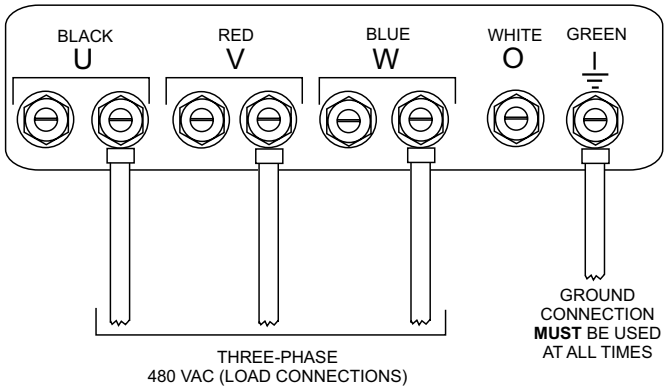


Figure 28. UVWO Terminal Lugs 3Ø-480V Connection

1Ø-480V UVWO Terminal Output Voltages

1. Make sure the voltage change-over board is jumpered for 480V operation as shown in Figure 27.
2. Connect the load wires to the UVWO terminals as shown in Figure 29.

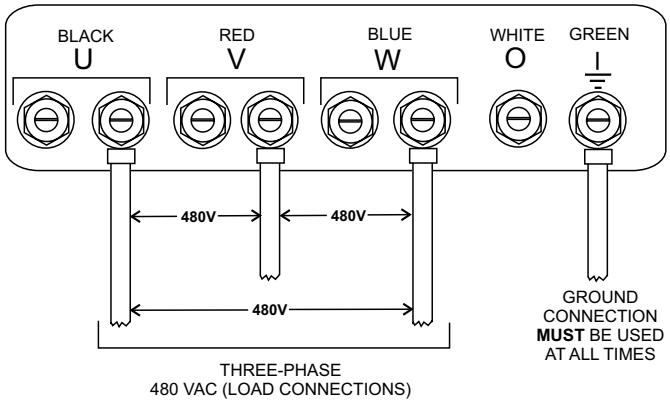


Figure 29. UVWO Terminal Lugs 1Ø-480V Connections

1Ø-277V UVWO Terminal Output Voltages

1. Make sure the voltage change-over board is jumpered for 480V operation as shown in Figure 27.
2. Connect the load wires to the UVWO terminals as shown in Figure 30.

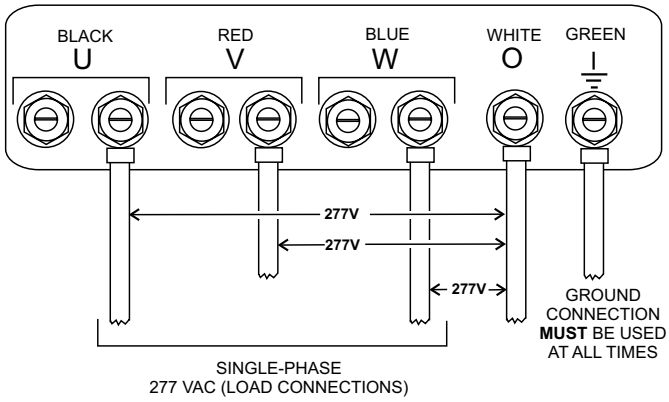


Figure 30. UVWO Terminal Lugs 1Ø-277V Connections

CIRCUIT BREAKERS

To protect the generator from an overload, a 3-pole, 600 amp, main circuit breaker is provided to protect the **U,V, and W Output Terminals** from overload. In addition two single-pole, 20 amp **GFCI** circuit breakers are provided to protect the GFCI receptacles from overload. Three 50 amp **load** circuit breakers have also been provided to protect the auxiliary receptacles from overload. Make sure to itch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

LUBRICATION OIL

Fill the engine crankcase with lubricating oil through the filler hole, but **DO NOT** overfill. Make sure the generator is level and verify that the oil level is maintained between the two notches (Figure 31) on the dipstick. See Table 10 for proper selection of engine oil.

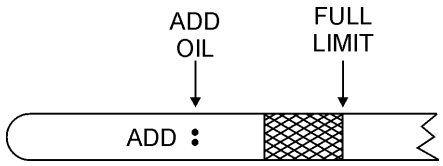
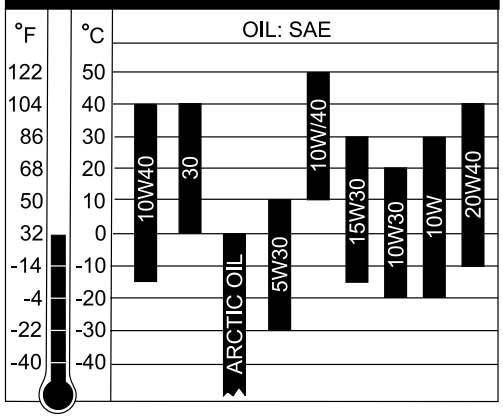


Figure 31. Engine Oil Dipstick

When checking the engine oil, be sure to check if the oil is clean. If the oil is not clean, drain the oil by removing the oil drain plug, and refill with the specified amount of oil as outlined in the **John Deere Owner's Manual**. Oil should be warm before draining.

Delo® engine oil is the recommended engine oil for this generator. When replacing engine oil please refill using Delo® 400 LE SAE 15W-40 (API CJ-4) engine oil.

Table 10. Recommended Motor Oil



FUEL CHECK

DANGER

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

Refilling the Fuel System

CAUTION

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

This generator has an internal fuel tank located inside the trailer frame and may also be equipped with an environmental fuel tank (Figure 32). **ALWAYS** fill the fuel tanks with clean fresh **#2 diesel fuel. DO NOT** fill the fuel tanks beyond their capacities.

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

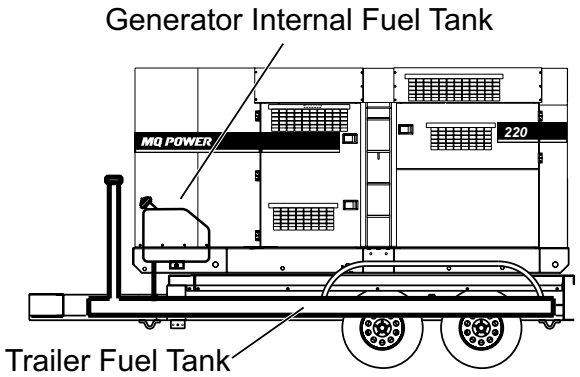


Figure 32. Internal Fuel Tank System

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 33).

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.

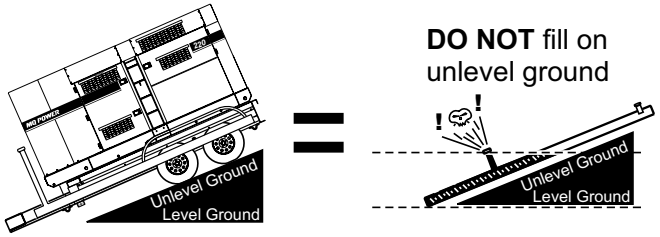


Figure 33. Only Fill on Level Ground

NOTICE

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

2. Remove fuel cap and fill tank as shown in Figure 34.

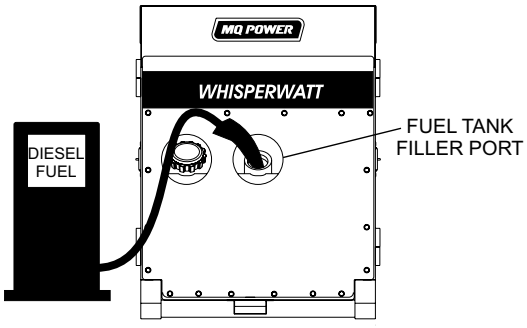


Figure 34. Fueling the Generator

3. **NEVER overfill fuel tank** — It is important to read the fuel gauge when filling trailer fuel tank. **DO NOT** wait for fuel to rise in filler neck (Figure 35).

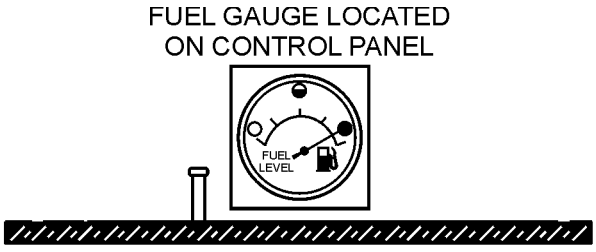


Figure 35. Full Fuel Tank

CAUTION

DO NOT OVERFILL fuel system. Leave room for fuel expansion. Fuel expands when heated (Figure 36).

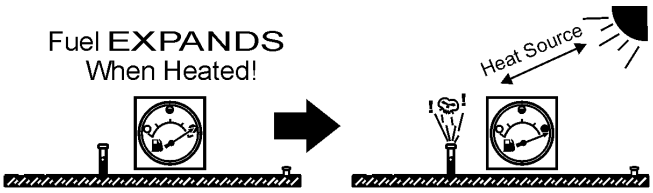


Figure 36. Fuel Expansion

DEF Refueling

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

1. Remove the filler cap from the DEF tank (Figure 37),
2. Next add DEF fluid to the tank. **DO NOT** overfill.

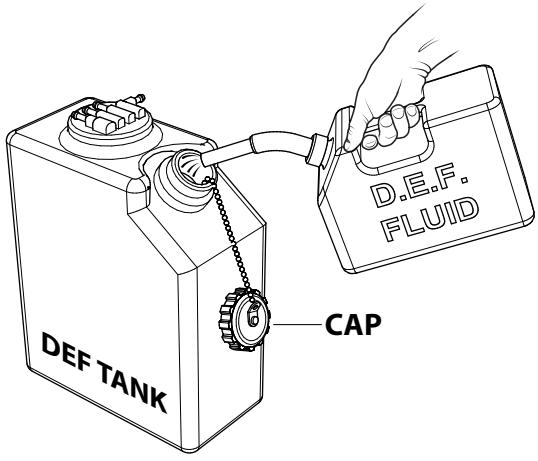


Figure 37. DEF Tank Filling

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 recovery tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 11 for engine, radiator, and recovery tank coolant capacities. Make sure the coolant level in the recovery tank is always between the "H" and the "L" markings.

Table 11. Coolant Capacity

Engine and Radiator	10.3 gal (39 liters)
Reserve Tank	N/A

Operation in Freezing Weather

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

Table 12. Anti-Freeze Operating Temperatures

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

NOTICE

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

Cleaning the Radiator

The engine may overheat if the radiator 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.

AIR CLEANER

Periodic cleaning/replacement is necessary. Inspect air cleaner in accordance with the **John Deere Engine Owner's Manual**.

FAN BELT TENSION

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

The fan belt tension is proper if the fan belt bends 10 to 15 mm (Figure 38) when depressed with the thumb as shown below.

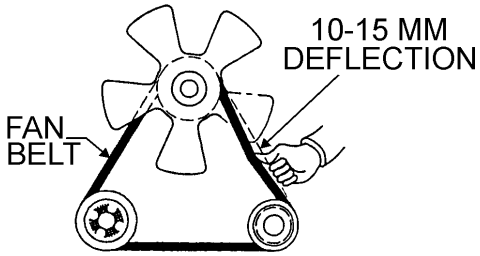


Figure 38. Fan Belt Tension

⚠ CAUTION

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

BATTERY

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

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

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

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

Battery Cable Installation

ALWAYS be sure the battery cables (Figure 39) are properly connected to the battery terminals as shown below. The **red cable** is connected to the positive terminal of the battery, and the **black cable** is connected to the negative terminal of the battery.

⚠ CAUTION

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

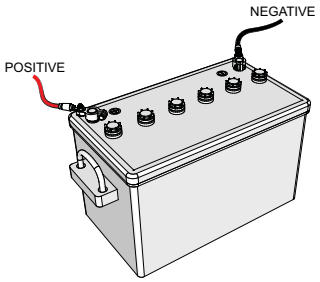


Figure 39. Battery Connections

When connecting battery do the following:

1. **NEVER** connect the battery cables to the battery terminals when the ***Auto-Off/Reset-Manual itch*** is in either the **AUTO** or **MANUAL** position. **ALWAYS** make sure that this itch 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 the alternator failure.

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

WIRING

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

PIPING AND HOSE CONNECTION

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

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

BEFORE STARTING

⚠ CAUTION

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

⚠ WARNING

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

1. Place the **main, G.F.C.I., and aux.** circuit breakers (Figure 40) in the **OFF** position prior to starting the engine.

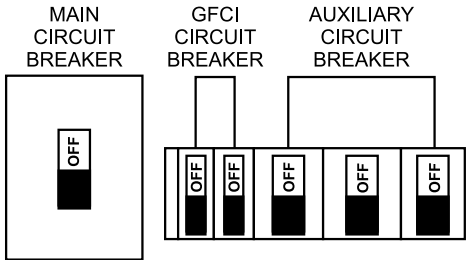


Figure 40. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Make sure the **voltage change-over board** has been configured for the desired output voltage.
3. Connect the load to the **receptacles** or the **output terminal lugs** as shown in Figure 14. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.
4. Tighten terminal nuts securely to prevent load wires from slipping out.
5. Close all engine enclosure doors (Figure 41).

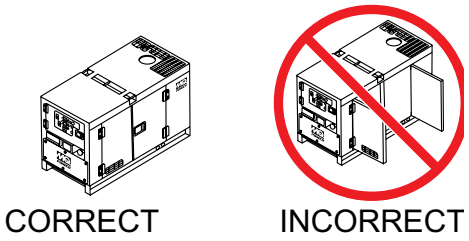


Figure 41. Engine Enclosure Doors

STARTING (MANUAL)

6. Place the ***Auto-Off/Reset Manual Switch*** in the **MANUAL** position to start the engine (Figure 42).

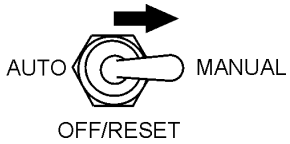


Figure 42. *Auto-Off/Reset* Manual Switch (Manual Position)

NOTICE

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

NOTICE

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

7. Once the engine starts, let the engine run for 1-2 minutes Let engine idle longer in cold weather conditions. Listen for any abnormal noises. If any abnormalities exist, shut down the engine and correct the problem.
8. The generator's frequency meter (Figure 43) should be displaying the 60 cycle output frequency in **HERTZ.**

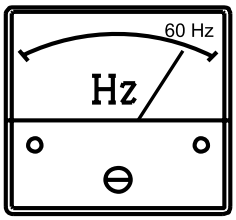


Figure 43. Frequency Meter

9. The generator's AC-voltmeter (Figure 44) will display the generator's output in **VOLTS**. If the voltage is not within the specified tolerance.

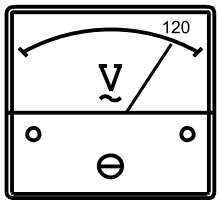


Figure 44. Voltmeter

10. Use the voltage adjustment control knob (Figure 45) to increase or decrease the desired voltage.

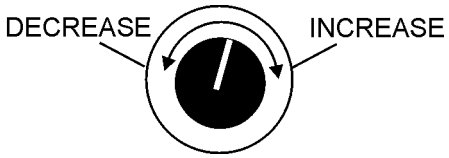


Figure 45. Voltage Adjust Control Knob

11. The ammeter (Figure 46) will indicate **zero amps** with no load applied. When a load is applied, the ammeter will indicate the amount of current that the load is drawing from the generator.

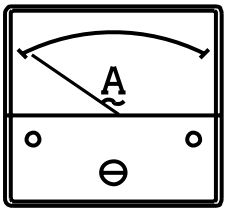


Figure 46. Ammeter (No Load)

12. The engine oil pressure gauge (Figure 47) will indicate the oil pressure of the engine. Under normal operating conditions the oil pressure is approximately 35 to 65 psi. (193~586 kPa).

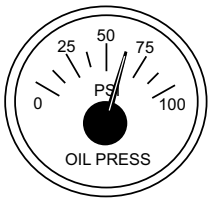


Figure 47. Oil Pressure Gauge

13. The **coolant temperature gauge** (Figure 48) will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be between 185°~207°F (85°~97°C).

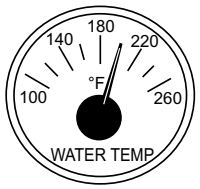


Figure 48. Coolant Temperature Gauge

14. The **tachometer gauge** (Figure 49) will indicate the speed of the engine when the generator is operating. Under normal operating conditions this speed is approximately 1800 RPM's.

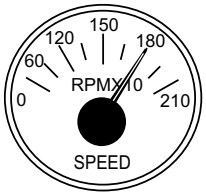


Figure 49. Engine Tachometer Gauge

15. Place the **main, GFCI, and aux.** circuit breakers in the **ON** position (Figure 50).

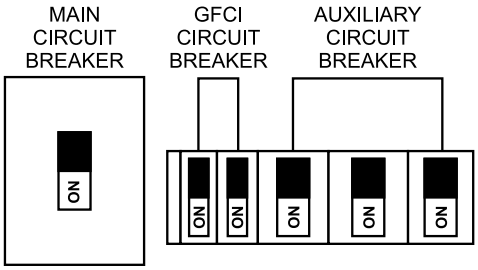


Figure 50. Main, Aux. and GFCI Circuit Breakers (ON)

16. Observe the generator's ammeter (Figure 51) and verify it reads the anticipated amount of current with respect to the load. The ammeter will only display a current reading if a load is in use.

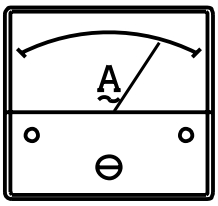


Figure 51. Ammeter (Load)

17. 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 itch.

CAUTION

When connecting the generator to a isolation (transfer) itch, **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 in the **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 the **AUTO** mode, remember the generator can start up at any time without warning. **NEVER** attempt to perform any maintenance when the generator is in the auto mode.

NOTICE

When the ***Auto Off/Reset Manual Switch*** is placed in the **AUTO** position, the engine glow plugs will be warmed and the engine will start automatically.

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

1. Perform steps 1 through 5 in the Before Starting section as outlined in the Manual Starting Procedure.
2. Place the **Auto Off/Reset Manual Switch** (Figure 52) in the **AUTO** position.

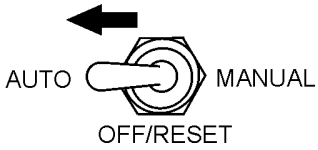


Figure 52. Auto Off/Reset Manual Switch (AUTO)

3. Continue operating the generator as outlined in the Manual Start-up procedure (start at step 7).

WARNING

NEVER stop the engine suddenly except in an emergency.

NORMAL SHUTDOWN PROCEDURE

To shutdown the generator, use the following procedure:

1. Place both the **MAIN, GFCI and LOAD** circuit breakers as shown in Figure 53 to the **OFF** position.

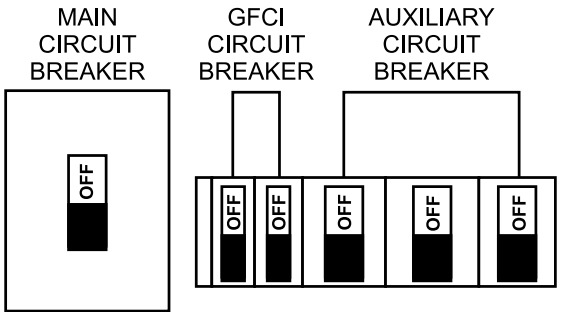


Figure 53. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Let the engine cool by running it at low speed for 3-5 minutes with no load applied.
3. Place the **Auto Off/Reset Manual Switch** (Figure 54) in the **OFF/RESET** position.

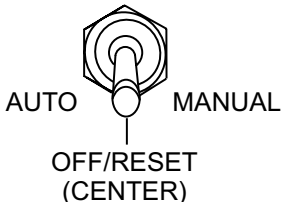


Figure 54. Auto Off/Reset Manual itch (Off/Reset)

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

EMERGENCY SHUTDOWN PROCEDURE

1. Place the **Auto Off/Reset Manual Switch** (Figure 55) in the **OFF/RESET** position.

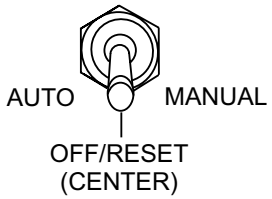


Figure 55. Auto Off/Reset Manual Switch (OFF)

Table 13. Inspection/Maintenance		10 Hrs DAILY	250 Hrs	500 Hrs or Every 12 Months	3000 Hrs or Every 36 Months	OTHER
Engine	Check Engine Oil and Coolant Levels	X				
	Check Fuel Filter/Water Separator Bowl	X				
	Check Air Cleaner	X				
	Check 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 SCA's As Required			X		
	Pressure Test Cooling System			X		
	Check Engine Speed			X		
	Test Thermostats				X	
	Check and Adjust Engine Valve Clearance				X	
	Test Glow Plugs				X	
	Inspect Diesel Particulate Filter (DPF) * [2]				X	
	Flush and Refill Cooling System*[3]					2 yrs. or 2000 hrs.
	Clean Inside of Fuel Tank					1000 hrs.
	Clean DEF Tank					As Required
	Check Crankcase Ventilation Filter*[4]					1500 hrs.
	Replace Air Cleaner Elements * [5]					As Required
Generator	Measure Insulation Resistance Over 3M ohms		X			
	Check Rotor Rear Support Bearing			X		

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

*[2] Expectation for minimal service interval will be at least 4500 hrs. based on engine power. However, actual service should take place when indicated by diagnostic gauge. Please contact nearest authorized Multiquip Service Center for DPF Cleaning.

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

*[4] Minimal Service interval will be at least 1500 hrs. or when service indicator light turns on or as indicated by diagnostic guage. Critical emission related service requred before 1500 hrs. is not necessary. The emissions-related warranty is valid up to 1500 hrs.

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

GENERAL INSPECTION

Prior to each use, the generator should be cleaned and inspected for deficiencies. Check for loose, missing or damaged nuts, bolts or other fasteners. Also check for fuel, oil, and coolant leaks. Use Table 13 as a general maintenance guideline **Engine Side** (Refer to the Engine Instruction Manual).

AIR CLEANER

Every 250 hours: Remove air cleaner element (Figure 56) and clean the heavy duty paper element with light spray of compressed air. Replace the air cleaner as needed.

Air Cleaner with Dust Indicator

This indicator (Figure 56) is attached to the air cleaner. When the air cleaner element is clogged, air intake restriction becomes greater and the dust indicator signal shows **RED** meaning the element needs changing or service. After changing the air element, press the dust indicator button to reset the indicator.

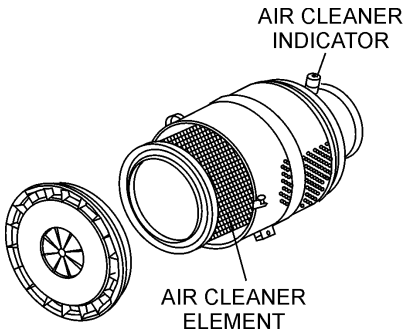


Figure 56. Air Cleaner/Indicator

NOTICE

The air filter should not be changed until the indicator reads **"RED"**. Dispose of old air filter. It may not be cleaned or reused.

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 air cleaner more **frequently** if these conditions exists.

FUEL ADDITION

Add diesel fuel (the grade may vary according to season and locations).

Removing Water from the Fuel Tank

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

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

Cleaning Inside the Fuel Tank

Drain the fuel inside the fuel tank completely. Using a spray washer (Figure 57) wash out any deposits or debris that have accumulated inside the fuel tank.

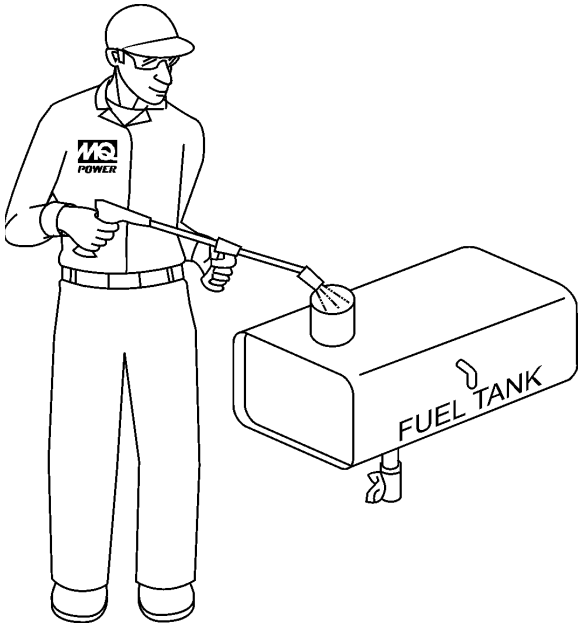


Figure 57. Fuel Tank Cleaning

FUEL TANK INSPECTION

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

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

Replacing Fuel Filter

- Replace the fuel filter cartridge with new one every 500 hours or so.
- Loosen the drain plug at the lower top of the fuel filter. Drain the fuel in the fuel body together with the mixed water. **DO NOT** spill the fuel during disassembly.
- Vent any air.

AIR REMOVAL

If air enters the fuel injection system of a diesel engine, starting becomes impossible. After running out of fuel, or after disassembling the fuel system, bleed the system according to the following procedure. See the **John Deere Engine Manual** for details.

To restart after running out of fuel, turn the itch to the "**ON**" position for 15-30 seconds. Try again, if needed. This unit is equipped with an automatic air bleeding system.

CHECK OIL LEVEL

Check the crankcase oil level prior to each use, or when the fuel tank is filled. Insufficient oil may cause severe damage to the engine. Make sure the generator is level. The oil level must be between the two notches on the dipstick as shown in Figure 31.

Replacing Oil Filter

- Remove the old oil filter.
- Apply a film of oil to the gasket/rubber seal (Figure 58) on the new oil filter.

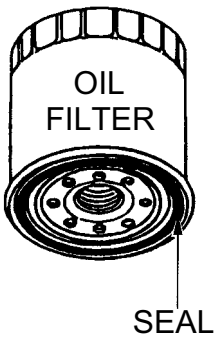


Figure 58. Oil Filter

- Install the new oil filter.
- After the oil cartridge has been replaced, the engine oil will drop slightly. Run the engine for a while and check for leaks before adding more oil if needed. Clean excessive oil from engine.

FLUSHING OUT RADIATOR AND REPLACING COOLANT

- Open both cocks located at the crankcase side and at the lower part of the radiator and drain 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 radiator cap tightly.
- Flush the radiator by running clean tap water through radiator until signs of rust and dirt are removed. **DO NOT** clean radiator core with any objects, such as a screwdriver.

WARNING

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

RADIATOR CLEANING

The radiator (Figure 59) 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.

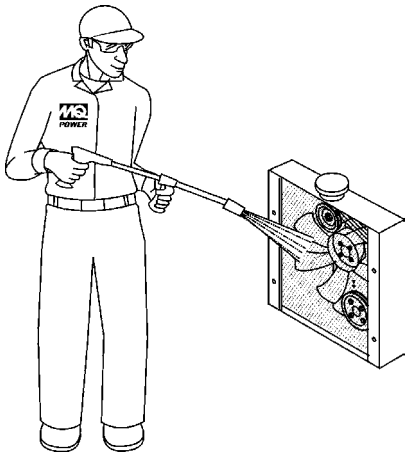


Figure 59. Radiator Cleaning

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

JACKET WATER HEATER AND INTERNAL BATTERY CHARGER 120 VAC INPUT RECEPTACLES (OPTIONAL)

This generator can be optionally equipped with two 120 VAC, 20 amp input receptacles located on the output terminal panel.

The purpose of these receptacles is to provide power via commercial power to the **jacket water heater** and **internal battery charger.**

These receptacles will **ONLY** function when commercial power has been supplied to them (Figure 60). To apply commercial power to these receptacles, a power cord of adequate size will be required (See Table 7).

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

To apply power to the jacket water heater simply apply power to the jacket water heater receptacle via commercial power using an power cord of adequate size.

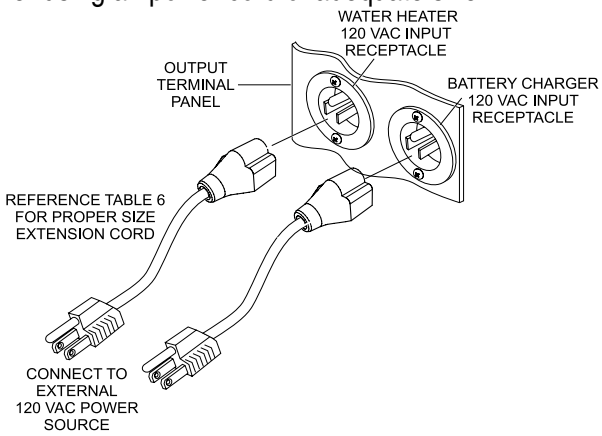


Figure 60. Battery Charger and Jacket Water Heater Power Connections

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.

EMISSION CONTROL

The emission control system employed with the John Deere 6068HFG09 diesel engine consist of a Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF). The oxidation catalyst and particulate filter are housed in one unit (Figure 61).

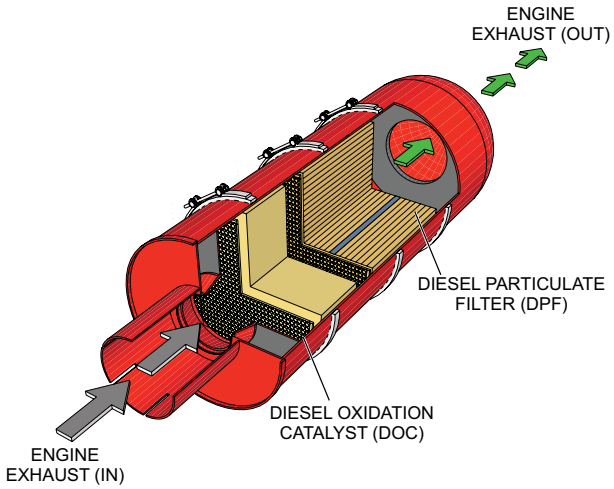


Figure 61. Typical DOC/DPF Unit

These devices help in filtering out large amounts of harmful Nitrogen Oxides (NOx) and Particulate Matter (PM) which are emitted by diesel engines. These exhaust emissions pose serious environmental and health risks. It is important to maintain and service this DOC/DPF 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 a catalysts to oxidize hydrocarbons and carbon monoxide.

Diesel Particulate Filter (DPF)

A diesel particulate filter (DPF) is a device designed to remove diesel particulate matter (soot) from the exhaust gas of a diesel engine. This type of filter usually removes about 85-95% of the soot.

Soot accumulated in the DPF is removed via the "regeneration process". Regeneration is the process of removing the accumulated soot from the filter. This regeneration process can occur in a few different ways.

- **Passive Regeneration** — Occurs during normal operation, typically under heavy load applications. Soot is oxidized faster than it is collected.
- **Active Regeneration** — Occurs when engine exhaust temperatures are not high enough to oxidize the soot collected in the DPF. Active regeneration requires assistance from the engine to help increase the heat level in the after-treatment system.

  Active regeneration occurs at a normal engine speed of 1800 rpm. In addition active regeneration is initiated automatically by the Engine Control Module (ECM) timer based program every 96 hours. This timer base program will reset at the end of any regeneration mode.
- **Forced (Stationary) Regeneration** — A forced regeneration only occurs when the operator has initiated this action at the ECU and the ECM recognizes a pre-programmed set point of soot in the DPF to allow a forced regeneration cycle.

  This process can take anywhere from 30 minutes to 1-1/2 hours. When forced regeneration is in process all loads must be removed from the generator, all circuit breakers must be placed in the OFF position (OPEN), and the engine speed set to idle.

DPF PRE-ALARM

In the event the Engine Control Unit (ECU) determines the soot level back pressure and/or tempertaure has reached a pre-determined trip point the ECU will indicate a maintenance action is required by the operator.

This maintenance action will be shown on the LCD display (DPF Warning Symbol) and the AMBER pre-alarm LED on the ECU control panel will be ON (lit). See Figure 62.

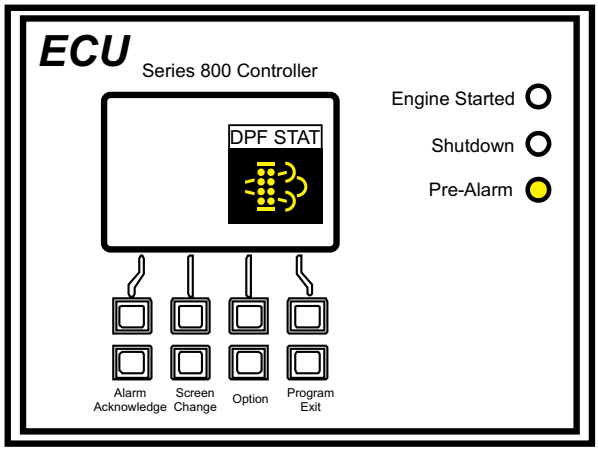


Figure 62. ECU DPF Pre-Alarm

The DPF pre-alarm status symbol displayed in Figure 62 indicates the soot level buildup has exceeded a pre-determined level and a "Forced Regeneration" action is required.

NOTICE

If the **AMBER** pre-alarm warning LED is ever **ON**, the operator should always take ***immediate action*** to correct the problem. If the engine is allow to run under this condition, a higher pressure differential will be created in the DPF and will result in the **RED** status LED being **ON**, causing an engine shutdown.

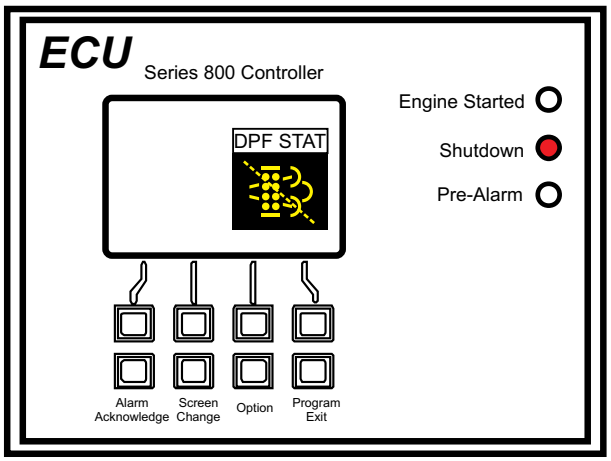


Figure 63. ECU DPF Engine Shutdown

NOTICE

If the **RED** engine shutdown LED is ever **ON** (Figure 63), John Deere recommends that the DPF be removed, cleaned or replaced. In addition the shutdown code must be cleared. To clear the code, the ECM must be reset by a licensed John Deere Engine Service Technician, using John Deere service software.

NOTICE

Soot and ash will accumulate in the DPF over time and must be cleaned. The ash is a result of the normal oil consumption while the engine is operated. The ash cleaning interval will largely depend on the engine's duty cycle and condition. Normal service intervals for cleaning ash from the DPF is every 6 months (5000 hours).

FORCED REGENERATION PROCEDURE

Follow the steps below to initiate a forced regeneration:

1. Verify that the **AMBER** pre-alarm LED is **ON** or **FLASHING** and the DPF symbol is shown on the ECU display.
2. Place all circuit breakers in the **OFF** position.
3. Press the **Program/Exit** button on the ECU controller and select **FORCE REGEN** mode.
4. Press and hold the request until the **REGEN ACTIVE** message is displayed on the screen, then release.
5. Once activated, regeneration will start automatically and the engine speed will increase through the forced regeneration cycle. This process will last anywhere from 30 minutes to 1-1/2 hours.

NOTICE

During the regeneration cycle the High Exhaust System Temperature (**HEST**) symbol may be displayed. Display of this symbol can be considered normal during the regeneration period.

If the ***diesel exhaust fluid*** (DEF) symbol (Figure 64) is displayed during ECU controller operation, it indicates the following:

- DEF tank level is below 10%. Reference Table 14, DEF Level System Action System.
- DEF quality is poor. The ***urea*** concentration to water is to high or low.
- Check DEF tank level and check active ***diagnostics trouble codes*** (DTC).

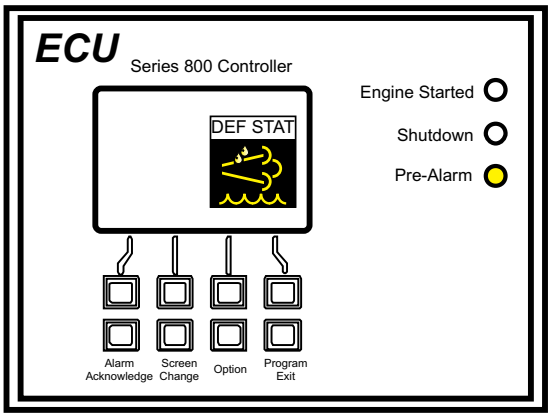


Figure 64. ECU DEF State Pre-Alarm

DEF SEVERE INDUCEMENT ALARMS (DGC2020HD)

If a warning for DEF Severe Inducement is present, consider it just like a "Check Engine Light" the reason for the inducement alarm is available under the menu: Metering->J1939-> Active DTC.

"Def Severe Inducement PA" (PA=Pre-Alarm): This is a notice to the operator to correct the issue before it escalates to an alarm.

Pre-alarm is commonly active when the DEF tank is at a low level, if the tank is refilled the Pre-Alarm is cleared and the unit has no adverse effects.

"DEF Severe Inducement A" (A=Alarm): This is a notice to the operator that an after treatment related DTC is causing the unit to enforce 70% de-rated power and the unit will not be allowed to carry full load. If the load is higher than 30% more than likely the control panel will show an "Under Frequency" (81) warning or alarm.

NOTICE

Unit derate occurs at below 0% DEF level. If DEF level is at empty, engine will shutdown. When refilling with diesel fuel is required, refill DEF tank as well.

NOTICE

Generator derating occurs during soot levels 4 and 5. Soot level 5 will cause the generator to shutdown If this condition occurs contact your nearest authorized service center.

DIESEL EXHAUST FLUID (DEF)

The amount of fluid in the DEF tank will be shown on the ECU Controller main screen during operation. The symbol shown in Figure 65 will be shown on the ECU monitor indicating the level of fluid in the DEF tank.

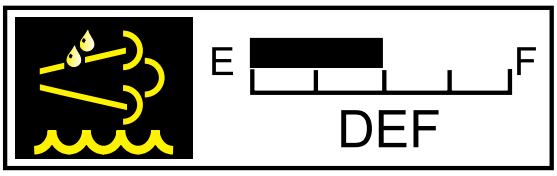


Figure 65. DEF Tank Level Guage

If the ***engine emissions system malfunction*** (EESM) symbol (Figure 66) is displayed during ECU controller operation, it indicates the following:

- Engine emissions are outside of normal operation range.
- Sysyem fault has occured.

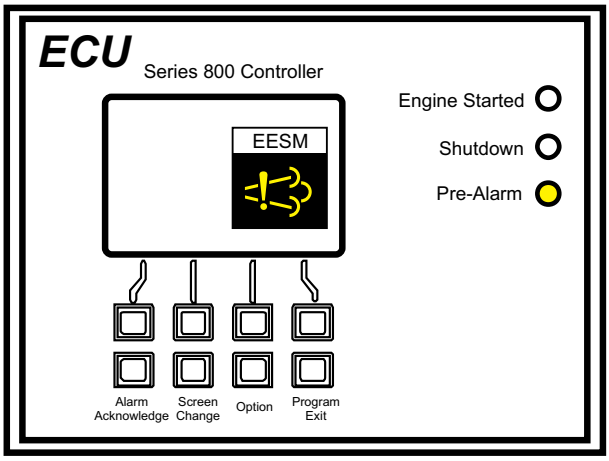


Figure 66. Engine Emissions System Malfunction Pre-Alarm

Table 14. DEF Level System Action System

DEF Level	Over 10%	Below 10%	0%	Empty or After 4 hrs. From 0%
Controller Message	—	DEF<10% Tank Level	DEF<10% Tank Level	DEF Tank Empty Level
DEF Symbol	—	ON	Blinking	Blinking
Pre-Alarm Lamp	—	—	ON	ON
Shutdown Lamp	—	—	—	ON Engine Shutdown

AUTO REGENERATION PROCEDURE

Auto regeneration process will automatically occur. No operator action is required for this process. Allow the engine to run for at least 30 minutes to complete the automatic regeneration process.

Reference Table 15 for the various soot level stages for the DPF system.

NOTICE

Generator derating occurs during soot levels 4 and 5. Soot level 5 will cause the generator to shutdown If this condition occurs contact your nearest authorized service center.

NOTICE

DO NOT perform regeneration in conditions where it may be unsafe due to high exhasust temperatures.

NOTICE

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

Table 15. Automatic DPF System

	Soot Level 0	Soot Level 1 & 2	Soot Level 3	Soot Level 4	Soot Level 5
Controller Message	N/A	N/A	FILTER CLEAN REQUESTED	SOOT LEVEL HIGH!	SOOT LEVEL VERY HIGH!
DPF Condition	Regen Not Required	Moderate Soot Level	High Soot Level	Very High Soot Level	Service DPF (Soot Only)
Pre-Alarm Lamp	N/A	N/A	Blinking	ON	ON
Shutdown Lamp	N/A	N/A	N/A	N/A	ON Engine Shutdown

REGENERATION (BASLER CONTROLLER)

If a manual regen is needed, the Basler DGC2020 HD controller will announce a pre-alarm on the controller. The pre-alarm will state "**NEED MAN REGEN**" and "**PRESS RUN BUTTON**". While in this condition, pressing the RUN button for 5 seconds will initiate the Stationary Forced Regen, it will then display a new pre-alarm "**MAN REGEN ACTIVE**". Once the regen completes, it will automatically shut down and display "**MAN REGEN COMPLT**".

DIAGNOSTIC MODE

There is a feature to put the controller in diagnostic mode. Diagnostic mode will keep the key switch on for service tool purposes. To place in diagnostic mode the engine must be in the off mode.

Press the "Alarm Silence" and the "Lamp Test" buttons at the same time for 5 seconds. To exit the diagnostic mode you can press reset, start the engine or turn control power off.

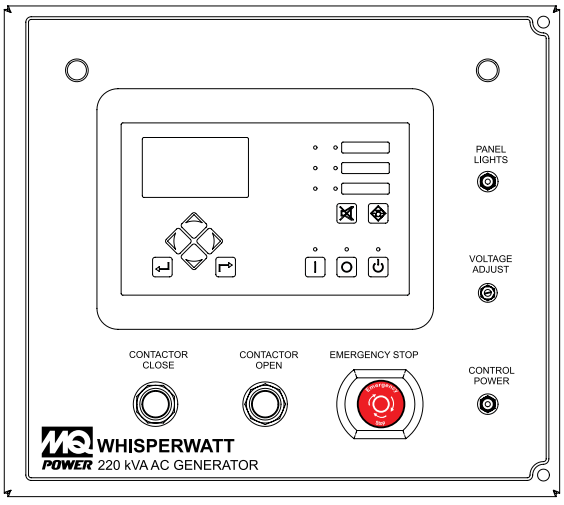
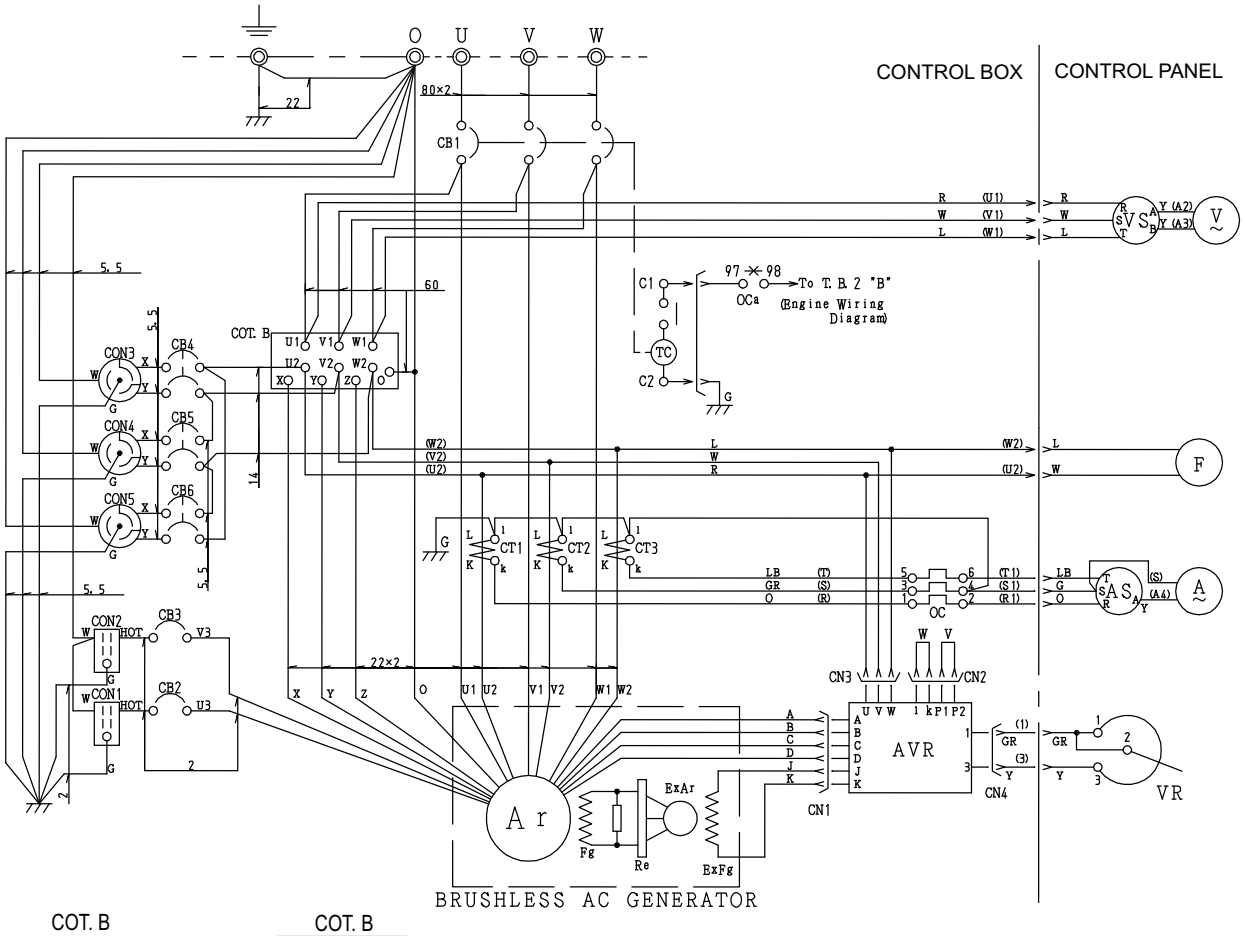
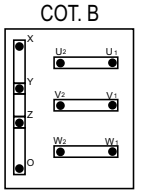
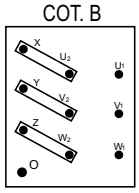


Figure 67. Basler DGC2020 HD Controller

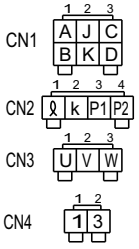




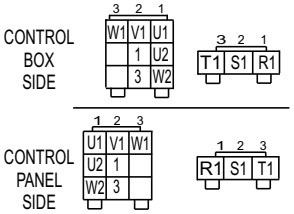
Voltage Change-Over Board-240V Set



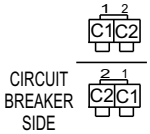
Voltage Change-Over Board-480V Set



AVR CONNECTOR (VIEW FROM INSERTING WIRE SIDE)



CONNECTOR (VIEW FROM INSERTING WIRE SIDE)

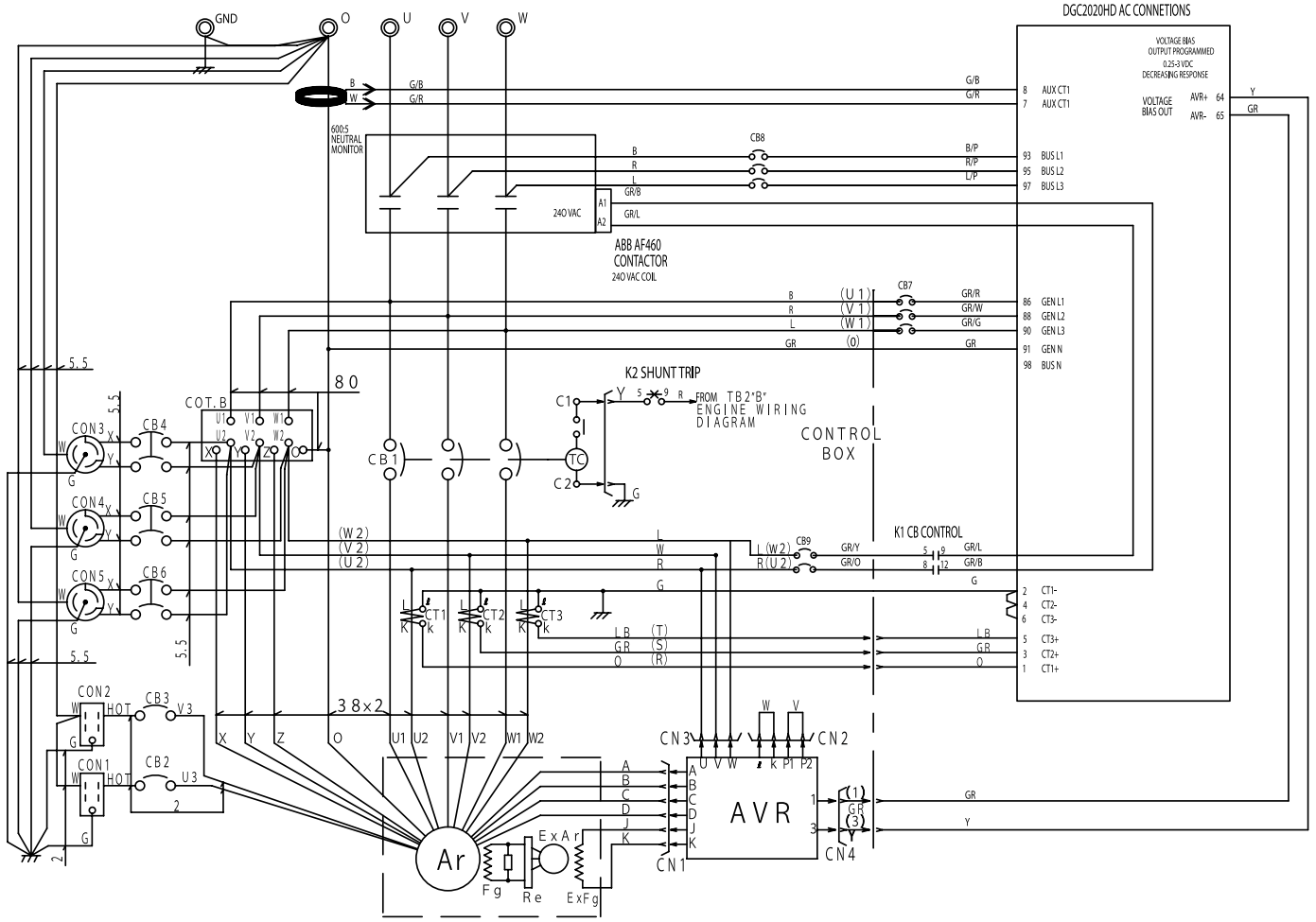


CB1 CONNECTOR (VIEW FROM INSERTING WIRE SIDE)

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		

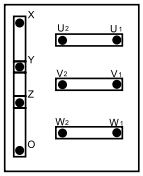
SYMBOL	DESIGNATION	SYMBOL	DESIGNATION
Ar	ARMATURE WINDING	COT. B	VOLTAGE CHANGE-OVER BOARD
Fg	MAIN GENERATOR FIELD WINDING	AS	AMMETER CHANGE-OVER SWITCH
Ex Ar	EXCITER ARMATURE WINDING	A	AC AMMETER 0~750, 1,500A
Ex Fg	EXCITER FIELD WINDING	VS	VOLTMETER CHANGE-OVER SWITCH
AVR	AUTOMATIC VOLTAGE REGULATOR	V	AC VOLTMETER 0~600V
VR	VOLTAGE REGULATING RHEOSTAT	F	FREQUENCY METER 45~65 Hz
Re	RECTIFIER	CB2~3	AUX. CIRCUIT BREAKER 20A
CT1~3	CURRENT TRANSFORMER 750/5A	CB4~6	AUX. CIRCUIT BREAKER 50A
CB1	CIRCUIT BREAKER 600 AMPS	CON2~3	RECEPTACLE 520R GFCI 20A, 125V
OC	OVER CURRENT RELAY	CON3~5	RECEPTACLE CS-6369 50A, 120/240V

GENERATOR WIRING DIAGRAM, BASLER (OPTION)



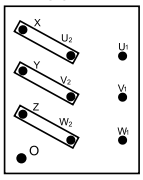
SYMBOL	DESIGNATION	SYMBOL	DESIGNATION
Ar	ARMATURE WINDING	COT. B	VOLTAGE CHANGE-OVER BOARD
Fg	MAIN GENERATOR FIELD WINDING	CB2~3	AUX. CIRCUIT BREAKER 1-POLE, 20A
Ex Ar	EXCITER ARMATURE WINDING	CB4~6	AUX. CIRCUIT BREAKER 2-POLE, 50A
Ex Fg	EXCITER FIELD WINDING	CB7~8	CIRCUIT BREAKER 3-POLE, 10A
AVR	AUTOMATIC VOLTAGE REGULATOR	CB9	CIRCUIT BREAKER 2-POLE, 20A
Re	RECTIFIER	K1	CONTACTOR, 240 VAC
CT1~3	CURRENT TRANSFORMER 750/5A	CON2~3	RECEPTACLE 520R GFCI 20A, 125V
CB1	CIRCUIT BREAKER 600 AMPS	CON3~5	RECEPTACLE CS-6369 50A, 120/240V

COT. B

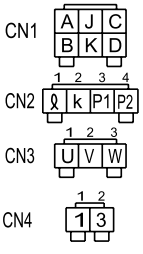


Voltage Change-Over Board-240V Set

COT. B

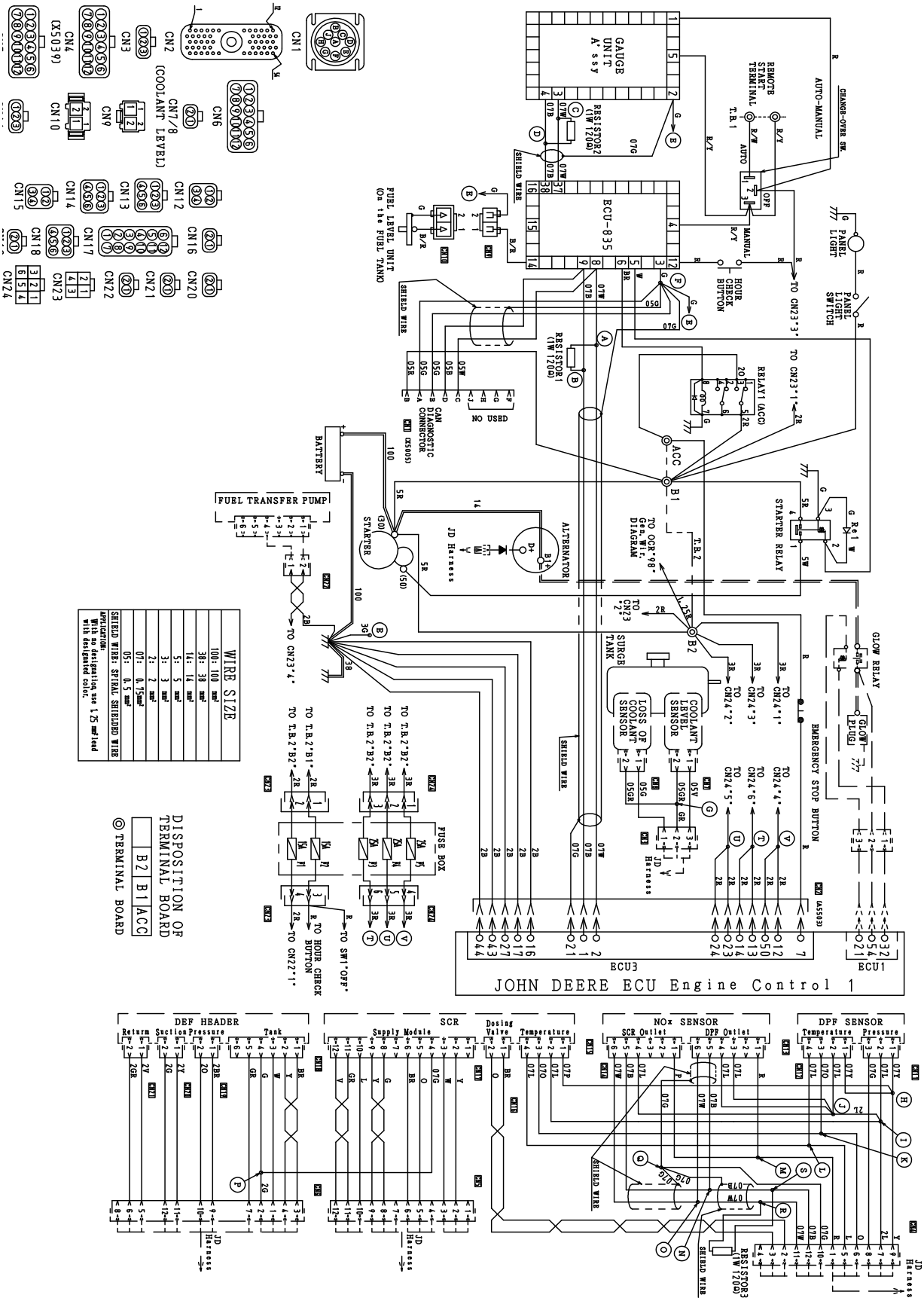


Voltage Change-Over Board-480V Set

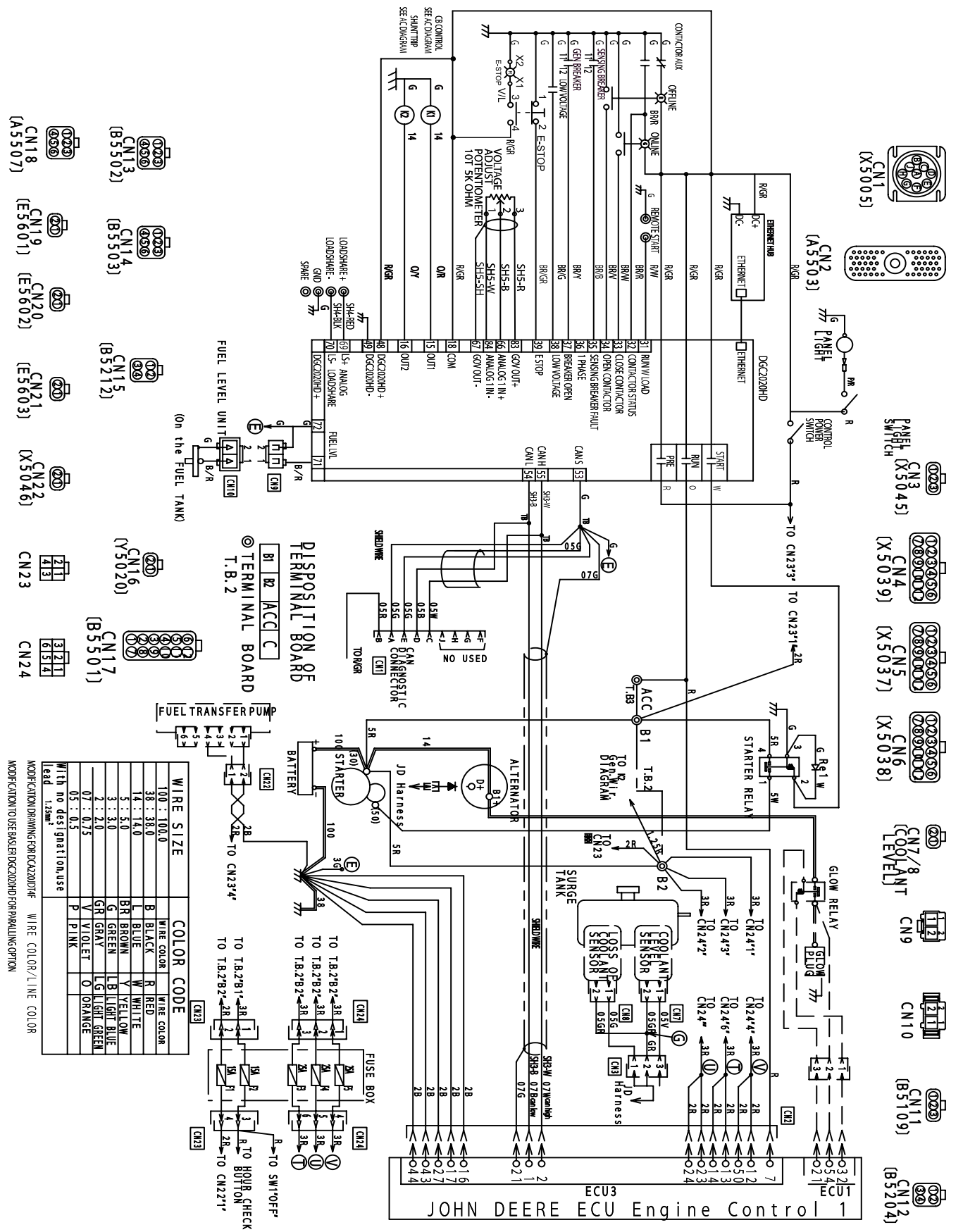


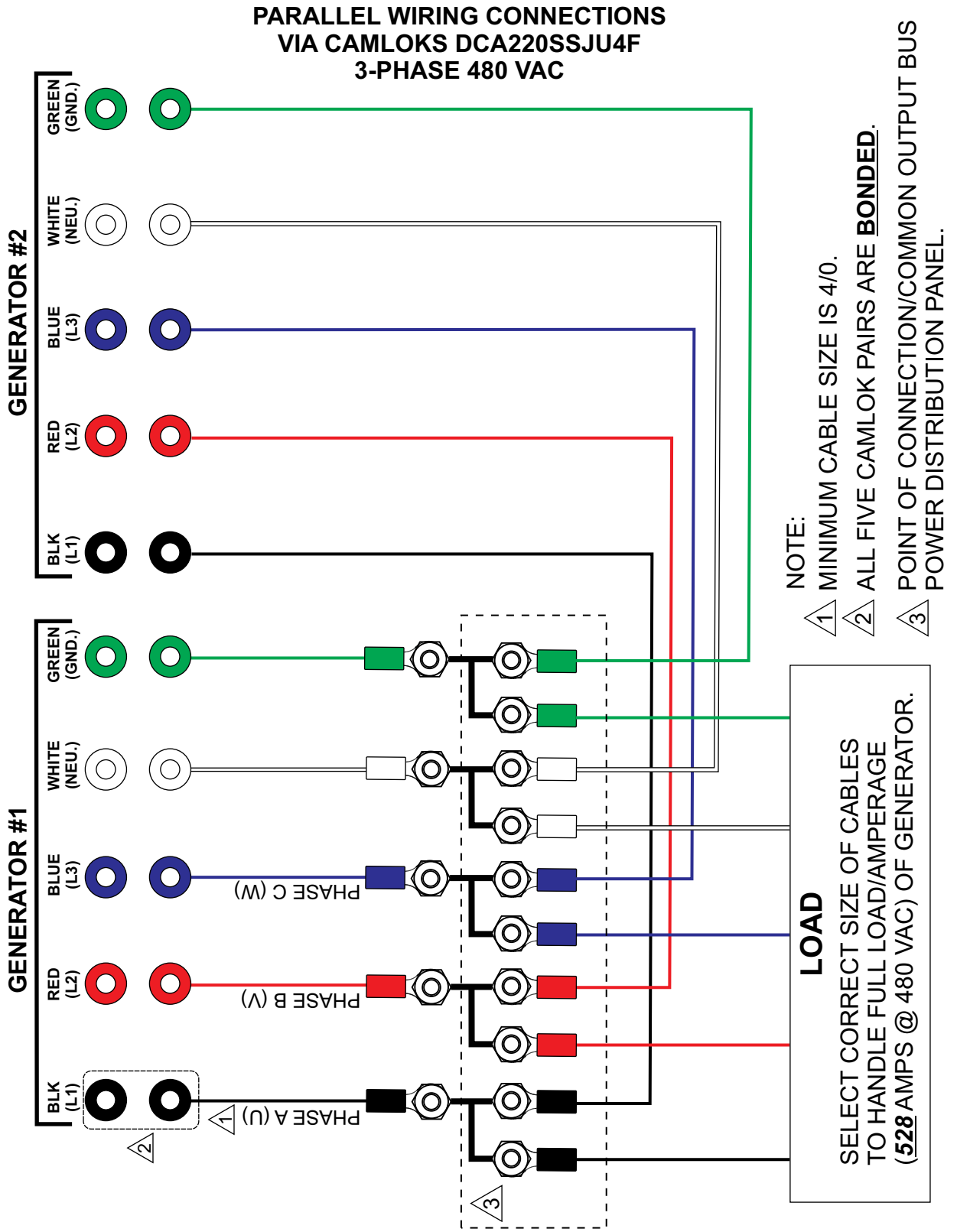
AVR CONNECTOR
(VIEW FROM INSERTING WIRE SIDE)

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		

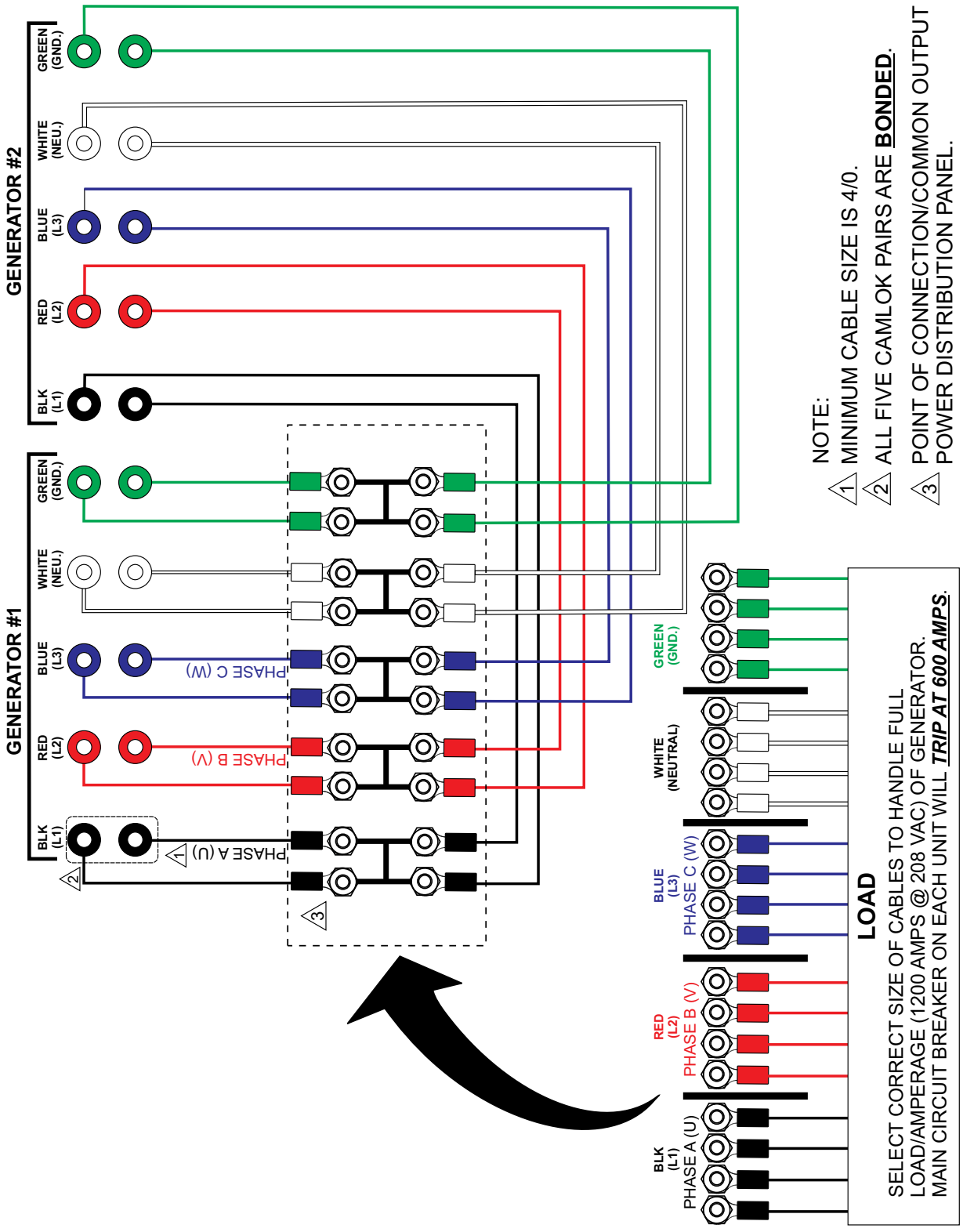

GAUGE UNIT A'ssy
ECU-835
AUTO-MANUAL
CHANGE-OVER SW.
REMOTE START TERMINAL
HOUR CHECK BUTTON
PANEL LIGHT
PANEL LIGHT SWITCH
RESISTOR2 (1W 120Ω)
RESISTOR1 (1W 120Ω)
RESISTOR3 (1W 120Ω)
SHIELD WIRE
FUEL LEVEL UNIT (On the FUEL TANK)
CAN DIAGNOSTIC CONNECTOR
NO USED
RELAY1 (ACC)
BATTERY
FUEL TRANSFER PUMP
STARTER
ALTERNATOR
STARTER RELAY
GLOW RELAY
GLOW PLUG
EMERGENCY STOP BUTTON
SURGE TANK
COOLANT LEVEL SENSOR
LOSS OF COOLANT SENSOR
FUSE BOX
TO OGR'98' Gen.Wir. DIAGRAM
JD Harness
ECU3
ECU1
JOHN DEERE ECU Engine Control 1
DEF HEADER
Return
Suction
Pressure
Tank
SCR
Supply Module
Dosing Valve
Temperature
NOx SENSOR
SCR Outlet
DPF Outlet
DPF SENSOR
Temperature
Pressure
CN1
CN2 (COOLANT LEVEL)
CN3
CN4 (X5039)
CN6
CN7/8
CN9
CN10
CN12
CN13
CN14
CN15
CN16
CN17
CN18
CN20
CN21
CN22
CN23
CN24
WIRE SIZE
100: 100 mm²
38: 38 mm²
14: 14 mm²
5: 5 mm²
3: 3 mm²
2: 2 mm²
07: 0.75mm²
05: 0.5 mm²
SHIELD WIRE: SPIRAL SHIELDED WIRE
APPLICATION:
With no designation use 1.25 mm² red with designated color.
DISPOSITION OF TERMINAL BOARD
B2 B1 ACC
TERMINAL BOARD

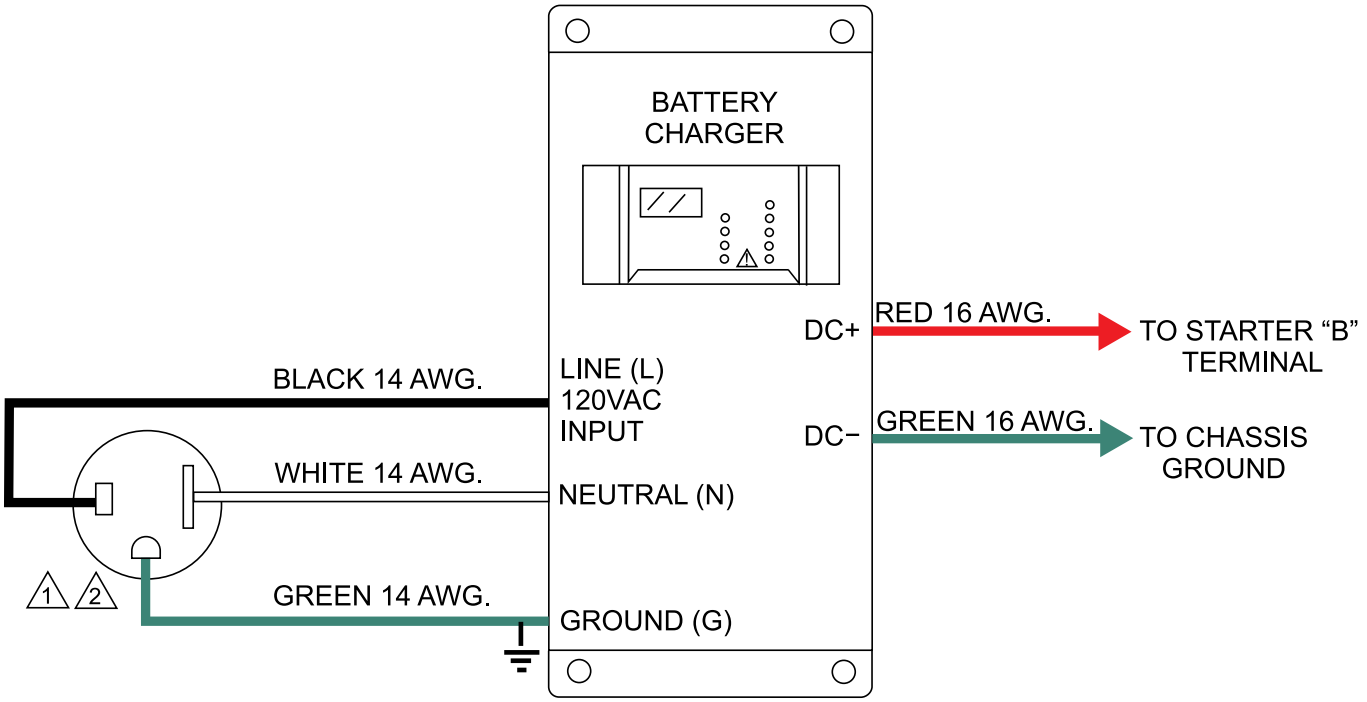
ENGINE WIRING DIAGRAM (BASLER DGC2020HD OPTION)




PARALLEL WIRING CONNECTIONS
VIA CAMLOKS DCA220SSJU4F
3-PHASE 480 VAC
GENERATOR #2
GENERATOR #1
GREEN (GND.)
WHITE (NEU.)
BLUE (L3)
RED (L2)
BLK (L1)
PHASE C (W)
PHASE B (V)
PHASE A (U)
LOAD
SELECT CORRECT SIZE OF CABLES
TO HANDLE FULL LOAD/AMPERAGE
(528 AMPS @ 480 VAC) OF GENERATOR.
NOTE:
1 MINIMUM CABLE SIZE IS 4/0.
2 ALL FIVE CAMLOK PAIRS ARE BONDED.
3 POINT OF CONNECTION/COMMON OUTPUT BUS
POWER DISTRIBUTION PANEL.

PARALLEL WIRING CONNECTIONS
VIA CAMLOKS DCA220SSJU4F
3-PHASE 208 VAC

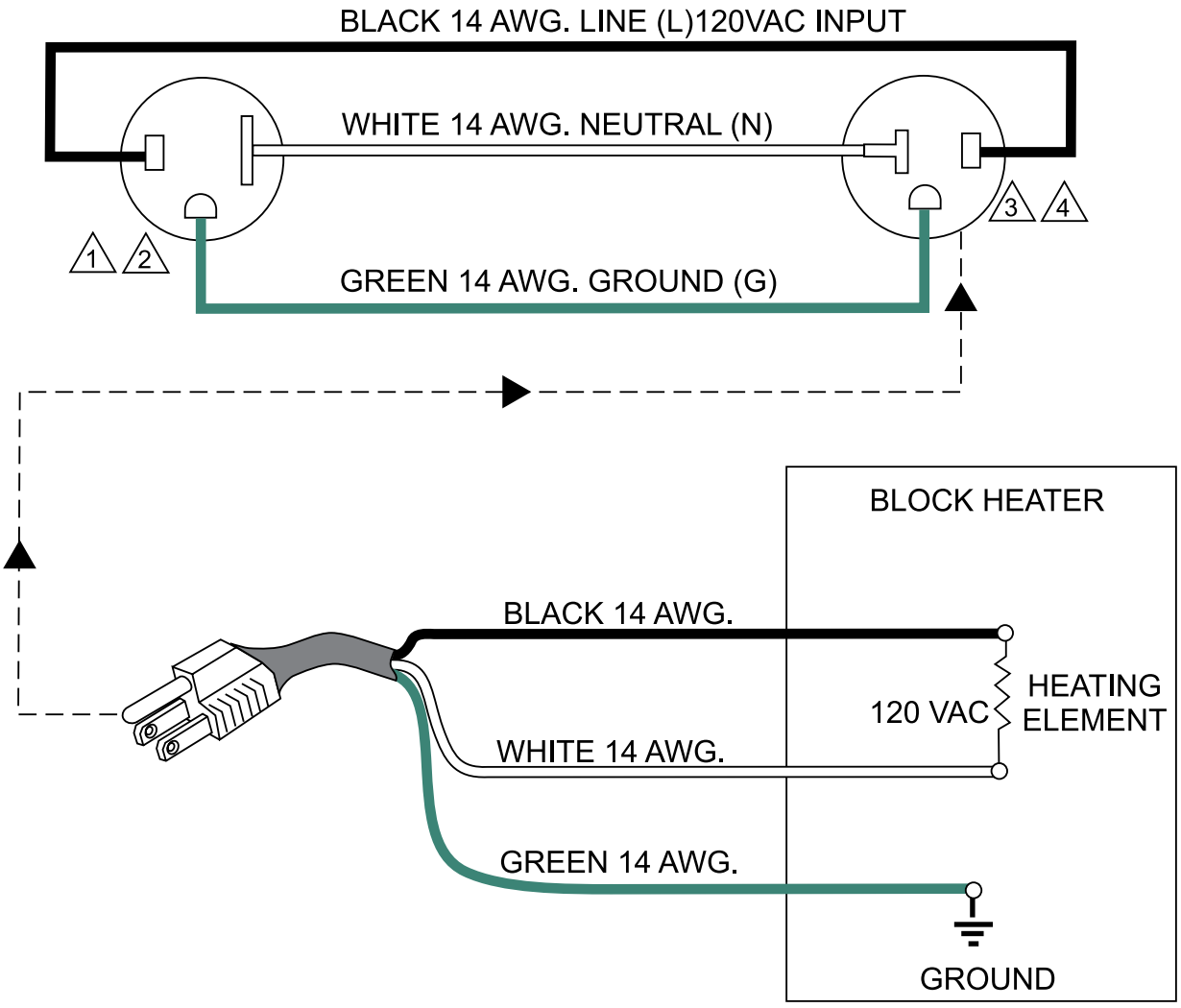




NOTES:

1. NEMA 5-15, 15A, 120 VAC (HBL5278C/HUBBLE RECEPTACLE).
2. RECEPTACLE IS MOUNTED ON OUTPUT TERMINAL PANEL ASSY.

WATER HEATING ELEMENT WIRING DIAGRAM (OPTION)



NOTES:

1. NEMA 5-15, 15A, 120 VAC (HBL5278C/HUBBLE RECEPTACLE)
2. RECEPTACLE IS MOUNTED ON OUTPUT TERMINAL PANEL ASSY.
3. NEMA L5-20R, 20A, 125 VAC (HBL5369C/HUBBLE RECEPTACLE).
4. RECEPTACLE IS MOUNTED ADJACENT TO WATER HEATING ELEMENT.

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 16 shown below for diagnosis of the Generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 16. Generator Troubleshooting

Symptom	Possible Problem	Solution
No Voltage Output	AC Voltmeter defective?	Check output voltage using a voltmeter.
	Is wiring connection loose?	Check wiring and repair.
	Is AVR defective?	Replace if necessary.
	Defective Rotating Rectifier?	Check and replace.
	Defective Exciter Field?	Check for approximately 19 ohms across J & K on CN1
Low Voltage Output	Is engine speed correct?	Turn engine throttle lever to "High".
	Is wiring connections loose?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
High Voltage Output	Is 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.
	Over current Relay actuated?	Confirm load requirement and replace.

The engine controller of this generator diagnoses problems that arise from the engine control system and the engine itself.

1. With the engine stopped (**OFF**). Push and hold the ***Hour Check Button*** (Figure 68) located on the control panel.

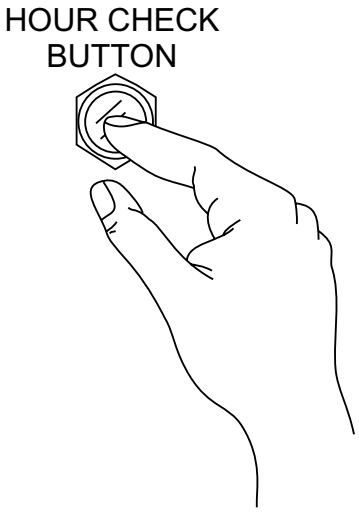


Figure 68. Hour Check Button

2. While keeping the ***Hour Check Button*** pressed, place the ***Auto Off/Reset Manual Switch*** (Figure 69) in the **MANUAL** position.

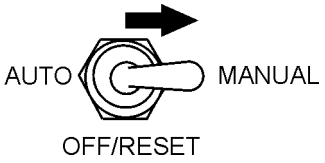


Figure 69. Auto-Off/Reset Switch (Manual Position)

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

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

6. After perfoming diagnostic tests, place the ***Auto Off/ Reset Manual Switch*** in the **OFF** position.

Touch Screen Operation

DGC-2020HDs with the color touch screen display option (style xTxxxxxxx) provide a convenient means of navigating through menus and settings by allowing direct interaction with what is displayed. All operations that can be performed using the touch screen can also be performed using the pushbuttons. However, critical settings must be initiated using the pushbuttons to prevent accidental operation with the touch screen.

Touch screen controls are illustrated in Figure A. Lettered locators in Figure A correspond to the control descriptions of Table A.

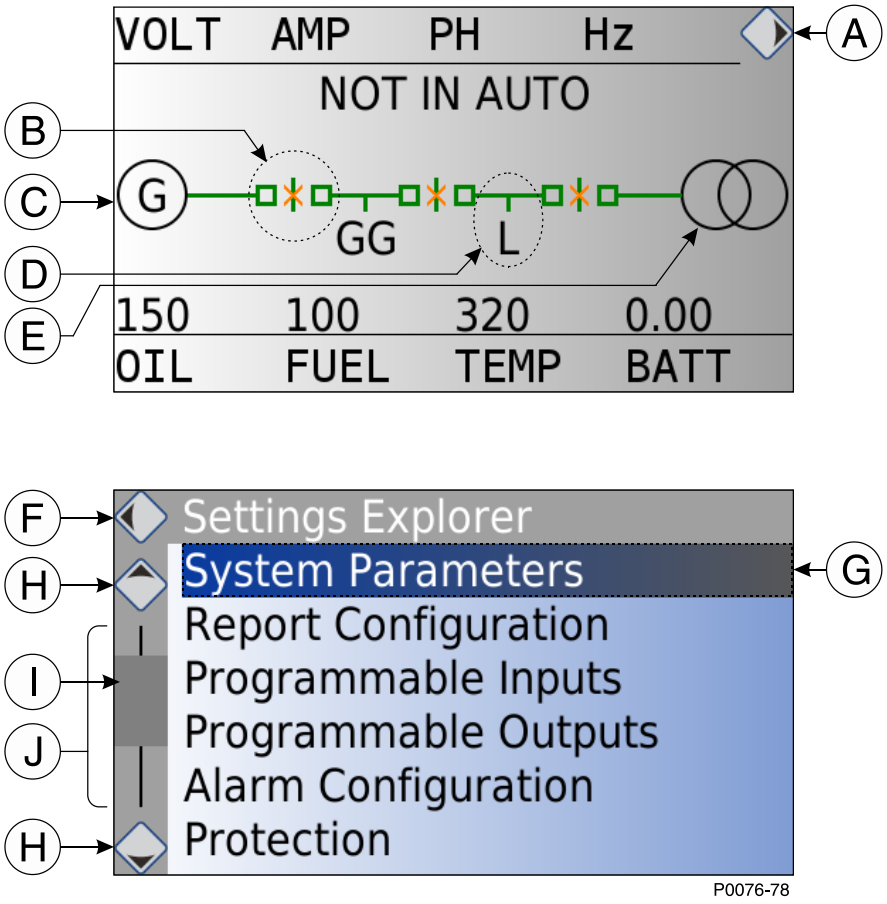


Figure A. Touch Screen Controls

Table A. Touch Screen Control Descriptions

Locator	Description
A	*Enter button*. This button, found only on the overview screen, enters the Main Menu.
B	Breaker control. To send an open or close request to a breaker in the system, follow these steps: 1. Touch the corresponding breaker in the diagram. 2. Press the up or down arrow keys to scroll the options. 3. Press Edit to send the selected breaker command request.
C	*Generator metering*. Touch the generator in the diagram to view metered voltage, current, frequency, kW, kvar, and power factor values of the local generator.

Locator	Description
D	*Bus metering*. Touch a bus in the diagram to view metered voltage, current, frequency, kW, kvar, and power factor values of the corresponding bus in the system.
E	*Mains metering*. Touch the mains in the diagram to view metered voltage, current, frequency, kW, kvar, and power factor values of the mains bus.
F	*Back button*. Touch the Back button to return to the previous menu.
G	*Menu Option*. Touch a menu option to enter its submenu. If the option is an editable value, adjust it using the arrow pushbuttons, and press the Edit pushbutton to accept the change.
H	*Up and Down Arrows*. Touching the Up arrow scrolls the menu options toward the top of the list and touching the Down arrow scrolls the menu options toward the bottom of the list.
I	*Scroll box*. This represents the range of options in the list that are currently being displayed. The scroll box has no touch commands.
J	*Scroll bar*. Scroll bars represent the entire list of options for the current menu screen. Touching a point in the white portion of the scroll bar will display the menu options at that position in the list.

Disabling the Touch Screen

Touch screen controls may be disabled by way of a setting, front panel pushbuttons, or automatically. A setting is provided on the Front Panel HMI screen to enable or disable the touch screen control. For details, refer to Display Setup, below. To disable touch screen controls using the front panel pushbuttons, press and hold Lamp Test then press Edit. Touch screen controls are disabled automatically if the touch screen detects a press for longer than 60 seconds.

Programmable Indicator Configuration

Up to three LED indicators may be programmed to suit the needs of a particular application. A replaceable card (Figure B) is provided that can be labeled to match the function of each programmable indicator.

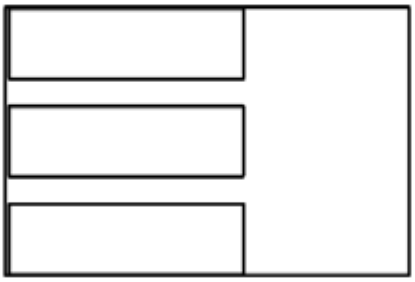


Figure B. Programmable Indicator Label Card

Information about configuring DGC-2020HD logic to control the programmable indicators can be found in the BESTlogic™*Plus* chapter.

To label the programmable indicators, perform the following steps.

1. Print the label text on readily-available address label sheets. The label card accommodates adhesive-backed labels measuring 0.5 by 1.75 inches. Avery part number 18167 is suitable for this purpose.
2. Remove all control power from the DGC-2020HD.
3. Remove the fasteners from the four mounting studs on the DGC-2020HD and separate it from the mounting panel or optional escutcheon plate. Disconnect the nine terminal block connectors; the Start, Run, and Pre relays; and the Ethernet (copper or fiber), USB, and DB-9 connectors.
4. Lay the front panel face-down on a suitable work surface.

5. Grasp the tab of the label card and pull free. The label card tab is located on the rear of the DGC-2020HD, see Figure C. When facing the back of the panel, the label card tab is on the left.
6. Apply the labels created in step 1 to the label cards. The rectangle outlines on the label card serve as guides for attaching the labels.
7. After applying the new labels, insert the label card into the slot. Ensure that the label card is oriented properly by viewing the custom labels through the label windows of the front panel.
8. Move the DGC-2020HD adjacent to the mounting panel or optional escutcheon plate and reconnect the cables removed in step 3.
9. Secure the DGC-2020HD to the mounting panel or optional escutcheon plate with the fasteners removed in step 3. The torque applied to the mounting hardware should not exceed 20 inch-pounds or 2.2 newton meters.
10. If desired, verify the function of the programmed indicators before returning the DGC-2020HD to service.

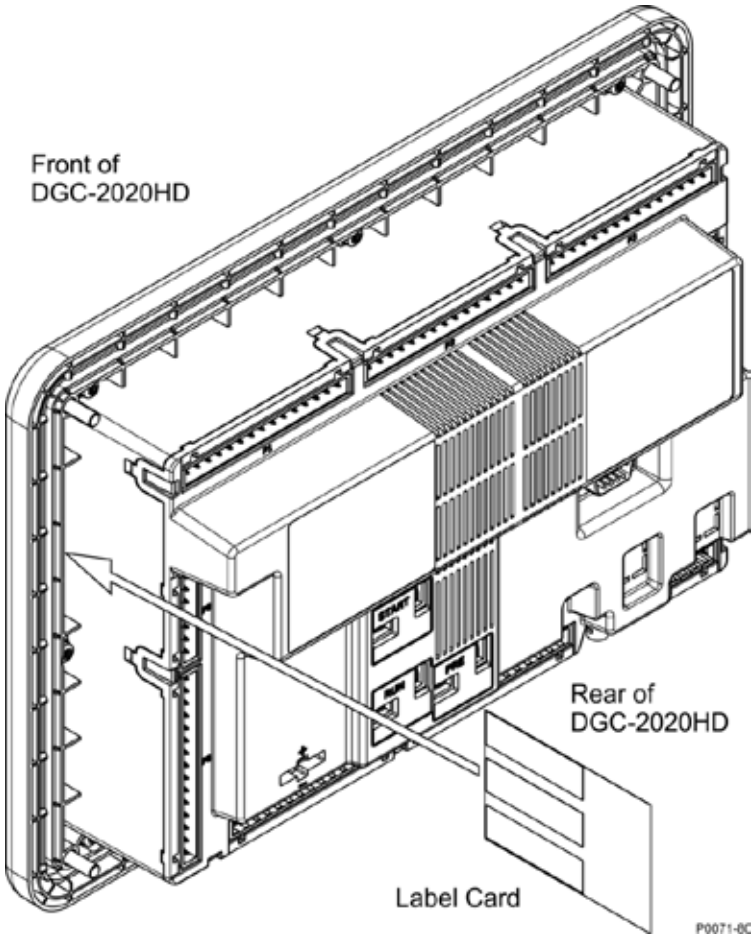


Figure C. Label Card Slot Location

Display Operation and Navigation

The front panel display is used to locally make settings changes and display metering values. Refer to items 11, 12 and 13 in Figure 6 for information on changing settings through the front panel and navigating through the screens.

Login and Permissions

When attempting to change a protected setting, the DGC-2020HD displays the Login Required screen. To log in, use the up or down arrow keys to scroll through the characters. Use the left or right arrow keys to enter more characters. Once the user name and password have been entered, press the Edit key to log in. To log out, press the Reset key while viewing any screen other than the following screen types:

- Action Event Screen (alarm/pre-alarm screens)
- CSV Screen
- Edit Screen
- Pixel Test Screen
- Real Time Clock Screen
- Overview Screen

If communication access is active through the modem, USB port, or Ethernet port, the front panel displays "REMOTE COMMS". If the remote user is logged in to BESTCOMS*Plus*® with Control security access or higher, the front panel can only be used for viewing metering data and settings information. Remote security access must be ended before modifying settings through the front panel.

Changing a Setting

To change a setting, navigate to the setting and press the Edit key. If you are not already logged in, you will be prompted for your password. Use the up or down arrow keys to raise or lower the value. Use the right or left arrow keys to select different digits. Press the Edit key again when finished.

Sleep Mode

Sleep mode de-energizes the LCD backlight when no pushbutton activity is detected for the duration of the LCD Backlight Timeout delay. Front panel LEDs remain lit during sleep mode. In units with the default monochrome LCD, the LCD heater is turned off during sleep mode. To enter sleep mode, the DGC-2020HD must be operating in OFF mode or Auto mode with the engine not running. Normal display operation resumes when any pushbutton is pressed or the genset is started remotely via the ATS input. Sleep mode is not entered while an alarm is active. Sleep mode can be permanently disabled through BESTCOMS*Plus*® or the front panel.

Overview Screen

The overview screen is the uppermost screen in the menu structure and is displayed by default. It displays metering information as well as a one-line diagram of the system's breaker configuration.

System Configuration One-Line Diagram

A one-line diagram of the system breaker configuration is displayed on the front panel. This diagram changes in real time to reflect the current state of the breakers.

The one-line diagram appears on both the front panel Overview and Summary screens.
Figure D, illustrates the different configurations of the one-line diagram.

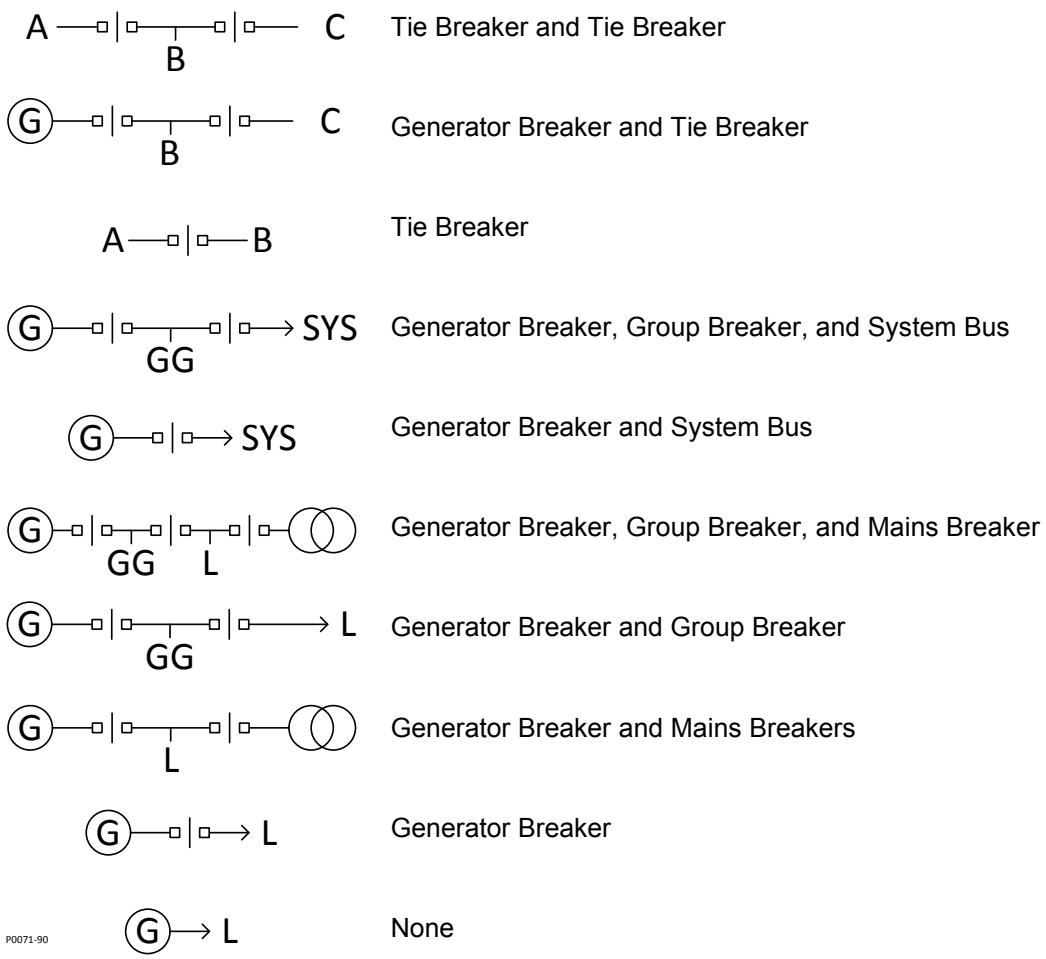


Figure D. System Configuration One-Line Diagrams

The diagrams in Figure D show all breakers in the open position and all buses in a dead/unstable state. Breaker and bus states in the diagram change in real time to reflect the actual breaker and bus status. When a breaker is open, the line between the contacts is vertical and when the breaker is closed, the line is horizontal. A stable bus is indicated by a filled rectangle and a bus in any state other than stable is indicated by an unfilled rectangle. On the optional touch screen, a dead bus is indicated by a green colored line segment and an energized (failed or stable) is indicated by a red colored line segment. See Figure E for the different breaker and bus states.

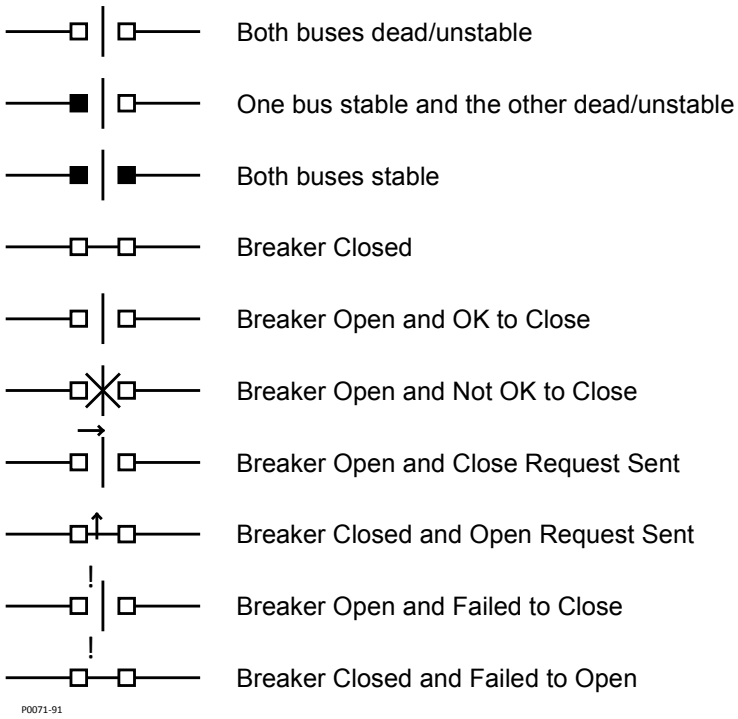


Figure E. One-Line Diagram Breaker and Bus States

Front Panel Shortcuts

Front panel shortcuts allow the user to intuitively view metered bus values and issue breaker commands by simply selecting components in the one-line diagram.

While viewing the overview screen, press Edit to enable a cursor in the system configuration one-line diagram. Moving the cursor, by using the left and right arrow keys, selects different components in the system diagram. A component selected by the cursor is displayed with inverted colors to differentiate it from the rest.

Select a bus in the diagram with the cursor and press Edit to view metered voltage, current, frequency, kW, kvar, and power factor values of the corresponding bus in the system.

To send an open or close request to a breaker in the system, move the cursor to the corresponding breaker in the diagram and press Edit. Press the up or down arrow keys to scroll the options. Press Edit again to send the selected breaker command request.

The system configuration one-line diagram which is displayed on the overview screen is determined by the System Type setting selection. For details on configuring the system type, see the *Configuration* chapter.

Scrolled Metering

BESTCOMS*Plus*® Navigation Path: Settings Explorer, General Settings, Front Panel HMI
Front Panel Navigation Path: Settings > General Settings > Front Panel HMI

When scrolled metering is enabled, user-selected metering values are displayed on the overview screen. Any number of the available values can be displayed. Up to nine values are displayed on the screen at one time. After the scroll time delay has elapsed, the next set of values is displayed and so on.

When scrolled metering is disabled, only the following parameters are displayed on the overview screen:

- VOLT∗
- AMP∗
- PH∗
- Hz
- OIL

- FUEL/DEF†
- TEMP/RUN HRS
- BATT/RUN HRS

∗ When scrolled metering is disabled, individual phase information can be automatically toggled at a rate set by the Phase Toggle Delay setting on the *Front Panel HMI* screen. When the Phase Toggle Delay is set to zero, information for each phase is obtained by pressing the up or down arrow keys on the front panel. When it is set to a number other than zero, the display will toggle through the phases automatically at the rate specified by the Phase Toggle Delay Setting. The overview screen automatically alternates the display of TEMP/BATT and RUN HRS.

† When a Selective Catalytic Reduction (SCR) with Diesel Exhaust Fluid (DEF) exhaust after-treatment system is implemented, the overview screen automatically alternates the display of FUEL level and DEF level.

To select the scrolling values, navigate to the Settings, General Settings, Front Panel HMI screen and edit the Scrolled Item Selection. The following parameters may be placed in the scrolling overview:

Adjusted Reserve Available
Analog Expansion Module 1: Inputs: AEM1 In1
Analog Expansion Module 1: Inputs: AEM1 In2
Analog Expansion Module 1: Inputs: AEM1 In3
Analog Expansion Module 1: Inputs: AEM1 In4
Analog Expansion Module 1: Inputs: AEM1 In5
Analog Expansion Module 1: Inputs: AEM1 In6
Analog Expansion Module 1: Inputs: AEM1 In7
Analog Expansion Module 1: Inputs: AEM1 In8
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD1
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD2
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD3
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD4
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD5
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD6
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD7
Analog Expansion Module 1: Resistance Temperature Detectors (RTD): AEM1 RTD8
Analog Expansion Module 1: Thermocouples: AEM1 TC1
Analog Expansion Module 1: Thermocouples: AEM1 TC2
Analog Expansion Module 2: Inputs: AEM2 In1
Analog Expansion Module 2: Inputs: AEM2 In2
Analog Expansion Module 2: Inputs: AEM2 In3
Analog Expansion Module 2: Inputs: AEM2 In4
Analog Expansion Module 2: Inputs: AEM2 In5
Analog Expansion Module 2: Inputs: AEM2 In6
Analog Expansion Module 2: Inputs: AEM2 In7
Analog Expansion Module 2: Inputs: AEM2 In8
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD1
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD2
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD3
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD4
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD5
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD6
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD7
Analog Expansion Module 2: Resistance Temperature Detectors (RTD): AEM2 RTD8
Analog Expansion Module 2: Thermocouples: AEM2 TC1
Analog Expansion Module 2: Thermocouples: AEM2 TC2
Analog Expansion Module 3: Inputs: AEM3 In1
Analog Expansion Module 3: Inputs: AEM3 In2
Analog Expansion Module 3: Inputs: AEM3 In3
Analog Expansion Module 3: Inputs: AEM3 In4
Analog Expansion Module 3: Inputs: AEM3 In5
Analog Expansion Module 3: Inputs: AEM3 In6
Analog Expansion Module 3: Inputs: AEM3 In7
Analog Expansion Module 3: Inputs: AEM3 In8
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD1
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD2
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD3
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD4
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD5

Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD6
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD7
Analog Expansion Module 3: Resistance Temperature Detectors (RTD): AEM3 RTD8
Analog Expansion Module 3: Thermocouples: AEM3 TC1
Analog Expansion Module 3: Thermocouples: AEM3 TC2
Analog Expansion Module 4: Inputs: AEM4 In1
Analog Expansion Module 4: Inputs: AEM4 In2
Analog Expansion Module 4: Inputs: AEM4 In3
Analog Expansion Module 4: Inputs: AEM4 In4
Analog Expansion Module 4: Inputs: AEM4 In5
Analog Expansion Module 4: Inputs: AEM4 In6
Analog Expansion Module 4: Inputs: AEM4 In7
Analog Expansion Module 4: Inputs: AEM4 In8
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD1
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD2
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD3
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD4
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD5
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD6
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD7
Analog Expansion Module 4: Resistance Temperature Detectors (RTD): AEM4 RTD8
Analog Expansion Module 4: Thermocouples: AEM4 TC1
Analog Expansion Module 4: Thermocouples: AEM4 TC2
Analog Inputs: Analog In 1
Analog Inputs: Analog In 2
Analog Inputs: Analog In 3
Analog Inputs: Analog In 4
Analog Outputs: AVR Output
Analog Outputs: GOV Output
Analog Outputs: LS Output
Base Load Level
Battery Voltage
Boost Pressure
Bus 1 Current: 3i0
Bus 1 Current: Average
Bus 1 Current: I1
Bus 1 Current: I2
Bus 1 Current: Phase A Current
Bus 1 Current: Phase B Current
Bus 1 Current: Phase C Current
Bus 1 Current: Ground
Bus 1 Dead
Bus 1 Failed
Bus 1 Forward Rotation
Bus 1 Frequency: Frequency
Bus 1 Frequency: Max ROCOF
Bus 1 Frequency: ROCOF
Bus 1 Power: Max Vector Shift
Bus 1 Power: Negative Var Hours Total
Bus 1 Power: Negative Watt Hours Total
Bus 1 Power: Phase A Complex Power
Bus 1 Power: Phase A Power Factor
Bus 1 Power: Phase A Vars
Bus 1 Power: Phase A Watts
Bus 1 Power: Phase B Complex Power
Bus 1 Power: Phase B Power Factor
Bus 1 Power: Phase B Vars
Bus 1 Power: Phase B Watts
Bus 1 Power: Phase C Complex Power
Bus 1 Power: Phase C Power Factor
Bus 1 Power: Phase C Vars
Bus 1 Power: Phase C Watts
Bus 1 Power: Positive Var Hours Total
Bus 1 Power: Positive Watt Hours Total
Bus 1 Power: Power Factor Lead/Lag
Bus 1 Power: Total Complex Power
Bus 1 Power: Total Power Factor
Bus 1 Power: Total Vars
Bus 1 Power: Total Watts
Bus 1 Power: Volt-Ampere Hours Total
Bus 1 Reverse Rotation
Bus 1 Stable
Bus 1 Voltage: Average Voltage L-L
Bus 1 Voltage: Average Voltage L-N
Bus 1 Voltage: Connection
Bus 1 Voltage: V2
Bus 1 Voltage: Voltage Phase A
Bus 1 Voltage: Voltage Phase A To Phase B
Bus 1 Voltage: Voltage Phase B
Bus 1 Voltage: Voltage Phase B To Phase C
Bus 1 Voltage: Voltage Phase C
Bus 1 Voltage: Voltage Phase C To Phase A
Bus 2 Current: 3i0
Bus 2 Current: Average
Bus 2 Current: I1
Bus 2 Current: I2
Bus 2 Current: Phase A Current

Bus 2 Current: Phase B Current
Bus 2 Current: Phase C Current
Bus 2 Current: Ground
Bus 2 Dead
Bus 2 Failed
Bus 2 Forward Rotation
Bus 2 Frequency: Frequency
Bus 2 Frequency: Max ROCOF
Bus 2 Frequency: ROCOF
Bus 2 Power: Max Vector Shift
Bus 2 Power: Negative Var Hours Total
Bus 2 Power: Negative Watt Hours Total
Bus 2 Power: Phase A Complex Power
Bus 2 Power: Phase A Power Factor
Bus 2 Power: Phase A Vars
Bus 2 Power: Phase A Watts
Bus 2 Power: Phase B Complex Power
Bus 2 Power: Phase B Power Factor
Bus 2 Power: Phase B Vars
Bus 2 Power: Phase B Watts
Bus 2 Power: Phase C Complex Power
Bus 2 Power: Phase C Power Factor
Bus 2 Power: Phase C Vars
Bus 2 Power: Phase C Watts
Bus 2 Power: Positive Var Hours Total
Bus 2 Power: Positive Watt Hours Total
Bus 2 Power: Power Factor Lead/Lag
Bus 2 Power: Total Complex Power
Bus 2 Power: Total Power Factor
Bus 2 Power: Total Vars
Bus 2 Power: Total Watts
Bus 2 Power: Volt-Ampere Hours Total
Bus 2 Reverse Rotation
Bus 2 Stable
Bus 2 Voltage: Average Voltage L-L
Bus 2 Voltage: Average Voltage L-N
Bus 2 Voltage: Connection
Bus 2 Voltage: V2
Bus 2 Voltage: Voltage Phase A
Bus 2 Voltage: Voltage Phase A To Phase B
Bus 2 Voltage: Voltage Phase B
Bus 2 Voltage: Voltage Phase B To Phase C
Bus 2 Voltage: Voltage Phase C
Bus 2 Voltage: Voltage Phase C To Phase A
Charge Air Temperature
Contact Expansion Module 1: CEM1 Input 1
Contact Expansion Module 1: CEM1 Input 2
Contact Expansion Module 1: CEM1 Input 3
Contact Expansion Module 1: CEM1 Input 4
Contact Expansion Module 1: CEM1 Input 5
Contact Expansion Module 1: CEM1 Input 6
Contact Expansion Module 1: CEM1 Input 7
Contact Expansion Module 1: CEM1 Input 8
Contact Expansion Module 1: CEM1 Input 9
Contact Expansion Module 1: CEM1 Input 10
Contact Expansion Module 2: CEM2 Input 1
Contact Expansion Module 2: CEM2 Input 2
Contact Expansion Module 2: CEM2 Input 3
Contact Expansion Module 2: CEM2 Input 4
Contact Expansion Module 2: CEM2 Input 5
Contact Expansion Module 2: CEM2 Input 6
Contact Expansion Module 2: CEM2 Input 7
Contact Expansion Module 2: CEM2 Input 8
Contact Expansion Module 2: CEM2 Input 9
Contact Expansion Module 2: CEM2 Input 10
Contact Expansion Module 3: CEM3 Input 1
Contact Expansion Module 3: CEM3 Input 2
Contact Expansion Module 3: CEM3 Input 3
Contact Expansion Module 3: CEM3 Input 4
Contact Expansion Module 3: CEM3 Input 5
Contact Expansion Module 3: CEM3 Input 6
Contact Expansion Module 3: CEM3 Input 7
Contact Expansion Module 3: CEM3 Input 8
Contact Expansion Module 3: CEM3 Input 9
Contact Expansion Module 3: CEM3 Input 10
Contact Expansion Module 4: CEM4 Input 1
Contact Expansion Module 4: CEM4 Input 2
Contact Expansion Module 4: CEM4 Input 3
Contact Expansion Module 4: CEM4 Input 4
Contact Expansion Module 4: CEM4 Input 5
Contact Expansion Module 4: CEM4 Input 6
Contact Expansion Module 4: CEM4 Input 7
Contact Expansion Module 4: CEM4 Input 8
Contact Expansion Module 4: CEM4 Input 9
Contact Expansion Module 4: CEM4 Input 10
Contact Inputs: Input 1
Contact Inputs: Input 2
Contact Inputs: Input 3
Contact Inputs: Input 4
Contact Inputs: Input 5
Contact Inputs: Input 6
Contact Inputs: Input 7
Contact Inputs: Input 8
Contact Inputs: Input 9
Contact Inputs: Input 10
Contact Inputs: Input 11
Contact Inputs: Input 12
Contact Inputs: Input 13
Contact Inputs: Input 14
Contact Inputs: Input 15

Contact Inputs: Input 16
Contact Outputs: Output 1
Contact Outputs: Output 2
Contact Outputs: Output 3
Contact Outputs: Output 4
Contact Outputs: Output 5
Contact Outputs: Output 6
Contact Outputs: Output 7
Contact Outputs: Output 8
Contact Outputs: Output 9
Contact Outputs: Output 10
Contact Outputs: Output 11
Contact Outputs: Output 12
Contact Outputs: Prestart
Contact Outputs: Run
Contact Outputs: Start
Coolant Level Settings
Coolant Pressure
Coolant Temperature
Device ID
Diesel Exhaust Fuel Tank Level 1
Diesel Exhaust Fuel Tank Level 2
Differential: Iop 2nd A
Differential: Iop 2nd B
Differential: Iop 2nd C
Differential: Iop 5th A
Differential: Iop 5th B
Differential: Iop 5th C
Differential: Iop A
Differential: Iop B
Differential: Iop C
Differential: Iop N
Differential: Ir A
Differential: Ir B
Differential: Ir C
DPF Outlet Gas Temperature
Engine Intercooler Temperature
Engine Load
Engine Oil Temperature
Engine Percent Load
Engine Speed (Rpm)
Fuel Level
Fuel Pressure
Fuel Rate
Fuel Temperature
Gen Current: 3i0
Gen Current: Average
Gen Current: Ground Current
Gen Current: I1
Gen Current: I2
Gen Current: Phase A Current
Gen Current: Phase B Current
Gen Current: Phase C Current
Gen Current: Ground
Gen Dead
Gen Failed
Gen Forward Rotation
Gen Frequency: Frequency
Gen Frequency: Max ROCOF
Gen Frequency: ROCOF
Gen Power: Max Vector Shift
Gen Power: Negative Var Hours Total
Gen Power: Negative Watt Hours Total
Gen Power: Phase A Complex Power
Gen Power: Phase A Power Factor
Gen Power: Phase A Vars
Gen Power: Phase A Watts
Gen Power: Phase B Complex Power
Gen Power: Phase B Power Factor
Gen Power: Phase B Vars
Gen Power: Phase B Watts
Gen Power: Phase C Complex Power
Gen Power: Phase C Power Factor
Gen Power: Phase C Vars
Gen Power: Phase C Watts
Gen Power: Positive Var Hours Total
Gen Power: Positive Watt Hours Total
Gen Power: Power Factor Lead/Lag
Gen Power: Total Complex Power
Gen Power: Total Power Factor
Gen Power: Total Vars
Gen Power: Total Watts
Gen Power: Volt-Ampere Hours Total
Gen Reverse Rotation
Gen Stable
Gen Voltage: Average Voltage L-L
Gen Voltage: Average Voltage L-N
Gen Voltage: Connection
Gen Voltage: V2
Gen Voltage: Voltage Phase A
Gen Voltage: Voltage Phase A To Phase B
Gen Voltage: Voltage Phase B
Gen Voltage: Voltage Phase B To Phase C
Gen Voltage: Voltage Phase C
Gen Voltage: Voltage Phase C To Phase A
Generated kvar
Generated kW
Injector Metering Rail Pressure
Intake Manifold Temperature
kvar Error

kvar PID
kvar Ramp Status
kvar Setpoint
kW Error
kW Load Percent
kW PID
kW Ramp Status
Load Share Active
Logic Control Relays: LCR 1-64
LS Input
Mains Base Load
Mains Total System kW Load
Next To Start
Next To Stop
Number of Units
Number of Units in Active Segment
Number of Units Online
Oil Pressure
PF Mode
PF Setpoint
Ramped Var Demand
Ramped Watt Demand
Rated kvar
Rated kW
Real Time Clock: Date
Real Time Clock: Time
Reserve Available
Speed Bias Output
Speed Error
Speed PID
Speed Source
System Load Bus: Frequency
System Load Bus: Total PF
System Load Bus: Total var
System Load Bus: Total Watt
System Load Bus: Average Current
System Load Bus: Average Voltage
System Generated kvar
System Generated kW
System Generated kW Percent
System Group Bus: Frequency
System Group Bus: Total PF
System Group Bus: Total var
System Group Bus: Total Watt
System Group Bus: Average Current
System Group Bus: Average Voltage
System Mains Bus: Frequency
System Mains Bus: Total PF
System Mains Bus: Total var
System Mains Bus: Total Watt
System Mains Bus: Average Current
System Mains Bus: Average Voltage
System Manager
System Online kvar Capacity
System Online kW Capacity
System Total kW Capacity
Total Fuel Used
Total Run Time
Var Demand
Var Mode
Volt Error
Volt PID
Voltage Bias Output
Watt Demand

Main Menu

Pressing the right arrow key while viewing the Overview screen opens the Main Menu screen. The Main Menu screen options consist of Metering, Settings, and Summary. Metering screens primarily display specific metering information. Settings screens primarily contain settings for configuring the DGC-2020HD. The Summary screen consists of a one-line diagram of the system configuration, mains fail transfer status, bus metering, and breaker command options.

Summary Screen

A one-line diagram, located at the top of the Summary screen, indicates system configuration and real time breaker status. This one-line diagram is essentially the same as the one described in *Overview Screen* above, except this diagram does not contain the shortcuts.

Mains fail transfer status is displayed just below the diagram. Mains fail transfer timers can be viewed by selecting Mains fail transfer status (top line) and pressing the right arrow key. Press the left arrow key to return to the Summary screen. See *Metering* chapter for details.

Metering of voltage, current, frequency, power, and power factor for the generator bus is displayed. Only metered voltage and frequency for Bus 1 and Bus 2 are displayed.

Breakers in the system are listed at the bottom of the Summary screen. To send an open or close request to a breaker in the system, move the cursor to the desired breaker in the list and press Edit. Press the up

or down arrow keys to scroll the options. Press Edit again to send the selected breaker command request. Breaker abbreviations are defined below:

- GB = Generator Breaker
- GGB = Generator Group Breaker
- MB = Mains Breaker
- TB = Tie Breaker
- TB2 = Tie Breaker 2

Front Panel Display Structure

The display structure of the Main Menu screens is provided below.

Metering

- **Engine**
  - Oil Pressure
  - Coolant Temperature
  - Battery Voltage
  - Engine Speed
  - Speed Source
  - Fuel Level
  - Engine Load
  - Coolant Level
  - Total Run Time
  - Hours to Maintenance
  - DEF Tank 1 Level (Visible when ECU Type is Standard, Volvo Penta, MTU SMC, MTU ADEC, GM/Doosan, Cummins, MTU SMC)
  - DEF Tank 2 Level (Visible when ECU Type is Standard, Volvo Penta, MTU SMC, MTU ADEC, GM/Doosan, Cummins, MTU SMC)
- **Gen**
  - Voltage
  - Current
  - Frequency
  - Power
  - Energy
  - Vector Shift
- **Bus 1**
  - Voltage
  - Current
  - Frequency
  - Power
  - Energy
    Vector Shift
- **Bus 2**
  - Voltage
  - Current
  - Frequency
  - Power
  - Energy
  - Vector Shift
- **Synchronization**
- **Differential**
  - Phase A
  - Phase B
  - Phase C
  - Phase Neutral
- **Bias Control**
  - Var Mode

  - PF Mode
  - Op Baseload Level
  - Op kvar Setpoint
  - Op PF Setpoint
- **Run Statistics**
  - Cumulative
  - Session
- **Status**
  - Status
  - Bus Condition
  - IO Module Connected
  - Run Request
  - Mains Power Control
- **Inputs**
  - Contact Inputs
  - Analog Input Values
  - Remote Contact Inputs
  - Remote Analog Input Values
  - Logic Control Relays
  - Remote System Manager Inputs
  - Broadcast Logic
- **Outputs**
  - Contact Outputs
  - Analog Outputs
  - Configurable Elements
  - Remote Contact Outputs
  - Remote Analog Outputs
- **Configurable Protection**
  - Configurable Protection 1 to Configurable Protection 32
- **Alarms**
- **Pre-Alarms**
- **Event Log**
  - Show Log
  - Reset
- **J1939 ECU**
  - J1939 Data (Visible when CAN Bus 2 ECU Support is enabled.)
  - J1939 Engine Config (Visible when CAN Bus 2 ECU Support is enabled.)
  - DTC Active Data (Visible when CAN Bus 2 ECU and DTC Support are enabled.)
  - DTC Previous Data (Visible when CAN Bus 2 ECU and DTC Support are enabled.)
- **MTU**
  - MTU Fault Codes (Visible when selected ECU type is MTU MDEC, MTU ADEC, MTU ECU7/8, and MTU Smart Connect.)
    MTU Status (Visible when selected ECU type is MTU MDEC, MTU ADEC, MTU ECU7/8, and MTU Smart Connect.)

- **System Status**
  - System Breaker Status
  - System Mains Bus
  - System Group Bus
  - System Load Bus
  - Power Breaker Sum
- **Real Time Clock**
- **Gen Network Status**
  - Units
  - Act Seg Units
  - Units Online
  - Sys Online kW Cap

  - Sys Online kvar Cap
  - Sys Generated kW
  - Sys Generated kW Percent
  - Sys Generated kvar
  - Sys Total kW Cap
  - ID1 to ID32
- **Gen Sequencing**
  - Mode
  - Next to Start
  - Next Start UID
  - Next to Stop
  - Next Stop UID
  - Start Timer 1
  - Start Timer 2
  - Stop Timer
  - Seq Mode
  - Sequence ID
  - Unit ID
  - Active Seg ID
  - Sys Manager
  - Sys Man UID
  - Start TD 1
  - Start TD 2
  - Stop TD
- **Load Shedding**
  - Sys Total Seq Reserve
  - Sys Online Reserve
  - Priority to Shed
  - Shed Delay
  - Shed Fast Delay
  - Priority to Add
  - Add Delay
  - Demand Start
  - Load 1 to 64
- **Reports**
  - Sequence of Events
  - Security Log
- **Diagnostics**
  - Control
  - Load Share Line
  - AEM-2020
  - CEM-2020
  - Mains Power

Settings

- **General Settings**
  - Front Panel HMI
  - Device Information
  - Access Control
  - Clock Setup
  - Display Units
- **Communication**
  - Ethernet
  - Ethernet 2 (Visible when redundant Ethernet is disabled.)
  - Redundant Ethernet
  - CAN Bus 1 (I/O) Setup
  - CAN Bus 2 (ECU) Setup

  - Modem Setup
  - RS485 Setup
  - RS232 Setup
  - Modbus Setup
  - Email Setup
- **System Parameters**
  - System Settings
  - Group Settings
  - Rated Data
  - Sensing Transformers
  - Remote Module Setup
  - Crank Settings
  - Auto Restart
  - Exercise Timer
  - Relay Control
  - Auto Config Detect
  - Engine Statistics
  - Seven Day Timer
- **Report Configuration**
  - Data Log
  - Trending
  - Sequence of Events Setup
- **Programmable Inputs**
  - Contact Inputs
  - Analog Inputs
  - Programmable Functions
  - Remote Contact Inputs
  - Remote Analog Inputs
  - Remote RTD Inputs
  - Remote Thermocouple Inputs
  - Remote Sys Manager Inputs
- **Programmable Outputs**
  - Output Contacts
  - Configurable Elements
  - Remote Contact Outputs
  - Remote Analog Outputs
- **Alarm Configuration**
  - Horn Configuration
  - Pre-Alarms
  - Alarms
  - Sender Fail
  - Prog Alarms
- **Protection**
  - Settings Group 0
  - Settings Group 1
  - Settings Group 2
  - Settings Group 3
  - Configurable Protection
- **Breaker Management**
  - Breaker Management
  - Breaker Hardware
  - Bus Condition
  - Synchronizer
  - Breaker Power Sum
- **Bias Control**
  - AVR Bias Control
  - GOV Bias Control
  - Mains Power Control

- **Multigen Management**
  - AVR Output
  - GOV Output
  - LS (Load Share) Output
  - Demand Start/Stop
  - Sequencing
  - Network Configuration
  - Load Shedding
- **Logic**
  - Logic Timers (1-8)
  - Logic Timers (9-16)
  - Logic Counters
  - Broadcast Logic

Summary

- System Configuration One-Line Diagram
- Mains Fail St (Status)
  - Mains Fail St (Status)
  - Transfer Delay
  - Max Transfer Time
  - Return Delay
  - Return Timer
  - Max Parallel Time
  - Open Transition Delay
- Gen VLL
- Gen Hz
- Gen Aac
- kW
- kvar
- PF (Power Factor)
- PF Lead/Lag
- Bus1 VLL
- Bus1 Hz
- Bus2 VLL (optional)
- Bus2 Hz (optional)
- GB Command (Visible when Generator Breaker control is enabled.)
  - Open, Close, or None
- GGB Command (Visible when Generator Group Breaker control is enabled.)
  - Open, Close, or None
- MB Command (Visible when Mains Breaker control is enabled.)
  - Open, Close, or None
- TB Command (Visible when Tie Breaker control is enabled.)
  - Open, Close, or None
- TB2 Command (Visible when Tie Breaker 2 control is enabled.)
  - Open, Close, or None

Display Setup

BESTCOMS*Plus*® Navigation Path: Settings Explorer, General Settings, Front Panel HMI
Front Panel Navigation Path: Settings > General Settings > Front Panel HMI

The DGC-2020HD LCD can be customized to fit the needs of your specific application. Most of the options can be adjusted using the front panel buttons while all options can be adjusted within BESTCOMS*Plus*. The display options are described below. Figure F shows the BESTCOMS*Plus* Front Panel HMI settings screen. Settings are listed in Table B.

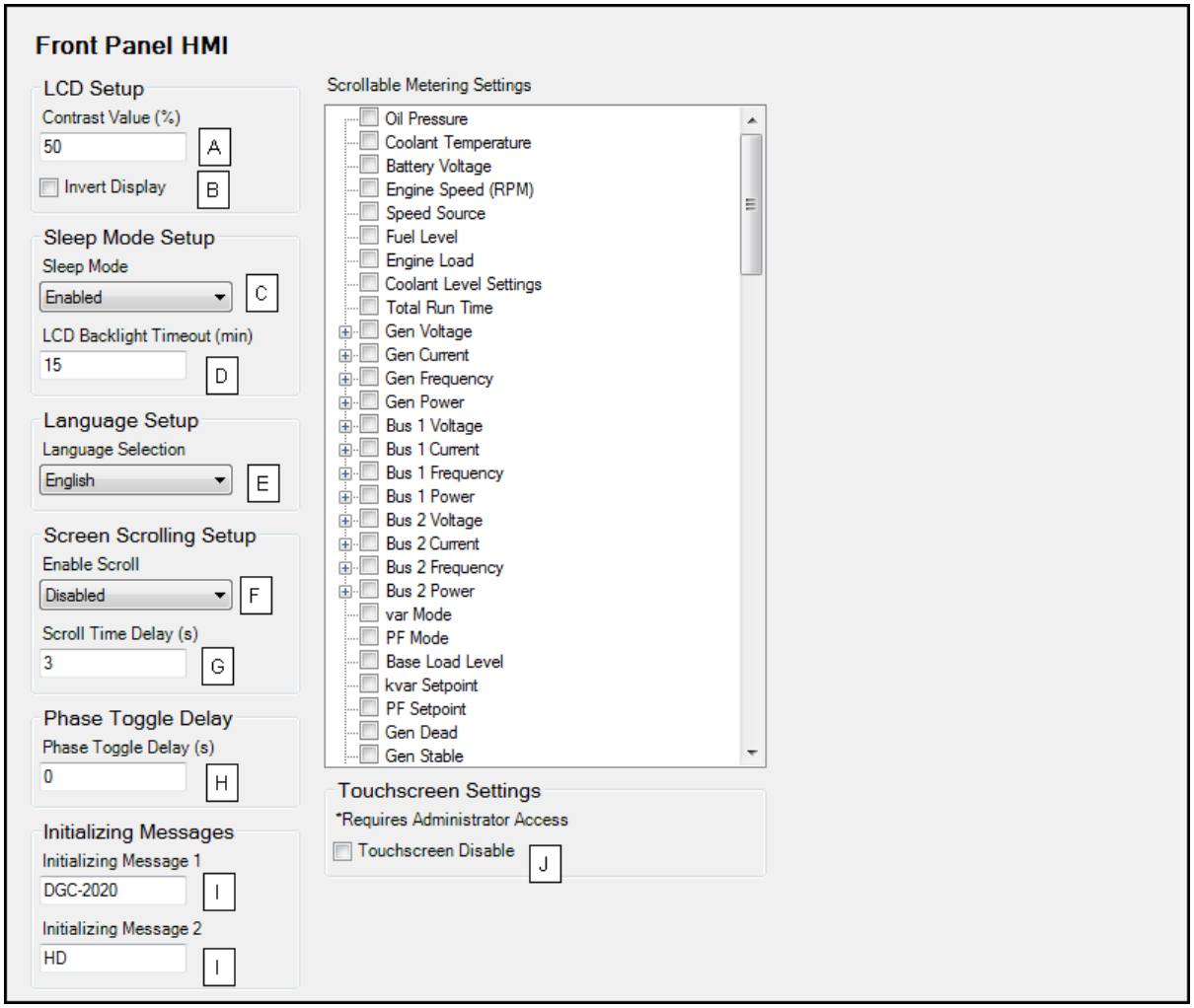


Figure F. Front Panel Settings Screen

Table B. Settings for Front Panel Settings Screen

Locator	Setting	Range	Increment	Unit
A	Contrast Value	0 to 100	1	%
B	Invert Display	Enabled or Disabled	n/a	n/a
C	Sleep Mode	Enabled or Disabled	n/a	n/a
D	LCD Backlight Timeout	1 to 120	1	minutes
E	Language Selection	English, French, Spanish, or German	n/a	n/a
F	Enable Scroll	Enabled or Disabled	n/a	n/a
G	Scroll Time Delay	1 to 600	varies	seconds
H	Phase Toggle Delay	0 to 120	1	seconds
I	Initializing Message	Up to 16 alphanumeric characters	n/a	n/a
J	Touchscreen Disable	Enabled or Disabled	n/a	n/a

LCD Contrast

Adjust this setting to compensate for your LCD viewing angle, the available ambient light, or the ambient temperature. This setting accepts values from 0 to 100, in increments of 1 percent.

Invert Display

When enabled, the LCD background is dark with light text.

Sleep Mode

Select *enabled* to send the DGC-2020HD into sleep mode during periods of inactivity to minimize battery drain.

LCD Backlight Timeout

When Sleep Mode is enabled, this setting dictates the amount of time that must elapse before the DGC-2020HD enters sleep mode. This setting accepts values from 1 to 120, in increments of 1 minute.

Language Selection

Front panel text is displayed in the selected language. Select English, French, Spanish, or German.

Screen Scrolling Setup

When scrolled metering is enabled, user-selected metering values are displayed on the overview screen. Any number of the available values can be displayed. Up to nine values are displayed on the screen at one time, after the scroll time delay has elapsed, the next set of values is displayed and so on.

Initializing Messages

Two custom initializing messages are displayed on the boot screen of the DGC-2020HD.

Touchscreen Disable

When checked, the touch screen controls are disabled.

Splash Screen

BESTCOMS*Plus*® Navigation Path: Settings Explorer, General Settings, Splash Screen
Front Panel Navigation Path: Not available through front panel

A splash screen, which is displayed for a few seconds upon powering up the DGC-2020HD, can be customized. The image must be exactly 480 pixels wide and 272 pixels high. Acceptable image formats are BMP, JPG, GIF, and PNG. This is only available to units with the optional color touch screen (style xTxxxxxxx).

Connect to the unit using BESTCOMS*Plus*. Click the Browse button on the Splash Screen, navigate to the desired image, select it, and click Open. If successful, the image appears in the Splash Screen in BESTCOMS*Plus*. Upload settings to the DGC-2020HD to transfer the image.

OPERATION MANUAL

HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL NUMBER ON-HAND WHEN CALLING

UNITED STATES

Multiquip Corporate Office

18910 Wilmington Ave.
Carson, CA 90746
Contact: mq@multiquip.com

Tel. (800) 421-1244
Fax (310) 537-3927

MQ Parts Department

800-427-1244
310-537-3700

Fax: 800-672-7877

Service Department

800-421-1244
310-537-3700

Warranty Department

800-421-1244
310-537-3700

Fax: 310-943-2249

Technical Assistance

800-478-1244

Fax: 310-943-2238

CANADA

Multiquip

4110 Industriel Boul.
Laval, Quebec, Canada H7L 6V3
Contact: infocanda@multiquip.com

Tel: (450) 625-2244
Tel: (877) 963-4411
Fax: (450) 625-8664

UNITED KINGDOM

Multiquip (UK) Limited Head Office

Unit 2, Northpoint Industrial Estate,
Globe Lane,
Dukinfield, Cheshire SK16 4UJ
Contact: sales@multiquip.co.uk

Tel: 0161 339 2223
Fax: 0161 339 3226

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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